

**The African Green Revolution and the Food Sovereignty
Movement: Contributions to Food Security and Sustainability**
A Case-study of Mozambique

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Although there is consensus among academics and policy makers that how we grow and distribute food needs to be more sustainable, the most appropriate ways of doing so remain unclear and are at times deeply contested. Over the last decade, two vastly different approaches to food security and sustainability have become increasingly prominent in Sub-Saharan Africa. One is the African Green Revolution, implemented by a consortium of partners comprised of African governments, the private sector, philanthropic donors, and multilateral institutions. The other is the African food sovereignty movement, headed by Africa's peasant unions and civil society organizations.

The ontological backgrounds of these two agrarian models inevitably influence their respective approaches to food security and sustainability in the different regions of Sub-Saharan Africa. The African Green Revolution is bent in favor of modern rationalist notions about structural transformation and development. The food sovereignty model is inspired by historical structural theories that tackle issues of power and (in)justice embedded within global political and economic structures. These diametrically opposed ideological foundations help to explain the polarization and tensions that exist between the two models. Such tensions, however, also hinder fruitful discussion about how to effectively address key concerns in Africa's food systems.

To advance the academic debates, this dissertation explores the following question: in what ways can sustainability assessment frameworks give insights into the potential contributions of the African Green Revolution and food sovereignty approaches to food security and sustainability in rural Mozambique? This study had three research objectives: (1) to refine conceptually and apply a sustainability assessment framework that merges key food security and sustainability goals in southern Africa's food and agricultural systems; (2) to better understand the perspectives of stakeholders implementing the African Green Revolution and the food sovereignty models as well as the farmers that they serve to determine what each model offers in terms of food security and sustainability; and (3) to tease out the implications of the two models' activities on the ground, including their potential impact on food and agricultural policies.

In 2014 and 2015, fieldwork was conducted in Mozambique, where both agrarian models are being implemented by two organizations. The African Green Revolution is supported by the Alliance for a Green Revolution in Africa (AGRA), and the food sovereignty model is represented by the National Union of Mozambican Peasants (UNAC). The field-research was designed to comparatively assess how the activities of these two organizations contribute to food security and sustainability from farmer perspectives. Various techniques were used to gather data, including a comprehensive literature review, semi-structured interviews with key informants (n=71) and participant observations.

The research identified five interrelated sustainable food system indicators that were informed by farmer perspectives and sustainability assessment literature: access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement. Taken together, these indicators can help to address both the technical aspects of meeting food security (issues of

production) and the policy and political economy issues that facilitate (or hinder) the means to achieving food security.

The research finds that the African Green Revolution and food sovereignty models respond to the needs of Mozambican smallholder farmers in more complex and nuanced ways than mainstay discussions in academic and public forums reveal. While some scholars and actors contend that the African Green Revolution and food sovereignty models are incongruent, Mozambican smallholder farmers utilize some of the resources that the models offer in complementary rather than competing ways. Neither model addresses critical components of food security and sustainability in their entirety. Where possible, farmers engage both models—taking from each what helps them to meet these two goals.

The conflicting interplay between the African Green Revolution and the food sovereignty movement at the broader political-economy level, versus farmers' complementary engagement with the two models, illustrates that meeting food security and sustainability objectives is, in some contexts, messy. This realization suggests a need for further research, particularly on options that may serve broad-based sustainability goals in Africa's food systems.

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DEDICATION

This dissertation is dedicated to the smallholder farmers of Mozambique who work tirelessly to produce food for their communities amidst difficult social and ecological pressures. This work is also dedicated to the loving memory of my friend Lael Stegall.

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LIST OF ABBREVIATIONS

- AFSA – Alliance for Food Sovereignty in Africa
- AGRA – Alliance for a Green Revolution in Africa
- CAADP – Comprehensive Africa Agriculture Development Programme
- DUAT – Direito de uso e Aproveitamento dos Terras (State-granted Land Right)
- DUS – District, Uniform and Stable
- FAO – Food and Agriculture Organization of the United Nations
- FOs – Farmers Organizations
- IPRs – Intellectual Property Rights
- ISFM – Integrated Soil Fertility Management
- MAP – Marketing Access Program (AGRA)
- MINAG – Ministry of Agriculture of Mozambique
- MT – Meticaís¹
- NGOs – Non-governmental Organizations
- PASS – Program for Africa's Seed Systems (AGRA)
- PPPs – Public-Private Partnerships
- SADC – Southern African Development Community
- SAFA – Sustainability Assessment of Food and Agricultural Systems
- SHP – Soil Health Program (AGRA)
- SMART – Smallholder Market Access for Rural Transformation (AGRA)
- UNAC – National Union of Mozambican Peasants
- UCAM – União de Cooperativas Agrícolas de Marracune (UNAC)
- UCAMA – União Provincial de Camponeses de Manica (UNAC)

¹ The Mozambican currency is Meticaís (singular Metical) (MT). At the time of my fieldwork in 2014, the exchange rate was approximately 1 USD = 30 MT

Chapter 1

Introduction

1.1 Research Context and Problem Rationale

Sub-Saharan Africa faces substantial challenges with respect to achieving food security in a manner that is both sustainable and equitable (NEDAP 2009; African Union 2014). Although the continent is characterized by vast regional differences, the Intergovernmental Panel on Climate Change (IPCC 2014) demonstrates that most regions are increasingly vulnerable to the impacts of climate change, seeing irregular temperatures and rainfall patterns. These changes are predicted to very likely reduce crop productivity and to adversely affect food security, particularly in seasonally dry areas (IPCC 2014, p. 1202). At the same time, the continent has the highest prevalence of undernourishment globally, estimated at 23 percent of its population (FAO 2015a, p.12). These challenges suggest that Africa's farmers will face difficult growing conditions, resulting in a need to produce and distribute food more sustainably. Sustainability in food and agricultural systems refers to practices that contribute to food security, social equity, and environmental benefits, while reducing ecological pressures (FAO 2012a).

There is consensus among academics and policy makers that how we grow and distribute food needs to be more sustainable and to contribute more to sustainability in general. However, the best approaches to doing so remain unclear and are at times deeply contested. Over the last decade, two vastly different approaches to food security and sustainability have become increasingly prominent in Sub-Saharan Africa. One is proposed by the African Green Revolution, implemented by a consortium of partners comprised of African governments, the private sector, philanthropic donors and multilateral institutions. The African Green Revolution emerged at the turn of the millennium as a philanthropic initiative, primarily led by the Rockefeller Foundation, to help stimulate production through improved technologies and to create dynamic agricultural markets that benefit smallholder farmers (DeVries and Toenniessen 2001; Rockefeller Foundation 2006; Toenniessen et al. 2008).

The other approach is proposed by the African food sovereignty movement, headed by Africa's peasant unions and civil society organizations. This model emerged in response to trade liberalization policies, especially structural adjustment policies across the global south that marginalized and impoverished rural populations (Desmarais 2007; McMichael 2014). Food

sovereignty seeks to foster greater equity and justice in the food system, e.g., to ensure more equitable access to productive resources, as well as to grow food using the principles of agro-ecology.

The ideological backgrounds of these two agrarian approaches inevitably influence their respective approaches to food security and sustainability in Sub-Saharan Africa. The African Green Revolution favors modern rationalist notions of structural transformation and agricultural development. For example, pioneers of the African Green Revolution tend to assume that farmers will readily adopt new farming technologies, provided that they can gain access to input and output markets, and as such should see improvements in crop yields and in food security (Toeniessen et al. 2008, p. 239).

At the same time, food sovereignty is inspired by historical structural ideas that tackle issues of power and (in)justice embedded within global political and economic structures. The food sovereignty movement first emerged in Latin America in the early 1990s, and has since been taken up by peasant organizations in parts of Sub-Saharan Africa. Today, food sovereignty is a prominent transnational agrarian movement, led by La Via Campesina, that resists economic liberalization policies, which helped to generate patterns of land and income inequality, marginalization, poverty and hunger, particularly in the global south (Martinez-Torres and Rosset 2010). The food sovereignty movement also supports communities' social control over productive resources, such as land, in order to achieve self-reliance as opposed to inserting farmers into global value chains (Via Campesina 2007; Menser 2014; McMichael 2014).

While the aforementioned ontological assumptions offer valuable insights into the dynamics of food security, they do not always give enough attention to farmer perspectives in different regions of Sub-Saharan Africa. In southern Africa, the capacity of the African Green Revolution and food sovereignty models to address smallholders' food security challenges in a sustainable manner remains unclear. Questions surrounding the most appropriate seed technology (Chapters 2 & 3), how best to secure rural populations' access to productive resources, particularly land (Chapters 2 & 5), and what types of market relations will be of most benefit to smallholder farmers (Chapters 2 & 4) are at the heart of key concerns about these two models. There is a need for more nuanced approaches to evaluating what progress is needed for smallholders' food security and agricultural sustainability (IAASTD 2009), and what each model has to offer to

achieve these two goals. Application of context-specific sustainability assessment frameworks of key food security concerns can provide new knowledge about an area where research is at a crossroads.

Several sustainability assessment frameworks for agricultural systems exist (Hansen 1996; Smith and McDonald 1998; von Wiren-Lehr 2001; van Cauwenbergh et al. 2006; Partidario et al. 2009; FAO 2013). A few such frameworks pertaining to peasant agriculture (or smallholder farming) in developing country contexts are also in place (Izac and Swift 1994; López-Ridaura et al. 2002; Astier et al. 2011). While these frameworks provide useful insights for implementing (or evaluating) activities based on strong sustainability principles, most limit their applications almost exclusively to systemic properties at the farm scale or local level.

For example, the Framework for Assessing the Sustainability of Natural Resource Management Systems (MESMIS) uses multiple socio-economic and environmental indicators for implementing sustainability practices in peasant farming systems, primarily in the context of Central and Latin America (López-Ridaura et al. 2002). The MESMIS' assessment criteria include yield efficiency and quality, soil nutrient balances, agro-diversity, market diversification, cost of external inputs vs. returns (income) and self-empowerment (p. 142-143). However, this framework primarily focuses its unit of analysis on factors at the farm, household and local economy level. Political issues, such as pervasive unequal power relations in food systems, which often go beyond the local and even regional spheres, are largely unaddressed in their frameworks. There is a need to fill this gap in agricultural sustainability assessments, because policy processes strongly shape how food is grown, and thus can lead to unsustainable outcomes.

This doctoral thesis took agriculture in Mozambique as a case study to carry out a sustainability assessment of the African Green Revolution and African food sovereignty movement from farmer perspectives. The study explored the models' potential contributions to addressing both the technical aspects of meeting food security and sustainability (i.e., issues of production) as well as to critically engage with political economy issues that facilitate (or hinder) the means of achieving them. The research considered five sustainable food system indicators: access to quality seeds, activities to improve soil health, income opportunity, land rights and policy engagement. The selection of these indicators was informed by the existing literature and the author's fieldwork in Mozambique.

The Importance of Smallholder Farmers

There are various terms in the literature that define small-scale producers, but most studies characterize this farming population based on factors such as farm size, geography, commodity and reliance on family labor. This doctoral thesis uses the term smallholder farmers, a subset of small-scale producers, and follows the FAO's (2013) definition (p. 34):

- Size: have land occupancy for areas considered small for their production and region;
- Mechanization: use no or little mechanization; and
- Labor: use mainly family labour for production.

Smallholder family farmers play an important role in Africa's food systems, with some estimates showing that they meet up to 80 percent of the population's food needs (McKeon 2015, p.55). But while smallholders grow food to feed a significant portion of the continent, they do so under difficult conditions. Smallholders face the impacts of climate change, have limited economic opportunities and are often vulnerable to land dispossession (FAO 2014). The focus of this dissertation on Africa's smallholder farmers, therefore, is intended to shed light on some of these challenges as well as to envision how different agrarian models may be (re)structured to better support them, in ways that advance food security and sustainability goals. This work is timely because improving the food security status of smallholder farmers has gained prominence in the past decade, especially in the wake of the 2007/2008 global food crisis. Indeed, the United Nations declared 2014 the international year of small-scale producers, a definition that extends to smallholder farmers, not only to draw attention to the difficulties they face, but also to highlight their critical contributions to the food system (FAO 2014, p. 1).

Smallholder farmers have also achieved considerable agency in problematizing public policies that sharpen agrarian crisis (McMichael 2014) and in articulating solutions in the global food system. Over the last 20 years, dedicated work from peasant movements, such as La Via Campesina, has empowered smallholder farmers to voice their own struggles. Indeed, La via Campesina was established by peasants who felt the need to engage directly with aspects of the global food system which disadvantage them rather than being spoken for and represented by non-governmental organizations (NGOs) (Desmarias 2007).

1.3 Research Question and Objectives

The purpose of this dissertation is to explore the potential contributions to food and agricultural system sustainability from the African Green Revolution and the African food sovereignty movement in southern Africa. The thesis is guided by the following question: *in what ways can sustainability assessment frameworks give insights into the potential contributions of the African Green Revolution and food sovereignty approaches to food security and sustainability in Mozambique?* This study had three research objectives:

1. To refine conceptually and apply a sustainability assessment framework that merges key food security and sustainability goals in southern Africa's food and agricultural systems.
2. To better understand the perspectives of stakeholders implementing the African Green Revolution and the food sovereignty models as well as the farmers that they serve to determine what each model offers in terms of food security and sustainability.
3. To tease out the implications of the two models' activities on the ground, including their potential impact on food and agricultural policies.

In exploring these objectives, this research contributes to the literature in both theoretical and empirical ways. First, a context-specific sustainability assessment framework of key food security and sustainability concerns sheds light on contextual realities that may not be fully appreciated by the respective ontological assumptions of the two models. For example, this research finds that while African Green Revolution projects positively contribute to the availability of modern agricultural technologies in Mozambique, farmers' uptake of them is fairly limited. Understanding why this is the case warrants analysis that goes beyond rationalist ideas about how societies adopt new technologies (Chapter 4). This case study also illustrates that a tendency by food sovereignty advocates to underestimate farmers' ability to benefit from larger agricultural markets and new agricultural technologies does not always reflect the reality on the ground (Chapter 3). New evidence and a different approach to examining concerns in southern Africa's food systems will create space for more nuanced deliberations and improved undertakings (Gibson 2016).

Second, this study adds to the literature on food system sustainability assessments, which is not only thin but also fragmented in application. That is, most studies examine segments of the

sector, e.g., a production site, or leave it up to specific entities (e.g., firms or producers) to self-report and self-regulate their sustainability impact (c.f. FAO 2013). This study refines sustainability assessment frameworks to address elements from four pillars of sustainability (social, economic, governance and ecological) in an integrative manner (Gibson et al. 2005; FAO 2013).

1.4 Conceptual Paradigms in Food Studies: Literature Review

Three academic bodies of literature informed this research: food security, the ontological backgrounds of the African Green Revolution and food sovereignty models, and sustainability assessment. Taken together, these literatures provide useful insights for understanding and possibly resolving the debate over how best to merge food security and sustainability goals in southern Africa's agricultural sectors.

1.4.1 Food Security

There are four commonly understood prerequisite conditions for food security: physical availability of food (achieved through production), access (attained through production, economic or social means), utilization (realized through diversified diets), and stability (ensuring the first three components at all times) (FAO 2008). Decades of work and policy deliberations have gone into the (re)conceptualization of food security. In the post-World War II era, world leaders established the Food and Agriculture Organization (FAO) of the UN to coordinate a multilateral food security arrangement (Shaw 2007). At the time, nation-states primarily focused on stabilizing food supply in order to prevent shortages and to avert famines. Hence, the FAO was tasked to improve the efficiency of global food production and distribution and to raise the world's standards of living through agricultural development (Shaw 2009). The first Green Revolution was conceived in this era: led by a consortium of International Agricultural Research Centers (IARCs) to transfer agricultural technologies from the West to the Third World starting in the 1960s (Easterbrook 1997; Parayil 2003).

The first two IARCs, the International Rice Research Institute in the Philippines (IRRI) and the International Center for Wheat and Maize Improvement in Mexico (CIMMYT) were established in 1960 and 1966 respectively. Scientists focused on developing high-yield varieties (HYVs) of maize, wheat and rice, and worked particularly well when planted using chemical fertilizers and

pesticides and irrigation controls. Some scholars considered the first Green Revolution a success because it helped to increase global grain production from about 690 million tons in 1960 to about 2 billion by 1992, raising the daily global per capita caloric intake from 2,063 to 2,495 between 1965 and 1990 (Easterbrook 1997). An extensive study² examining the impact of international research for 11 major food crops, for the period 1960 to 2000, found that the diffusion of these HYV crops had positive impacts reducing aggregate levels of hunger (Evenson and Gollin 2003).

Despite its positive impact on aggregate global food supply, the first Green Revolution had serious distributional, ecological and social problems (Shiva 1991; Parayil 2003; Dano 2007). As a result, this agrarian model did little to improve food security for the poor, even in Asia where it was considered a success (Shiva 1991). In 1972-1974, moreover, the world experienced a food crisis, which demonstrated just how fragile meeting the world's food needs was, and how quickly the situation could change (Shaw 2007, p. 115). World leaders met in Rome for the UN World Food Conference in 1974 to negotiate policy action on food security. At that meeting, food security was defined as the adequate availability of food supply at the global and national level, to sustain consumption and to offset instability in production and prices (UN 1975; Maxwell 1996). Policy documents that came out of the conference resoundingly emphasized that production had to increase, particularly in developing countries where increases in food prices wreaked havoc (Hathway 1975).

The conference also passed a resolution to establish the International Fund for Agricultural Development (IFAD), in order to finance agricultural production and rural development projects in the world's poorest countries. IFAD began its operations in 1977 and together with IARCs disseminated Green Revolution activities. By the early 1980s, a total of thirteen IARCs were involved in varietal improvement research for a wide range of crops in developing countries (Shaw 2009).³ Some scholars, however, grew increasingly dissatisfied with a focus on supply management by global governance institutions to address problems of hunger and food security.

² The study was conducted by the Consultative Group for International Agricultural Research's (CGIAR) Technical Advisory Committee (TAC) (see Evenson and Gollin 2003)

³ IARCs came together under a coordinating umbrella of the Consultative Group on International Agricultural Research (CGIAR) in 1971

Amartya Sen (1981) demonstrated that increased availability of food through the first Green Revolution and trade in Bangladesh did not prevent widespread hunger and a famine in 1974. Food supply (including food production and net imports), was actually higher that year than it had been during the other years between 1971 and 1976, and that four of the famine districts were, in fact, among the top five in terms of food-grains availability per head (Sen 1981, p. 138). The people who died from the famine or suffered from hunger in these regions were those unable to command a control of food especially through purchase. A large segment of agricultural laborers lost employment due to a flood that hit Bangladesh that year, which reduced the demand for labor but also increased immediate food prices in the anticipation of future food shortage (Sen 1981). This led Sen to the conclusion that the mere presence of food in the economy does not avert hunger or famines; rather, the key factor was one's ability to establish command over food through livelihood system based on one or more of four key entitlements: purchase, production, labor or transfer.

Individual command over food could be achieved through *purchase*, which depends on the ability to work and earn an income; direct *production* of one's food; exchange of one's *labor*, for example through share-cropping; or *transfer*, either directly in the form of food aid or indirectly through social security arrangements such as monetary grants (which can be used to purchase food). The transfer entitlement is particularly important for those unable to access food any other way. Sen's theoretical contribution as well as other literature and field experience on famines (e.g., de Waal 1989; Dreze and Sen 1989) made clear that food insecurity is as much a consequence of collapsed livelihood systems as it is of failure in production. Sen's (1981) seminal work on "food entitlement" initiated a paradigm shift in how food security was conceptualized (Maxwell 1996).

Clapp (2015a) provides a summary of the subsequent (re)definitions of food security over time. In 1983, the FAO added a third prong to its original definition: 'Ensuring that all people at all times have both physical and economic access to the basic food that they need' (FAO, 1983). In 1986, the World Bank elaborated the concept in terms of: 'access of all people at all times to enough food for an active, healthy life' (World Bank 1986). In 1996, the FAO introduced a more complex definition of food security: that 'all people, at all times, have physical and economic

access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’.

While the (re)definition of food security demonstrates a comprehensive understanding about its multiple dimensions, the discussion over how best to achieve it is characterized by divergent interpretations and competing frames (Mooney and Hunt 2009; Wittman et al. 2010; Schanbacher 2010; McMichael and Schneider 2011; Carolan 2013; Clapp 2015a). Mooney and Hunt (2009) delineate three framings of food security: hunger, risk and community. When conceptualized as hunger, food insecurity is understood as a problem of inadequate production in hunger-prone regions and insufficient trade (see also Carolan 2013; Lee 2013). Responses to solving it tend to reinforce dominant practices of increasing production and trade. When framed as risk, food security is associated with food safety. Thus, different actors offer biotechnology solutions, e.g., genetically modified organisms that can withstand certain dangers in food systems, such as pathogens and climatic variables. Finally, community food security thinking offers a critical interpretation that moves beyond the frame of “preventing hunger” to promoting local and regional food systems that conserve ecological resources, enhance community well-being and preserve cultural heritage (Mooney and Hunt 2009, p. 478-479).

Some scholars view the African Green Revolution as a refashioning of the first Green Revolution of the 1960s (which targeted key states in Asia and the Americas), with the addition of strategic public-private partnerships and biotechnologies (Dano 2007; Holt-Giménez 2008; McMichael and Schneider 2011; Patel 2013). Critics argue that African Green Revolution advocates similarly tend to frame food security as a problem of hunger (and risk), and as such prescribe technocratic solutions to increase food production and economic growth (Patel 2013). In contrast, some scholars point to the food sovereignty model as a friendlier alternative because it supports community food security and promotes the values of community control over productive resources (Lee 2013; Wittman et al. 2010; Patel 2009).

The aforementioned food security framings offer a helpful understanding of the models’ implementation approaches to their projects in Sub-Saharan Africa. However, contextual dimensions entailing socio-ecological and political factors also significantly shape how each model plays out on the ground. Indeed, earlier attempts to disseminate a Green Revolution in

Africa were largely unsuccessful⁴ because its production component largely relied on technological packages consisting of seeds, chemical fertilizers and pesticides, which were unsuitable for the agro-climate or the farmers (Evenson and Gollin 2003; Dano 2007; Holt-Gimenez 2008). This research sheds light on current contextual dimensions in southern Africa's agricultural systems through an empirical case-study of Mozambique.

1.4.2 Ontological Backgrounds: the African Green Revolution and Food Sovereignty Models

The activities of the African Green Revolution and food sovereignty movement can be effectively interpreted when their philosophical foundations and theoretical assumptions are also taken into consideration (c.f. Moon and Blackman 2014). Ontology has to do with frames of knowledge—and the validity that people assign to certain truths (Khagram et al. 2010). The ontological backgrounds of these two agrarian models are diametrically opposed. In many ways, their differences have also created polarized debates about what each model represents—hindering fruitful engagement about how to effectively address key concerns in Africa's food systems.

1.4.2.1 African Green Revolution

The African Green Revolution's approach to agricultural development is grounded in the economic theory of structural transformation. This scholarship emerged in the mid-to late 1950s, and postulates that the pathway for economic transformation involves intensifying agricultural productivity in order to raise capital and expand other sectors, especially manufacturing and service industries (Lewis 1954; Rostow 1960; Johnston and Mellor 1961; Schultz 1964). Those taking this perspective argue that sizable gains in agricultural productivity can be achieved through the uptake of farming technologies (e.g., improved inputs), as well as by investing in key infrastructure: roads, agricultural research, education, extension, etc. (Johnston and Mellor 1961). Scholars drew on empirical evidence to show that various nations (e.g., those in Western

⁴ Two IARCs were established in Africa: the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria was inaugurated in 1967, only a year after the CIMMYT was founded in Mexico, and the West Africa Rice Development Association (WARDA) in Bouake, Ivory Coast opened in 1971. Few African farmers adopted improved crop varieties developed at these centers (predominately rice, wheat and maize), and as a result the region did not see aggregate improvement in yields (see Evenson and Gollin 2003)

Europe and North America) went through roughly the same process of structural transformation (Rostow 1960).

The African Green Revolution emerged at the turn of the millennium with similar ideas to jumpstart structural transformation in Sub-Saharan Africa through agriculture-led growth. At the time, trade negotiations on the Uruguay Round to establish an internationally-binding set of agricultural rules had recently come into effect. Organizations including the International Food Policy Research Institute (IFPRI) and the World Bank were optimistic that liberalized agricultural markets would bring economic benefits to poor countries and smallholder farmers (Pinstrup-Andersen et al. 1999; World Bank 2000). Developing countries, they argued, could gain better access to markets for their primary commodities in industrial nations, and the process would facilitate agricultural transformation in the former. The World Bank (2000) in particular championed public-private partnerships as a way to modernize Africa's agricultural sectors, and integrate farmers into liberalized market value chains (p. 193-201).

The early 2000s also saw a significant rise in private sector investment in agricultural research and development, particularly biotechnology (Parayil 2003; Chataway et al. 2004). Some actors welcomed new biotechnologies and saw in them opportunities for the rural poor (Pinstrup-Andersen et al. 1999; Paarlberg 2000). According to Paarlberg (2000), areas most affected by malnutrition and rural poverty, e.g., Sub-Saharan Africa, were those bypassed by the first Green Revolution. He explains that this was partially because the first Green Revolution depended on "hard to get, hard to manage 'packages' of purchased inputs" (p. 22) consisting of seeds, chemical fertilizers and pesticides. But new bio-engineered seeds had a unique promise of reducing the cost of inputs because all productivity-enhancing factors were inserted in the seed itself (ibid).

Other scholars behind the African Green Revolution were also optimistic about new biotechnologies, particularly their potential to make farming more environmentally sustainable—by reducing or eliminating pesticide use, minimizing soil tillage and requiring less land to be converted to agriculture (DeVries and Toenniessen 2001; see also Conway 1998; Borlaug 2004).

In 2006, the Rockefeller and the Bill and Melinda Gates Foundations established the Alliance for a Green Revolution in Africa (AGRA), a philanthropic organization, to coordinate African Green Revolution activities in Sub-Saharan Africa by promoting:

scientific development of more productive crops and fertilizers; cultivation of local talent in plant science, farming, agricultural policy, and business; strong commitment from national governments; and public-private collaboration on infrastructure, water and irrigation, the environment, and building markets for the inputs and outputs of a revolutionized farm sector (Rockefeller Foundation 2006, p. 4).

The ontological perspectives of the aforementioned institutions, scholars and actors tend to favor modern rationalist ideas of agricultural development. There are several key assumptions these actors make for how to achieve the African Green Revolution. As mentioned, one is that technology transfers, e.g., hybrid seeds plus inserting farmers into market value chains, is a primary means to tackle hunger and poverty (Toeniessen et al. 2008; Sanchez et al. 2009). Another assumption is that modern biotechnology can deliver win-win solutions by addressing the challenge of low crop productivity while helping farmers adapt to climate change (Paarlberg 2008). The African Green Revolution scholarship also assumes that farmers have limited knowledge about the use or benefits of modern technologies, but that such gaps can be addressed by better extension services (Otsuka and Kijima 2010; AGRA 2013). These ontological assumptions are vastly different to those of food sovereignty.

1.4.2.2 Food Sovereignty

Food sovereignty's approach to food security is rooted in a peasant-led resistance to neoliberal economic policies that incorporated agriculture into the international trade regime during the 1990s (Clapp 2015a). A prominent actor in this model is La Via Campesina, a transnational food sovereignty movement comprise of 164 organizations that represent peasants, smallholders, farm workers, rural women and indigenous agrarian communities in 73 countries in Africa, Asia, Europe and the Americas (Via Campesina 2015). A well-documented history of La Via Campesina (Desmarias 2007) explains that the groundwork of the movement started in Nicaragua in 1992, at a conference of peasant and farmer organizations. This was followed-up by

another gathering in Belgium in 1993 that became known as the First International Conference of La Via Campesina.

At the World Food Summit in 1996, La Via Campesina introduced the concept of food sovereignty, defined as: “the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agricultural systems...[to put] those who produce, distribute and consume food at the heart of the food system, rather than the demands of markets and corporations” (Via Campesina 2007 in Patel 2009, p. 666).

In Sub-Saharan Africa, food sovereignty was taken up by peasant groups that joined La Via Campesina in 2004. The Network of West African Peasant Organisations and Producers (ROPPA) and the National Union of Mozambican Peasants (UNAC) were among Africa’s first food sovereignty movements. ROPPA was established by peasant unions from ten West African countries in 2000. The movement emerged as a response to trade liberalization policies that weakened the position of Africa’s produce on world markets, and defeated farmers’ competitiveness in their own markets because of heavily subsidised imports (ROPPA 2003). Long-term food-aid to the region through the 1980s and early 1990s also undermined domestic markets, e.g., by discouraging local production due to market gluts and low producer prices (Blein and Jeudy 2007). According to ROPPA, the impoverishment of Africa’s peasants was not merely a result of unfavorable climatic or economic conditions, but was also a “logical outcome of the rules of the game negotiated and then imposed on producers” (ROPPA 2003, p. 5).

Food sovereignty scholars similarly contend that agricultural liberalization policies had particularly detrimental effects on producers and rural food security in the global south (Wittman et al. 2010; McMichael 2011, 2014; Akram-Lodhi 2013). Cheap food imports forced millions of farmers out of the farm sector, which fueled the ‘planet of slums’ phenomenon (Davis 2006). That is, farmers ejected out of agriculture, formerly the lifeblood of their livelihoods, found themselves living in subhuman conditions on city fringes, poor and hungry (McMichael 2009). And as countries opened up their markets further during the 1990s, agro-corporations were able to ramp up their export position—expanding transnational links between farm sectors in different regions. The result is that agro-corporations have grown both in size and scope and today occupy a dominant position in the global food system (McMichael 2009; Wilkinson 2010). Agro-

corporations engage in a global nexus of biofuel investment, large-scale foreign land acquisition, and financialization (Clapp 2016)—activities which increased their economic success, but carry severe ramifications for food security, social equity, and environmental sustainability.

In framing food as a human right, therefore, food sovereignty reclaims control of food systems by putting farmers, communities and states back at its center, such that they may self-determine how to grow and distribute food in a manner that enhances livelihoods and food security (Claeys 2012). This focus in effect engenders action towards (re)organizing food systems to serve collective rights of citizens as opposed to market values under the WTO regime (McMichael 2014, p. 937).

The ontological perspectives of food sovereignty scholars and actors are inspired by historical structural ideas rooted in sociology, which tackle issues of power and (in) justice embedded within global political and economic structures. Several key assumptions from these actors are also applied to food sovereignty efforts in Sub-Saharan Africa. One is that the social control of food systems predominately entails adopting agro-ecology as a means to foster people's dignity and ecological viability (Menser 2014). Another assumption is that seed sovereignty, which is farmers' rights to save, exchange, reproduce, and grow their own seeds, is a primary means to achieve autonomy and self-determination in food production (Kloppenburg 2010). Food sovereignty also assumes that farmers should grow food for self-sufficiency purposes and be embedded in locally-based markets as opposed to global value chains (Nyéléni 2007, 2015).

The respective ideological backgrounds of these two agrarian models offers valuable insights into the complex challenge of achieving food security and the tensions surrounding their respective assumptions (elaborated in Chapter 2). Mozambique provided the ideal case study to evaluate these two models because the country sees a high level of activity from both. The succeeding chapters will show that the ontological assumptions of the African Green Revolution and food sovereignty do not always hold in some contexts, especially when sustainability factors that are needed to achieve food security for smallholder farmers are taken into consideration. The use of sustainability assessment helped to delineate a methodological framework to evaluate these two agrarian models from farmer perspectives.

1.4.3 Sustainability Assessment

Sustainability has various definitions and interpretations, but it is commonly seen as a measure of lasting economic, social and environmental progress (Gibson et al. 2005). Sustainability became a global concern in the early 1970s when world leaders met at the UN Conference on the Human Environment in Stockholm (1972) to discuss environmental problems caused by human activities. Early efforts on sustainability predominately sought to keep economic growth within the Earth's limited resources and to distribute wealth equitably between and within nations (WCED 1987).

During the 1990s, some sustainability scholars became increasingly concerned with how governance institutions measured progress towards sustainability—using mostly quantitative indicators to assign objective values to complex (and sometimes unpredictable) socio-ecological systems (Robinson et al. 1990; Meadows 1998; Fricker 1998). Scholars argued that various key qualities of life, e.g., justice, choice, sufficiency and interdependence could only be subjectively measured, if at all. Thus, sustainability initiatives also had to reflect changes in attitudes, values and aspirations that could eventually lead to overall positive gains in socio-ecological conditions (Robinson et al. 1990; Gibson et al. 2005; Sneddon et al. 2006).

In response, scholars developed sustainability assessment frameworks to define qualitative indicators of progress, in addition to quantitative ones. Such frameworks outlined methodologies and guidelines for evaluating decision-making process, projects and programs (Becker 1997; Devuyt 1999; Bossel 1999; Pope et al. 2004; Gibson et al. 2005; Pope and Grace 2006; Weaver and Rotmans 2006). Many approaches to sustainability assessments are derived from Environmental Impact Assessments (EIAs), which originally mandated that project developers address or mitigate potential adverse environmental consequences resulting from their operations (Pope et al. 2004; Dalal-Clayton and Sadler 2005; Morrison-Saunders and Therival 2006). Pope et al. (2004) explain that early EIAs were “typically a reactive, ex-post process that aimed to evaluate the environmental impacts of a policy, plan or programme for which decision-making [was] well advanced or complete against a baseline, to evaluate the acceptability of the impacts and to identify potential modifications to improve the environmental outcomes” (p. 600).

The EIAs' reactive approach to anticipated negative environmental effects was initially most often considered a technical procedure, negotiated privately between a government and a polluter to determine abatement requirements (Gibson et. al 2005, p. 22). Over time, more progressive EIAs evolved. Projects saw significant changes in the assessment process, i.e., they become more thoroughly proactive, and in terms of scope, components of socio-economic and cultural issues were added to existing ecological or biophysical pillars (Pope et al. 2004; Gibson et. al 2005). Morrison-Saunders and Therival (2006) explain that some new assessments focused on enhancing positive outcomes or "net gains" for society and the environment, which was quite a different approach from that of the old EIAs that sought to simply minimise or manage negative impacts (see also Pope 2006). As a result, sustainability assessment procedures became iterative—continuing throughout the length of a project and even beyond—rather than a 'one-time event' (Weaver and Rotmans 2006).

Sustainability assessments also became more transparent and inclusive, by making the general public a valuable stakeholder alongside project managers, policy-makers and experts (Weaver and Rotmans 2006). The trajectory of building integrative and broad sustainability was indeed a significant achievement, but the approach remained incomplete and fragile (Gibson 2006). For the most part, project developers separated the three pillars into 'silos', which posed a danger of creating "warring houses" favouring social, economic or environmental issues (Morrison-Saunders and Therival 2006). Gibson (2006) warns that such a process encourages balancing cost-benefit factors and making trade-offs, which although often inevitable, ought to be seen as a last resort rather than an assumed undertaking (p 264). The author explains that strong integrative sustainability must recognize the interconnections and interdependencies between the three pillars, and thus seek links that "mutually [reinforce] gains on all fronts" (p. 265).

The new conceptualization of sustainability assessment, importantly, became an envisioning of a sustainable future pathway for the system of interest (Weaver and Rotmans 2006, p. 14). The 'assessing for sustainability' as Pope et al. (2004) explains, is a process of working towards a progressive societal state. Thus, scholars recommend project developers to clearly define the progress that is needed and the improvements that are crucial, as well as which types of trade-offs can be tolerated, in general and in specific circumstances (Gibson et al. 2005, p. 36).

Implementing such a task requires generic guiding criteria that encompass sustainability values

and principles, and rules for handling trade-offs (Weaver and Rotmans 2006). Common adoption of basic criteria allows for consistency in application domains as well as a benchmark for evaluation and monitoring. Because the particularities of each case and context differ, sustainability assessment scholars suggest tailoring generic criteria to fit specific settings and/or subject areas.

There are various sustainability assessments for food and agricultural systems. According to Hansen (1996), most are characterized by one of two broad conceptual approaches. The first is a goal-prescribing concept that identifies specific management strategies, e.g., organic farming that makes use of natural inputs and excludes the use of agro-chemicals at the field or farm level (see also Weil 1990; von Wiren Lehr 2001). This approach was developed as an alternative to the perceived ‘unsustainable’ conventional agriculture, dominant in North America and Europe (Hansen 1996). Conventional agriculture is characterized by large-scale, mechanized equipment and extensive use of chemical inputs, and has created problems associated with depleted freshwater sources, soil degradation, reduced genetic diversity, displaced small farms, negative health and ecological effects, and so on.

The second approach is a system-describing concept that aims to fulfil a diverse set of goals for agriculture to become increasingly resilient over time. Hansen (1996) explains that this approach is concerned with the viability of agriculture in a changing world, and uses multiple measurable indicators to guide society to respond to physical, social and economic change. Von Wiren-Lehr (2001) uses the term goals-oriented concept to describe this systems approach and outlines basic assessment criteria. The author identifies a four-step strategy: I: Goal definition—formulation of a case-specific perception of sustainability with respect to spatial and temporal scales. II: Indicator/indicator sets—characterization of the state aspired defined through measurable parameters. III: Evaluation strategy—an assessment of the system under investigation based on the goals defined and selected indicators. IV: Management advice—recommendations for end-users aiming to plan a new sustainable production system, or improve the sustainability of an existing system.

Today, the most comprehensive sustainability assessments in food and agricultural systems take a system-describing approach, outlining clear goals and evaluation strategies to help society progress towards sustainability. In 2013, the FAO introduced the Sustainability Assessment for

Food and Agricultural Systems (SAFA) framework, a global initiative that provides comprehensive indicator metrics and standards to assess the sustainability performance of enterprises and organizations along food and agriculture supply chains (FAO 2013). Whereas most sustainability assessment frameworks limit their work to three pillars of sustainability (social, economic and ecological), SAFA adds a fourth pillar: good governance (p. 76). This pillar addresses issues of accountability, participation, respect for rules of the law, etc., and offers valuable insights for broadening the scope of sustainability assessments to engage with policy issues that may facilitate or undermine agricultural sustainability. Indeed this study draws insights from SAFA's framework.

SAFA's four sustainability pillars, referred to as dimensions (good governance, environmental integrity, economic resilience and social well-being) are translated into sustainability practice through 21 themes, 58 sub-themes and 116 indicators (FAO 2013, p. 76). But similar to other sustainability assessments, SAFA's application is confined to segments of the food sector (e.g., a production site) or leaves it up to specific entities (e.g., firms or producers) to self-report and self-regulate their sustainability impact (FAO 2013). Building system-wide sustainability requires integrative sustainability assessments that address concerns in food and agricultural systems in their entirety.

For this study, it was impossible to apply all of the SAFA indicators due to time and logistical constraints—and a majority of them were not applicable to smallholder food systems. Noble (2014) explains that sustainability-oriented baseline studies can save time and resources by appraising the most important factors, referred to as Valued Ecosystem Components (VECs), that are defined by clear spatial and temporal boundaries. VECs are those factors or indicators (environmental, social and economic) that warrant detailed consideration because they likely carry significant impacts and are important to the public and/or research community (Noble 2014, p. 104-109). Typical sustainability baseline studies, however, tend to neglect interactions among the effects on and of VECs. Such studies also often focus on the immediate proposed undertaking without due attention to other sources of cumulative effects, and may ignore factors that are not impact receptors, e.g., needs to address systemic uncertainties.

The early research design of this study correlated to SAFA's four sustainability dimensions.⁵ However, these were modified during the course of fieldwork to reflect and focus on key sustainable food system indicators that warrant detailed consideration, and which could be reasonably assessed within the temporal and spatial limits of the case study, as recommended by Noble (2014). Five indicators informed by sustainability assessment literature and farmer perspectives in Mozambique were selected for detailed assessment: access to quality seeds, activities to improve soil health, income opportunity, land rights and policy engagement. Taken together, these indicators can help to address both the technical aspects of meeting food security (issues of production) objectives and political economy issues that facilitate (or hinder) the means of achieving food security.

In many ways, the tensions between the African Green Revolution and food sovereignty models are connected to how policies are applied, and what they do or do not address, etc. For instance, critics of the African Green Revolution view its emphasis on upscaling technocratic innovations to resolve a 'low-productivity trap' as problematic because the diagnosis is reduced to a technical challenge (with a technical fix) (Scoones and Thompson 2011; Jarosz 2012; Javdani 2012; Moseley et al. 2015). In various places across Sub-Saharan Africa, agricultural technological interventions are often overshadowed by significant social, economic and political inequalities, e.g., large-scale land acquisitions (Jarosz 2012, p. 193). When unaddressed, such inequalities will likely deepen smallholders' marginalization, hunger and poverty.

This study's application of selected food system indicators sought to engage with some of the most important political economy concerns. The methodology section below and Chapter 2 elaborate on the study's selection of these five indicators. Nonetheless, sustainability assessment frameworks allowed this dissertation to foster an integrated understanding of key issues, consider the complexities that characterize socio-ecological systems, and open up space for opportunities that may serve broader and forward-looking options (Gibson 2016).

⁵ These were organized as environmental integrity (practices that enhance ecological diversity); economic resilience (income-generating agricultural activities); social well-being (skills training in various areas of food production); and governance (influencing public policy to provide better support to farmers).

1.5 Empirical Context: Mozambique

Mozambique is located in southern Africa and is a member of the Southern African Development Community (SADC) (Figure 1.1). Southern Africa has a wide diversity of ecosystems including grassland, savannah, forests, semi-arid and arid zones. An estimated 70 percent of the region's population depend on agriculture for food, income and employment (SADC 2016, 10). The region is especially vulnerable to the impacts of climate change and is currently experiencing the worst drought in 35 years (SADC 2016).

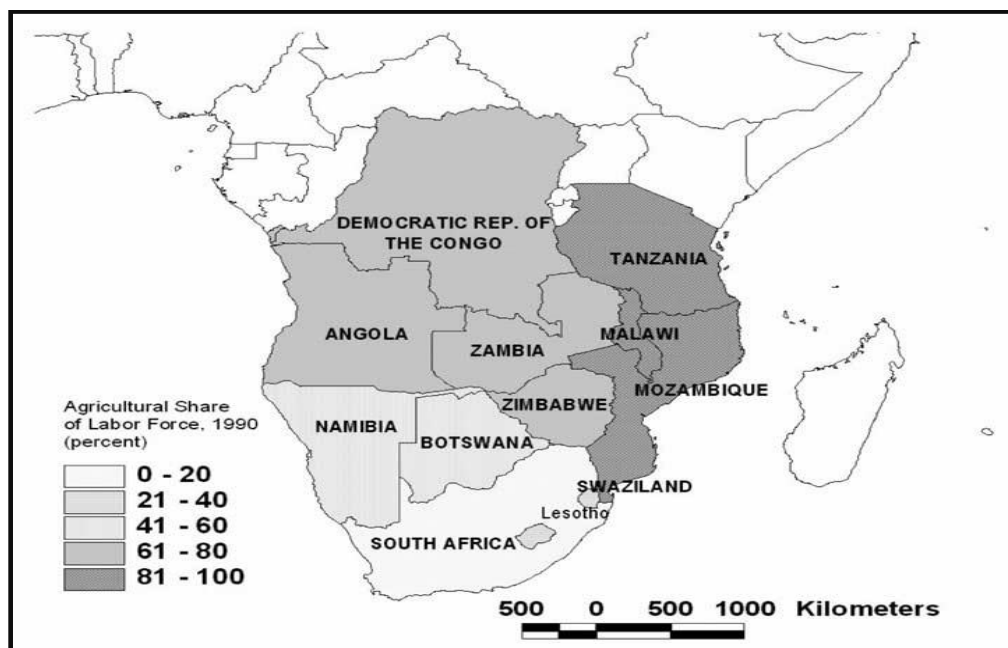


Figure 1.1: Map of Southern African Development Community (SADC) countries (Leichenko and O'Brien 2001).

Mozambique's history features a brutal colonial legacy, and a destabilization war that was orchestrated by external governments and Structural Adjustment Programs (SAPs).⁶ These historical events have significantly contributed to the country's underperforming agricultural sector and weak economic development. Under Portuguese colonialism (1891-1975), Mozambique's native populations faced various forms of forced labor, including contract labor

⁶ Chapter 4 provides a more detailed history of Mozambique's agricultural sector.

in South Africa's mines; and unequal exchange in agricultural products (Hanlon 1984; Ambrahamsson and Nilsson 1995). The Front for the Liberation of Mozambique (FRELIMO) led guerilla warfare against colonial rule (1964-1974), came to power in 1975, and adopted a Marxist-Leninist ideology to guide the establishment of a socialist state (Ottaway 1988).

The newly independent state faced major problems from the onset. Among these was a destabilization war coordinated by the white minority-ruled governments of Rhodesia (now Zimbabwe) and apartheid South Africa within two years of independence. At the time, the Zimbabwe African National Union was fighting a war of independence in that country. In solidarity, the FRELIMO-led government offered them military bases and imposed UN-mandated sanctions against its neighbor (Hanlon 1996). Rhodesia responded by setting up an anti-FRELIMO guerilla group, the Mozambique National Resistance (MRN, later renamed Renamo) to start a war that entailed sabotage actions meant to cripple Mozambique's socio-economic development (Hanlon 1991, 1996). Renamo's rebel forces raided and attacked communal villages, schools and health posts that the new government set up, burned shops and factories, and blew up public infrastructure, i.e., roads, railways and dams (Hanlon 1991, p. 19-20; Andersson 1992). The war ended in 1992, but left the country in ruins: it cost the state USD 20 billion, one million people died and five million were internally-displaced or became refugees in neighboring countries (Hanlon 2010).

Whereas the war paralysed the agricultural sector and overall economy through much of the 1980s, a major drought affected southern Africa in 1983, leading to a famine in Mozambique. This crisis forced Mozambique to appeal for food aid from the international donor community. But donor countries, especially the United States in 1984, made clear that the transfer of food aid was conditional upon joining Bretton Woods Institutions (the World Bank and International Monetary Fund) and on adopting SAPs (Hanlon 1996. p 16). Mozambique's lending negotiations with these institutions started in 1984, but it was not until 1987 that restructuring loans under SAPs came into effect. By the following year, foreign aid made up 70 percent of the country's Gross Domestic Product (GDP) (Hanlon 1991, p. 62). Through the 1990s and 2000s,

Mozambique received large inflows of foreign aid; the country earned a reputation of being a ‘donor darling’ (Hanlon 2010).⁷

Mozambique experienced modest GDP growth in the post-war era (on average 4 percent per year) (Alden 2001, p. 10), and exceptional growth in the 2000s (on average 7.4 percent per year) (Masha and Ross 2014). However, the country has seen little human development (Hanlon 2010). Donor assistance came with strict conditionality, especially under the IMF’s SAPs and the Poverty Reduction and Growth Facility lending programs. The IMF has traditionally sought to ensure that grantees resolve balance of payment problems fairly quickly (over a two to five-year period), and as such put firm caps on government expenditures (Hibben 2016). In Mozambique, donor-driven spending cuts in nearly all areas of the economy (education, health care, agriculture) contributed to high levels of poverty and chronic malnutrition, particularly in rural areas (Hanlon and Smart 2008).

Mozambique’s troubled past, including why the country came to be a ‘donor darling’ under desperate measures, has strongly contributed to the country’s underperforming agricultural sector. Today, the country also faces dire food security challenges. A majority of rural households are unable to grow sufficient food to last a whole year (Cunguara and Hanlon 2010), and 49 percent live below the national poverty line of 1 USD per person per day (GoM 2016). High levels of poverty particularly make it difficult for households to access food through purchase or other means, especially during the lean season that occurs between October and April (Figure 1.2).

⁷ At the moment, however, the country is facing a serious economic crisis—caused primarily by a secret debt of more USD 2 billion that was arranged from 2013 to 2014 between two international banks—Credit Suisse and Russian bank, VTB, and three parastatal companies—Empresa Moçambicana de Atum (Ematum) (USD 850 million), Pro-Indicus (USD 622 million) and Mozambique Asset Management (MAM) (USD 535 million) (Africa Confidential 2016). While these loans took place under the leadership of President Armando Guebuza (2005-2014), they were largely concealed by the incumbent administration of President Filipe Nyusi (Africa Confidential 2016). Following revelations about the deception by Mozambican authorities and the extent of the debt crisis between April-June 2016, the International Monetary Fund (IMF) suspended its concessionary loan to the country, a Stand-By Credit Facility of USD 283 million, which was agreed upon in October 2015 (Hanlon 2016a). Other international donors also suspended budgetary support to Mozambique, and alongside the IMF are calling for an international forensic audit into the country’s debt scandal (Hanlon 2016a) (see also Hanlon 2016b).

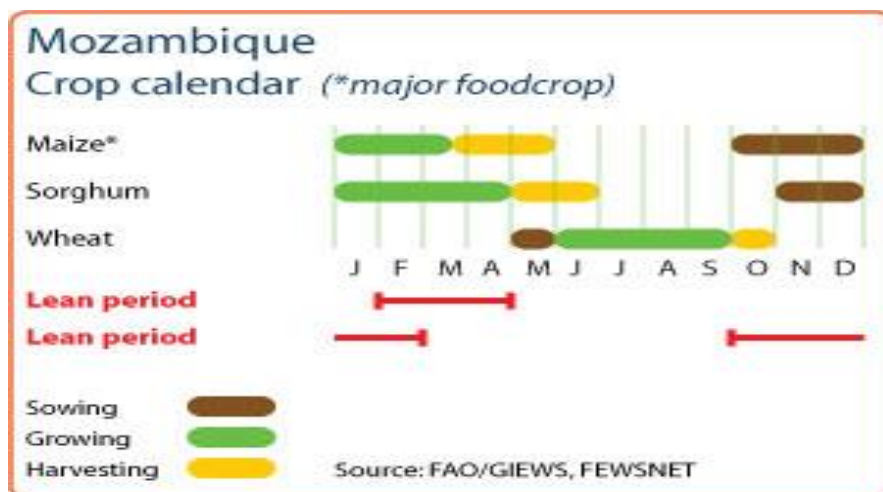


Figure 1.2: Mozambique’s Crop Calendar and Lean Season (FAO/GIEWS, FEWSNET 2015)

Besides food security challenges, Mozambique was well suited for an in-depth study of the African Green Revolution and food sovereignty models due to a high level of activity from both sides. The country ranks high among AGRA’s strategic target areas, listed under its priority countries of investment, along with three others: Ghana, Tanzania and Mali. With a large number of smallholder farmers, reliable rainfall and relatively good soils, these countries are considered high-potential “breadbasket” areas of their regions (AGRA 2014). From 2009 to 2012, 40 percent of AGRA’s resources were allocated to these four countries (Kambewa et al. 2013). Mozambique has received over 50 AGRA grants, totalling USD 46.97 million as of 2015 (AGRA 2015).

At the same time, Mozambique is home to one of Africa’s first food sovereignty movements (UNAC).⁸ Founded in 1987 by peasants, UNAC emerged in an era of SAPs as a national platform that mobilizes agricultural resources for rural communities and to advocate for farmers’ livelihood interests (Nhampossa 2009). Since 2004, UNAC hosted La Via Campesina’s Africa 1 regional secretariat.⁹ Today, UNAC is active in all ten provinces and in over 80 districts, representing over 100,000 Mozambican peasants (UNAC 2016). The movement’s enduring

⁸ ROPPA and UNAC were the first farmer unions in Africa to join La Via Campesina in 2004.

⁹ La Via Campesina member organizations in southern and east Africa fall under its Africa 1 region, located in six countries: Mozambique, Tanzania, DR Congo, Madagascar, Angola, Zimbabwe and South Africa.

presence in the country, and its origins as a peasant movement in which farmers engage in decision-making and elect leaders, are among its greatest strengths.

1.6 Methodology

Overall, this research was designed to comparatively assess the ways in which the African Green Revolution and the food sovereignty movement contribute to food security and sustainability from farmer perspectives in Mozambique. The intensive nature of a case study allowed for in-depth investigation of these two agrarian models (Baxter 2010). The research focused on two organizations, the Alliance for a Green Revolution in Africa (AGRA) implementing the former model, and the National Union of Mozambican Peasants (UNAC) supporting the latter. As mentioned, there are polarized debates over the suitability of either the African Green Revolution or the food sovereignty movement to address the food security needs of Africa's smallholder farmers (elaborated in Chapter 2). This makes it difficult to have a reasoned debate over how to effectively address key concerns in food systems.

In response, this study draws insights from the sustainability assessment literature to combine the technical aspects of food security (quality seeds and soil health) and income with political economy issues in the food system (land rights, policy engagement). A sustainability assessment of the two agrarian models, from the vantage point of farmers, is an attempt to get the respective camps to appreciate both the technical aspects of food security and the political economy concerns surrounding it. At a theoretical level, moreover, such an approach can help to bridge the ideational divide between the African Green Revolution and food sovereignty models, by drawing on empirical case-study material to delineate the type of progress needed to merge food security and sustainability goals.

Supported by ethics clearance from the University of Waterloo, fieldwork involving semi-structured interviews with key informants and participant observations was conducted in Mozambique over a period of seven months in 2014 and 2015. Three months were dedicated to evaluating AGRA's activities—with the majority of data collection taking place in August 2014 and from January to February 2015. Three months went to assessing UNAC's activities—with most of the data collection taking place from May to June 2014 and in March 2015. The assessment process was twofold. First, it established guiding evaluation criteria for progress on

the four pillars of sustainability (Table 1.1). Second, it identified food system indicators that characterize conditions or trends that are important for meeting smallholder food security and sustainability objectives. The criteria here are concerned with efforts that seek not only to mitigate negative impacts on the indicators, but also to foster overall positive net gains on them in an integrative manner. The evaluation criteria were informed by sustainability assessment frameworks (Pope et al. 2004; Gibson et al. 2005; Partidario et al. 2009; FAO 2013; Noble 2014).

A variety of information sources were used to assist in the selection of indicators, including peer-reviewed and gray literature, the author's first-phase of fieldwork in 2014 (entailing interview interactions with farmers and project implementers from UNAC and AGRA), documents and reports from the two organizations, and national and regional agricultural documents. These sources were helpful in gauging key contextual constraints and priorities for smallholder food security in Mozambique and the broader region.

Table 1.1: Guiding Sustainability Criteria for Evaluating the African Green Revolution and Food Sovereignty Models in Mozambique

Sustainability Pillar	Criteria	Indicator
Environmental	Maintain (or increase) levels of production over the long term to ensure food availability. Facilitate ecological integrity and the health of bio-physical systems.	Access to Quality Seeds Activities to Improve Soil Health
Economic	Provide lasting livelihood opportunities that allow households to pay for other basic necessities such as health care, education, clean water, etc.	Income Opportunities
Social	Promote intra-generational and intergenerational equity to ensure fair access to productive resources.	Land Rights
Governance	Foster public dialogue to ensure that policy undertakings over time prevent and minimize unsustainable practices, and to prioritize investments in key areas that promote positive net-gains.	Policy Engagement

Framework informed by: Gibson et al. 2005; Pope et al. 2004; Noble 2014; Partidario et al. 2009; FAO 2013; López-Ridaura et al. 2002; Astier et al. 2011

In the context of Mozambique, the aforementioned indicators were those of integral concern for study participants with regards to smallholder food security and sustainability. These indicators could also be reasonably assessed through interview discussions with research participants. While other relevant indicators for smallholder food systems exist, e.g., rainfall and climate, they were less feasible subjects for this study due to scoping and technical limitations (Noble 2014). The section below provides a brief justification for the indicators. Chapter 2 also provides further analysis.

1.6. 1 Environmental: Quality Seeds and Soil Health

At the farm level, sustainability seeks to maintain or increase yields over the long term through the efficient use of natural, synthetic and economic resources (López-Ridaura et al. 2002; Morse 2010). In Mozambique, farmers see low and stagnating crop productivity, and as mentioned, most cannot produce enough food to last a whole year (Cunguara and Hanlon 2010). Farmers who participated in this study viewed quality seeds that produce a decent yield and healthy soil practices that maintain or enhance the potential for lasting productivity as critical to facilitating physical availability and access to food. Therefore, the contributions of UNAC and AGRA to these two indicators were assessed based on this perspective as well as the aforementioned sustainability assessment framework. Achieving long-term sustainability, however, also requires improved biodiversity and system integrity in food and agricultural systems. This need often entails optimizing the use of agro-ecological farming practices, such as nutrient cycling and crop-diversity (Pretty 1998; Gliessman 1998; Altieri and Nicholls 2005). Agro-ecology is especially important in smallholder food systems where farmers have limited income or access to credit. Thus, while moderate use of external inputs, e.g., chemical fertilizers, can increase crop yields, practitioners must consider other factors such as the cost of inputs and whether poor farmers can reliably gain access to them (Hecht 1995; Astier et al. 2011).

1.6. 2 Economic: Income Opportunities

Agriculture serves multiple functions. It directly provides food and income through produce sale. Agriculture can also offer ecological services, maintains rural landscapes and represents cultural heritage (IAASTD 2009). In rural Mozambique and the broader region of southern Africa, farming is, in most cases, the only feasible means of food provision and income. Farmer study participants emphasized that income from agricultural produce is critical to meeting other household needs, such as paying for health care, education, clean water, etc. Sustainability assessment literature similarly explains that improved economic opportunities in agricultural sectors are vital to sustaining rural livelihoods (López-Ridaura et al. 2002; van Cauwenbergh et al. 2007; IAASTD 2009). Trends in agricultural markets in southern Africa, however, are characterized by low and volatile farm gate prices, to an extent that the agriculture sector does not offer reliable returns to support smallholders' livelihoods (Walker et al. 2004; Boughton et al. 2007; Jayne et al. 2010; Cunguara 2012; Mather et al. 2013). The criteria used to evaluate

progress on this indicator assessed what action each of the organizations has taken to foster market relations that allow farmers to earn stable incomes under fair trade conditions.

1.6. 3 Social: Land Rights

As mentioned, a significant majority of Mozambique's and southern Africa's rural populations use land to directly produce their food as well as for various subsistence purposes, such as grazing, collecting wild produce and firewood (c.f. Hanlon 2004). Over the last decade, however, rural communities have seen increased pressure on land-use as government authorities encourage private investors to enter the agricultural sector. The rate at which land transfers are occurring in Mozambique and in several Sub-Saharan African countries is unsustainable and the side effects are often negative. Large-scale land transfers have contributed directly to the displacement of rural populations and to the enclosure of former public lands and other resources, e.g., water (De Schutter 2011; Borras et al. 2011; Cotula 2013; UNAC and GRAIN 2015). While various global land governance initiatives¹⁰ are in place to promote responsible investments in land transfers, land markets tend not to work in the interest of the rural poor or adequately address issues of gender equity (Borras 2008; Collins 2014). Moreover, while several countries including Mozambique have legal provisions that recognize customary land rights (GoM 1997), the law is often used poorly. Authorities generally privilege leases to agro-investors at the expense of rural dwellers (Milgroom 2015). Secure access to land was an important concern for farmers, and some study participants faced problems of intimidation from authorities over their land occupancy rights. The criteria used to assess progress on this indicator analysed what action each of the two organizations has taken to protect farmers' land rights over the long term.

¹⁰ These include the Principles for Responsible Agricultural Investment developed by the UN Conference on Trade and Development (UNCTAD), the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD) and the World Bank, Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests developed by the Committee on World Food Security.

1.6.4 Governance: Policy Engagement

Effective public policies and state investments in agricultural infrastructure have an important role in facilitating food security. For countries in the early stages of agricultural transformation in particular, national governments have a crucial role to play in the areas of market development, extension support, information about production flows and prices and public infrastructure, etc. (Dorward et al. 2004). The state is also a prime guarantor of food security in that it enforces the legal nature of various entitlements—ensuring that prices of exchange are fair and stable, and protecting and promoting the social and economic conditions necessary to secure individuals’ access to food (Dreze and Sen 1989, FAO 1996). Yet, as illustrated by a high rate of land transfers in Mozambique, governance policies can directly act as a barrier to facilitating livelihood and food security. Various other policy mechanisms that hinder progress towards food security may be less salient, but are equally harmful. For example, a persistent global trend in food systems is that farm input costs are on the rise, while output prices (earned by producers) are low and/or extremely volatile (IAASTD 2009; Koopman 2012). Global food markets are also increasingly concentrated in the hands of a few agro-corporations (IAASTD 2009). Mozambican farmers were similarly concerned with some of these challenges. Thus, the criteria applied to evaluate progress on this indicator assessed how the two organizations engaged with policy processes to help food systems progress towards sustainability.

The aforementioned indicators may be contested in the broader academic literature. Some scholars coming from the food sovereignty perspective might not value technical indicators of quality seeds and income. Similarly, those coming from the African Green Revolution perspective may not entirely appreciate justice indicators such as land rights. There could also be tensions surrounding various interpretations of “quality seeds”, including this study’s use of the term to describe conventionally bred open-pollinated varieties (OPVs) and hybrids. Chapter 2 elaborates on how to interpret potential difference in opinions on some of these issues. Nonetheless, case study evidence from Mozambique will demonstrate that these indicators characterized primary concerns for farmers, and should be respected as such.

For this study, these indicators were analysed based on the results that came from my interviews, which as mentioned entailed interactions with farmers and project implementers from UNAC and AGRA. During fieldwork, the evaluation process of the two organizations was guided by

progressive sustainability assessments. This means that the assessment criteria were concerned with the ways in which the organizations took action not only to mitigate negative impacts on these indicators, but also to foster overall positive net gains on them in an integrative manner across all pillars of sustainability (c.f. Gibson et al. 2005). This research did not assign quantitative measures, but discussed the organizations' performance on these indicators in terms of low, moderate, or high impact as per outlined criteria.

1.6.5 Research Sites

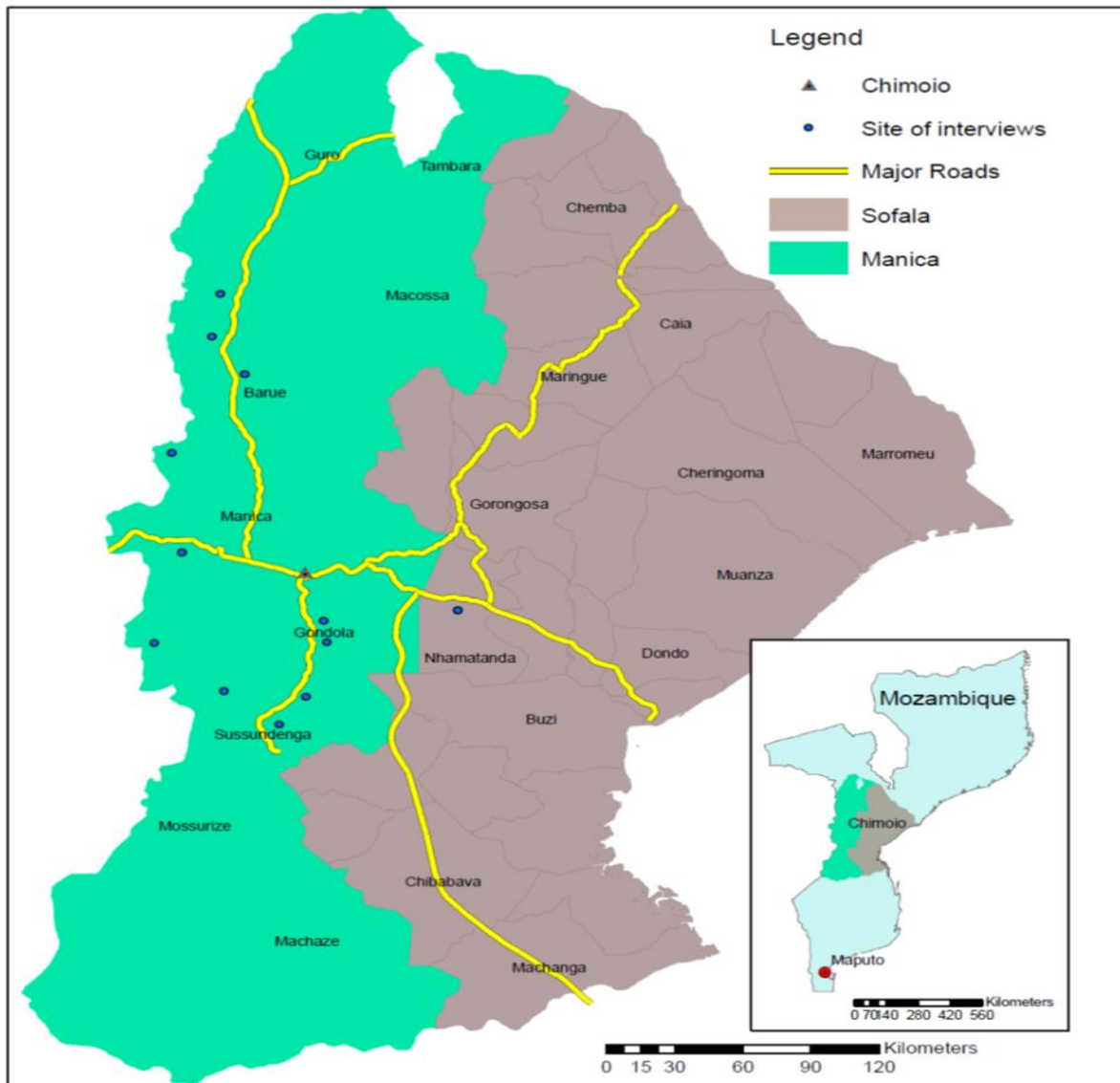
Fieldwork examining AGRA's activities primarily took place in Manica province (and one site in Sofala province)¹¹ where the organization's activities were implemented by locally-based NGOs (Figure 1.3).¹² The vast share of this dissertation's fieldwork was with Concern Universal, a UK-based charity, and the lead coordinator of AGRA's Building the Capacity of Smallholder Farmers and Farmers Organizations (BCFFO) or the *Integrated Project*. A consortium of eight locally-based organizations and companies¹³ implemented this project in five districts, three in Manica province (Manica, Sussundenga and Gondola) and two in Sofala province (Nhamatanda and Gorongosa). With a budget of USD 3.2 million, the project had a lifespan of 36 months (May 2013 to April 2016) and targeted 40, 000 smallholder beneficiaries to increase their crop productivity and link them to markets (Concern Universal 2013, 2014, 2016). The project managed to work with 43,636 smallholder farmers by the end of its cycle. A lesser proportion of the research was with AGRA's Smallholder Market Access for Rural Transformation (SMART) program that was implemented by another UK-based charity, the Micaia Foundation, in Bárúè, Guro and Manica districts. The SMART project worked with over 14, 000 smallholder farmers—training them in marketing principles and linking them to structured markets. The project ran from June 2011 to November 2014 (Micaia Foundation 2014).

¹¹Sofala province was at the center of military actions between the national army and Renamo. As a result, my travel to this province was especially restricted. I was only able to conduct interviews at one site in Nhamatanda. In general, both Manica and Sofala provinces had a heavy military and police presence, and as such there were safety concerns, particularly with regards to travelling to remote villages.

¹² I did not find GIS data locating the exact positions (i.e. longitudes and latitudes) of the villages where interviews took place. Instead, village site locations were entered manually, using approximate distance to tarred roads as a guide.

¹³ The partners are: Kulima, Sementes Nzara Yaperá, Kixiqula, Dengo Commercial, AGRIMERC-ODS, OCODEMA, IDEAA and APAC.

Field-research Site in Mozambique



Data Source: Global administrative areas. University of Berkeley (2012).



Figure 1.3 Map of Field-research Sites in Mozambique

Fieldwork examining UNAC’s activities primarily took place with two of its unions: the *Uniao de Cooperativas Agrricolas de Marracune (UCAM)* in Marracune district, Maputo province, and the *União Provincial de Camponeses de Manica (UCAMA)*, in Manica province in Chimioi city and also the districts of Bárue, Sussundenga and Manica (see Figure 1.3). UNAC has three union levels: at the districts, in each province, and at the national scale. In each district, UNAC farmer associations join together to form a union, which in turn forms a provincial union, and finally

comes together with other unions under the national umbrella of UNAC. To become a member of UNAC, peasants must join an association and pay a small fee: MT 55 (about USD 1.5) per person per year.¹⁴ In Marracune district, UCAM is made up of 5, 000 members working in 28 associations. In Manica province, UCAMA has 8, 515 members.

1.6.6 Data Collection

This research took a predominately qualitative methodological approach to assess how AGRA's and UNAC's activities might contribute to food system sustainability from farmer perspectives. This study addresses a highly complex social phenomenon, thus a qualitative approach to data collection was suitable for several reasons (Creswell 2013). The African Green Revolution and the food sovereignty models are occurring in diverse agricultural contexts where our understanding of farming communities' motivations to embrace (or reject) certain technologies as well as the pressures they face is incomplete (Jones et al. 2015). Thus, the purpose of fieldwork was not simply to amass data, but also to gain access to unquantifiable knowledge related to the meanings that people give to their circumstances through "symbolic interaction" (Berg and Lune 2012). The fieldwork methods of this study, therefore, were informed by a constructivist epistemology and an interpretivist philosophy—both seek to create new knowledge through "generating [rich] contextual understanding" (Moon and Blackman 2014, p 1172).

Purposive sampling was relied upon to recruit study participants who could provide insightful information related to the research question and objectives (Bernard 2011). Individuals who had an existing relationship with either organization were targeted for interviews. However, a few additional participants who were not affiliated with either but who were authoritative figures or experts in the field of study were asked to participate. The sample population (n=71) was determined by time and logistical constraints (see Table 1.2 for interview participant details).

To initiate the interview process, I contacted the two organizations to inquire about conducting research with them—both were receptive to my request. It was important to build rapport with the organizations' employees and/or project implementers who were gatekeepers in the farming communities where most of the interviews took place. Extensive rapport was also developed with study participants, providing people with ample time and space to understand the purpose of

¹⁴ Information from my interview discussions with the movement's farmers and staff 2014, 2015

the research, and what their involvement would entail if they decided to participate. I paid particular attention to issues of consent, voluntary participation, privacy, respect and anonymity, as per University of Waterloo's guidelines for research involving human participants. As mentioned, this study received ethics clearance from the University of Waterloo (ORE # 19763), prior to the commencement of field research.

In each encounter with participants, I verbally outlined the purpose and goals of the research, explained the potential benefits (and risks), and assured confidentiality through anonymity. Participants' consent was obtained orally and in written form, and they were asked permission for the interviews to be audio recorded. As a researcher, I also had a responsibility to be willing to build genuine relationships with interviewees beyond the boundaries of the research (Berg and Lune 2012). Openness is helpful in establishing common ground and rapport as well as in helping to smooth over the imbalance of hierarchy (Berg and Lune 2012). As an outsider and foreigner, I also strove to follow suitable cultural practices, such as in dress appearance, conducting research at appropriate times and days, being flexible with my diet, etc.

Two sets of semi-structured interviews were conducted (Table 1.2). The first set of interviews targeted organizational employees/project managers (from AGRA and UNAC) to gain insights about operational activities. The aim was to interact with staff members, e.g., program managers, field-officers, contract/ implementing partners and affiliated associations. In addition to inquiring about each organization's establishment and work in Mozambique, interview questions solicited information related to the measures taken to facilitate or implement the selected indicators; how the organizations' efforts contribute to food security; and what constraints (or enabling factors) they face in affecting the indicators (Appendix A).

The second set of semi-structured interviews targeted smallholders who were the primary beneficiaries of the organizations' respective agrarian models. In addition to inquiring about how farmers became affiliated with either organization, interview questions sought to scrutinize how farmers were responding to the different agrarian activities of the two models; e.g., whether they are able to gain access to new agricultural technologies and how their livelihood and food security were affected as a result of the organizations' efforts (Appendix B). I also conducted focus group interviews with farmers' associations. Group interviews are especially helpful in

gaining access to information which must often be negotiated through collective meaning and group identities (Barbour 2008, p. 135). Focus group meetings also help to clarify issues that may not be well explained in individual interviews (Barbour 2008). The nature of semi-structured interviews meant that although the questions were open-ended, impromptu queries were added to reflect participants' responses and interests.

Table 1.2: Break-down of Participant Interviews

Interview participant	Organization/Affiliation			Total #
	AGRA	UNAC	Other	
Organizational employees/project managers/affiliates	7 (staff) 1 (agro-dealer) 2 (seed companies)	7 (staff) 1 (jurist)	2 (National agricultural research institute staff) 2 (International Organizations staff) Out of these, 3 informed the AGRA's model and 1 informed UNAC's model	22
Beneficiary farmers	12 (individual farmers) 4 (small groups, range 2-6 people) 7 (focus groups, range 7-15 people)	16 (individual farmers) 4 (small groups, range 2-6 people) 6 (focus groups, range 7 – 15 people)		49
Total #	33	34	4	71

Note: some participants were interviewed more than once

Although the sample sizes are relatively small (33 interviews with AGRA affiliates and 34 in the case of UNAC), they meet the minimum acceptable size of 15 interviews required for qualitative research (Guest et al. 2006, p. 61). Data saturation occurs at a point where excess information does not add new or useful insights to the topic under investigation (Mason 2010). While I

started to see some degree of saturation in the interviews with farmers, it was difficult to determine the point of saturation in interviews with project staff. However, both the sample size and participants level of expertise on the subject were adequate to allow for a replication of the study (Balarajan and Reich 2016).

I worked with three research assistants (all were enrolled at local universities) to interpret non-English speaking interviewees: Portuguese, Xichangana and Chimanyika (and dialects of Chiute, Chidau and Sena). In Manica province, one of the research assistants comes from a village in Sussundenga district (Dombe) and was particularly talented at relating to farmers and making them feel at ease. He had in-depth knowledge about the everyday realities of farming communities in the region, and as such provided valuable insights to this study. With the exception of three interviews that were conducted by research assistants, I conducted all of the interviews: each lasted between 40 and 60 minutes. I also collected quantitative data from the Integrated Project on their farmers' produce sales and prices during the first year of the project (2013/2014). The preliminary results of AGRA interviews were presented to project staff in Chimoi in April 2015. Their feedback provided further clarity on some of the key themes that emerged early on from the data.

In addition to interviews, and throughout the study, participant observations were relied upon. This entailed residing in at least one of the researched rural communities (Marracune), engaging in daily activities, attending special events, rituals, etc. (Lapan et al. 2012). Detailed observation of contextual issues can be helpful in uncovering discrepancies between how the people being studied perceive and present information and what they actually do in practice (Barbour 2008). Participant observation is complementary to interviews and can help the researcher build an in-depth picture of the case (Creswell 2013).

1.6.7 Data Analysis

This study drew insights from organizational analysis literature to assess AGRA's and UNAC's impact, in terms of *implementation process* and *outcome*, on the sustainable food system indicators from the vantage point of farmers. Organizational analysis applied here is less concerned with an evaluative process that validates an organization's legitimacy (based on pragmatic or normative reasons) (Richardson and Dowling 1986; Suchman 1995), than with its

impact on a social activity (Weick 1995; Golant and Sillince 2007). The first analytical dimension looked at how each organization's investments and/or activities are executed, taking into account contextual issues related to the sustainable food system indicators (implementation process). The data revealed that neither organization addresses all five indicators in their entirety, both entities focus more on some components than others. As such, the empirical chapters (3, 4 & 5) will focus on those indicators that each organization has strong engagement with and/or were of key concern for its members (interviewed in this study). In the case of AGRA, these are quality seeds (increasing the availability of improved seeds) and income opportunities (integrating smallholder farmers into markets). For UNAC, its strongest impact is on land rights (taking proactive measures to safeguard peasants traditional land-use rights).

The second analytical dimension looked at outcomes, and focused on beneficiary farmers, e.g., scrutinizing whether they were able to gain access to new agricultural technologies, and how their food and livelihood security was affected as a result of the organizations' activities (Chapter 3). The process drew heavily on farmers' experiences delineated in interviews. Where possible, secondary statistical data pertaining to farmers' activities was used (Chapter 4).

Data analysis of interviews and field notes was done manually, and took an inductive approach, using grounded theory, to search for patterns in the gathered information (Blackstone 2012). The first step in the data analysis was to read and re-read transcripts, taking notes of key attributes and ideas that emerged. The second step was to categorize or codify the data into themes and subthemes to help draw meaning from underlying trends and patterns. The final step was to arrange the codes into a coding structure of themes and subthemes. With regards to the organizations' performance on the indicators, a low rating entailed little to no action to improve the conditions or trends on each in the direction of the sustainability criteria. A moderate rating constituted partial action to meet the target criterion. For example, efforts that increase the levels of good quality seeds, but do not ensure that farmers can gain access them qualify as having a moderate impact. A high rating is attained when an organization's activities actively seek to foster improvements on the conditions and trends of an indicator as per outlined criteria. To increase the validity and reliability of the primary data, this study relied upon triangulation with secondary data, from peer-viewed and gray literature on African Green Revolution and the food sovereignty activities in Mozambique and the broader region.

1.6.8 Limitations

This study has several limitations both in design (as a qualitative case-study) and in implementation (due to contextual constraints). The sample size was too small for statistical purposes; thus, the evidence presented here should not be used to make analytical generalizations (Onwuegbuzie and Collins 2007) about the impact of the agrarian models' activities beyond the communities where the research took place. Due to low levels of infrastructure development, especially in rural Manica province, most of the interviews with beneficiary farmers were conducted at sites located in close proximity to main roads, accessible by public transportation because of unrest in the area. In Manica province, conducting interviews in communities near main roads was also a matter of safety, i.e., having an escape route. There was a heavy military and police presence in the region at the time of the fieldwork that made travelling to remote areas intimidating. Further details are provided in Chapter 4. As a result, the interview process could not avoid sampling bias, and I recognize that this is a limitation of the study.

There is also the challenge associated with biased responses from participants, whereby some people may feel the need to describe their project or impacts "in glowing terms" (Jones et al. 2015, p. 58). I encountered this at least once, but was able to reassess such bias by member-checking, i.e., verifying the information with other project members. These limitations indicate the difficulty of assessing in depth, particularly of statistically quantifying, African Green Revolution and food sovereignty impacts on food security and agricultural systems' sustainability in Mozambique. Nonetheless, this study provides an important starting point to advance mainstay academic debates about what the two agrarian models and its supporters represent. It highlights that contextual dynamics, in some places, are complex and messy and thus warrant more-nuanced deliberations and further empirical research.

1.7 Organization of Dissertation

This dissertation adopts a manuscript format. In addition to the introductory and concluding chapters, four publishable manuscripts make up the bulk of this work. There is, however, some repetition of the research purpose and contextual background throughout the thesis because the manuscripts were written for different academic journals. The key objectives and contents of each chapter are outlined below.

Chapter 2 is titled: *The African Green Revolution and the Food Sovereignty Movement: Sustainability Considerations for Meeting Food Security in Southern Africa*. This chapter delves deeper into how the ontological backgrounds and assumptions of the African Green Revolution and food sovereignty models influence their respective approaches to food security and sustainability in Sub-Saharan Africa. The chapter also illustrates that the models' diametrically opposed ideological foundations help to explain the polarization and tensions that exist the two. To help move the discussions past the binary, this chapter draws insights from sustainability assessment literature to propose a framework comprised of key sustainable food system indicators that are important for merging food security and sustainability goals in southern Africa. This manuscript is currently under review at the *International Journal of Agricultural Sustainability*.

Chapters 3, 4 and 5 present the empirical account of this doctoral work, and outline how the African Green Revolution and the food sovereignty models are being implemented on the ground in the context of Mozambique. Chapter 3 is a comparative assessment of the two agrarian models and is titled: *Contested Food Security Agendas in Mozambique: the African Green Revolution and Food Sovereignty Movement*. This chapter presents the data from my interviews and explores in depth how Mozambican farmers engage with the two models. While some critical food studies scholars and actors contend that the two agrarian models are incongruent, this chapter reveals that farmers in central Mozambique utilize some of the tools that the models offer in complementary, rather than competing ways. Neither model addresses critical components of food security and sustainability in their entirety. Where possible, farmers engage both models—taking from each what helps them to meet these two goals.

While both AGRA and UNAC teach integrated soil health practices, neither is able to sufficiently ensure that a majority of farmers have access to quality seeds. AGRA attempts to

raise rural incomes by linking farmers to reliable buyers for their crops, but UNAC is weak on efforts to create income opportunities for farmers. And while UNAC works diligently to empower farmers to (re)claim land rights, AGRA does little to affect farmers' land rights. Both organizations also make significant contributions to policy. AGRA works to strengthen the capacity of service providers in the public and private sectors. UNAC is engaged at the grassroots level in proactive measures to safeguard the rights of rural producers and to challenge poor policy practices. From the vantage point of farmers, therefore, each model addresses a critical component (s) of food security and sustainability that the other fails to tackle, and thus, there is a complementary effect. This manuscript will be submitted to the *Canadian Journal of Development Studies*.

Chapter 4 is titled: *The Alliance for a Green Revolution in Africa (AGRA) and Underperforming Markets in Mozambique*. This chapter also presents the data from my interviews and participant observations, and is supplemented by empirical evidence from peer-reviewed and gray literature. The study finds that AGRA performs well to increase the availability of improved seeds. However, the availability of improved seeds has not translated into a broad uptake by farmers. This gap is due to a marketing approach that requires farmers to pay for full-priced inputs in an environment where output markets offer low returns, particularly for staple crops such as maize. Overall, AGRA is making important strides in addressing aspects of food security. However, the process continues to be complex and messy. This manuscript is currently under review at *Food Policy*.

Chapter 5 is titled: *The Political Economy of Customary Land Rights in Mozambique: Lessons from a Food Sovereignty Movement*. This chapter presents my interview data and participant observations on the food sovereignty case study, and is complemented by existing scholarship. The analysis reveals that UNAC's proactive measures to safeguard peasant land-use rights are at the heart of its food sovereignty struggles. Among these are teaching practices that empower peasants to understand and (re) claim their customary rights under the country's land law (unfamiliar to a large segment of the rural population). This participatory approach draws attention to poor policy practices that can cause and exacerbate food insecurity, i.e., unequal access to and distribution over resources and skewed power relations. At the same time, this

action demonstrates that appropriate solutions can emerge when marginalized people are given a real voice and capacity to engage with authorities and the outside world.

UNAC's capacity to address other sustainable food system indicators, however, is severely limited. While the movement faces major funding constraints, shortcomings in the principles of food sovereignty, which largely promote the rights of producers and self-sufficiency, also inhibit UNAC from addressing other key food security and sustainability objectives. This manuscript has been accepted for publication as a book chapter forthcoming in Duncan, Jessica and Bailey, Megan (eds.) *Sustainable Food Futures: Multidisciplinary Solutions* (Routledge 2017).

Chapter 6 provides a concluding summary of this dissertation, reiterating its contributions to academic scholarship and to food and agricultural policy. This chapter also answers the research question, taking into consideration the strengths of the research framework, as well as the limitations of this study. Finally, the chapter outlines possible areas for further research.

Chapter 2

The African Green Revolution and the Food Sovereignty Movement: Sustainability Considerations for Meeting Food Security in Southern Africa

2.1 Overview

Two vastly different approaches to food security and sustainability have become increasingly prominent in Sub-Saharan Africa over the last decade. One is the African Green Revolution model, implemented by a consortium of partners comprised of African governments, the private sector, philanthropic donors, and multilateral institutions. The other is the food sovereignty model, headed by Africa's peasant unions and civil society organizations. This chapter examines how the ontological backgrounds of these two agrarian models inevitably inform and influence their respective approaches to food security and sustainability in Sub-Saharan Africa. On one hand, the African Green Revolution favors modern rationalist notions of economic structural transformation and agricultural development. On the other hand, food sovereignty is inspired by historical structural ideas rooted in sociology that tackle issues of power and (in) justice embedded within global political and economic institutions. These diametrically opposed ideological foundations help to explain the polarization and tensions that exist between the two agrarian models. Such tensions, however, also hinder fruitful discussion about how to effectively address key concerns in food and agricultural systems. In response, this chapter draws insights from sustainability assessment literature to propose a framework comprised of key sustainable food system indicators that are important for merging food security and sustainability goals in southern Africa.

Key words: African Green Revolution, food sovereignty, sustainability assessments, food security, southern Africa

2.2 Introduction

The last decade has seen growing consensus among academics and policy-makers about a need to foster greater sustainability in food and agricultural systems. Sustainability in this sector refers to practices that contribute to food security, social equity, and environmental benefits, while reducing ecological scarcities (FAO 2012a). A rich body of literature offers guidance on how to stimulate sustainability in the global food system in a manner that facilitates broad-based food security and equity for all (IAASTD 2009; Lawrence et al. 2010; Garnett and Godfray 2012; FAO 2012a, 2013). In some regional contexts, however, the best approaches to merging food security and sustainability goals remain unclear and are at times deeply contested. An example is in Sub-Saharan Africa, where two vastly different agrarian models—the African Green Revolution and the African food sovereignty movement—have emerged to offer distinct food security and sustainability solutions.

The African Green Revolution is being implemented by a consortium of partners comprised of African governments, the private sector, philanthropic donors, and multilateral institutions. The objective of this initiative is to increase crop productivity and income opportunities for smallholder farmers through investments in agricultural technologies and market value chains (Rockefeller Foundation 2006; Toeniessen et al. 2008; Denning et al. 2009; AGRA 2009). A prominent partner in this consortium is the Alliance for a Green Revolution in Africa (AGRA), a philanthropic organization established in 2006 by the Rockefeller Foundation and the Bill and Melinda Gates Foundation. The food sovereignty model is supported by the continent's peasant and farmers' unions and associated civil society organizations. The Alliance for Food Sovereignty in Africa (AFSA) is a consolidation of the region's food sovereignty groups, launched in 2011 at the UN Framework Convention on Climate Change (UNFCCC) Conference of Parties 17 (COP 17), which was held in Durban, South Africa. Members of this movement seek to mobilize political activism around peasant rights to productive resources (land, water, seeds, etc.) and to revitalize Africa's food systems using the principles of agro-ecology (AFSA 2011; Anderson and Campeau 2013; AFSA and GRAIN 2015).

Both agrarian models make important contributions in their efforts to improve the performance of Africa's food and agricultural sectors. However, debates are highly polarized in academic and public forums about the suitability of each model to serve the needs of the poor. Critics view the

African Green Revolution as promoting the corporatization of Africa's agriculture through a market-led ideology and an implementation model based on high-priced input packages that carry heavy economic risks for farmers (Koopman 2012; Holt-Giminez and Altieri 2013; Bellwood-Howard 2014; AFSA 2015). The food sovereignty model is also critiqued by various scholars coming from different philosophical backgrounds. While the food sovereignty movement clearly rejects the tenets of agricultural liberalization under the World Trade Organization's Agreement on Agriculture (c.f. McMichael 2014), there appears to be confusion about what alternative trade model is acceptable (c.f. Burnett and Murphy 2014). Whereas food sovereignty places emphasis on self-reliance at the household and local level, critics raise doubts about whether smallholders can generate a sufficient marketable surplus to supply even local markets (Bernstein 2014; Agarwal 2014). These polarizing views of the African Green Revolution and the food sovereignty movement make it difficult to have fruitful engagement about how to effectively address concerns in Africa's food and agricultural systems.

This chapter examines the debates surrounding how best to merge food security and sustainability goals in southern Africa's food systems. Informed by farmers' perspectives in Mozambique,¹⁵ it draws insights from sustainability assessment literature to outline a framework comprised of key sustainable food system indicators that are important for meeting these two goals. These are access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement. Taken together, these indicators can help to address both the technical aspects of meeting food security (issues of production) and engage with political economy issues that facilitate (or hinder) the means of achieving it. A sustainability assessment of the African Green Revolution and food sovereignty models' potential contributions to these indicators, from the vantage point of farmers, is an attempt to get the respective camps to appreciate the value of both the technical aspects of food security and the political economy concerns surrounding it.

The outline of the chapter is as follows. First, it maps out the ontological backgrounds of the African Green Revolution and food sovereignty models. The activities of these two agrarian

¹⁵ Based on the author's fieldwork in Mozambique for a period of seven months in 2014 and 2015 entailing a comparative assessment case study of the Alliance for a Green Revolution in Africa (AGRA) and the National Union of Mozambican Peasants (UNAC) (a food sovereignty movement), and their contributions to these two goals from farmer perspectives.

models can be effectively interpreted when their ideological foundations and theoretical assumptions are taken into consideration (c.f. Moon and Blackman 2014). The models' diametrically opposed ontologies also help to explain the binary views that highlight the contradictions between and within the two. Next, the chapter elaborates on the application of sustainability assessment and the significance of the selected sustainable food system indicators. The advantage of applying a context-based sustainability assessment is a capacity to foster an integrated understanding of key issues and complexities that characterize socio-ecological systems and the possibility to open up space to consider opportunities that may serve broader and forward-looking options (Gibson 2016). This section also includes a discussion on how this study's sustainability assessment framework might be received by both sides of the debate.

2.3 Diametrically Opposed Ontological Backgrounds

2.3.1 African Green Revolution

The African Green Revolution emerged at the turn of the millennium with ideas to jumpstart economic structural transformation in Sub-Saharan Africa through agriculture-led growth. The institutions, scholars and actors behind this agrarian model share an ontological perspective that favors modern rationalist ideas about agricultural development. During this era, trade negotiations on the Uruguay Round to establish an internationally-binding set of agricultural rules had recently come into effect—on January 1, 1995. Organizations like the International Food Policy Research Institute (IFPRI) and the World Bank were optimistic that liberalized agricultural markets would bring economic benefits to poor countries and smallholder farmers (Pinstrup-Andersen et al. 1999; World Bank 2000). Developing countries, they argued, could gain better access to markets for their primary commodities in industrial nations, and the process would facilitate agricultural transformation in the former. The World Bank (2000) in particular championed public-private partnerships as a way to modernize Africa's agricultural sectors, and integrate farmers into liberalized domestic markets (p. 193-201).

The early 2000s also saw a significant rise in private sector investment in agricultural research and development, particularly biotechnology (Parayil 2003; Chataway et al. 2004). Some actors welcomed new biotechnologies and saw in them opportunities for the rural poor (Pinstrup-Andersen et al. 1999; Paarlberg 2000). According to Paarlberg (2000), areas most affected by

malnutrition and rural poverty, e.g., Sub-Saharan Africa, were those bypassed by the first Green Revolution. He explains that this was partially because the first Green Revolution depended on “hard to get, hard to manage ‘packages’ of purchased inputs” (p. 22), consisting of seeds, chemical fertilizers and pesticides. But new bioengineered seeds had a unique promise of reducing the cost of inputs because all productivity-enhancing factors were inserted in the seed itself (ibid).

Other scholars behind the African Green Revolution were also optimistic about new biotechnologies, particularly their potential to make farming more environmentally sustainable—by reducing or eliminating pesticide use, minimizing soil tillage and requiring less land to be converted to agriculture (DeVries and Toenniessen 2001; see also Conway 1998; Borlaug 2004).

During the late 1990s, moreover, the problem of alarmingly high levels (and concentrations) of hunger and poverty in rural Sub-Saharan Africa started to gain global political attention (FAO 1996; World Bank 2000). World leaders introduced initiatives to address global hunger and poverty, e.g., the UN Millennium Development Goals (MDGs) of 2000. African governments also vowed to prioritize agricultural development and committed to allocate at least ten percent of their national budgets to the sector (African Union 2003). At the African Heads of States Summit in 2003, leaders endorsed the Comprehensive African Agriculture Development Programme (CAADP) to become a continental leading policy framework to stimulate agriculture-led growth and food security, and to address poverty. However, CAADP required large investments (about USD 15.7 billion per year in the first decade) (NEPAD 2003, p. 19). Thus, the Africa Union, alongside lending institutions and donors, emphasized sharing responsibilities between key partners in the public and private sectors. These actors also encouraged strategic partnerships with philanthropic donors, sub-regional organizations and farmers’ organizations at the national and international levels (NEPAD 2003).

In 2006, the Rockefeller Foundation and the Bill and Melinda Gates Foundation established the Alliance for a Green Revolution in Africa (AGRA), a philanthropic organization, to coordinate African Green Revolution activities in Sub-Saharan Africa by promoting:

scientific development of more productive crops and fertilizers; cultivation of local talent in plant science, farming, agricultural policy, and business; strong commitment from

national governments; and public-private collaboration on infrastructure, water and irrigation, the environment, and building markets for the inputs and outputs of a revolutionized farm sector (Rockefeller Foundation 2006, p. 4).

Today, the African Green Revolution is supported by a wider group of actors beyond the Gates and Rockefeller Foundations. Among these is the Grow Africa Partnership, founded in 2011 by the World Economic Forum, the African Union and the New Partnership for Africa's Development (NEPAD). Grow Africa works with governments to facilitate private sector investments in agriculture on the continent—partner companies include Monsanto, Syngenta, Cargill and Yara International. Investments from these companies are expected to create local jobs and increase rural incomes (Grow Africa Secretariat 2013). Another, similar African Green Revolution initiative is the G8's New Alliance for Food Security and Nutrition in Africa, launched in 2012 as public-private endeavour that seeks to accelerate agriculture-led growth in Africa and lift 50 million people out of poverty by 2022. In southern Africa, several countries, such as Mozambique and Malawi, have introduced national strategies and legislation to implement their Green Revolution activities (see GOM 2007).

African Green Revolution scholars and actors make several key assumptions about how to achieve food security and agricultural development in Africa. One is that technology transfers, e.g., hybrid seeds plus insertion of farmers into market value chains, represent a primary means to tackle hunger and poverty (Toeniessen et al. 2008; Sanchez et al. 2009). For example, Sanchez et al. (2009) argue that most African smallholder farmers, producing maize or staple crops on less than one hectare, are unlikely to escape absolute poverty unless they diversify to high-value (marketable) crops, e.g. onion, sunflower, hibiscus, chili peppers, etc. (p. 40). The African Green Revolution scholarship also assumes that modern biotechnology can deliver win-win solutions by addressing the challenge of low crop productivity while helping farmers adapt to climate change (Paarlberg 2008). With some regions of the continent especially vulnerable to droughts, e.g. southern Africa, Paarlberg (2008) explains that farmers in such areas can benefit from bio-engineered drought-tolerant crops. Such crops offer stable yields under adverse climatic conditions, which can deter farmers from resorting to various impoverishing strategies, such as selling off household assets (p. 154).

The African Green African Revolution scholarship also assumes that farmers have limited knowledge about the use or benefits of modern technologies, but that such a gap can be addressed by better extension services (Otsuka and Kijima 2010; AGRA 2013). Otsuka and Kijima (2010) assert that a possible explanation for low crop yields in Africa is that “many farmers do not know or have never heard of hybrid maize variety.... [and] do not know the highly positive effect of fertiliser on hybrid maize production” (p. 62). Scoones (2002, p. 116) provides a similar analysis of some of the key assumptions made by pro-poor biotechnology advocates. Nonetheless, these ontological assumptions are vastly different from those of food sovereignty.

2.3.2 Food Sovereignty

Food sovereignty’s approach to food security is rooted in a peasant-led resistance to neoliberal economic policies that incorporated agriculture into the international trade regime during the 1990s (Clapp 2015a). A prominent actor in this agrarian model is La Via Campesina, a transnational food sovereignty movement comprised of 164 organizations that represent peasants, smallholders, farm workers, rural women and indigenous agrarian communities in 73 countries in Africa, Asia, Europe and the Americas (Via Campesina 2015). La Via Campesina originally emerged from Latin America (Desmarias 2007). The majority of this movement’s members are forbearers of rural populations that suffered the consequences of a long history of economic liberalization, land and income inequality, discrimination and marginalization (Martinez-Torres and Rosset 2010).

At the World Food Summit in 1996, La Via Campesina introduced the concept of food sovereignty, defined as: “the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agricultural systems...[to put] those who produce, distribute and consume food at the heart of the food system, rather than the demands of markets and corporations” (Via Campesina 2007 in Patel 2009, p. 666).

In Sub-Saharan Africa, food sovereignty was taken up by peasant groups that joined La Via Campesina in 2004. The Network of West African Peasant Organisations and Producers (ROPPA) and the National Union of Mozambican Peasants (UNAC) were among Africa’s first

food sovereignty movements. ROPPA was established by peasant unions from ten West African countries in 2000. The movement emerged as a response to trade liberalization policies that weakened the position of Africa's produce on world markets, and defeated farmers' competitiveness in their own markets because of heavily subsidised imports (ROPPA 2003). Long-term food-aid to the region though the 1980s and early 1990s also undermined domestic markets, e.g., by discouraging local production due to market gluts and low producer prices (Blein and Jeudy 2007). According to ROPPA, the impoverishment of Africa's peasants was not merely a result of unfavorable climatic or economic conditions, but of "logical outcome of the rules of the game negotiated and then imposed on producers" (ROPPA 2003, p. 5).

Food sovereignty scholars similarly contend that agriculture liberalization policies had detrimental effects on producers and rural food security in the global south (Wittman et al. 2010; McMichael 2011, 2014; Akram-Lodhi 2013). Cheap food imports forced millions of farmers out of the farm sector, which fueled the 'planet of slums' phenomenon (Davis 2006). That is, farmers ejected out of agriculture, formerly the lifeblood of their livelihoods, found themselves living in subhuman conditions on city fringes, poor and hungry (McMichael 2009). And as countries opened up their markets further during the 1990s, agro-corporations were able to ramp up their export position—expanding transnational links between farm sectors in different regions. The result is that agro-corporations have grown both in size and scope and today occupy a dominant position in the global food system (McMichael 2009; Wilkinson 2010). Agro-corporations engage in a global nexus of biofuel investment, large-scale foreign land acquisition, and financialization (Clapp 2016)—activities which increased their economic success, but carry severe ramifications for food security, social equity, and environmental sustainability.

In 2011, at the UNFCCC Conference of Parties 17 (COP 17) in Durban South Africa, Africa's food sovereignty groups consolidated to establish the Alliance for Food Sovereignty in Africa (AFSA). Today, AFSA is comprised of 21 member networks¹⁶ that share a common concern over the various agricultural development strategies being pushed by external entities, such as the New Alliance for Food Security in Africa, the Grow Africa Partnership, and AGRA (AFSA

¹⁶ For a full list of AFSA members, visit <http://afsafira.org/what-is-afsa/>

2015). AFSA fears that such initiatives stand to corporatize Africa's agriculture, and intensify problems of land grabbing and bio-piracy of genetic resources (AFSA 2016).

AFSA's mission is aligned to that of the international food sovereignty movement (led by La Via Campesina). As such, AFSA has adopted the Declaration of Nyéléni¹⁷, which spells out the agenda for food sovereignty. In this model, food is framed as a human-right as opposed to a commodity (Patel 2009). Food sovereignty (re)claims control of food systems by putting farmers, communities and states back at its center, such that they may self-determine how to grow and distribute food in a manner that enhances livelihoods and food security (Claeys 2012). This focus in effect engenders action towards (re)organizing food systems to serve the collective rights of citizens as opposed to market values under the WTO regime (McMichael 2014, p. 937).

The ontological perspectives of food sovereignty scholars and actors are inspired by historical structural ideas rooted in sociology that tackle issues of power and (in) justice embedded within global political and economic structures. Phil McMichael (2014), an historical sociologist, explains that the agrarian and crises we face are associated with 20th century governance structures that globalized food and agricultural systems via liberalized agricultural markets, structural adjustment policies, large-scale industrial production, etc. (see also Friedmann and McMichael 1989). A globalized food system, however, has failed to adequately feed the world in a manner that is socially and ecologically sustainable (Weis 2007; Clapp 2016). As mentioned, such a system has also exacerbated various problems in the sector: long-term marginalization of family farms, land and income inequality, poverty and hunger, etc., particularly in the Global South (Martinez-Torres and Rosset 2010). Reversing some of these problems, according to food sovereignty scholars, requires creating more localized food systems.

Several key assumptions from food sovereignty actors are also applied to food security efforts in Sub-Saharan Africa. One is that the social control of food systems predominately entails adopting agro-ecology as a means to foster people's dignity and ecological viability (Menser 2014). Agro-ecology replicates the microcosms of traditional agriculture to improve the productivity of rural ecological landscapes, using a diversity of crops and low-input technologies (Altieri and Nicholls 2005; Scherr and McNeely 2007; Amekawa 2011). In particular, agro-

¹⁷ The Declaration of Nyéléni was adopted at the meeting of food sovereignty movements in the village of Nyéléni in Sélingué, Mali, 2007. To see the declaration, see: <http://nyeleni.org/IMG/pdf/DeclNyeleni-en.pdf>

ecology seeks to scale-up agricultural innovations through farmer-to-farmer exchanges (Holt-Gimenez 2006) and to conserve and regenerate ecological resources using mainly natural inputs. The principles of kinship, cooperation, reciprocity, mutual well-being, etc., are at the center of agro-ecology, which stand to foster dignity and social reproduction in rural communities (Menser 2014, p. 61). Altieri and Nichols (2005) assert that agro-ecology has already proven successful in meeting the food security needs of thousands of resource-poor farmers living in marginal environments in Africa, Asia and Latin America (p. 134).

Another assumption of the food sovereignty perspective is that seed sovereignty, which is farmers' rights to save, exchange, reproduce, and grow their own seeds, is a primary means to achieve autonomy and self-determination in food production (Kloppenburg 2010). La Via Campesina (2013) argues that smallholders' capacity to choose what food to grow and how to produce it will disappear if governance structures do not recognize and respect seed sovereignty. Kloppenburg (2010) similarly emphasizes that seeds sit at a critical nexus of both foodstuff and production, and whoever controls them gains a substantial measure of control over the shape of the entire food system (p.152). Food sovereignty also assumes that farmers should grow food for self-sufficiency purposes and be embedded in locally-based markets as opposed to global value chains (Nyéléni 2007, 2015 AFSA 2011).

2.4 Ideational Impasse

Fostering sustainability in the agricultural sector requires efforts that mitigate potential adverse consequences and enhance positive outcomes, particularly for the people who rely on this sector for their livelihoods and the biospheric systems upon which viable agriculture depends. As such, it is important to consider whether the activities of the African Green Revolution and the Africa food sovereignty movement are designed and carried out to contribute to sustainability. Current tensions surrounding the two models are necessarily linked to questions about the extent to which their activities contribute to progress toward sustainability (political, social, economic and environmental). Thus, a discussion that looks at the models' respective impact on sustainability is helpful to bridging the ideational divide between them.

For example, critics of the African Green Revolution argue that this model has a "universalizing" narrative that favors technocratic interventions (i.e., hybrid seeds plus insertion of farmers into

market value chains) (Scoones and Thompson 2011; Amanor 2011; Thompson 2014). But critics say such interventions primarily serves the interests of a small but powerful set of actors in the public and private domains (c.f. Tansey 2011). State interests are driven by a need to deliver ‘quick fixes’ for low-crop productivity and food insecurity in a political process obscured by electoral gains and patronage (Chinsinga 2011). Private actors are vying to make profits, through proprietary seed technologies and by pushing for the expansion of intellectual property rights in Africa (Tansey 2011).

In Malawi, elected officials have gradually shifted the government agricultural input subsidy programs, in place since the late 1990s, from providing farmers with maize open pollinated varieties (OPVs) to hybrids (Chinshinga 2011; Brooks 2014). Chinshinga (2011) explains that high yields attained by hybrids enable politicians to “have something to show to the people during election campaigns” (p. 63), and are generally a fast solution to meet food gaps at the national level. Odame and Muange (2011) similarly show that Kenya’s Green Revolution is geared towards technocratic interventions that can deliver higher food production, and focuses on favourable agronomic regions to boost yields even further.

Although hybrid seeds and related technologies used in the African Green Revolution may improve crop productivity and boost food security numbers, such inputs are often proprietary to powerful agro-corporations. In southern African seed markets, multinational companies, such as Monsanto, Syngenta and Dupont, are gaining prominence through mergers and acquisitions. For example, Malawi’s National Seed Company (MNSC) was bought up by Cargill in 1989, and was subsequently sold to Monsanto in 1996 (ACB 2015a). Monsanto also purchased two of South Africa’s largest seed companies at the time, Carnia Seed and Sensako. The largest remaining domestic seed companies in the region were recently purchased by other multinationals: South Africa’s Panner Seed merged with Dupont (Pioneer Seed) in 2013 and Zambia’s Maize Research Institute (MRI) was bought up by Syngenta that same year (ACB 2015a).

Some of these corporations have freely acquired germplasm developed in public institutions and by farmers over many decades (Thompson 2012). However, the transnational seed companies have filed sweeping patent documents with the World Trade Organization (WTO) for climate-ready seeds developed in field trials in Africa (Benzer-Kerr 2010). At the same time, such private actors are among entities pushing for the implementation of uniform seed laws in the

region, entailing intellectual property rights. New seed laws are expected to equip seed companies with enormous power and control as their seeds start to dominate the region's markets (Tansey 2011).

The African Green Revolution's commercially-oriented approach to food security certainly raises questions about its capacity to enhance social and economic sustainability for Africa's smallholder farmers given the high cost of inputs in resource-poor environments. Koopman (2012) explains that AGRA's disproportionate support for commercial input packages is likely to carry heavy economic risks for farmers because input costs have an upward trend while farm gate prices can be extremely volatile. Andree et al. (2014) assert that the dire experience of farmer-dependency on high-priced inputs elsewhere, for example in India where poor farmers are trapped in a cycle of debt (see Mirsha 2007), is illustrative of the dangers that Africa's farmers could face in the African Green Revolution. Some critical food scholars and actors go further in their calls to reject this agrarian model altogether, claiming that it offers no valid solutions for Africa's food security challenges (Holt-Giminez and Altieri 2013; AFSA 2015). AGRA and its philanthropic supporters are ostensibly promoting corporate interests in Africa under a guise of "helping the poor" (Dano 2007; AFSA 2015; Curtis 2016). Critics call for rebuilding food systems based on an alternative model of food sovereignty, free from subordination or co-optation by the African Green Revolution.

At the same time, various scholars coming from different philosophical backgrounds question food sovereignty's capacity to sustainably feed the world and foster viable rural livelihoods. Foremost, critics argue that food sovereignty's vision for self-sufficiency is overstated. While this model rejects industrial agriculture, Jansen (2015) argues that its one-sided approach to agro-ecology, based on little to no external inputs, is problematic. Some marginal areas that rely on local resources often see low yields or a depletion of natural resources. Thus, some use of industrial inputs (e.g., chemical fertilizers and improved varieties) can be critical to raising yields in agro-ecological regions with adverse conditions (Jansen 2015; Lotter 2015). It is also unclear whether smallholders' low-input agriculture can adequately feed a growing number of non-producers in developing countries (Bernstein 2014). In southern Africa, urban populations are projected to rise drastically in the coming decades (Crush and Frayne 2011; Parnell and Pieterse 2014).

Critics also point to the contradiction that lies in food sovereignty's principle of supporting farmers' democratic choice in what crops to produce and how to grow food while promoting a particular type of agriculture (Agawal 2014). For example, even though La Via Campesina excludes NGOs from its core functions because of their apparent paternalistic tendencies, it also sidelines farmers and organizations like the International Federation of Agricultural Producers (IFAP) that, in its view, have a pro-trade-liberalization stance (see Desmarias 2007). The problem here is the exclusion of farmers who choose to grow commercially viable crops and associate with global market relations, despite the movement's values of self-determination.

Bernstein (2014) argues that food sovereignty perpetuates a (misinformed) view that peasants should produce food for household and local self-sufficiency purposes rather than for global markets. However, farmers often face complex realities that do not always align with food sovereignty's visions. For example, food sovereignty supports building local food economies with short and fair distribution chains between producers and consumers (Nyéléni 2007; 2015). Yet, domestic agricultural markets in southern Africa present vast challenges for producers (Boughton et al. 2007; Barrett 2010; Jayne et al. 2010; Mather et al. 2013). Output markets are characterized by price instability and low investment returns, and generally see small volumes of produce traded (Poultine et al. 2006). A compelling body of literature explains that many peasants are leaving agriculture, and those who stay opt to produce commercially viable crops (Bryceson et al. 2001; Masakure and Hansen 2005; Hall 2009; Li 2009; Agarwal 2014). Export agriculture supports the livelihoods of millions of smallholders (Burnett and Murphy 2014).

The mismatch between the food sovereignty discourse and farmers' desires appears to arise from preconceived categories used to define rural populations and their farming practices. Bernstein (2014) points out that food sovereignty scholars tend to describe farmers as 'small-scale,' 'self-provisioning,' 'stewards of the land,' and their farming practices as 'socially just and rational, and 'ecologically-wise.' Such peasant qualities are often contrasted with market relations that are viewed as 'capitalist,' 'exploitative' and 'unsustainable' (Bernstein 2014). But in reality, agrarian communities have disparate interests, and exemplify social and class differentiation. Other scholars also caution against idealizing 'peasant farming,' as the process potentially locks farmers into subsistence poverty (Paarlberg 2008).

2.5 Insights from Sustainability Assessment

The respective ideational backgrounds and critiques of the African Green Revolution and food sovereignty models offer valuable insights into the complex challenge of achieving food security. However, there is a growing level of polarization surrounding the debates, raising concerns about the two models' capacity to foster sustainability in Africa's food and agricultural systems in ways that serve the livelihood needs of smallholder farmers. Questions surrounding the most-appropriate seed technology; how best to secure rural populations' access to productive resources, particularly land, and what types of market relations will be of most benefit to smallholder farmers, are key sustainability concerns. Thus, there is a need for more-nuanced approaches to evaluating what progress is needed for smallholders' food security and agricultural sustainability (IAASTD 2009), and what each model has to offer to achieve these two goals. Context-specific sustainability assessment frameworks of key food security concerns can provide new knowledge about an area where research is at a crossroads.

Many approaches to sustainability assessments are derived from experience with Environmental Impact Assessments (EIAs), which originally mandated that project developers avoid or mitigate potential adverse environmental consequences resulting from their operations (Pope et al. 2004; Dalal-Clayton and Sadler 2005; Morrison-Saunders and Therival 2006; Gibson 2006). Pope et al. (2004) explain that early EIAs were "typically a reactive, ex-post process that aimed to evaluate the environmental impacts of a policy, plan or programme for which decision-making [was] well advanced or complete against a baseline, to evaluate the acceptability of the impacts and to identify potential modifications to improve the environmental outcomes" (p. 600).

Over time, more progressive EIAs evolved. Projects saw significant changes in the assessment process, i.e., they became more thoroughly proactive (Pope et al. 2004; Gibson et al. 2005). The work of sustainability assessment scholars is gradually helping to shift EIAs from having a primary focus of identifying and mitigating adverse socio-ecological impacts to seeking overall lasting positive net gains for three pillars of sustainability: social, economic and ecological. Today, progressive sustainability assessments require project proponents and planners to design their activities in ways that improve socio-ecological conditions in an integrative manner across the three pillars. Improvements on the health of biophysical systems, equity in resource use, livelihood sufficiency and opportunity, and public dialogue, etc. are among key measures needed

to help society to progress towards sustainability (Gibson et al. 2005, p. 265). Because strong interconnections exist among the three pillars, sustainability assessments demand that project implementers foster mutually reinforcing gains on relevant measures or conditions (Morrison-Saunders and Therival 2006; Gibson 2006).

Several sustainability assessment frameworks for agricultural systems exist (Hansen 1996; Smith and McDonald 1998; von Wieren-Lehr 2001; van Cauwenbergh et al. 2006; Partidario et al. 2009; FAO 2013). A few such frameworks pertaining to peasant agriculture (or smallholder farming) in developing country contexts are also in place (Izac and Swift 1994; López-Ridaura et al. 2002; Astier et al. 2011). Although these frameworks provide useful insights for implementing (or evaluating) activities based on strong sustainability principles, most limit their applications almost exclusively to systemic properties at the farm scale or local level.

For example, the Framework for Assessing the Sustainability of Natural Resource Management Systems (MESMIS) uses multiple socio-economic and environmental indicators for implementing sustainability practices in peasant farming systems, primarily in the context of Central and Latin America (López-Ridaura et al. 2002). The MESMIS' assessment criteria include yield efficiency and quality, soil nutrient balances, agro-diversity, market diversification, cost of external inputs vs. returns (income) and self-empowerment (p. 142-143). However, this framework primarily focuses its unit of analysis on factors at the farm, household and local economy level. Political issues, which often go beyond the local and even regional spheres, as well as concerns over power relations that are pervasive in food systems, are largely unaddressed. In addition, the aforementioned frameworks, rather than assess sustainability from farmer perspectives, tend to take a deductive approach to evaluating indicators based on established normative criteria. An evaluative process based on farmer perspectives allows this group to verify sustainability assessment criteria based on their lived experience with the conditions or trends that indicators represent. This latter approach enables the research to focus more directly on areas that are of key concern or priority to farmers.

In many ways, moreover, the tensions between the African Green Revolution and the food sovereignty models are connected to how policies are applied, and what they do or do not address, etc. For instance, critics of the African Green Revolution view its emphasis on upscaling technocratic innovations to resolve a 'low-productivity trap' as problematic because the

diagnosis is reduced to a technical challenge (with a technical fix) (Scoones and Thompson 2011; Jarosz 2012; Javdani 2012; Moseley et al. 2015). In various places across Sub-Saharan Africa, agricultural technological interventions are often overshadowed by significant social, economic and political inequalities, e.g., large-scale land acquisitions (Jarosz 2012, p. 193). When unaddressed, such inequalities will likely deepen smallholders' marginalization, hunger and poverty.

There is a need for sustainability assessments to substantively engage with policy, including its effects on the social, economic and environmental dimensions of sustainability. Governance mechanisms strongly shape what and how food is grown, distributed and ends up—or does not end up—in the mouths of consumers (Lang and Heasman 2015; Lawrence et al. 2010). Policy processes, therefore, are partly to blame for the unsustainable practices in Africa's food and agricultural systems, as well as why millions of people are food insecure in that region and around the world (c.f. FAO 2012a).

Whereas most sustainability assessment frameworks limit their work to the usual three pillars of sustainability (social, economic and ecological), the FAO's (2013) Sustainability Assessment Framework for Food and Agricultural systems (SAFA) adds a fourth pillar: good governance. This pillar addresses issues of accountability, participation, respect for rules of the law, etc., and offers valuable insights for broadening the scope of sustainability assessments to engage with policy issues that may facilitate or undermine smallholder food security.

SAFA is designed to assess the sustainability performance of enterprises and organizations along food and agriculture supply chains (FAO 2013). SAFA's four sustainability pillars, referred to as dimensions (good governance, environmental integrity, economic resilience and social well-being) are translated into sustainability practice through 21 themes, 58 sub-themes and 116 indicators (FAO 2013, p. 76). But similar to other sustainability assessments, SAFA's application is confined to segments of the food sector (e.g., a production site) or leave it up to specific entities (e.g., firms or producers) to self-report and self-regulate their sustainability impact (FAO 2013). Building system-wide sustainability requires integrative sustainability assessments that address concerns in food and agricultural systems in their entirety.

Due to time and logistical constraints, scholars conducting empirical research to evaluate the sustainability impact of African Green Revolution and food sovereignty activities may not be able to apply all of the SAFA indicators. Moreover, a majority of the indicators are not applicable to smallholder food systems in southern Africa. Noble (2014) explains that sustainability-oriented baseline studies can save time and resources by appraising the most important factors, referred to as Valued Ecosystem Components (VECs), that are defined by clear spatial and temporal boundaries. VECs are those factors or indicators (environmental, social and economic) that warrant detailed consideration because they likely carry significant impacts and are important to the public and/or research community (Noble 2014, p. 104-109). Typical sustainability baseline studies, however, tend to neglect interactions among the effects on and of VECs. Such studies also often focus on the immediate proposed undertaking without due attention to other sources of cumulative effects, and may ignore factors that are not impact receptors, e.g., needs to address systemic uncertainties.

Following Noble's (2014) suggestion on defining boundaries, this chapter delineates a sustainability assessment framework to help us better understand farmer perspectives on the African Green Revolution and food sovereignty models in southern Africa. Data collection and analysis for such a sustainability assessment framework should entail a combination of several techniques, taking into consideration temporal and spatial constraints.

A comprehensive literature review of the characteristics and concerns surrounding each context is necessary to delineate what sustainable food system indicators to appraise.¹⁸ Researchers would also need to conduct fieldwork. This may include semi-structured interviews, surveys and focus group meetings with farmers and organizations implementing agrarian activities of the African Green Revolution and food sovereignty models to help refine and narrow in on those indicators that warrant detailed consideration. Where possible, researchers may also take quantitative measures at the farm level (e.g., soil properties, species diversity, crop yields, total biomass, income levels, etc.) (see López-Ridaura et al. 2002).

The author undertook fieldwork in Mozambique, entailing interview interactions with farmers and project implementers from UNAC and AGRA in 2014 and 2015. The sustainability

¹⁸ Indicators will vary depending on what contextual factors are likely to carry significant impacts, and are of key concern to the public in that particular setting and /or research participants (Noble 2014)

assessment process was twofold. First, it established guiding evaluation criteria for progress on the four pillars of sustainability (Table 2.1). Second, it identified food system indicators that characterize key concerns with regards to achieving food and livelihood security for smallholder farmers. A variety of information sources were also used to assist in the selection of indicators, including peer-reviewed and gray literature, documents and reports from the two organizations, and national and regional agricultural documents. These sources were helpful in gauging contextual constraints and priorities for smallholder food security. While other relevant indicators for the lasting viability of smallholder food systems exist, e.g., rainfall and climate, they were less feasible subjects for investigation due to scoping and technical limitations (c.f. Noble 2014).

The guiding sustainability criteria here are concerned with efforts that seek not only to mitigate negative impacts on the indicators, but also to foster overall positive net gains on them in an integrative manner. The evaluation criteria are informed by sustainability assessment frameworks (Pope et al. 2004; Gibson et al. 2005; Partidario et al. 2009; FAO 2013; Noble 2014). While numeric measures may be assigned to the organizations' performance, these have to be accompanied by a comprehensive qualitative discussion to shed light on the complex realities and qualities of life, e.g., issues of justice, that are not easily quantifiable. The research findings from Mozambique illustrate that farmers are utilizing some of the resources offered by the African Green Revolution and food sovereignty models in complementary rather than competing ways (Chapter 3).

Table 2.1: Guiding Sustainability Criteria for Evaluating the African Green Revolution and Food Sovereignty Models in Mozambique

Sustainability Pillar	Criteria	Indicator
Environmental	Maintain (or increase) levels of production over the long term to ensure food availability. Facilitate ecological integrity and the health of bio-physical systems.	Access to Quality Seeds Activities to Improve Soil Health
Economic	Provide lasting livelihood opportunities that allow households to pay for other basic necessities such as health care, education, clean water, etc.	Income Opportunities
Social	Promote intra-generational and intergenerational equity to ensure fair access to productive resources.	Land Rights
Governance	Foster public dialogue to ensure that policy undertakings over time prevent and minimize unsustainable practices, and to prioritize investments in key areas that promote positive net-gains.	Policy Engagement

Framework informed by: Gibson et al. 2005; Pope et al. 2004; Noble 2014; Partidario et al. 2009; FAO 2013; López-Ridaura et al. 2002; Astier et al. 2011

This framework is meant to guide research that comparatively assesses the activities of the African Green Revolution and food sovereignty models in particular contexts. The selected indicators and criteria do not necessarily identify all the main areas where important contributions could be made in food and agriculture system redesign for Southern Africa. Regional studies seeking to propose sustainability requirements for broader purposes should consider additional indicator and criteria areas for assessment. Such areas may include making food and agricultural systems flexible and adaptive enough to deal with uncertainties and surprises; minimizing post-harvest loss and other inefficiencies; promoting equity in opportunities beyond land rights (e.g., gender equity, better opportunities for the least advantaged); integrating agricultural and non-agricultural ecological systems beyond soil health;

and paying direct attention to interactive effects and explicit consideration of trade-offs and how to avoid or minimize them.

Moreover, the selected indicators in this study may be contested in the broader academic literature. Some scholars coming from the food sovereignty perspective might not value technical indicators of quality seeds and income. Similarly, those coming from the African Green Revolution perspective might not entirely appreciate justice indicators such as land rights. There might also be tensions surrounding various interpretations of “quality seeds”, including the use of improved seeds to describe conventionally bred open pollinated varieties (OPVs) or hybrids. The concept of “good governance” and what constitutes appropriate policy engagement may also be subject to different opinions. But as mentioned, these particular indicators represent key concerns from Mozambican farmers’ perspectives. The terminology used to describe these indicators is less important—what matters are the opportunities and challenges they present for farmers. Therefore, these indicators should be respected as such.

2.5. 1 Environmental: Quality Seeds and Soil Health

At the farm level, progress towards sustainability requires maintaining or increasing yields through the efficient use of natural, synthetic and economic resources (López-Ridaura et al. 2002; Morse 2010). In Mozambique and the broader region, farmers see low and stagnating crop productivity—a majority of households are unable to produce enough food to last a year (Cunguara and Hanlon 2010; FAO 2011a). Thus, quality seeds that produce a decent yield and healthy soil practices are critical to facilitating physical availability and access to food.

Achieving long-term sustainability, however, also requires improved biodiversity in food and agricultural systems. This need often entails optimizing the use of agro-ecological farming practices, such as nutrient cycling and crop diversity (Pretty 1998; Gliessman 1998; Altieri and Nicholls 2005). Agro-ecological practices are especially important in smallholder food systems where farmers have limited income or access to credit. Thus, while moderate use of external inputs, e.g., chemical fertilizers, can increase crop yields, practitioners must consider other factors such as the cost of inputs and whether poor farmers can reliably gain access to them (Hecht 1995; Astier et al. 2011).

To foster positive improvements on the indicator of access to quality seeds, this study recommends that crop-breeding activities target crops that help farmers meet their nutritional needs, suit southern Africa's diverse agronomic environment, and encourage participatory engagement from farmers (van Etten 2011; Lynam 2011). High quality seeds should be accessible to a majority of farmers in given contexts over the long term. Mozambican farmers interviewed by the author similarly agree with this idea. Access to seeds can entail delivery either through commercial channels, e.g., agro-dealers, or social means, such as community seed banks.

Some actors coming from the food sovereignty perspective may take issue with the various interpretations of “quality seeds”, including using the term to describe conventionally-bred open pollinated varieties (OPVs) and hybrids. Indeed, some African Green Revolution initiatives, such as the Water Efficient Maize for Africa (WEMA) project,¹⁹ make use of three breeding approaches to improve seed quality: conventional, marker-assisted and genetic modification²⁰ (WEMA 2016). But with Monsanto as one of its implementing partners, WEMA might symbolize a case for concern, given the emergent interests of agro-companies looking to patent germplasm developed in field-trials in the region (see ACB 2015b). New intellectual property rights developments are likely to carry significant sustainability effects in the region, and as such demand further attention not only from those supporting the two agrarian models, but from policy-makers as well.

With respect to soil health, continual improvements are needed because agricultural systems often export nutrients from soils. If these nutrients are not replaced, the result is soil degradation and decline in crop yields (FAO 2011b). Improving soil health entails adopting Integrated Soil Fertility Management (ISFM) practices, which can comprise organic and inorganic nutrient stocks. Healthy soils should have a capacity to recycle vital crop nutrients and to maintain a diversity of organisms that minimize disease-and-pest outbreaks (FAO 2011b). Although high-

¹⁹ The project is funded by the Bill and Melinda Gates and the Howard G. Buffett Foundations and the US Agency for International Development (USAID). WEMA's implementing partners include the African Agricultural Technology Foundation (AATF), the International Maize and Wheat Improvement Center (CIMMYT), Monsanto and national agricultural research centers in five participating countries: Mozambique, Tanzania, Kenya, South Africa and Uganda (WEMA 2016).

²⁰ Genetically modified WEMA varieties in these countries are currently being planted in confined field trials, but have not yet been commercially released (see ACB 2015b).

input agriculture (which makes use of chemical fertilizers) is frequently linked to unsustainability, Hansen (1996) argues that no-input agriculture can equally be unsustainable. Studies in Benin, Mali, Tanzania and Zambia demonstrate evidence of resource degradation in the absence of nutrient renewal (Budelman and van der Pol 1992 in Hansen 1996, see also Lotter 2015). In each case, extensive overuse of soils resulted in erosion, leaching and de-nitrification. Consequently, farmers often experienced harvest loss (Hansen 1996; Smith and McDonald 1998). The authors conclude that some application of fertilizer could make these farming systems more sustainable. But, as mentioned, practitioners have to consider how poor farmers can reliably access (often) high-priced external inputs or find suitable local sources or revised agricultural system solutions.

2.5.2 Economic: Income Opportunities

Agriculture serves multiple functions. It directly provides food and income through produce sale. Agriculture also offers ecological services, maintains rural landscapes and represents cultural heritage (IAASTD 2009). In rural Mozambique and the broader region of southern Africa, farming is, in most cases, the only feasible means of food provision and income. Income from agricultural produce is critical to meeting other household needs, such as paying for health care, education, clean water, etc. Sustainability assessment literature similarly explains that improved economic opportunities in agricultural sectors are vital to sustaining rural livelihoods (López-Ridaura et al. 2002; van Cauwenbergh et al. 2007; IAASTD 2009).

Trends in agricultural markets in southern Africa, however, are characterized by low and volatile farm gate prices, to an extent that the agriculture sector does not offer reasonable returns to support smallholders' livelihoods (Walker et al. 2004; Boughton et al. 2007; Jayne et al. 2010; Cunguara 2012; Mather et al. 2013). Masakure and Hansen (2005) show that Zimbabwean small-scale farmers choose to produce high-value 'out-of-season' fresh produce under contract for UK supermarkets. The authors outline several major reasons why Zimbabwe's smallholders chose to grow under contract. One is the opportunity to earn an income given that there are few alternative livelihood options. Another reason is having a guaranteed market and access to transportation in an environment where both components are underdeveloped (Masakure and Hansen 2005). There are evident needs to foster domestic market relations that allow farmers to earn stable prices under fair trade conditions.

Those coming from the food sovereignty perspective may not value income as a key indicator for food security and sustainability. For them, self-provisioning and working towards self-sufficiency might be a more important goal considering that the problems of underperforming domestic agricultural markets and depressed output prices are directly linked to distorted international trade agreements and practices (Nyéléni 2007; 2015). Indeed, Pretty et al. (2011) explain that numerous initially successful efforts to increase farmers' yields in Sub-Saharan Africa have ended in failure due to weak (income) incentives in agricultural market (p.8). These are legitimate concerns that warrant serious engagement from the two agrarian models and policy-makers. Chapter 4 provides further discussion on markets.

Nonetheless, much of the smallholder population, particularly in Mozambique, sale of produce is currently the primary means to earn a living. Self-provisioning might not be a feasible option in the short-to-medium term given that there are few to no other livelihood opportunities, e.g., industry jobs. Mozambican farmers who participated in this study agree that there is a need to foster better incentives that establish equitable trade practices in domestic agricultural market.

2.5.3 Social: Land Rights

A significant majority of southern Africa's rural populations use land to produce their food as well for various subsistence purposes, such as grazing, collecting wild produce and firewood (c.f. Hanlon 2004). Over the last decade, however, rural communities have seen increased pressure on land-use as state authorities encourage private investors to enter the agricultural sector. The rate at which land transfers are occurring in some Sub-Saharan countries is unsustainable and the side effects are often negative. From 2004 -2009, total land transfers of land were estimated at 1.2 million ha in Ethiopia, 2.7 million ha in Mozambique and 4 million ha in Sudan (Aabø and Kring 2012). Large-scale land transfers have contributed directly to the displacement of rural populations and to the enclosure of former public lands and other resources, e.g., water (De Schutter 2011; Borras et al. 2011; Cotula 2013; UNAC and GRAIN 2015). In response to an international outcry over the detrimental effects of 'land grabs', global governance institutions

have introduced various initiatives²¹ to promote responsible investments in land transfers (see Collins 2014).

The World Bank makes a case for African countries to formalize community-based tenure systems as a way to manage land-related conflicts, and to improve the ‘the fluidity of land markets’ (Byamugisha 2013, p. 9). Where formalized tenure systems exist, Byamugisha states that countries can see increased productivity as ‘land moves from less efficient to more efficient producers through rental and sales markets’ (ibid, p. 36). Indeed, those coming from the African Green Revolution perspective tend to favor market innovations that will transfer land to the most efficient farmers in the long run (c.f. Pingali 2012). For them, large-scale land transfers may not necessarily be undesirable as long as they can create income opportunities, e.g., jobs, for rural populations so they can purchase food and other basic necessities.

Compelling empirical evidence from southern Africa, however, demonstrates that market-based tenure systems scarcely address the interests of the rural poor, including issues of gender inequality in tenure allocations (Paul and Steinbrecher 2013; Collins 2014; Milgroom 2015; AFSA and GRAIN 2015). Privatized tenure systems also fail to recognize the multiple forms of land use by communities, such as grazing, sourcing forest foods and engaging in cultural practices and rituals.

Moreover, several African countries, including Mozambique, Tanzania, Ethiopia and Zambia, already have in place fairly strong legal provisions that recognize customary land rights (Landmark 2016), but the law is often used poorly. For example, Mozambique’s land law (GoM 1997) requires investors entering the agricultural sector to undertake community consultations in order to identify lands that are not legally occupied and/or negotiate for their use with local communities (Hanlon 2004). But rather than engage in substantial discussion with communities about the scale and value of investment, many investor-consultations tend to “sell the project” to a few local representatives, offering vague promises for jobs, food security and rural development (Hanlon 2004; Aabø and Kring 2012). In Mozambique and the broader region, land

²¹ These initiatives include the Principles for Responsible Agricultural Investment developed by the UN Conference on Trade and Development (UNCTAD), the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD) and the World Bank, Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests developed by the Committee on World Food Security.

deals are characterized by corruption and by improper to no community consultations; hence, rural populations continue to face the risk of land dispossession (Cotula 2013; Borras et al. 2011; UNAC and GRAIN 2015).

Fostering sustainability by strengthening land rights could mitigate negative social impacts, such as community land dispossession, and improve communities' equitable access to productive resources, particularly for vulnerable populations. Thus, it is important for activities of the two agrarian models to engage in advocacy efforts that seek to minimize large-scale transfers, as well as to invest in proactive measures that build greater transparency and equity in land-use rights.

2.5.4 Governance: Policy Engagement

Most of the aforementioned indicators (especially seeds, incomes and land rights) have strong links to policy—progress towards sustainability would inevitably require engagement with governance mechanisms. As illustrated by a high rate of land transfers in Mozambique and the broader region that are facilitated by national policies, policy measures can act as a barrier to facilitating livelihood and food security. Various other policy mechanisms that hinder progress towards food security may be less salient, but are equally harmful. For example, a persistent global trend in food systems is that farm input costs are on the rise, while output prices (earned by producers) are low and/or extremely volatile (IAASTD 2009; Koopman 2012). Such distorted incentives in agricultural markets, combined with unfair international trade rules, may inadvertently discourage farmers from increasing their food production. These challenges suggest a need for more-effective engagement with policy processes to help food systems progress towards sustainability.

State investments in agricultural sector infrastructure also have an important role in facilitating food security. For countries in the early stages of agricultural transformation like those in southern Africa, states have a crucial role to play in the areas of market development, extension support, information about production flows and prices and public infrastructure, etc. (Dorward et al. 2004). The state should be a prime guarantor of food security as it can enforce the legal nature of various entitlements—ensuring that prices of exchange are fair and stable, and protecting and promoting the social and economic conditions necessary to secure individuals' access to food (Dreze and Sen 1989, FAO 1996). Fostering sustainability in southern Africa's

food systems would also entail engaging policy-makers to prioritize government investments to key areas of the agricultural sector.

Evaluating organizations' performance on these indicators would entail an inductive approach that seeks to verify and apply sustainability assessment criteria based on farmers' lived experiences. Performance ratings should be addressed in a qualitative manner, e.g., assigning a low, moderate or high rating to an organization's efforts depending on whether there is progress towards (or regress from) a target criterion. A low rating identifies little to no action to improve the conditions or trends on each in the direction of the sustainability criteria. A moderate rating recognizes partial action to meet the target criterion. For example, efforts that increase the levels of good quality seeds, but do not ensure that farmers can gain access them, qualify as having a moderate impact. A high rating is attained when an organization's activities have some evident success and actively seek to foster improvements on the conditions and trends of an indicator as per outlined criteria.

2.6 Conclusion

The African Green Revolution and food sovereignty models' respective approaches to food security and sustainability in southern Africa are influenced by their ontological backgrounds. The former model leans towards modern rational ideas about structural transformation and development. As such, African Green Revolution efforts predominately support increasing the availability of improved agricultural technologies, e.g., hybrid seeds, and fostering output markets as a way to increase crop productivity and rural incomes. The latter model is grounded in historical structural principles that wrestle with issues of power and (in) justice in global political and economic structures. Food sovereignty activities in southern Africa largely seek to mobilize political resistance against policy practices that undermine peasants' access to productive resources, particularly land, and to support agro-ecology as a way to foster social reproduction and revitalize crop productivity.

The African Green Revolution and food sovereignty models make important contributions in their efforts to improve the food security and sustainability performance of southern Africa's food and agricultural sectors. In the case of Mozambique, farmers are utilizing some of the tools that both agrarian models offer in complementary ways to meet their needs (Chapter 3).

However, polarized politics in academic and public forums highlight the contradictions between and within the African Green Revolution and food sovereignty models. This situation hinders fruitful engagement that helps to effectively address concerns in southern Africa's food and agricultural systems.

This chapter has shown that insights from sustainability assessments can help to shift discussions towards more-open dialogue about food system concerns in specific contexts from farmer perspectives. In Mozambique and the broader region of southern Africa, the selected indicators and evaluation criteria illuminate important characteristics of smallholder agricultural needs and challenges that must be met by the competing agrarian models. Taken together, the five indicators can help to address both technical aspects of meeting food security (seeds and soils) and income and engage with political economy issues that shape how food is grown and distributed (land rights, policy engagement). From farmers' points of view, both the technical and political dimensions are important to achieving broad-based food security and sustainability.

The value of sustainability assessments, moreover, is their capacity to foster an integrated understanding of essential issues, while creating space for options needed to help communities progress towards sustainability through context-based criteria (Gibson 2016). These insights offer lessons for how African Green Revolution and food sovereignty scholars can engage in a more productive debate, as the transition to sustainability hinges on being open to influence and critique (Pope and Grace 2006). Finding common ground in food security and sustainability discussions is crucial because hunger continues to affect a large segment of the rural population in southern Africa. The increasingly fragile nature of farming in the region due to the threat of climate change also suggests a need for novel solutions. History has also shown that efforts that change the world are those that mobilize and collaborate across differences, shifting and creating new forces and agents in their paths (Tsing 2004).

Chapter 3

Contested Food Security Agendas in Mozambique: the African Green Revolution and the Food Sovereignty Movement

3.1 Overview

Some critical food studies scholars and actors contend that the food security agendas of the African Green Revolution and the food sovereignty movement are incongruent. This chapter takes Mozambique as a case study to explore how the two agrarian models play out on the ground, drawing on the results of fieldwork conducted by the author in central Mozambique in 2014 and 2015. The research examined the activities of two organizations: the Alliance for a Green Revolution in Africa (AGRA), which implements the former model, and the National Union of Mozambican Peasants (UNAC), which supports the latter. The author finds that farmers in central Mozambique utilize some of the tools that the models offer in complementary, rather than competing ways. Neither model addresses critical components of food security and sustainability in their entirety. Where possible, farmers engage both models—taking from each what helps them to meet these two goals. These findings offer some important lessons for academic debates that are often insular—favoring one model over the other.

Keywords: *African Green Revolution, AGRA, food sovereignty, UNAC, food security, sustainability, Mozambique*

3.2 Introduction

Critical food scholars and actors often present the food security agendas of the African Green Revolution and the food sovereignty movement in oppositional frames. Jarosz (2012) describes the African Green Revolution as a top-down agrarian model that offers technical fixes—hybrid seeds, synthetic fertilizers and market value chains—to address the food crisis in Africa (see also Holt-Giménez and Altieri 2013). The various influential and elite actors behind the African Green Revolution, e.g., the Gates Foundation and the G8, ostensibly promote a “universalizing” narrative that favors technocratic interventions (Scoones and Thompson 2011; Amanor 2011; Moseley et al. 2015).

In contrast, some food studies scholars point to food sovereignty as a friendlier alternative because it builds context-specific food systems from the bottom-up in a manner that fosters local autonomy and dignity and prioritizes farmers’ knowledge and agro-ecological practices (c.f. Altieri and Toledo 2011; Lee 2013; Menser 2014). Jarosz (2012) juxtaposes such agrarian qualities with African Green Revolution technologies that are supposedly controlled by transnational corporations, and suggests that food sovereignty holds greater potential to enhance food security and sustainability.

African Green Revolution’s commercially-oriented investments are undoubtedly a legitimate cause of concern, given the high cost of inputs in resource-poor environments. Andree et al. (2014) warn that African Green Revolution technologies are likely to create dependencies and debt for smallholder farmers. However, critics of the African Green Revolution model do not always give enough attention to farmer perspectives with regards to the complex ways Africa’s producers interact with this model. For example, some food sovereignty actors underestimate farmers’ capacity to engage effectively with new agricultural technologies. In Gambia, Bornstein (2015) demonstrates that the New Rice for Africa (NERICA) modern seed varieties have come under farmers’ traditional seed-saving and exchange practices, which is contrary to narratives that portray farmers as ‘passive victims’. In Mozambique similarly, Di Matteo et al. (2016) show that smallholders have engaged effectively with the soya value-chain industry. Soya bean farmers in Gurue have rejected unfavorable market relations with buyers and embed the crop into their traditional farming systems to improve their food and livelihood security (ibid, p. 64).

This chapter presents the results of fieldwork conducted by the author in central Mozambique in 2014 and 2015. The overall study was designed to comparatively assess how the food sovereignty movement and the African Green Revolution contribute to food security and sustainability from farmer perspectives. The fieldwork focused on the activities of two organizations. The National Union of Mozambican Peasants (UNAC) supports the former model and the Alliance for a Green Revolution in Africa (AGRA) implements the latter. The study delineated sustainable food system indicators that are important for facilitating smallholder food security and sustainability: access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement. The selection of these indicators was informed by farmers' perspectives ²²and sustainability assessment frameworks (e.g. López-Ridaura et al. 2002; Gibson et al. 2005; FAO 2013; Astier et al. 2011).

While some scholars and actors contend that the African Green Revolution and food sovereignty models are incompatible, this chapter finds that farmers in Mozambique utilize some of the tools that the models offer in complementary rather than competing ways. Neither model addresses critical components of food security and sustainability in their entirety. Where possible, farmers engage both models—taking from each what helps them to meet these two goals.

Whereas both AGRA and UNAC teach integrated soil health practices, neither is able to sufficiently ensure that a majority of farmers have access to quality seeds. AGRA attempts to raise rural incomes by linking farmers to reliable buyers for their crops, but UNAC is weak on efforts to create income opportunities for farmers. And while UNAC works diligently to empower farmers to (re)claim land rights, AGRA does little to affect farmers' land rights. Both organizations also make significant contributions to policy. AGRA works to strengthen the capacity of service providers in the public and private sectors. UNAC is engaged at the grassroots level in proactive measures to safeguard the rights of rural producers and to challenge poor policy practices. As such, each model addresses a critical component (s) of food security and sustainability that the other fails to tackle, and thus, there is a complementary effect.

The conflicting interplay between the African Green Revolution and the food sovereignty movement at the broader political-economy level, versus farmers' complementary engagement

²² Based on author's fieldwork entailing interview interactions with farmers and project implementers from both UNAC and AGRA

with the two models, illustrates that meeting food security and sustainability is, in some contexts, messy. This realization suggests a need for further research, particularly on options that may serve broad-based sustainability goals in Africa's food systems. The first section of this chapter briefly maps out Mozambique's unique agricultural concerns to help explain why the country sees a high level of activity from both agrarian models. The second section draws on research findings to show what each model offers to key food system indicators from farmer perspectives.

3.3 Mozambique's Agricultural Contextual Concerns

Mozambique is home to one of Africa's first food sovereignty movements. UNAC was founded by Mozambican peasant associations in 1987 at a time when the country adopted market-liberalization policies under the International Monetary Fund's structural adjustment facilities (UNAC 2014).²³ Lending institutions prompted state budget cuts across all sectors and advised the government to create more-powerful incentives for private actors to invest in agriculture (Hanlon 1991). But due to a civil war in the country (1977-1992), the state was unable to attract private sector investments; per capita crop production also decreased during this time (Amrahamsson and Nilsson 1995; Hanlon 2010). UNAC was established as a national platform to mobilize agricultural resources for rural communities and to advocate for peasants' livelihood interests during these difficult years (Nhampossa 2009). Once peace and security were re-established in the mid-1990s, Mozambique saw a sharp rise in foreign direct investments (UNCTAD 2012).²⁴ Donor partners and the government were enthusiastic that foreign investors would also drive growth in the agricultural sector, as domestic private enterprises had limited capacity to do so (Hanlon 2004). In 1997, the state passed a national land law that allows foreign (and domestic) investors to gain land-use rights while at the same time protecting peasants' customary land rights (GoM 1997).

It was only during the early 2000s that foreign investments started to expand in Mozambique's agricultural sector, following a global interest in biofuels, and later, food security pressures in some Persian Gulf and Asian countries (see Kachika 2011). Mozambique became one of the top

²³ The government of Mozambique adopted SAPs upon receiving loans from the International Monetary Fund and World Bank starting in 1987 (Hanlon 1991, 1996).

²⁴ Initially, the bulk of FDIs went to the mining and industry sectors. Between 1996 and 2005, FDI inflows stood at \$ 1.6 billion dollars; 76 percent of this share represented projects in industry, whereas the combined sectors of agriculture, forestry and fisheries attracted only 11 percent of this sum (UNCTAD 2012).

countries in Sub-Saharan Africa to lease land to investors at a high rate (Cotula 2013). Precise figures on total land leased out to investors remain imprecise due to lack of transparency in public disclosure and because some projects have not been fully implemented. Nonetheless, official sources cite 2.7 million hectares transferred to agro-investors between 2004 and 2009 (Deininger et al. 2011). Such a high rate of land transfers is problematic. Land deals have left many rural communities vulnerable to land dispossession, particularly because authorities and investors pay little respect to customary land rights (Justiça Ambiental and UNAC 2011). Whereas the land law requires investors to undertake substantive community consultations in order to identify lands that are not legally occupied or to negotiate their use with local communities, the process has often not worked in the public's best interest (Hanlon 2004). Concerns surrounding community land dispossession compelled UNAC to start to prioritize a fight for peasant land rights during the early to mid-2000s.²⁵

In 2004, UNAC joined La Via Campesina and officially became a food sovereignty movement. Today, UNAC is active in all ten provinces and in over 80 districts, representing over 100,000 Mozambican peasants (UNAC 2016). The movement's enduring presence in the country, and its origins as a peasant movement in which farmers engage in decision-making, and elect leaders, are among its greatest strengths.

At the same time, Mozambique sees a high level of engagement from various African Green Revolution initiatives, including AGRA. Following the 2003 African Heads of State Summit (held in Maputo), which urged countries to prioritize investments in agriculture, Mozambique introduced its own Green Revolution Strategy (MINAG 2007). In the early 2000s, moreover, the country, under the guidance of multilateral lenders (particularly the IMF), adopted the Poverty Reduction Strategy Papers (PRSPs) as key policy frameworks to address poverty.²⁶ The country's second PRSP (2006-2009) forms the basis of its present agricultural strategy: to 'kick-start' structural transformation through Public-Private Partnerships (PPPs) (GOM 2006, p. 132). Mozambique's Green Revolution strategy has been renamed the Strategic Plan for Agricultural

²⁵ Interview with UNAC staffer, Maputo, May 2014

²⁶ PRSPs are part of the IMF's post-Washington Consensus reform measures that encourage 'pro-poor' economic growth strategies in Low-income Developing Countries (LIDCs). Reform measures came as a result of mounting public pressure against neoliberal market policies and internal debates within the IMF and World Bank concerning the 'soundness' of structural adjustment policies, especially in light of high debt levels in LIDCs at the time (see Hibben 2016)

Development (PEDSA), and aims to transform the agriculture sector from a predominately subsistence sector to a highly productive and globally competitive one (MINAG 2010).

AGRA is an important partner in the consortium of actors implementing the African Green Revolution in Mozambique. A philanthropic organization established by the Rockefeller and the Bill and Melinda Gates Foundations in 2006, AGRA seeks to “trigger a uniquely African Green Revolution that will transform agriculture into a highly productive, efficient, competitive and sustainable system that assures food security and lifts millions out of poverty” (AGRA 2009, p. 9). Today, AGRA works in 17 African countries to improve agricultural performance through investing in key areas of seeds, soils, market access and policy support. The organization does so under several programs, including the Program for Africa’s Seeds Systems (PASS), the Soil Health Program (SHP), and the Market Access Program (MAP).

Mozambique ranks high among AGRA’s strategic target areas, listed under its priority countries for investment, along with three others: Ghana, Tanzania and Mali. With a large number of smallholder farmers, reliable rainfall and relatively good soils, these countries are considered high-potential “breadbasket” areas of their regions (AGRA 2014). From 2009-2012, 40 percent of AGRA’s resources were allocated to these four countries (Kambewa et al. 2013).

Mozambique has received over 50 AGRA grants, totalling USD 46.97 million as of 2015 (AGRA 2015). The country also faces dire food security challenges. A majority of rural households are unable to grow sufficient food to last a whole year (Cungura and Hanlon 2010), and 49 percent live below the national poverty line of 1 USD per person per day (GoM 2016).

3.4 Comparative assessment of Two Models from Farmer Perspectives

AGRA and UNAC both recognize the importance of achieving food security in a sustainable manner. However, the organizations' sustainability contributions to addressing key food security concerns from farmer perspectives in Mozambique remain unclear. Sustainability has various definitions and interpretations, but it is commonly seen as a measure of economic, social and environmental progress that can be maintained across generations (Becker 1997; Gibson et al. 2005; Sneddon et al. 2006; Runnals 2008). For the purpose of this research, sustainability is concerned with addressing smallholder agricultural needs and challenges based on evaluation criteria that foster lasting positive net gains in the food system indicator areas identified above. Taken together, these indicators can help to address both the technical aspects of meeting food security (issues of production) and the policy and political economy issues that facilitate (or hinder) the means of achieving it.

3.4.1 Contributions to Accessing Quality Seeds

AGRA and UNAC are both engaged in efforts to increase smallholder farmers' access to quality seeds. However, the two organizations take different approaches to doing so. Smallholder farmers in central Mozambique typically grow their food using traditional (unimproved) seed varieties. In farmer interviews with both AGRA-supported participants and those affiliated with UNAC, a majority reported that their traditional seeds do not provide sufficient yields to meet household food security for an entire year.²⁷

In Magossa, Sussundenga district, members of a newly established Farmer Organization (FO) affiliated with AGRA's *Integrated Project*²⁸ explain that they joined this initiative with hopes to gain access "to different quality of seeds and to [learn] new techniques for working the land".²⁹ Farmers belonging to UNAC's provincial union, *União Provincial de Camponeses de Manica*

²⁷ Focus group interview in Sussundenga district, 22 January 2015; small group interview in Manica district, February 10th 2015

²⁸ This AGRA-funded project was implemented by a consortium of eight local partners: Kulima, Sementes Nzara Yapera, Kixiqula, Dengo Commercial, AGRIMERC-ODS, OCODEMA, IDEAA and APAC, with Concern Universal, a UK-based charity, as the lead coordinator. The project worked in five central districts, three in Manica (Manica, Sussundenga and Gondola) and two in Sofala province (Nhamatanda and Gorongosa). With a budget of USD 3.2 million, the project had a lifespan of 36 months (May 2013 to April 2016) and assisted 40, 000 smallholder beneficiaries to increase their crop productivity and link to markets (Concern Universal 2016).

²⁹ Focus group interview in Sussundenga district, 22 January 2015

(UCAMA) in Nhanguzue, Sussundenga district express similar wants. Specifically, they would like to gain access to improved seeds that can increase their yields so as to have enough food for household consumption and a surplus to sell for income.³⁰ The problem for most farmers is that they are struggling to gain access to quality seeds that offer a decent yield, due to a lack of capital (i.e., to purchase seeds through commercial channels) and inadequate social infrastructure such as community seed banks.

UNAC's overall production model is based on agro-ecology. Agro-ecology seeks to improve the quality of traditional seeds via the selection, preservation and community exchange of such seeds. A few of UNAC's unions promote the conservation of traditional varieties, and the movement has worked with the *Movimento dos Pequenos de Agricultores* (MPA) of Brazil to exchange knowledge in reviving indigenous seeds.³¹ But due to significant resource constraints and donor interests, UNAC faces enormous difficulty in expanding breeding activities for indigenous seeds to substantively affect crop productivity on a per farm basis or at the national level. The movement operates on a relatively small budget—about USD 3.8 million dollars per annum over a five year period.³² This amount is both inadequate to assist all the movement's farmers and inconsistently distributed.³³

As a result, UNAC relies on various development partners for agricultural assistance. In Manica province, UCAMA has funding from the Southern African Confederation of Agricultural Union (SACAU) to implement conservation agriculture (CA), using improved farm inputs (hybrid seeds and herbicides). However, the SACAU project has a relatively small budget: USD 350, 000 or South African Rand 4, 4 million (Norad 2013). Thus, improved inputs are provided (for free) only to a few “lead farmers”, comprising three to five individuals per farmers' association.³⁴ The rest of UNAC's farmers (8, 515 in total) learn CA techniques in demonstration plots but most cannot afford to purchase improved inputs.

Compared to UNAC, AGRA has considerably more resources and technical capacity to dedicate to its activities. In Mozambique, AGRA's funding share to the PASS program is over USD 8

³⁰ Focus group interview in Sussundenga district, 31 March 2015

³¹ Interview with UNAC staffer, Marracune, 30 May 2014

³² Follow up interview with UNAC staffer, Maputo, 15 April 2015

³³ *ibid*

³⁴ Interview with UCAM staffer, Chimioi, 12 March 2015

million and the Soil Health Program and the received USD 4 million as of 2015 (AGRA 2015). The Integrated Project in Manica province, as mentioned, has received USD 3.2 million from AGRA for a period covering 36 months (Concern Universal 2013, 2016).

Through PASS, the organization supports domestic crop-breeding activities to develop new varieties of priority crops for smallholder farmers. In Manica province, AGRA has sponsored two family-run seed companies, both partners in the Integrated Project, to multiply conventionally-bred maize seeds—open pollinated varieties (OPVs) and hybrids.³⁵ Both companies' efforts contribute to increasing the availability of improved seeds in central Mozambique—their seeds are distributed and sold to farmers through AGRA-supported agro-dealers in the Integrated Project.

The availability of improved seeds, however, has not translated into a broad uptake by farmers. This gap is due to a marketing approach that demands farmers to pay for full-priced inputs in an environment where output markets offer low returns relative to input prices, particularly for staple crops such as maize. AGRA does not traditionally provide farmers with price support, such as vouchers or subsidies because when used long-term, vouchers are considered to undermine competitive markets.³⁶ Thus, to facilitate farmers' access to improved seeds, AGRA's Market Access Program (MAP) provides grants to financial institutions to establish (or reinforce) credit facilities that serve smallholder farmers and Farmers Organizations (AGRA 2013). Credit supply to farmers is expected to stimulate steady and long-term demand for improved inputs, and in turn, to encourage broad-based participation from breeders, seed companies, agro-dealers, etc.

In central Mozambique, however, a vast majority of AGRA-supported farmers have not been able to gain access to credit. In the Integrated Project, an NGO partner with a micro-credit bank received AGRA funding to distribute credit to farmers. However, only 102 loans were extended to farmers in the first year of the project (2013-2014),³⁷ representing less than 0.3 percent of the project's 40,000 actual beneficiaries. Far fewer loans were provided in the second year (2014-

³⁵ Interviews with both seed companies in August 2014, and January 2015. I also visited the production site of one of the seed companies on several occasions, first in August 2014 and again in January and February of 2015

³⁶ Interview with seed sector development expert, Maputo, April 16, 2015

³⁷ Interview with project staffer, Chimoio, 21 January 2015

2015) because the bank saw low reimbursement rates—only 11 percent of the loans were recovered.³⁸

More importantly, output markets for staple crops, such as maize, offer farmers substantially lower returns relative to the cost of inputs. During the time of fieldwork in Manica province, the retail price for maize OPVs was approximately MT 35/kg (USD 0.90 cents), and hybrids cost about MT 110/kg (USD 3.5). In comparison, farmers in the integrated project were earning on average MT 4.8/kg (USD 0.16 cents) for their maize (Table 4.2), representing seed-to grain-price ratios of 6:1 for OPVs and 21:1 for hybrids. These high seed-to-grain price ratios help to explain farmers' low uptake of full-priced improved inputs sold by agro-dealers in the Integrated Project (see Chapter 4 for detailed analysis).

Thus, traditional maize varieties and those recycled from previous harvests still make up a significant share of farmers' seeds.³⁹ Where possible, these recycled varieties are supplemented with improved OPVs and hybrid seeds from various sources. The government and other donors offer highly subsidized OPVs and hybrid seeds, distributed by certified agro-dealers in the region.⁴⁰ Some interviewed participants affiliated with AGRA's Integrated Project are beneficiaries to such input subsidy programs.⁴¹ Several other NGOs working in the region also provide improved inputs to farmers, either for free or on credit, for instance by giving seeds at the start of the planting season, but deferring payment until after harvest.⁴² In Barue district for

³⁸ *ibid*

³⁹ Small group interview, Sussundenga district, 5 February 2015

⁴⁰ In 2009, the UN Food and Agriculture Organization (FAO) and the European Union (EU) launched a voucher program, as part of a 7.2 million Euro agriculture development project to Mozambique (FAO 2010). During the first phase of the FAO/EU voucher program (2009-2011), some 25, 000 farmers in central and northern Mozambique were offered packages of improved maize (hybrids or OPVs) or rice seeds, along with synthetic fertilizers (FAO n.d.). The total monetary cost of the inputs per voucher was about USD 115—the program covered 73 percent of the total cost, while farmers were required to cover the rest in cash, about USD 32. However, the overall uptake was low: nearly half of the qualified farmers (46 percent) did not pick up their vouchers, claiming that they could not afford the co-payment of MT860 (about USD 32) (Carter et al. 2013). This voucher program was suspended between 2012 to 2013 but resumed in 2014.

⁴¹ In Nhamatanda district (Sofala province), an AGRA-supported farmer organization is supported by a local NGO, Associacao Mocambicana para Desenvolvimento da Democracia (AMODE), to gain access to the resumed FAO/EU voucher program. During the 2014/2015 production cycle, these farmers bought inputs from a selection of kits. One kit contained 12 kg maize, 4 kg beans (cowpea) and cost MT 150; another kit had 25 kg maize, 3 kg beans and sold for MT 290; the last kit came with two 50 kg bags of fertilizers and cost MT 1900. The voucher packages of the EU/FAO input program are considerably cheaper than to those sold in the first phase of the project (Small group interview, Nhamantanda district, 18 February 2015)

⁴² Focus group interview, Manica district, 19 February 2015

instance, the Cooperative League of the USA (CLUSA) has distributed hybrid seeds to several Farmer Organizations (FOs) as part of a donor project to stimulate smallholders' participation in soybean and sesame value chains (CLUSA 2015). Among such FOs are those that belonged to AGRA's Smallholder Market Access for Rural Transformation (SMART) project, implemented by the Micaia Foundation. CLUSA has assisted FOs to establish seed banks as a way to collect, recycle and redistribute soya seeds for their members.⁴³ To do so, members can borrow 20 kilograms of seeds from the association, but must return 40 kilograms (double) of seeds from their harvest. Soya is recycled for about three growing seasons before farmers replenish their seed banks with new higher quality hybrid seeds. Overall, the process has allowed a wider network of farmers to gain access to soya seeds.⁴⁴ CLUSA has also helped FOs in other regions to set up soya seed banks, notably in Zambezia (Di Matteo et al. 2016). With regards to AGRA's and UNAC's performance on the sustainability criteria for quality seeds, both organizations score a moderate rating as neither is able to ensure that a majority of their farmers can gain access to such seeds.

3.4.2 Contributions to Improving Soil Health

AGRA and UNAC are both involved in efforts to improve soil health; their approaches to doing so are somewhat similar, particularly at the farm level. Several soil studies show empirical evidence of nutrient depletion, and moderate to low soil fertility, especially in the north and central regions where most of the country's staple crops such as maize are grown (Folmer et al. 1998; Maria and Host 2006). In some regions, erosion and leaching are the primary causes of poor soil health—with leaching being especially high in “nutrient-mining” crop systems, such as maize and cassava (Folmer et al. 1998). In other regions, soils naturally have high acid levels and low capacity to absorb Phosphorus, which tend to limit plant growth (Maria and Host 2006). Fertilizer use, particularly among smallholder farmers, is extremely low. Estimates show that less than five percent of Mozambican smallholder farmers use chemical fertilizers, mainly due to a high cost and risky output markets that offer low financial returns (Benson et al. 2012).

In Manica province, smallholder farmers typically practice slash-and-burn and shifting agriculture—whereby they clear and burn an area, farm it for four to five years until the soil is

⁴³ Focus group interviews, Bárue district, 13 August 2014

⁴⁴ *ibid*

exhausted, and then shift to another plot to repeat the process. AGRA's SHP is designed to respond to problems of poor soil health. The program disseminates Integrated Soil Fertility Management (ISFM) practices that combine the use of synthetic fertilizer with compost manure, intercropping and crop rotations, agroforestry and other practices (Atemi 2014). AGRA-supported farmers in the Integrated Project learn ISFM practices in demonstration plots, involving plant-and-row spacing, fertilizer use and crop rotation. Interviewed farmer participants are generally appreciative of these new agronomic skills, particularly the possibility to farm productively in one area for a longer time than four to five years and to reduce the habit of shifting agriculture.⁴⁵ AGRA's contributions to soil health has a moderate impact because while farmers learn new techniques in demonstrate plots, their ability to apply some of them on their own farms, e.g., fertilizers, is often restricted due to problems of access.

For UNAC, its production model promotes agro-ecological practices that involve crop diversity and nutrient recycling, both important attributes for augmenting soil quality. Crop diversification in particular plays an important role in helping rural households to improve their nutritional diets. While a small share of UNAC's farmers have adopted agro-ecological practices in Manica and Maputo provinces (see Chapter 5 for detailed analysis), the movement faces substantial difficulty in scaling up agro-ecology in a manner that allows households to adequately meet their food security needs and have a surplus for market sales. UNAC's performance on the soil health indicator is therefore moderate due to the movement's limited ability to scale-up activities needed to make improvements in this area.

3.4.4 Contributions to Income Opportunities

AGRA and UNAC take completely different approaches to addressing the indicator of income opportunities for rural households. For a vast majority of smallholder farmers in Manica province, farming is in most cases, the only feasible means to earn an income, but even then it is inadequate. Smallholder farmers sell their produce to earn an income in order to pay for other basic necessities such as health care, clean water, education, etc. Beneficiary farmers of AGRA and UNAC elucidate the importance of income opportunities from their produce sales. In

⁴⁵ Individual farmer interview, Sussendenga district, 4 February 2015; focus group interview, Sussendenga district, 5 February 2015

Phanze, Bárúè district, farmers belonging to UCAMA (UNAC's provincial union) explicate this challenge:

Well, farming is more than just a way feeding ourselves. It is our only economic activity which helps us to buy additional food items like cooking oil, dried fish, salt, and so on. We need money to take our maize to the grinding mill, but more importantly, we need money to pay school fees for our kids and for the clinic when someone in the household falls ill.⁴⁶

AGRA-supported farmers in Mavonde, Manica district, similarly explain that:

Here [we] survive by selling what we grow. There are no companies where we can get work, so we sell our crops to get cash to cover expenses for our families. But because market prices are very low, we are forced to sell even maize that we are supposed to eat at home.⁴⁷

In Manica province, UNAC is not engaged in any activity to assist farmers participate more favorably in domestic markets, so that they may earn better prices for their crops. In interview discussions with UCAMA staffers, they do recognize that local markets present vast challenges for farmers. Yet, the union “does not yet have a marketing policy plan or initiative in place”⁴⁸ to assist its farmers in local markets. The movement's little to no action to improve farmers' income opportunities means that its performance to meet the target criterion has a low score.

Unlike UNAC's activities, AGRA's projects provide farmers with marketing-skills training, link farmers to domestically based agro-buyers and build crop storage facilities to help reduce post-harvest loss (see also KIT and AGRA 2013). In Manica and Sofala provinces, project implementers introduce FOs to buyers with an intention of establishing contractual agreements between parties. Agro-buyers in the region are relatively few compared to producers, thus contracts help farmers not only to have access to a secure market, but also to “convince agro-dealers to buy at relatively fair prices.”⁴⁹

⁴⁶ Focus group Interview in Bárúè district, 3rd April 2015

⁴⁷ Focus group interview, Manica district, 19 February 2015

⁴⁸ Interview with UCAMA staffer, 12 March 2015

⁴⁹ Interview with project staffer, Chimoio, 26 January 2015

Several AGRA-supported farmer organizations (particularly those located close to main roads) have managed to secure contracts with buyers. AGRA's SMART project has helped to facilitate partnerships between two of its FOs, the Samora Moisés Machel association and Kulima Kuacanaca association, and two buyers, the World Food Program (WFP), which agreed to buy maize, and Abílio Antunes, which purchased soya. Farmers belonging to the Samora Moisés Machel association explained that things have changed for the better since they secured contracts with buyers.⁵⁰ With 1, 505 members, the association managed to sell 350 tonnes of soya and 300 tonnes of maize on behalf of its members during the 2013/ 2014 agricultural season. The buyers picked up the produce. For soya, the association members each earned 15 MT/kg. Several farmers highlight changes in their lives as a result of AGRA's efforts to help them succeed in domestic markets:

“Agriculture has become a profit-generating activity, and my family is better off. I managed to build my own home and pay school fees for my younger brother.⁵¹”

“With profits from my produce and a loan from the association, I now own and operate a grinding mill here in Chidengue. Prior to 2007, I could not even afford 20 meticaís to grind my maize at the local mill. Today, my life is different. My family eats [a diverse diet], from what we from grow and what we buy at the market.⁵²”

Although AGRA is making important strides to help smallholder farmers participate more favorably in domestic markets, the overall process remains quite complex. As mentioned, agro-buyers in central Mozambique are few and far apart. In most cases, buyers are reluctant to sign contracts with FOs, and quote farm-gate prices that are often below official prices.⁵³ Thus, a majority of AGRA's supported FOs in the Integrated Project have not managed to secure contracts with buyers.⁵⁴ But regardless of the challenges associated with domestic markets, interviewed farmers appreciate AGRA's efforts to improve their economic situation.⁵⁵ Farmers

⁵⁰ Focus group interview in Báruè, 13 August 2014

⁵¹ Individual farmer interview, Báruè district, 8 August 2014

⁵² Individual farmer interview, Báruè district, 8 August 2014

⁵³ Interview with project staffer, Chimoio, 26 January 2015

⁵⁴ Interview with project staffer, Chimoio, 26 January 2015

⁵⁵ Individual farmer interview, Manica district, 20 January 2015

point to the marketing skills they learn, involving collective price bargaining and maintaining high quality produce standards, as essential components to help them succeed in markets.⁵⁶

AGRA's marketing opportunities and skills training have attracted some UNAC farmers to join its projects in Manica province. In Chichira, Sussundenga district, a farmer association belonging to UNAC since 1993 became a beneficiary of AGRA's Integrated Project in 2014. Members explain that they joined AGRA's project to better achieve their livelihood goals because UNAC is not always able to assist them with their various needs.⁵⁷ For these and other farmers in the region, the opportunity to participate more favorably in domestic markets is important in their decision to engage with AGRA's Green Revolution model. AGRA's performance on this indicator achieves as a high rating.

3.4.4 Contributions to Land Rights

AGRA's UNAC's approaches to engaging with the indicator of land rights are also vastly different. Smallholder farmers in central Mozambique use land to directly produce their crops for food and for various subsistence purposes, such as grazing, collecting wild produce and firewood (see Hanlon 2004). Thus, secure access to land plays an integral role to food and livelihood security. At the same time, the government attracts commercial investors (foreign and domestic companies) as a way to drive growth in the sector and address rural poverty (GoM 1997; MINAG 2010). The national land law of 1997 was introduced to accommodate private investors into the agricultural sector while protecting peasants' customary land rights. In 2009, the state awarded Portucel, a Portugal-based company, 43 DUATs (land-use rights) for 182, 886 ha in Manica province and 173, 000 ha in Zambezia province to grow eucalyptus crops for wood pulp to export to global markets (IFC 2014). In the two provinces, an estimated 24,000 families (around 120,000 people), primarily peasant farmers, reside within the territories that Portucel has DUATs for (IFC 2014). In Manica province, this land transfer has created land claim problems between the company and farming communities.

Interviewed farmers affiliated with both UNAC and AGRA express concern that Portucel's activities have created and sometimes exacerbated land conflicts. A president of a farmer

⁵⁶ Small group interview, Sussundenga district, 4 February 2015

⁵⁷ individual interview and focus group interview in Sussundenga district, 5 February 2015

association belonging to UNAC explains that Portucel did not conduct proper consultations with residents in its DUAT-designated areas, or go back to Maputo to raise the issue with authorities there, but started working on community lands.⁵⁸ In the districts of Bárúè and Sussundenga, where large segments of Portucel’s plantations are located, farmers explain that some residents in their communities have already lost their land-use rights, while others face a high risk of land dispossession (see Chapter 5).

In the wake of Portucel’s farming activities in their communities, some UNAC farmers reported their concerns to their union (UCAMA) in Chimioio. Among such farmers are those in Chichira who, as mentioned, are also affiliated with AGRA. The decision to seek help from UNAC, according to interview participants, is because the movement “always reinforces the situation of [peasant] land rights”.⁵⁹ Members further explain that while various other non-governmental organizations (NGOs) have held workshops to educate rural communities about the land law, those NGOs have gone away—and some residents neglect the information they learned. But UNAC has a permanent presence and continually helps farmers to understand their land rights.⁶⁰

After numerous outcries from its farmers about Portucel’s activities, UCAMA hired a jurist to help address the growing problem of land conflicts in the province.⁶¹ The union’s decision to hire a jurist, i.e., someone with a professional background in law, was not only to assist UCAMA to teach farmers about the land law more effectively, but to have a legal representative available if court action arises.⁶² UCAMA’s jurist trains the union’s farmers to prevent and resolve community land conflicts and assists farmers to formalize their customary DUATs.⁶³

The technical process of formalizing a DUAT is known as “delimitation” and involves (verbal) testimony from a community leader about the applicant’s customary or good-faith occupancy, and registering that DUAT with the land services cadaster (see Northfold and Tanner 2007). UCAMA farmers in Bárúè have gathered the necessary documents to formalize their DUATs, but find the process increasingly difficult.⁶⁴ Some local authorities, including community leaders,

⁵⁸ individual farmer interview in Sussundenga district, 26 March 2015

⁵⁹ Focus group interview, Sussundenga district, 26 March 2015

⁶⁰ *ibid*

⁶¹ interview with UCAMA staffers, Chimoio, 9 February 2015

⁶² *ibid*

⁶³ Interview with UCAMA jurist, Chimoio, 16 March 2015

⁶⁴ Focus Group interview in Bárúè, 27 March 2015

are reluctant to assist farmers. In Honde, the local government (Posto Administrativo), informed farmers that a DUAT had already been issued to Portucel for the land they wished to claim. Farmers were advised to negotiate directly with the company to cede its DUAT.⁶⁵ UNAC's efforts to re(claim) peasant land rights in Manica have proved challenging because Portucel is already farming the area and local authorities appear indifferent to farmers' concerns. UNAC has had relatively greater success in Maracune (Chapter 5), where proactive educational measures have taught farmers to refuse land deals.

While less successful, UNAC's land rights struggles in Manica province draw attention to poor policy practices that can cause and exacerbate food insecurity, i.e., unequal access to and distribution of resources and skewed power relations. Policy frameworks such as PEDSA outline goals to address rural poverty and improve food security. However, it is far from clear how the state might achieve such goals when land deals between authorities and investors pay little respect either to the legal mechanisms that govern land investments, or to farmer livelihoods. UNAC's performance on this indicator achieves as a high rating.

Unlike UNAC, AGRA does little to affect farmers' land rights in Manica province or indeed the broader region. Koopman (2012) explains that AGRA's perspective on smallholder farmers' land tenure and ownership favors market innovation as a way to transfer land to the most efficient and productive farmers in the long run. Some African Green Revolution scholars postulate that increased agricultural efficiencies will inevitably move excessive labour out of agriculture into other sectors of the economy (see Pingali 2012). For this study, AGRA's little to no action to improve farmers' land rights means that its performance to meet the target criterion has a low score.

⁶⁵ Focus Group interview in Báruè, 27 March 2015

3.4. 5 Contributions to Policy Engagement

AGRA and UNAC also take immensely different approaches to influencing Mozambique's policy processes that relate to the agricultural sector. From a strong sustainability standpoint, effective policy engagement involves active measures that help the state not only to mitigate adverse impacts on the aforementioned sustainable food system indicators, but also to foster positive net gains on them. In Mozambique, the ways in which agricultural policies are applied can sometimes intensify existing economic and social inequalities and marginalize rural communities further. Portucel's activities in Manica province and some national policies (e.g., PEDSA) that support such investments are illustrative of problematic and unsustainable policy practices.

UNAC's most significant policy engagement pertains to its broader struggle for peasants' land rights. Alongside other civil society organizations, such as *Associação Rural de Ajuda Mutua* (ORAM), UNAC frequently lobbies the government to uphold communities' land rights and to improve the governance of land transfers (Paradza 2011). But such efforts have seen little success. Thus, UNAC has taken some proactive measures to help safeguard peasant land rights. One such measure is land law workshops (or training) that teach farmers about their constitutional rights to land-use based on customary and good-faith occupancy-based DUATs and the critical role that land has in sustaining livelihoods. Comprehensive understanding of their rights empowers farmers to refuse land deals, address internal land conflicts in their communities, or negotiate better terms of engagement, including compensation for land concessions.⁶⁶ This approach contributes to building a critical mass of rural residents who understand their rights to productive resources and (in some contexts) to (re) claim them, by confronting authorities over poor governance.

Although not always successful, the movement's grassroots efforts to help peasants navigate the land law are emblematic of the political pressure needed to establish greater transparency and justice in the country's agricultural policies and in the use of productive resources.

⁶⁶ This is based on my participant observations and discussions with UNAC activists and farmers in Marracune, Maputo province, where the movement's efforts are much more successful than in Manica province and elsewhere in the country (see also Shilomboleni 2016).

Another critical component for fostering effective public policies in agricultural sectors is to support investments in physical and soft infrastructure. Resource constraints limit Mozambique's capacity to comprehensively invest in key areas of the agriculture sector, including domestic market development, research and extension, roads, storage etc. AGRA works to strengthen the capacity of service providers in the public and private sectors. Through PASS, the organization supports domestic crop-breeding activities to develop improved varieties (conventional bred OPVs and hybrids) of priority crops in the country. Such seed varieties include maize, cassava, sorghum, rice, sweet potato, cowpeas and groundnuts. The result is that 44 new varieties have been officially released, 36 of which are now commercialized (AGRA 2015).

AGRA's SHP trains extension staff, and works with agro-dealers to bring ISFM knowledge to smallholder farmers. The organization's activities at the policy scale, however, tend to focus on fertilizer use and regulation to the detriment of agro-ecological policy considerations. For example, a SHP grant went to the Ministry of Agriculture to strengthen the National Fertilizer Regulatory System that seeks to establish quality standards for the country's growing fertilizer market (see MINAG 2010).⁶⁷ Evidently, there was a problem of poor-quality fertilizers circulating in the economy—some traders manipulated the chemical content, mislabelled and under-filled fertilizer bags (MINAG 2010; IFDC 2012a; AGRA 2014). Grant support from SHP helped MINAG to train official fertilizer inspectors and government extension officers in fertilizer quality analysis and support strategic laboratories in improving their capacity to do sample testing for quality, among other activities (MINAG 2010) In 2013, the government passed the *Regulation on Fertilizer Management* bill (Decree No 11) to inspect, supervise and control all activities in the fertilizer supply chain—from registration of imported fertilizer to use in local markets (GoM 2013).

Both UNAC and AGRA make important strides in fostering improvements in policy engagement, albeit working under a challenging policy climate. As such, each of the organizations scored a moderate to high rating in their respective performance on this target criterion.

⁶⁷ An underlying objective of this SHP-funded project was to deliberate on a national policy framework that would effectively implement and enforce fertilizer regulations.

3.5 Discussion and Concluding Remarks

The agrarian models of the African Green Revolution and the food sovereignty movement come from distinct ideological backgrounds. Critical food scholars often highlight the stark contrasts between the two models, in a debate that has become increasingly polarized. Holt-Giménez and Altieri (2013) associate the African Green Revolution's technocratic and commercially-oriented approach to food security to everything they find unpalatable with neoliberal policies that govern the global food system. Other scholars and actors take a similar approach, arguing that the African Green Revolution primarily serves the interest of a few powerful players and is likely to further marginalize Africa's smallholders among other things (c.f. AFSA 2015). Some academics and activists promote food sovereignty as a more appropriate response to Africa's food security and sustainability challenges. Andree et al. (2014) counterpoise food sovereignty's bottom-up activism around issues of equity and justice in food systems to African Green Revolution's top-down approach to food security.

In Mozambique, however, the incongruent interplay between the two agrarian models at the broader political-economy level does not always translate into a similar outcome on the ground. A closer comparative assessment of how the African Green Revolution and the food sovereignty models respond to the needs of smallholder farmers reveals a more nuanced relationship. Unlike critics in academic and civil society circles, Mozambican farmers in Manica province do not favor one model over the other. What farmers appreciate, instead, is the different tools and capacities offered by the respective activities of the two models. Where the two models operate concurrently, farmers often engage with both in a complementary manner, taking from each what helps them to meet their food security and sustainability goals.

AGRA's African Green Revolution activities seek to assist smallholder farmers to gain access to improved agricultural technologies and to connect them to reliable buyers. Farmers find AGRA's efforts to help them engage more favorably in domestic markets particularly valuable because there are few to no viable alternative means to earn an income in rural Manica. Some farmers belonging to UNAC have joined AGRA's projects to gain access to marketing opportunities and skills. Although UNAC recognizes that output markets present vast challenges for its members in the province, the movement takes no measures to address the problem.

One of the most important concerns in Mozambique's agricultural sector is the growing rate of land transfers, entailing both large-scale land deals as well as medium-sized transfers to local elites (see Chapter 4). The overwhelming pace at which these transfers are occurring and the subsequent displacement of rural populations are key reasons why UNAC has prioritized peasant land-rights issues. Because agriculture is in most cases the only viable source of livelihood, secure access to land is directly linked to food security. In Manica province, farmers facing the risk of land dispossession due to Portucel's activities were able to approach UNAC because of the movement's longstanding advocacy of peasant land rights. UNAC's efforts to safeguard peasants' rights to land-use, though not always successful, play an important role in challenging poor policy practices in the agricultural sector.

Unlike UNAC, AGRA does not adequately engage with concerns surrounding land rights. In Manica province, AGRA's projects have involved several farmers associations whose members are affected by Portucel's activities. However, the organization paid no attention to the problem, possibly because land rights are outside of AGRA's predetermined areas of investments.

Smallholder farmers in Manica province, moreover, would like to see improvements in how the two agrarian models assist them, i.e., more effective responses to their contextual needs and realities. For example, AGRA's emphasis on delivering agricultural technologies through commercial channels, where farmers are required to pay for full-priced inputs, is arguably desirable for long-term sustainability. However, it does not seem to be feasible in Mozambique's low-income environment characterized by huge input/output price gaps. Indeed, even farmers' overall uptake of highly subsidized inputs provided by the government and other donor partners remains relatively low. In Bárúè district, some farmers have found ways to embed hybrid soy seeds into their traditional seed-saving and exchange practices through community seed banks. The process has enabled a wider network of farmers to access high quality seeds more successfully than they could through commercial channels. A key question for the African Green Revolution is whether it can accommodate and/or facilitate alternative channels (e.g., community seed banks) that can help disseminate agricultural technologies to a wider segment of Africa's smallholder farmers.

Although the food sovereignty movement supports building local economies with short and fair distribution chains that are based on transparent relationships between producers and consumers

(Nyéléni 2007, 2015), there is no detailed plan for how to operationalize such measures in Mozambique or the broader region. The Alliance for Food Sovereignty in Africa (AFSA) is against international trade, particularly of recent cash crops, such as flowers, sweetcorn, asparagus, green beans, etc., which are expanding in Africa's agricultural sectors (AFSA 2011). Yet, AFSA does not provide substantive details of how to build reliable domestic and local markets such that producers may participate more favorably in them.

Compelling empirical evidence about the nature of domestic and local markets in Mozambique and the broader region demonstrates that they present vast challenges for producers (Boughton et al. 2007; Barrett 2010; Jayne et al. 2010; Mather et al. 2013). Output markets are characterized by price instability and low investment returns, and as such see small volumes of produce traded (Poultine et al. 2006). The food sovereignty movement's weak capacity to articulate measures for creating income opportunities for farmers through domestic markets, is not surprising considering that many documents that promote the principles of food sovereignty primarily focus on the rights of rural producers and self-reliance (Nyeleni 2007).

Understanding the respective conceptual visions of the two agrarian models and the socio-ecological ramifications they carry is important to inform ongoing food security debates and policy efforts. Equally important is careful consideration of farmer perspectives on what the two models have to offer in meeting local food security needs in a sustainable manner. Such analysis sheds light on the major challenges and complexities these two models face in implementing their activities. From the perspective of smallholder farmers, neither model on its own helps them to fully meet their food security and sustainability demands. Rather, the two models offer complementary tools, and if possible, farmers engage with both, taking from each those aspects that bring them closer to these two goals. This messy reality on the ground suggests a need for further research, particularly on options that may serve broad-based sustainability goals in southern Africa's food systems.

Chapter 4

The Alliance for a Green Revolution in Africa (AGRA) and Underperforming Output Markets in Mozambique

4.1 Overview

Although host countries in Africa see AGRA as an important partner in their efforts to improve agricultural performance, the organization is subject to much contention, particularly in academic forums. This paper presents the qualitative results of fieldwork conducted in Manica province, Mozambique in 2014 and 2015, which examined how AGRA's activities might contribute to improving smallholder food security and agricultural sustainability in that country. The study finds AGRA to perform well to increase the availability of improved seeds. However, availability of improved seeds has not translated into a broad uptake by farmers. This gap is due to a marketing approach that requires farmers to pay for full-priced inputs in an environment where output markets offer low returns, particularly for staple crops such as maize. The contextual dynamics under which the African Green Revolution takes shape in Mozambique are quite complex and messy and as such warrant more-nuanced deliberations than are currently evident in dominant academic debates.

Key words: *AGRA, African Green Revolution, markets, improved seeds, Mozambique, Manica*

4.2 Introduction

Mozambique has a reputation of being a ‘donor darling’ (Hanlon 2010) due to large inflows of foreign aid in recent decades and for ‘loyally following a neo-liberal, free market development policy’ agenda (Cunguara and Hanlon, 2010 p.1).⁶⁸ A pivotal area of donor investments is the agricultural sector, which sees high levels of African Green Revolution activities from a network of stakeholders comprised of multilateral institutions, philanthropies and private enterprises. The objective of the African Green Revolution is to increase crop productivity through the use of agricultural technologies and to raise rural incomes by linking smallholders to market value chains (Rockefeller Foundation 2006; Sanchez et al. 2009; Otsuka and Larson 2013). The Alliance for a Green Revolution in Africa (AGRA) is an important partner in this endeavour, and has invested significant resources in the agricultural sectors of nearly 20 African countries.

Mozambique ranks high amongst AGRA’s strategic target areas along with three others: Ghana, Tanzania and Mali. With a large number of smallholder farmers, reliable rainfall and relatively good soils, these nations are considered high-potential “breadbasket” areas of their regions (e.g., AGRA 2014). From 2009-2012, 40 percent of AGRA’s resources were allocated to these four countries (Kambewa et al. 2013). Although such donor investments are welcomed by hosts (NEPAD 2003; GoM 2006; MINAG 2010), mainstay academic debates about the African Green Revolution and what AGRA represents largely resemble a dualistic discussion about either its potential promise (Toeniessen et al. 2008; Sanchez et al. 2009) or peril (Thompson 2014; Koopman 2012). Some critical scholars tend to dismiss the African Green Revolution altogether, arguing that it offers technocratic fixes that stand to reorient small-scale agriculture into industrial monocultures (McMichael and Schneider 2011; Holt-Giménez and Altieri 2013).

⁶⁸ At the moment, however, the country is facing a serious economic crisis—caused primarily by a secret debt of more USD 2 billion that was arranged from 2013 to 2014 between two international banks—Credit Suisse and Russian bank, VTB, and three parastatal companies—Empresa Moçambicana de Atum (Ematum) (USD 850 million), Pro-Indicus (USD 622 million) and Mozambique Asset Management (MAM) (USD 535 million) (Africa Confidential 2016). While these loans took place under the leadership of President Armando Guebuza (2005-2014), they were largely concealed by the incumbent administration of President Filipe Nyusi (Africa Confidential 2016). Following revelations about the deception by Mozambican authorities and the extent of the debt crisis between April-June 2016, the International Monetary Fund (IMF) suspended its concessionary loan to the country, a Stand-By Credit Facility of USD 283 million, which was agreed upon in October 2015 (Hanlon 2016a). Other international donors also suspended budgetary support to Mozambique, and alongside the IMF are calling for an international forensic audit into the country’s debt scandal (Hanlon 2016a) (see also Hanlon 2016b).

This chapter is not intended to critique the highly politicized neoliberal antecedents behind this agrarian model's investments in Africa—much of this topic has been eloquently covered elsewhere (Dano 2007; Scoones and Thompson 2011; Holt-Giménez and Altieri 2013; Patel 2013; Curtis 2016). While these critiques have some valuable insights, they also risk shutting down meaningful dialogue with stakeholders implementing this model and the farmers it serves. Some parts of Sub-Saharan Africa see complex challenges related to merging food security and sustainability goals, and thus need more nuanced discussions.

This chapter presents the qualitative results of fieldwork conducted in Manica province, Mozambique in 2014 and 2015 that examined how AGRA's activities might contribute to smallholder food security and sustainability there. The research examined the ways in which AGRA responds to five key sustainable food system indicators that were informed by farmer perspectives⁶⁹ and sustainability assessment literature: access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement (López-Ridaura et al. 2002; Gibson et al. 2005; FAO 2013; Astier et al. 2011). Taken together, positive steps in these indicator areas can help to address both the technical aspects of meeting food security (issues of production) and engage with political economy issues that facilitate (or hinder) the means of achieving it.

The study finds AGRA to perform well in contributing to the availability of improved seeds, including by financially supporting Mozambican students to study crop science at top African universities and by funding crop breeding programs to develop new varieties of priority crops for the region's smallholders (Kambewa et al. 2013). The availability of improved seeds, however, has not translated into a broad uptake by farmers. This gap is due to a marketing approach that requires farmers to pay full price for inputs, in an environment where output markets offer low returns, particularly for staple crops such as maize.

The outline of the chapter is as follows. First, it briefly maps out the history of agricultural sector development in Mozambique. The country's colonial legacy, a destabilization war that was orchestrated by external governments, and Structural Adjustment Programs (SAPs) have

⁶⁹ This is from the author's first-phase of fieldwork in 2014, entailing interview interactions with farmers and project implementers from both AGRA and the National Union of Mozambican Peasants (UNAC), a food sovereignty movement. More details below.

significantly shaped its (underperforming) agricultural sector. Second, the paper outlines the research methodology, providing information about the study site and the limitations of the study. Next it presents the results. There follows a concluding discussion on lessons from this case-study and implications for food policy.

4.3 Three Decades of Turmoil and Different Development Ideologies

Mozambique gained independence in June 1975 after a decade of guerrilla warfare against colonial rule led by the Front for the Liberation of Mozambique (FRELIMO). Under Portuguese colonialism, the country was grossly underdeveloped, and authorities paid little attention to the welfare of its native population. The vast majority of black Mozambicans experienced racism and discrimination; various forms of forced labor, including contract labor in South Africa's mines; and unequal exchange in agricultural products (Hanlon 1984; Ambrahamsson and Nilsson 1995). The new government, under FRELIMO's leadership, adopted a Marxist-Leninist ideology to guide the establishment of a socialist state (Ottaway 1988).

The newly independent state, however, faced major problems from the onset. With an economy primarily dependent on commodity exports, Mozambique suffered from the global economic recession of 1974, which reduced its foreign earnings (Manning 2002). Production also plummeted as Portuguese settlers fled the country—destroying everything they could on their way out, including farm machinery, and construction supplies, and pouring cement down drainage systems (Andersson 1992). The state adopted a *socialization of the countryside* program in 1977 to increase crop production and to implement state-run marketing networks. Agriculture was collectivized through a three-tier system comprised of state farms, communal villages and cooperatives. The centralized agricultural program, however, experienced substantial problems.

State farms were organized on plantations formerly owned by Portuguese settlers and represented only a small-segment of the agricultural sector. But by 1981, state farms absorbed up to ninety percent of the state's agricultural budget (Ottaway 1988; Manning 2002). The government also established communal villages as a way to bring together scattered peasants—to farm collectively and to sell their produce to the state through cooperatives. However, communal villages failed to reach a broad base of the population and met resistance even from those who participated. In the early 1980s, only about 18 percent of the rural population were associated

with communal villages (Ottaway 1988). Peasants earned low prices and responded by reducing production and side selling their produce (Alden 2001).

State efforts to develop the agriculture sector were also immensely undermined by a destabilization war, coordinated by the white minority-ruled governments of Rhodesia (now Zimbabwe) and later apartheid South Africa. Within two years of independence, Mozambique came under assault from Rhodesia. At the time, the Zimbabwe African National Union was fighting a war of independence in that country. In solidarity, the FRELIMO-led government offered them military bases and imposed UN- mandated sanctions against its neighbor (Hanlon 1996). Rhodesia responded by setting up an anti-FRELIMO guerilla group, the Mozambique National Resistance (MRN, later renamed Renamo), to start a war that entailed sabotage actions meant to cripple Mozambique's socio-economic development. Renamo's rebel forces raided and attacked communal villages, schools and health posts that the new government set up, burned shops and factories, and blew up public infrastructure, i.e., roads, railways and dams (Hanlon 1991, p. 19-20; Andersson 1992).

In the wake of Zimbabwe's independence in 1980, Rhodesia's security services transferred Renamo's operations over to South Africa's military services, which strengthened its military capacities and supplies even further (Hanlon 1996, p. 14). Sabotage actions continued until 1992, when the war ended. However, the country was in ruins: the war cost the state USD 20 billion, one million people died and five million were internally-displaced or became refugees in neighboring countries (Hanlon 2010). Renamo reinvented itself into a political party, but deteriorating political relationships with the government over the last 20 years have recommenced armed conflict in the country (Dzinesa and Motsamai 2013). Military actions began in October 2012 and stopped in August 2014, but resumed in September 2015 and are ongoing. Initially, much of the violence was concentrated in Sofala province, where Renamo's base camp is located (in Gorongosa district). Today, the conflict affects most central and northern provinces especially Sofala, Manica, Tete Nampula and Niassa. Renamo also engages in shooting on civilian cars, buses and trucks on the main roads (especially the N1) that connect the country's three regions: the north, center and south.

Another important factor that shaped Mozambique's underperforming agricultural sector is SAPs, which came from multilateral donors. As the war of destabilization paralysed the

agricultural sector and overall economy through the early 1980s, a major drought affected southern Africa in 1983, leading to a famine in Mozambique. Faced with a fiscal and humanitarian crisis, the government turned to the West for food aid. But donor countries, especially the United States in 1984, made clear that the transfer of food aid was conditional upon joining Bretton Woods Institutions (the World Bank and International Monetary Fund) and on adopting SAPs (Hanlon 1996, p 16). Mozambique complied: its first economic restructuring loans under SAPs came into effect in 1987. By the following year, foreign aid made up 70 percent of the country's Gross Domestic Product (GDP) (Hanlon 1991, p. 62).

Across Sub-Saharan Africa, SAPs were introduced on the basis that governments' interventions in their agricultural sectors were inefficient, and that free markets could allocate resources and deliver agricultural services more competently (Kherallah et al. 2002; Oya 2007). State budgets for agriculture were drastically cut, subsidies to state farms were scaled back, and price controls in the sector were lifted. African countries reduced their agricultural budget shares from an average of 42 percent of their GDPs in 1965 (Karshenas 2001, p. 317) to about six percent by the late 1980s to 1990s (World Bank 2008).

In Mozambique, donor-driven spending cuts were applied to nearly all areas of the economy (education, health care, agriculture), a process that significantly contributed to reduced social and economic welfare of the population in both urban and rural areas (Hanlon and Smart 2008). For example, due to pressure from lending institutions, especially the IMF, the minimum wage in Mozambique fell to USD 15 per month in 1995 (Hanlon 2010, p. 87).⁷⁰ In the late 1990s and early 2000s, the alarming high levels of poverty and chronic malnutrition in Sub-Saharan Africa started to gain global political priority (FAO 1996; World Bank 2000). World leaders introduced initiatives to address global hunger and poverty, e.g., the UN Millennium Development Goals.

African governments also vowed to prioritize agricultural development and committed to allocate at least ten percent of their national budgets to the sector (African Union 2003). At the African Heads of States Summit in 2003, leaders endorsed the Comprehensive African

⁷⁰ Low levels of development in Mozambique, however, contrast with modest GDP growth in the post-war era (on average 4 percent per year) (Alden 2001, p. 10), and exceptional growth in the 2000s (on average 7.4 percent per year) (Masha and Ross 2014).

Agriculture Development Programme (CAADP) as continental leading policy framework to stimulate agricultural-led growth, and food security and to address poverty. However, CAADP required large investments (about USD 15.7 billion per year in the first decade) (NEPAD 2003, p. 19). The African Union alongside lending institutions and donors emphasized sharing responsibilities between key partners in the public and private sectors. These actors encouraged strategic partnerships with philanthropic donors, sub-regional organizations and farmers' organizations at the national and international levels (NEPAD 2003).

CAADP provided policy space for various African Green Revolution initiatives such as AGRA to take hold in the region. A philanthropic organization established by the Rockefeller and the Bill and Melinda Gates Foundations in 2006, AGRA seeks to improve agricultural performance in Africa through investments in seed technologies, soil fertility and market development among other things (AGRA 2012, 2013). As an 'alliance', AGRA provides a platform to facilitate Public-Private Partnerships (PPPs) and to help smallholder farmers increase their crop productivity, food security and incomes (AGRA 2009).

Mozambique, under the guidance of multilateral lenders (i.e., the World Bank and IMF), also adopted the Poverty Reduction Strategy Papers (PRSPs) as a key policy framework to address poverty.⁷¹ The country's second PRSP (2006-2009) forms the basis of its current agricultural strategy: to 'kick-start' structural transformation through PPPs (GoM 2006, p. 132). The strategy has been renamed the Strategic Plan for Agricultural Development (PEDSA) to cover the period 2011-2020, and aims to transform the agriculture sector from a predominately subsistence sector to a highly productive and globally competitive one (MINAG 2010).

Mozambique's troubled past, including why the country came to be a 'donor darling' under desperate measures, significantly contributed to its current underperforming agricultural sector. Today, Mozambique is one of the poorest nations in the world, ranked 180 out of 182 countries on the UN Human Development Index (HDI) in 2016. Nearly 50 percent of its citizens live below the national poverty line of 1 USD per person per day (GoM 2016). The country is also

⁷¹ PRSPs are part of the IMF's post-Washington Consensus reform measures that encourage 'pro-poor' economic growth strategies in Low-income Developing Countries (LIDCs). Reform measures came as a result of mounting public pressure against neoliberal market policies and internal debates within the IMF and World Bank concerning the 'soundness' of structural adjustment policies, especially in light of high debt levels in LIDCs at the time (see Hibben 2016)

vulnerable to environmental change, being especially prone to frequent droughts and floods (WFP 2010). Over the last several decades, the population has seen average temperatures rise by 1.6 °C and delays in rainfall, which have negatively affected crop productivity (WFP 2010).

In addition, several soil studies show empirical evidence of nutrient depletion, and moderate to low soil fertility, particularly in the north and central regions where most of the country's staple crops such as maize are grown (Folmer et al. 1998; Maria and Host 2006). In some regions, erosion and leaching are the primary causes of poor soil health—with leaching being especially high in “nutrient-mining” crop systems, such as maize and cassava (Folmer et al. 1998). In other regions, soils naturally have high acidic levels and low capacity to absorb phosphorus, which tend to limit plant growth (Maria and Host 2006). Fertilizer use, particularly among smallholder farmers, is extremely low. Estimates show that less than five percent of Mozambican smallholder farmers use chemical fertilizers, mainly due to high cost and risky output markets that offer low financial returns (Benson et al. 2012).

The aforementioned economic and environmental challenges suggest that Mozambican farmers will likely continue to grow food under difficult circumstances in the near future. The key question now is not so much whether donor aid in the sector is needed (it is), but rather how development projects, working in these difficult environments can have a positive impact on food security and on improving rural livelihoods.

4.4 Methodology

Overall, this research was designed to assess comparatively the ways in which the African Green Revolution and the food sovereignty movement contribute to food security and sustainability from farmer perspectives in Mozambique. The intensive nature of a case study allowed for in-depth investigation of these two agrarian models (Baxter 2010). The study focused on two organizations, AGRA implementing the former model, and the National Union of Mozambican Peasants (UNAC) supporting the latter. Initially, the research design was modelled after the FAO's Sustainability Assessment of Food and Agricultural Systems (SAFA), specifically its four sustainability dimensions.⁷² However, these were modified during the course of fieldwork to reflect and focus on sustainable food system indicators that were of key concern to research participants with regards to achieving smallholder food security and sustainability. These are access to quality seeds, activities to improve soil health, land rights, income opportunities and policy engagement.

Fieldwork involving semi-structured interviews with key informants and participant observations was conducted in Mozambique over a period of seven months in 2014 and 2015. Three months were dedicated to examining AGRA's efforts—with the majority of data collection taking place in August 2014 and from January to February 2015. Three months went to assessing UNAC's activities—with most of the data collection taking place from May to June 2014 and in March 2015.

This paper presents findings only from AGRA's activities. The assessment of UNAC is presented in another paper (Chapter 5). The analysis here also only focuses on two components that were of key concern to study participants: seed technology (access to quality seeds) and market access (for income opportunities). These two aspects also present major operational challenges to AGRA's activities in Manica province. Therefore, this chapter focuses on these components to offer an in-depth discussion on the lessons learned and to consider options for

⁷² These were organized as environmental integrity (practices that enhance ecological diversity); economic resilience (income-generating agricultural activities); social well-being (skills training in various areas of food production); and governance (influencing public policy to provide better support to farmers).

improved undertakings. An overview of AGRA's contributions to other indicators is addressed elsewhere (Chapter 3).

4.4.1 Study Site and Sampling

Fieldwork examining AGRA's efforts took place primarily in Manica province (and one site in Sofala province)⁷³ where the organization's activities were implemented by locally-based NGOs (Figure 4.1).⁷⁴ The vast share of this research was with Concern Universal, a UK-based charity, and the lead coordinator of AGRA's Building the Capacity of Smallholder Farmers and Farmers Organizations (BCFFO) or the *Integrated Project*. A consortium of eight locally-based organizations and companies⁷⁵ implemented this project in five districts, three in Manica (Manica, Sussendenga and Gondola) and two in Sofala (Nhamatanda and Gorongosa). With a budget of USD 3.2 million, the project had a lifespan of 36 months (May 2013 to April 2016) and targeted 40,000 smallholder beneficiaries to increase their crop productivity and link them to markets (Concern Universal 2013). The project managed to work with 43,636 smallholder farmers by the end of its cycle. A lesser proportion of the research was with AGRA's Smallholder Market Access for Rural Transformation (SMART) program that was implemented by another UK-based charity, the Micaia Foundation, in Bárue, Guro and Manica districts. The SMART project worked with over 14,000 smallholder farmers—training them in marketing principles and linking them to structured markets. The project ran from June 2011 to November 2014 (Micaia Foundation 2014).

A qualitative approach to data collection was suitable for two reasons. First, the African Green Revolution is occurring in diverse agricultural contexts where our understanding of farming communities' motivations to embrace (or reject) certain technologies as well as the pressures they face is incomplete (Jones et al. 2015). Thus, my purpose as a researcher was to gain access to farmer perspectives about how African Green Revolution activities serve their specific needs

⁷³Sofala province was at the center of military actions between the national army and Renamo. As a result, my travel to this province was especially restricted. I was only able to conduct interviews at one site in Nhamatanda. In general, both Manica and Sofala provinces had a heavy military and police presence, and as such there were safety concerns, particularly with regards to travelling to remote villages.

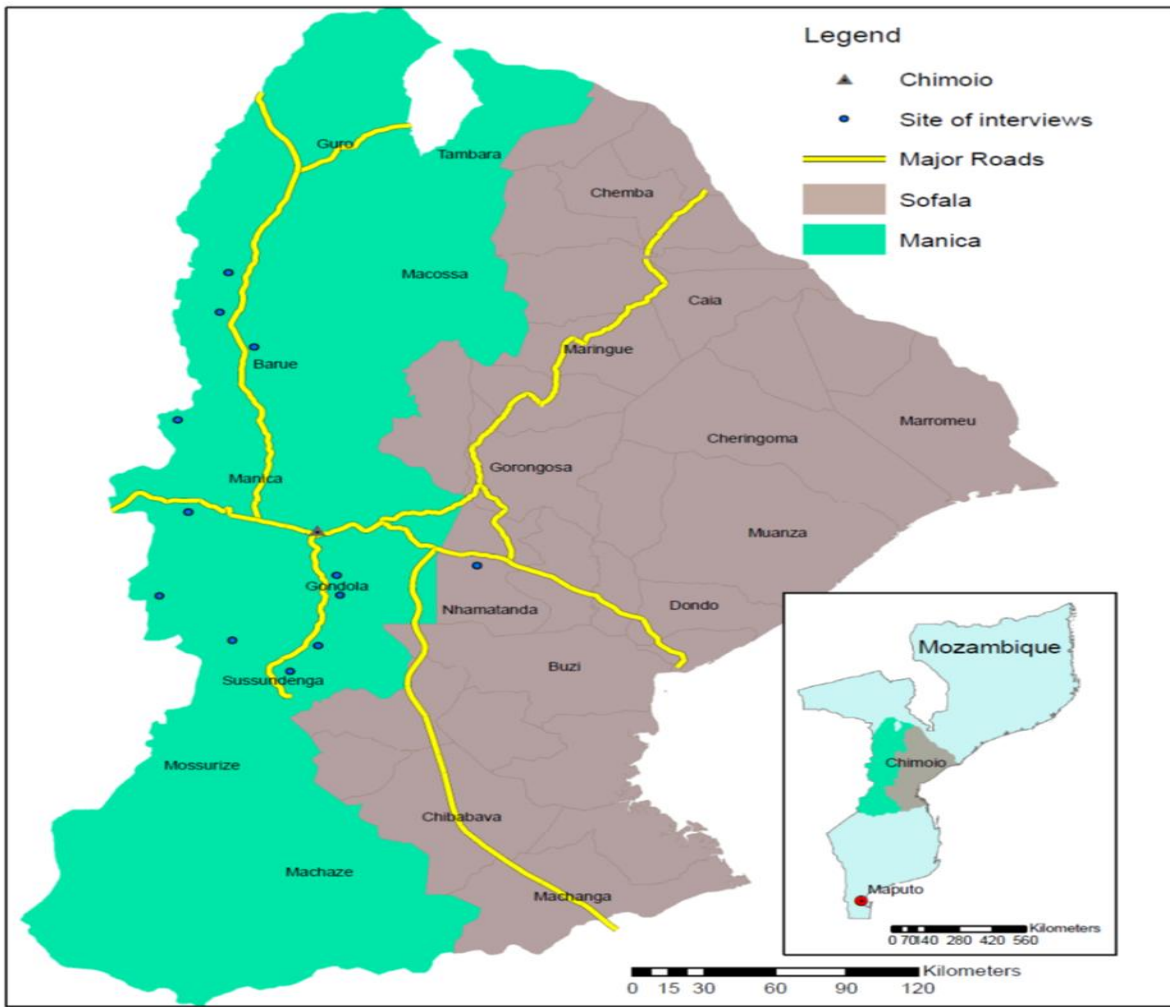
⁷⁴ I did not find GIS data locating the exact positions (i.e. longitudes and latitudes) of the villages where interviews took place. Instead, village site locations were entered manually, using approximate distance to tarred roads as a guide.

⁷⁵ The partners are: Kulima, Sementes Nzara Yaperá, Kixiqula, Dengo Commercial, AGRIMERC-ODS, OCODEMA, IDEAA and APAC.

rather than to simply amass data (Berg and Lune 2012). Insights from voices on the ground can help to deepen our knowledge of the everyday realities of farming and to identify agricultural interventions that may be more appropriate and relevant (Jones et al. 2015).

Second, time and logistical constraints made a qualitative approach more suitable for this study. Not only were AGRA-supported projects working with a large number of farmers, but also poor road networks and the distances between villages in Manica province make surveys challenging and time consuming. Most of the interviews with beneficiary farmers were also conducted at sites located in close proximity to main roads, and accessible by public transportation. Conducting interviews in communities near main roads was also a matter of safety, i.e., having an escape route. As mentioned, a heavy military and police presence in the region at the time of the fieldwork made travelling to remote areas intimidating. As a result, the interview process could not avoid sampling bias, and I recognize that this is a limitation of the study.

Field-research Site in Mozambique



Data Source: Global administrative areas. University of Berkeley (2012).

Figure 4.1 Map of Field-Research Sites in Mozambique

4.4.2 Data Collection

Purposive sampling was relied upon to recruit study participants who could provide insightful information related to the study’s objectives (Bernard 2011). Thus, individuals who had an existing relationship with AGRA’s projects were targeted for interviews. However, a few additional participants who were not affiliated with the organization but who were authoritative figures or experts in the agricultural sector field were also asked to participate. Study participants were identified by email, telephone, and/or in person, as well as by snowball sampling, which is the use of respondents’ own networks to identify additional participants (Barbour 2008).

Two sets of semi-structured interviews were conducted. The first targeted organizational employees/project staff to gain insights about operational activities. The aim was to interact with staff members, e.g., program managers, field-officers, contract/ implementing partners and affiliated associations. In addition to inquiring about AGRA's establishment in Mozambique, interview questions solicited information related to the measures taken to facilitate or implement VSCs; how the organization's efforts contribute to food security; and what challenges/constraints staff members face in implementing their activities (Appendix A).

The second set of semi-structured interviews targeted smallholders who were the primary beneficiaries of AGRA's activities. In addition to inquiring about how farmers became affiliated with the organization's projects, interview questions sought to scrutinize how farmers were responding to the African Green Revolution agrarian model, e.g., whether they are able to gain access to new agricultural technologies and how their livelihood and food security were affected as a result (Appendix B). I sought to ensure qualitative rigour by visiting accessible research sites more than once and by interviewing several farmers in the same associations (e.g., through focus groups, small-groups or individual interviews) for validity checking.

In total 36 semi-structured interviews were conducted. The first set included seven project staff, one agro-dealer, and two seed company owners. The second set included 12 individual farmers, four small-groups (ranging between two and six people), and seven focus groups (ranging from seven to 15 people). In addition, three other participants who were not affiliated with AGRA projects but with national (one stakeholder) and international institutions (two stakeholders) implementing African Green Revolution activities participated in this study. I also collected quantitative data from the Integrated Project on their farmers' produce sales and prices during the first year of the project (2013/2014). The preliminary results of the study were presented to project staff in Chimoi in April 2015. Their feedback provided further clarity on some of the key themes that emerged early on from the data.

The sample size was determined by time and logistical constraints, and although relatively small, it meets the minimum acceptable size of 15 interviews required for qualitative research (Guest et al. 2006, p. 61). Data saturation occurs at a point where excess information does not add new or useful insights to the topic under investigation (Mason 2010). While I started to see some degree of saturation in the interviews with farmers, it was difficult to determine the point of saturation in

interviews with project staff. However, both the sample size and participants level of expertise on the subject were adequate to allow for a replication of the study (Balarajan and Reich 2016).

4.4.3 Data analysis

Data analysis of interviews and field notes was done manually, and took an inductive approach, using grounded theory, to search for patterns in the gathered information (Blackstone 2012). The first step in the data analysis was to read and re-read transcripts, taking notes of key attributes and ideas that emerged. The second step was to categorize or codify the data into themes and subthemes to help draw meaning from underlying trends and patterns. The final step was to arrange the codes into a coding structure of themes and subthemes. To increase the validity and reliability of the primary data, this study relied upon triangulation with secondary data, from peer-viewed and gray literature on African Green Revolution activities in Mozambique and the broader region.

4.4.4 Limitations

This study has several limitations both in design (as a qualitative case-study) and in implementation (due to contextual constraints). The sample size was too small for statistical purposes; thus, the evidence presented here should not be used to make analytical generalizations (Onwuegbuzie and Collins 2007) about the impact of African Green Revolution activities beyond the communities where the research took place. As mentioned, the study could also not avoid sampling bias due to low levels of infrastructure development, including a lack of adequate accommodation for visitors in much of rural Manica province. There is also the challenge associated with biased responses from participants, whereby some people may feel the need to describe their project or impacts “in glowing terms” (Jones et al. 2015, p. 58). I encountered this at least once, but was able to reassess such bias by member-checking. These limitations indicate the difficulty of assessing in depth, particularly of statistically quantifying, African Green Revolution impacts on food security and agricultural systems’ sustainability in Mozambique. Nonetheless, this study provides an important starting point to advance mainstay academic debates about what the African Green Revolution and its supporters represent. It highlights that contextual dynamics, in some places, are complex and messy and thus warrant more-nuanced deliberations and further empirical research.

4.5 Results and Discussion

As mentioned, the analysis here focuses on two sustainable food system indicators that were of key concern to study participants, and which present major operational challenges to AGRA's efforts: seed technology (access to quality seeds) and market access (for income opportunities).

4.5.1 Seed Technology

AGRA's African Green Revolution activities in Mozambique seek to improve the performance of the agricultural sector through investments in the areas of seeds, soil fertility, market access, policy advocacy and community capacity building. The role of AGRA in investing in these areas, according to one respondent, is "to supplement the government's efforts in the agriculture sector... [in order] to serve the country's smallholder farmers the best way we can."⁷⁶

A critical component of the organization's activities, therefore, is to strengthen the knowledge and technical skills of service providers in the sector. The same respondent elaborates that:

After all, we want a sustainable capacity development at the local level, which provides sustainable services to farmers for the years to come. So that if AGRA's assistance no longer exists at some point, we will have capacity at the local level to provide smallholders with the services that they need.⁷⁷

Indeed, AGRA is strengthening the capacity of multiple partners in the country's seed sector through its Program for Africa's Seeds Systems (PASS). The program supports crop-science education, providing PhD and MSc level scholarships to Mozambican citizens to study primarily at top African universities (Kambewa et al. 2013). PASS-funded graduates, alongside crop scientists in public institutions, such as the National Agriculture Research Institute (IIAM), are further supported to develop new varieties of priority crops, conventionally-bred Open Pollinated Varieties (OPVs) and hybrids. In Mozambique, such crops include maize, cassava, sorghum, rice, sweet potato, cowpeas and groundnuts. The result is that 44 new varieties have been officially released, 36 of which are now commercialized (AGRA 2015).

⁷⁶ Interview with project staffer, Maputo, 21 August 2014

⁷⁷ *ibid*

The author saw this local capacity building in Manica province with two family-run seed companies, both partners in the Integrated Project, whose activities contribute to increasing the availability of improved seeds in the region.⁷⁸ The seed companies have worked closely with a crop scientist from the International Maize and Wheat Improvement Center (CIMMYT) in Harare, hired by the Integrated Project to train them in multiplying improved maize varieties. These varieties include two OPVs (Matuba and Drought Tolerant Maize for Africa (DTMA) and a hybrid variety (SP-1). Both companies multiply OPVs, but only one of them works with a hybrid variety. Grant support from the project has enabled the seed companies to gain access to breeders' varieties, mainly from CIMMYT and IIAM, as well as to purchase related technologies (fertilizers, herbicides, etc.) for seed multiplication.⁷⁹

Expanding complementarities and coordinating plant-breeding activities between these various entities are part of broader efforts to revitalize crop-breeding capacity in the region, made possible by donor funding, notably by the Bill and Melinda Gates Foundation (Lynam et al. 2010; Smale et al. 2013). Such collaboration enables crop-breeders to share resources, working in heterogeneous agronomic environments and in national agricultural research institutions that face budgetary and capacity constraints (Lynam et al. 2010, p. 3-4).

In Manica province, both seed companies work with small-medium landholding farmers as out-growers to multiply their basic seeds. One company works with seven out-growers (with an average landholding of 10-20 hectares); the other works with 47 out-growers (with an average landholding of three to seven hectares). The decision to work with relatively larger farmers, according to one company, "is for efficiency purposes...it is easier to drop off inputs and pick up [the seeds] from a few numbers of large farms who grow bigger quantities than from a large number of smallholders who grow in small quantities."⁸⁰ In a normal growing season, the company sources about 350 metric tons of seeds from its out-growers.

Both seed companies are linked to agro-dealers in the Integrated Project, working in all five districts to serve the project's farmers. Since most agro-dealers are small businesses, the seed

⁷⁸ I visited the production site of one of the seed companies on several occasions, first in August 2014 and again in January and February of 2015

⁷⁹ Interview with seed company, Chimoio, 19 January 2015

⁸⁰ *ibid*

companies provide them with inputs on credit to be paid off after the planting season. However, both companies are experiencing problems with some agro-dealers unable to pay off their debt.

One respondent explains that:

Some agro-dealers have not managed to pay for the seeds they took last year. They come up with various excuses: some say that farmers did not buy, or that the [seeds] rotted. It is very difficult to reach agro-dealers that are far away, e.g. in Goroghosa and Nhamatanda that is more than 200 kilometers from Catandica, [and] we are also not able observe their sales.⁸¹

AGRA's support of the seed companies in Manica province, as well other PASS efforts elsewhere certainly do contribute to improving the availability of improved seeds in Mozambique. However, the problem with some agro-dealers' inability to pay off their debt also speaks to another important challenge: AGRA-supported farmers have difficulty adopting improved seeds and related technologies. Other empirical studies similarly demonstrate low adoption rates of modern high-yield varieties amongst farmers in Mozambique and elsewhere in Sub-Saharan Africa (World Bank 2012a; Lunduka et al. 2012; Carter et al. 2013; Nyantakyi-Frimpong and Bezner Kerr 2015).

4.5.2 Farmers Limited Uptake of (Full-priced) Improved Seed Technology

In interviews and focus group meetings, most farmers affiliated with the Integrated Project express genuine enthusiasm about AGRA's investments. However, they also expressed concern and frustration with not being able to fully access improved seeds (and fertilizers) due to high costs and an inability to access credit. One farmer explains that "the project brings inputs to be used in demonstration plots only, [but] the farmers are not given seeds; they have to find ways to buy the seeds from the agro-dealers."⁸² At the time of fieldwork in Manica province, agro-dealers affiliated with the Integrated Project sold seeds at full retail prices: OPV maize cost approximately MT 35/kg (USD 0.90 cents) and hybrids cost about MT 110/kg (USD 3.5).⁸³ The president of a Farmers Organization (FO) explains that:

⁸¹ Follow-up interview with seed company, Barue district, 24 January 2015

⁸² individual farmer interview, Gondola district, 8 August 2014

⁸³ The exchange rate between the US dollar and the Mozambican Meticaais in 2014/2015 when the fieldwork was conducted was approximately 1 USD = 30 MT.

Here farmers cannot afford to buy many bags of seeds. Depending on how much money they have, farmers would buy one to three bags of hybrid maize seeds. They would plant their fields with a mix of hybrid seeds and traditional seeds.⁸⁴

AGRA does not provide farmers with price support, .e.g., vouchers or subsidies because they are viewed to undermine competitive markets, especially when used over extended periods.⁸⁵

Instead, the organization supports locally-based financial facilities to provide credit to smallholders, thereby enabling farmers to pay for full-priced inputs and to stimulate rural economies (AGRA 2013). Credit supply to farmers is expected to stimulate steady and long-term demand for improved seeds and fertilizers, and in turn, encourage broad-based participation from breeders, seed companies, processors, agro-dealers, etc. In Manica province, a partner NGO in the Integrated Project with a micro-credit bank received AGRA-funding to do just that.

However, only a small group of farmers were eligible to receive loans from the micro-bank; 102 loans were extended to farmers in the first year of the project (2013-2014),⁸⁶ representing less than 0.25 percent of the project's (40, 000) beneficiaries. Far fewer loans (53) were provided in the second year (2014/2015) because the bank saw low reimbursement rates in the first year—only 11 percent of the loans were recovered.⁸⁷

Thus, traditional maize varieties and those recycled from previous harvests still make up a significant share of farmers' seeds.⁸⁸ Where possible, these recycled varieties are supplemented with improved OPVs and hybrid seeds from various sources. As explained earlier, some farmers buy a limited amount of seeds from the Integrated Project's agro-dealers, depending on their income situation. Farmers are also able to gain access to OPVs and hybrid seeds that are highly subsidized by government and other donor subsidy programs, distributed by certified agro-dealers in the region.

For example, in 2009, the UN Food and Agriculture Organization (FAO) and the European Union (EU) launched a voucher program, as part of a 7.2 million Euro agriculture development

⁸⁴ Individual farmer interview, Sussendenga district, 4 February 2015

⁸⁵ Interview with seed sector development expert, Maputo, 16 April 2015

⁸⁶ Interview with project staffer, Chimoio, 21 January 2015

⁸⁷ *ibid*

⁸⁸ Small group interview, Sussendenga district, 5 February 2015

project to Mozambique (FAO 2010). During the first phase of the FAO/EU voucher program (2009-2011), some 25, 000 farmers in central and northern Mozambique were offered packages of improved maize (hybrids or OPVs) or rice seeds, along with synthetic fertilizers (FAO n.d.). Each package was sufficient to cover a half-hectare plot, consisting of 100 kg fertilizer and 12.5 kg of improved maize or rice seeds. The total monetary cost of the inputs per voucher was about USD 115—the program covered 73 % of the total cost, while farmers were required to cover the rest in cash, about USD 32. However, the overall uptake was low: nearly half of the qualified farmers (46%) did not pick up their vouchers, claiming that they could not afford the co-payment of MT860 (about USD 32) (Carter et al. 2013). This voucher program was suspended from 2012 to 2013 but resumed in 2014, offering smaller input packages at a considerably lower cost than the first phase of the project.

Some AGRA-supported farmers in the Integrated Project are beneficiaries of the resumed FAO/EU voucher program. Members of an AGRA-supported farmer organization in Nhamatanda district (Sofala province) purchased inputs from the FAO/EU voucher program during the 2014/2015 production cycle, and explain that it offers a wide selection of kits.⁸⁹ One kit contained 12 kg maize, 4 kg beans (cowpea) and cost MT 150 (about USD 5); another kit had 25 kg maize, 3 kg beans and sold for MT 290 (about USD 9); the last kit came with two 50 kg bags of fertilizers and cost MT 1900 (about USD 60). Various other NGOs working in the region also provide improved inputs to farmers, either for free or on credit, for instance, by giving seeds at the start of the planting season, but deferring payment until after harvest.⁹⁰ While subsidy programs help farmers to gain access to improved seeds because they lower the cost of inputs, they appear to undermine AGRA's efforts to stimulate farmers' demand for full-priced inputs.

Based on participant observations and interview discussions with project staff/implementers, several have also raised concerns about farmers' low uptake of full-priced improved inputs sold by agro-dealers in the Integrated Project. The issue was discussed at a project meeting held in Chimoio (with representatives from all eight partners of the Integrated Project) in January 2015. Stakeholders had different opinions about the cause of the problem. One of the seed companies views subsidy programs as a key cause that not only undermines reliable and long-term demand

⁸⁹ Small group interview, Nhamatanda district, 18 February 2015

⁹⁰ Focus group interview, Manica district, 19 February 2015

for inputs from farmers, but creates unequal competition for his business. Evidently, farmers become accustomed to buying seeds at subsidized prices, and during election periods, they sometimes receive seeds for free—made possible by politicians vying for farmers’ votes.⁹¹ Some AGRA-trained agro-dealers also carry government-subsidized seeds, which results in fewer sales of the company’s seeds.⁹²

At the same time, farmers tend to take subsidized prices as the market value for inputs, while the actual cost may be over 70 percent higher, as in the case of the EU-FAO voucher program. Thus, when AGRA-supported farmers are asked to pay the cost of inputs, they find the price difference confusing. Some beneficiaries of the Integrated Project believe that they are charged higher prices for inputs in the project than by agro-dealers in town.⁹³

The aforementioned factors are important to farmers’ low demand for full-priced improved inputs. However, a bigger concern found by this research has to do with underperforming output markets that offer low returns relative to the cost of inputs, especially for maize crops. Other empirical studies similarly show that Mozambique’s output markets are characterized by price instability and low investment returns, particularly for staple crops (Tschirley et al. 2006; Boughton et al. 2007; Cunguara and Kelly 2010; Cunguara 2012).

4.5.3 Output Market Challenges

Maize is the most widely grown and marketed crop in central Mozambique as well as amongst the Integrated Project farmers. This study drew on official maize price data published monthly by the Ministry of Agriculture’s Agricultural Market Information System (SIMA) for Manica and Sofala provinces. The data show that producer prices per kg (i.e., farm-gate prices) fluctuate throughout the year, but are particularly low around harvest season May-July (Table 4.1). At the time of fieldwork, the exchange rate between the US dollar and the Mozambican Metical was conducted was approximately 1 USD = 30 MT.⁹⁴

⁹¹ Interview with seed company, Chimoio 19, January 2015

⁹² *ibid*

⁹³ Interviews in Gondola district in 2014, Manica and Sussendenga districts in 2015

⁹⁴ The Metical has lost more than half its value against the dollar since the time of field work. Today, the exchange rate is 1 USD = 76 MT. The freefall of the MT is largely due to the economic crisis the country is facing (Hanlon 2016).

Table 4.1: Official Maize Producer and Retail Prices in Manica (Manica Province) and Nhamantanda (Sofala Province) 2014

Month	Manica maize		Nhamatanda maize		MT/USD exchange rate
	Producer price	Retail price	Producer price	Retail price	
January	10.29	11.43	10.29	11.43	30.31
February	11.43	14.29	10.29	11.43	30.86
March	10.29	11.43	10.29	11.43	30.54
April	6.86	8.57	5.71	6.86	30.75
May	6.86	8.00	5.71	6.86	30.72
June	6.86	8.00	5.71	6.86	30.74
July	5.71	6.86	5.71	6.86	30.63
August	6.86	8.00	5.71	6.86	30.50
September	6.86	8.00	5.71	6.86	30.61
October	8.00	9.14	6.86	8.00	30.95
November	10.29	11.43	8.00	14.86	31.11
December	9.14	10.29	8.00	9.14	31.88

Source: SIMA (2014) website (<http://www.sima.minag.org.mz/>)

These official producer prices were then compared to data collected from the Integrated Project on farmers' produce sales (in metric tonnes⁹⁵) and prices during the first year of the project (2013/2014) (Table 4.2).⁹⁶ To determine how much each farmer is earning per unit sale, the author converted the sale prices into MT/kg (Table 4.2.1). The data show revenues well below official producer prices (i.e., farm-gate prices). For example, producer prices for maize in

⁹⁵ 1 metric tonne equals 1,000 kilograms

⁹⁶ These figures represent only the data for produce quantity and sales sold through farmer organizations and reported to the project staff. Some farmers did not sell their produce through their associations or engaged in side-selling. Hence, these production numbers do not reflect farmers' total produce.

Manica in July was MT 5.71/kg (USD 0.19 cents), but the project farmers were earning on average MT 4.8/kg (USD 0.16 cents), which is 16 percent lower than the farm-gate price.

Similar studies examining smallholders' earnings elsewhere show that producers with access to market information and collective marketing, as is the case with Mozambican farmers in the Integrated Project, earn higher farm-gate prices (Svensson and Yanagizawa 2009; Shiferaw et al. 2011; Courtois and Subervie 2013). In Uganda, Svensson and Yanagizawa (2009) illustrate that smallholders with regular access to market information (i.e., radio-based transmissions) earn prices that are 15 percent higher than farm-gate prices for their maize as they were able to improve their bargaining power with local traders (p. 7). In Kenya, similarly, Shiferaw et al. (2009) demonstrate that smallholders belonging to farmer organizations receive 20 to 25 percent higher prices for their maize than established farm-gate prices. Organized farmers in Kenya were also able to exploit economies of scale through bulking and bypass middlemen in rural markets to connect directly with wholesalers and retailers (Shiferaw et al. 2011).

Table 4.2: Integrated Project's Produce Sales by Farmers in all Farmer Organizations 2013/2014

District	Producer sales (Metric tonnes)/MT								Total Sales (tonnes)	Total Sales (MT)
	Maize		Soya		Sesame		Beans			
	Quant.	Sale	Quant.	Sale	Quant.	Sale	Quant.	Sale		
Gondola	245.7	1,236,600	30.26	365,820	4.2	47,000	18.2	545,030	298.36	2,194,450
Sussundenga	1116.1	5,010,970	3	35,000	103.41	3,835,860	16.7	393,225	1239.21	9,275,055
Manica	870.34	4,116,790	93.91	1,341,035	0	-	20.45	697,575	984.70	6,205,400
Nhamatanda	1745.5	8,135,750	0	-	49.4	19,040,000	115	1,150,000	2354.5	28,325,750
Gorongosa	445	2,321,050	0	-	79.5	3,075,000	230	3,019,500	754.5	8,415,550
Total	4422.64	20,871,160	127.17	1,741,855	68.11	25,997,860	400.35	5,805,330	5631.27	54,416,205

Source: Compiled from the Integrated Project 2015

Table 4.2.1 Average Produce sales MT/kg

	Maize	Soya	Sesame	Beans
Gondola	5.1	12	11	30
Sussundenga	4.5	12	37	24
Manica	4.8	14	-	34
Nhamatanda	4.7	-	38	10
Gorongosa	5.2	-	39	13

Author's calculations of average producer sales

When seed-to-grain price ratios are taken into consideration, moreover, the output prices earned by farmers in the Integrated Projected (on average USD 0.16 cents) do not appear to offer profitable returns, particularly for hybrid produce. As mentioned, OPV maize seeds sold for about USD 0.90/kg while hybrids cost USD 3.50/kg, representing seed-to grain-price ratios of 6:1 and 21:1 respectively. Agricultural economists explain that farmers in low crop-yield environments where markets are relatively less developed require low seed-to-grain price ratios of around 5:1 to make improved seeds (i.e., hybrids) a profitable investment (Heisey et al. 1998 in Smale and Olwande 2014, p. 413). For example, Kenya’s seed-to-grain price ratio of hybrids fell from 10:1 in the early 1990s to 5:1 in 2010. This reduced ratio saw an increase in the number of smallholders growing hybrids from an estimated 62 percent of the farm population to 82 percent during that period (Smale and Olwande 2014).⁹⁷ But higher seed-to-grain price ratios in Tanzania: 7:1 for OPVs and 10:1 for hybrids appear to discourage farmers from purchasing improved seeds (World Bank 2012b, p. 12). The National Panel Survey (NPS) in Tanzania found that only 16.8 percent of households used improved seeds in the 2010/2011 agricultural cycle (World Bank 2012b). In Mozambique similarly, high seed-to-grain price ratios may help to explain farmers’ low uptake of full-priced improved inputs sold by agro-dealers in the Integrated Project.

AGRA’s Market Access Program (MAP) is designed to help farmers succeed in domestic output markets by linking them to reliable buyers. In Manica province, AGRA-supported projects have sought to introduce farmers to domestically-based agro-buyers, with an intention of negotiating contractual agreements between producers and potential buyers. Because agro-buyers in the region are relatively few compared to producers, establishing contracts is critical for farmers not only to have a secure market, but also to “convince agro-dealers to buy at relatively fair prices”.⁹⁸ Without contracts, farmers are essentially price-takers. A majority of farmer organizations had difficulty securing contracts with buyers in Manica. A marketing officer explains that:

⁹⁷ Despite numerous hybrids developed by private seed companies, only one hybrid variety (H614) is used by a majority of smallholder farmers. H614 is owned by the Kenya Seed Company, a parastatal enterprise, and is cheaper relative to other hybrids. H614 unlike newer hybrids is also better able to withstand moisture stress and its flintier grain makes it resistant to pests (Smale and Olwande 2014).

⁹⁸ Interview with project staffer, Chimoio, 26 January 2015

This past production season, which was the first for this project, was very challenging for the farmers and also for [us]. Foremost, the political and military tensions between Renamo and government forces, and shootings on the N1 road cut off travels from the south to the central region. Buyers from the south, even those that had already signed contracts with the project's farmers, could not travel to Manica to buy their produce. Buyers in Manica took advantage of the situation; lack of competition led them to drive down prices of all crops. Big buyers such as DECA, Abilio Antunes and VEN quoted their own prices.⁹⁹

The author observed that farmers located far from main roads face the most difficulty linking to buyers and generally tend to earn low prices. Rural roads in Manica are in poor condition, and are often washed out during the rainy season. Thus, buyers are usually reluctant to travel long distances off paved roads.¹⁰⁰ Instead, farmers often have to hire transportation to deliver their produce to town, which is quite costly. Members of the Kugarika Tange Nhamo association in Mavonde attest to high transportation costs. Mavonde is located 60 km from Manica town—and the closest accessible main road. Although this association of 830 members was unable to secure any contracts with buyers, they sold 33 tons of soya to Abilio Antunes at MT 15/kg (USD 0.50 cents). The association, however, had to hire a truck to deliver the produce to the company's factory near Chimoio, about 130 km away. The farmers paid nearly MT 4, 500 (USD 150) in transportation fees, which was a large share of their income.¹⁰¹ For maize, the association sold 85 tons to a buyer who came from Manica to their village but offered MT 4/kg (USD 0.13 cents). Some members of the association refused to sell their maize through the association, arguing that the agro-dealer's offer of MT 4/kg was too low. Instead, they sold in side-markets but not for much more—for around MT 4.5-5/kg.¹⁰²

In a few cases, some AGRA-supported farmer associations (particularly those located close to main roads) have managed to secure contracts with buyers. Among these are farmer associations that were supported by AGRA's SMART project in Barue district. The project helped to facilitate contractual agreements between two of its farmer associations, the Samora Moisés Machel association and Kulima Kuakanaca association, and two buyers, the World Food

⁹⁹ Ibid

¹⁰⁰ Interview with project staffer, Chimoio, 29 July 2014

¹⁰¹ Focus group interview, Manica district, 19 February 2015

¹⁰² Focus group interview, Manica district, 19 February 2015

Program (WFP), which agreed to buy maize, and Abílio Antunes, which purchased soya. Farmers belonging to the Samora Moisés Machel association explained that:

Marketing was a big problem here in Chidenge – each individual farmer used to sell his or her produce on the side of the road. And as a result, many of our members had reduced production significantly because there were no markets.¹⁰³

But things have changed for the better since the farmers secured contracts with buyers. Serving 1,505 members, the association managed to sell 350 tonnes of soya and 300 tonnes of maize on behalf of its members during the 2013/ 2014 agricultural season. The buyers picked up the produce, meaning that farmers saved in transportation costs. For soya, the association members each earned 15 MT/kg. One farmer highlights the changes in her life since she joined this association:

Prior to joining the Samora Moisés Machel association, I used to be labor on other peoples' farms. Life was very difficult, and my family did not have enough to eat. When I joined the association, we received...extension support and financial literacy training. I managed to increase my production, and sell my produce through the association.¹⁰⁴

For smallholder farmers in Manica province, access to reliable markets matters because farming is primarily the only feasible means of income. In many interview discussions, farmers highlight the importance of income from produce sales—it helps to cover the cost of household basic necessities, such as salt and cooking oil and pay for school and hospital fees. Where farmers are able to participate favorably in markets, such as the case with Samora Moisés Machel association members, they can increase crop production, which they report is important both for household food security and income.

¹⁰³ Focus group interview in Barue, 13 August 2014

¹⁰⁴ Individual farmer interview, Barue district, 13 August 2014

4.6 Conclusions and Policy Implications

This case study has shown that the African Green Revolution in Manica province, as implemented by AGRA-supported stakeholders, takes shape under complex and messy contextual dynamics. These factors have important implications not only for food policy, but also for ongoing debates about the African Green Revolution in some countries. Mozambique's underperforming agricultural sector is closely linked to its colonial past, a war that was supported by external governments, and structural adjustment policies. While the country has made modest progress to (re) build amenities (e.g., roads) in farming areas, there remain serious resource and capacity constraints that hinder agriculture from becoming a viable source of livelihood and food security for a majority of the smallholder population (Mabiso et al. 2014). Thus, it is no surprise that the agricultural sector has become a key area of donor investments, and that AGRA's investments and efforts to strengthen the capacity of service providers is welcomed in the country.

This paper also illustrated that although AGRA performs well to increase the availability of improved seeds, this has not translated into a broad uptake by farmers for several reasons. However, a closer analysis of farm gate prices reveals that what producers earn, particularly in maize markets, offers low returns relative to the cost of inputs. Seed retail prices in Manica province during the time of fieldwork were for OPV maize approximately MT 35/kg (USD 0.90 cents), and for hybrid maize about MT 110/kg (USD 3.5). In comparison, farmers were earning, on average, MT 4.8/kg (USD 0.16 cents) for their produce—representing seed-to grain-price ratios of 6:1 for OPVs and 21:1 for hybrids. With these large gaps in input/output prices, it is far from clear how farmers will be able to fully adopt improved inputs.

These findings should by no means be interpreted as another reason to dismiss African Green Revolution activities. A more fruitful engagement would be to consider how the model's activities can respond more effectively to farmers' contextual needs and realities. For example, farmers of the Samora Moisés Machel association in Bárúè district (affiliated with AGRA's SMART project) also worked with another NGO, the Cooperative League of the USA (CLUSA) as part of an initiative to stimulate smallholders' participation in soyabean and sesame value chains (CLUSA 2015). CLUSA has assisted the association to establish seed banks as a way to

collect, recycle and redistribute soya seeds for its members.¹⁰⁵ To do so, members can borrow 20 kilograms of seeds from the association, but must return 40 kilograms (double) of seeds from their harvest. Soya is recycled for about three growing seasons before farmers replenish their seed banks with new higher quality hybrid seeds. Overall, the process has allowed a wider network of farmers to gain access to soya seeds.¹⁰⁶ CLUSA has also helped FOs in other regions to set up soya seed banks, notably in Zambezia (Di Matteo et al. 2016). Thus, an important consideration is whether African Green Revolution activities can accommodate and/or facilitate alternative channels, such as community seed banks, that help to disseminate agricultural technologies to a broader segment of smallholder farmers.

At the same time, discussions about African Green Revolution activities need to consider options to address poor performing output markets. In Manica province, farmers are not self-sufficient and have to engage in output markets to earn money, not only to purchase other food items but also to take care of their household demands (school and hospital fees, etc.). Low farm gate prices, however, frequently force farmers to sell more of their food bundles at harvest, often at the expense their household food security later in the season.¹⁰⁷ While AGRA's efforts to help farmers connect to reliable markets for their produce are important, more systemic policy efforts from the government are needed to help poor farmers participate more favourably in domestic markets (Jayne et al. 2006; Timmer 2015; IFAD 2016).

Finally, although millions of donor funds that have gone towards agricultural sector development in Mozambique over the last 10 -15 years, data on and analysis of their impacts on improving performance to adequately address the needs of the rural poor remain elusive. Thus, there is a need for continued social science research that captures the less salient, complex realities at play in Africa's agricultural communities. The use of sustainability assessment frameworks to examine AGRA's contributions to sustainable food system indicators from farmer perspectives offers some insightful lessons. This approach allowed this research to provide an integrated understanding of key challenges involved in addressing the food security needs of the rural poor in a sustainable manner. This process also showed that AGRA makes important contributions in

¹⁰⁵ Focus group interviews, Bárue district, 13 August 2014

¹⁰⁶ *ibid*

¹⁰⁷ This is based on my participant observations studying both AGRA-supported and food sovereignty-supported farmers in Manica province.

some areas, but there are evident needs for improvements. Thus, rather than dismissing African Green Revolution and AGRA's activities altogether, as some critical food scholars lean towards, a more fruitful engagement might be to focus the debates on how to build strong sustainability. Further research that helps promote contextual understanding (Moon and Blackman 2014) can contribute to improved scholarly discussions and policy decisions regarding how best to progress towards sustainable outcomes in the region's agricultural sectors.

Chapter 5

The Political Economy of Customary Land Rights in Mozambique: Lessons from a Food Sovereignty Movement

5.1 Overview

This chapter takes Mozambique as a case study to examine the nature of food sovereignty struggles, led by the National Union of Mozambican Farmers (UNAC), as they relate to merging food security and sustainability goals. Fieldwork conducted in Manica and Maputo provinces in 2014 and 2015 considered the movement's contribution to five sustainable food system indicators that were informed by farmer perspectives and sustainability assessment literature: access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement. The study finds that UNAC's strongest area of engagement is with land rights because although the country has fairly strong legal provisions that protect the land-use rights of rural farming communities, the law is often used poorly. State officials regularly privilege land leases to agro-investors at the expense of peasant populations. In response, UNAC has taken some proactive measures to safeguard peasant land rights. Among these are teaching practices that empower peasants to understand and to (re)claim their customary-based rights under Mozambique's land law (unfamiliar to a large segment of the rural population). UNAC's efforts play an important role in fostering sustainability in the country's agricultural sector.

Key words: land rights, UNAC, food sovereignty, agro-ecology, food security

5.2 Introduction

In recent years, a growing number of Sub-Saharan Africa-based peasant organizations and civil society groups have come together under the banner of food sovereignty. An example is the Alliance for Food Sovereignty in Africa (AFSA), launched in 2011 at the UN Framework Convention on Climate Change (UNFCCC) Conference of Parties 17 (COP 17) in Durban, South Africa. Comprised of 21 member networks,¹⁰⁸ AFSA seeks to build sustainable and equitable food systems that support peasant rights to productive resources (land, water, seeds, etc.) and promote the principles of agro-ecology on the continent among other things (AFSA 2011; AFSA and GRAIN 2015). The multiple challenges facing Africa's agricultural sectors in the 21st century, e.g., vulnerability to the impacts of climate change and high levels of hunger (IPCC 2014; NEPAD 2009), clearly warrant greater sustainability in how food is grown and distributed.

In southern Africa's diverse rural contexts, the food sovereignty movement's sustainability contributions towards key food security concerns, and how farmers receive its model, is scarcely examined in the academic literature. A few studies examine the links between food sovereignty and nutrition in the region (see Patel et al. 2015; Chopra and Tomlinson 2007). However, such studies tend to make normative claims that associate food sovereignty's diverse farming practices with improved nutrition. Scarcely analysed is how food sovereignty's theoretical ambitions to create agro-ecological and culturally-appropriate food systems respond to farmers' food security and sustainability needs. This chapter aims to fill this gap by drawing on empirical evidence from a case-study of Mozambique.

The author conducted fieldwork in Manica and Maputo provinces in 2014 and 2015 with the National Union of Mozambican Peasants (UNAC), a member organization of AFSA and La Via Campesina. The research examined UNAC's potential contributions to smallholder food security and sustainability, taking into account five key sustainable food system indicators that were informed by farmer perspectives¹⁰⁹ and sustainability assessment literature (López-Ridaura et al. 2002; Gibson et al. 2005; FAO 2013; Astier et al. 2011). These indicators are access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement

¹⁰⁸ For a full list of AFSA members, visit <http://afsafrika.org/what-is-afsa/>

¹⁰⁹ This is from the author's first-phase of fieldwork in 2014, entailing interview interactions with farmers and project implementers from both UNAC and the Alliance for a Green Revolution in Africa (AGRA). More details below.

(Chapter 2). Taken together, the indicators can help to address both the technical aspects of meeting food security (issues of production) and engage with political economy issues that facilitate (or hinder) the means of achieving it.

The study finds that UNAC does not address all five indicators in their entirety, but focuses its activities more on some components, notably land rights, than others. Today, Mozambique is one of the top countries in Sub-Saharan Africa that leases land to foreign and domestic investors—official estimates show that 2.7 million hectares have been transferred to domestic and foreign investors between 2004 and 2009 (Cotula 2013). Such a high rate of land transfers has displaced a large number of peasants, while others face pressure to give up their lands (Borras et al. 2011; UNAC and GRAIN 2015; Milgroom 2015).

In response, UNAC takes some proactive measures to help safeguard peasant land rights. Among these are teaching practices that empower peasants to understand and to (re)claim their customary land rights under the country's land law (unfamiliar to a large segment of the rural population). This participatory approach helps to draw attention to poor policy practices that can cause and exacerbate food insecurity, especially unequal access to and distribution of resources and skewed power relations. At the same time, it demonstrates that appropriate solutions can emerge when marginalized people are given a real voice and capacity to engage with authorities and the outside world.

While UNAC's efforts on peasant land rights play a vital role in fostering sustainability in Mozambique's agricultural sector, the movement faces severe capacity constraints to impact other key areas of smallholder food security and sustainability. For instance, UNAC is weak on efforts to create income opportunities for farmers, including shaping domestic and local markets such that producers may participate more favorably in them. Although some of these limitations are associated with financial constraints, others have to do with shortcomings in the principles of food sovereignty itself. Food sovereignty largely focuses its efforts on the rights of producers and self-sufficiency purposes (c.f. Nyeleni 2007, 2015; AFSA 2015), offers little detail on how to build reliable markets that can facilitate economic sustainability among rural households.

The outline of this chapter is as follows. First, it briefly maps out UNAC's historical background, including information on its two unions examined in this study. Second, the chapter describes

UNAC's struggle for peasant land-use rights and the teaching practices used to (re)claim those rights. Next, the chapter addresses the constraints that UNAC faces with regards to affecting other key components of smallholder food security and agricultural sustainability in Mozambique. There follows a concluding discussion about lessons from this case study and the implications for research and policy.

5.3 A Historical Context of UNAC's Peasant Mobilization

In southern Africa, Mozambique has relatively strong peasant mobilization at the grassroots compared to its neighbors. Early peasantry organizing in Mozambique can be traced back to the post-colonial era when the new government, led by the Front for the Liberation of Mozambique (FRELIMO) party, sought to establish a socialist state (Ottaway 1988). During Portugal's colonial rule (1891-1975), some parts of the country, notably the Incomati River basin in southern Mozambique, were under extensive irrigated agriculture, farmed by Portuguese-settlers who grew rice and other crops to feed Maputo. At the time of independence in 1975, however, most Portuguese farmers fled the country. The state adopted a *socialization of the countryside* program in 1977 to increase crop production and to implement state-run marketing networks. Agriculture was collectivized through a three-tier system comprised of state farms, communal villages and cooperatives. The purpose of the program was to raise productivity and to implement state-run marketing networks in the agricultural sector (see Ottaway 1988; Manning 2002).

Some peasants who were farm laborers on settler plantations, especially in Maputo province, occupied those lands, forming cooperatives under the new state-run agricultural system.¹¹⁰ But the socialization of the countryside program failed to reach a broad base of peasants on a national scale and experienced major operational problems (Manning 2002). The program was unable to generate sufficient produce to meet domestic needs or to export (Hanlon 1996). The result was perennial trade deficits, which became increasingly difficult to finance amidst a destabilization war that further drained the government of scarce resources (Hanlon 1996). While Mozambique's state-run cooperatives were unsuccessful, they generated strong peasant mobilization at the grassroots. In Marracune district, peasants who formerly belonged to state cooperatives

¹¹⁰ Participant observations and interviews with UNAC farmers and staff in Marracune May-June 2014

continued to work together, and in 1987, came together with other peasant associations to form UNAC.¹¹¹

This peasant movement emerged in the era of market-liberalization policies that the country adopted as a result of the International Monetary Fund's structural adjustment policies (UNAC 2014).¹¹² Lending institutions prompted state budget cuts across all sectors and advised the government to create more-powerful incentives for private actors to invest in agriculture (Hanlon 1991). But due to a civil war in the country (1977-1992), the state was unable to attract private sector investments; per capita crop production also decreased during this time (Ambramsson and Nilsson 1995; Hanlon 2010). UNAC was established as a national platform to mobilize agricultural resources for rural communities and to advocate for peasants' livelihood interests during these difficult years (Nhampossa 2009). Once peace and security were re-established in the mid-1990s, Mozambique saw a sharp rise in foreign direct investments (UNCTAD 2012).¹¹³ Donor partners and the government were enthusiastic that foreign investors would drive growth in the agricultural sector as domestic private enterprises had limited capacity to do so (Hanlon 2004). In 1997, the state passed a national land law that allows foreign (and domestic) investors to gain land-use rights while at the same time protecting peasants' customary land rights.

As property of the state, land cannot be sold or mortgaged, but it can be occupied and utilized by individuals and communities as deliberated within the land law (GoM 1997). Mozambican citizens who occupy land based on customary norms or have settled and used a certain area of land in "good-faith" over a period of ten years automatically have a state-granted land right, referred to as a "direito de uso e aproveitamento dos terras" (DUAT) (GoM 1997). Investors entering the agricultural sector, either Mozambicans or foreigners, are required to apply for a lease from the state as well as to undertake community consultations to identify lands that are not legally occupied and/or negotiate their use with communities (Hanlon 2004). If there are no

¹¹¹ Interview with UNAC staffer, Maputo 26 May 2014

¹¹² The government of Mozambique adopted SAPs upon receiving loans from the International Monetary Fund and World Bank starting in 1987 (Hanlon 1991, 1996).

¹¹³ Initially, the bulk of FDIs went to the mining and industry sectors. Between 1996 and 2005, FDI inflows stood at \$ 1.6 billion dollars; 76 percent of this share represented projects in industry, whereas the combined sectors of agriculture, forestry and fisheries attracted only 11 percent of this sum (UNCTAD 2012).

counter claims, the state can approve the DUAT for up to 50 years, and can renew it once for another 50 years.

It was only during the early 2000s that foreign investments started to expand in Mozambique's agricultural sector, following a global interest in biofuels, and later, food security pressures in some Persian Gulf and Asian countries (see Kachika 2011). Mozambique became one of the top countries in Sub-Sahara Africa to lease land to investors at a high rate (Cotula 2013). Whereas the land law requires interested parties to undertake substantive community consultations, authorities and investors pay little respect to customary land rights. Rather than engage in substantial discussion with communities about the scale and value of investment, many investor-consultations tend to "sell the project" to a few local representatives, offering vague promises for jobs, food security and rural development (Hanlon 2004; Aabø and Kring 2012). Concerns surrounding community land dispossession compelled UNAC to start to prioritize a fight for peasant land rights during the early to mid-2000s.¹¹⁴

In 2004, UNAC joined La Via Campesina and officially became a food sovereignty movement. Today, UNAC is active in all ten provinces and in over 80 districts, representing over 100,000 Mozambican peasants (UNAC 2016). The movement's enduring presence in the country, and its origins as a peasant movement in which farmers engage in decision-making, and elect leaders, are among its greatest strengths.

5.3.1 Study Sites and Sampling

Fieldwork examining UNAC's potential contributions to food security and agricultural sustainability was conducted between May 2014 and April 2015, with two of its unions the *União Provincial de Camponeses de Manica* (UCAMA) in Manica province, and the *Uniao de Cooperativas Agrricolas de Marracune* (UCAM) in Marracune district, Maputo province. Data were gathered from participant observations, peer-reviewed and gray literature and 35 semi-structured interviews with key informants.

Overall, this research was designed to comparatively assess the ways in which the African Green Revolution and the food sovereignty movement contribute to food security and sustainability

¹¹⁴ Interview with UNAC staffer, Maputo, 26 May 2014

from farmer perspectives in Mozambique. Initially, the research design was modelled after the FAO's Sustainability Assessment of Food and Agricultural Systems (SAFA), specifically its four sustainability dimensions.¹¹⁵ However, these were modified during the course of fieldwork to reflect and focus on sustainable food system indicators that were of key concern to research participants with regards to achieving food security and sustainability in smallholder food systems. As mentioned, these are access to quality seeds, activities to improve soil health, land rights, income opportunities and policy engagement. These indicators could also be reasonably assessed within the temporal and spatial limits of the case study (Noble 2014). The fieldwork lasted for seven months, three months of which were dedicated to examining UNAC's activities, and three months were focused on the Alliance for a Green Revolution's (AGRA) African Green Revolution. This chapter presents findings only from UNAC's work. The research on AGRA's work is presented in another paper (Chapter 4). The analysis here primarily focuses on the movement's activities on land rights—its strongest area of engagement. An overview of UNAC's struggle to affect other indicators is also addressed elsewhere (Chapter 3).

UNAC farmers in both Manica province and Marracune district are seeing increased pressure on land-use as local authorities prioritize investments from domestic and foreign investors. In Marracune, 24 semi-structured interviews were conducted with farmers, UCAM staff and activists (including one interview at UNAC's head office in Maputo city), and a government employee based at the District Service of Economic Activities (SDAE). The majority of data collection for this case study took place between May to June 2014. Located 35 km south of Maputo city in the Incomati river basin, the district of Marracune has attracted sugar-cane planters (over the last 15 years) and more recently housing developers. Because the area is in close proximity to the city, urban dwellers with rising incomes are looking to buy second homes in the area. As such, land transfers in Marracune are predominately localized, attracting mostly local elites to develop relatively small areas of land.

In Manica province, 11 semi-structured interviews were conducted (most were focused group and small-group interviews), with UCAMA staff (one was a small-group interview with staff

¹¹⁵ These were organized as environmental integrity (practices that enhance ecological diversity); economic resilience (income-generating agricultural activities); social well-being (skills training in various areas of food production); and governance (influencing public policy to provide better support to farmers).

members), farmer associations and a jurist hired by the union. There were overlaps between UCAMA and AGRA working with the same farmers in this region, and several farmer associations interviewed in this study were affiliated with both organizations. The majority of data collection for this case study took place in March 2015 in Chimioi city and the districts of Báruè, Sussendenga and Manica. Farmers in these three districts (especially the first two) are affected by a large-scale farmland investment belonging to a Portugal-based company, Portucel Ltd., which grows eucalyptus crops to generate wood pulp for export.

In 2009, the government awarded Portucel a total of 43 DUATs (land-use rights) for 182, 886 ha in Manica province and 173, 000 ha in Zambezia province (IFC 2014). Portucel's activities in the two provinces are part of its USD 2.3 billion forestry and energy investment project in Mozambique. The World Bank's International Finance Corporation (IFC) is a financial partner and advisor to the company and has invested around USD 32 million to support the first phase of the company's integrated plantation forestry operations (IFC 2014). In the two provinces, however, an estimated 24, 000 families (around 120,000 people), primarily peasant farmers, reside within the territories that Portucel has DUATs for (IFC 2014). As such, there are overlapping land claims between the company and communities.

5.4 Land Struggles and Participatory Action to (re)Claim Peasant Rights

A significant majority of rural Mozambicans use land to produce their food, and collect wild produce for various subsistence purposes (c.f. Hanlon 2004). UNAC's struggle for peasants' land rights, therefore, comes from an understanding that land is central to food security—both at the household and national levels. According to an UNAC staffer:

We cannot talk about food security in Mozambique when people who live and work the land do not have secure access to it. Peasants conserve our traditional food systems—the place where our national food security will come from—and those at its center cannot be dispossessed of land.¹¹⁶

The looming threat of land dispossessions in Mozambique has prompted UNAC and its member unions to take proactive measures to safeguard community land rights. In both provinces, the

¹¹⁶ Interview with UNAC staffer, Maputo, 26 May 2014

movement teaches farmers about their legal rights to land-use and assists them in formalizing their DUATs. Gaining a comprehensive understanding of the land law empowers rural populations to exercise their land-use rights more effectively. Communities can: a) refuse land deals; b) address internal land conflicts; or c) negotiate better terms of engagement, including compensation in land transfers.¹¹⁷ The movement's activists, however, put greater emphasis on refusing land deals.¹¹⁸ Although land investors commonly promise attractive compensation packages, employment opportunities and infrastructure projects, the likelihood of such benefits materializing is far from clear (Aabø and Kring 2012). UNAC has watched as many of its peasant members in other regions lost their land to foreign and domestic investors.¹¹⁹

5.4.1 Marracune Case study: Uniao de Cooperativas Agrícolas de Marracune (UCAM)

UNAC efforts to (re)claim community land rights have been especially impactful in Marracune. Those farmers who received training of the land law share their experience of empowerment that comes with understanding their rights. A group of UNAC farmers in Marracune explain that: “the land law training...has helped us so much because every day we are fighting against authorities and people who want to take our land. We have copies of the land law so we are able to invoke the articles that protect us.”¹²⁰ Farmers are now well aware that they have legal occupancy of their land and no one is allowed to take it away without adhering to the law. This newly acquired knowledge has given them a voice to engage with authorities and the outside world to (re)claim their rights.

UNAC farmers in Marracune also appreciate the important role that land has for food security. One farmer explains that:

the land law training has opened our eyes to say no to land dispossession. For example, government officials brought an investor who wanted to take our land in order to plant sugar cane. They told us we would get jobs as farm laborers on the plantations. This is

¹¹⁷ This is based on my participant observations and discussions with UNAC activists and farmers. In Marracune, I also participated in a land law workshop with about 15 members belonging to one of the union's farmers associations on 30 May 2014

¹¹⁸ Ibid

¹¹⁹ In northern Mozambique as well, vast areas have been transferred to ‘a number of foreign companies, some in collaboration with local businesses linked to members of [the country's] ruling FRELIMO party’ (UNAC and GRAIN 2015, p. 5). The land is expected to be used for various purposes, including investments in mining, transportation, resource extraction, and production of export crops (UNAC and GRAIN 2015).

¹²⁰ Focus group interview, Marracune, 12 June 2014

not sustainable—because you are going to go there as a worker and receive MT 3,000.¹²¹ If you have four children, how will you feed them with [that money]? But if you have your own land and grow your food, you can have something to eat and something to sell.¹²²

While the land law training has empowered peasants to push back on land grabs, the process has not stopped authorities from intimidating communities over land claims. This is why UNAC also assists farmers to formalize their DUATs. The technical process of formalizing a DUAT is known as “delimitation” and involves a (verbal) testimony from a community leader about the applicant’s customary or good-faith occupancy, and registering that DUAT with the government’s land registry services (Northfold and Tanner 2007). This step offers further protection from land dispossession, as land that is visible to authorities in government databases is less likely to be targeted for investment purposes. In the event that land under a formalized DUAT becomes the target of investment, the investors are actually forced to negotiate its use with communities (Oakland Institute 2011).

UNAC’s support for formalized land rights, however, should be understood more as a means to maintaining land for social reproduction as opposed to turning land into an equity asset for economic gains. Indeed, the global food sovereignty movement under the leadership of La Via Campesina is against land reform policies that privatize land under a neoliberal agenda. This position can be traced back to 1999, when La Via Campesina launched the Global Campaign for Agrarian Reform (GCAR). The purpose was to mobilize a ‘human rights-based approach’ to land, which recognizes its multiple functions and distinction as a ‘common community resource’ instead of a commodity (Borras 2008, p. 262- 265). While the GCAR campaign has influenced global land reform debates to at least consider the various functions (and meanings) of land, some governance institutions still predominately take a privatization approach to land reform, particularly for Sub-Saharan Africa (Borras 2008).

For instance, several land reform initiatives and legislation at the global and regional levels recognize the importance of protecting and formalizing community-based land rights, such as

¹²¹ Mozambique’s currency exchange rate was approximately USD 1 = MT 30 in 2014 when this field research was conducted.

¹²² Individual farmer interview, Marracune, 23 June 2014

those that exist under traditional tenure systems (UN 2008; AU-ECA-AfDB 2010; FAO 2012b; Byamugisha 2013). However, the end goal of formalizing land rights for some institutions, notably the World Bank and the African Development Bank, is to clarify property rights under a variety of existing tenure systems so that land can be transformed into a commodity in order to stimulate growth in the agricultural sector (AU-ECA-AfDB 2010, p.16).

Byamugisha (2013) makes a case for African countries to formalize tenure systems and to improve the “the fluidity of land markets” (p. 9). Where formalized tenure systems exist, countries can evidently see increased productivity as “land moves from less efficient to more efficient producers through rental and sales markets” (Byamugisha 2013, p. 36). The author also supports demarcating community property rights as a way to avoid and effectively manage land conflicts, especially in light of the phenomenon of “land grabs” in Sub-Saharan Africa. Byamugisha (2013) argues that land-related risks and conflicts can be avoided if states modernize traditional land right systems, entailing the documentation of customary tenure rights and strengthening the efficiency of land delivery institutions.

Extensive empirical evidence from the different regions of Sub-Sahara Africa, however, demonstrates that market-based tenure systems result in the transfer of land to the highest bidder, under unequal terms (Paul and Steinbrecher 2013; AFSA and GRAIN 2015). For the most part, privatized tenure systems fail to recognize the multiple forms of land use by communities, including non-monetized functions that contribute directly and indirectly to livelihood and food security, as illustrated below. In recent years, La Via Campesina, in response to shifting global land initiatives and debates, has reformulated its strategy to the issue, adopting the concept of *territory* whereby the purpose of land is to “reconstruct and defend community” (Rosset 2013 in Claeys 2015, p. 49-51). Many of these multidimensional functions and concepts of land resonate with UNAC activists and farmers in Mozambique.

In Marracune, an UCAM activist explained that the government claims to bring economic development to the area, but tends to neglect the human right issue (to land). He argued that authorities do not follow the law—they come and take the land without prior community consultation about investment projects. In the process, peasants are obliged to abandon their way

of life, and their traditional linkages to their ancestor's graves, just to satisfy someone else's interests. This, in his view, is what actually undermines the life of peasants.¹²³

Because authorities often expropriate land from peasants on the basis that they do not use it efficiently, "in ways that maximize production,"¹²⁴ UCAM farmers have adopted agro-ecological farming practices to give visibility to their land occupancies.¹²⁵ Agro-ecology replicates peasants' traditional agriculture by diversifying cropping systems and using natural inputs such as animal manure in order to regenerate soil fertility and to maintain productivity (Altieri and Toledo 2011). In Marracune, farmers use crop residues and manure to improve soil health; for pest and disease control, farmers learn to use ash, pepper leaves, acacia and neem leaves. The region has two growing seasons. The first is the rainy season, during summer, when farmers grow traditional crops: maize, peanuts, cassava, sweet potatoes, beans, etc. The second is the winter season, when vegetables consisting of spinach, cucumbers, lettuce, tomatoes, cabbage, etc., are grown almost exclusively on farms along the Incomati River. These winter season crops are sold in local markets and are an important source of cash income for rural households.

Crop diversity, in time and space, provides nutritionally diverse diets to farmers in circumstances where they often have limited external support or ability to engage in alternative livelihood opportunities (Amekawa 2011). Moreover, high levels of agro-biodiversity help communities adapt to and build resilience to climate change. Extensive research on agro-ecological management practices has demonstrated their significant impact of food systems' sustainability as well as food security (Gliessman 1998). In Marracune, similarly, agro-ecology helps farmers to meet some of their household food security needs while acting as a buffer against land dispossession.

¹²³ Interview with UCAM staffer, Marracune 17 June 2014

¹²⁴ *ibid*

¹²⁵ Participant observations and informal discussion with UCAM farmers in a weekly collective farming day, 13 June 2014

5.4.2 Manica Case-study: *União Provincial de Camponeses de Manica (UCAMA)*

Although UNAC's proactive measures to safeguard community land rights in Marracune are relatively successful, the movement faces significant challenges to do the same in Manica province. The state has already issued a DUAT to Portucel in 2009, following government and donor mandates to stimulate economic growth in the agriculture sector through Public-Private Partnerships (GoM 2006; MINAG 2010) (see Chapter 5 for further discussion). UCAMA staff and activists assert that Portucel for the most part, did not conduct proper community consultations that engaged peasants.¹²⁶ Many peasants were surprised to see caterpillar tractors clearing community land and outsiders planting eucalyptus saplings.¹²⁷ After numerous outcries from its members about the company's activities, UCAMA hired a jurist to assist in navigating the land law and to help address growing land conflicts within communities.¹²⁸

In its Environmental Impact Assessment report, Portucel has identified overlapping land claims as an area of concern for its operations (Portucel 2014) and committed to undertake several strategies to address them. The company vowed to: a) seek to acquire even larger land concessions for its plantations in order to allow communities who reside within Portucel-issued DUATs to continue their agricultural activities undisturbed; b) negotiate land access only with communities and households who have sufficient, unused surplus land to cede; c) rely on community leaders to work with residents to identify unoccupied lands for transfer to Portucel; d) recognize and respect the decisions of those households who choose not to cede land to the company; and e) leave highly productive, low-lying areas for agriculture and conservation (IFC 2014).

But rather than minimize land conflicts, the company's redress strategies have exacerbated them. An example is in Barue district where land conflicts are particularly complicated because communities there saw an inflow of internally displaced people after the country's civil war ended in 1992.¹²⁹ Some long-term inhabitants of this area who negotiated land deals with Portucel ceded land that belonged to "newer" immigrants. In many cases, however, "newer"

¹²⁶ interview with UCAMA staffers, Chimoio, 9 February 2015

¹²⁷ *ibid*

¹²⁸ *ibid*

¹²⁹ Focus group interview in Barue district 27 March 2015

immigrants have achieved their DUATs by good-faith occupancy, which requires a minimum of ten years.

There are several ways with which this large-scale land transfer to Portucel (and others similar to it) is problematic for rural livelihoods. The process also shows how the law is poorly used.

UCAMA's jurist explains that government officials in Maputo tend to lease land to large-scale investors without much consideration for local farming and ecological conditions.¹³⁰ He argues that many such investor projects take place in some of the most productive areas of the country, the center and the north. Such prime land is likely to be already under use to grow food, for some subsistence purpose, or communities have claims on it—hence a potential source of conflict.

In the case of Portucel, the company's strategy to negotiate land with people who have extensive acreage also raises some challenges. On one hand, high rates of rural poverty and lack of economic opportunity drives some residents to give up their land in order to receive agricultural assistance and/or employment. For farmers who cede unused land, Portucel offers them farm inputs for a period of three years, or employment on its plantations.¹³¹ This appeal is particularly attractive in an environment where 49 percent of the population live below the national poverty line, of USD 1 per person per day (GoM 2016), and as much as 50 percent of rural households lack adequate access to food throughout the year (Mabisa et al. 2014). Once the three years are up, however, the company continues to use the same land as it takes eight years to grow one eucalyptus crop.

On the other hand, land is, in most cases, the only viable source of household food security, but even then it is inadequate. One farmer explains: “look at the people who are negotiating with Portucel to take half of their land, they do not know that they are being exploited...eucalyptus leaches the soils of nutrients and after three to four years those farmers will not be able to grow any food on their land. One needs to ask, where will they go?”¹³² Those farmers who are unfamiliar with the land law are especially vulnerable to losing land—they are less likely to

¹³⁰ Interview with UCAMA jurist, Chimoio, 16 March 2015

¹³¹ Interview with UCAMA staffers, Chimoio, 9 February 2015

¹³² Focus group interview, Sussendenga district, 26 March 2015

protest when asked to cede land by local authorities or are quick to accept investors' job offers and agricultural assistance.¹³³

In Bárue, some farmers have sought assistance from their local chiefs and the local government (*Posto Administrativo*) in formalizing their DUATs, but they were advised to negotiate directly with the company for it to authorize ceding its DUAT.¹³⁴ The president of the farmer association exclaims that:

...this is insane. Portucel came here recently, how I can ask [the company] to authorize my occupancy of my land? I was born here; my children and grandchildren were born here. So what is the point of me asking for my land from someone who has come from outside of Mozambique? In the past, Mozambicans fought for their land from the Portuguese...Now farmers are struggling to keep their land because of companies like Portucel.¹³⁵

Overall, UCAMA farmers are pessimistic about the possibility of (re) gaining their land-use rights and feel defeated, particularly in the face of land policy practices that favor private investors at the expense of smallholder farmers.¹³⁶ Land in the districts, according to farmers in Bárue, is given away by high-ranking politicians in Maputo who ostensibly are out of touch with peasants' realities.¹³⁷ While less successful, UNAC's land rights struggles in Manica province draw attention to poor policy practices that can cause and exacerbate food insecurity. These findings also demonstrate why justice indicators, i.e., land rights, have an important role to play in food security efforts and debates. As critical scholars rightly argue, the problem of hunger in Sub-Saharan Africa cannot simply be reduced to a challenge of low crop- productivity. Because as this chapter and other studies illustrate, agricultural development initiatives on the continent are often overshadowed by serious socio-political inequalities, which when unaddressed can further marginalize smallholder farmers (Koopman 2012; Jarosz 2012).

Therefore, fostering sustainability in Africa's diverse food systems must necessarily involve approaches that mitigate negative social impacts, such as community land dispossession, and those that improve communities' equitable access to productive resources, particularly for

¹³³ Interview with UCAMA jurist Chimoio, 16 March 2015

¹³⁴ Focus group interview in Barue, 27 March 2015

¹³⁵ *ibid*

¹³⁶ focus group interview in Sussendenga, 26 March 2015

¹³⁷ focus group in Barue district, 27 March 2015

vulnerable populations. In Mozambique, UNAC's struggles and efforts to help peasants navigate the land law are emblematic of the political pressure needed to establish greater transparency and equity in the use of productive resources. As such, land rights as a sustainability indicator provide useful lessons for food security policy and research.

5.5 Weak Impact on Other Sustainable Food System Indicators

UNAC's capacity to address other key food system indicators, which are also required to facilitate the prerequisite conditions for sustainable food security, is severely limited. Being a food sovereignty movement, UNAC promotes agro-ecology as its model of food production. As mentioned, agro-ecology seeks to optimize the use of natural resources, e.g., crop residue, and mixed cropping to improve soil health and to rely on participatory breeding activities to enhance seed quality. UNAC encourages farmers-to-farmer exchanges to revive the breeding of indigenous seeds, entailing seed saving, preservation and exchange of traditional varieties.¹³⁸ The movement has also worked with the *Movimento dos Pequenos de Agricultores* (MPA) of Brazil to exchange knowledge in reviving indigenous seeds.¹³⁹ But due to significant resource constraints and donor demands, UNAC faces enormous difficulties in scaling up agro-ecology to substantively affect crop productivity at the national level. The movement operates on a relatively small budget—about USD 3.8 million dollars per annum over a five year period.¹⁴⁰ This amount is both inadequate to assist all the movement's farmers, and inconsistently distributed.¹⁴¹

As a result, the movement relies primarily on various development partners for agricultural assistance, including Action Aid International, the Norwegian People's Aid, the Swedish International Development Cooperation (SIDA), the Mozambican government, and the Southern African Confederation of Agricultural Union (SACAU). The agrarian agendas of some of these actors are vastly different from that of the food sovereignty movement. For instance, SACAU tends to favor African Green Revolution principles that promote commercial-oriented agricultural sectors and the union's activities are supported by the Bill and Melinda Gates

¹³⁸ Participant observations in Marracune district, June 2014

¹³⁹ Interview with UNAC staffer, Marracune, 30 May 2014

¹⁴⁰ Follow up interview with UNAC staffer, Maputo, 15 April 2015

¹⁴¹ *ibid*

Foundation, Monsanto and AGRA (SACAU 2016). UNAC's affiliation to SACAU, according to some UNAC activists, might not have been well received by La Via Campesina as there were some political consequences.¹⁴²

To illustrate, La Via Campesina rotates its international secretariat amongst its member organizations, i.e., per region. When it was time to move the international secretariat from Jakarta, Indonesia to Africa 1,¹⁴³ Mozambique seemed like an obvious choice: La Via Campesina's regional secretariat was already located there (at UNAC) and the country had strong peasantry organization and activism. However, the chairmanship was given to the Zimbabwe's Smallholder Farmer Forum (ZIMSOFF), which joined La Via Campesina only in 2013—the same year when the latter announced to move its international secretariat from Indonesia to Zimbabwe. An UNAC staffer explains that the union's decision to partner with SACAU in 2012 was a likely factor that led La Via Campesina to bypass Mozambique.¹⁴⁴

In Manica province, UCAMA has funding from SACAU to implement conservation agriculture, entailing the use of hybrid seeds of maize and cowpeas as well as herbicides. Conservation agriculture practices used in this project aim to build farming systems based on minimum physical soil disturbance, permanent soil cover and crop diversification (Norad 2013). The work fits within the broader definition of agro-ecology, which encompasses a range of system-oriented approaches in agronomy and alternative use of agriculture technologies (Gliessman 2013; Jansen 2015). However, the project has a relatively small budget: USD 350, 000 or South African Rand 4, 4 million (Norad 2013), which is inadequate to assist UCAMA's 8515 farmers.¹⁴⁵ Thus, farm inputs (hybrid seeds and herbicides) are provided for free only to a few "lead farmers", consisting of three to five individuals per farmers association.¹⁴⁶ The rest of the union's farmers learn conservation agriculture techniques in demonstration plots, but most cannot afford to purchase improved inputs.

¹⁴² Follow-up interview with UNAC staffer, Maputo, 15 April 2015, and participant observations of UCAMA activists discussions in Manica province, March 2015

¹⁴³ La Via Campesina member organizations in southern and east Africa fall under its Africa 1 region in the following countries: Mozambique, Tanzania, DR Congo, Madagascar, Angola, Zimbabwe and South Africa.

¹⁴⁴ Follow-up interview with UNAC staffer, Maputo 15 April 2015

¹⁴⁵ Interview with UCAMA staffer, Chimoio 12 March, 2015

¹⁴⁶ Ibid

In Marracune district, similarly, UCAM relies on donor partners for agricultural assistance. As part the government's Green Revolution strategy, the Ministry of Agriculture's District Service of Economic Activities (SDAE) in the region offers commercial maize seeds (hybrid and/or Open Pollinated Varieties seeds) and fertilizers to farmers at subsidized rates.¹⁴⁷ This government initiative fits within an agenda to increase crop production and to broaden farmers' engagement into agro-markets.¹⁴⁸ UCAM works with SDAE to distribute agricultural inputs to farmers, including its members. However, such assistance is neither sufficient nor stable over time.¹⁴⁹ During some growing seasons, the local government will plan to provide inputs on a particular date but then fails to deliver assistance in a timely manner that corresponds to planting dates. At other times, farmers receive only partial assistance, or there would be no help at all.¹⁵⁰

Limited funding support has resulted in a tendency by UCAM in Marracune to assist only the most organized farmer associations, shown by members' ability to work collaboratively and to adopt agricultural technologies.¹⁵¹ A staffer explains that allocating scarce resources based on performance track-record seeks to ensure (and encourage) high quality outcomes, e.g., in production and in sales.¹⁵² Associations not selected for assistance must cover the cost of inputs themselves. One association leader summarizes the predicament that comes with organizational financial constraints:

farming is difficult here because peasants do not receive sufficient assistance from the government. Peasants need inputs as well as equipment such as tractors to work the land. They are poor and cannot afford to buy [these] on their own. As UCAM, we fight to help them improve their production and to diversify their farming activities. However, the movement does not have a lot of resources to assist farmers. We rely on donors to help us but we do not get enough support from them either.¹⁵³

¹⁴⁷ interview with SDAE employee, Marracune, 4 June 2014

¹⁴⁸ *ibid*

¹⁴⁹ Interview with farmer association leader, Marracune, 3rd June 2014

¹⁵⁰ *ibid*

¹⁵¹ Every fifth of the month, all 28 Associations presidents meet at UCAM office to present progress on activities and raise challenges facing respective associations —each association is also required to deliver an accompanying written report.

¹⁵² Interview with UCAM staffer, Marracune, 17 June 2014

¹⁵³ Interview with farmer association leader, Marracune, 3rd June 2014

Those farmers who are unable to access improved inputs, either through the union or purchase, express frustration at being unable to expand their crop output.¹⁵⁴ One farmer articulates that “our goal is to grow food to eat at home as well as to market widely in the country. But for this we need resources—and we are ready to do this”.¹⁵⁵

Finally, UNAC is weak on efforts to create income opportunities for farmers. In Manica province in particular, farming is, in most cases, the only means of earning an income for rural households, but even then it is inadequate. Income from agricultural produce is critical to help rural households meet other livelihood needs, such as paying for health care, education, clean water, etc. Farmers sell their produce in local markets, but they face substantial challenges. Existing markets, particularly for staple crops like maize, are characterized by price instability and low investment returns (Walker et al. 2004; Tschirley et al. 2006; Boughton et al. 2007). In both provinces, producer prices earned in local markets are too low to enable economic sustainability among rural households. But with farming largely the main source of (a low) income, farmers are forced to sell more of their food bundles, sometimes at the expense of household food security. Farmers in Phanze, Manica province explain this challenge:

...Well farming is more than just a way feeding ourselves. It is our only economic activity which helps us to buy additional food items like cooking oil, dried fish, salt, and so on. We need money to take our maize to the grinding mill, but more importantly, we need money to pay school fees for our kids and for the clinic when someone in the household falls ill.¹⁵⁶

Farmers in Phanze express discontent with the market, arguing that none of them sold their maize at satisfying prices. They sold because they need the money, and to get rid of their produce so as to avoid post-harvest loss.¹⁵⁷ But low prices are discouraging even for the few farmers that receive additional input support. In Marracune, farmers walk one to two hours to bring their produce to the town market, which runs twice a week. But because there are no established “floor” prices, farmers tend to sell their products at different prices—often at a

¹⁵⁴ interview with farmer, Marracune 9 June 2014

¹⁵⁵ interview with farmer, Marracune 18 June 2014

¹⁵⁶ Focus group Interview in Barue district, 3rd April 2015

¹⁵⁷ *ibid*

loss.¹⁵⁸ Members of one association explain that they earn low prices at every harvest due to lack of price controls from tax inspectors, and lack of cooperation amongst peasants.¹⁵⁹ For example, “you may sell beans for MT 20/kg (USD 1.5); however, another farmer would come with a lower price. You can’t do anything reducing your price too.”¹⁶⁰ Lack of proper storage, particularly for fresh produce, both at home and the marketplace especially forces peasants to engage in a race to the bottom pricing.

UNAC’s weak capacity to create income opportunities for farmers, including shaping domestic and local markets such that producers may participate more favorably in them, however, is not solely associated to financial constraints. It also has to do with shortcomings in the principles of food sovereignty itself. Food sovereignty largely focuses its efforts on the rights of producers and ensuring their self-sufficiency (Nyeleni 2007; 2014), but offers little detail on how to build reliable markets that are needed to facilitate economic sustainability among rural households (c.f. Bernstein 2014). In both Manica province and Marracune district, farmers express a need to connect to more reliable buyers and/or structured marketing channels.¹⁶¹

5.6 Discussion and Concluding Remarks

UNAC’s strongest (and important) contribution to smallholder food security and sustainability is its proactive measures to protect peasant land rights. While not always successful, the movement’s land rights efforts engage with governance mechanisms, drawing attention to poor policy practices that can hinder the means to achieving food security, as illustrated in Manica province. UNAC’s struggles for land rights provide timely lessons for the ongoing global debates about land reforms in Sub-Saharan Africa.

Global governance institutions, e.g., the World Bank and several UN agencies, are calling on states to ramp up measures to protect and formalize community lands rights under various traditional tenure systems. In 2015, world leaders committed to provide legal status to customary and indigenous land rights in two international agreements: the Paris Agreement on Climate Change and the UN Sustainable Development Goals (Oxfam et al. 2016). However, many of the

¹⁵⁸ Interview with farmer, Marracune, 13 June 2014

¹⁵⁹ Focus group interview, Marracune, 12 June 2014

¹⁶⁰ *ibid*

¹⁶¹ *ibid*

global debates on land reforms and formalized tenure rights are centered on potential benefits: economic growth, equity in resource use, poverty alleviation, sustainable land management, conflict mitigation, democracy, etc. (AU-ECA-AfDB 2010; Byamugisha 2013; Oxfam et. al 2016). While these goals are indeed worthwhile aspirations that could help improve land governance, there is less discussion about the underlying motives behind, or end-goals of, formalized tenure systems: to privatize land.

Several countries in Africa, including Mozambique, Tanzania, Ethiopia and Zambia, already have in place legal provisions that recognize land occupancy based on customary traditions (Landmark 2016). But these nations also have a high rate of land investment activities, which rather than address local development challenges, inadvertently contribute to the further marginalization and food insecurity of rural populations. Aside from communities losing their land and access to former public lands, significant natural resources, including water, are diverted to private land investments (De Schutter 2011). Land reform debates need to seriously consider the negative consequences of advocating for community-based tenure rights under a neoliberal development agenda.

UNAC's teaching practices in Marracune offer important insights for rural communities elsewhere that are similarly struggling against privatization interests in land-use rights. Equipping farmers with knowledge about the legitimacy of their land occupancy rights as enshrined in national and international laws can help them understand that they too are important stakeholders in land affairs. In Marracune, the process demonstrates that appropriate solutions can emerge when marginalized people are given a real voice and capacity to engage with authorities and the outside world. Well-informed farmers are more likely to be better-prepared to engage in discussions with investors and authorities, and to be in a good position to negotiate favorable terms on their land leases, for example by demanding fair compensation. At the same time, being aware of the growing market demand for land on the continent and around the world can motivate communities, like those in Marracune, to invest in sustainable land-use practices as a way not to lose their land to private investors.

While UNAC's efforts to safeguard peasant land rights play an important role in fostering sustainability in Mozambique's agricultural sector, the movement's capacities to address other important areas of smallholder food security and sustainability are severely limited. UNAC's

production model promotes the principles of agro-ecology as a way to improve soil health and to enhance seed quality. Due to various constraints, however, UNAC faces enormous difficulty scaling up agro-ecology in a manner that allows households to adequately meet household food security and to have a surplus for market sales. The movement relies on multiple donors to help its farmers gain access to quality seeds, i.e., conventionally-bred OPVs and hybrids. However, such assistance is quite limited and is only extended to a small proportion of the movement's farmers. At the same time, UNAC is weak on efforts to create income opportunities for farmers in domestic and local markets. As illustrated by farmers in Phanze, Manica province, produce sale help rural households to sustain other important aspects of livelihood security.

This case study's application of sustainability assessment frameworks to closely examine food sovereignty's ambitions to create agro-ecological and culturally-appropriate food systems offers important lessons. First, the use of sustainability assessments enabled this study to provide a more integrated understanding of context-specific food security and sustainability concerns from farmer perspectives. While the food sovereignty movement focuses its efforts primarily on social justice indicators such as land rights, there are other important aspects its model does not pay enough attention to, e.g., facilitating income opportunities for farmers in domestic markets. Second, sustainability assessments offer valuable insights for how to build strong sustainability, i.e., demanding action that not only mitigate negative adverse impacts on key issues of concern (sustainable food system indicators), but also foster lasting positive net-gains on them in an integrative manner across four pillars of sustainability (environmental, social, economic and good governance). This approach opens up space to consider options that can help us progress towards sustainability in food and agricultural systems.

Chapter 6

Conclusion

This concluding chapter revisits the broader research purpose and objectives of this dissertation. Overall, the thesis drew insights from sustainability assessment frameworks as a way to investigate the potential contributions of the African Green Revolution and the African food sovereignty movement to food security and sustainability in Mozambique. Thus, this chapter reiterates the major findings and answers the research question. The significance of the dissertation to advancing academic scholarship and development practice is also emphasized here. In addition, this chapter discusses the limitations of the study and considers potential areas for further research.

6.1 Review of Research Objectives and Goals

Although both the African Green Revolution and the African food sovereignty models recognize the importance of achieving food security in a sustainable manner, there are major tensions over their activities in academic and public forums. In southern Africa, these models' sustainability contributions from farmer perspectives have also been unclear. Thus, the purpose of this dissertation was to examine in depth how the African Green Revolution and the food sovereignty movement attempt to contribute to food systems sustainability from the viewpoint of smallholder farmers in Mozambique. The research selected and refined an assessment framework comprised of key sustainability requirements for achieving broad-based improvements in southern Africa's food and agricultural systems. The study then applied this framework to a case study of Mozambique, where both models are being implemented by two organizations. The African Green Revolution is supported by the Alliance for a Green Revolution in Africa (AGRA), and the food sovereignty model is represented by the National Union of Mozambican Farmers (UNAC). The research sought to gain insights into the relevant measures taken by each organization to address conditions or trends that characterize important needs and challenges for smallholder food security and sustainability. The research had three objectives:

1. To refine conceptually and apply a sustainability assessment framework that merges key food security and sustainability goals in southern Africa's food and agricultural systems.
2. To better understand the perspectives of stakeholders implementing the African Green Revolution and the food sovereignty models as well as the farmers that they serve to determine what each model offers in terms of food security and sustainability.
3. To tease out the implications of the two models' activities on the ground, including their potential impact on food and agricultural policies.

6.2 Major Findings

The African Green Revolution and food sovereignty models come from distinct ontological backgrounds that inevitably influence their respective approaches to food security and sustainability in Sub-Saharan Africa. The two models' ideological foundations and assumptions about how to address concerns in food systems are also a principal area of contestation amongst critical food scholars and actors.

The African Green Revolution emerged in the late 1990s to early 2000s as a philanthropic initiative, led by the Rockefeller Foundation and the Bill and Melinda Gates Foundation, to help increase crop productivity through the use of modern technologies and to integrate smallholder farmers into markets (DeVries and Toenniessen 2001). Various actors behind this model, e.g., donors, lending institutions, agro-corporations and African governments, share an ontological perspective that favors modern rationalist ideas of economic structural transformation and development. Among the assumptions that African Green Revolution actors make is that modern agricultural technologies are a primary means to address food security challenges and poverty in Sub-Saharan Africa (Sanchez 2009).

At the same time, the ontological background of food sovereignty is informed by historical structural ideas rooted in sociology that tackle issues power and (in)justice in the global food system. Indeed, the global food sovereignty movement came from peasant organizations, notably La Via Campesina, whose members suffered detrimental effects of neo-liberal economic policies in agriculture—policies that, according to some critics, the African Green Revolution is promoting for Africa (see McMichael and Schneider 2011). In Sub-Saharan Africa, 21 peasant organizations and civil society groups have come together to form the Alliance for Food

Sovereignty in Africa (AFSA). AFSA's mission, like that of the international food sovereignty movement, seeks to build food systems that support peasant rights to productive resources and promote the principles of agro-ecology, among other things (AFSA 2011). Food sovereignty scholars and actors make several assumptions about how to achieve food security in Sub-Saharan Africa. Among such suppositions is that smallholder farmers should grow food for self-sufficiency purposes and domestic markets as opposed to global value chains (AFSA 2011).

The different assumptions of the African Green Revolution and food sovereignty, however, have become a focal point of polarized debates in academic and public forums. The former model is critiqued by some scholars for promoting a "universalizing" narrative that favors technical fixes to food security—hybrid seeds, synthetic fertilizers and market value chains (Scoones and Thompson 2011; Amanor 2011; Jarosz 2012). At the same time, various scholars are critical of food sovereignty's ambitions for self-sufficiency. Jansen (2015) argues that food sovereignty's one-sided support for agro-ecology is problematic because some marginal areas that rely on local inputs already see low yields, and can benefit from a use of industrial inputs. Similarly, Bernstein (2014) is skeptical whether smallholders' low-input agriculture can adequately feed a growing number of non-producers in developing countries.

The tensions surrounding the African Green Revolution and food sovereignty models help us to understand the complex challenge of achieving food security. However, viewing them as utterly incompatible models also hinders fruitful discussions on how best to address concerns in southern Africa's food systems. To advance the academic debates, this dissertation developed a context-specific sustainability assessment framework that merges food security and sustainability goals (Chapters 1 & 2). Taking a country case-study of Mozambique, the research identified five interrelated sustainable food system indicators that characterize conditions or trends that are important for meeting smallholder food security and sustainability objectives: access to quality seeds, activities to improve soil health, income opportunities, land rights and policy engagement. Taken together, understanding effects on these indicators can help to address both the technical aspects of meeting food security (issues of production) and engage with political economy issues that facilitate (or hinder) the means to achieving it.

Some scholars and actors coming from the African Green Revolution and the food sovereignty movement may not agree with the indicators selected for analysis in this study. Those associated

with the former model may only favor technical indicators of quality seeds and income opportunities. Proponents of the latter model might value justice indicators of land rights above the others. Some actors may also disagree with the study's interpretation of "quality seeds", including extending the term to hybrid seeds. However, the aforementioned indicators represent key concerns from Mozambican farmers' perspectives, and should be respected as such.

Drawing on insights from sustainability assessment frameworks, the research delineated criteria for what progress is needed to facilitate the prerequisite conditions for smallholder food security in Mozambique. The author then carried out fieldwork to comparatively assess the activities of two organizations, AGRA and UNAC, implementing the respective models of the African Green Revolution and food sovereignty from farmer perspectives. Specifically, the research examined how the organizations strove not only to mitigate negative impacts on the sustainable food system indicators, but also to foster overall positive net gains on them (Pope et al. 2004; Gibson et al. 2005; Partidario et al. 2009; FAO 2013; Noble 2014). The sustainability assessment framework was modified during the course of fieldwork—to refine and narrow in on the aforementioned indicators, which warranted detailed consideration from farmer perspectives.

This approach of shifting the debate to assess AGRA's and UNAC's agrarian models from the viewpoint of farmers was helpful in two ways. First, it shed light on some challenging contextual realities that each of the two agrarian models might not have sufficiently considered in a holistic manner. For example, African Green Revolution scholars tend to assume that farmers will readily adopt new farming technologies, given that they can gain access to input and output markets (Toeniessen et al. 2008). At the same time, some food sovereignty scholars view modern agricultural technologies and global value chains as a debt trap for smallholder farmers (McMichael 2013). In the context of Mozambique, however, these assumptions do not always reflect the reality. Farmers engage with the two agrarian models in more complex and nuanced ways than mainstream discussions in academic and public forums suggest.

Second, the sustainability assessment framework was helpful in trying to bridge the divide between two very different approaches to food security and sustainability. Adopting evaluation criteria concerned with enhancing net gains on sustainable food system indicators allowed this research to clearly define the type of progress needed in Mozambique's smallholder food systems. Thus, the two agrarian models' activities were assessed based on their capacity to

address contextual sustainability and food security concerns from farmers' perspectives as opposed to their respective ontological viewpoints. This evaluative process was useful in establishing common ground around key values that are important for meeting these two goals and the necessary action needed to strengthen them.

The research finds that the African Green Revolution and food sovereignty models each make important contributions to food security and sustainability goals in Mozambique. Some critical food scholars and actors often emphasize that the food security agendas of the two agrarian models are incongruent. Ostensibly, the African Green Revolution's technocratic approach to food security is irreconcilable to food sovereignty's political vision of justice and equity in the food system (Holt-Giménez and Altieri 2013; Jarosz 2012; AFSA 2015). Thus, some critics regularly point to food sovereignty as a friendlier alternative.

But Mozambican farmers in Manica and Maputo provinces, unlike some critics in academic and civil society circles, do not favor one model over the other. What farmers appreciate, instead, is the different tools and capacities offered by the respective activities of the two models. Where possible, farmers engage with both models in a complementary manner, taking from each what helps them to meet their food security and sustainability goals.

AGRA's African Green Revolution activities seek to assist smallholder farmers gain access to improved agricultural technologies and to connect them to reliable buyers. In central Mozambique, farmers find AGRA's efforts to help them engage more favorably in domestic markets particularly valuable because produce sale is the primary means for rural households to earn an income. However, output markets present vast challenges for farmers: agro-buyers are few and far apart and have a tendency to quote farm-gate prices that are below official price bands.¹⁶² In response, AGRA's projects offer farmers marketing skills, involving collective price bargaining and measures to maintain high quality produce. The organization also connects farmer organizations to potential buyers, with an intention of establishing contractual agreements so that farmers have a guaranteed market and agents who offer fairer prices. Farmers view AGRA's efforts as vital for their success in underperforming domestic markets.¹⁶³

¹⁶² Interview with project staffer, Chimoio, 26 January 2015

¹⁶³ Small group interview, Sussundenga district, 4 February 2015

While UNAC recognizes that output markets present vast challenges for farmers in Manica province, the movement hardly takes any measures to address the problem. Thus, some of its farmers have joined AGRA's projects to gain access to marketing opportunities and skills.

Another important concern for Mozambican smallholder farmers is the growing rate of land transfers, entailing both large-scale land deals as well as medium-sized transfers to local elites (Chapter 5). Farmers have seen increased pressure to give up their land-use rights as state authorities privilege land leases to private investors (see also UNAC and GRAIN 2015; Milgroom 2015). Problems associated with community land dispossession have compelled UNAC to prioritize peasant land rights.¹⁶⁴

Through education and skills training, UNAC is helping Mozambican rural communities to gain a comprehensive understanding of the country's land law, which has provisions that are meant to recognize and protect their customary land-use rights. These participatory efforts empower rural populations to exercise their land-use rights more effectively. Communities can a) refuse land deals, b) address internal land conflicts and c) negotiate better terms of engagement, including compensation in land transfers. Greater emphasis, however, is placed on refusing land deals. Although land investors commonly promise attractive compensation packages, employment opportunities and infrastructure projects, the likelihood of such benefits materializing is far from clear (Aabø and Kring 2012). In Manica province, farmers facing the risk of land dispossession, due to Portucel's activities, were able to approach UNAC because of the movement's longstanding advocacy efforts for peasant land rights. Although not always successful, UNAC's efforts to safeguard peasants' rights to land-use rights play an important role in challenging poor policy practices in the agricultural sector.

But unlike UNAC, AGRA scarcely engages with concerns surrounding land rights. In Manica province, AGRA's projects have involved several farmers associations whose members are affected by Portucel's activities. However, the organization paid no attention to the problem, possibly because land rights are outside of AGRA's predetermined areas of investments.

While both AGRA and UNAC teach integrated soil health practices, neither is able to sufficiently ensure that a majority of farmers have practical and affordable access to

¹⁶⁴ Interview with UNAC staffer, Maputo 26 May 2014

quality seeds. AGRA performs well in increasing the availability of improved seeds, but this has not translated into a broad uptake by farmers. The organization requires farmers to pay for full-priced inputs, but output markets offer low returns, particularly for maize. At the same time, UNAC promotes crop breeding of indigenous seeds. However, significant resource constraints limit the movement's ability to expand its operations and to substantively affect crop productivity on a per farm basis or at the national level. Thus, UNAC depends primarily on various development partners for agricultural assistance.

6.3 Research Contributions

6.3.1 Theoretical Contributions

The evidence from this case study raises questions about the polarized nature of debates in the broader literature. In particular, some critical scholars' tendency to dismiss the African Green Revolution as a top-down technocratic approach that offers no viable solutions to Africa's food security challenges is not a position that resonates with Mozambican farmers interviewed in this study. In Manica province, farmers utilize the models in complementary rather than competing ways, most saliently demonstrated by their engagement with AGRA's market access opportunities and UNAC's land-rights struggles.

An important theoretical contribution emerging from this dissertation is the refinement and application of sustainability assessment frameworks to address sustainable food security in southern Africa. This process fostered an integrated understanding of farmers' priorities when it comes to merging their food security and sustainability goals. Such an approach is especially important to shifting the debate *away* from the dichotomy of the African Green Revolution versus the food sovereignty models in Africa's food systems, *towards* what each model contributes to these two goals.

The case study findings reveal that neither model addresses critical components of smallholder food security and sustainability considerations in their entirety. Rather, each model significantly contributes to improving the performance of one or more sustainable food system indicators that the other fails to tackle, and thus, there is a complementary effect. While some critical food scholars favor food sovereignty as a friendlier alternative, the research in Mozambique reveals

that it faces severe capacity constraints and is limited by the shortcomings of food sovereignty principles itself.

The evidence from the ground also raises questions about the two models ontological assumptions. The experience of AGRA-supported farmers in Manica province contradicts African Green Revolution rationalist claims about how societies adopt new technologies. At the same time, food sovereignty theoretical ambitions for self-sufficiency are defied by farmers' economic needs to be included in market value chains to earn an income and take care of their household needs.

Another important theoretical contribution from this study is its delineation of context-specific indicators that addresses both the technical aspects of food security as well as political economy issues that facilitate (or hinder) the means to achieving it. Dominant agricultural development initiatives and projects in Sub-Saharan Africa have primarily assumed that food security is a problem of low crop productivity, which experts treat as a technical challenge with a technical fix (see Jarosz 2012). Such an approach, however, as critical food scholars rightly argue is troubling and can obscure many deep-rooted problems. Mozambique's national agricultural policies, e.g., the Strategic Plan for Agricultural Development (PEDSA), promote agro-investment projects as pro-poor and pro-growth (MINAG 2010). But as illustrated by Portucel's activities in Manica province, such investments can aggravate inequalities and deepen smallholders' marginalization and food insecurity. Fostering positive net gains in food and agricultural systems, therefore, requires active engagement with and critique of policies that neglect equity effects and consequently hinder progress towards sustainability.

Considering that each of the models proves to be deficient in application as neither covers the full range of food security and sustainability objectives that matter to smallholder farmers on the ground, further testing in other studies is warranted. First, the African Green Revolution and food sovereignty models, and others with similar ambitions, ought to be generally assessed in light of comprehensive sustainability-based criteria to identify gaps and weaknesses. Second, suitable responses to the revealed deficiencies could consider collaboration with other models that have compensating virtues, or expansion of the deficient models to address the gaps and weaknesses.

The study's sustainability assessment framework can be modified and applied to almost any food and agricultural systems pertaining to smallholder agriculture. While factors of concern in each context will vary, this dissertation's theoretical framework, like strong sustainability assessments, is concerned with whether agrarian activities strive not only to mitigate negative impacts, but also to foster and integrate positive net gains in the multiple dimensions and roles of food systems (c.f. Gibson et al. 2005). Additional empirical research that adopts such a theoretical framework will be important to supplementing the findings from this doctoral work. Bridging the deeply insular views in academia over the inaptness of either the African Green Revolution or the food sovereignty movement to respond effectively to Africa's food security needs, let alone address global demands, will also require evidence from multiple case-studies.

A greater understanding of contextual realities and constraints in many diverse settings and a commitment to envisioning a sustainable future pathway for food systems can also provide a basis for interrogating the ontological assumptions and implications of the African Green Revolution and the food sovereignty movement in a more effective manner. Moreover, increased evidence of how the two agrarian models play out on the ground can help shift the debate in academic and policy forums about the respective contributions from each and how their activities may be (re)structured to better respond to farmers' needs.

6.3. 2 Contributions for Practitioners

The empirical account of the complex reality associated with merging food security and sustainability goals in Mozambique offers valuable lessons for practitioners and policy makers. Foremost, Mozambican farmers' perspectives on how the two agrarian models serve their needs provide crucial insights into the types of improvements that are needed in the agricultural sector in order to respond more effectively to contextual realities.

For example, AGRA's emphasis on delivering agricultural technologies through commercial channels, where farmers are required to pay for full-priced inputs, is arguably desirable for long-term sustainability. However, it does not seem to be feasible in Mozambique's low-income environment characterized by large input/output price gaps. Indeed, even farmers' overall uptake of highly subsidized inputs provided by the government and other donor partners remains relatively low. A key question for the African Green Revolution initiatives is whether they can

accommodate and/or facilitate alternative channels (e.g., community seed banks) that can help disseminate agricultural technologies to a wider segment of Africa's smallholder farmers.

Second, agricultural change in Sub-Saharan Africa is unlikely to achieve broad-based transformation without incorporating contributions from the food sovereignty model. The growing voice of peasant movements, which critiques poor practices and articulates creative solutions to the challenges that their members face, can no longer be ignored. In its endorsement of the International Year of Family Farming (IYFF), the FAO (2014) recognizes the value of empowered peasant movements in moving food systems forward. Their perspectives can inform the public policies that affect their members directly, but which too often are not geared towards supporting them (p. 29). Moving the sector forward, according to the FAO (2014) requires fostering inclusive political, cultural and economic spaces that guarantee the rights of family farmers, as well as enabling them to choose their own development paths (p.1). The food sovereignty movement's political struggle to demand greater transparency and equity in the use of productive resources, particularly land, plays a vital role in undoing poor policy practices in the food system (Chapter 5).

UNAC's strongest (and important) contribution to smallholder food security and sustainability is its proactive measures to protect and apply peasant land rights. While not always successful, the movement's land rights efforts engage with governance mechanisms, especially by drawing attention to poor policy practices that can hinder the means to achieving food security, as illustrated in the case of Manica province. UNAC's struggles for land rights provide timely lessons for the ongoing global debates about land reforms in Sub-Saharan Africa.

Finally, the complexities associated with merging food security and sustainability goals in Africa's food systems suggest that practitioners take a precautionary approach in project implementation. This entails being open to honest critique, respecting uncertainty and being willing to alter approaches where necessary. The transition to sustainability necessarily hinges on flexibility in institutional and policy arrangements (Pope and Grace 2006).

6.4 Limitations of the Study and Possible Future Research

Due to time and logistical constraints, this study did not conduct quantitative measurements, e.g., surveys, to give it statistical significance. Not only were both organizations working with a large number of farmers in Manica,¹⁶⁵ but poor road networks and vast distances between villages make surveys challenging and time consuming. Most of the interviews with beneficiary farmers were conducted at sites located in close proximity to main roads, which were accessible by public transportation. Occasionally, I was able to share a ride with project staff to gain access to the few remote sites where interviews were also conducted. As a result, the interview process could not avoid sampling bias.

Conducting interviews in communities that were near main roads was also a matter of safety, i.e., having an escape route, because there were military tensions¹⁶⁶ in the region at the time of my fieldwork. I was informed by project staff that rebel or government soldiers sometimes pass through or visit remote villages. Thus, conducting research in such sites may be risky, especially for foreigners. The military crossfire and the destruction of some rural infrastructure such as roads mean that conducting fieldwork in central Mozambique, at least in the near future, will remain challenging. With the exception of Marracune in Maputo Province, I was also unable to reside in rural communities in Manica due to a lack of adequate accommodation for visitors. I stayed in Chimoio city (a common housing option for foreign researchers in this area), and commuted to interview sites—some of which were up to 70 km away. As a result, my participant observations in some researched communities were restricted.

These limitations indicate the difficulty of assessing in depth, particularly of statistically quantifying, the sustainability impact on food and agricultural systems of the two organizations in Mozambique. Nonetheless, this study provides an important starting point for robust sustainability assessments in agricultural sectors of Sub-Saharan Africa. This study can be

¹⁶⁵ As mentioned, the integrated project worked with over 32, 000 and UNAC works with over 8, 000 farmers.

¹⁶⁶ Twenty years after the civil war that concluded with the General Peace Agreement, deteriorating relationships between the FRELIMO-led government and Renamo resulted in a two year, armed conflict from October 2012 to August 2014 (Dzinesa and Motsamai 2013). Violence escalated as government forces attacked Renamo's base camp located in Gorongosa district. In response, Renamo rebel forces engaged in shooting civilian cars, buses and trucks on the N1 road (that connects all three regions). The shootings reduced road travel to the central region.

replicated in other countries in the region, either as single or multiple case studies, to broaden the scope of comparative assessments.

Considering that this study encompassed a broad overview of the key contributions from, and tensions between, the African Green Revolution and food sovereignty movement, further research opportunities could focus on, and refine, each of the identified areas: seeds, soils, land rights, income opportunity and policy. Drastic changes in the southern Africa's seed sectors make this an important and exciting area of further research. Similar to other sub-regional bodies, the Southern African Development Community (SADC) has introduced legislation that is focused on harmonizing rules for seed certification and trade (AFSA and GRAIN 2015). Harmonized seed regulations are intended to address perceived inefficiencies in trade patterns in southern Africa, such as disparate (and lengthy) variety-testing and release procedures and border restrictions on the movement of emergency seed consignments (SADC 2008, p. vi). However, the SADC Secretariat has established strict criteria for what constitutes marketable seeds in the region through its Variety Catalogue and Database.

The guidelines require a variety to be officially released in at least two SADC countries, and be Distinct, Uniform, Stable (DUS) (SADC 2008, p. 3). DUS varieties are those that display uniformity in all crops when planted and have unique characteristics that will remain stable over time. Varieties that do not meet these standards, essentially most farmers' traditional varieties, will be excluded from the SADC Variety Catalogue, and their cross-border trade or movement will be illegal (ACB 2015a). So far, the SADC variety Catalogue contains only hybrid maize varieties belonging to two companies: Monsanto (five varieties) and Syngenta (seven varieties) (ACB 2015a, p. 15). Critical food actors contend that multinational agro-corporations are among entities pushing for the implementation of uniform seed laws in the region, entailing Intellectual Property Rights (ACB 2015a). As multiple southern African countries align their national seeds laws with harmonized regional regulations, deeper research is needed to examine how such activities are unfolding on the ground.

Continued research on the impact of large-scale land transfers and land-use rights is also warranted because farmland grabs still affect large parts of the continent. Recent work by GRAIN (2016) shows that while some of the biggest land deals in the region and across the globe have been scaled back or shelved, the problem is far from over (p. 2-3). Land deals are

taking different forms, being labelled as ‘responsible agricultural projects’ that adhere to various sustainability frameworks and guidelines for how to minimize social and environmental costs (GRAIN 2016). Such deals, however, are deepening land dispossession and intensifying conflicts in some parts of the world (GRAIN 2016). In addition, the creative work of social movements that have taken proactive measures to safeguard peasants’ land rights warrants further research (Chapter 5), including how such initiatives may be streamlined into policy institutions.

Finally, efforts to foster competitive agricultural markets that improve income opportunities for Africa’s smallholders represent another pivotal area that warrants continued research. Several food studies recognize a need for policy approaches to build effective complementary relations between government intervention and market forces to drive agricultural growth in a manner that address the needs of poor farmers (Timmer 1989; Dorward et al. 2004; Jayne et al. 2006; Timmer 2015). In Mozambique, a possible area of market intervention could be to strengthen and effectively manage existing national buffer stocks. In an attempt to dampen price volatility, the government has constructed some grain silos in the country’s central and northern provinces (Mabiso et al. 2014). The government could collaborate with competitive domestic agro-buyers to purchase farmers’ crops—at subsidized (higher) farm gate prices (see Timmer 1989; 2015 on many of these points). As engagement from the private sector increases, the government can eventually reduce its intervention in grain markets—focusing less on price stabilization and more on building marketing infrastructure. Although such policies are costly, and state intervention in Africa’s agricultural markets has historically been unwieldy, countries can capitalize on PPPs both to pool resources and to craft appropriate roles for governments and private actors.

Some critical scholars, however, highlight the risks associated with inserting smallholder farmers into market value chains (McMichael 2013; Oya, 2010). Evidently, smallholder farmers generally enter such market arrangements as contract growers, whereby they are given farm inputs (seeds, fertilizers, herbicides, etc.) or short term credit at the start of growing season. McMichael (2013) argues that such kinds of value relations tend to disadvantage smallholder farmers. The process exposes them to debt and land dispossession when their crops fail (to germinate) or are unable to meet strict product standards. At the same time, smallholders who are associated with value chains risk losing their autonomy to grow their own food (see also Clapp

2015 b). More empirical research that ponders these concerns in Sub-Saharan Africa could advance the groundwork of this dissertation.

6.5 Final Reflections

Providing sufficient, safe and nutritious food for all people in a manner that is environmentally and socially sustainable is one of the most important challenges that we face in the 21st century. This challenge is especially pronounced in Sub-Saharan Africa where the majority of those affected by food insecurity are farmers. Two different agrarian models—the new Green Revolution and the food sovereignty movement—have emerged to offer distinct solutions to address this challenge. However, a stalemate in academic and public forums over the suitability of each model to genuinely address the food security and sustainability needs of the region’s smallholder farmers makes it difficult to objectively assess the significance of their respective contributions.

This dissertation has taken a transdisciplinary approach to develop and apply a sustainability assessment framework that can be used to determine how food and agricultural systems may be restructured to build broad-based sustainability. The research framework integrated knowledge from different disciplines and drew on the experience and opinions of diverse stakeholders through field research, which was a transdisciplinary endeavour (Lele and Noorgard 2005; Broto et al. 2009; Lang et al. 2012). The study’s sustainability assessment framework offers a unique way of thinking and reacting to patterns where existing research is contested and inconclusive (Wickson and Carew 2010; Khargram et al. 2010). I hope that this dissertation’s theoretical and empirical contributions will pave way for new narratives that explore the integration of key issues in food and agricultural systems across all four sustainability pillars.

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APPENDIX A

Semi-structured interview guide for organizational employees/project managers/ affiliates

Note: The nature of semi-structured interviews meant that the process was also shaped by participants' responses. Thus, some additional questions were added impromptu. In addition, not all questions were relevant to each participant, in which case only applicable ones were posed.

1. Background information

- i). Tell me about your organization's (or project's) vision of the African Green Revolution/Food Sovereignty in Mozambique?
- ii). Overall how are your organization's/ project's activities translated into practice and how do these contribute to smallholder food security?

2. Quality Seeds and Soil Health

- i) What measures do you implement to ensure the steady supply of and farmers' access to good-quality seeds?
- ii) What soil quality practices do you implement to affect crop yields?

3. Income Opportunity

- i) What initiatives/measures are in place to assist farmers in linking to markets?
- ii) In what ways do market access linkages help increase farmers' income?

4. Land Rights

- i) What is the nature of land right struggles do you see or encounter in the communities you work with?
- ii) What activities/strategies does the organization engage in to ensure that farmers have secure access to land?

5. Policy Influence

- i) What is your organization's/project's impact on agricultural and food security policy and/or the broader development context?
- ii) What are the key challenges and constraints (political, institutional, economic or social) that you encounter/ face in your work as they relate to implementing your organization's agrarian model and achieving food security in Mozambique?

APPENDIX B

Semi-structured interview guide for organizations' beneficiary farmers

1. Background information

i). Tell me about when and why you became a beneficiary/member of your organization?

2. Quality Seeds and Soil Health

i) What specific agronomic practices/skills have you acquired with the assistance of your organization and how have they helped you to improve the quality and quantity of what you grow?

ii) Have you been able to implement new soil health practices on your farm that you learned from your organization? If not, why?

iii) How have you been able to access good-quality seeds? If not, why?

3. Income Opportunity

i) How do market initiatives promoted/fostered by your organization help you to connect to agro-buyers?

ii) How have such market linkages allowed you to earn a good price and/or increase your income?

4. Land Rights

i) What is the nature of land rights struggles in your community?

ii) In what ways does the support of your organization help secure your access to land?

5. Impact

How does assistance from your organization impact your household food security and overall livelihood well-being?

Have you seen improvements in your household's access to adequate food throughout the year and reduction in hunger?

6. Challenges and Constraints

What challenges and constraints do you face as a farmer (political, institutional, economic or social)?

APPENDIX C

Official maize producer and retail prices in Manica (Manica) and Sofala (Nhamantanda) 2014

Month	Manica maize		Nhamatanda maize		MT/USD exchange rate
	Producer price	Retail price	Producer price	Retail price	
January	10.29	11.43	10.29	11.43	30.31
February	11.43	14.29	10.29	11.43	30.86
March	10.29	11.43	10.29	11.43	30.54
April	6.86	8.57	5.71	6.86	30.75
May	6.86	8.00	5.71	6.86	30.72
June	6.86	8.00	5.71	6.86	30.74
July	5.71	6.86	5.71	6.86	30.63
August	6.86	8.00	5.71	6.86	30.50
September	6.86	8.00	5.71	6.86	30.61
October	8.00	9.14	6.86	8.00	30.95
November	10.29	11.43	8.00	14.86	31.11
December	9.14	10.29	8.00	9.14	31.88

Source: MINAG/SIMA (2014)

APPENDIX D

Integrated Project's Produce Sales by Farmers in all Associations 2013/2014

District	Producer sales (Metric tonnes)								Total Sales (tonnes)	Total Sales (MT)
	Maize		Soya		Sesame		Beans			
	Quant.	Sale	Quant.	Sale	Quant.	Sale	Quant.	Sale		
Gondola	245.7	1,236,600	30.26	365,820	4.2	47,000	18.2	545,030	298.36	2,194,450
Sussundenga	1116.1	5,010,970	3	35,000	103.41	3,835,860	16.7	393,225	1239.21	9,275,055
Manica	870.34	4,116,790	93.91	1,341,035	0	-	20.45	697,575	984.70	6,205,400
Nhamatanda	1745.5	8,135,750	0	-	49.4	19,040,000	115	1,150,000	2354.5	28,325,750
Gorongosa	445	2,321,050	0	-	79.5	3,075,000	230	3,019,500	754.5	8,415,550
Total	4422.64	20,871,160	127.17	1,741,855	68.11	25,997,860	400.35	5,805,330	5631.27	54,416,205

Source: Integrated Project 2015

	Average Product sales MT/kg			
	Maize	Soya	Sesame	Beans
Gondola	5.1	12	11	30
Sussundenga	4.5	12	37	24
Manica	4.8	14	-	34
Nhamatanda	4.7	-	38	10
Gorongosa	5.2	-	39	13