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Food systems change under large agricultural investments in Kenya and Mozambique

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To the people of the Nanyuki area, Kenya, and
Gurué, Monapo, and Ruacé Districts, Mozambique

Contents

Abstract

The goal of this dissertation is to explore the effects of large agricultural investments on food systems change around Nanyuki, Kenya and in the Nacala corridor, Mozambique. Specifically, the effects of these investments on land, the food supply chains, food environments, and food consumption were studied. In Africa, food systems already change against a backdrop of global food system pressures, such as the inroads of supermarkets, and local drivers, such as demographic and economic changes. The large agricultural investments likely intersect with these changes, but if the investments amplify them, and to what degree, is less known. Methodologically, a postpositivist mixed-methods approach was used for an instrumental case study design with study areas in Kenya and Mozambique. Multiple data collection techniques were used, including (un)structured interviews and a household survey, and data were analysed through inductive thematic analysis and between-groups analysis. The results show myriad effects of the investments to food systems, including to land, self-production, agricultural engagement, food distribution and food environments. Overall, the investments linked with more modern food systems that were characterised by lower self-production and higher diet diversity. This change occurred through 'hybrid modernity' rather than linear modernity as certain traditional dynamics strengthen alongside modernisation processes. In the end, more inclusive food governance arrangements, such as food sovereignty, can counteract some of the adverse effects of large agricultural investments.

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Publications and presentations

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5. Institute for Poverty, Land and Agrarian Studies and the Centre for the Study of Governance Innovation, University of Western Cape, South Africa, 13 March, 2018
6. INNO4SD PhD Academy, Centre for the Study of Governance Innovation, South Africa, 01 December 2017
7. The seminar '*Trajectories of Change in Food Systems Around the World*', Centre for Environmental Humanities, Aarhus University, Denmark, 25 April 2017.

Figures

Tables

Photos

Boxes

Abbreviations

ANOVA	Analysis Of variance
CETRAD	Centre for Training and Integrated Research in ASAL Development
CF	Counterfactual
DUAT	Direito de Uso e Aproveitamento de Terra
E	Employed
FAO	Food and Agricultural Organisation
FCS	Food Consumption Score
FES	Food Expenditure Share
FVC	Food Value Chain
HDDS	Household Dietary Diversity Score
HH	Household
HLPE	High Level Panel of Experts on Food Security and Nutrition of the United Nations Committee on World Food Security
IFPRI	International Food Policy Research Institute
IFR	International Food Regime
LAI	Large Agricultural Investment
NE	Non-engaged
ODK	Open Data Kit
PCA	Principal Component Analysis
ProSAVANNA	Programme for the Development of Agriculture in the Tropical Savannahs in Mozambique
SDGs	Sustainable Development Goals
SP	Self-production
SSA	Sub-Saharan Africa
UNDP	United Nations Development Programme
USD	United States Dollar

Chapter 1 - Introduction

This chapter introduces the dissertation by providing the background to the research, its purpose, the objectives of this dissertation and the hypotheses formulated. This dissertation' objective is to study the effects of Large Agricultural Investments (LAIs) on food systems in Kenyan and Mozambican study areas. The studied food systems already change against a backdrop of global food system pressures, such as the inroads of supermarkets, and local drivers, such as demographic and economic changes. The LAIs likely intersect with these changes, but if the LAIs amplify them, and to what degree, is less known. The change in food systems, and the position of LAIs, is discussed by Modernisation theory and International Food Regime theory and their related 'conventional' and food sovereignty governance frames. This dissertation adds empirical findings to the food governance debates, particularly pertaining to LAIs. The hypotheses state that the LAIs decreased the availability and access to land, decreased small-scale production, increased market dependence for diets and shifted diets towards processed foods. This dissertation' limitations include the low external validity of case studies, the low predictability of food systems research, and the boundaries of the food systems under study. The data collection challenges included enumerator biases, recall period, and the period in which the survey and interviews were administered. The outcome of this chapter is to introduce the studied topics and to set the objectives, research questions, and hypotheses. The next chapter conceptualises food systems change, overviews the dynamic of LAIs, and develops food sovereignty.

Keywords problem statement, background to the research, research objectives and hypotheses, limitations

1 Introduction

1.1 Introduction

In Africa, food systems intersect with challenges such as demographic growth, urbanisation, and climate change, as African food systems are key drivers of livelihood provision, development, and human-environment interactions. Food systems can provide healthy diets from sustainable food production, but fail to high human and ecological costs. The governance of African food systems shapes how food systems are changing as a response to these challenges, which will have substantial social, economic, and ecological impacts for generations of Africans. The issue of LAIs in Sub-Saharan Africa (SSA) is at the forefront of competing narratives on food governance as it intersects with contrasting food governance paradigms and development trajectories. Specifically, opponents to LAIs are concerned about the effects of the LAIs on the nearby households (HHs) on issues such as land access, food security, and livelihoods. More broadly, the entrance of LAIs might contribute to a process of food system change that transition 'traditional' food systems to a more 'modern' one. This transition would have repercussions to the food security and livelihoods of the HHs and the functioning of their local food systems and governance. As such, a study of the effects of LAIs to food systems can contribute to the broader debates on food governance in SSA and the future of its food systems due to these competing development trajectories.

This study collaborated with the AFGROLAND research project on *'African Food, Agriculture, Land and Natural Resource Dynamics, in the context of global agro-food-energy system changes'*.[1] This project engages the University of Pretoria in South Africa, the University of Bern in Switzerland, CIRAD in France, CETRAD in Kenya, the Catholic University of Mozambique in Mozambique, and the Malagasy Land Observatory in Madagascar.[2] This international and multidisciplinary project brought food security experts, governance scholars, political scientists, and environmental scientists from six countries together around land investments. The project' objective was to study the social and environmental effects of LAIs in study areas in Kenya, Mozambique, and Madagascar. The survey data of this dissertation came from AFGROLAND's social-economic work package. For this dissertation, the Kenyan partner for data collection was CETRAD, and the Mozambican partner was the Catholic University of Mozambique, Cuamba Faculty. These institutions provided access to infrastructure, enumerators, stakeholders and gave feedback. Besides the AFGROLAND collaboration, this dissertation was strengthened by the supervision of Prof Fioramonti, Department of Political Sciences, Faculty of Humanities, and the co-supervision of Prof Korsten, Department of Plant and Soil Sciences, Faculty of Natural and Agricultural Sciences. In an increasingly integrated world, social problems often transverse the specialisations of academic disciplines. To study these problems, such as food insecurity, a transdisciplinary approach is needed. This dissertation' transdisciplinary approach and supervision provides unique benefits to the study of food systems and its complex challenges.

[1] http://www.afgroland.net
[2] Because of time constraints, AFGROLAND's study areas in Madagascar were not included.

This dissertation consists of six main chapters. **Chapter 1** introduces the background to the research, its purpose, the objectives of this dissertation and the hypotheses formulated. In **Chapter 2**, the theoretical and conceptual framework of this dissertation is presented. Chapter 2 explores and connects LAIs and food sovereignty with food systems change. **Chapter 3** explains the methodology, which includes the research approach, design, methods and analyses used for this dissertation and introduces the study areas in Kenya and Mozambique. In short, a postpositivist mixed-methods approach was used for a case study design with sites in Kenya and Mozambique. The quantitative part focuses on between-groups analysis, while the qualitative part utilises inductive thematic analysis. In **Chapter 4**, the data collected for the Kenyan case study is analysed based on the conceptual framework of Chapter 2 and the methodological approach of Chapter 3. The data collected in Mozambique is analysed in **Chapter 5**. Lastly, **Chapter 6** discusses the results based on Chapter 4 and 5 and contributes to the debate on LAIs, food sovereignty, and food systems change through the case studies.

1.2 Background to the study

In this dissertation, the effects of LAIs on food systems around Nanyuki, Kenya and the Nacala corridor, Mozambique are analysed. Since 2008, a perceived 'wave' of LAIs got widespread attention in popular media (The Guardian, 2008, 2009). In the wake of this wave, several observatories were founded to monitor land rights.[3] Even though the LAIs wave was not so large as initially depicted (Kaag & Zoomers, 2014), the topic still receives plentiful attention in the academic literature[4] and regularly resurfaces in popular media (The Economist, 2014; The Guardian, 2014; The New York Times, 2017b). The LAI dynamic receives ample attention in both popular media and academic literature, but several shortcomings in understanding the phenomenon and its implications exist. First, global and local data on LAIs are unreliable. The land deals are often shrouded in secrecy, with agreements either not readily available or having non-disclosure clauses (Anseeuw et al., 2012). Therefore, cross-checking the data is difficult (Anseeuw, 2013). The land transferred by national elites as a front for foreign corporations receives far less attention than direct foreign investments. There is a focus on cash crops and biofuels, with sectors such as forestry being underrepresented (Cotula, 2012). These shortcomings obscure the full scale of the LAIs. Second, previous research on LAIs focused mainly on land access and rights violations (Bernstein, 2015; Klopp & Lumumba, 2014; UNAC & GRAIN, 2015), livelihoods and labour (Li, 2011; Oberlack, Tejada, Messerli, Rist, & Giger, 2016), the drivers of the LAIs (Borras & Franco, 2012; Cotula, 2013; Cotula, Vermeulen, Leonard, & Keeley, 2009; Hall, 2011; Hall et al., 2015), and agrarian change (Borras & Franco, 2012). While the global food system is analysed as a driver of LAIs (Cotula, 2013), a food systems approach lacks in the study of LAIs.[5] This dissertation addresses these gaps by analysing, first, primary collected data and second, adopting a food systems approach to position LAIs within broader food systems change and food governance frames. The

[3] For example, Landmatrix.org and farmlandgrab.org monitor global land rights with a focus on land rights transfers from developing countries to foreign corporations.

[4] A 19th June 2018 Web of Science query on the keywords "large agricultural investment"* OR "land grab"* OR "acquisition of land" OR "land acquisition" OR "land deal" OR "land investment" OR "farmland investment" OR "land transaction" OR "land rush" on all document types and in all languages between 2000-18 yielded 1,152 results. In 2000, 24 documents were published compared to a record of 168 documents in 2017.

[5] The ("food system"* AND) query was added to the Web of Science query on the 19th June 2018 (footnote 5) and yielded no usable literature that adopted a food systems approach.

next sub-sections introduce the most important topics of this dissertation, ranging from a food systems approach to the LAIs in Kenya and Mozambique.

1.2.1 A food systems approach

Food connects with complex ecological, social, economic, and political relationships. Food production depends on a complicated interplay of factors such as soil fertility, labour, technology, and demand. Food distribution is governed by trade law, food safety legislation, and is influenced by built infrastructure and world market prices, to name a few. Food consumption is mediated by cultural traditions, purchasing power, food availability, and personal preferences. Today, the production, distribution, processing, and consumption of food provide more livelihoods worldwide than any other product and sector. Furthermore, food systems connect to a myriad of challenges, ranging from persistent undernourishment, rising obesity, to the environmental degradation related to food production. (HLPE, 2017). A food systems approach embeds food in these numerous relationships and is key to connect the many challenges. From food insecurity to environmental degradation, food systems provide a novel approach to problems that date back to the origin of our species.

1.2.2 Global food system challenges

Daily et al. (1998) has presented humanity's success to feed itself on two criteria, namely the proportion of people whose access to basic nutritional requirements is secure (*food and nutrition security*), and the extent to which global food production is sustainable (*environment*). Worldwide, the food systems have not achieved those aims. This failure has negatively affected human wellbeing (FAO, IFAD, UNICEF, WFP, & WHO, 2017) and the ecosystems (Altieri & Nicholls, 2012; FAO, 2017a; Pelletier et al., 2011; Weis, 2010).

Food and nutrition security

Food security is a 'master frame' for food systems outcomes, meaning that its importance is rarely doubted (Clapp, 2014b; Duncan, 2015). However, malnourishment affects, at a minimum, one out of every three persons. While caloric production exceeds consumption twice (Brunel, 2001), access barriers to food cause widespread malnutrition and undernourishment (FAO & WHO, 2014). Minimally two billion people are micronutrient deficient (De Schutter, 2014; Pinstrup-Andersen, 2009), and about 815 million people undernourished (FAO et al., 2017). Furthermore, 1.9 billion people are deemed overweight, and 600 million people considered obese (Ng et al., 2014; WHO, 2014). The consequences deriving from malnutrition and undernourishment are perceived as the number one risk to health worldwide (WFP, 2011). The leading cause of food insecurity is poverty (Chaifetz & Jagger, 2014; De Schutter, 2013c; de Waal, 1997; Devereux, 1994; Oxfam, 2014). Poverty is intrinsically connected to livelihoods. While there are few data available on employment on food system level, food production alone provides 40% of global employment. In Africa, almost 60% of the workforce is employed in agriculture (Losch, 2016). While the share of people working in agriculture declines, employment rises in other parts of the food system, such as food services (WB, 2017).

Environment

Food systems severely impact ecosystems. For example, water and other scarce resources are intensively used, with food production accounting for 70% of freshwater withdrawal worldwide (OECD, 2013). Agriculture is directly responsible for 20% of the anthropogenic greenhouse gas emissions (EPA, 2007; Vermeulen, Campbell, & Ingram, 2012), and indirectly up to 50% of total anthropogenic emissions (De Schutter, 2014; Horrigan, Lawrence, & Walker, 2002). As a result, food systems have become the single biggest contributor to anthropogenic greenhouse gas emissions and the leading cause of biodiversity loss ensuing the current mass extinction of species. In the meanwhile, most of the food is being inefficiently produced, wasted, or lost (Pelletier et al., 2011).

1.2.3 From traditional to modern food systems

Since the rise of agriculture more than 10,000 years ago, food insecurity and environmental costs related to food production have been problematic (Standage, 2009). These problems shift as food systems and their outcomes, such as livelihoods and food insecurity, are changing rapidly around the world. A food system typology, ranging from 'traditional' to 'modern', aid in understanding changes while food systems shift from one type to another. The food systems are not static entities but are changing rapidly around the world. The changes include different livelihoods provisions, concentration in the production and distribution phases, and dietary shifts. The scale and speed of these changes in food systems are remarkable when considering the historical importance of 'traditional' food systems on human development. Traditional food systems were dominant around the world before they started to change from 1870 onwards in the developed world (Bernstein, 2016; McMichael, 2009). In traditional food systems, production was mainly through small-scale farming and little mechanisation. Food was mostly for self-consumption or sold through local markets, with diets primarily derived from the immediate region. Undernourishment and micronutrient deficiencies were high in these traditional food systems, while overweight was low (HLPE, 2017). In traditional food systems, agriculture provides most of the livelihoods.

After the 1870s, a global food regime emerged and Western food systems started to change dramatically (Friedmann & McMichael, 1989; Hobsbawm, 1975). In modern food systems, mechanisation and the application of improved seeds, herbicides, synthetic fertilisers, and insecticides aid food production. The distribution of food becomes more and more concentrated, especially as supermarkets gain control of larger sections of the market. On the consumption side, diets are less derived from the immediate region but can contain ingredients from around the world (HLPE, 2017). The application of industrial methods and longer distribution routes created environmental challenges as well (Weis, 2010). Food insecurity changes in modern food systems. In 1990, 18.6% of the world was undernourished. In the following 25 years, undernourishment dropped to 10.9% while population increased with an additional two billion people (FAO, 2015). In modern food systems, the challenge is not undernourishment, but overweight, which is on the rise since the 1980s (Ng et al., 2014). This trend continues today. For example, it is projected that 57.3% of all youths in the USA will be obese at the age of 35 years (Ward et al., 2017). For livelihoods, the shift from a traditional to a modern food system means a decrease in agricultural jobs. Over the past millennia, traditional food systems provided most livelihoods in every country. The recent history

of humanity is still very much intertwined with traditional agriculture. It was only with the emergence of industrialisation that food systems started to shift rapidly.[6] Today, 'modern' food systems affect traditional food systems that still exist in developing countries. While traditional food systems persist in SSA, changes include a decreasing share of agriculture in the economy, an influx of supermarkets and supermarket products, and an increase in overweight (Gómez & Ricketts, 2013; Losch, 2016; Ng et al., 2014; Reardon & Gulati, 2008).

1.2.4 Theories of change and food governance frames

Modernisation theory and International Food Regime (IFR) theory[7] are two competing theories that explain and predict these food systems changes and their related food governance frames, that is 'conventional' or liberalism, and food sovereignty. Each theory and related governance frame approaches food systems change and the place of LAIs differently, and proposes solutions to the challenges of food insecurity and ecological loss (Patel, 2013). Both Modernisation theory and IFR theory explain and predict changes in the food systems, but while opponents of Modernisation theory allow and encourages the LAIs, the supporters of the IFR theory reject it. These opposing stances are rooted within their different analysis of food systems change and how a food system should look.

On the one hand, adopters of the Modernisation theories encourage the transition of traditional to Western 'modern' food systems, which is necessary for a country's broader economic development. The structural changes of a country should mimic those of the West. Their adherents point to the low productivity levels (yield gap) of Southern producers as a reason of food insecurity, while offering biotechnology as a solution to decrease the expansion of farmland, synthetic fertilisers, and insecticides (Deininger, 2011). Moreover, the current food insecurity and ecological degradation would have been worse if modern production methods were not implemented (Patel, 2013). Consequently, feeding a projected 9.3 billion people requires a deepening of those methods. The food governance paradigm attached to Modernisation theory is 'conventional' or liberalism. A food system should adopt industrial techniques, and its markets should be liberalised. Modernisation proposals include liberalising the trade for biotechnology, safeguarding intellectual property, and opening markets for investments to attract capital (Mckeon, 2015). The LAIs could be present. One the other hand, IFR theory and food sovereignty adherents criticise the LAIs. IFR theory places the modern food systems within their historical context and notes the (post-)colonial conditions that underwrite its construction and functioning. While it distinguishes and compares two historical food 'regimes', namely the colonial and development regimes, it discusses an emerging contemporary globalisation or corporate regime. It is different from Modernisation theory as it does not necessarily envision a linear trajectory between traditional and modern food systems. Scholars of IFR theory often frame the LAIs as a continuation of the colonial tendencies that supported the first (and in many ways the second as well) food regime (McMichael, 2009).

Supporters of food sovereignty use IFR theory to criticise linear development thinking and its associated political agenda of liberalism while presenting an alternative food governance frame or paradigm to food systems change. Food sovereignty places the blame for the current food insecurity and environmental problems on modern

[6] Even before World War II, only Britain and Belgium employed less than 20% of their workforce in agriculture. After all, according to Hobsbawm (2001), the Middle Ages ended for 80% of humanity only in the 1950s when industrial capitalism spread beyond the heartlands of North America and Western and Central Europe, decreasing the number of jobs in agriculture.
[7] Also known as 'Food Regime Analysis' (Bernstein, 2016).

food systems. The modern governance framework is too oriented on production and ignores distribution (Candel, 2014), which leads to several paradoxes, including the hungry farmers' (Beauregard, 2009), scarcity amidst abundance (McMichael, 2007), and the stuffed and starved paradox (Patel, 2008). For food sovereignty, communities should decide on their food system and protect their traditional food systems. Food sovereignty claims that modern food systems are unsustainable, and the solution to food insecurity is traditional food systems that place small-scale farmers and their agroecological production methods central. In a food sovereign system, there is no place for the LAIs. Both theories and governance frames analyse the dynamics of the LAIs, but either encourage or reject them. Due to these dichotomous positions, the LAIs can be regarded as an extreme case study as it goes to the core of the two theories assumptions and predictions. By analysing the effects of the LAIs with empirical findings, these theories and governance frames can be debated on a more solid basis.

1.2.5 Large agricultural investments

An increase in the price and volatility of agricultural commodities stimulated growth of LAIs projects. The LAIs involve the acquisitions of land, mostly in developing countries, and this caused a debate concerning its impacts and benefits to local communities. Within the wave of LAIs, land rights for over 42.2 million ha worldwide were transferred between 2000-16 (Nolte, Chamberlain, Giger, & Wilson, 2016), which is a much higher rate of land transfer than those in the past decades (Deininger, 2011). Even as the transfer of land rights in Eurasia increase (Land Matrix, 2017; Visser & Spoor, 2011), Africa is the largest recipient of LAIs with 10 million ha in concluded deals that mainly focus on food crops and agrofuels (Cotula, 2013; The Economist, 2014). The LAIs are an outcome of the influx of finance into the food systems in which capital was mobilised to invest in the commodity markets. The intervention of financial players in the commodity markets is a key driver of land transfers and LAIs (Cotula, 2013). As a result, the LAIs link international finance with local food systems. While the LAIs' production depend on local resources, such as land, soil fertility, and labour, its output is mostly sold through the international markets by global supply chains.

However, the LAIs are not the only factor of global-local food systems interactions. For example, the influx of global distribution systems into African food systems is rarely questioned, even if it is difficult to gauge the influx' size (Abrahams, 2009). In these distribution systems, a more concentrated agro-supply chain and a supermarket revolution increasingly target African markets (Reardon & Gulati, 2008). These changes may pressure Africa's local food systems and the centrality of small-scale farmers and their traditional markets. As observed in Asia and Latin-America, this pressure can increase over time (Reardon & Gulati, 2008; Reardon, Timmer, Barrett, & Berdegué, 2003). However, others doubt the transformative force of supermarkets in Africa and highlight the resilience of traditional markets and traditional local food systems that provide the overwhelming majority of Africa's diet (Abrahams, 2009).

1.2.6 Large agricultural investments in Kenya and Mozambique

The relationships between the global food system, the LAIs, and the local food systems are debated (Joala, Zamchiya, Ntauazi, Musole, & Katebe, 2016). On the local level, it is not clear how the LAIs shape the local food systems in which they operate and who the winners and losers are. Some authors argue that the arrival of the LAIs signifies a grab of control over land, labour, supply chains and other resources that can fundamentally

alter the African food systems towards a less enabling space for most of its people (Hall, 2011; Li, 2011). Others argue the opportunities that LAIs can bring to local communities and rural development (Cotula et al., 2009; Deininger & Xia, 2016). In any case, it is likely that contextual factors, such as the business model of the LAIs and the national land laws, shape the effects that the LAIs have on local food systems. In Kenya and Mozambique, different LAIs business models interact with different national food systems. The national food system of Kenya can be described as an export-oriented sector with a high prevalence of small-scale commercial farmers in a tri-partite alliance between state, agribusiness, and small-scale farmers. Agriculture is vital to the livelihoods of Kenyans (FAO, 2017a; Oya, 2012; Smalley & Corbera, 2012; World Bank, 2016b). Kenya is characterised as a 'little land available, high yield gap' country for LAIs (Deininger, 2011) due to existing land pressures and low yields that struggle to keep up with population growth (D'Alessandro et al., 2015). In 2017, the Land Matrix reported that 323,456 ha of land changed ownership in Kenya, with 367,535 ha intended for interest or negotiation in 2004-16 (Land Matrix, 2017). The low numbers of intended projects possibly miss out on national investors, as they receive less media attention than international investors and are thus less visible to the Land Matrix.

The national food system of Mozambique has mostly small-scale production and informal food distribution. Food imports are necessary to meet demand due to a high yield gap. Agriculture is crucial to the livelihoods of Mozambicans, with limited off-farm opportunities, especially in the North (FAO et al., 2017; World Bank, 2016a). Mozambique ranks as a top recipient country for LAIs (Nolte et al., 2016). The pull factors for land investments in Mozambique include a high yield gap, relatively low population density, and 'plentiful suitable' land (Deininger, 2011). Between 2004-09, an estimated 2.67 million ha of land was transferred, with domestic actors responsible for 53% (Deininger & Byerlee, 2011). In 2017, the Land Matrix database reported that 2.68 million ha of land were transferred. Between 2004-14, 1.14 million ha were intended for interest or negotiation (Land Matrix, 2017). The background and topics of this dissertation were introduced in this section. Through a food systems approach, global food system challenges and change are connected to LAIs in Kenya and Mozambique. The next section explains the objectives and research questions of this dissertation, together with its limitations and challenges.

2 Objectives and research questions

The primary objective of this dissertation is to analyse the effects of LAIs on local food systems in regions of Kenya and Mozambique. This primary objective is composed of four secondary objectives that are outlined in five chapters. The secondary objectives and the chapters that engage with the objective are:

1. To embed food with its social, economic, and political contexts through the food systems approach (*Chapter 2 and 3);*
2. Identify the key issues in the food systems debate, and specifically the linkages between food sovereignty, LAIs, and food systems change in Kenya and Mozambique (*Chapter 2);*
3. To ground the theoretical aspects of food systems with empirical data from multi-level case studies, specifically the effects of LAIs on selected local food systems in Kenya and Mozambique (*Chapter 4 and 5)*; and

4. To critically engage and contribute to the current food governance debate and the positions of LAIs and food sovereignty *(Chapter 6).*

The following research questions aim to achieve the primary and secondary objectives:

1. How is food linked to issues such as livelihoods, food security, trade, health, and climate change, and how does a food system approach support the understanding of these connections? *(Chapter 2 and 3);*
2. What are the most major changes in food systems worldwide and Sub-Saharan Africa? *(Chapter 2);*
3. What are the theories underpinning these changes in food systems? *(Chapter 2);*
4. What are the most common research tools for food systems research? *(Chapter 3);*
5. How do the food systems in the study areas around Nanyuki, Kenya and the Nacala corridor, Mozambique function? *(Chapter 4 and 5);*
6. What are the effects of the LAIs on the food supply chains, food environments, food security and livelihoods of the HHs in the study areas regions in which they operate? *(Chapter 4 and 5)*;
7. How do food systems change under the LAIs in the study areas? *(Chapter 4, 5 and 6); and*
8. What are the conclusions drawn from the findings, and how do they contribute to the broader food governance debate? *(Chapter 6).*

2.1 Hypotheses

Regarding the primary objective of this dissertation, 'to analyse the effects of LAIs on local food systems around Nanyuki, Kenya and the Nacala corridor, Mozambique', three hypotheses were developed. Each of these hypotheses corresponds with a key element of the food systems approach and the LAIs debate, namely land, production, distribution, and consumption.

1. LAIs were linked with decreased access to land by small-scale producers.
2. LAIs were linked with decreased agricultural engagement.
3. LAIs were linked to decreased self-production and higher market dependency for food access.
4. LAIs were linked to differences in the diet composition of HHs, especially with higher processed food consumption.

The integration of LAIs (independent variable, see **Chapter 3**) with the research question and hypotheses is developed and depicted in **Fig. 1**. This figure reflects the possible linkages of LAIs with land availability and access, production, market integration, and consumption changes. First, in this dissertation, groups with and without LAIs present are compared regarding their availability and access to land. In **Fig. 1**, the relationships between LAIs and land availability and access are depicted as negative, meaning the more LAIs, the less land is available and accessible. In contrast, when more land is available and accessible, more LAIs will be attracted to the area. The relationship between land availability and access to food production is positive: when more land is available and accessible, more food production can take place. The availability and access to land is an important research factor as the land debate is central in the discussion on the LAIs (**Chapter 2**). Second, the food production characteristics of groups with and without LAIs present are compared. The hypothesis tests if LAIs lower the HHs' food production of the areas in which it is present and that this relationship is strengthened when LAIs provide

employment. In this dissertation, food production is not categorised as an important research factor as the data gathered on this topic had many shortcomings which are exacerbated by an absence of bookkeeping and the fluctuation between seasons. In sum, making claims on the effects of the LAIs on production with this data is challenging. While this challenge of production measurement will be addressed (**Chapter 3** for an overview of the operationalised variables), it carries less weight than the important research factors in the conclusions. The relationship between food production and market integration is negative: when a household produces more for themselves, they are less dependent on the market for their dietary needs.

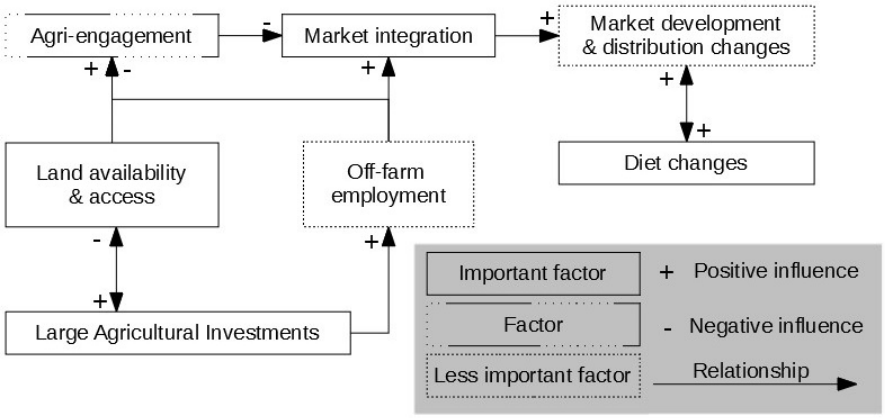

Fig. 1 Conceptual framework illustrating hypothesised linkage of large agricultural investments and diet changes. Source: Dekeyser, 2019.

Third, it is hypothesised that households in an area where a LAI is present are more integrated into the markets as they produce less and have higher access to cash thanks to more non-agricultural employment opportunities. This leads to more market development and distribution changes to cater to these changes. Generally, higher market integration and market development for food access are linked with food consumption changes (**Chapter 2**). Fourth, the food consumption of groups with and without LAIs are compared. Around the world, as food consumption changes, often more towards processed food, it creates more demand for different distribution networks and market development (**Chapter 2**), creating a self-reinforcing loop. In sum, **Fig. 1** links the LAIs with (food) consumption changes through an integrated approach based upon a food systems conceptualisation presented in **Chapter 2**. The goal is to compare groups with and without LAIs present on each of these (important) factors. The focus is not causal questions[8] but induction through comparison.

2.2 Limitations and challenges

The limitations of the research in this dissertation include the low external validity of case studies, the low predictability of food systems research and the boundaries of the food systems under study. The data collected through interviews and surveys come with their own set of limitations and challenges, including enumerator biases, recall period, and the period in which the survey and interview are administered. A post-positivist mixed-

[8] '*Causal questions ask whether or not, and to what extent, observed changes are due to the interventions being evaluated rather than to other factors, including other programmes and/or policies'* (Goodrick, 2014, p. i).

method approach to case studies is used in this dissertation. Case studies have two main limitations. First, case studies based on a small number of cases can be problematic for their low external validity. Case studies can be rich in context but low on general insights in the broader phenomenon under study. Second, a generalisation can lead to problems as well: a generalisation based on a larger number of case studies can lead to abstraction and so leave out the contextual details relevant to the study's outcome. In these instances, crucial heterogeneity of contexts and processes is disregarded (Oberlack et al., 2016). Food systems are highly complex and change according to their broader environments. In this complexity, it is difficult to forecast the different future states of the food system. In other words, the predictive value of the case studies is low (Pereira, 2012).

To operationalise, boundaries are set to the system's scope. There are trade-offs associated with any choice of boundaries, which is for each researcher to decide. For this dissertation, the food system is limited to the most important elements and connections as outlined in **Fig. 1** and **Chapter 2**. The importance of the elements and connections are explored through a combination of literature review, a large-scale HH survey, and in-depth interviews. The in-depth interviews were either unstructured or semi-structured and respondents were selected through either elite or snowball selection. The respondent can have time constraints, be unwilling to talk about the topic at hand, and interviewees can give conflicting information. Furthermoe, a researcher needs to be aware of their own implicit biases and those of the respondents. In this case, there are likely to be large differences in age, level of education, region of birth and cultural upbringing between the interviewee and the interviewer, which contributed to vastly different life experiences and privileges. The use of a translator further contributes to a distance between the researcher and whom that is researched. While the emphasis of the qualitative data is on the fluxes of food rather than the perspectives of the participants, there is possibly large cultural difference between subject and the researcher in the in-depth interviews. However, validation of findings with local partner institutions can partly address possible skewed findings due to biases. These biases might be less prevalent in large-scale surveys, but these surveys come with their own set of challenges. A large-scale HH survey provides a snapshot of a HH but is less apt to capture historical processes. Surveys on HHs often have a chicken-or-egg dilemma when it comes to cause-and-effect; namely, it is difficult to ascertain what dynamic came first. Even after training, each enumerator can retain biases and interpretations when administering the questions. The standardisation of surveys does not readily provide space for contextual answers. In rural food systems research, the period of the year in which a survey is conducted matters. The time devoted to farming or the selling and buying of produce fluctuates throughout the year. Broadly speaking, a 'harvest' and 'lean' season can be distinguished. The time of the year in which the survey is conducted will inevitably influence the outcome of the survey. Ideally, a survey will be done at the same time in all the areas to limit this error or collected at multiple times to determine seasonal effects. The survey data for this dissertation was collected in the shortest possible timeframe. For an overview of the data collection periods, see **Chapter 3**. Due to these limitations and challenges, the findings of this research are a snapshot of the effects of LAIs and food systems change. The scope to generalise for all LAIs is neither warranted nor the objective of this research. This research' findings are limited to specific case studies in Kenya and Mozambique. However, comparing case studies can generate better knowledge of certain dynamics, such as the effects of LAIs.

3 Summary

This chapter introduced the dissertation by providing the background to the research, its purpose, the objectives of this dissertation and the hypotheses formulated. This dissertation' objective is to study the effects of LAIs on local food systems in study areas in Kenya and Mozambique. These food systems change already against a backdrop of global food system pressures, such as the inroads of supermarkets, and local pressures, such as demographic and economic changes. The large agriculture investments are likely to intersect with these pressures, but little is known about the extent that LAIs amplify these pressures. The discussion on food systems change and the position of the LAIs is debated within Modernisation theory and International Food Regime Theory and their related food governance frames of 'conventional' or liberalism and food sovereignty. This dissertation will contribute to these debates through empirical findings, which are often lacking. The research hypotheses focus on four food system elements: land, production, food environments and consumption. The limitations of this dissertation include the low external validity of case studies, the low predictability of food systems research and the boundaries of the food systems under study. The data collection challenges include enumerator biases, recall period and the period in which the survey and interviews were administered. The next chapter presents the literature review and conceptual framework of this dissertation and links large agriculture investments and food sovereignty with food systems change.

Chapter 2 - Literature review and conceptual framework

The goal of this chapter is to present, explore and link large agricultural investments (LAIs) and food sovereignty with food systems change. This objective is approached through six main sections. First, the conceptual framework of food systems and food systems change is introduced and defined. Second, two theories on food systems change are compared. Both theories, namely Modernisation theory and International Food Regime theory, focus on different drivers and project different food system trajectories. This provides the theoretical framework to discuss food systems change between different food governance frames. Third, the dynamic of LAIs exemplifies the divergent viewpoints on food systems change. Fourth, food sovereignty, the most prominent food governance framework opposing LAIs, is developed. Fifth, LAIs and food sovereignty are linked back to the current changes in food systems, with a specific focus on SSA. Lastly, the topics and their linkages are summarised. The outcome of this chapter portrays the theories, debates and linkages between food system change, LAIs, and food sovereignty.

Keywords food systems change, large agricultural investments, food sovereignty, food governance

1 Conceptualising food systems

The conceptual framework of food systems and food systems change is introduced and defined in this section. The conceptual framework of this research fits within a systemic approach to food, which is paramount to understanding the many (inter-)linkages between issues such as food, land and diet, and is a vital resource to comprehend complex problems such as the persistence of malnourishment. After introducing and defining the conceptual framework, this section unpacks the elements and drivers of the food systems framework and applies this information to propose a typology of food systems. This typology ranges from traditional to modern and is important to analyse changes in food systems. The next section uses this conceptualisation of food systems to discuss theories that explain and predict changes in food systems and their associated food governance frames.

1.1 A food systems lens

All humans need food, as its energy and nutrients enable our biophysical functioning. This basic need shapes our history, social relations, and our environments in many ways. Agriculture spawned the first civilisations, food culture forms an integral part of any country's identity, and whole ecosystems are transformed to satisfy our demands for food. In a unique way, food traverses and relates to a complicated range of issues. It provides livelihoods to farmers, traders and cooks around the world. It is also a driver of land-use change when areas, such as the Brazilian *cerrado*, are transformed for food production. Food production, distribution, and consumption are major contributors to greenhouse gas emissions (Pelletier et al., 2011). Food affects health, as certain diseases are linked to diets (Lusk & McCluskey, 2018). Today, malnutrition is the leading cause of poor health globally (Patterson et al., 2019). Food is fiercely debated within trade agreements. Many countries support and subsidise their agricultural sectors. Food relates to poverty, it influences cultures, and it pressures biodiversity loss, to name just a few. To understand these (inter-)linkages of issues and the resulting complexity, research on food is increasingly approached through the concept of food systems.

The concept of food systems refers to the embedding of food in multifaceted and multi-layered processes, linking food production, processing, distribution, and consumption, and that these processes are underpinned by complex political, economic, social and ecological relationships (Ericksen, 2008; GloPan, 2016; Hendrickson, 2015). Food systems include '…*all of the activities and elements-environment, people, inputs, processes, knowledge, infrastructure, and institutions-involved in getting food from farms to consumers*' *plates'* (IFPRI, 2016, p. 2). Furthermore, it '…g*athers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes'* (HLPE, 2014, p. 29). Rather than connecting food solely to factors of production, such as land and labour, the concept of food systems links food with domains such as agricultural subsidies, agri-markets, biodiversity, nutrition, and the health impacts of different diets (IPES-Food, 2015). A food systems approach was developed as a response to paradoxes such as the perseverance of food undernourishment while world production exceeds consumption, and the recognition of social, economic and ecological change on food (Delaney et al., 2018). As food systems entail

the production and consumption of food, each person forms part of a food system, even if only as a consumer of food.

A systemic approach helps to engage with complex problems that have multi-causality[9] resulting from the interactions amongst interdependent elements (Ericksen, 2008). For example, an iron deficiency is a problem that can depend on the availability of iron-rich food, the ability of an individual to absorb iron, and the economic access to iron-rich food. Each element can contribute to iron deficiency. At the same time, these elements are not independent of each other, as an individual's ability to absorb iron is linked to its health status, which influences their economic position and thus the affordability of iron-rich food. Each element can have multiple second-tier variables, which can be deconstructed to third- or fourth-tier variables (Oberlack et al., 2016). An element such as economic access to iron-rich food can be further deconstructed to study the influences of gender, education, age, and so on. A key feature of a systemic approach is the understanding that a system is more than the sum of its parts, as properties can emerge out of the connections between its elements. For instance, a storage facility by itself does not constitute a distribution system but can become one by connecting a farm and a market. The future of a system depends on the changing connections between its elements.

A systemic outlook avoids the formulation of a problem from only one perspective at the exclusion of others by incorporating the contexts in which the systems operate. The contexts will partly determine the systems' outcomes, which are heterogeneous due to the variability of the contexts (Ericksen, 2008; Ison, Maiteny, & Carr, 1997). The understanding of this complexity and adaptability means that a monocentric focus on just one element of a system misses both the influence of its connections and its systems properties. Rather than adopting a linear-causality approach to a problem, a systemic approach emphasises the complexity and interconnectedness of social reality. Due to the understanding of this complexity and interconnectedness, a food system approach supports the identification of the trade-offs associated with an intervention. For example, the decision to divert water resources towards crop production can have a negative effect on fish reserves, just as redirecting food crops to biofuel can raise prices for urban consumers and enhance food insecurity (IFPRI, 2016). The adoption of a systemic lens of food does not solve the conflicts between different goals, but it does provide a framework to analyse these trade-offs due to the understanding of interconnectedness among the elements, on any scale or level.[10] The issue of scale is an important topic in food system research. The smallest scale or most local food system amounts to the consumption of one's self-produced or collected food, without selling to the markets. In this autarkic setting, the producer-consumer is not dependent on the market for its consumption or the selling of its food. Today, most people purchase most, if not all their food, and even in the developing world, many rural citizens are net food buyers. This food is overwhelmingly derived from the region, but increasingly from international trade (FAO, 2015; Holt-Giménez, 2009; Tschirley, Reardon, Dolislager, & Snyder, 2015).

Today, the interconnectedness between different scales within the food system increases as food is traded more and more through complex supply chains. Within the food economy, the increased importance of international trade results in food that is mediated through complex agro-supply chains that ultimately span the globe, forming part of the global food system. The global food system operates on a worldwide scale and is the uppermost layer of the food systems concept. It is inherently connected to the local food systems. On the one hand, the global food system sources its products from local food systems, creating an innate connection between natural resources,

[9] Multi-causality refers to outcomes that have multiple causes (Franzese, 2007).
[10] Scale is '*the spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon'*, whereas level is the *'the units of analysis that are located at the same position on a scale'* (Gibson, Ostrom, & Ahn, 2000, p. 218).

agri-subsidies, food policies, producers and consumers who may be far away from each other. On the other hand, local food systems can source food from other food systems, regional or global, that might not be locally produced, out of season, cheaper, and have a higher quality than locally produced food. The global food system connects producers and consumers across continents as, for example, a soy farmer in Brazil feeds pigs in Flanders that gets consumed in Russia. In this way, consumers and farmers who are continents away can be linked with the expanding agrarian frontier in Brazil and contribute to the deforestation of the Amazon, with consumers of global goods as the endpoints of a more complex food 'web' (Clapp, 2016; Patel, 2008; Tabuchi, Rigby, & White, 2017).

This study adapts the conceptualisation of a food system from the High Level Panel of Experts on Food and Nutrition (HLPE) of the United Nations Committee on Food Security report 'Nutrition and food systems' (HLPE, 2017). The conceptualisation used here is different from the HLPE by its emphasis on the political dimension of food governance, a discarding of the Sustainable Development Goals (SDGs) in the framework, and by adding food security and livelihoods to outcomes of food systems. This adapted food system framework is presented in **Fig. 2**.

This food systems conceptualisation has three elements and five drivers that influence outcomes. The three elements are the supply chains, food environments, and consumer behaviour, which constitute the core of the food system. Then, there are five drivers affecting the three elements. These five drivers are: biophysical and environmental; innovation, technology and infrastructure; political and economical; socio-cultural; and demographics. Together, these elements and drivers influence the outcomes of the food systems (HLPE, 2017), which include the diets and nutrients that people access, livelihoods and food security. These elements, drivers, and outcomes affect each other and provide feedback loops as, for instance, a diet rich in animal-sourced food (an outcome) pressures the environment (a driver) through its contribution to greenhouse gases (FAO, 2006b), which affects production systems (an element) (IPES-Food, 2016). The next sub-section briefly unpacks the different elements of food systems.

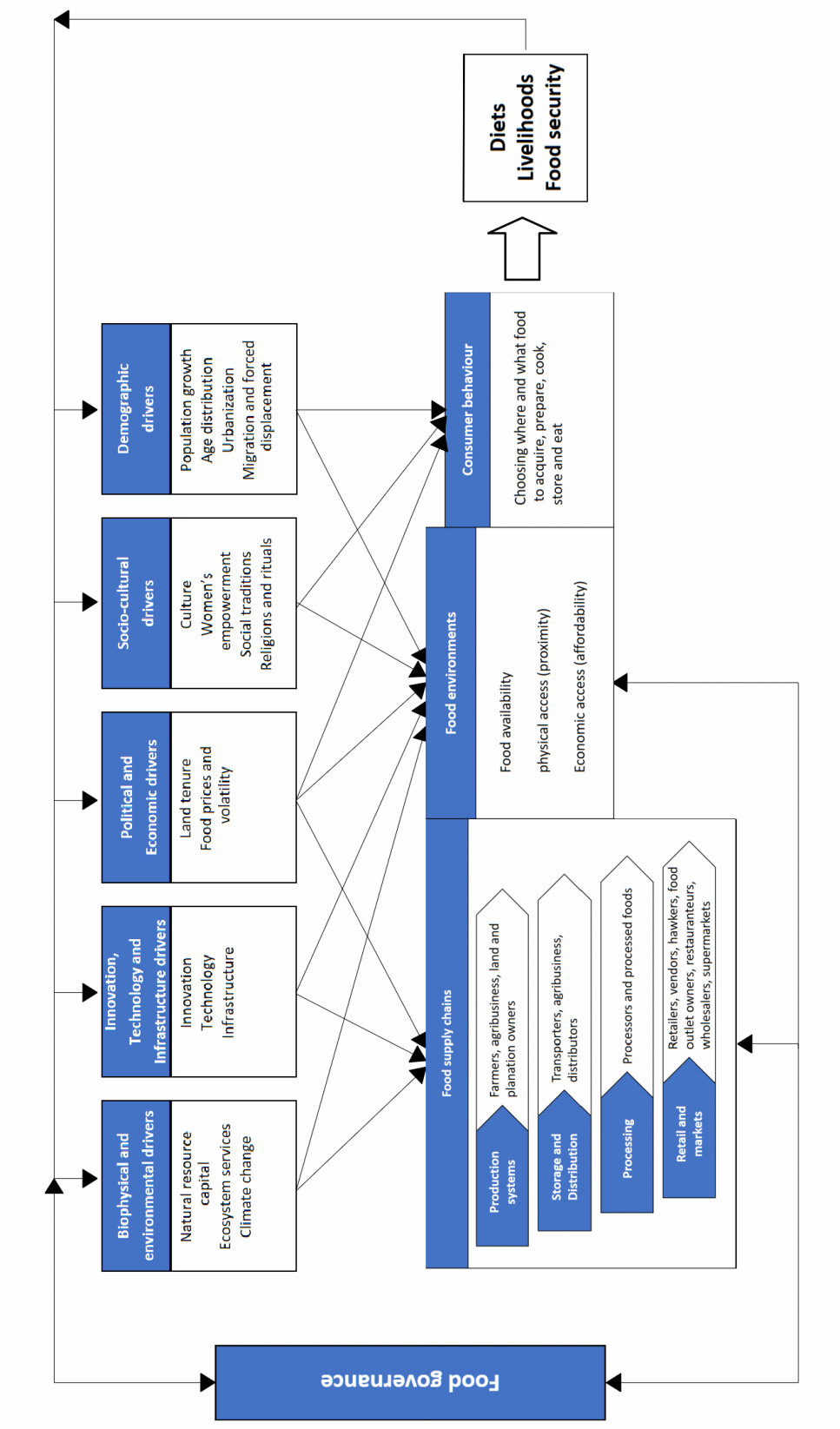

Fig. 2 Conceptual framework for food systems
Source: Adapted from HLPE, 2017

1.2 Elements of food systems

The three elements of food systems consist of food supply chains, food environments, and consumer behaviour. Five drivers affect these elements. However, not all elements are impacted in the same way, or at all, by these drivers. For example, the behaviours of consumers are usually not heavily influenced by issues such as soil degradation. But the failure of a crop due to a biophysical and environmental driver such as drought can profoundly affect food supply chains and food environments (Kelley, Mohtadi, Cane, Seager, & Kushnir, 2015).

1.2.1 Food supply chains

The food supply chains '*…consist of the activities and actors that take food from production to consumption and to the disposal of its waste'* (HLPE, 2017, p. 24). The food supply chains used in this research entail production, processing, and distribution, including points of sale. The production systems involve diverse types of farmers, the agro-production systems at a farm level, the varieties of the food grown and the diversity of the food available, and the origins of the available food. The farmers can be typified on their scale, such as small-scale[11] or large-scale farming. The differentiation between a small-scale and a large-scale farmer is not only determined by the size of land, although this is an important indicator, but also by the size of investment per hectare (ha) and the mobilisation of family labour in contrast to wage labourers. In 2012, there were about 500 million farms worldwide (FAO, 2012). Family farmers produce 80% of the world's food, constitute 98% of all farms, and work on 53% of all agricultural land. About 84% of these farms are smaller than two hectares (FAO, 2015; Graeub et al., 2016).

In an African context, food processing can involve drying, milling, curing, smoking and packaging. When food is processed, its nutritional profile can change, as carbohydrates can be lost, such as fibre through the shelling of maize, and minerals can be added, such as salt (HLPE, 2017). Although the drying and milling of food date back millennia, since the 1980s the degree of highly processed food becomes more dominant, especially in more urbanised countries, and is linked to increased obesity (Monteiro, Moubarac, Cannon, Ng, & Popkin, 2013). Retail outlets and markets can be formal or informal[12] and local or distant (HLPE, 2017). Many of the markets in which small-scale African farmers participate are 'invisible' to policymakers (CSM, 2016). Traditionally, markets were centred around local producers and involved a rather small range of perishable goods sold by many traders. Today, population growth and dietary changes make internationally traded food ever more important, especially for SSA (van Ittersum et al., 2016).[13] International food trade comes with both benefits and harm to importing countries, from cheaper food prices to vulnerability to market shocks (FAO, 2015). It can increase the diversity of the national food supply (Monteiro & Cannon, 2012). Now, the midstream agri-food chain is concentrating rapidly, with the 'supermarket revolution'[14] competing or collaborating with traditional markets and sellers (Reardon, 2015),

[11] Small-scale is not only a size issue, but involves also social organisation of production and reproduction (Bernstein, 2014). It is defined as '*practised by families (including one or more households) using only or mostly family labour and deriving from that work a large but variable share of their income, in kind or in cash'* (HLPE, 2013, p. 10). It extends to small-scale fisheries, livestock and pastoralists as well (Kay, Mattheisen, McKeon, De Meo, & Faus, 2018).

[12] '*All economic activities by workers or economic units that are – in law or practice – not covered or sufficiently covered by formal arrangements*' (FAO, 2017b, p. vi).

[13] Unless otherwise specified, SSA food systems refers to Sub-Saharan food systems excluding South Africa. South Africa has a food system that has very different characteristics than other SSA food systems (Cochet, Anseeuw, & Freguin-Gresh, 2015)

[14] A supermarket is defined here as *'A self-service retail market selling especially foods and household merchandise'* (Merriam-Webster, 2018, p. 1). Furthermore, this research uses the added characteristic that the self-service retail market should be branded and part of a larger distribution group.

and contributing to dietary change (Monteiro et al., 2013). However, it is not inevitable that modern markets replace traditional ones. Small-scale farmers can supply to supermarkets, just as small kiosks can sell a variety of ultra-processed food to places that are too small to attract a supermarket. For instance, in Brazil the food giant Nestlé operates a large network of door-to-door sellers to market their wares (Jacobs & Richtel, 2017). **Table 1** gives an overview of the different food value chains based on their sources and their market outlets. In short, supply chains include production, processing, distribution, and marketing food diversity. These contexts are tremendously complex due to the numbers of stakeholders and consumers involved, which contribute to a diversity of food environments.

Table 1 Food value chain typologies

Type	Description
Traditional	Traditional traders buy primarily from smallholder farmers and sell to consumers and traditional retailers in wet (mostly local) markets.
Modern	Domestic and multi-national food manufacturers procure primarily from commercial farms and sell through modern supermarket outlets.
Modern-to-traditional	Domestic and multi-national food manufacturers sell through the network of traditional traders and retailers (eg, 'mom and pop' shops).
Traditional-to-modern	Supermarkets and food manufacturers source food from smallholder farmers and traders.

Source: Gomez & Ricketts, 2013

1.2.2 Food environments

A food environment '*…refers to the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food*' (HLPE, 2017, p. 11). It is often analysed geographically (Lytle & Sokol, 2017). The food environments include food entry points, which are '*…the physical spaces where food is obtained*' (HLPE, 2017, p. 11), and identifies the constraint and influences of the broader political, social and cultural norms on consumers food choices (HLPE, 2017). The food environments are key to understanding the changes from a traditional self-grown, local diet to modern supermarkets with diets that require an ever-increasing 'food miles'[15] (Clapp, Desmarais, & Margulis, 2015a; Weber & Matthews, 2008). It is the broader environments that influence the choices people make around food. For example, the choices a household can make within a food environment are shaped by their income. In this interconnected world, both household income and the food markets are affected by trade agreements (Blouin, Hawkes, Henson, Drager, & Dubé, 2010). These agreements are ultimately reflected in the diets (Asfaw, 2008; Monteiro & Cannon, 2012) and related health outcomes, such as the observed strong rise in overweight and obesity worldwide (Di Cesare et al., 2016; Ng et al., 2014). The food environments comprise food availability, physical access (proximity), and economic access (affordability).

Food availability refers to a sufficiently consistent supply of food, mostly measured at national or international levels. National food availability is sufficient when it meets the dietary energy requirements of its population. Food security was initially concerned with this national food sufficiency. But the focus on the national level

[15] A measure of the environmental effects associated with distributing food from its point of production to consumption (Pretty, Ball, Lang, & Morison, 2005). From a life-cycle analysis, this constitutes a relative small proportion of a diet's footprint, with 83% of greenhouse gas emission exhausted at the production phase (Weber & Matthews, 2008).

critically misses distributional concerns and access barriers of households and individuals due to, for example, geography, poverty and gender. Or, as Jones et al (2013, p. 483) remarked, *'Although food availability remains a fundamental component of our current understanding of food security, scholars at the time soon began to recognize that food availability was not sufficient for ensuring household access to food*'. As a result, food security later incorporated additional concerns by including food utilisation and food access (Pinstrup-Andersen, 2009).

South Africa exemplifies the importance of the physical environment on food system outcomes. Compared to its neighbouring countries Zimbabwe and Mozambique, South Africa has high overall food availability and less than 5% undernourishment (IFPRI, 2016). It is also a country where 69.3% of women are overweight, of whom 42% obese (Di Cesare et al., 2016; FAO, 2014b; Ng et al., 2014). South Africa, a country whose food entry points are dominated by supermarkets, has '…*good access to bad food and bad access to good food*' (Oxfam, 2014, p. 2), underscoring the importance of the physical environment to access food. Physical access (proximity) is concerned with the physical environment in which food is distributed and accessed. It engages with issues such as mobility, distance, obstacles due to natural geographic conditions, and the infrastructure to access food entry points (HLPE, 2017). For example, there can be ample food available in a town through a supermarket, but older people might have difficulties travelling to this market. Moreover, the supermarket might not stock a high level of fresh foods and vegetables, which influences the diet people can access.

Generally, the main obstacle to economic access (affordability) of food is poverty (FAO, 2015), especially in conflict zones (de Waal, 1997). Food affordability is an important determinant of food choice (Lee et al., 2013). One standard measure of economic access is the proportion of food expenditure of a household's income, which averages 6.2% in the USA and 56% in Nigeria (HLPE, 2017). Poorer households spend higher portions of their income on food than those with more income. Although poor urban households are particularly vulnerable to rising food prices (Zezza & Tasciotti, 2010), most rural households are net food buyers as well (Edelman et al., 2014). The measurement of the food environment, however, is complicated with rare causal and longitudinal relationships between the environment and population health, especially because early food environment studies presumed that people's diets are mainly influenced by their proximity to food outlets (Caspi, Sorensen, Subramanian, & Kawachi, 2012). For example, in one Baltimore case study, the low availability of healthy food was associated with poorer diet quality, even when income and education were factored in. It was further noted that the link between the availability of healthy food and a healthy diet was most correlated with the proximity of the closest store. In other words, proximity to healthy food near your home matters (Franco et al., 2009).

Traditionally, food environment studies looked at the food available in stores and the distance of a household to these food outlets. But neither the availability of a food item, nor linear distance of a store with healthy food are good predictors of intake (Lytle & Sokol, 2017). For instance, in certain areas there is no relationship between proximity to supermarkets and obesity (Drewnowski et al., 2014). It is proposed by Caspi, Sorensen, Subramanian & Kawachi (2012) that pure distance-based notions of food accessibility be abandoned as research consistently shows little to no relationships. The availability of certain food in the food environment is a necessary condition for utilisation, but not its only determinant.

Thus, a distinction should be made between a community food environment and a consumer food environment, in which the former refers to the availability of food through stores and the latter to dietary intake. Certainly, food choices can be more constrained within some restrictive food environments that impede the variability of food choices (**Fig. 3**).

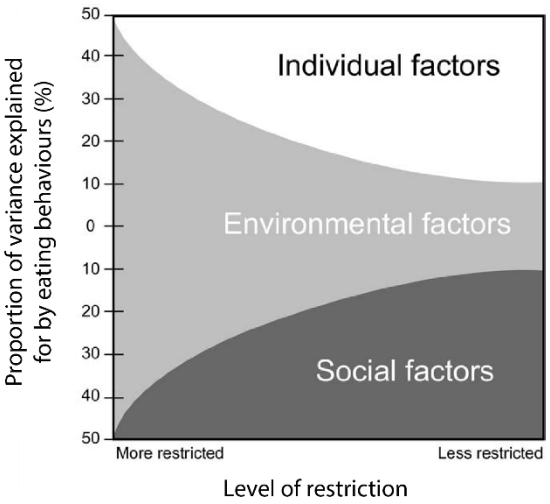

Fig. 3 The relationship among individual, environmental and social factors in more or less restricted environments
Source: Lytle, 2009

In short, the food environments constrain and shape food choices (Haddad et al., 2016). However, food environments do not negate the potential agency of people to make individual food choices. It does underscore that these choices are constrained and shaped by the physical, economic, political and socio-cultural contexts in which people make individual choices. By observing the rise of fast-food chains and organic food, the diverging pathways in which both food environments and consumer behaviour change become visible.

1.2.3 Consumer behaviour

Consumer behaviour '*…reflects the choices and decisions made by consumers, at the household or individual level, on what food to acquire, store, prepare, cook and eat, and on the allocation of food within the household'* (HLPE, 2017, p. 11). Food movements, like the 'locavores' with their focus on local food, and recent attention to gluten-free diets as well, show the increased impact that food consumers have on shaping the food and farming systems. The adoption of certain new technologies, such as the frequently debated use of genetically modified organisms (Scott et al., 2016), are hindered by consumer's reluctance (Lusk & McCluskey, 2018). While food environments provide broader structures in which consumers make choices, individuals make decisions within this structure based on preferences such as taste, convenience, and household traditions. Consumer behaviour, such as traditional celebrations and cultural knowledge, plays an important role to determine food system outcomes (Lytle, 2009). Eating a vegetarian or vegan diet is a consumer choice based on ethical, social, and medical considerations, while abstaining from alcohol is a choice that can be driven by religion. Food choices are further driven by considerations of convenience and quality. Behaviour of consumers can include preference based on the colour of meat to predict tenderness, a fondness for beverages in glass instead of cartons or cans, and reluctance for certain odour to choose products (Grunert, 2002). These issues of consumer's acceptance of various foods can prompt food environments to change and accommodate the changed desires of consumers.

Although the importance of agency in food choices is acknowledged, this research will focus more on the supply chains and the food environments for two reasons. First, a study based on a systems approach needs to delineate the scope or reach of the research as the area of study is highly complex and broad. The choice for inclusion or exclusion of elements, actors, and connections is based on restraints such as time availability, budget, and interest. Second, as portrayed in **Fig. 3**, consumers' choice is dependent on availability. The more restrictive a food environment is, the less individual factors determine the overall outcome. Presumably, the study areas of

Kenya and Mozambique are relatively restricted food environments, especially in comparison with the open and abundant food environments in the cities of the industrialised North. Taking these contexts into consideration, the study of consumer behaviours and food choices are not an objective.

1.2.4 Food governance

The persistence of malnourishment and the failings of compartmentalised approaches, such as a focus solely on dietary guidelines or production, to sufficiently address the challenges of sustainability and inequality in food systems has increased the attention towards the governance of food systems. While agriculture is distinctively susceptible to social and political factors (Archer, Dawson, Kreuter, Hendrickson, & Halloran, 2008), poor governance can be the main driver for food insecurity (Candel, 2014). The renewed focus on governance follows the recognition of food as embedded in complex adaptive systems (Vermeulen et al., 2012) and the roles that governance performs in their functioning. Food systems are governed, as its activities are not random but *'...organised, dynamic and contested, resulting from the interactions of different actors' agendas, strategies, and capacities within the food system'* (Delaney et al., 2018, p. 289). A further impulse to improve global food governance was the reformation of the United Nations Committee on World Food Security (Brem-Wilson, 2015; McKeon, 2015; Metzger, 2015), which involves civil societies in high-level decision making, and acts as the leading platform to discuss global food governance. The Committee on World Food Security propelled the inclusion of alternative food governance pathways into the global policy arena (Duncan, 2015).

There is no widely accepted definition of food governance yet, but (global) food *security* governance is well studied (Candel, 2014; Candel, Breeman, Stiller, & Termeer, 2014; Duncan, 2015; FAO, 2011a). Food security governance is the '*…formal and informal rules and processes through which interests are articulated, and decisions relevant to food security in a country are made, implemented and enforced on behalf of members of a society*' (FAO, 2011a, p. 17). Essentially, food security governance is the governance concerned with advancing food (and nutrition) security. At the international level, global food security governance focusses on the governance regime and the actors involved in global food security. These actors include the Rome-based organisations of the United Nations[16], the World Trade Organization and the World Bank, forums such as the G8, G20 and the World Economic Forum, along with philanthropic organisations such as the Bill and Melinda Gates Foundation (Duncan, 2015). As the FAO underscores that 'T*he link between food security, starvation and crop failure becomes a thing of the past, the analysis of food insecurity as a social and political construct has emerged*' (2006a, p. 1), the social and political linkages of food increasingly becomes part of food security and the food security governance debate. With the recognition of the multiple functions of food, (global) food security governance is progressively changing towards (global) food governance.

Candel (2014) attempted to define food governance as *'...the formal and informal interactions across scales between public and/or private entities ultimately aiming at the realization of food availability, food access, and food utilization, and their stability over time'* (p. 598). This definition, however, targets food security and is more silent on food's linkages with issues such as power, market, subsidies, biodiversity, health, and employment (IPES-Food, 2015). Rather than specialised food security or developmental policy, food governance should favour

[16] These are the Food and Agriculture Organization (FAO), the World Food Programme (WFP), and the International Fund for Agricultural Development (IFAD).

an integrated food policy that changes 'old' to 'new' food policies. Old food policies targeted rural populations, their employment and food production. The main concern was undernutrition. New food policy, on the other hand, is mostly targeting urban and rural poor coupled with a focus on food manufacturing and marketing rather than on production only (Duncan, 2015). As '*…political leaders become increasingly aware of the complexity and dynamic nature of managing the global food system*' (Metzger, 2015, p. 345), the food governance landscape at the global level is more and more acknowledging the complex contexts of food. This understanding of food as embedded in adaptable, complex systems supports the identification of the interactions governing food and contributes towards a systemic understanding of food (Ericksen, 2008). Furthermore, food governance differs from *global* food security governance as it is intrinsically multi-scalar, meaning that it incorporates both local and global levels and anything in between. To approach food governance as multi-scalar enables the study of food governance on individual, household, community, national, regional and global food systems level.

The implementation of systemic food governance through integrated food policy is, at best, difficult. Policy incoherence is persistent (Carbone, 2008), and policy integration is one of the 'philosophers stones' in public policymaking (Candel & Pereira, 2017). This complexity raises the question if 'common' food policy is feasible. When striving for policy integration, decision-makers need to choose more explicit goals and instruments within a governance vision (Candel & Pereira, 2017). Especially in food, the policy incoherence is apparent when governments launch anti-overweight campaigns while subsidising sugar production (GloPan, 2016; Obenchain & Arlene, 2015). Within increased social and ecological volatility, the capacity to shape the food systems becomes more and more important as greater resilience and adaptation is required (Delaney et al., 2018). The challenges related to food systems underscores the significance of food governance studies, especially considering that the threats of climate change and the pursuit of several Sustainable Development Goals (SDGs) (Griggs et al., 2013) that require greater coordination in the food systems (Dekeyser, Bizotto Molina, D'Allessandro, & Tietjen, 2019).

Today, governance continues to evolve (**Table 2**). As a result, new forms change the governance of the food systems. One the one hand, the growth of supply chains and their importance within the food economy provides multinational corporations with the power to set their demands throughout the whole chain. Centred around the market, these corporations exercise their power through private standards such as GLOBALG.A.P. Criticasters point to the challenges of the ability of poorer small-scale farmers to adhere to these private standards. Thus, these private standards might produce obstacles to the participation of poorer small-scale farmers into the expanding global supply chains (Fuchs, Kalfagianni, & Havinga, 2011; Swinnen, 2007). Within this market-centred approach to food governance, the ability of citizens to shape food governance is limited to the size of their purchase power.

On the other hand, calls for greater participation and decision-making power of citizens outside of an individual's purchasing power has been raised as well. Food citizenship, food democracy and food sovereignty are some of the recent proposals that aim to shift power from the market to civil society (Dekeyser, 2019; Hassanein, 2008; Patel, 2009). Later, this chapter will develop in-depth food sovereignty, one of the most prominent of these proposals (**Section 4).**

BOX 1 The evolution of authority: from monocentric government towards food governance

The state was the sole authority after a long period of successfully nationalising power from diverse power holders such as guilds, clans, aristocracy,… and even the pope. Traditionally, the state is understood as the formal and institutional processes at the national level that provides public order and the supportive framework for collective action. The state is characterised by its ability to make decisions and the capacity to enforce them (Stoker, 1998). The state is the '…*organisation specialised in exercising political authority within a given territory and over the people of that territory*' (Genschel & Zangl, 2008, p. 2). The governing body of the state is the government (FAO, 2011a), which refers to '…*the formal institutions of the state and their monopoly of legitimate coercive power*' (Stoker, 1998, p. 17). Together with the nationalisation of authority from the early modern ages, the scope of government continues to increase and dominates matters ranging from the arts, sports, and gender to environmental protection and macroeconomic processes. The defining characteristics of a liberal government has become its adherence to a constitution and the rule of law, coupled with the construction of its own administrative structures. These administrative structures have enabled governments to gain more autonomy to implement its will over non-state actors. The result of the nationalisation process was the emergence of only one political authority within a national territory (Genschel & Zangl, 2008). It is a 'monocentric' governance model because there is only one centre of political power and authority, which has been solely the state for a long period of time (Termeer, Dewulf, & van Lieshout, 2010). This approach to governance and authority still dominates many research practices (Fukuyama, 2013).

However, since the '70s the above-mentioned nationalisation of power halted and reversed into denationalisation or power-sharing. Denationalisation challenges the governments' monopoly on both horizontal and vertical decision-making. Vertical shifts include power, coordination, and responsibilities shifting to international levels (upward shifts), to subnational or regional levels (downward shifts), or to civil society and non-state actors (outward shifts). Horizontal shifts increase the importance of contracts and other jurisdictional mechanisms in social relations (Duncan, 2015). These horizontal shifts do not neglect the fact that most non-state actors are dependent on the government as the central body of political authority and are ultimately unable to replace it. Denationalisation is not understood as a threat to the core functioning of the state: the government is still regarded responsible for everything political and '*...remains the central node in an increasingly decentralised authority structure'* (Genschel & Zangl, 2008, p. 23). However, the vertical and horizontal shifts change government from a monopolist of authority to its manager. The government, then, is part of a network of power that includes actors such as Non-Governmental Organisations (NGO), International Governmental Organisations (IGO), Civil Society Groups (CSO), regions and the private sector.

The inclusion of non-state actors in decision-making through denationalisation characterises the shift from government to governance. Governance is defined by Rhodes as '…*a change in the meaning of government, referring to a new process of governing; or a changed condition of ordered rule; or the new method by which society is governed*' (1996, pp. 652–653) and date its roots back to the times of Aristotle (FAO, 2011a). Governance refers to rule-making or steering (Kjær, 2014). While the outputs are not different from government, the processes are. These processes create the conditions for ordered rule and collective action. The essence of governance is its '…*focus on governing mechanisms which do not rest on recourse to the authority and sanctions of government*' (Stoker, 1998, p. 17). As a process it incorporates participation, negotiation and

coordination (Duncan, 2015) and adaptation, learning and experiment (Stoker, 1998). Hence, governance is an observable phenomenon as well as a political project. This review situates governance as a multi-actor decision-making process that goes beyond the traditional government (Fioramonti & Nhema, 2016). Governance has three pillars: state (political domain), markets (economic domain) and civil society (socio-cultural domain) (Duncan, 2015). By transcending traditional government, researchers can dissect the complexity involved in the interaction between the state, market and civil society. Governance and its five propositions are unpacked in **Table 2**.

Table 2 Overview of governance conceptualisations

Conceptualisation	Description
Beyond government	Governance refers to a set of institutions and actors that are drawn from but also extend beyond government.
Transboundary	Governance identifies the blurring of boundaries and responsibilities for tackling social and economic issues.
Power dependence	Governance identifies the power dependence involved in the relationships between institutions involved in collective action.
Networks	Governance is about autonomous self-governing networks of actors.
Government as manager	Governance recognizes the capacity to get things done which does not rest on the power of government to command or use its authority. It sees government as able to use new tools and techniques to steer and guide.

Source: Adapted from Stoker, 1998

First, the concept of governance acknowledges multiple centres of power when it includes actors and institutions beyond the state or government. By focusing on the complex networks of decision-making, it embeds government in broader societal structures (Stoker, 1998). For instance, as policy and administration are increasingly within an international context, governance becomes more multi-level (Termeer et al., 2010). Although a government is required to uphold the political structures, governance can engage entirely outside of government (Genschel & Zangl, 2008). Second, the boundaries and responsibilities in governance are increasingly blurred as civil society or the private sector take up tasks that were traditionally were in government's hands. The state, market and civil society are continuously interacting to shape policies and collective behaviour (Fioramonti & Nhema, 2016). For example, charity organisations alleviate needs that are traditionally part of the government's responsibility without an overarching authority or formal system of control (Stoker, 1998). Third, collective action organisations are linked with other organisations through power dependence, as organisations need to exchange resources and negotiate everyday purposes with other organisations. The context of exchange and the rules of the game shape the outcomes. Power dependence is a key trait, so no-one has a clear dominant position (Duncan, 2015; Stoker, 1998). Fourth, network governance indicates the increasingly complex networks, both formal and informal, associated with governance decisions. Networks organise relationships between relatively autonomous, but interdependent actors, who continuously interact (Duncan, 2015). Self-governing networks '*…involve not just influencing government policy but takes over the business of government*' (Stoker, 1998, p. 23). Ostrom (1990) researched examples of governance processes that captured collective action into self-governing networks and common resources. Her work showed that self-governing networks could sustainably govern commons without an external authority through a polycentric governance model. Within these networks, negotiation is the primary mode of interaction (Duncan, 2015). Lastly, governance changes governments' administrative role of intervention and control to steering and coordination (Bevir,

2006). According to Stoker (1998), a government should integrate and regulate through systemic management so that thinking and action can transcend individual sub-systems. This avoids unwanted side effects and establishes mechanisms for effective coordination.

1.3 Livelihoods and food security as outcomes of food systems

This sub-section engages with livelihoods and food security as outcomes of food systems. The ability of a food system to include and support livelihoods and to provide food (and nutrition) security is of crucial importance, especially in SSA where the population is still predominately rural and small-scale farming provides most livelihoods. More than 60% of Africans are engaged in (mostly informal and family-based) agriculture, and their absolute numbers are likely to grow (Losch, 2016). Furthermore, agriculture is still responsible for 69% of all income for rural Africans (Davis, Di Giuseppe, & Zezza, 2017).

However, the decision to label livelihoods and food security as outcomes is an arbitrary one. Within a system, the boundaries of what constitutes an outcome, element and driver can shift. For instance, livelihoods and food security can also be drivers of food systems change, when, for example, farmers who move out of agriculture impact food production or when household's rising incomes change their diets. The decision to label livelihoods and food (and nutrition) security as an outcome predicts the size and direction of the relationships between livelihoods and food security regarding other components. The effects of food supply chains and food environments on livelihoods and food security exceed the impacts of the reverse relationship (the effects of food security and livelihoods on food supply chains and food environments).

1.3.1 Livelihoods

The term 'livelihoods' includes some or all of the following attributed: locales (urban-rural livelihoods), occupations, social difference, directions (trajectories) and dynamic patterns (resilient or sustainable). A livelihood perspective or analysis would start with how different people live in different places (Scoones, 2009). Livelihoods '*…comprises the capabilities, assets (including both material and social resources) and activities required for a means of living'* (Scoones, 1998, p. 5). It includes human, social, natural, physical, and financial capital (Kanji, Macgregor, & Tacoli, 2005). Three broad rural livelihood strategies can be identified: agricultural intensification or extensification, livelihood diversification, and migration. Most rural households use a combination of these strategies (Scoones, 1998), although rural income diversification is less evident in SSA than in other regions (Davis et al., 2017).

Livelihoods in SSA are intrinsically connected to the food systems. The urban population in Africa increased tenfold since the 1960s and will likely triple by 2050 (Losch, 2016; UNECA, 2017). Despite rapid urbanisation, the rural population of SSA will increase by 59% by 2050, adding 350 million rural citizens (Losch, 2016). The livelihoods in SSA are strongly linked with agriculture and the food systems. About 60% of Africans derive their livelihoods from agriculture, which is much more than the average of 40% worldwide or the 2% of North America. While employment in agriculture is declining, jobs in food services are likely to rise (WB, 2017). Livelihoods in the LAI debate can comprise a broad array of indicators, data collection methods, factors and actors (Oberlack et al., 2016). For this research, livelihoods will be used to understand how the food systems support or

impede the livelihoods of households due to, for example, access to land or other natural productive factors, or market access.

1.3.2 Food security

One of the most important outcomes of food systems is food and nutritional security. Food security has been over defined, with Maxwell and Smith (1992) counting dozens, and Clay (2002) totalling 200 food security definitions. Still, the 1996 FAO definition is the most widespread and accepted: food security is '*a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life*' (FAO et al., 2017). This definition is based on four pillars: availability, accessibility, utilisation and stability (Grote, 2014). Availability refers to the match between the quantity of food produced and consumed, while accessibility is concerned with the affordability, allocation and preference for food. Utilisation takes in the nutritional and social values of food and food safety, whereas stability is concerned with the strength and resilience of the other three pillars (FAO, 2014b; Pereira, 2014; Pereira & Ruysenaar, 2012). A lack of food security, or food insecurity, can cause malnutrition. Malnutrition includes undernourishment[17] (hunger), micronutrient deficiencies[18] (hidden hunger), as well as overweight and obesity[19]. There can be overlap between these forms, as an undernourished person is likely to be micronutrient deficient, and an obese person can be insufficient in certain vitamins as well. Interestingly, like undernourishment in the developing world, overweight and obesity are linked with lower social class in the developed world (Finkelstein et al., 2012; Monteiro et al., 2013). Although food security is a contested concept, most notably by the food sovereignty movement, its dominance as a master frame forces its opponents to rather claim ownership than to reject it. After all, it is easier to semantically capture food security then to proliferate food insecurity (Duncan, 2015).

Currently, the burden of malnutrition impacts one in three people and is prevalent in all countries, developed and developing (IFPRI, 2015). Up to 88% of countries have a serious burden of two or three forms of malnutrition (HLPE, 2017). In 2016, around 815 million people were undernourished, a number that has risen since 2014. More worrisome than absolute increase is the uptick in the prevalence of undernourishment. After a period of notable decline, prevalence of undernourishment rose in 2016 for the first time since the early 2000s, to 11% of the world population today (FAO et al., 2017). The lower boundary for micronutrient deficiencies is two billion people (De Schutter, 2014; Pinstrup-Andersen, 2009). Furthermore, 1.9 billion people are overweight, which includes 672 million people considered obese (IFPRI, 2019; Ng et al., 2014; WHO, 2014). The consequences deriving from malnutrition are perceived as the number one risk to health worldwide (WFP, 2011). Food (in)security and malnutrition are increasingly approached through food systems to understand this paradox of the 'stuffed and the starved' (Patel, 2008). In tackling world hunger, the governance of food systems needs to be factored in as well (Delaney et al., 2018). For Ericksen, the '…*pressing issues pertaining to food security today have to do with food systems, encompassing a range of economic and environmental and social features that are undergoing rapid change*' (2008, p. 237). The goal of zero hunger is enshrined as SDG 2 and is thus ensured of continuing

[17] '*A state, lasting for at least one year, of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements'* (FAO, 2014b, p. 50).
[18] Deficiency of '*vitamins, minerals and certain other substances that are required by the body in small amounts*' (FAO, 2015, p. 53).
[19] '*Body weight that is above normal for height as a result of an excessive accumulation of fat*' (FAO, 2014b, p. 50).

international attention until the SDGs end in 2030. Food and agriculture are interwoven in many more SDGs, including good health and well-being (SDG 3); decent work and economic growth (SDG 8); responsible production and consumption (SDG 12); climate action (SDG 13), and life on land (SDG 15). But achieving SDG 2 in a sustainable manner will form a tremendeous challenge in light of current food system changes (Godfray et al., 2010). The next sub-section will group food systems into three typologies, ranging from traditional to mixed and modern, which enables us to understand better the changes that have occurred in food systems. Some of these changes span many centuries of development, but new dynamics and technologies accelerated the transformation of food systems.

1.3.3 Food systems typologies

The food system typologies are based on the HLPE (2017) and the International Food Policy Research Institute (IFPRI) (2015) are presented in this section. Overall, three broad food systems can be typified that have similar characteristics. These are traditional, mixed, and modern food systems (HLPE, 2017). To differentiate food systems is a challenge as they are complex, heterogeneous, and evolving (IFPRI, 2015). However, there are also many similarities across supply chains, food environments, outcomes and drivers of food systems. For example, the modern food systems of Belgium and France share many resemblances that are quite unlike the traditional food systems of Malawi and Zambia. If differentiated by food system typology, there are apparent similarities in the outcomes of food undernourishment, micronutrient deficiencies, and obesity (HLPE, 2017). In short, different food systems affect food security, livelihoods and diets in diverse ways.

Traditional

Traditional food systems are those that are mostly rural, locally-embedded and driven by small-scale farmers who sell for informal wet markets. The supply chains are dominated by small-scale production with low labour productivity and an absence of large farms. The food is regularly self- or locally produced and seasonal. Roads and other infrastructure are basic, while transport is difficult and slow. Households can buy food from local and weekly markets, whereas kiosks sell fresh and packaged foods, especially oil, salt and sugar. Eating outside of the house is rare. The distances to formal markets are long and challenging. There is little enforcement of food safety standards and little to no cold storage. People's diets are mostly staple crops and unprocessed or minimally processed food with household spending a large part of their income on food. The high consumption of staples often affects micronutrient intake, resulting in high rates of micronutrient deficiencies and stunting, while seasonal hunger is problematic. Overweight and obesity are low while undernourishment is high. A large section of the workforce derives their livelihoods from the food systems (HLPE, 2017; IFPRI, 2015).

Mixed

Mixed food systems are more diverse, with increased urbanisation and off-farm employment, have different market channels and added diet choices. Food is produced at both local small farms with moderate productivity and at larger farms that are further away. There are both local wet markets and supermarkets with a large assortment of processed, packaged, and fresh foods that are available out of season. This diversity in food entry points is further enhanced when the number of kiosks and restaurants grow. There are more households in peri-urban

and urban areas, and those households have a higher income. Overall, roads and other infrastructure have improved. Packaged foods are advertised more, and food quality and safety regulations are increasingly enforced. There is more diversity available, and diets contain adequate levels of energy and protein. Undernourishment and stunting are rarer with improvements in diets, access to medical service, and sanitary hygiene. The decrease in undernourishment and stunting is part of the epidemiological transition of countries.[20] However, the diet changes with additional fat and sugar, processed grains and sugar, which often lead to more overweight and obesity. Rather than infectious diseases, morbidity from non-communicable diseases such as cardiovascular diseases and diabetes rise. The percentage of people in rural areas and households that derive their livelihoods from food production is steadily falling (HLPE, 2017).

Modern

Modern food systems have diets with high food miles, which are mainly derived from the industrial production system and concentrated distribution channels, even though speciality markets (small, local, organic, fair trade) exist. The supply chains of modern food systems are long, complex and ultimately span the globe. Agriculture is highly capital intensive and substitutes labour with mechanisation and chemicals. The percentage of the workforce employed in agriculture is low. There is high urbanisation with more people living in urban areas than rural citizens. There are many food entry points in these urban areas that offer a great variety of food choices, while prepared meals, both casual and high end, are consumed outside of the household. Concentrated distribution channels like supermarkets dominate food purchases, but other speciality markets are available at additional costs. While total food expenses rise, the households spend less of their income on food. Advertisement for food is widespread. Information about the linkages between health and diets coexist with non-communicable disease prevention programmes. However, overweight and obesity are high (HLPE, 2017; IFPRI, 2015). These food system typologies indicate different configurations of food systems because of demographic, epidemiological, economic, technological and political drivers, among others. Food systems differences impact the resulting outcomes. Today, the drivers of food systems have changed and are changing the food systems around the world, with a particular reconfiguration of the global food system (McMichael, 2009; Patel, 2008).

The concept of food systems was presented and their elements, outcomes, and typologies introduced in this section. These food systems are changing rapidly around the world. Over the last century, a transition from traditional to modern food systems has occurred in the Western world, and has spread to Latin-America and Asia in the last four decades (Burch & Lawrence, 2009; Losch, 2016; Reardon, Barrett, Berdegué, & Swinnen, 2009). Similar projections of food systems transformation are made for SSA as well (Reardon et al., 2015; Tschirley et al., 2015). The next section engages with two theories that explain and predict changes in food systems, and their associated food governance frames of liberalism and food sovereignty. The section of theories on food systems change is followed by an in-depth discussion of the dynamics of LAIs and food sovereignty.

[20] The epidemiological transition '…*is a phase of development witnessed by an increase in population growth rates brought about by medical innovation in disease mitigation and a shift from infectious diseases to non-communicable disease, followed by a re-levelling of population growth from subsequent declines in fertility rates'* (HLPE, 2017).

2 Theories of food systems change

As the previous section conceptualised food systems and their differences, two theories that explain and predict food systems change, or the shifts between traditional and modern food systems will be discussed in this section. Modernisation theories envision a transformation of traditional food systems to modern ones through economic development, production growth, urbanisation and globalisation that culminate in structural transformation.[21] Alternatively, IFR theory points to the role of power and capital in the formation of the global food system and sees a clash between two different food systems models. From a food regime perspective, the transition from traditional to modern is not necessarily assumed or desirable. There are two associated food governance frames associated with each theory, namely liberalism with Modernisation theories, and food sovereignty with IFR theory. The next section introduces LAIs as a global driver that brings about food systems change in SSA.

2.1 Modernisation theories

A sizeable portion of the literature on food systems change predict an almost linear trajectory of food systems change in SSA. Just as in the developed world, and afterwards in Latin America and Asia, a transition from traditional food systems to mixed and modern food systems in SSA is not only projected but actively pursued (Mckeon, 2015; Patel, 2013; Patel, Bezner Kerr, Shumba, & Dakishoni, 2015). Rather than stand-alone and viable typologies by themselves, each with its strengths and weaknesses, modernisation theories chart a trajectory through a structural transformation that starts with traditional food systems and ends with modern ones. After all, Marx declared, '*the country that is more developed industrially only shows, to the less developed, the image of its own future*' (1867, preface).

The key drivers of modernisation theories are markets and technologies. In this view, producers follow the logic and signals of markets, and failings are attributed to institutional obstacles, imperfect markets, or farmer's lack of entrepreneurship. The stagnation in SSA agriculture is linked to institutional patterns that distort agricultural and food markets (van der Ploeg, 2018). The proposed evolutionary process of modernisation and progress results with agriculture conducted as a business, driven by entrepreneurship and linked to an expanding urban economy (Scoones, 2009). In the 1930s, this process started in the developing world as the industrialisation of food systems deepened (De Schutter, 2017). Paradoxically, the agricultural modernisation process starts with increasing agricultural productivity which frees labour and suppresses wages for industrial sectors, whose growth will eventually decrease the share of agriculture as part of GDP (**Fig. 4**). '*In most development models, modern industry is the cutting edge of economic growth, while agriculture plays the role of a resource reservoir which can be drawn on for supplies of food, labor, and finance to fuel the growth of urban activities*' (Timmer, 1988, p. 290). It is a process that converts 'backwards' small-scale farmers to modern, large, and efficient ones. Generally, the increased prominence of capital integrates farming and supply chains, which aims to create stability while

[21] '*The process of structural transformation refers to changes in the sectoral and spatial distribution of economic activities and people, illustrated by the evolutionary pathway followed by many countries throughout the world'* (Losch, 2016, p. 7). Moreover, '*structural transformation is the process by which low-income societies, in which agriculture absorbs most labor and generates most economic output, become high-income societies characterized by a relatively smaller but more productive agricultural sector'* (Barrett, Christian, & Shiferaw, 2017, p. 5). Structural transformation expands on agricultural transformation as it links to issues such as non-agri work, urban consumers, demographic changes, or nutritional shifts (Barrett et al., 2017).

standardising through technology (Bernstein, 2009). Regions, embedded in globalisation, specialise in the products in which they hold a comparative advantage. These regions would supply the global market through international supply chains, while others would increasingly derive their diets from a wide range of products that are delivered by the global market. By transcending of time and place, modern food systems provide the availability of food from around the world and out of season.

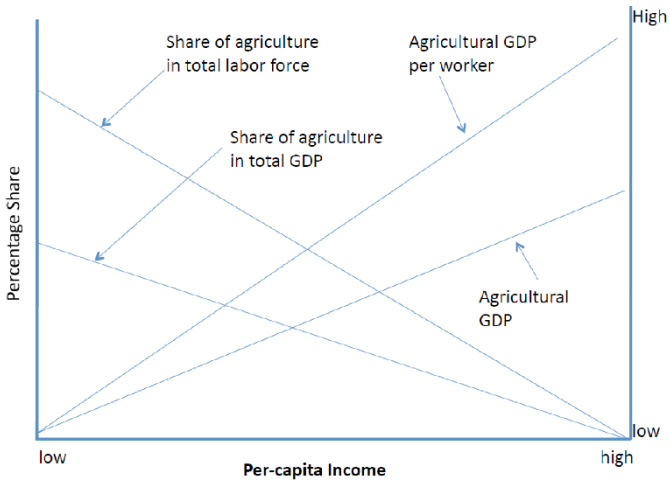

Fig. 4 Agriculture in the economic transformation process
Source: Badiane, 2014

Within modernisation theories, the trajectories of small-scale farmers, the average land size per farm and the percentage of farmers in the total workforce are depicted in Fig. 5.[22] The growth of large farms causes the demise of small ones, and thus drives a process of rural class differentiation (van der Ploeg, 2018).

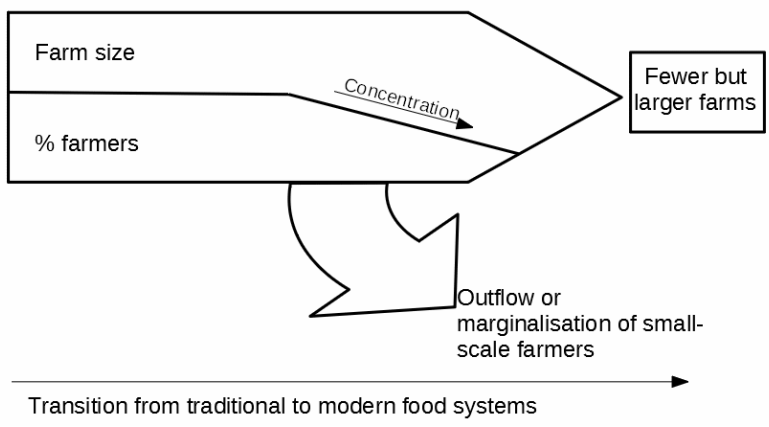

Fig. 5 Trajectories of farm size and farmers share in modernisation theory

Supply chains and food environments would go through similar trajectories as Fig. 5 due to processes of concentration and financialisation. These changing trajectories would cause both a shift in the occupation of the

[22] Fig. 5 is different from a Chayanovian approach that would see contractions and expansions in farm sizes due to demographic growth, for example as farms would be divided at inheritance into ever smaller pieces, or as a larger farmer family buys up the plots (van der Ploeg, 2018). A Chayanovian approach places the dynamics of growth and decline within the farm and the agricultural sector, rather than in relationship to other sectors. Another observation from Fig. 5 is that both farm concentration and a declining share of famers are seemingly captured in one process. This co-existence of farm growth and declining share in famers' does not need to be the case. For example, Africa is rapidly urbanising and the share of farmers is already diminishing (Losch, 2016). But it is less clear if farms are concentrating, which challenges the mechanistic processes of modernistic theory (van der Ploeg, 2018).

ex-farmers and in food production. When small-scale farmers are squeezed out of agriculture, they are added to the labour reserve for a bourgeoning industrialisation, and in a later phase service industry development. As many small-scale farmers leave agriculture, the food production models change as well. The resulting intensification and mechanisation lead to a higher output per hectare and per farmer while capital and mechanisation replace labour (De Schutter, 2017). Farming, as a way of life, turns into agriculture, foremost an economic sector (Bernstein, 2016).

For SSA's food systems, the outcome of these trajectories would reflect a fundamental shift from the current way of producing, distributing, and consuming. Concerning these shifts, **Table 3** summarises some of the transformations of SSA food systems that would occur.

Table 3 Transformations in traditional food systems towards modern ones

Elements and outcomes	Transformations
Supply chains	Percentage of farmers goes down and the share of large and industrial farms rises. Standardisation of agriculture through technology.
Food environment	Distribution channels concentrate through supermarkets.
Diets	Dietary changes towards increased energy-dense and processed food.
Food security	Less undernourishment, but higher overweight.
Livelihoods	Differentiation in livelihood options, squeeze on small-scale farmers, conversion of (some) small-scale farmers to farmworkers.

Currently, notions of 'traditionalism' are marketed within modern food systems. The search for forgotten or neglected grains (eg, quinoa), 'older' diets (eg, banting), and 'natural' production methods (eg, organic) commercialise and brand traditionalism, but is not a reversion to a traditional food system. If anything, the embedding and commercialisation of traditionalism into niche markets showcase a modern food system with a mature and extensive market.

2.1.1 Liberalist food governance frames

Modernisation theories broadly underpin 'conventional' or liberal food governance frames. When compared to food sovereignty (**Section 4**), there is no unified liberal food governance agenda or movement. However, there are a few themes associated with liberalist food governance frames that turn the assumptions and predictions of Modernisation theories into a political agenda.

Liberal food governance frames (**Table 4**) underscore the importance of competition and the roles of markets and technology in driving food systems change (Duncan, 2015). Farmers, if they want to be competitive in this globalised world, should become commercialised as 'agricultural entrepreneurs', which often implies scaling up. The role of governments is to support capitalism's determination towards capital accumulation, which in turn drives broader economic development. Traditional food systems are mired in paternalism and other backward social institutions that hamper broad notions of 'progress'. The transition from traditional food systems to modern ones should be politically supported. This political support includes the adaptation of industrial techniques and the liberalisation of its markets. Furthermore, proposals include liberalising the trade for biotechnology, safeguarding intellectual property, and opening markets for investments to attract capital (Mckeon, 2015).

In short, liberalist food governance frames centre around progress and modernisation driven by the markets. They uphold an image of modern food systems as a mirror of the impending fortune of traditional food systems. But the assumptions and predictions of both Modernisation theories and liberal food governance frames are not without critiques.

2.1.2 Critiques of modernisation theories and liberal food governance frames

There are several critiques of the assumptions and linearity of these modernisation trajectories - and liberal governance frames in general - and their applicability to SSA' contexts. Issues of environmental externalities, lack of employment generation, and the continuing persistence and prominence of small-scale farmers contradict modernisation replicability in SSA. Fundamentally, modernisation theories overlook opposing dynamics in food systems change and ignores the historical contributions of SSA food systems to overall Western development and modern food systems.

First, the externalities of development trajectories around the world shrank the environmental space for the replication of these processes in SSA as well. The prime example is climate change, which already exacerbates environmental volatility. Second, SSA has 'urbanisation without industrialisation', meaning that the ability of other sectors to absorb the freed labour from agriculture is limited indeed (Losch, 2016). In SSA cities, it is the informal service sector that provides most of the urban livelihoods, creating 'consumption cities', but not productive sectors (UNECA, 2017). Third, small-scale farmers persist and can flourish around the world (van der Ploeg, 2014, 2018). There are processes of 're-peasantisation' that contradict modernisation trajectories (van der Ploeg, 2008). Small-scale farmers, previously viewed as part of the food insecurity problem, are back again as a crucial part of solutions to unemployment, malnutrition, and poverty (Graeub et al., 2016). After all, class differentiation is not an inevitable outcome but a tendency within capitalism (Bernstein, 2009).

Fundamentally, modernisation theories overlook the roles that SSA food systems have played, and continue to play, in the construction of modern food systems in the North. The relationships between the colonial empires and plantations, in particular to the industrial development of Europe, are well documented (Bernstein, 2014; McMichael, 2007, 2009). Commodities from the colonies, especially sugar, fuelled the industrial workshops of the world (Standage, 2009). Rather than a linear development trajectory contained and driven by itself, the historical development of the West was, and is, linked with the people, ecosystems and food systems of the South, settler-states and the West's own internal peripheral areas. The mechanistic approach of modernisation theories overlooks these interactions and might not be able to discuss or predict the development trajectories in these former colonies or peripheral areas. The assumption that SSA would, in broad lines, replicate the food systems and socio-economic developments of the North ignores the distribution of power in the history of development, particularly in relation to Europe and SSA.

On the one hand, there are dynamics in SSA food systems that closely match assumptions of modernisation theories, such as increased urbanisation, off-farm employment, dietary change, concentration and financialisation. On the other hand, opposing dynamics to modernisation theories, such as the persistence of small-scale farmers, flourishing of informal and decentralised markets, and high failure rates of large farms (Nolte et al., 2016) challenge linear trajectories of change. These conflicts raise the need for theories of food systems change that incorporate these issues of relational development and power. To this extent, the concept of IFR theory can provide a

deeper understanding of the possible trajectories of SSA food systems and their relations with the global food system.[23]

2.2 International Food Regime theory

The construction of the global food system is analysed by IFR theory, which led to the identification of the rise and fall of two historical food regimes. This IFR analysis is akin to Wallerstein's world-system analysis (Goldfrank, 2000; Wallerstein, 2004) insofar as its unit of analysis is one global, connected and overarching system, supplemented with a focus on a Polanyian double movement between agriculture and a world capitalist economy (McMichael, 2009). The value of IFR theory lies in its comprehension of the construction of the global food system, its forms and its transitions, and the role of agriculture in developing the capitalist global economy (Friedmann & McMichael, 1989). It engages with questions on the international food system starting from the 1870s, such as food production (where, how and by whom is what food produced?) and consumption (where and how is food consumed, and by whom?) (Bernstein, 2016). '*The food regime concept is a key to unlock not only structured moments and transitions in the history of capitalist food relations, but also the history of capitalism itself*' (McMichael, 2009, p. 163). In this research, the use of IFR theory lies in analysing and debating our contemporary 'food regime'.

2.2.1 Historical food regimes

From this historical point of view, IFR theory identifies two worldwide food regimes, named the colonial and development regimes. A worldwide food regime is a '…*rule-governed structure of production and consumption of food on a world scale'* (Friedmann, 1993, p. 30) and links '…*international relations of food production and consumption to forms of accumulation…'* (Friedmann & McMichael, 1989, p. 95). An emerging contemporary third food regime, termed the globalisation or corporate regime, is currently debated by food regime scholars (Burch & Lawrence, 2009; Friedmann, 2016; McMichael, 2009).

The first food regime started in 1870 and ended between 1914-30. It is termed the colonial or imperial regime as it was organised around European imports of exotic commodities from colonies in African and Asia coupled with cheap grains and meat from settler colonies such as the USA, Canada, and Argentina (Bernstein, 2016). The exotic imports supported European industrialisation and Britain's 'workshop of the world'. In the end, the competition of monoculture in colonies replaced parts of Britain's staple food production (McMichael, 2009). By the 1930s, European dominance declined. This demise and the decolonisation of Asia and Africa after 1945 spurred a transition from the first to the second food regime. The second food regime started approximately in the 1950s and ended in the 1970s. The 'development' regime was centred on the use of food as a means of hegemonic dominance through food aid and trade. The USA, at the heart of this regime, directed its surplus food to allies and its empire. While the North re-nationalised its agriculture through subsidies, the growth of global agricultural

[23] The global food system is the food system that operates on an international scale, with global supply chains and tied to the international market.

corporations restructured agricultural sectors. At the same time, the specialisation dynamic of increased globalisation linked national farm sectors with the global supply chains to construct transnational commodity complexes, such as the soy-animal trade (Bernstein, 2016; McMichael, 2009). Within the soy-animal complex, the intensive meat production and consumption of the Western middle class can be linked with soy producers in the *cerrado* of Brazil (Tabuchi et al., 2017; Weis, 2007).

While states were central to the first food regime, their importance continues in the second food regime even as their dominance declines while the standing of corporations and capital grows. The importance of corporations and capital changed the distances within food systems (Clapp, 2014a) as '*The movement of agro-food complexes, … [increases] separation and mediation by capital of each stage between raw material inputs and final consumption'* (Friedmann & McMichael, 1989, p. 113). However, states were still heavily involved in the regulation of their national agriculture. The industrialisation of food production and its reliance on external inputs and mechanisation, grew (Bernstein, 2016).

For developing countries, food aid and food dumping augmented dependence while simultaneously enhancing production growth, through Green Revolution technologies, and strengthened national self-sufficiency (Bernstein, 2016; Luan, Cui, & Ferrat, 2013; Patel, 2013). In general, Africa shifted from self-sufficiency to becoming a net food importer (Luan et al., 2013), while the international prices for exotic commodities declined. A combination of rising farm debt in the North, the rise of export competitors (notably Brazil) and a loss of power from the USA demised the second food regime in the 1970s (Bernstein, 2016).

2.2.2 A contemporary food regime

There is an on-going discussion on the existence of a contemporary third food regime and its drivers (Bernstein, 2016; Friedmann, 2016; McMichael, 2015a). The original formulation of the two food regimes was done after their proposed end date (Friedmann & McMichael, 1989), which makes an overview and delimitation more straightforward. In short, the opposition to a third food regime concerns the centrality of food in its contribution to world capitalism and the role of social food movements in the future of economic governance (Friedmann, 2016). In other words, proponents of a third food regime place food and agriculture as a central contributor to the problems of world capitalism, such as inequality and environmental degradation, while at the same time locate the solutions to these problems in food social movements, such as food sovereignty.[24] Food sovereignty is a food governance framework that places power and control over local food systems in the hands of communities. Nonetheless, the debate on an emerging regime identifies drivers and trajectories of food systems change, with the contemporary regime named the 'globalisation' or 'corporate' regime.

The proponents of a third food regime situate its emergence in the late 1980s. The third food regime is fundamentally a dichotomy between a process of deeper global integration and developing counter-movements, of which food sovereignty is its most prominent alternative (Dekeyser, 2014; Dekeyser, Korsten, & Fioramonti, 2018). Thus, IFR theory analyses '*…a foundational divide between environmentally catastrophic agro-*

[24] Friedmann (2016) succinctly places this debate into the age-old Marxist approach to post-capitalism, which envisions only the possibility of socialism, or barbarism. This denies the adaptability of capitalism or the agency of people to devise configurations that are different from those two outcomes. Even so, the issue of climate change might be the upper limiter of capitalist production and expansion (Klein, 2015; Weis, 2010).

industrialisation and alternative, agroecological practices that is coming to a head now as we face a historic threshold…' (McMichael, 2009).[25] One the one hand, extensive agro-industrial complexes tie mass production through standardised industrial agriculture with concentrated distribution systems, such as the 'supermarket revolution'. These commodified complexes enable an ever-increasing variety and richness to affluent consumers while subjugating ecosystems, societies and cultures (Mckeon, 2015; Patel, 2008; Weis, 2010). In the corporate food regime, export agriculture is universal (McMichael, 2016). Food is shipped throughout the world with large food miles by a 'world agriculture', or food from nowhere (McMichael, 2009). Through trade agreements such as the WTO's Agreement on Agriculture (AoA), states relished their roles as the main drivers of food regimes to transnational corporations and capital. Criticasters blame these agreements for facilitating food 'dumping', or the selling of food below the costs of production and putting small-scale farmers out of work (Rosset, 2008).

On the other hand, several counter-movements challenge the agro-industrial complex and uses food and agriculture as solutions to the crises of the broader neoliberal project (McMichael, 2016). These movements entail Food Sovereignty, Slow Food, Community Supported Agriculture and small-scale organic producers (McMichael, 2009; Sage, 2014). This research focuses on food sovereignty as it is the most prominent political food counter-movement (Holt Giménez, 2010). Food sovereignty is introduced and analysed in a later section, but Table 4 provides a selected overview of the differences between modernisation theories, which are generally considered to be part of the theories advocating agro-industrialisation, and food sovereignty.

Table 4 Selected overview of factors in liberal and food sovereignty governance frames

Factors	**Liberal**	**Food sovereignty**
Mutual relations between direct producers	Competition	Collaboration and reciprocity
Driving forces	Markets, technologies, agricultural policies	Community governance of local food systems
Nature of driving forces	External to agricultural sector	Food citizenship
Central actors	Agricultural entrepreneurs	Small-scale farmers and communities in local food systems
Location of growth potential	Mostly, if not exclusively, in large farms	Small-scale farmers
Origin of food	Food from nowhere specifically	Local food takes priority

Source: adapted from Ploeg, 2017

Food sovereignty is not against development or processes of modernisation. Instead, modernisation theories assume certain processes of development and predict specific outcomes, which food sovereignty criticises while providing alternative pathways of development. The governance of modernisation theories places the markets centrally, with a critical role for competition between producers and distributors. Drivers, such as markets and technologies, come from outside of the agricultural sector, and external drivers are the main determinants of the configuration of the agricultural sector. The production landscape is dominated by 'agripreneurs' on large farms. For consumers, food might come from around the world and indicates, on the one hand increased choice, and on the other hand the spatial, economic, and social distances in diets. Food sovereignty opposes this and places the democratisation of food systems central while envisioning local, small-scale and agro-ecologically produced food. The main drivers determining the agricultural sector are communities themselves, with investments that originate locally and that drive the small-scale farms. Within diets, local food is prioritised (Dekeyser, 2014).

[25] For criticisms to these assumptions of a 'catastrophic agro-industrialisation' and a 'historical threshold', see Jansen (2015).

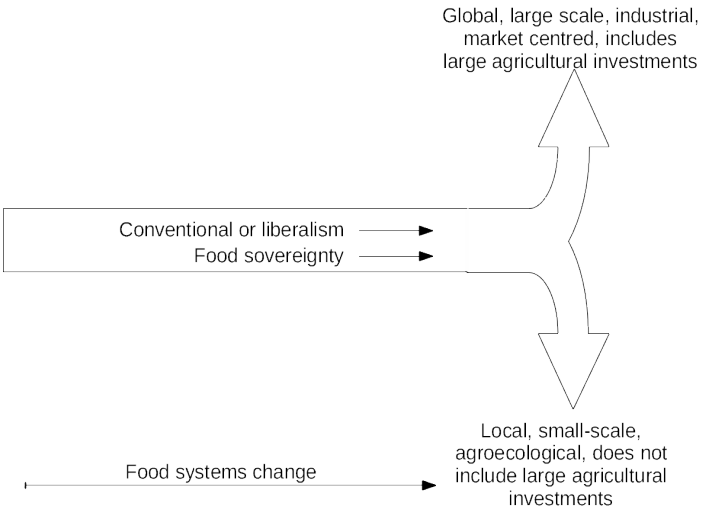

Fig. 6 Diverging pathways of food systems change in the third food regime

In short, IFR theory analyses historical periods of food regimes and discusses an emerging regime that envisions two competing pathways. Each pathway is characterised by opposing dynamics such as space (global-local), power (corporate-democracy), scale (large-small), production (industrial-agroecological), and drivers (capital-community).[26] It explicitly positions itself against linear modernisation theories (McMichael, 2016). The dominance of either dynamic is not clear and, therefore, the outcome of food systems change is not determined. In comparison with modernisation theories, IFR theory does consider the possibility of alternative pathways, such as symbiosis between the two proposed pathways (Friedmann, 2016). These two theories explain and predict food systems change. Within both theories, the debate over LAIs is central to the future of SSA's food systems as it influences land, control, and the place of small-scale farmers (McMichael, 2015b).

3 Large agricultural investments in Sub-Saharan Africa (2000-17)

3.1 Introduction to large agricultural investments

An increase in the price and volatility of agricultural commodities stimulated an increase of LAIs projects. The LAIs are '*…transfers of rights to use, control, or own land from smallholder households or communities to corporate actors… through sale, lease, or concession of areas larger than 200 ha*' (Oberlack et al., 2016, p. 154), or in which these corporate actors *'…employ much more hired than family labour and practise clear labour division within a management hierarchy'* (Smalley & Corbera, 2012, p. 1040). The LAIs involves acquisitions of land, mostly in developing countries, and this has caused a debate concerning the impacts and benefits for local communities. Within the wave of LAIs, land rights for over 42.2 million ha worldwide were transferred between

[26] Locally, food systems can have any combination of these factors, or more factors.

2000-16 (Nolte et al., 2016), which is a much higher rate of land transfer than was evident in past decades (Deininger, 2011). Even as the transfer of land rights in Eurasia increases (Land Matrix, 2017; Visser & Spoor, 2011), Africa is the largest recipient of LAIs with 10 million ha in concluded deals that are mainly focused on food crops and agrofuels (Cotula, 2013; The Economist, 2014).

A transfer of ownership is rare; most of these land deals are leases with a duration that is up to 50 or 99 years (Cotula, 2013). The attention of investors in Africa is driven by the large amount of perceived available land and weak land rights (Deininger, 2011).[27] Other drivers include increased demand and prices for food, energy systems transitions, biodiversity conservation, climate change responses, geopolitics and development strategies (Oberlack et al., 2016). In SSA, LAIs are a driver of specific land-use change. This land-use change can either shift food crops from self-consumption to cash crops, food crops to biofuels, or convert non-food lands such as forests to food production or biofuels (Borras & Franco, 2012). The LAIs are associated with business models that range from independent farmers, cooperatives, 1000-day speculative farming, asset management, contracting, and agribusiness models (Boche & Anseeuw, 2013). These business models are '…*frequently associated with industrial agricultural production methods, dominated by transnational corporations producing for export'* (Clapp, 2015, p. 307).

Initially, media outlets published their concerns that 'finance-poor, resource-rich' and often food deficient countries lease land to investors from 'finance-rich, resource-poor' countries (Borras & Franco, 2012; The Guardian, 2008, 2009). These concerns contributed to the ample attention that the 'land grab'[28] dynamic received in civil society, academia, and international institutions such as the World Bank, with reports and academic special issues dedicated to the topic. The name LAI instead of land grab is used as land grab rarely captures the complexity of the current surge in agricultural investments (Hall, 2011). However, land transferred to international investors still takes a central position in the current LAI debate. The governments of some developing countries saw the increase of investors in the agricultural commodity market as an opportunity to attract capital to their agricultural sectors and support rural development. Their agricultural sectors often bore a high yield gap and dwindling public investments for decades (Deininger & Xia, 2016). For investors, the support of the authorities is essential and there is almost always a close relationship with the national governments (Borras & Franco, 2012). The support of the government makes land deals, while frequently unfair and at times mired in corruption, almost always legal (Kaag & Zoomers, 2014; Smalley & Corbera, 2012). Within the LAIs dynamic, some governments themselves are active investors in foreign agricultural sectors and land. Gulf states, with the 2007-08 food price crisis and the presumed end of cheap food in mind, sought to acquire land in Africa, the 'last frontier', to decrease their reliance on the international markets and ensure food security of their growing population. However, the largest group of investors are not related to governments. The primary types of investor worldwide and in Africa are private companies (45% of total area worldwide) and stock exchange-listed companies (32%) (Nolte et al., 2016).

The favourable investment opportunities attracted international capital from a range of regions and financial institutions that were interested in production, speculation, and diversification of their portfolios. Land is especially an attractive investment as it is both a productive asset and an object with speculative potential (Clapp,

[27] Certain parts of Africa were branded as containing large tracts of unused land that suits agriculture and thus available for investors. This narrative of 'empty' land overlooked incomplete land records and the amount of land without (informal) ownership is quite limited (Deininger & Xia, 2016). Regarding weak land rights, Deininger (2011) found an association between a low recognition of land rights in a country and a high demand by investors for land.

[28] A popular term to denote the large agricultural investments that involved land dispossessions.

2014a; Isakson, 2014), but also for diversification as these investments are lowly correlated with volatile equity markets (Cotula, 2012). Land investments are attractive partly because the land is subsidised, as much of the land transferred is undervalued or free, and investments might not be profitable if the land were valued accurately (Li, 2011). Investors speculate on land, but the rights and access to water that are often tied to land transfers become increasingly important as well, which prompts concerns over 'water grabbing'.

The LAIs are not purely speculative, but include productive projects as well. For example, Southeast Asian companies' eye African land for palm oil as land prices are considerably cheaper, or there is less regulation than in their region. A large share of investment comes from the same continent, and South African investors are especially active in Southern Africa. But the main foreign actors in African international land transfers are Europeans, intertwining current land transfers with a long colonial history of exploitation, including plantations (Cotula, 2013). However, national investors are estimated to be the most important players in the number and size of land deals (Deininger & Byerlee, 2011). While the diaspora takes part in land deals as they acquire land in their country of origin or support family members' expansion of land through remittances, the key roles in both domestic and international deals are for the national and urban elites (Cotula, 2012). The dominance of national investors is more difficult to detect than international investors, which is reflected in the media and literature attention they receive. Regardless of the origin of investors, the surge of LAIs in African land started a debate on the advantages and disadvantages of the LAIs, especially to its immediate communities and their food security, livelihoods, and control over food and markets. The supporters of these investments argue their possible positive impacts on livelihoods provision and food security, while opponents worry about a loss of sovereignty and an increased dependency on food imports over time.

3.2 The consequences of large agricultural investments

3.2.1 Advantages

Within the LAIs debate, proponents argue the opportunities that LAIs can bring to local communities and rural development through a greater access to capital, technology, knowledge and markets, while LAIs projects can contribute to GDP growth and government revenue at the national level (Cotula et al., 2009; Deininger & Xia, 2016). For the local government, a land tax derived from LAIs can be a great source of revenue. The LAIs can provide public goods and social services to the local communities through Corporate Social Responsibility, such as infrastructure, health facilities, or schools (De Schutter, 2011). The World Bank suggests that LAIs can reduce poverty through wage employment, out-growers or contract schemes, and payment for leasing or buying land. When LAIs produce food, they can contribute to a growing population's food security (Deininger & Byerlee, 2011). When LAIs promise employment opportunities or out-growers and contract schemes, the local communities can be eager to welcome the LAIs, especially those without access to land (Hall et al., 2015). Where rural areas often have limited off-farm opportunities, the employment generated by LAIs can diversify the livelihood choices. As small-scale farmers in most LAIs recipient countries only use a quarter of their production potential, spill-overs from the LAIs can contribute to a decrease of the high yield gap of African farmers (Deininger, 2011).

Access to financial tools and markets promises to bring efficiency gains and facilitate more efficient risk management for farmers (Clapp, 2014a, 2015). There is concern about whether the LAIs provide these advantages.

Many of the promises of rural development, employment, and corporate social responsibility were not kept or did not materialise. In the first place, many LAIs projects failed implementation. Second, governments found it difficult to enforce agreements when the land was already transferred (Deininger, 2011). The employment generation depends on the type of farming operations, while many of the LAIs prefer capital-intensive plantations that require fewer labourers rather than labour-intensive out-grower schemes. Even then, the wage itself becomes a source of contention (Lanari, Liniger, & Kiteme, 2016). The replacement of small-scale farmers with capital-intensive crops can diminish employment by 75% (Nolte et al., 2016). Furthermore, the amount of proclaimed 'available' or 'free' land in Africa might be much lower than assumed or promoted (Deininger, 2011). The loss of land for local communities can impact their food security while the LAIs can undermine local businesses and cause environmental damage (Cotula et al., 2009). The farmers displaced by LAIs can open new spaces for agricultural production which pushes the agricultural frontier into forest lands or lands marginally suited to agriculture. The LAIs and local communities frequently compete for access to the same resources that are already under increased pressure from either population growth or environmental degradation.

3.2.2 Disadvantages

There are doubts about whether the recipient countries have the capacity to manage these land deals (De Schutter, 2011). This lack of capacity can '*…imply that the risks associated with such investments are immense*' (Deininger, 2011, p. 244). Land rights in Africa are often vague, which heightens the risk of conflicts between local communities and investors. Customary mechanisms govern land access of up to 80% of African users and, besides providing a locally recognised framework where formal legal instruments are frequently lacking, can deliver secure and long-term land rights. However, unclear land demarcation and land rights coupled with overlapping customary and formal legal frameworks also add to an increase in ethnic and indigenous land conflicts (Anseeuw & Alden, 2010). The land rights in Africa are not static, as small-scale farmers engage in a land market themselves (Christiaensen, 2017; Deininger, Savastano, & Xia, 2017). But when a traditional land custodian sells land without community approval, customary relationships come under stress (Cotula, 2013). The investors are rarely interested in marginal lands but prefer those with fertile soils, irrigation potential, infrastructure and access to markets, which are already under pressure from other sectors such as mining. The most substantial strain might come from a rapidly growing population, with Africa having the highest population growth rate in the world for the past five decades (ILO, 2017; Rakotoarisoa, Iafrate, & Paschali, 2011). The LAIs exacerbate these pressures as it traverses with formal, customary, ethnic and historical relationships within a changing rural landscape. For the local communities, who wins and who loses from LAIs is differentiated by class, gender, education, age, nationality, and religion.

Furthermore, local communities might be excluded from the negotiations concerning the transfer of the lands they live and work on (Cotula et al., 2009). The national land laws might be well developed and incorporate customary tenure, such as in Mozambique, but this does not necessarily translate into implementation and protection of local communities and customary rights in practice. Understaffed government departments may be unable to process the applications thoroughly and have little data on land usage, low capacity to monitor the promises and outcomes of projects, and an inadequate legal system when disputes arise (De Schutter, 2011). The state can

be both a protector and perpetrator in unfair land dispossession (Milgroom, 2015). International institutions, such as the FAO and the World Bank, reacted to the concerns over the unfair processes and impacts of LAIs through the development of voluntary guidelines. Thus far, the objectives and impact of these guidelines are contested. The Principles for Responsible Agricultural Investment that Respect Rights, Livelihoods and Resources (UNCTAD, FAO, IFAD, & WB, 2010) are criticised for failing to protect livelihoods (De Schutter, 2011; Stephens, 2013) and are seen as a framework of self-regulation for investors that legitimises LAIs. Alternatively, the Committee on World Food Security developed the Principles for Responsible Investment in Agriculture and Food Systems, which is based on a human rights framework and offers a more comprehensive approach to natural resource rights (CFS, 2014). However, the effect of both guidelines on the ground is unclear (Milgroom, 2015). While LAIs are actively supported by numerous governments of receiving countries, they can have a profound impact on local food systems, such as access to land and food security (UNAC & GRAIN, 2015). In short, *'...unclear or duplicative institutional responsibilities, neglect of environmental and social issues in project preparation, failure to monitor and enforce agreements, and insufficient attention to checking economic viability often lead to very negative impacts on the ground'* (Deininger, 2011, p. 218).

3.3 The large agricultural investment dynamic today

Currently, the general view is that the LAIs followed a boom-bust cycle with a peak after the 2007-08 food price crisis (Arezki, Deininger, & Selod, 2015). Kaag and Zoomers (2014) named both the rush towards land and its media attention a hype. The area of African land and number of deals under negotiation and cancelled is multiple times higher than the area of cultivated land or the concluded deals (Nolte et al., 2016). Some governments reacted to the many failings by imposing a moratorium on large land deals or made it more difficult to obtain leases while they cancelled some projects that did not implement their pledges. The failure of many projects is a combination of declining pull and push factors. On the finance side, capital was less freely available after the 2008 financial crisis. The biofuels lost much of their appeal when the oil price dropped, with the collapse of the heralded jatropha projects as most notable example. Overall, the land rush is smaller than initially presented, but its scale is still large. According to the World Bank, those projects that fail can still create negative effects for local communities and the environment (Deininger & Byerlee, 2011), for example by increasing land pressure. '*We can conclude that there is underperformance in terms of positive effects and a growing consensus that the negative impact for local groups should not be underestimated*' (Kaag & Zoomers, 2014, p. 216). In short, the debate on LAIs focusses on local land rights, human rights violations of land dispossession, the impact on local communities and the environment, and the overarching unequal power relationship between locals and international investors or domestic elites. Kaag and Zoomer (2014) argue that African land dispossession by foreigners is nothing new and dates back to the European colonisation. The current wave of LAIs fits a neo-colonial dynamic of resource grabbing and dispossession, but one in which southern countries and elites take a stronger role. While local communities can be eager to welcome and engage with LAIs that need community labour (Hall et al., 2015), the working conditions and wages can be a source of contention (Lanari et al., 2016). The possible impacts of LAIs on the local farmers is summarised by Deininger and Xia as '*While, in principle, investments in large production units or higher up in the agricultural value chain can have very positive effects on neighboring small farmers,*

systematic evidence of the size of such effects remains scant, limiting the scope for evidence-based policy-making' (Deininger & Xia, 2016, p. 228).

3.4 Summary of large agricultural investments

Relevant to both Modernisation theories and IFR theory, the LAIs insert issues related to financialisation and concentration of land and money into food systems already undergoing rapid transitions. First, the LAIs are driven by an influx of capital in the commodity markets, which operate against a backdrop of 'financialisation', or the increased importance of capital in the food systems that shifts power towards financial actors. Second, the 'supermarket revolution' reshapes the food markets as global retailers increase their share of food expenditure and through their dominant position restructure agro-supply chains. The small-scale farmers have difficulties supplying food to these agro-supply chains at a price, quality, and scale that is demanded. The LAIs and their preferred production systems of capital-intensive crops and orientation towards export fit the requirements to access the global supply chains rather than small-scale farmers, and thus integrate new southern sites of production into the global food system. The dynamics of concentration and financialisation shape the food systems and the conditions of the LAIs. For Modernisation theory, these changes are desirable as it fits within a market-driven model of agro-modernisation. For IFR theory, the LAIs are a crossroad that converts small-scale production and local markets into large-scale and global markets. World capitalism is integrating peripheral areas into the global market but is only interested in those parts that contribute to accumulation. For some LAIs, such as those that focus on labour-intensive crops, the nearby communities are important for their labour. If the crops are not labour intensive, the nearby communities and its labour are left out (Li, 2011). Alternatively, food sovereignty presents a diverging direction in food governance by placing small-scale farmers and the local market central. For the food sovereignty proponents, the LAIs are a modern continuation of colonial dispossession. The next section introduces, unpacks and develops the concept of food sovereignty as one of the most prominent alternative frameworks to Modernisation theory.

4 Food sovereignty: shifting debates on democratic food governance[29]

4.1 Introduction

The concept of food sovereignty emerges as part of the critical debate around food governance and food security at local and international levels. Current industrial food systems are often criticised for their negative impact on society and the environment, including human health, biodiversity loss, climate change, and limited

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food accessibility for the poorest segment of the population (Chappell et al., 2013; FAO, 2015; Pelletier et al., 2011). Against this backdrop, food sovereignty is presented as an alternative model based on the democratisation of food systems and the inclusion of small-scale farmers and sustainable production. Initially developed by farmers and civil society, the concept became increasingly popular among governments, academia, and international institutions such as the United Nations (UN) and the Food and Agriculture Organisation (FAO). Legislation that embraces food sovereignty principles has been adopted in 15 countries and incorporated into the constitutions of countries such as Bolivia, Venezuela, Mali, Senegal and Nepal (Godek, 2015; Schiavoni, 2017). It became the key slogan for one of the most important transnational social movements in the world, La Vía Campesina (LVC), which first introduced the food sovereignty concept in 1996 (Martínez-Torres & Rosset, 2010). In this section we unpack food sovereignty to present its current status followed by a historical overview that portrays its evolution. Second, we critically engage with the most important current debates and discuss the latest developments in the evolution of food sovereignty. In the end, we discuss the development and future trajectories of food sovereignty.

4.2 Unpacking food sovereignty

4.2.1 The pillars of food sovereignty

The concept of food sovereignty is associated with the right to food (RtF) and food justice (Rosset, 2003). Each concept has a specific perspective on how to achieve food security, yet they all share a call for reconnecting local and global food security, social justice, and citizens' participation in food governance. Within these debates, a number of social movements have taken a leading role. The most prominent member and driving force of the food sovereignty movement is LVC, which claims to represent between 200 and 500 million members worldwide through its 164 participating organisations (LVC, 2017; Martínez-Torres & Rosset, 2010, 2014). To date, food sovereignty is '…*at once a slogan, a paradigm, a mix of practical policies, a movement and a utopian aspiration*' (Edelman, 2014, p. 960). A diverse group uses food sovereignty for different roles, which leads to various interpretations that at times complement or contradict each other. Environmental groups embrace the idea of food sovereignty for its sustainable production methods through agroecology, while farmer unions support the focus on farmers' rights. Development organisations and North-South solidarity groups use food sovereignty thought for solutions to food insecurity and the protection of livelihoods, and policymakers take inspiration for a greater intervening role for agricultural policies. These different interpretations can conflict with each other and it is not yet clear how food sovereignty as a concept can balance these multiple expectations. In this section we present and unpack the food sovereignty definition and pillars from the Nyéléni Declaration of 2007. The Nyéléni Declaration was the outcome of a large summit of the food sovereignty movement in Mali that laid the foundations for the food sovereignty program and is still the most used definition of food sovereignty to date. We unpack the Nyéléni definition along its four main components, which include the importance of rights, the issue of how power is exercised, the importance of spatial dimensions (especially the localisation of production) and the distribution of resources. We critically engage with the Nyéléni definition and program in later sections.

– **Right** '*Food sovereignty is 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 agriculture systems*.

– **Power** *It puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. […] It offers a strategy to resist and dismantle the current corporate trade and food regime, and proposes directions for food, farming, pastoral and fisheries systems determined by local producers*.

– **Space** *Food sovereignty prioritises local and national economies and markets and empowers peasant and family farmer-driven agriculture, artisanal fishing, pastoralist-led grazing, and food production, distribution and consumption based on environmental, social and economic sustainability*.

– **Distribution** *Food sovereignty promotes transparent trade that guarantees just income to all peoples and the rights of consumers to control their food and nutrition. It ensures that the rights to use and manage our lands, territories, waters, seeds, livestock and biodiversity are in the hands of those of us who produce food. Food sovereignty implies new social relations free of oppression and inequality between men and women, peoples, racial groups, social classes and generations*' (Nyéléni, 2007, p. 9).

This Nyéléni definition was translated into six pillars that represent the common framework and the collective vision of the movement (Schiavoni, 2015). These pillars are (1) Food for people, (2) Values food providers, (3) Localised food, (4) Local food control, (5) Building knowledge and skills and (6) Agroecology (Nyéléni, 2007). Table 1 presents the Nyéléni pillars. The first pillar states the right to sufficient, healthy, and culturally appropriate food for all individuals and communities, and rejection of the concept of food as a mere commodity. The RtF is a law-based request for states and communities to '*…respect, protect, and fulfil [an individual's] needs for appropriate access to sufficient food of an acceptable quality*' (Windfuhr & Jonsén, 2005, p. 19). This right to food was adopted by UN agencies dating back to 1999 (UNHR, 2010). For the food sovereignty movement this includes a rejection of the liberalisation agreements of the World Trade Organisation (WTO), which shrinks the ability of states to develop their own agricultural policies, and to support their producers (Weis, 2007). This limitation of state power by the WTO hinders solutions to food insecurity. Widespread food insecurity in a world capable of producing food for a population double its size (UNDP, 2008), is '*…a violation of human rights*' (Ziegler, 2008, p. 5). The second pillar respects and supports the rights and roles of small-scale farmers who cultivate, grow, harvest, and process food. It defends the agrarian rights of small-scale farmers, which include access to water, land, and markets. This pillar resists the unequal power of small-scale farmers versus transnational food corporations or 'food giants' in local and global markets. A topic of resistance is the food import dependency in developing countries that follows the dumping of food sponsored by the Common Agricultural Policy or the United States of America (USA) agricultural subsidies (Obenchain & Arlene, 2015; Patel, 2008).

Third, food producers and consumers are brought together in localised food systems as food sovereignty prioritises local markets over global ones, without the rejection of international trade itself (Burnett & Murphy, 2014). Although the majority of food is produced and consumed locally, food trade rules are designed to enhance and protect international trade (Mckeon, 2015; Windfuhr & Jonsén, 2005), creating 'poverty traps' (Chappell et al., 2013). According to food sovereignty and the recent 'locavores' movement, a localised food system leads to higher quality, more sustainable, and fairer food systems (Cleveland, Carruth, & Mazaroli, 2015). These 're-embedded' spaces (Kneafsey, 2010) can also offer opportunities for greater citizens participation (Sage, 2014).

Table 5 Pillars of food sovereignty

Pillars	Description
Food for people	People have the right to healthy and culturally appropriate food.
Values food providers	The aspirations, needs and livelihoods of those who produce, distribute, and consume food are placed at the heart of food systems and policies.
Localised food	Local food production and consumption are prioritised in localised food systems.
Local food control	Food producers have a level of control over the resources needed to produce, while localised food systems are governed by communities and peoples.
Building knowledge and skills	Knowledge is spread through farmer knowledge networks on a peer-to-peer basis.
Agroecology	Agroecology is endorsed for its sustainable methods in producing food and its benefits to communities and the environment.

Source: adapted from Nyéléni, 2007

Fourth, the local community is the main level of decision making and places the control and access to the means of production in the hands of local producers (Beauregard, 2009; Edelman, 2014). Control and access to the means of production are both an outcome and an instrument for implementing the food sovereignty program. Access to land is fundamental to food sovereignty (McMichael, 2015b) and is increasingly under pressure. Urbanisation and other economic sectors compete for similar resources, including the replacement of food crops by export crops in the land grab debate (Deininger, 2011; Deininger & Xia, 2016; Hall et al., 2015). The political institutions required for this control are still debated, although polycentric approaches such as open source licences for seed development are proposed (Kloppenburg, 2014). Fifth, knowledge and skills are constructed, distributed, and received by farmer networks. Within these networks, farmers who design solutions to common problems promote them to their peers. This social construction and distribution protect the knowledge from privatisation and intellectual property rights. The knowledge is shared and belongs to everyone rather than specifically to any farmer (Martínez-Torres & Rosset, 2014). Sixth, agroecology studies the ecology of food systems (Francis et al., 2003), and forwards a production method that mimics natural ecosystems in farming. Its core principles include diversification, recycling and optimising interactions in the farming system (Altieri & Toledo, 2011) and increases biodiversity, which is considered crucial for the future of agriculture (Chappell et al., 2013). The agroecological movement aims to shift the industrial production model towards small-scale production that minimises external inputs (Chaifetz & Jagger, 2014), as this contributes to social benefits such as broader economic development (De Schutter, 2010). More than a sustainable production method, agroecology is a social process as it is farmers that drive the creation of knowledge, distribution and reception while they gain greater control and access to inputs and production methods. These six pillars form the founding principles of the food sovereignty program. The next section briefly presents the history of food sovereignty and LVC.

4.2.2 The roots of food sovereignty

The earliest roots of food sovereignty date back to the mid-twentieth century. After the post-WWII food policy of the 'right to food' and the Cold War's 'right to freedom from hunger' (Chaifetz & Jagger, 2014; Patel, 2013), a 1983 Mexican government program[30] used '*soberania alimentaria*' to reduce dependencies as it aimed to improve self-sufficiency and national control over the food chain. This 'pre-food sovereignty' peaked in 1987,

[30] Programa Nacional de Alimentación (Edelman, 2014).

with '*autonomía alimentaria*' used later by Costa Rican activists to promote sovereignty in exports (Edelman, 2014). In the 1980s, Latin America adopted neoliberal policies that eroded the state's power to intervene in its agricultural sector. The globally fragmented small-scale farmer organisations reacted to this diminished role of their states by taking their struggles to the international level (Desmarais, 2007; Martínez-Torres & Rosset, 2010). Small-scale farmers' organisations developed international connections as they adopted a frame of common struggle, and a 1992 meeting in Nicaragua saw organisations from Central America, Europe, Canada, and the USA debate the need for transnational small-scale farmers solidarity (Desmarais, 2007). In 1993, these debates resulted in the creation of the 'movement of organisations', LVC, translated as 'The Peasant Way' (Holt-Giménez, 2009). Particularly, the 1994 Uruguay Round of the General Agreement on Tariffs and Trade strengthened the bonds between northern and southern farmers against neoliberalism. In those early years, LVC started to represent small-scale farmers far and wide as it progressively gained access to global agrarian policy forums, while it continued to distance itself from non-political NGOs and international organisations that did not share its radical ideas (Desmarais, 2007).

In 1996, LVC developed the first interpretation of food sovereignty as '*The right of each nation to maintain and develop its own capacity to produce its basic food, respecting cultural and productive diversity. We have the right to produce our own food in our own territory. Food sovereignty is a precondition to genuine food security*' (LVC, 1996, p. 1). At that point, LVC protested not only an increased liberalisation of their respective countries' agricultural sector but presented an alternative direction in food governance. The newly formed LVC brought, through food sovereignty, the century-old question of the position of small-scale farmer back to the forefront: are small-scale farmers bound to disappear in the historical march to industrialisation (Bernstein, 2014) or will they be allowed to adapt and carry on feeding the world?[31] LVC chooses the latter (Agarwal, 2014). From 2000 onward, LVC formed relationships and alliances with other groups and organisations such as the World Social Forum and the FAO, but it refuses to engage with the WTO and the World Bank. Hence, LVC became a key international player and rallies diverse groups and organisations under the banner of food sovereignty (Martínez-Torres & Rosset, 2010). As its international profile grew, LVC deepened its internal organisational structure to absorb its many new members while changing and enriching the food sovereignty definition and program at the 2007 Nyéléni meeting (see Table 1). The changes in food sovereignty thought from 1996 to 2007 included a shift of the sovereign position from the national level to the peoples or communities, a condemnation of large food corporations and a call to end all gender violence (Nyéléni, 2007). Today, academics and policymakers take part in the process of forming food sovereignty.[32] This influences debate on the flexibility and contradictions of food sovereignty, as well as the development of the 'next generation of food sovereignty'.

[31] Small-scale farmers deliver as high as 90% of all food production in African countries (Holt-Giménez, 2009).

[32] One of the drivers of these debates is a series of conferences organised at Yale University (2013) and the International Institute of Social Studies (2014) which captured academics and activists' concerns with food sovereignty, resulting in special issues of the Journal of Peasant Studies (2014), Globalizations (2015), and Third World Quarterly (2015).

4.3 Current debates in food sovereignty

Farmers' organisations, policymakers, international institutions, academics, environmental and development organisations inserted food sovereignty into the debates on food security and food systems. All these stakeholders can recognise their needs and values in the 'big tent' concept of food sovereignty, but their different interpretations may have inconsistencies with each other (Patel, 2009). In this section, we review the most recent and important debates. The food sovereignty movement criticises industrial food governance and proposes a radical alternative, but the fast changes in agriculture and the heterogeneity of the actors involved with food systems contribute to more complex agricultural landscapes. It is not clear how food sovereignty can be a guiding paradigm for all in this complexity. We group these debates into two main categories. The first deals with the organisation of food sovereignty, such as rule enforcement. Second, we contribute to the debate on the values of food sovereignty, such as pluralism within food sovereignty. We conclude with a reflection on the need for precision versus flexibility within food sovereignty.

4.3.1 Organising food sovereignty

Identity of the sovereign

Who is to be sovereign in food sovereignty? The definition of sovereign shifted from the original focus on the nation towards peoples or communities. In 1996, LVC's definition identified the nation as the level on which to organise food sovereignty, which was a reaction to diminished national agricultural sovereignty after the 1994 WTO's Agreement on Agriculture (AoA) (Agarwal, 2014; Desmarais, 2007). Recognising that the state was regularly infringing peasant's rights, the 2007 Nyéléni Declaration identified the 'peoples' and 'communities' as sovereign as food sovereignty became *'The rights of peoples… to define their food and agricultural systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems...'* (Nyéléni, 2007, p. 9). Such a broad interpretation places everyone at the heart of food systems, as everyone, in one way or another, at least consumes food. But more problematic is that it includes everyone without a specific distinction of scale, thus bringing the large-scale landowners and distributors, whom food sovereignty rails against, to the decision-making table (Patel, 2009).

Governing and rule enforcement

The idea of food sovereignty protests against the concentration of power in large, vertically integrated corporations, and proposes *'…a narrative about returning decision-making control to producers and consumers in the food system to mitigate the negative externalities of capital and state control of food, including hunger and food insecurity'* (Trauger, 2014, p. 1147). This self-governance of communities, tribes, and groups over their food systems ensures that power over food is controlled by those most involved and affected by its production, distribution, and consumption. The proposed decision-making structures are organised around local, self-organising bodies such as communities, groups, or individuals with their relevant organisation forms such as food councils and traditional leadership, which can form part of networks with multiple and overlapping sovereignties (Trauger, 2014). These networks might form a (con-) federation that would deal with the workings and conflicts of one sovereign group or level with another. However, the food sovereignty program includes strong views on farm sizes, property relations, production methods, and market relations, to name a few. Opposition to these views is

expected when evidence suggests, for example, class differentiation within small-scale or family-based communities in commodity relations (Jansen, 2015; Park, White, & Julia, 2015). Strong regulatory mechanisms are required, and it is questionable that voluntary associations will have the power to enforce them outside of the state.

The state in food sovereignty

We approach the role of the state here in two ways: first, what role could the state play in a food sovereignty society, and second, what are the current outcomes when the state engages in the food sovereignty process through legislation? First, the role of the state remains uncertain and is noted as the 'elephant in the room' (Bernstein, 2014), seen as an obstacle to food sovereignty (Clark, 2016) or, until recently, has just not received much attention (Schiavoni, 2017). This is in contradiction to the rather large role that the state should take in a food sovereignty society. The program of food sovereignty requires an active and strong state for its extensive agrarian reform, but its proposed devolution of powers to peoples and communities can paradoxically weaken the central state (Trauger, 2014). The reliance on the state as the ultimate enforcer of rules might lead to an uneasy relationship, as it should support food sovereignty groups that can contradict its interests (McMichael, 2015b). Ideally, the interactions between the state and civil society should create a 'state society' synergy that is mutually reinforcing and would enable systemic change or reform (Schiavoni, 2017). As the food sovereignty movement regards food as embedded in complex adaptive systems that operate at different scales, the state should recognise the 'multiple sovereignties' that food sovereignty groups hold in these overlapping scales, which could cross local, national, or international levels (Iles & Montenegro de Wit, 2015; Schiavoni, 2015). Ultimately, a 'partner state' (Clark, 2016) should distribute power to communities and create the conditions necessary for the food sovereignty communities to function.

Second, food sovereignty legislation has been adopted by 15 countries worldwide with the Latin America region pioneering the most advanced food sovereignty policies (Godek, 2015; Schiavoni, 2017). Bolivia and Venezuela wrote food sovereignty principles into their constitutions of 2009 and 1999, respectively, but the actions these states took depended on their divergent interpretations of food sovereignty. The Bolivian food sovereignty program builds on the national state as it incorporates food sovereignty into the larger strategy of Bolivia's decolonisation, with land redistribution and support for small-scale farmers and their markets. In Venezuela, the objective of the state is to decrease its very high food import dependency and rebuild its national agricultural system (Kappeler, 2013). Venezuela decentralised powers to the community level in order to create a sovereign space for local communities and included an agrarian policy that limits the size of landholdings, taxes unused property, redistributes fallow land to small-scale farmers and subsidises food. The Venezuelan food sovereignty program enables local *comunas* councils to govern their food systems, thus structurally transforming power relations through institutional changes. Bolivia, on the other hand, bypassed meaningful land reform as it distributed forest reserves to small-scale farmers rather than addressing its large farm holdings (McKay, Nehring, & Walsh-dilley, 2014). This is not to say that Venezuela's food sovereignty program is not without many shortcomings. For example, the state reduced undernourishment by relying on food imports rather than increases in (small-scale) production and reinforced state farms instead of small-scale farmers (Kappeler, 2013). This signals a priority for food security through imports instead of food sovereignty (Schiavoni, 2015).

In the countries where the state takes part in a food sovereignty process, civil society has sought partnerships with progressive elements of the state. While '*The state cannot stand alone on food sovereignty, and neither*

can local communities, groups, or peoples' (McKay et al., 2014, p. 1117), the role of the state in food sovereignty itself is still under discussion.

Property relations in food sovereignty

For the food sovereignty project, access to land is fundamental as both a space to implement parts of its program and as a mobilising force for land activists (McMichael, 2015b). The food sovereignty literature prioritises 'access', 'sharing' and 'rights to use' (Trauger, 2014), thus preferring a collective rather than individual ownership. The potential benefits of collective ownership are labour specialisation or pooling of access to inputs and markets (Agarwal, 2014). However, the rights of individuals versus the collective and the form of ownership structures are left for the peoples and community to decide. The proposed ownership structures include cooperatives, collectives, customary law, individual ownership, or any combinations of these. But the collective rights can create tensions such as between farmers that already have access to land and those that have not. Even the food sovereignty movement itself has both wealthy farmers that are not supportive of redistributive land reform and landless groups that demand it. Furthermore, it is not clear if farm workers are considered 'landless' and in need of access to land (Patel, 2009).

Food security and food sovereignty

Food security and the RtF are distinguished from food sovereignty as '*While food security is more of a technical concept, and the RtF a legal one, food sovereignty is essentially a political concept*' (Windfuhr & Jonsén, 2005, p. 15). At its launch, the proponents of food sovereignty opposed food security as it was perceived to have a more technical than political approach and in favour of international trade (Hopma & Woods, 2014; R. P. Lee, 2013). Crucially, the food sovereignty movement finds that food security lacks an answer to how it is achieved. Later on, the food sovereignty movement recaptured the concept of food security as it proclaimed food sovereignty necessary to achieve 'true and sustainable' food security (Patel, 2009). Perhaps it was easier to recapture the master frame of food security than to ignore or oppose it (Clapp, 2014b; Duncan, 2015).Currently, the food sovereignty movement uses food security as an objective but distances itself from approaches that do not place small-scale farmers centrally. While the idea of food sovereignty criticises the individual focus of food security, it has paid more attention to the food security of producers and less so towards those (poor) households that depend on the market for their food, or the impacts of gender, age, and class on food access (Clapp, 2014b).

4.3.2 Values

Autonomy

Autonomy is approached as the outcome of food sovereignty and an instrument to implement the food sovereignty program. First of all, the idea of food sovereignty enshrines the autonomy of peoples and communities to define their food and agricultural systems, which can be interactively shaped with the state or other societal actors such as educational programs (Meek et al., 2017; Schiavoni, 2017). However, food sovereignty also includes strong calls for gender egalitarianism, agroecology and prioritising local food and consumption. The assumption that peoples or communities are interested in all of the fundamentals of the food sovereignty program is criticised by Bernstein (Bernstein, 2014) as 'agrarian populism' for idealising small-scale farmer communities as sustainable or just. While agroecology is a cornerstone of the food sovereignty program, it is questionable that

small-scale farmers will logically choose agroecological production methods over industrial ones. The assumption of the food sovereignty movement for agroecology disregards the limited choices that force peripheral producers into labour-intensive agriculture and ignores the capacity, or willingness, of conscious farmers to choose other production methods. A sovereign community might choose to adopt genetically modified organisms or abandon farming altogether for another activity on the land. Even some LVC members have an explicit industrial agenda (Jansen, 2015). Farmers may or may not (autonomously) prioritise long-distance trade if this is to their benefit, or if this enhances their food security and dietary needs with products outside their local food systems or season. Fundamentally, it is not specified if only a selection of the food sovereignty program can be adopted rather than the whole concept, and how a conflict between different elements of the program will be handled. It is rarely questioned if there is a contradiction between the solidarity vision of food sovereignty and an individual farmer's right (Iles & Montenegro de Wit, 2015).

Pluralism

Proponents of food sovereignty advance the democratic control of localised food systems to achieve food security with sustainable production. Currently, most agrarian systems already have a combination of local control, localisation, food security, sustainability, or industrialisation. As the food sovereignty narrative of a 'global food system in crisis' might not be manifested everywhere, many small-scale farmers engage in industrial agriculture and find opportunities in the global food system (Edelman et al., 2014; Jansen, 2015). Park et al. add that '*To assume that all rural women would choose (small-scale/family) farming as opposed to engagement with corporate agriculture is quite a leap of faith*' (2015, p. 596). While there is continuous debate within food sovereignty through the diálogo de saberes or 'dialogue among different knowledges and ways of knowing' (Martínez-Torres & Rosset, 2014), the diverse farmers' interests can lead to different needs and wants. These diverse interests might lead to different decisions on food system governed through food sovereignty, just as not all democratic societies are the same. It is not clear how much of this pluralism is accepted within food sovereignty, or which elements have more priority than another. For Hospes (Hospes, 2014), a strive to end 'food violence' might be a better common framework in a plural society than food sovereignty.

Modern society is far more than food production and consumption and has more social struggles outside those that focus on food alone. While food sovereignty has links with the wider social 'transition' movement (Sage, 2014) and other movements that have similar goals (García Trujillo, 2015), it is unclear how food sovereignty relates to struggles beyond food or other rights frameworks. Although food sovereignty builds solidarity around food, this focus can obstruct other struggles or rights in a plural society. For example, Bolivia adopted food sovereignty in its constitution but its agrarian expansion drives a massive Amazon deforestation (Tabuchi et al., 2017). Generally, the degree of tolerance for pluralism outside and within food sovereignty is '*…one of the biggest and most challenging questions*' (Edelman et al., 2014, p. 922).

Gender

Although it is questioned if women provide most of the agricultural labour (Palacios-Lopez, Christiaensen, & Kilic, 2017), the 'feminisation of agriculture' increases as off-farm employment is disproportionally taken by men (De Schutter, 2013b). In spite of this, women in agriculture face gendered obstacles to equal power, owning less than 20% of landholdings in developing countries which results in a higher level of food insecurity than men (FAO, 2011b; Patel, 2012). Gender disparities impact access to land, capital, participation in agrarian transitions

and political voice through paternalism and gender roles (Ngcoya & Kumarakulasingam, 2017). The food sovereignty movement reacts to this by promoting radical gender egalitarianism (Patel, 2009), and women's rights are considered to be of '…*paramount importance for the realization of food sovereignty*' (Park et al., 2015, p. 585) and 'non-negotiable' (Patel, 2012). LVC as an organisation has an egalitarian approach to gender representation. But, as the food sovereignty movement strives for greater decision-making power for the community, group, and family unit, it needs to address the inequalities that persist in these units, rather than to hide different agrarian classes in the notion of a homogeneous community (Jansen, 2015). Park et al. (2015) criticise the food sovereignty movement for its 'we are all the same' rhetoric that can downplay class and other divisions and does not systematically address gender. The food sovereignty movement advances gender equity while it simultaneously advocates for small-scale farmers, one of the fiercest bastions of paternalism. The need to address the conservatism of small-scale farmers is apparent as, for example, rural women are still more likely to be dispossessed by male relatives than by a state or corporations (Agarwal, 2014). Greater gender equality might be obstructed by patriarchy in autonomous food sovereignty groups that do not adopt the whole food sovereignty program.

Localisation

The food sovereignty movement seeks to embed food in localised food systems as it rejects neoliberal trade agreements that approach food as a mere commodity, such as the AoA. This does not imply that food sovereignty precludes long-distance trade, but rather that it emphasises local food systems and short-distance trade. This localisation goes beyond a reduction of geographical distance as it aims for local food systems to have higher quality, more sustainable, and fairer food. However, whether local food can deliver these results is contested (Cleveland et al., 2015; Coley, Howard, & Winter, 2009; Peters, Bills, Wilkins, & Fick, 2009). Although local can be an alternative space of political engagements (Ayres & Bosia, 2011; Dekeyser & Korsten, 2015), spatial proximity does not necessarily mean political accessibility. Localisation does not equal food sovereignty, even if large-scale agriculture is generally more connected to larger distribution networks and distant markets (Robbins, 2015). Localisation could impact the food and nutritional security of many households that depend on food that is spatially ever more distant (Clapp, 2014a, 2015). Millions of livelihoods depend on the trade of products over long distances and engaged farmers do not necessarily want to change to the local market (Park et al., 2015; Soper, 2016). These farmers could benefit more from an improved power position in the international market rather than focusing on their local markets (Burnett & Murphy, 2014). Furthermore, the popularity of a food system reform that limits people's access to favoured non-necessities such as tea, coffee, and off-season products, is doubtful. To build a local food system is not enough to overcome tensions such as an urban-rural divide or class differences within a community. Localising food is only one piece of the larger project of food system reform and is not enough in itself (Robbins, 2015).

Complexity

The rural and solidarity focus of food sovereignty might conflict with the needs of non-farmers, for example around the price of food. About 54.5% of people live in cities and this figure will increase (UN, 2016; WHO, 2016). The urban poor change their diet and are increasingly obese (Foo & Teng, 2017; Ng et al., 2014) while they remain vulnerable to high food prices (Zezza & Tasciotti, 2010). That most rural citizens are net buyers of food further complicates the rural-urban divide (Edelman et al., 2014). Therefore, urban agriculture plays a role in the food security strategy of many poor urban households (Zezza & Tasciotti, 2010), which includes food

sovereignty positive initiatives such as box schemes, farmers markets, and community gardens. Ideally, a food sovereignty city produces most of the food it can while it purchases the rest through a local network from its surrounding producers with limited intermediaries, thus ensuring that the surrounding producers are included in the urban food matrix.

Currently, these surrounding producers are likely to be engaged in more rural migration, off-farm employment, and large-scale up-and downstream value chains (Park et al., 2015). Many rural young farmers seek to diversify with off-farm employment or do not want to farm at all (Agarwal, 2014). The percentage of the population engaged in agriculture is still a powerful marker of poverty, and the possibility of a return to small-scale farmer dominated landscapes, with high labour input, is doubtful in these complex and more diverse rural economies (Jansen, 2015). In these complex societies, the concept of food sovereignty should be flexible enough to deliver social justice and food security in each locality but should also be precise enough to allow it to be implemented in different settings.

Adaptability

The current debates on food sovereignty include tensions between precise and flexible interpretations. To Edelman et al. (Edelman et al., 2014), food sovereignty is regarded as a dynamic process rather than a set of fixed principles. To view food sovereignty as a process, rather than an outcome, is key in understanding the enthusiasm of its different actors as its flexibility allows wide-ranging interpretations. To not prevent other interpretations is even the first rule of food sovereignty (Patel, 2009). This flexible approach has to insert food sovereignty into the food debates and has sustained the broad food sovereignty movement. Flexibility is useful when engaging with today's complex agricultural landscapes and in adapting to local people's needs. That local food sovereignty leads to different outcomes in a plural society is as much inevitable as it is welcome. On the other hand, these flexible and sometimes contradictory interpretations of food sovereignty can hinder its implementation (Godek, 2015). Many of the issues raised need to be addressed for food sovereignty to transition from a slogan and framework towards policy, specifically concerning consumers, pluralism, and other rights frameworks. Since its start in 1996, the development of food sovereignty has advanced through discussion and reflection, and the current debate may provide a new dynamic to this. Controversially, if the food sovereignty movement is clearer on what is prioritised and how this is implemented, it might lose some of its supporters.

Currently, the concept of food sovereignty is developing beyond its traditional small-scale producers and is inclining towards the inclusion of whole food systems, a process which De Schutter (De Schutter, 2013a) defines as 'the second generation of food sovereignty'.

4.4 Future trajectories

The current debates highlight the challenges and inconsistencies of the present conceptualisation of food sovereignty. When it comes to future trajectories, we can identify two main emerging dynamics. First of all, a potential 'second generation' of action in the field takes a broader food systems approach as it incorporates cities and consumers into the concept. In particular, it appears as if a '…*new era of research in food sovereignty*' (Alonso-Fradejas, Borras, Holmes, Holt-Giménez, & Robbins, 2015, p. 434) strives for '…*greater specificity and a refusal to seek refuge in vague and comforting platitudes*' (Edelman et al., 2014, p. 927). Second, the interaction

between food sovereignty and other social movements is increasing. Particularly the second generation themes of democracy, social linkages and resilience are similar to the broader 'transition' movements that propose locally rooted alternatives to the social and ecological problems created by industrialisation. In Table 2 we unpack these emerging trajectories.

Table 6 Pillars of food sovereignty's second generation

Pillars	Description
Urban-rural linkage	Local food systems create local alliances and overcome the urban-rural divide.
Democratising innovations	Consumers are active citizens that co-design the food system through food democracy.
Strengthen social links	Interactions through food create connections within the community and increase social health.
Resilience over efficiency	Increased diversity and reduced dependency create a more resilient food system.
Agroecology	Farmers transform from receivers to co-creators of knowledge.

Source: adapted from De Schutter 2013b

First, local food systems link cities with their surroundings, thus reducing food miles and increasing inter-dependence and community relationships. The distancing in industrial food systems, such as through financialization (Clapp, 2014a), is replaced by a priority on local food, which is expected to increase solidarity between urban consumers and rural producers. The city becomes a prominent element of food sovereignty, whose focus was initially on rural areas and their food production (McMichael, 2014). Second, the food system is governed by active citizens that are included in a democratic decision-making process. Food has the capacity to trigger social mobilisation and civic engagement if certain conditions are present (Sage, 2014). For example, cities around the world experiment with 'food democracy' through emerging urban food policies and food councils, such as the Milan Urban Food Policy Pact (Carlson & Chappell, 2015; Scherb, Palmer, Frattaroli, & Pollack, 2012). Third, the interactions through food strengthen social links and well-being in communities. Food is a powerful driver of community interaction, for example when community gardens link people regardless of class, gender, or ethnicity (Saldivar-tanaka & Krasny, 2004). food sovereignty becomes then '*…as much a practice of creating connectivity as of creating autonomy*' (Iles & Montenegro de Wit, 2015, p. 494).

Fourth, the food system should create broader value, including social and ecological value, and be built on resilience rather than the pursuit of private profit and continually increasing yields. The food sovereignty movement proposes food systems that have a diversity of techniques and crops with a minimum concentration of input suppliers to safeguard its resilience, while local food systems protect against international volatility (Chaifetz & Jagger, 2014). Lastly, agroecology remains central to food sovereignty and this is summed up as *'Agroecology without food sovereignty is a mere technicism. And food sovereignty without agroecology is hollow discourse*' (Martínez-Torres & Rosset, 2014, p. 986). Agroecology itself is increasingly accepted by farmers' unions and civil society groups and is a strong reason why environmental groups such as Friends of the Earth are part of the food sovereignty movement.

These themes of democracy, social linkages and resilience are also prevalent in the 'transition' movements. These movements seek to bring changes to the current economic system and promote locally embedded alternatives to distancing and unsustainable production and consumption. The food sovereignty movement has linkages with these movements and the World Social Forum (Patel, 2009). Crucially, as food sovereignty is '*…not about sovereignty of food. It is about sovereignty of people and values assigned to food*' (Hospes, 2014, p. 121), the

lessons learned from food sovereignty can inspire and spill-over to other domains such as energy, finance, water, knowledge and health. Aspirations of various social movements to make local communities sovereign over their energy or finance has roots in a rich leftist tradition and the food sovereignty movement could pay more attention to these traditions (Edelman, 2014). However, the lessons learned from food sovereignty and its debates can provide a strong contribution to these traditions and other social movements, specifically the transition movement (Sage, 2014).

4.5 Conclusion

In this article, we discussed the concept and practice of food sovereignty while critically reflecting on its present state and future trajectories. food sovereignty is being used by practitioners as a catchphrase, by policy-makers as a set of guidelines, and by social movements as a mobilising ideology. Its various interpretations explain its relative success at permeating policy debates in a number of societies and in different political contexts. While the six founding principles of food sovereignty portray a focus on agrarian rights and food production, its lack of clarity and contradictions, specifically in terms of its organisational structure and its values, has led to critiques and debates. These debates are likely to shape the future trajectories of food sovereignty. In particular, it seems that the second generation of thinking and action is broadening the original focus on 'agrarian sovereignty' to incorporate consumers, cities, and urban food security through a broader food systems approach. As the critique of conventional market-based approaches to development becomes more mainstream due to the convergence of economic, social and environmental crises, it is likely that food sovereignty will emerge as a 'connecting concept', capable of uniting various streams of theory and practice, from systems thinking to post-growth economics and social innovation.

5 Linking large agricultural investments and food sovereignty in Sub-Saharan food systems change

The previous two sections introduced the debates on Large Agricultural Investments (LAIs) and food sovereignty. The LAIs and food sovereignty in current global and SSA food systems change are connected in this section. First, the dynamics of concentration and financialisation in the global food system is the focus of this section. Financialisation and concentration shape the global food system and drive the dynamic of LAIs. Second, the Sub-Saharan food systems are overviewed, and the impact of the global food system is described. Particularly, this section focuses on the role of small-scale farmers in competition with supermarkets and their difficulty supplying the global market. Third, global and SSA food system change is linked with the dynamic of LAIs and with food sovereignty.

5.1 Introduction

There are myriads of ways in which the global food system interacts with the local food systems. In this dissertation, the focus lies on the LAIs and its effects on the local food systems in which it operates. The LAIs themselves are driven by changes within the global food system, including the dynamics of concentration and financialisation. As the LAIs are intertwined with the global food system and the local food systems in which it operates, it forms a bridge between the global food system and the local ones. These linkages between these global food system dynamics, the LAIs, and the local food systems are conceptualised in **Fig. 7**. The following sections will unpack this figure and will discuss the place of food sovereignty within these linkages of the global food system, the LAIs, and the local food systems.

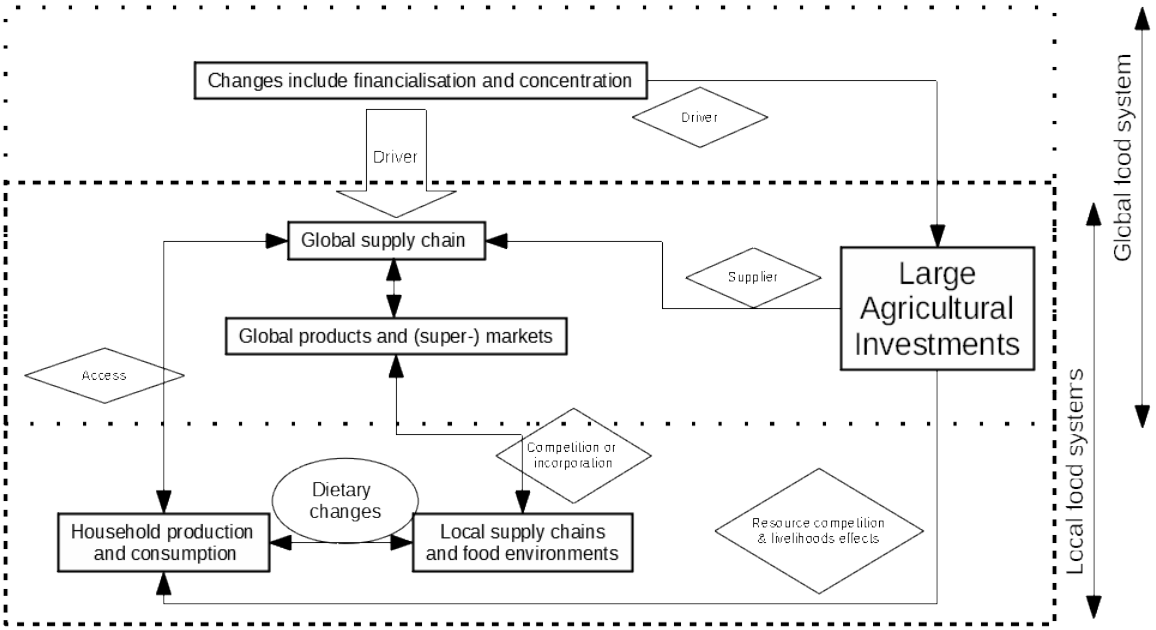


Fig. 7 The conceptual linkages of large agricultural investments with global and local food systems

5.2 Global food systems change

At present, major mergers within the agricultural input industry result in three companies commanding 70% of the pesticide market worldwide (The Economist, 2017; The New York Times, 2017a). But the crucial links between producers and consumers are concentrating rapidly as well. The agro-food chains and supermarkets are getting more vertically coordinated and amassing more market share. This concentration results in more availability of internationally traded products in local food systems. However, the particular demands of the supermarkets hinder small-scale farmers and provide incentives toward large-scale farming, including LAIs. As the LAIs mostly focus on the international market (**Section 3.1**), it is a supplier to the global value chains and supermarkets.

The concept of financialisation includes the increased importance of capital in the functioning of the global food system. The concentration in the global food system is partly driven by financialisation as well. As the LAIs

are an outcome of the influx of finance into the food systems (**Section 3.1**), the financialisation of the global food system affects the local food systems in which they operate.

5.2.1 Concentration in the food supply chains and the supermarket revolution

The agro-food chains within the global food system are becoming more concentrated. Particularly, the supermarkets have greatly strengthened their position and power, which allows them to restructure the Food Value Chains (FVCs) (Burch, Dixon, & Lawrence, 2013). These FVCs, or the 'hidden middle' of the agro-food chains that include processing, logistics, and wholesale, are more vertically coordinated and concentrated through a few firms. These FCVs facilitate international food trade. The international trade of food takes place on an increasingly larger scale and lengthens the distances from the point of production to consumption (FAO, 2016a; Patel, 2008).

A few private actors amass more and more commanding power in the modern FVC due to these concentrations. As such, they have more power to dictate their terms and thus shape the food systems and the global food markets (Clapp, 2015; Cotula, 2012; FAO, 2016a; Isakson, 2014; Reardon, 2015). For example, in the developed world, the global retail chains and supermarkets are the dominant food distributors. But this is not a dynamic confined to the developed world. Since the 1990s, the 'supermarket revolution' drove an expansion of supermarkets in the developing world that competes for market share with the traditional markets (Neven, Odera, Reardon, & Wang, 2009; Reardon & Gulati, 2008; Tschirley et al., 2015). In Southeast Asia and Central America, supermarkets controlled 30 to 50% of the food markets by the mid-2000s (IFPRI, 2017).

The supermarkets overcame the limitations of space and time for food, so food that is grown on the other side of the world or out of season is ever available. As such, a larger diversity of food becomes more available for SSA's urban and middle class. Although there are rampant inequalities in the food systems, there is also an increased homogenisation of markets and diets that is partly fuelled by broader processes of globalisation, urbanisation, and development (Khoury et al., 2014). But traditional diets shift with the appetite and budget for a more diverse, and energy-dense diets. This shift contributes to a rapid rise of non-communicable diseases and overweight in SSA (Gómez & Ricketts, 2013; Monteiro & Cannon, 2012). This change in markets impacts food production models. Supermarkets prefer large mechanised farms, preferably under direct control, as they need plentiful, stable, and cheap supply with strict quality and safety controls (Fuchs et al., 2011; Robbins, 2015). But food production becomes less and less important as the globalisation of the supply chains shifted profit-making from producing food to its processing, packaging, trading, transport, branding and distribution (Oya, 2012).

In short, agro-supply chains have become more concentrated, with supermarkets taking a commanding position in restructuring the agro-supply chains. But while the supermarkets are considered the 'masters of the food system', the title of 'masters of the universe' goes towards the financial titans and capital (Burch & Lawrence, 2009; Isakson, 2014).

5.2.2 Financialisation

Capital takes a more important role and shapes the food systems through a process of 'financialisation'. Financialisation is both the increased importance of capital in the food systems and the intertwining of food and the financial markets, which draws food in complex financial derivates and increases its commodification (Clapp, 2014a). Financial actors become more prominent in the agro-food chain and more active in food retailing, food

processing, commodity trading, distribution of insurance and risk, agricultural input provision, and land, all which affects the price of food. The rising importance of capital compared to other resources, such as labour or land, indicates a power shift towards financial elites in the food systems (Isakson, 2014). It is not only financial actors that move into agro-food chains, as actors in the FVC also move into finance (Burch & Lawrence, 2009). Some of the large supply chain actors, such as Cargill, derive their profit more and more from financial rather than productive activities (Isakson, 2014). As a result, the concentration and financialisation lead to different 'distancing' within the food systems, from producers that are disconnected from the final product, the decoupling of the points of ecological pollution from the endpoint of consumption, or abstracting food through complex financial instruments (Clapp, 2014a).

5.3 Sub-Saharan food systems change

The SSA's food systems are mostly reliant on food produced on a small scale (FAO, 2015; Graeub et al., 2016), mostly for self-consumption but also distributed through a myriad of small markets and locally consumed (Holt-Giménez, 2009; Reardon, 2015). Although SSA agriculture has changed dramatically over the last two decades due to climate change, urbanisation, population growth, a declining population share in agriculture (Christiaensen, 2017), and increasing imports (FAO, 2016a), this depiction mainly holds. Nonetheless, its food systems are in motion. For example, over the last four decades, African agri-food markets have expanded 6-8-fold (Reardon et al., 2015). Supermarkets are poised to enter the SSA market and establish their supply chains (Reardon & Gulati, 2008) and in some regions have already become a dominant force.

The roles of small-scale farmers, and especially poorer small-scale farmers, is under pressure in this global food system (Swinnen, 2007). At the forefront is the question of whether the small-scale farmer is bound to disappear in the historical march to industrialisation (Bernstein, 2014), or can adapt and keep on providing food to the world (Agarwal, 2014). The interaction between SSA small-scale farmers and the global food system is two-fold. First, while many SSA small-scale farmers are part of the global food system - from which they source agrochemicals and sell produce such as coffee - their integration is generally difficult and follows class and gender lines. Second, the global food system competes with SSA small-scale farmers in their traditional markets as the supermarket's share in food purchases increases (FAO, 2016a; Reardon & Gulati, 2008; Tschirley et al., 2015).

5.3.1 The position of small-scale farmers in the global supply chains

First, the global food system already integrates many African as producers, consumers, or labourers (Horton, Donovan, Devaux, & Torero, 2016). Small-scale farmers derive parts of their inputs, such as inorganic fertilisers and other agrochemicals, from the international markets (Cavatassi et al., 2011; Sheahan & Barrett, 2017). The export of small-scale farmers produce can be the preferred option for the farmers themselves enabling them to partake in 'inclusive value chains' and 'value-chain development', thus strengthening their food security, livelihoods, and broader economic development (Horton et al., 2016; Neven & Reardon, 2006; Soper, 2016). In a 'win-win' scenario, integration can lead to access to reliable markets, capital, and technology for the farmers (Cavatassi et al., 2011; Sheahan & Barrett, 2017).

However, the advantages of the global food system to southern small-scale farmers is contested (Fuchs et al., 2011), with either more positive (Cavatassi et al., 2011; Minten, Randrianarison, & Swinnen, 2007) or negative effects of integration (Mckeon, 2015; Weis, 2007). Much depends on the context and terms of trade between local producers and those actors that link them to the global food system (Swinnen, 2007). In this, the impacts of global integration are locally specific. Because the advantageous or disadvantageous effects depend on contexts, it is challenging to develop consistent food system relationships for all farmers. Similarly, it is challenging to establish equal access to international trade for farmers. As a result of the variable contexts, levels of food security vary greatly among farmers and countries (FAO, 2016a).

Small-scale farmers' export to higher-quality markets, either individually, through cooperatives, or by out-growers and contract schemes, is mostly beneficial. But the selling of produce to the international market usually requires substantial investments in production systems and food quality to satisfy the requirements set by private actors in the chain (Fuchs et al., 2011). It is difficult for small-scale farmers to access supermarkets due to their requirements of quality, safety, and scale (Abrahams, 2009). The feasibility of small-scale farmer integration into the 'new agricultural economy' also depends on the type of crops, with those that are labour-intensive and less appropriate for mechanisation having better market opportunities (Minot & Sawyer, 2016). Only cash crops and other high-value commodities are wanted for export, and these crops might differ from staples that provide food security through self-consumption. For small-scale farmers, the higher price received for selling produce in a more lucrative international market might not outweigh the extra costs of agrochemicals and other production inputs, leaving the small-scale farmer worse off (Cavatassi et al., 2011). Critical scholars of integration warn of the unequal power positions that lead to *'…proletarisation… without dispossession'* (Oya, 2012, p. 7).

The obstacles to successful integration into the global value chains are so high that it is doubted if resource-poor small-scale farmers can overcome them, with added challenges for female farmers (Horton et al., 2016). Integration into the international supply chains comes with inherent costs, because farmer's livelihoods are linked to the fluctuations in international commodity prices. While it is feasible to link small-scale farmer produce to the international markets, which can yield benefits by those farmers, the structure of the global food system makes it difficult for many small-scale farmers to succeed. The global supply chains, agri-technologies, subsidies regimes, or access to capital are generally in favour of large, specialised and capital-intensive farms that operate with high labour productivity as a result of its intensive mechanisation (Weis, 2007). While inclusion benefits certain farmers, it is not a rural development strategy in itself (Horton et al., 2016).

5.3.2 The supermarket revolution in Sub-Saharan Africa

Second, supermarkets compete with traditional markets of small-scale farmers as it increases its share of household food expenditures in SSA countries (Reardon & Gulati, 2008; Tschirley et al., 2015). Today, the market share of supermarkets or modern retail chains in SSA is small, besides South Africa, particularly as traditional markets source fresh food such as fruits, vegetables and meats. This divide in markets is similar to the supermarket revolution of Asia and Latin-America in the 1990s when supermarket offered processed and packaged food first and only moved into fresh food later (Reardon & Gulati, 2008).

However, due to SSA's economic growth, supermarkets are spreading rapidly as a reaction to a rising middle class. The supermarkets are concentrated in cities, as most villages are just too small to justify a modern

supermarket. They make micronutrients and other required nutrients more available in these cities, but the nutritional benefits accrue primarily to the middle or high-income groups that supermarkets overwhelmingly depend on for their sales. These middle or high-income groups are attracted to supermarkets for food quality, diversity, and convenience, such as ready-to-eat meals. The appealing new foods lead to a substitution of staples for diets with processed food dense in sugar and fat, which contribute to overweight and obesity (Foo & Teng, 2017). The supermarkets change the dietary landscape of this urban group by making products more available and contributing to an obesogenic environment (Gómez & Ricketts, 2013). The urban poor shop far less as the higher quality foods of supermarkets come with a markup in price. But this does not mean that the poor do not access supermarket products.

The market for packaged products, such as sodas or biscuits, have expanded much more rapidly in the developing world than the developed world since the '80s (Monteiro et al., 2013). These consumption changes in developing countries are not primarily driven by supermarkets, but by small sellers. These small sellers can sell the products in lower quantities, give credit, and lower transportation costs. Rather than the high volume, low margin business models of supermarkets, the small seller levies a higher markup to compensate for its low volumes. Currently, small sellers in SSA that offer processed products are expanding more rapidly than supermarkets themselves. For this group, the supermarkets change their dietary landscape as they make products more available and contribute to an obesogenic environment (Gómez & Ricketts, 2013).

While the diffusion of supermarket products goes beyond supermarkets themselves, supermarkets do shift the markets from traditional to large, concentrated and wholesale (Reardon et al., 2003). In Latin-America, Asia, and South Africa, supermarkets took off in the '90s and consolidated afterwards. While the supermarkets first started with processed and packaged goods, they integrated fresh food and vegetables later to the supermarket menu. For Latin-America, supermarkets occupied 50-60% of the retail market in 2000, up from 10-20% in the '80s, with higher proportions for processed and packaged goods and lower proportions of fresh food and vegetables. However, the fraction of fresh food and vegetables in diets is declining. As a result, 3 out of 10 pesos spent on food in Mexico went to Mal-Wart in 2003, and this number is rising. This expansion is even faster in South-East Asia. In Kenya, supermarkets are spreading from the cities into small to medium-sized towns (Reardon & Gulati, 2008; Reardon et al., 2003). This expansion shows the ability of supermarkets to amass market share rapidly and change the distribution landscape.

In SSA, the retail chains either import or buy from commercial farms (such as the South African supermarket Shoprite that operates in Mozambique) or incorporate local small-scale producers (such as the Kenyan milk boards that sell to the Kenyan Budget supermarket) (Gómez & Ricketts, 2013). As supermarkets take up a larger share of the market, small-scale farmers lose parts of their traditional market outlets while having only minor successes in supplying the supermarkets.

BOX 2 The dependency of Africa on food imports

As a region, Africa is a net food importer (FAO, 2016a). The costs of food imports are relatively small at 3-5% of GDP as domestic production keeps feeding most of Africa. However, it is unlikely that dependency on food imports will change anytime soon and will probably increase in the future. At 43%, cereals are the bulk of Africa's food imports (Rakotoarisoa et al., 2011). In SSA, the consumption of cereals could go up with 335%

towards 2050, mostly due to the rapidly growing population rather than dietary changes, while intensification, substitution for higher-yielding varieties, and expansion of production are not deemed sufficient to cover future consumption increases. For example, Kenya's 2050 cereal demand is projected to be 346% of its consumption in 2010. It is doubtful if African regional trade can make up the differences, making food imports from the international market more important in the future (Rakotoarisoa et al., 2011; van Ittersum et al., 2016). As such, SSA's dependence on international food imports is likely to rise (FAO, 2016a). The food imports need to be paid for with foreign exchange reserves, something that some African countries struggle with because non-agricultural exports are low. This pressure on foreign exchange earnings can be a vicious cycle, as historically no low-income country, besides Singapore, industrialised while importing much of its food (van Ittersum et al., 2016). The export of certain crops comes from a few countries, increasing the dependence of importing countries on powerful agricultural countries. The USA alone accounts for 53% of the world's maize export. This concentration can increase the volatility of the world's food prices, with poorer households disadvantaged as they spend a higher fraction off their income on food. While some countries cannot produce all their food due to their natural resources base (Burnett & Murphy, 2014; Clapp, 2017), this is not the case for most of Africa. But even with low food consumption and a diet that has changed minimally, the ability of Africa to feed its population has decreased from the 1960s (Luan et al., 2013). Food imports per capita grew eight times faster than food production between 1980 and 2007. Accordingly, food imports are important to Africa's food security. Africa's decline in self-sufficiency started during a period of population growth, stagnating agricultural output, weak government and lack of infrastructure. This decline was partly a result of the countries' economic and political policies, including periods when state intervention, structural programs, and liberalisation were in and out of vogue (Rakotoarisoa et al., 2011).

In short, SSA's food systems rely on food produced by small-scale farmers that are distributed through a myriad of small markets and that is mostly locally consumed. The global food system shrinks the space for small-scale producers and their markets, while various obstacles make it difficult for those producers to supply the global market. As *'Faced with the growing threat of dispossession, declining terms of trade and increasingly unstable markets for their output, small farmers are arguably the biggest losers of the financial transformation of food provisioning'* (Isakson, 2014, p. 770).

However, these elements, drivers, and outcomes change constantly, and the food systems have altered fundamentally over the world since industrialisation and colonisation, with an intense acceleration of changes in the last few decades (Christiaensen, 2017; De Schutter, 2017; Patel, 2013). In general, it is unlikely that LAIs are the primary driver of food systems change in SSA compared to population growth, urbanisation, and climate change. However, LAIs might be the most important linkage between global and local food systems and the main driver of food systems change of those areas in which they operate.

5.4 The large agricultural investments as a driver of change

At first sight, the LAIs are themselves an outcome of changes within the global food system, as it is driven by financialisation. The LAIs are an outcome of the influx of finance into the food systems in which capital was mobilised to invest in the commodity markets. The intervention of financial players in the commodity markets is a key driver of land transfers and LAIs (Cotula, 2013).

However, the LAIs influence the local food systems in which it operates as well. When the LAIs produce food, they sell it primarily to the international markets through global food supply chains. This supply makes more food available that can be traded on a global scale, ensuring the expansion and reproduction of the global food system.

Within local food systems, the LAIs transform not only land, labour, or natural resources, but stimulates a broader transformation that extends to the control over supply chains and the governance of the markets (Cotula, 2012). LAIs lead to greater control over food, natural resources, and labour that are needed for production. Although it is not always the case, the increased incorporation into the international markets through the global food system can lead to a loss of self-determination, autonomy, and control in local food systems (Soper, 2016). This loss of control enables LAIs to incorporate natural resources such as land into the global food system, but the preferred large mechanised farms limit the inclusion of the local communities' labour (Li, 2011). Authors such as Hall (2011) claim that this will lead to a 'South Africanisation' of the African continent, ie to bring the supermarkets, large mechanised farming, and control over land and labour that characterises the South African food system to other countries. The 'South Africanisation' is shifting farming from unimodal to bimodal landscape.[33]

Supermarkets drive the expansion of the global food system in developing countries. To a certain degree, this is already underway with supermarkets coming into SSA (Neven et al., 2009; Reardon, 2015; Tschirley et al., 2015), impacting the informal markets that are crucial to SSA's food security (IFPRI, 2016, 2017). The LAIs prefer large mechanised farms that export their food within international chains (Cotula, 2013), and this is very different from the current SSA food systems (IFPRI, 2016). None of these dynamics are inherent but enabled by a food governance paradigm that seeks industrialisation and globalisation as answers to issues such as reducing undernourishment, producing sufficient food, providing access to foreign currency and overall development. It is an approach that favours a model of economic growth that disregards the social and environmental costs to it (Fioramonti, 2013, 2014). After all, '*Sustainable growth and development in Africa as well the continent's contribution to the world economy in the 21st century will continue to depend largely on the manner in which land and land-related resources are secured, used and managed. This will require that these issues be addressed through comprehensive people-driven land policies and reforms which confer full political, social, economic and environmental benefits to the majority of the African people*' (AU, 2009, p. 41).

The debate on these issues will intensify as the global food system dynamics of concentration, financialisation, and the LAIs make inroads into SSA's food systems. Criticasters warn about negative effects on livelihoods, food security and overall rural development (IPES-Food, 2016). Part of these criticasters' call is for an alternative food governance paradigm that places local, small-scale, and agroecological central to these goals of

[33] An unimodal distribution is many small farms with a few large ones, while a bimodal distribution is many small farms on small plots with large farms occupy most of the land (Timmer, 1988).

rural development and reduction of undernourishment (De Schutter, 2017). In short, a call for food sovereignty as an alternative to the LAIs.

5.5 Food sovereignty and a future food regime

In **Section 4**, the concept of food sovereignty was introduced, criticised and developed. Food sovereignty is almost antithetical to the governance paradigm underpinned by modernisation theories that enable the LAIs. According to food sovereignty, a focus on local markets, local producers and sustainable production methods deliver a superior food system to one that is marked by large-scale production, supermarkets, and access to internationally traded food. The LAIs do not have a place in this (McMichael, 2015b).

Particularly relevant to this research is the discussion concerning access to land and how this impacts the types of food systems (Anseeuw, 2013). In short, for adherents of food sovereignty, it all starts with the control over land. The control over land shapes the kind of farming and the food systems. The agro-production systems can range from intensive, high external input production systems to extensive, low external input farming and everything in between these two ends. The varieties of food grown reflect the agro-diversity of the farm and higher diversity is linked to farm or food systems resilience, while access to a diverse diet is essential to tackle micronutrient deficiencies (FAO, 2016b; IPES-Food, 2016). These factors affect the potential of a food system to obtain balanced diets from the locality. Strong availability of local food throughout the seasons indicate that the local food system can satisfy the local diet. Alternatively, the absence of non-local products can indicate poverty among households that are unable to purchase these products, resulting in food insecurity, especially in the lean season.

As IFR theory projects a ‘foundational divide’ in this ‘historical threshold’, the changes brought by LAIs influence the debate on the feasibility of food sovereignty. From a food sovereign point of view, the LAIs and their changes are an ‘extreme’ case of inclusion into a configuration of the global food system that is driven by financialisation. The dynamics associated with the LAIs, and the reactions to it, allows a glimpse into a possible new food regime future. As the debate on future directions of food systems rages on (Clapp, Desmarais, & Margulis, 2015b; Clapp et al., 2015a; Gaudreau, 2015), research with a food sovereignty lens into the changes by LAIs provides indications of this future food regime.

In short, the LAIs are driven by changes within the global food system. The LAIs are both an outcome of the global food system, a supplier to its concentrating supply chains, and a driver of change in local food systems. The place of local food systems and the roles of small-scale farmers are under pressure within this dynamic of expanding global food systems into local ones. For the small-scale farmers, their markets receive competition of supermarkets, and their inclusion into the global supply chains is difficult. For adherents of food sovereignty, this intrusion of the global food system in local food systems is problematic. While there is little discussion that SSA food systems without a LAI presence change rapidly under the pressures of population growth, urbanisation, and climate change, accelerations of food systems changes are envisioned by those food systems where a LAI is present.

6 Summary

This chapter embedded food into its social, economic, and political contexts through the food systems approach. Through this approach, issues such as livelihoods, food security, trade, health, and climate change are linked with food, which enables the understanding of these linkages. Furthermore, an overview of the most important changes in food systems worldwide and in SSA were used to discuss two theories of food systems change, namely Modernisation theory and Food Regime Analysis, and their associated food governance frames of liberalism and food sovereignty. After outlining these theoretical discussions, the dynamic of LAIs was described because it highlights crucial differences in a few food governance frames.

In summary, the elements of a food system can include food supply chains, food environments, and consumer behaviour (**Section 1**). These elements are influenced by biophysical and environmental drivers; innovation, technology, and infrastructure drivers; political and economic drivers; socio-cultural drivers; and demographic drivers. Individuals can derive diets, livelihoods, and food security from these food systems. Food governance influences all these elements, drivers, and outcomes. Overall, food systems can be typified into traditional, mixed, or modern food systems. Depending on the type of food systems, substantial differences in production, livelihoods, or diets can be observed.

Both Modernisation theory and Food Regime Analysis (**Section 2**) explain and predict food system changes. Within both theories, the debate on LAIs is central due to its influence on land, small-scale farmers, and their well-being. On the one hand, Modernisation theory rationalises LAIs and the displacement of small-scale farmers as food systems modernise. On the other hand, Food Regime Analysis reviews the construction of the modern food systems and criticises the linear assumptions of Modernisation theory. Furthermore, adherents of Food Regime Analysis discuss a contemporary food regime that coalesces around a divide between industrial models that include both LAIs and food sovereign systems. In the end, food systems and their changes are complex and engage ultimately all of humanity. While Food Regime Analysis presents a dichotomous choice, social reality is often more complex and messier than the assumptions and predictions of these two theories. A liberalist food governance frame is broadly associated with Modernisation theories and aims for government support to food systems transitions. A modern food system is a mirror of the future for a traditional one. In contrast, adherents to the food governance frame of food sovereignty decry the assumptions of Modernisation theory and the political agenda of a liberal food governance frame.

The large agricultural investments dynamic is unpacked in **Section 3**. With many projects not passing the proposal stage, the scale of LAIs today is not as large as it was proclaimed in the past. Nonetheless, its effects are numerous, but the debates on the advantages and disadvantages of these effects often lack empirical data. Without this data, discussions concerning the place of LAIs within food governance frames are hindered.

The most prominent alternative food governance paradigm is food sovereignty (**Section 4**). Food sovereignty envisions a radically different food system than one that supports LAIs, but it too has critics. The most important critique is the contradiction between the devolution of power towards sovereign groups, and the presumption that these sovereign groups will implement the food sovereignty programme (**Section 4.3**). Or, more controversially, the presumption that all food sovereign groups would reject LAIs ignores the advantages that LAIs can provide.

Lastly, changes in global and SSA food systems change are linked to the LAIs and food sovereignty. The LAIs are both an outcome of the global food system, a supplier to its concentrating supply chains, and a driver of change in local food systems. The place of local food systems and the roles of small-scale farmers are under pressure within this dynamic of expanding global food systems into local ones. For adherents of food sovereignty, this intrusion of the global food system into local food systems is problematic. While there is little discussion that SSA food systems without a LAI presence change rapidly under population growth, urbanisation, and climate change, accelerations of food systems changes are envisioned by those food systems where a LAI is present.

The following chapter will expand upon the theoretical foundations and literature of this chapter to introduce the methodological approach and research design used to collect and analyse data from study areas in Kenya and Mozambique.

Chapter 3 - Methodology and description of study areas

The methodology, which includes the research approach, design, methods, and analyses used are explained in this chapter, together with an introduction to the study areas in Kenya and Mozambique. In short, a postpositivist mixed-methods approach was used for an instrumental case study design with study areas in Kenya and Mozambique. In this chapter, this approach is broken down into four main sections. First, the research methods and design are explained, based upon a postpositivist mixed-methods instrumental case study design. This section includes the appropriateness of the research methods and design for the intended study. Second, the study areas are introduced together with the data collection procedures and the sampling processes. The introduction of the study areas includes a brief overview of the Kenyan and Mozambican national food systems. In this section, maps of the study areas show the study areas and the spatial distribution of the survey. The data collection follows a fit-for-purpose approach that includes (un-)structured interviews, semi-structured interviews and a survey. Third, this is followed by the data analysis procedures, which include the qualitative and quantitative analytical techniques and the main variables examined in the dissertation. For the qualitative data, an inductive thematic analysis is employed. For the quantitative data, a between-groups analysis is used. The last section summarises this chapter and the methodology selected for this dissertation. The outcome of this chapter portrays the methodology and research design of the intended study. This will be used as a background to analyse the Kenyan case study in Chapter 4 and the Mozambican case studies in Chapter 5.

Keywords postpositivism, mixed-methods, instrumental case study, inductive thematic analysis, between-groups analysis

1 Research method and design

1.1 Epistemology

The epistemological paradigm[34] for this dissertation is postpositivism. Postpositivism builds on positivism and can be regarded as an extension of it (Giddings & Grant, 2007). The epistemological paradigm of positivism is frequently used in the sciences without explicit referral or acknowledgement (Adam, 2014). Positivism seeks absolute truth through cause-effect relationships that are discovered by quantitative methods that test hypotheses on their confirmability. The goal is '*…to develop and statistically test a hypothesis, a proposition of cause (independent variable) and effect (dependent variable) about a problem'* (Grant & Giddings, 2002, p. 15). In the social sciences, positivism has apparent shortcomings. Social theories are part of the studied social context and are thus not external to subjects as in natural science. There is a gap between perception and interpretation (Asdal, 2005). The use of methods such as triangulation, meta-analysis, mixed-methods, or case-based research is a testimony to the shortcomings of simple quantitative positivism that only relies on a single source of data or analysis, a single method, or only on variables without context. Postpositivism allows the inclusion of multiple sources of data, multiple techniques of data collection, and emphasising the contexts of case-based research (Adam, 2014).

Postpositivism emerged out of the critiques on positivism, formulated by the likes of Karl Popper (Grant & Giddings, 2002). But postpositivism abandons positive determinism, meaning the position where effects have a linear cause with predictable outcomes. Instead, postpositivism goes beyond simple cause-effect relationships as '*Outcomes are the result of a complex array of causative factors that interact with each other*' (Giddings & Grant, 2007, p. 54). Thus, outcomes are not always predictable and are mediated by contextual factors. As such, within a postpositivist paradigm, evidence supports a high degree of probability rather than absolute truth (Giddings & Grant, 2007). The paradigm of postpositivism orients positivism towards more complex and comprehensive explanations and the relations within. Like positivism, postpositivism can include quantitative research. But postpositivism does connect it with a more complex research design (Adam, 2014).

Postpositivism is distinguished from other epistemological paradigms such as interpretivist, radical/critical and post-structural models as it emphasises discovering knowledge to explain events or to test a hypothesis of cause and effect. This emphasis is unlike interpretivism, where the researcher interprets the experiences of the participants as social reality is subjectively constructed by individuals and others in a social context (Hesse-Biber, Rodriguez, & Frost, 2015). Postpositivism is different from the radical/critical paradigm, where the researcher has preconceived notions of the ways reality, and change, should materialise and empower others. In comparison with post-structural paradigms, postpositivism does not specifically study individuals as subjects of discourses, but as objects of the study (Grant & Giddings, 2002). At last, the values that people may hold are not a field of inquiry for postpositivism (Brodsky, Buckingham, Scheibler, & Mannarini, 2015).

Postpositivism is adopted for this dissertation as its inclusion of multiple sources of data, multiple techniques of data collection, and emphasises on the contexts of case-based research makes it more suitable to attain

[34] '*… the frame of reference that defines the attitude and relation of the researcher to the production of data and the selection of research tools and methods'* (Adam, 2014, p. 5).

the objectives set out in **Chapter 1** than, for example, logical positivism. This dissertation' objective is not to arrive at a definitive axiom on the effects of the LAIs everywhere and at all times, but to understand the effects of LAIs in particular case studies (see **Chapter 1** for the objectives and limitations).

1.2 Research method

Postpositivist assumptions underpin a mixed-methods approach (Giddings & Grant, 2006). Although the definition of a mixed-method approach is problematic (Maxwell, Chmiel, & Rogers, 2015), a mixed-methods approach as a combination of qualitative and quantitative methods for collecting and analysing data is employed for this dissertation (Anderson, 2015). Mixed-methods is often used for research that crosses disciplinary borders (Hesse-Biber, 2015). It is different from 'multimethods' research, in which more than one method for collecting and analysing data is present, but does not necessarily involve a combination of quantitative and qualitative methods. For example, more than one qualitative method can be present in multimethods research. As such, mixed-methods is a particular combination of multimethod research. Although the term 'mixed-methods' is quite new, its conceptual development started in the 1950s and 1960s. However, the combination of qualitative and quantitative methods is much older (Mark, 2015).

A mixed-methods approach has some disadvantages, including the lack of definitive guidelines for a mixed-methods study. In contrast, the 'art' of mixed-methods (Hunter & Brewer, 2015) can occur in a variety of ways (Mark, 2015). A mixed-methods study usually takes longer and requires more resources than a monomethod study and requires greater attention to the methods used (Anderson, 2015). Certainly, the outcomes of the different methods also need to inform each other (Mark, 2015). However, compared to other research designs, the mixed-methods approach is superior regarding case studies in a multidisciplinary setting due to its fit-for-purpose approach to its qualitative and quantitative data collection and its mixed data analysis. This fit-for-purpose approach lends itself well to incorporating multiple perspectives necessary for the in-depth understanding of a social phenomenon (Creswell, 2011; Giddings & Grant, 2006). Mixed-methods incorporates the strengths of both designs while minimising their weaknesses (Johnson & Onwuegbuzie, 2004). This method can add value and strengthen analysis (Shaffer, 2013). Qualitative research is used in cases where there is little literature, or a more in-depth understanding is warranted. A qualitative researcher should be keenly aware of the importance of subjectivity to humans (Hesse-Biber et al., 2015), but is often challenging to generalise. In contrast, quantitative research can be used to test hypotheses or to develop generalisations regarding a phenomenon (Anderson, 2015). Quantitative research has risks: important contextual details that contribute to a case study's outcome can be disregarded, and the crucial heterogeneity of contexts and processes lost (Oberlack et al., 2016). For these reasons, a mixed-methods approach is most appropriate to answer research questions 6-8 (Chapter 2).

The effects of LAIs on food systems change is analysed through a mixed-methods approach in this dissertation. A mixed-methods approach, with its ability to incorporate multiple data sources and data analysis techniques, is best suited to tackle the complexity of food systems and the effects of the LAIs on them. Based on

the Johnson and Onwuegbuzie (2004) matrix on the relationship between mixed-methods, this research positions the quantitative part as dominant to the qualitative analysis.[35]

The qualitative analysis is used as part of a 'mapping' exercise and provides the contexts of the local food systems. The quantitative part has households (HHs) as the primary unit of analysis. Due to the larger scale and reliability of the survey data in this research, the quantitative part is generally dominant over the qualitative part, as is often the case for postpositivist researchers (Mark, 2015). If there is a strong disagreement between the different methods on a particular issue, each issue will be discussed and decided on separately. Even these two methods might fail at providing answers to the questions raised. But applying both methods will increase the access to knowledge and the validity and reliability of the analysis in order to fulfil the objective of this dissertation (**Chapter 1**).

1.3 Research design

For this dissertation, a one-shot, post hoc and between-groups instrumental case study design with counterfactual (CF) groups was adopted. Mixed-methods research often refers to a single study or case study (Anderson, 2015) to study contextual effects (Hunter & Brewer, 2015). The case study *'…is a research strategy which focuses on understanding the dynamics present within single settings… Case studies can involve either single or multiple cases, and numerous levels of analysis'* (Eisenhardt, 1989, p. 534). A case study is appropriate when a phenomenon, event or issue is to be studied in-depth within its real-life context (Crowe et al., 2011). An instrumental case study *'…uses a particular case (some of which may be better than others) to gain a broader appreciation of an issue or phenomenon'* (Crowe et al., 2011, p. 2). The case studies in question are selected food systems in Kenya and Mozambique (**Fig. 8**), and the phenomenon is the effects of the LAIs. The data were collected after the treatment intervention, or the LAI, had occurred (post hoc). There was a single interval of data collection (one-shot). For the qualitative part, data were collected through (un-)structured and semi-structured interviews. The data were analysed using inductive thematic analysis. For the quantitative part, data were collected through a HH survey. The quantitative analysis aims to compare groups based on the intervening variable, the LAIs, through between-groups analysis.

The choice of a postpositivist mixed-methods approach to an instrumental case study design with study areas in Kenya and Mozambique was described and justified in this section. On the background of this epistemological and methodological clarification (see **Table 15** for an overview), the selected study areas and data collection procedures are introduced and explained in the next section. This is followed by the procedures for data analysis.

[35] Denoted as *'QUAN + Qual'*, where the time order of the data collection is concurrent and the quantitative method is generally dominant over the qualitative method (Johnson & Onwuegbuzie, 2004).

2 Description of study areas and data collection

In this section, the study areas are introduced, and the collection procedures explained for both the qualitative and quantitative data. First, the selection of the study areas is outlined, followed by an introduction to national food systems and study areas in Kenya and Mozambique. These two countries were chosen because of their distinctive LAIs models and different national food systems. As such, the national food systems of Kenya and Mozambique are introduced with a brief overview of the land tenure and the LAIs dynamics in each country. This overview is followed by an introduction to the study regions and areas. Second, the data collection procedures are explained together with the population and sample selection.

2.1 Selection of the study areas

The selection of the study areas was made in three phases. First, Kenya and Mozambique were selected by the AFGROLAND project as the literature suggested different business models of LAIs in the two countries. With the selection of Kenyan and Mozambican study areas, the effects of these different business models could be studied. In the Kenyan study area, LAIs were present on old colonial farms with low land pressure due to their land-intensive production model. In the Mozambican study areas, new investors pressured land with an extensive production model that requires large areas of land, such as the production of grains. Hence, land pressure around Nanyuki, Kenya, could be lower than in the Nacala corridor, Mozambique, resulting in different effects on the food systems and HH. Second, the regions within the countries were selected given the prevalence of LAIs. For Kenya, the region around Nanyuki was selected, while the Nacala corridor was selected for Mozambique (see **Table 7** for the study areas within their area and country and **Fig. 8** for the study areas' spatial positioning).

Table 7 Location of study areas in Kenya and Mozambique and investor's presence

Country	Region	Study area	Investor present
Kenya	Nanyuki	Tigithi, Kangaita, Nyariginu, Naibor, Buuri	Yes (factual)
		Barrier	No (counterfactual)
Mozambique	Gurué	Manlé	Yes (factual)
		Muela	No (counterfactual)
	Monapo	Ramiane	Yes (factual)
		Canacué	No (counterfactual)
	Ruacé	Ruacé Town	Yes (factual)

Third, within the regions, the study areas were selected based on an investor's presence. Within the Nanyuki region and the Nacala corridor, communities surrounding a LAIs were selected as 'factual' or investor areas (ie, with a LAI present, see **BOX 3**). Conversely, communities that have similar characteristics as the investor areas, but without LAIs, were selected as 'counterfactual' (CF).[36] In Kenya, the areas of Tigithi, Kangaita, Nyariginu, Naibor, and Buuri constitute the investor areas, and Barrier the CF area. The five investor areas were selected to

[36] In Kenya, the selection of the CF area was done in collaboration with the research institute CETRAD and following field visits to compare for ecological and demographic similarity with the investor area. In Mozambique, the CF selection was done in discussion with government and field visits to compare for ecological and demographic similarity.

represent the different business types of LAIs in the Nanyuki region. In Mozambique, the Muela area acts as the CF to the investor area of Manlé in the Gurué region. For the Monapo region, the Canacué area acts as CF to the investor area of Ramiane. For the Ruacé region, there is no CF to Ruacé town as no similar town was found in the vicinity.[37]

BOX 3 Counterfactuals versus controls

A CF (group) is like a control (group) as there is no independent variable present. A CF (group) is often conflated with a control (group), but some differences are relevant to this research. Generally, a control group is part of a (quasi-)experimental setting, but a CF is not. In an experimental setting with a control group, an intervention (or independent variable) is randomly introduced or manipulated, but not to all participants. Thus, two groups are created, namely the treated groups with the intervention and an untreated group (control) without the intervention. A comparison of the treated group with the control group can shed light on the impacts that the intervening variable might have on the participants (Kenny, 1975).In a CF setting, the intervention (in this case, the LAIs) are not introduced or manipulated by the researchers as it would be very difficult or unethical to do so. Rather, for this dissertation, a study area where an independent variable (the investments) is already present (the factual) is compared with a study area that is as much ceteris paribus (or all things being equal) with the other study area *as possible*, except for the presence of the intervention (the CF). A CF design is appropriate for this research as other existing pressures, such as economic and demographic changes, might be prevalent as well. A CF, while lacking the internal validity of a control setting, provides the opportunity for comparison between groups with and without the intervention. Another difference relates to the random assignment of the intervention. In a controlled setting, the intervention can be randomly assigned, with procedures that can blind both the participants (by use of placebo) and the researchers from initially being able to identify treatment assignment of study participants. In this dissertation, the intervention is not randomly distributed as the LAIs are attracted by features that include soil fertility, access to infrastructure, and water availability. These features also influence the dependent variables of this research, such as production or food security. Due to these limitations, this research is not an explanatory case study that searches for causal relationships between the intervention and the dependent variables, but an instrumental case study that compares factual and CF groups.

[37] Ruacé Town is different from the other study areas due to its level of urbanisation. While Muela, Manlé, Canacué and Ramiane are villages with limited populations, Ruacé is a town with a considerably larger population and a relative higher level of development compared to the other Mozambican study areas.

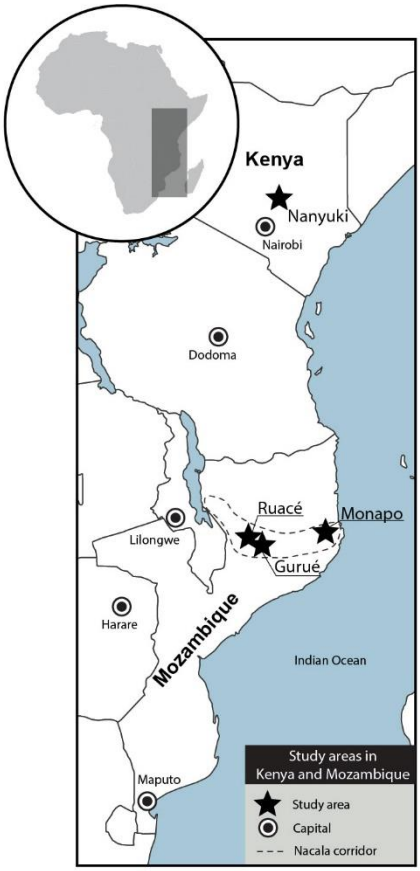


Fig. 8 Location of the study areas in Kenya and Mozambique

The study areas are in the Nanyuki region, Kenya, and the Gurué, Monapo, and Ruacé regions, Mozambique (**Fig. 8**). The survey distribution of the researched sites is displayed in **Fig. 11** for Kenya, and in **Fig. 14** and **Fig. 15** for Mozambique.

The next sections introduce the national food systems, the LAI dynamic, and the specific study areas in Kenya and Mozambique. This introduction is followed by a description of the data collection procedures. In short, the national food system of Kenya can be described as an export-oriented sector with a high prevalence of commercial small-scale farmers in a tripartite alliance between the state, agribusiness, and small-scale farmers. Agriculture is vital to the livelihoods of Kenyans (FAO, 2017a; Oya, 2012; Smalley & Corbera, 2012; World Bank, 2016b). The LAIs are likely to be underreported in the national figures due to a complex interplay between national and international actors, which obscures the actual ownership. The national elites of Kenya are active in land investments as well, a dynamic that is often overlooked but is possibly larger in scale than the international actors (Klopp & Lumumba, 2014).

The national food system of Mozambique can be summarised as mostly informal food distribution with a high yield gap, necessitating food imports to meet demand. Agriculture is crucial to the livelihoods of Mozambicans, who have limited off-farm opportunities, especially in the North (FAO et al., 2017; World Bank, 2016a). As a top recipient country for the LAIs, Mozambique had a challenging time processing and guiding the surge of LAI projects, prompting a moratorium in 2009 (Deininger, 2011; Hall, 2011; Nolte et al., 2016).

2.2 Description of the Kenyan case study

2.2.1 An introduction to the national food system of Kenya

Compared to its neighbours, Kenya invested more in health, education, and infrastructure, and has a resulting medium Human Development Index, the only one in the East African region (UNDP, 2016).[38] After a long period of stagnation, Kenya's Gross Domestic Product (GDP) per capita almost tripled between 2005 and 2016

[38] The Human Development Index is a composite statistic that ranks countries based on their life expectancy at birth, mean years of schooling, and gross national income per capita. It includes measures of inequality, gender, and poverty as well. A country can score 'very high', 'high', 'medium', and 'low' on the index, which ranges from 0 to 1. In 2015, Kenya had a Human Development Index of .555. The highest scoring country was Norway, at .949, and the lowest was the Central African Republic, at .352 (UNDP, 2016).

to $1455.36 for its 48.46 million people (World Bank, 2016b, 2017a). Still, poverty is high, and growth is slower than its neighbours. The informal sector in Kenya represented 83% of the employed in 2012, in a country where official unemployment stands at 40% (Betsema & Van Westen, 2016).

Although agriculture represents only one-fifth of the country's GDP, it plays a crucial role for food security and livelihoods as the sector engages up to 80% of Kenyans (FAO, 2017a; Smalley & Corbera, 2012; World Bank, 2016b). The sector has a long-standing tripartite relationship between state, agribusiness, and smallholders (Oya, 2012). The sector is dominated by small-scale farmers who provide 75% of all outputs, but the average plot is ever decreasing in size. While the average size of landholdings varies across the country, in 2005, farmers worked on land that was 0.86 ha on average (FAO, 2018). Today, small-scale farmers own 0.2 to 0.3 ha each on average. On these plots, maize, the country's staple crop, and beans are the most prevalent crops. The farmers themselves are on average 55 years old (D'Alessandro, Caballero, Lichte, & Simpkin, 2015). Kenya has strong pastoralist groups that work in the arid regions, which lead the vital livestock sector (FAO, 2017a). Even so, small-scale farmers are decreasing while medium and large farms increase, driven by supermarket contracts (**Chapter 2**). Small-scale farmers have lost market share in the fruit and vegetable market, from a 75% share in 1992 to 10-20% in the late 1990s (Oya, 2012). Kenya's agriculture struggles with shifting weather patterns, population growth, changing demographics, and political instability (D'Alessandro et al., 2015). Overall, Kenya has marks of a 'Mixed' food system on the national scale (**Chapter 2**), in which most food is still produced by small-scale farmers and supermarkets take up more and more market share. Furthermore, diets change, and the burden of food insecurity is shifting from rural undernourishment to more urban overweight (D'Alessandro et al., 2015; HLPE, 2017; Reardon et al., 2003).

BOX 4 Food distribution with exports and imports in Kenya

Generally, Kenya exports more food value than it imports (**Fig. 9**). In **Fig. 10**, the top ten countries that Kenya imports from and exports to are presented. While this data from the World Bank is possibly more reliable than the Mozambique import and export data (**Fig. 13**), this World Bank data does not fully capture informal cross-border trading, and thus **Fig. 10** and **Fig. 13** probably disregards important trade connections with the neighbouring countries. Nevertheless, **Fig. 10** shows that the main export markets of Kenya are in Western-Europe, its immediate neighbours, and around the Gulf of Oman. At the same time, these markets are not important for Kenyan imports.

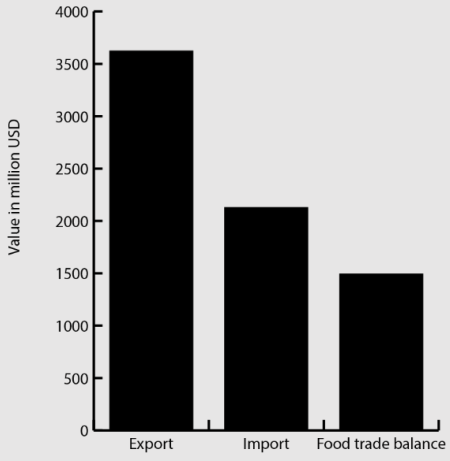


Fig. 9 Total export, import and food balance value of Kenya, 2015
Source: The World Bank World Integrated Trade Solutions, 2017b

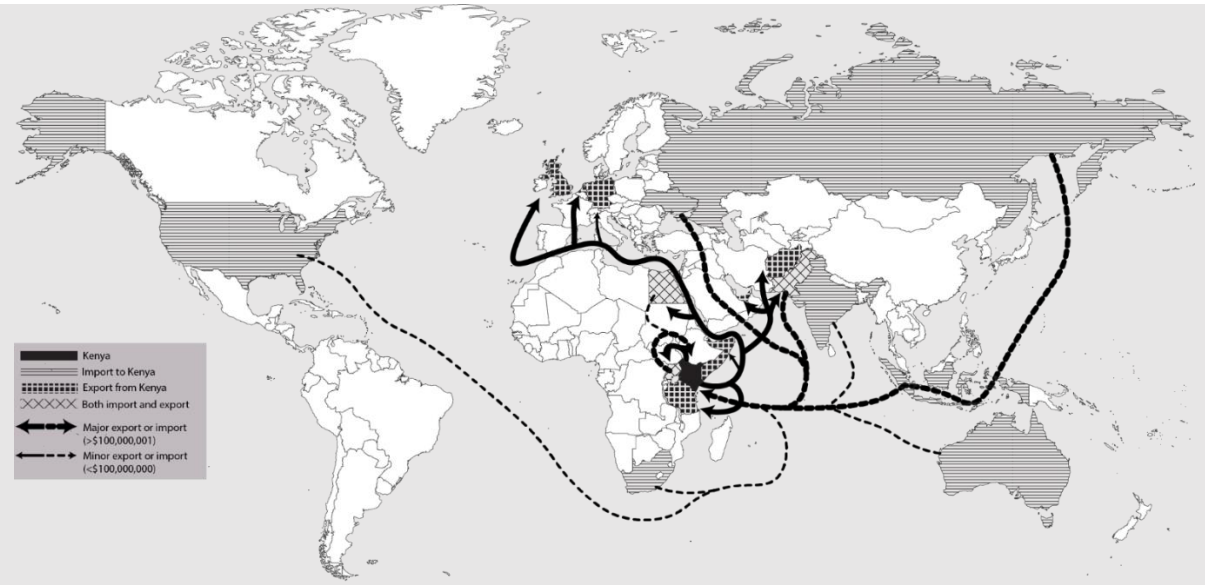


Fig. 10 Top ten origin and top ten destination countries for Kenya's food imports and exports, 2015
Source: The World Bank Integrated Trade Solutions, 2017b

Rural Kenya has a 'traditional' food system (HLPE, 2017). Small-scale farmers produce part of their diets themselves, and the production of the main staple maize is widespread. In villages, kiosks provide sugar, cooking oil and cereal flours, while milk, eggs and vegetables are bought at neighbours (HLPE, 2017). The informal markets are still strong, but the supermarkets are gaining market share. Traditional food and vegetable chains still deliver up to 66% of staples to the capital Nairobi. While supermarkets expand, particularly in small and medium towns, their clientele is limited to the top 20% of income groups (Gómez & Ricketts, 2013). In the region, Kenya is the frontrunner in terms of the supermarket share that supermarkets hold of sales (Reardon et al., 2003). On the consumption side, micronutrient deficiencies are still prevalent, and diabetes is rising (HLPE, 2017).

2.2.2 Land access and tenure

Kenya had a turbulent relationship with the control over land before and during the Mau Mau revolt of 1952-60. While British colonial rule (1895-1963) and its grabbing of land created much landlessness, Kenyan political elites used land redistribution after independence to mobilise communities and to grab land for themselves and their patronage. Land and ethnic linkages are still used for mobilisation today (Médard, 2010). The colonial and post-colonial land distribution still create tensions between ethnic groups that are exacerbated by population growth, declining soil fertility and climate change (The New York Times, 2017b). The population in Kenya is predicted to double in the next 27 years, pushing the agricultural frontier into more marginal areas and increasing tensions with pastoralists (FAO, 2017a). In this context, access to water becomes more contentious (Deininger, 2011).

Three tenure systems govern Kenya's land. The first is communal land, which follows the customary law and bars the sale of land. Second, government trust land provides land access to pastoralists. Third, a freehold land tenure system governs private land (D'Alessandro et al., 2015). Activists tried to reform Kenya's land laws because they do not sufficiently protect land users against dispossession by political elites with linkages to investors, but this is opposed by the political class that has benefited from previous dispossessions. This colonial and

elite dispossession results in severely unequal access to land, a situation that is getting worse (Klopp & Lumumba, 2014). In short, a relatively high population density causes a squeeze on land availability that is skewed by colonial history and post-colonial patronage. Farmers generally occupy small plots of land that underperform in terms of yields and contribute to smallholders being trapped in poverty (Deininger, 2011; Ulrich, 2014).

2.2.3 Large agricultural investments in Kenya

Kenya is characterised as a 'little land available, high yield gap' country for LAIs (Deininger, 2011). This characterisation is due to existing land pressures and low yields that are leading to a situation whereby agricultural production struggles to keep up with population growth (D'Alessandro et al., 2015). In 2017, the Land Matrix reported that 323,456 ha of land changed ownership in Kenya between 2004-16, with 367,535 ha intended for interest or negotiation (Land Matrix, 2017). Two projects of 100,000 ha each, but whose current status is unknown, make up the bulk of the area intended for interest or negotiation. The low numbers of intended projects possibly omit deals made by national investors, because they receive less media attention than international investors and so are less visible to the Land Matrix. Generally, Kenyan elites sell former colonial farms to investors. This does not cause land dispossession and are thus rarely recorded. New investment proposals also fail to materialise. Many of the proposed investments are stalled or cancelled, including a project from Qatar, partly due to local resistance. The share of domestic investors outweighs international investors in the recent large land transfers (Klopp & Lumumba, 2014), and there seems to be no difference in benefits to the local communities if the investors are domestic, perhaps even the opposite (Smalley & Corbera, 2012).The scale of the LAIs in Kenya is likely to be underreported due to a complex interplay between local and international actors. Because LAIs by national investors are likely to be underreported, the importance of a local level case study grows as it can create a deeper understanding of the LAIs and their effects in Kenya. This knowledge can be used to monitor land transactions and impacts of LAIs in Kenya.

2.2.4 Nanyuki study area profile

The studied area of Nanyuki includes Nanyuki town (**Fig. 11**). In this area, large farms are the largest employers (Ulrich, 2014). It is home to several foreign-owned farms that are not unusually large in terms of land size, but they involve considerable investment and are highly capital-intensive per square meter. Kenya's agricultural sector has an export-oriented profile (Smalley & Corbera, 2012), and this is no different in the Nanyuki region where farms engaged in extensive floriculture and horticulture target the European markets primarily. These large farms often are involved in disputes over the sharing of scarce water between small and large farmers, wages of workers on large farms, and the impacts of the extensive use of chemicals in floriculture on the health of workers and surrounding communities (Lanari et al., 2016).

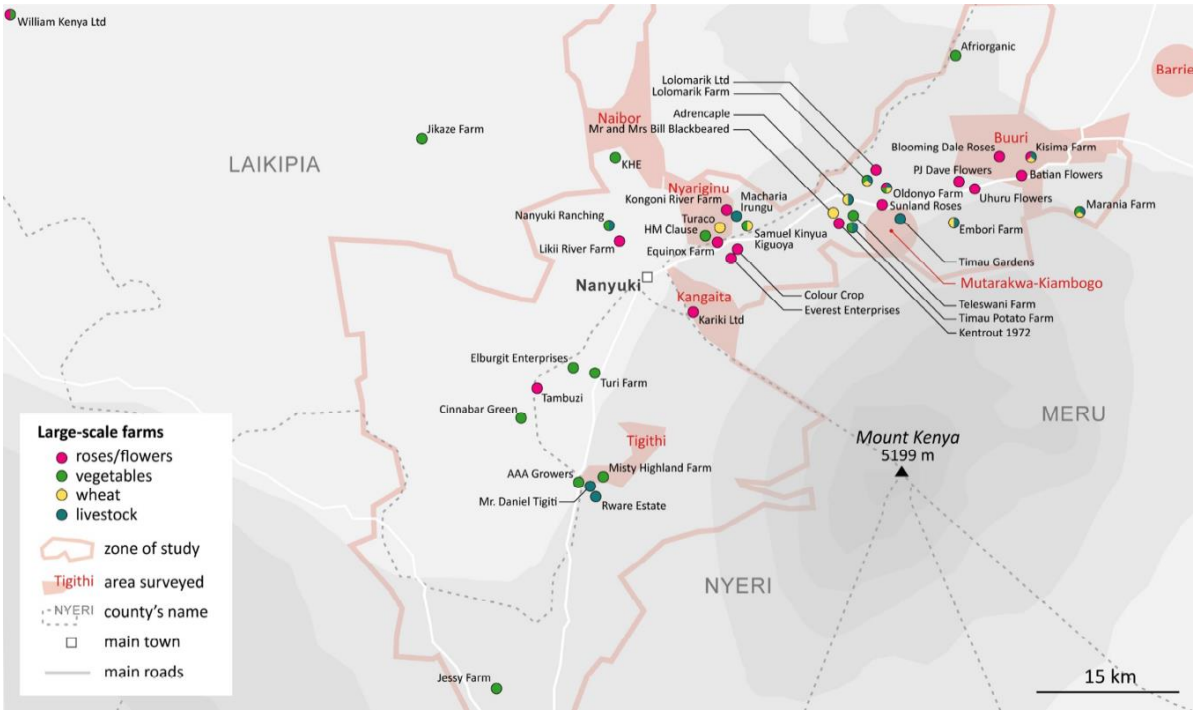


Fig. 11 Nanyuki's area: large-scale agricultural farms and surveyed zones (excl. Mutarakwa-Kiambogo). Visualisation: Aurélien Reys. Source: Reys et al., 2018

The communities adjacent to a LAI are Tigithi, Kangaita, Nyariginu, Naibor, and Buuri. Each of these localities has a different LAIs, either a rose farm or a horticultural farm. The CF area is Barrier, which is approximately 10 km from the nearest LAI.

BOX 5 A brief history of the researched site in Kenya

The Nanyuki study area curves around the northwest side of Mount Kenya, which is a major tourist attraction. In the past, the British colonial had large farms dotted around Nanyuki. After independence, these colonial farms were partly distributed to small-scale farmers and partly assigned to Kenyan elites for political gains. The land redistribution in the area was favourable to the Kikuyu tribe, the ethnic group of Jomo Kenyatta, Kenya's first president.[39] Today, up to 75% of the rural population engages in small-scale farming. This area has been successful in attracting LAIs, with 24 large horticultural farms established between 1991-2003 (Ulrich, 2014). Soldiers in the British army, which has long maintained a base in the area, often remain in Kenya after their military deployment and buy farms from local brokers. Nanyuki is the central market town in the Nanyuki study area. The town of approximately 30.000 people is connected with a tarmacked road that leads to Kenya's capital, Nairobi, and Meru, which is an agricultural market town on the other side of Mount Kenya. The area near Mount Kenya is semi-humid (1000-1500 mm of rainfall annually) in the east, semiarid (400-900 mm) and arid (about 350 mm) towards the west (Berger, 1989 quoted in Eckert, Kiteme, Njuguna, & Zaehringer, 2017).

[39] Elders and government official, personal communications, June-August, 2016.

2.3 Description of the Mozambican case studies

2.3.1 An introduction to the national food system of Mozambique

Mozambique ranked as one of the poorest countries of the world and had the 8th lowest Human Development Index in 2016, positioned between Sierra Leone and South Sudan (UNDP, 2016).[40] Characterised by high self-employment in subsistence agriculture and increasing inequality in the country, illiteracy rates of the poor have increased (World Bank, 2016a). About 75% of Mozambique's population of 28.83 million people are involved in agriculture on mostly small plots, as 99.78% of the almost four million farms were between 0.1-10 ha in 2012. This dominance signifies the central position of small-scale farming in providing livelihoods and food security in Mozambique. However, the average small farm shrank from 2.4 ha in 2002 to 1.71 ha in 2014 (Deininger & Xia, 2016). Still, small-scale farmers occupy 90% of the cultivated land.

BOX 6 Food distribution with exports and imports of Mozambique

Officially, Mozambique imports more value derived from food than it exports (**Fig. 12**). The main export destinations for Mozambican food products are West-Europe and South Africa. It imports mostly from Portugal, South Africa, Namibia, United Arab Emirates, Malaysia, and Indonesia (**Fig. 13**). The absence of strong food trade connections with its neighbouring countries is striking. According to the World Bank (2017b), South Africa is the only neighbouring country that is a top ten food trader with Mozambique.

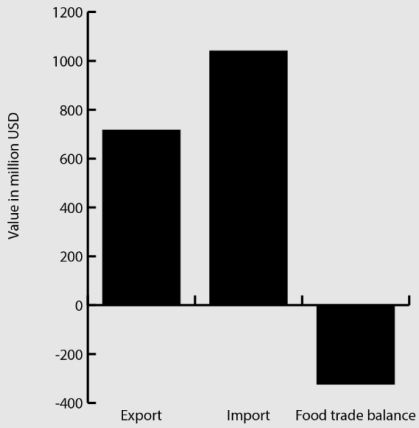


Fig. 12 Total export, import and food balance value of Mozambique, 2015
Source: The World Bank World Integrated Trade Solutions, 2017b

Just as in Kenya (**BOX 4**), the informal cross-border trade might not show in the numbers and could skew the results towards long-distance trade that require more infrastructure than is available in the official statistics (eg, airports and ports). Regional differences can also be important. For example, in the research region of Gurué District, informal cross-border trade with Malawi was important, especially for the trade of dried fish. In general, Kenya is more successful in supplying the global market, with more than $3.6 billion in exports in 2015 compared to 716 million for Mozambique. In per capita terms, Kenya exports three times more than Mozambique ($76 per capita for Kenya to $25 per capita for Mozambique). More controversially, even in a country where 75% of citizens are engaged in agriculture, Mozambique imports 31% more than it exports, creating a net food bill of $324 million in 2015, or $11 per capita (World Bank, 2017b).

[40] In 2015, Mozambique had a Human Development Index score of .418 (UNDP, 2016).

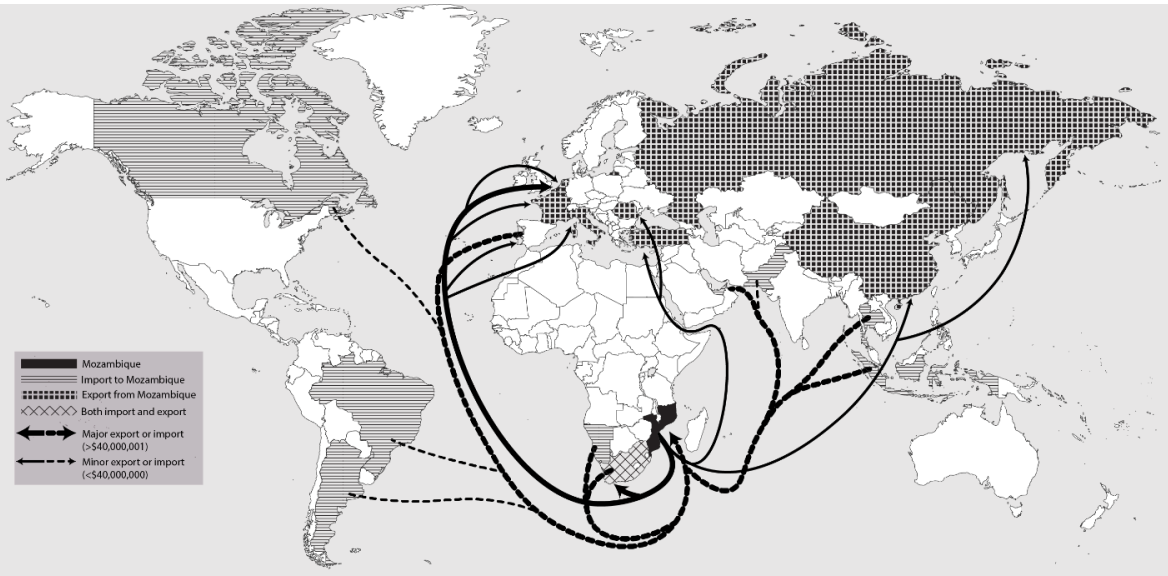


Fig. 13 Top ten origin and top ten destination countries for Mozambican food imports and exports, 2015

Even as it absorbs most of the country's labour, the agricultural sector contributes only to 26% to the official GDP (World Bank, 2016a). Against a backdrop of economic growth and increased foreign aid, rural poverty and agricultural production and productivity have worsened (Cunguara & Hanlon, 2012). There is a higher prevalence of poverty in the more rural north than in the more urban south. The northern provinces of Nampula and Zambezia are populated by 48% of all poor Mozambicans in 2009, up from 42% in 2003, while the poverty increased by 5% between 2003-09. The isolation and distances to markets due to weak transport networks limit the access of small-scale farmers to markets and creates a poverty trap due to low investment and low productivity (World Bank, 2016a). Overall, the national food system of Mozambique is characterised as a 'traditional' food system, in which prevalence of undernourishment is high, urbanisation is low, most livelihoods are derived from agriculture, and informal markets are dominant.

2.3.2 Land access and tenure

In 1997, after public consultation, Mozambique enacted one of the most celebrated progressive land laws in the world. This law does not replace the 1990 constitutional stipulation that all land belongs to the state, but the 1997 law on land recognises and protects customary rights. While the state provides formal land rights through a 'right of use and benefit of land' or Direito de Uso e Aproveitamento de Terra (DUAT), customary land rights have full legal equivalence. Although much of the former colonial estates were not redistributed, a person occupying and cultivating land continuously for more than ten years has a right to that land. This provision protects land users in a country with few formalised title deeds (Cotula et al., 2009).

Officially, investors need to consult with the local communities that might hold customary rights to the land before they can acquire a DUAT to the land. A provincial DUAT is granted for two years to foreign investors, and this can be revoked if the project's provisions are not implemented. Although provisional leases are rarely evoked (Deininger & Byerlee, 2011), there are examples of revoked leases (Milgroom, 2015). However, the ex-

istence of a progressive land law does not necessarily translate into an absence of land conflicts or unfair dispossession. The practical registration of land rights and enforcement of the land laws are lacking, especially concerning the rights of local communities (Tanner, 2010). The Mozambican elites use this lack of implementation to facilitate land dispossession, either for their projects or to enable foreign investors to access land. It is a discrepancy between politics 'in the air' and politics 'on the ground' (Milgroom, 2015).

2.3.3 Large agricultural investments in Mozambique

Mozambique ranks as a top recipient country for LAIs (Nolte et al., 2016). The pull factors for land investments in Mozambique include a high yield gap, a relatively low population density, and 'plentiful suitable' land (Deininger, 2011). Between 2004-09, an estimated 2.67 million ha of land were transferred, with domestic actors responsible for 53% (Deininger & Byerlee, 2011). In 2017, the Land Matrix database reported that 2.68 million ha of land was transferred (Land Matrix, 2017). Initially, the Mozambican government welcomed and encouraged investors as it sought to attract foreign capital and benefit from its land resources. Within 18 months, Mozambique received (informal) requests for up to 13 million ha of land, especially for an ensuing biofuel hype in Jatropha that the government promoted. This overwhelming demand prompted the Mozambican government to issue a moratorium in 2009 (Deininger & Byerlee, 2011; Hall, 2011). The government included more high-level government intervention in the decision-making process and large land leases now require presidential approval. Still, state bodies, such as the Centro de Promoção de Agricultura, are centres to facilitate international investment in agriculture while Mozambique transfers its land at low rates.

In Mozambique, about 14 million ha of land in the Nacala corridor is under negotiation between a joint Brazil-Japan-Mozambique project named ProSAVANNA (Programme for the Development of Agriculture in the Tropical Savannahs in Mozambique) (UNAC & GRAIN, 2015).[41] It is one of the largest LAI projects in the world. The ProSAVANNA project is a large-scale infrastructure and development project that seeks to industrialise northern Mozambique based on the Brazilian Cerrado model. While Brazil would bring its expertise in large soy plantations from its cerrado, Japan would benefit from the cheap soy exports. Brazil has a special interest and relationship with Mozambique, both for its shared language and its location for exporting soy to Eastern markets (Clements & Fernandes, 2013; Cotula, 2013). However, the World Bank has warned of the ecological effects of soy production in the Brazilian Cerrado and the small number of jobs it created (Deininger & Byerlee, 2011). The ProSAVANA project, signed in 2009, seems stalled for now. But other investments continue in the region (UNAC & GRAIN, 2015), with Japanese infrastructure developing throughout the corridor (especially roads and bridges).

2.3.4 Overview of the study areas in Mozambique

In Mozambique, the Nacala corridor study area includes other LAI projects, besides the 14 million ha still negotiated for the ProSAVANNA project. For example, the Norwegian company Green Resources holds rights to 126,000 ha in the corridor for forestry, with 4,000 ha under cultivation in 2016.[42] The following sub-

[41] The Nacala corridor is an area designated for development that roughly ranges from the Nacala port to Malawi. It includes Monapo, Nampula, Gurué, and Cuamba, and goes to up to Lichinga (**Fig. 8**).
[42] Green Resources Nampula, personal communication, March 17, 2016.

sections focus on describing the specific study areas, located in the West (e.g. Gurué and Ruacé) and the East (e.g. Monapo) of Northern Mozambique (**Fig. 8**).

BOX 7 A brief history of land and the large agricultural investors in Gurué, Monapo and Ruacé

In Gurué's investor area, the nearby LAI (tea plantation) has existed since colonial times. After the independence of Mozambique in 1975, the state nationalised the plantation. In the mid-1990s, the plantation was privatised. In 2010, the privatised company went bankrupt, and the small-scale farmers of the community started to farm the fallow land of the former plantation. In 2014, the plantation was taken over by the current owners which expelled the small-scale farmers that operated the former plantations land. The discontent due to displacements led to discussions in the community, with the traditional chief (*regulos)* taking the case to his immediate superior (*Chef de Localidade)*. However, the small-scale farmers lost the case. Even though the community leader knows about the DUAT, the formal Mozambican title deed for land access, either he does not know anyone in the community who has used it or knows how to apply for it. [43]

In Monapo's investor area, a colonial sisal plantation named Companhia Cultural de Angoche has existed since 1965. The sisal plantation remained operational until the Mozambican independence in 1975 when the Swiss and German owners fled. Afterwards, a Portuguese national rented the plantation for three years and established a new company named SATAR, which was subsequently introduced to the community. According to public records, a company named SATAR requested a licence in 1988.[44] A lengthy period of abandonment followed in the wake of the Mozambican civil war during the 1970s-90s. In the meanwhile, people started to farm the lands of the plantation. When SATAR returned in 2005, it restarted operations. In 2013, it expelled the small-scale farmers from the land. However, those that worked at the plantation received parts of the plantation's land. As most of the workers are male, female-headed HHs bore a disproportional burden of land dispossession. Of all areas, only in the investor area of Monapo are the land sizes of female-headed HHs significantly lower than the male-headed HHs.[45]

In Ruacé, an older plantation existed opposite the main road of the town. Around the end of the 20th century, the plantation closed, and workers were offered land access from the plantation in return for unpaid wages. In 2010, a new LAI named Hoyo-Hoyo re-appropriated the old plantation grounds and started to expel the small-scale farmers to grow soy and maize (Joala et al., 2016). Compensation was offered for land dispossession, and promises of water, education and a bridge were made to the community. Even though most of the community was against the LAI, the community felt powerless against the establishment of the Hoyo-Hoyo company as they had support from the central government in Maputo. Today, the community has conflicts with the LAI on matters such as land appropriation, promised infrastructure developments in the town, and the employment it creates. The compensation for land is deemed too low, and the demand for land by dispossessed farmers caused a spike in land prices. The company did not follow through on its promises to invest in a school

[43] While the state provides formal land rights through a 'right of use and benefit of land' or Direito de Uso e Aproveitamento de Terra (DUAT), customary land rights have full legal equivalence (see **Chapter 3** for more information on Mozambican land rights).
[44] Government officials of the Serviços Distritais das Actividades Económicas (SDAE), personal communications, October 23-24, 2016.
[45] Sign. differences between categories by study areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

and water infrastructure. The employment created is low, mostly seasonal, and the pay is irregular. The community drafted a letter to the *Chef de Posto* to complain about Hoyo-Hoyo and includes a request to have the land given back to the community.

2.3.5 Gurué District profile

Situated in the Zambezia Province, the town of Gurué acts as the distribution hub for the region (**Fig. 14**). The Gurué District is home to the largest tea plantations in Mozambique, together with eucalyptus, nuts, and soy plantations. The new investors in Gurué district include the LAIs companies Agromoz (mainly soy for a large domestic poultry company) and Murrimo Macadamia (mainly macadamia nuts, not harvested yet) that arrived in 2012 and acquired the rights to 9,000 ha and 3,200 ha of land respectively. These companies displaced between 96 and 150 small-scale farmers (Joala et al., 2016).

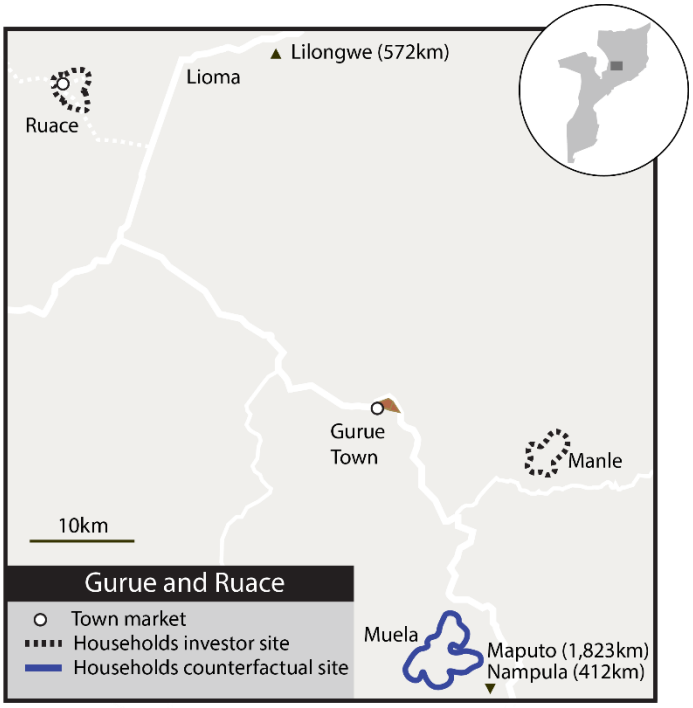


Fig. 14 Gurué and Ruacé district study areas

The surveyed town of Manlé lies about 15 km East from Gurué town and is only accessible by a dirt road. Manlé's adjoining tea plantations were established under colonial rule. With the civil war of the 1990s, the plantation declined. In recent times, the company expanded again on their former lands, dispossessing small-scale farmers that established themselves there. The surveyed town of Muela lies south of Gurué with no investments present within a 20 km radius. It is connected to the main road by a dirt path and has a similar demographic profile as Manlé (**Table 11**). The town of Ruacé adjoins the soy and maize plantation of Hoyo-Hoyo, which established itself on former colonial land in 2010 (Joala et al., 2016). In the absence of plantation activity, small-scale farmers cultivated the land. Consequently, the re-establishment of the plantation caused a wave of land dispossession. The town of Ruacé is accessible by a long dirt road. Due to demographic differences (ie, Ruacé has a much higher population density than Manlé and Muela), and a lack of a suitable CF site, no CF was selected for Ruacé town.

2.3.6 Monapo District profile

The Monapo district lies in the eastern part of Northern Mozambique (**Fig. 8**). The town of Monapo is in the centre of the study areas (**Fig. 15**). Its town market acts as the central distribution hub of the region. To the north of Monapo lies Ramiane, which adjoins the plantation of Sisaleira de Ramiane. This former colonial plantation produces sisal. After a period of non-activity due to the civil war of 1970-90s, a new company started to re-invest in the plantation in 2005 and in 2013 expelled small-scale farmers who planted between the sisal rows in the company's absence. Although it is connected with only a dirt path to the main road, its accessibility is the best of all the researched sites. Located to the north of Ramiane is the feira, or weekly market, of Itocula. The weekly market is an important place to sell and buy goods from traders outside of the community of Ramiane. The CF site to Ramiane is Canacué, to the south of Monapo town. The village is difficult to access, as it is situated at the end of a long dirt road which connects it to the main road. It has a small weekly market on its premises, but it is a much smaller market than the one for Itocula.

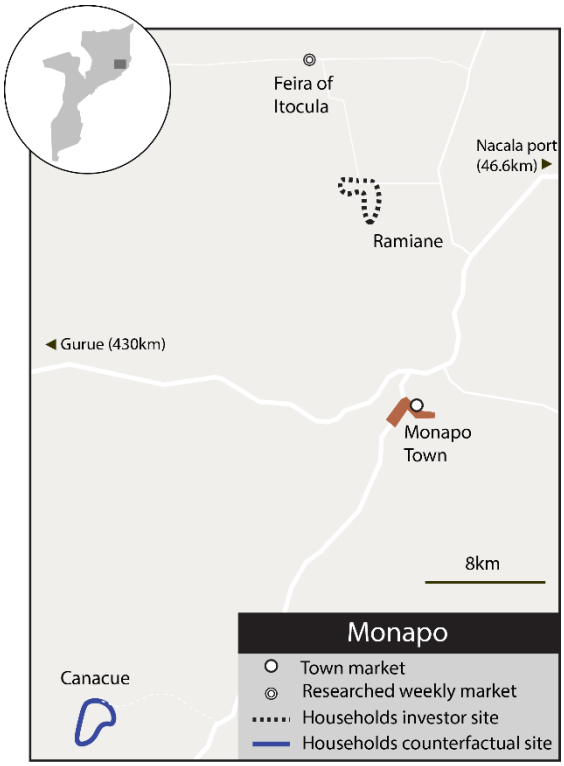


Fig. 15 Monapo district study areas

2.4 Data collection

In this section, the data collection procedures are explained, which include the population and sample selection. This research is almost exclusively based on primary data, rather than secondary data, as there was a lack of prior data on the specific study areas in Kenya and Mozambique. Because of collaboration with the AFGROLAND project, access was granted to their survey data (**Chapter 1**). On topics where the HH survey was lacking, and to gather additional data, interviews were conducted (**Section 2.4.1**). The Research Ethical Committee of the Faculty of Humanities, University of Pretoria, approved the proposal for this research (reference number GW20160520HS).[46] Multiple data collection techniques were employed in the study areas. The choice for each technique reflected the challenges and opportunities of the area. A mixed-methods design allows a fit-for-purpose approach that incorporates multiple data collection techniques, such as unstructured, semi-structured, and structured interviews, and surveys. As mentioned in **Section 1.3**, the data collected is a result of (un-)structured and semi-structured interviews to map the food systems of the studied areas and a HH survey on food security and

[46] See Appendix.

livelihoods. Overall, both the qualitative and quantitative data collection for this dissertation took place between February 2016 and March 2017 (**Table 8**).

Table 8 Summary of the data collection periods

Begin date	End date	Country	Location	Objective	Author present
21/02/2016	28/02/2016	Kenya	Nanyuki region	Pilot interviews	Yes
13/03/2016	18/03/2016	Mozambique	Nampula, Monapo regions	Pilot interviews	Yes
19/06/2016	06/08/2016	Kenya	Nanyuki, Ex-Lewa, Ntugii, Kiirua, Tigithi areas	Interviews	Yes
05/09/2016	31/10/2016	Mozambique	Gurué, Ramiane, Ruacé, Manlé, Canacué, Muela, Monapo areas	Interviews and survey	Yes
13/01/2017	16/02/2017	Kenya	Nanyuki, Tigithi, Kangaita, Nyariginu, Naibor, Barrier areas	Interviews and survey	Yes
16/02/2017	25/03/2017	Kenya	Naibor, Timau, Nyariginu, Kangaita, Tigithi, Barrier areas	Survey	No

For the unstructured and semi-structured interviews, oral confirmation was obtained after the objective of the research was detailed, and the rights of participants were stated. The permission to use identifiers for the interviewee (eg, location) was discussed before interviews took place. For the structured interviews, a consent form for the interviewees to take part in this research was presented. The answers of the interviewees are anonymised through their food business type (eg, restaurant or open market) unless explicit approval is given for other identifiers to be used (eg, name and specific place). Even though permission was obtained for the photographs, all persons are anonymised. The survey conducted through the AFGROLAND project had their consent mechanism through the Open Data Kit (ODK) software (**BOX 8**). The between-group data analysis anonymises the responses at the individual level. The author was present in all data collection periods except for the 16th of February to the 25th of March of 2017. In this period, the data collection consisted exclusively of the HH survey. As this survey was conducted by trained enumerators (**Section 2.4.2**), the absence of the author is unlikely to skew the collected data.

2.4.1 Qualitative data collection

Within the study areas, 131 unstructured and semi-structured interviews were conducted with food businesses, supermarkets, HHs, middlemen and traders, decision-makers, and civil society organisations and researchers (**Table 9**). Furthermore, 146 structured interviews were conducted with food businesses around Nanyuki. In total, 277 qualitative interviews were conducted based on a fit-for-purpose approach to capture the main dynamics of the food system and the movement of food. In the study areas, interviewees were selected based on the complexity of the food system and access to different stakeholders. For example, in a less complicated food system, such as Manlé, all food businesses could be interviewed. In the more complex food system of Ruacé town, not all food businesses could be interviewed, so a selection of businesses (eg, open markets or retail) were selected. Where possible, interviews were scheduled with civil society and research organisations. No personal information of the interviewee (eg, age, gender, migration status) was captured as the purpose was not to analyse the actors and their socio-economic profile, but rather the main dynamics of the food systems and the movement of food. For example, several interviews were conducted in Ramiane to construct the historical relations between the community and the LAI regarding land. The interviews that were not in English were conducted through a translator

fluent in English and the national and local languages, including Portuguese, Emakhuwa, and Elomwe in Mozambique and Kikuyu in Kenya. Regional specific terms were used where appropriate for both the interviews and the survey. The number of interviews per country is presented in **Table 9**.

Table 9 Number of key informant interviews and meetings in 2016 and 2017

Key informant group	Kenya	Mozambique
Food business*	150	55
Households	31	17
Middlemen and traders	5	8
Decision-makers	0	5
Civil organisations and researchers	2	4

*Excludes food production

The category of food business includes all commercial activities related to food, excluding food production. These food businesses range from traders, small and large, to hawkers, restaurants, or retailers.[47] The food business interviews typically included their set-up (eg, years in businesses and reasons for opening), the fluxes of the food (eg, inventory, origin, and channel), markets (eg, space, newcomers, place, market fees and competition), LAI interaction or effects, and changes over the last ten years (eg, new products and new channels). The food businesses were selected to capture the fluxes of food in and out of the territories and the distribution chains within the territories. The scale of these food businesses ranged from a hawker selling 5 kg of tomatoes next to the road to an established supermarket chain selling a wide range of food that can contain ingredients from around the world. The HH interviews and survey captures the production of food.

Interviews were conducted with HHs around Nanyuki and in the Nacala corridor to complement the HH survey or to capture the fluxes of food in areas where no food businesses were present. Part of these interviews included the authority structure within the communities and, if present, the relationship of the community to the LAIs regarding land access, employment, conflict resolution, and history of land in the area. Middlemen and traders connect the production of food with its processing or consumption over longer distances. They are a crucial node in understanding the food networks and mapping the fluxes of food in and out of the regions. The smallest middlemen buy just a few kilograms of produce, while the largest middlemen can send a truckload of food products to another area. Decision-makers include traditional chiefs, government authorities, and community leaders. Topics of discussion included market policies and government intervention in the food system. With the traditional chiefs and community leaders, land distribution, conflict resolution, and changes in the community were discussed. If LAIs were present, the relationship and history with the LAIs were discussed as well. Around Nanyuki, civil society and research organisations were interviewed instead of decision-makers. When civil society and research organisation were present, interviews and discussion of the preliminary findings were conducted to cross-validate and receive feedback. Around Nanyuki, the primary discussion partner for feedback regarding the study was the CETRAD research centre, in Mozambique the NCLUSA organisation.

Structured interviews in Kenya

Around Nanyuki, 146 structured interviews were conducted with food businesses (**Table 10**). These food businesses consisted of open market stalls (82), supermarkets (4), restaurants (34), spot market/hawking (14),

[47] For a detailed breakdown of the different food business categories, see **Appendix 2**.

small retail (9) and wholesale (3). The other four food business interviews around Nanyuki (**Table 9**) were supermarkets. These supermarkets were interviewed through semi-structured interviews regarding the origin of their stock, the history of their business, competition with local markets, and new products. Besides this, an inventory of two supermarkets (eg, products range and shelf space) was taken with the help of one enumerator.

Table 10 Food business types interviewed in 2016

Food business type	Number of interviews
Open market stalls	82
Supermarkets	4
Restaurant	34
Spot market/hawking	14
Small retail	9
Wholesale	3

The structured interviews were conducted through the Open Data Kit software (**BOX 8**) by five trained enumerators from the CETRAD research centre in Nanyuki.[48] A preference for structured interviews was due to the large number of food businesses present, necessitating added resources for data capture. These interviews included the same questions as the food businesses in Mozambique, and a stratified sample of food business types was interviewed in-depth through a semi-structured interview.

2.4.2 Quantitative data collection

Survey description and weighting

A survey on livelihoods and food security was successfully conducted on 922 HHs (**Table 11**) from 12 areas (**Table 7**) by the AFGROLAND project (**Chapter 1**). The survey collected information at HH level (eg, size of household, ownership of assets) along with HH members' level (eg, age, gender, origin, occupation) (Reys et al., 2018). The survey had six sections. Section 1 captured the location (GPS coordinates) and date of the response. Section 2 included the origin and demography of the HH, while section 3 was about the non-agricultural economic activities and income of the HH in 2016. Section 4 inquired about land ownership, land use, and agricultural activities. Section 5 asked about the HH's home, service delivery and assets that the HH might have. Finally, section 6 focused on HH's food security.

The universe was all the HHs in the study regions, excluding the largest urban centres. The sampling scheme differs between the two countries as stratified random sampling was conducted around Nanyuki, and random sampling in the Nacala corridor. Around Nanyuki, each study area (**Section 2.1** addresses the study area's selection) was divided into groups of 300 HHs, and a random selection of these groups was conducted. For the CF, the number of randomly selected groups and HH selection rate in these groups reflected AFGROLAND's desire to conduct roughly a third of all surveys in the CF area. This results in two randomly selected groups of 300 HHs, and a selection rate of 30%. For the investor areas, the number of randomly selected groups for each study area depended on the area's demographic size. In Buuri, two groups of 300 HHs were selected, while one group was selected for the Tighithi, Kangaita, Nyariginu, and Naibor areas. The selection rate of HHs within these groups was 20%. As a result, 66% of the surveys were conducted in the investor areas, and 33% in the CF area.

[48] Trained and coordinated by the author.

This division resulted in 360 randomly selected HHs in the investor areas, and 180 HHs selected in the CF area, for a combined 540 randomly selected HHs in six study areas. The surveyed HHs are representative for all the HHs in the Nanyuki study region, besides Nanyuki town (see **Fig. 11** for demarcation). Overall, the stratified random sampling resulted in 540 surveys, of which 51 surveys had to be discarded for quality reasons and one survey was excluded as the HH was located in the CF area, but contracted by a LAI (Reys et al., 2018; Reys & Mutea, 2017). People were counted as a HH member if they slept the previous night at the HH. Within the 488 HH surveys, the characteristics of 2,009 HH members and 668 plots of land that the interviewed HHs had access to were captured.

Table 11 Details of the survey and household's weight

Country	Region	Study area	Total households represented	Groups selected[a]	Selection rate	Total target households in zone	Total interviews completed	Final weight
Kenya	Nanyuki	Barrier	600	2	30%	180	170	4
		Buuri[a]	2100	2	20%	120	111	19
		Tigithi	600	1	20%	60	53	11
		Kangaita	1200	1	20%	60	52	23
		Nyariginu	1500	1	20%	60	50	30
		Naibor	600	1	20%	60	52	12
Mozambique	Gurué	Muela	300	1	40%	120	110	1
		Manlé	300	1	20%	60	59	1
	Monapo	Canacué	300	1	40%	120	118	1
		Ramiane	600	2	15%	90	89	1
	Ruacé	Ruacé	900	3	15%	135	128	1

[a]Groups of 300 households. Source: Adapted from Reys, 2016; Reys et al., 2018

In the Nacala corridor, the study areas were divided into groups of 300 HHs. Then, one group of 300 HHs was selected in Muela, Manlé, and Canacué; two groups in Ramiane; and three groups in Ruacé, reflecting the demographic size of the areas. The selection rate of HHs within these groups reflected AFGROLAND's desire to roughly divide the number of surveys equally across investor and CF areas. Thus, the selection rate of HHs within these groups varied between 15-40% across the study areas. As a result, 525 HHs were randomly selected in the study areas. This selection leads, after discarding 21 surveys for quality reasons, to 504 successfully completed surveys (Reys, 2016). The surveyed HHs are representative of all the HHs in their HH group. People were counted as a HH member if they slept the previous night at the HH. The 504 HH surveys captured the characteristics of 2,405 HH members and 1,374 plots of land that the interviewed HHs accessed. In both countries, the survey was administered by trained enumerators from the region or country through tablets with ODK software (**BOX 8**).[49] Care was taken that all the enumerators used local terminology consistently in each study region. For the random sampling, the enumerators invited the head of the randomly selected household, or if absent the spouse, for an interview. If both the households head and spouse were absent, the enumerators moved to the next closest household.

After the survey data was collected, a weight adjustment was conducted that assigned a survey weight (W_i) to all HHs. A survey weight is '*…the number of individuals in the target population represented by the sample respondent*' (Biemer & Christ, 2008, p. 317). The weight was particularly relevant for the investor study areas in

[49] Enumerators were trained by AFGROLAND researchers Reys, A., Mercandalli, S., and Dekeyser, K in Kenya and by Reys, A., and Mercandalli, S. in Mozambique. In Kenya and Mozambique, enumerators teams were headed by Reys, A. while Dekeyser, K. assisted. The survey was designed by the AFGROLAND project with aid from McIntyre, A. and Fossi, F.

the Nanyuki region, as this region is analysed as a whole. This weight was attributed proportionally to the total of households living in the study area to adjust for under-representation (Reys et al., 2018), and adjusted for surveys discarded for quality reasons. This weight adjustment repairs sample misrepresentation caused by unequal probability sampling (Biemer & Christ, 2008) and reduces sampling error (Lohr, 2008). The weight did not adjust for non-response, as a non-responsive HH was replaced by the next closest HH. Certainly, this dissertation does not compare the study regions around Nanyuki and the Nacala corridor due to differences in data collection, weighting, and representativeness, but analyses each study region separately.

Household categories

In both countries, the households within a investor area (**Table 7**) were categorised as 'Employed' (E) if minimally one household member worked at a LAI, and categorised as 'Non-engaged' (NE) when no member was LAI employed. The households in the non-investor areas were categorised as 'Counterfactual' (CF). **Table 12** depicts the total number of surveyed HHs in each category across the regions. In Kenya, the NE and E HHs in the investor areas of Buuri, Tigithi, Kangaita, Nyariginu, and Naibor were aggregated, thus representing all NE and E HHs in the Nanyuki region.[50] In Mozambique, the regions were not grouped and the HHs were not aggregated due to major ecological, production, and consumption differences between the more coastal area of the Monapo region, the inland Gurué region and the more urbanised Ruacé region. Grouping the regions would make it difficult to discern between the effects that LAIs have on HHs and geographical differences.

Table 12 Number of household surveys conducted across the household categories and regions

Household category	Investor present	Nanyuki	Gurué	Monapo	Ruacé
		# (% of total)	# (% of total)	# (% of total)	# (% of total)
Counterfactual	No	170 (34.8)	110 (65.1)	118 (57.0)	0 (0)
Non-engaged	Yes	270 (55.3)	22 (13.0)	29 (14.0)	102 (79.7)
Employed	Yes	48 (9.4)	37 (21.9)	60 (29.0)	26 (20.3)

Data: Afgroland (2016, 2017)

BOX 8 Open Data Kit (ODK) software

The surveys and structured interviews were captured through ODK software.[51] This open-source software package allows the coding of questions into an Android app.[52] In the case of the AFGROLAND project, the answers of the interviewee are entered by an enumerator in a tablet. Using ODK has several advantages. First, completed forms were automatically uploaded to the ODK server, minimising the risks of transcription errors and data loss. Second, answers were automatically added to a central database, skipping the costly step of manually inputting paper surveys into a database and eliminating confusion about handwriting. Third, ODK can repeat a list of questions based on previous input. For example, a list of questions on the basic characteristics of a HH member (eg, age, gender, and education) can be repeated for the number of members in the HH. Fourth, it

[50] '*After weighting, we assert that 1081 out of the 21300 members of the locations directly surveyed are working in a large-scale farm. Extrapolated at the level of our study area populated by 200,000 inhabitants, this number would reach 10,000 employees. However this probably overestimates the reality as areas selected where located closer by farms than the average. The total population also include the town of Nanyuki where farming activities are much less represented than in the surrounding rural areas. By subtracting Nanyuki population over the total, we get the number of 7500*' (Reys et al., 2018, p. 12).

[51] https://www.opendatakit.org

[52] The author gave workshops on ODK coding to the CETRAD research centre in Kenya on 25/01/2017 and the Department of Political Sciences, University of Pretoria on 15/06/2017.

allows a wide range of questions that are not possible on paper, such as drawing on a map of the area, listening to audio or looking at a video or photo. Fifth, it can capture the geolocations of the interviews, to reflect interviewees' spatial distribution by plotting their location on a map. Sixth, limitations can be set on questions (eg, age cannot be higher than 130 years) and calculations can be made (eg, total income calculated by the different income streams) to increase validity. Seventh, simple descriptive analytics is possible through the ODK server immediately after submitting the interview, allowing the team leader to follow up on the enumerators. In short, surveys through ODK are faster, cheaper, allow more options for data collection, and have a higher validity and reliability than paper surveys.

The data collection procedures were explained in this section, which includes the population and sample selection. The different informant groups and the tools used for data collection were presented as well. The next section presents the techniques selected to analyse the collected data.

3 Data analysis

This section presents the data analysis techniques for the collected data. On this basis, **Chapter 4** will analyse the Kenyan case studies, and **Chapter 5** the Mozambican case studies. The data collection started in February 2016 and was completed by February 2017. The data analysis was done between February 2016 and October 2018. The next section provides a summary of this chapter on the primary research and methodological elements used in this dissertation (**Table 15**).

3.1 Qualitative data analysis

The data that originates from the unstructured and semi-structured interviews (**Section 2.4.1** and **Table 9**) is used to provide context to the quantitative analysis and to map the functioning of the food systems in the study areas. This qualitative data was analysed using an inductive approach to thematic analysis. In cases where no previous studies were available, an inductive approach was used as no themes were available from the literature (Vaismoradi, Turunen, & Bondas, 2013). Thematic analysis is defined as *'…a method for identifying, analysing and reporting patterns (themes) within data'* (Braun & Clarke, 2006, p. 79). The analytical process of thematic analysis allows for inductive description and interpretation while emphasising contexts and the drawing of thematic maps. Furthermore, '*…thematic analysis involves the search for and identification of common threads that extend across an entire interview or set of interviews'* (Vaismoradi et al., 2013, p. 400).

For this dissertation, the main goal is to examine patterns in the fluxes of food and relationships between the different elements (**Chapter 2**) of the food systems. This examination was achieved by adapting existing concepts, such as the food web, foodshed, and the FAO's food systems assessment, to this research. In the literature, there are a few approaches for the assessment of local food systems and the analysis of food fluxes. Each of these approaches has a specific focus on certain food system dimensions. The most relevant approaches are food webs or foodsheds (examples include CPRE, 2012 and SSARE, 2011) and food system assessments

(FAO, 2014a). Generally, a food web is '*A way to describe the connections between food producers, the food retailers, caterers or other food providers and the consumers in the community who buy and eat their food*' (CPRE, 2012, p. 5). The main goal is the mapping of the local production, distribution, consumption, and the local employment that the local food system generates. A food web is used to identify the local food system and its benefits. Its scope is limited, as it includes only local flux, ignoring the advantages or disadvantages of a supermarket or export-oriented producers. A food web does not evaluate other aspects of food systems, such as governance, livelihood, or sustainability. Its premises, fuelled by a movement termed 'locavores', state that the locality of food leads to higher quality, more sustainable, and fairer food systems. Each of these premises is contested (Butler, 2013; Cleveland et al., 2015; Peters et al., 2009).

As the food web focuses on local connections, the foodshed studies '…*the geographical area from which a population derives its food supply*' (Peters et al., 2009, p. 2). A foodshed analysis identifies the actual and potential sources of food for a population. As a result, it aims to tell us something about the potential of a population to be fed from locally sourced food (Butler, 2013). Its analysis starts from a farm, where the raw food is then followed through to the point of consumption, counting the costs of production, distribution, and consumption (Peters et al., 2009).

For this research, the food web and foodshed approach are elaborated upon in two ways. First, the foodshed concept establishes the incoming fluxes of food, which is integrated with the outgoing food fluxes to capture the outwards market integration of small-scale farmers or the LAIs. This dimension cannot be researched by using only the outward food flux information. Because the LAIs are rarely oriented to the local markets, the movement of food away from the study areas would not be captured with a standard foodshed approach. Within the studied areas, the fluxes of food are mapped by interviewing producers, distributors, and consumers and through the study of the interactions between these groups. This mapping starts by identifying the food businesses (eg, markets, stores, kiosks, and restaurants) and HHs within the area, and all the food that is consumed, purchased, or sold in the last year. While the HHs indicate the food that is produced and consumed in the area, the food businesses provide the market linkages that bring food that is not self-produced in and out of the territory. The advantage of this method is that it captures all the food consumed within a given territory. The disadvantage is that the scale of the food system generally does not allow the identification of the complete supply chain of all the food, as this would require extensive research into the global supply chain of the many ingredients that are part of, for example, the energy drinks sold at a rural market stall. The focus is on the current degree to which a local food system is feeding itself within the limits of the defined study area. For example, when a food business is interviewed through a semi-structured interview, an inventory is taken, and then the routes and origin of these food items are constructed. The changes to the inventory, business, or the trade routes are determined, and a map of the fluxes of food in and out of the area emerges as the data of multiple food businesses is combined.

Second, both the food web and foodshed focus primarily on either the fluxes of food or the geographical source area. The Sustainability Assessment of Food and Agriculture Systems (FAO, 2014a) incorporates governance, environmental, economic, and social dimensions as well. From these approaches, a conceptual food system framework was constructed in **Chapter 2** that fits the needs of this research. The local food governance of the researched territories is studied by interviewing government officials, elders, local leaders, heads of markets, supermarket managers, and middlemen to portray the role of social institutions in the functioning of the local food system. Local food governance includes the governance and functioning of markets, government policies that

impact supply chains, the governance of communities, and the organisation of the interactions between communities and LAIs.

3.2 Quantitative data analysis

The main analytical techniques used for the survey are listed in **Table 13**. As the research design of this dissertation is a between-groups analysis of a case study, the analytical techniques focus on examining differences between groups on the topics of land, production, distribution, consumption and food security. For nominal variables, the Chi-Square test is used (**Table 13** for a description of the main analytical techniques used). For normally distributed continuous variables either the Independent samples t-test is used for the means of two groups, or the one-way ANOVA for more than two groups. But normality is the exception rather than the norm in smaller surveys. The nonparametric data is analysed through the Mann-Whitney U test for the median or means of two groups or the Kruskal-Wallis test for more than two groups. Furthermore, a Principal Component Analysis reduces the explanatory factors that account for the variability between the HHs, and the components are then plotted according to their HH category and study area to examine their relationship. The results describe between-groups similarities or differences. The statistical software program SPSS (version 25) was used to conduct these statistical tests.

Table 13 Main statistical tests used for quantitative analysis

Analytical Technique	Description
Chi-Square analysis	Analyses the independence of two categorical variables via a contingency table.
Independent samples t-test	Examines the difference between the means of two independent groups.
One-way Analysis of Variance (ANOVA)	Partitions the observed variances into components based on different sources of variation; one-way ANOVA examines the equality of several independent groups based on one dependent/outcome variable.
Kruskal-Wallis (H)	A nonparametric statistical test that assesses the differences among three or more independently sampled groups on a single, non-normally distributed continuous or ordinal variable.
Mann-Whitney U (Wilcoxon rank)	Nonparametric test used to compare the means or medians of two independent groups.
Principal Component Analysis	Explores the underlying structure of correlations among observed variables in an attempt to reduce the dimensionality of data, wherein a small(er) number of factors significantly account for the correlations among the set of measured variables; utilizes the total variance of each variable to assess the shared variation among the variables.

Source: adapted from McKight & Najab, 2010; Onwuegbuzie & Hitchcock, 2015

3.3 Operationalisation of main variables

3.3.1 Variables selected for analysis

The main variables derived from the qualitative and quantitative data collection are operationalised in **Table 14**.

Table 14 Selection of the main variables used for quantitative and qualitative analysis

Concept and variable	Description	Type of variable
Land		
Land access	Access to a plot or communal area, or no plot.	Categorical
Land access type	Channel to access land; and	Categorical
	The longitude of this access.	Numeric
Land securitisation	How access to land is legally securitised.	Categorical
Land main use	What the land is used for.	Categorical
Land size	The number of plots; and	Numeric
	The area of the combined plots.	Numeric
Land loss	The changes to the land area;	Ordinal
	The loss of land;	Categorical
	Compensation for the loss of land;	Categorical
	Worrying about land loss; and	Categorical
	Impact of investors on land availability.	Categorical
Land changes	Change in land access.	Categorical
Food production		
Production	Types of crop produced;	Categorical
	Animal production;	Categorical and Numeric
	Change of animal production; and	Categorical
	Engagement in agriculture.	Ordinal
Food distribution		
Sale of production	Channels to sell self-production.	Categorical
Food fluxes	Destination and sources of food sale; and	Categorical
	Pathways of food trade.	Narrative
Buying food	Channels used to obtain food groups.	Narrative
Food environments		
Accessibility of markets	Distance to markets by foot;	Ordinal
and degree of isolation	Distance to a paved road on foot;	Ordinal
	Possession of electricity and water; and	Categorical
	Expansion of food trade from a household perspective.	Categorical
Food availability	Availability of products in the study areas.	Categorical
Food affordability	Food budget share.	Numeric
Market changes	Changes in self-production and market dependency.	Ordinal and Numeric
Food systems outcomes		
Diets	Consumption of food groups on a weekly basis.	Numeric
Food security	Household Dietary Diversity Score; and	Numeric
	Food Consumption Score.	Numeric
Livelihoods	Household size and age;	Numeric
	Engagement outside of agriculture;	Categorical
	Employment through the investors; and	Categorical
	Change of economic situation over the last ten years.	Categorical

3.3.2 Specific measurements used

Food security is an outcome of the food systems under study (**Chapter 2**). Of the numerous standardised food security measurements available, three are used, including the Food Expenditure Share (FES), the Household Dietary Diversity Score (HDDS) and the Food Consumption Score (FCS). This selection of these instruments was based on data availability of the necessary variables in the survey, and their relevance to the hypothesised changes that the LAIs can bring to food systems. The FES calculates the '*…average share of total expenditures spent on food by households…'* (Jones et al., 2013, p. 485). It is an indicator of economic access to food and includes the value of consumption derived from self-production. For example, HHs that spent more than 75% of their total expenditure on food can be considered very vulnerable in their ability to absorb increases in food prices or diminishing incomes.

The HDDS is '*…meant to reflect, in a snapshot form, the economic ability of a household to consume a variety of foods'* (FAO, 2008, p. 3). The HDDS indicator is often used as a proxy for HH food access. It is calculated by summing up 12 food groups for a 24h recall period. The HDDS results in a score of 0 to 12 (Jones et al., 2013). The cut-off points of the HDDS are not standardised, but the following cut-off points are adopted in this dissertation: Low category <=3 HDDS; Medium category 4 to 5 HDDS; and High category >=6 HDDS. The HDDS is, together with the FCS, an indicator of food availability. The FCS is a composite score based on dietary diversity, food frequency, and relative nutritional importance. It is a core indicator used by the World Food Programme (WFP, 2008). The FCS links dietary diversity and HH food access. It multiplies the frequency of seven food groups (eg, meat or fruit) by an assigned weight, and these values are then summed up to obtain the FCS score. The HHs are then grouped according to their FCS score in 'poor', 'borderline', or 'acceptable' (Jones et al., 2013). This section presented the data analysis techniques for the collected data. In short, inductive thematic analysis is used for the qualitative part, and between-group analysis for the quantitative part. The main concepts analysed are land, food production, food distribution, food environments, and food systems outcomes. The food security situation of a HH is described through the FES, HDDS, and FCS indicators. The next section summarises this chapter.

4 Summary

In **Chapter 2**, the linkages between large agricultural investments and food systems change were presented. In this chapter, the methodology to study these linkages are outlined and the study areas are introduced. The research and methodological elements are summarised in **Table 15**. In short, a postpositivist mixed-methods approach was used for a case study design for study areas in Kenya and Mozambique.

Chapter 1 presented the objectives of this dissertation, followed by **Chapter 2** where the conceptual framework was delineated. This chapter outlined the methodology used to study the concepts presented in **Chapter 2** and to attain the objectives stated in **Chapter 1**. The next chapters will analyse these linkages in the study areas in Kenya (**Chapter 4**) and Mozambique (**Chapter 5**). Based on these chapters, **Chapter 6** will conclude on the linkages between large agricultural investments, food sovereignty and food systems change in the study areas in Kenya and Mozambique.

Table 15 Summary of the main research and methodological elements

Research and methodological element	**Summary**
Epistemology	Postpositivism.
Research method	Mixed-methods (QUAN + qual).
Research design	One-shot, post-hoc instrumental case study design with counterfactual groups.
Population	Qualitative: Food systems of the researched sites; and Quantitative: all households in the research region
Unit of analysis	Quantitative: household
Independent variable	Large agricultural investments.
Dependent variable	Food systems, land, production, distribution, consumption, food security.
Data analysis	Inductive thematic analysis (qualitative); and Between-groups analysis (quantitative).
Data collection periods	February 2016, June-August 2016, January-February 2017, March 2017 (Kenya); and March 2016, September-October 2016 (Mozambique).

Chapter 4 - Food systems change under large agricultural investments around Nanyuki, Kenya

The goal of this chapter is to analyse the effects of Large Agricultural Investments (LAIs) on food systems change in the Nanyuki area, Kenya. This chapter builds on the objectives outlined in chapter 1, the literature review and conceptual framework of Chapter 2, and the methodology explained in Chapter 3. The analysis of the data was through inductive thematic analysis and between-groups analysis. The food supply chains, food environments, and food systems outcomes were compared for three categories. This comparison was followed by a principal component analysis whose components typified households into four food systems types, including relatively traditional and modern food systems. Lastly, this chapter is summarised. The results indicate that LAIs did not directly affect land access and availability or affect engagement in agriculture. The LAIs did spur an expansion of supply chains as they affected the importance of self-production in the diet, although this was not reflected in the diets consumed. Groups with LAIs present were more engaged in more 'modern' food systems. The next chapter analyses the effects of LAIs in the Mozambican study areas of Gurué, Monapo, and Ruacé.

Keywords land, food supply chains, food environments, food security

1 Introduction

The data to analyse the effects of LAIs in the Nanyuki area, Kenya, were collected between February 2016 and March 2017, which involved a survey and (un-)structured and semi-structured interviews. The analysis of the data was through inductive thematic analysis and between-groups analysis, which differentiated the surveyed households (HHs) in three categories, namely counterfactual (CF), non-engaged (NE), and employed (E). The results are presented in four main sections. First, in the section of food supply chains the analyses of land, food production, and food distribution are presented. Second, in the food environments section, the accessibility, availability, and affordability of food with the channels to access the diets are analysed. Third, the diets, food security, and livelihoods indicators are analysed in the section on food systems outcomes. Lastly, a principal component analysis classifies the households into four food systems types, including relatively traditional and modern food systems. The next section analyses the food supply chains of the study areas and compares the land, food production, and food distribution between the CF, non-engaged, and employed.

2 Food supply chains

2.1 Land

2.1.1 Land access and use by the households

The goal of this section is to analyse the effects that the LAIs have on land access and availability. This goal is attained through a comparison of the land access and availability by respondent categories. Furthermore, this section aims to answer hypothesis one, namely if '*the LAIs were linked to decreased access to land'* (**Chapter 1**). There were few differences between the categories regarding the access, access type, security, and use of land (**Table 16**). A minority of the HHs (0 to 1.5%) did not have access to land. Most HHs, ranging from 98.1 to 100%, had access to plots. Almost none of the land access (0 to 0.4%) was communal. The land was mostly secured through title deeds (56.1 to 62.1%) and customary access (12.3-27.6%), with higher customary security by the non-engaged. Securitisation through informal paper was more important for the non-engaged (19.6%) and the employed (16.3%) categories than the CF (10.4%). Generally, only 0 to 1.2% of HHs did not know how their land was secured. The land was mostly used for a combination of housing and farming (64.5 to 70.7%), and land use was similar across the categories. The renting out of land, and the use of land solely for housing, was low across the categories. The channels to access land will be analysed in the next sub-section.

Table 16 Percentage of households' that have access to land, with land security, and primary land use per unit of land, by household category

	Counterfactual	**Non-engaged**	**Employed**
Land access[a]	(N=680)	(N=5056)	(N=956)
Plots	99.4	98.1	100
Communal	0.0	0.4	0.0
None	0.6	1.5	0.0
Land security[b]	(N=960)	(N=6874)	(N=1419)
Title deed	61.7	62.1	56.1
Customary	27.1	12.3	27.6
Informal paper	10.4	19.6	16.3
Other	0.0	4.8	0.0
Don't know	0.8	1.2	0.0
Primary land use[b]	(N =960)	(N=6685)	(N=1419)
House and farm combined	70.0	70.7	64.5
Farming, forestry, grazing	25.8	22.3	29.1
Rented out	2.1	1.3	2.1
House	1.3	2.9	3.0
Fallow	0.0	1.9	0.0
Other	0.8	0.9	1.3

[a]Per household, [b]Per unit of land. Weighted data. Data: Afgroland (2017).

2.1.2 Land access channels

Generally, the channels to access land were inheritance, purchases, and leases
Table 17).

Table 17 Proportion of channels to access land with the median years of access to the land, by household category

	Counterfactual (N=960)	**Non-engaged (N=6874)**	**Employed (N=1419)**
Inheritance	55.0	23.0	45.7
Purchase	24.6	55.1	33.4
Lease	15.8	12.9	20.1
Donation	1.7	3.4	0.8
New	0.0	0.3	0.0
Barter	0.0	0.3	0.0
Traditional	0.4	0.0	0.0
Other	2.5	4.9	0.0
Median years	15.0	12.0	8.0

Weighted data. Data: Afgroland (2017).

The categories differed in the channels used for land access. First, the CF (55%) and the employed (45.7%) had a higher prevalence of inheritance than the non-engaged (23%). Second, the non-engaged relied more on purchases for land access (55.1%) compared to the CF (24.6%) and employed (33.4%). Third, the employed accessed more through leases (20.1%) than the CF (15.8%) and the non-engaged (12.9%). Across the categories, donation, new lands, barter, or traditional land access was low (0 to 3.4%). Interestingly, traditional land access was low compared to the importance of customary security (**Table 16**), which might indicate a low availability of new land that can be dispensed through the traditional channel. Generally, the CF held their lands the longest at 15 years, compared to 12 years for the non-engaged, and eight years for the employed. Excluding the one plot that was accessed through the traditional channel, purchases were the most stable channel to access land.

2.1.3 Land size

On average, a HH had between 1.4 and 1.5 plots at their disposal, with a total land size that ranged from 0.8 to 1.6 ha per HH (**Table 18**). The employed had significantly more (p=.001) plots of land at their disposal than the non-engaged. In terms of total land size, the CF had significantly more land than the non-engaged (p<.001) and the employed (p<.001). Also, the non-engaged had significantly more land (p=.001) than the employed.

Table 18 Mean number of plots and land size, by household category

	Counterfactual (N=680)	**Non-engaged (N=5056)**	**Employed (N=956)**
Mean units of land	1.4	1.4^{E*}	1.5^{NE*}
Mean total land size (ha)	$1.6^{NE**,E**}$	$1.1^{CF**,E*}$	$0.8^{CF**,NE*}$

Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. *Sign. difference (p=.001); **Sign. difference (p<.001) with CF *Counterfactual*; NC *Non-engaged*; E *Employed*. Weighted data. Data: Afgroland (2017).

However, within the land debate, it is worth noting that size is not everything. According to the literature, the value of land is not only a function of its scale, but also other factors such as location, fertility, or distance to road infrastructure. As described in **Chapter 2**, LAIs are generally interested in high-valued land that is often already used by local communities.

2.1.4 Land loss

Most of the HHs (74.1 to 87.7%) of HHs reported no increase or decrease of land surface, followed by less land (7.9 to 22.4%) and more land (2.6 to 4.4%) (**Fig. 16**).[53] The CF was significantly different from the non-engaged (p=.001) and the employed (p<.001), while the non-engaged was significantly different from the employed (p=.045). These differences are likely attributable to the higher prevalence of land loss in the CF and the non-engaged compared to the employed. Land loss for the CF was much higher at 22.4% compared to the non-engaged (12.8%) and the employed (7.9%).

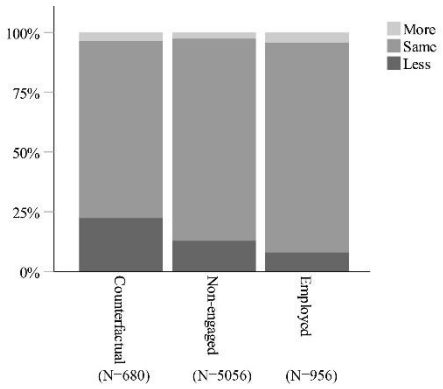


Fig. 16 Percentage of households reporting land area changes in the past ten years, by household category
Weighted data. Data: Afgroland (2017)

[53] Sign. differences between categories by study areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

The LAIs were not directly responsible for any of the land decreases in the study areas. As outlined in **Chapter 3**, the LAIs around the Nanyuki area operated on colonial land that was appropriated after independence by Kenya's elite. This land was then sold to the LAIs. Therefore, the LAIs were not linked to any (recent, direct) dispossession of land.

2.1.5 Perceptions of land security

The HHs' perspective of investor's impact on land availability and the HH's perspective on land loss are shown in **Fig. 17**.[54]

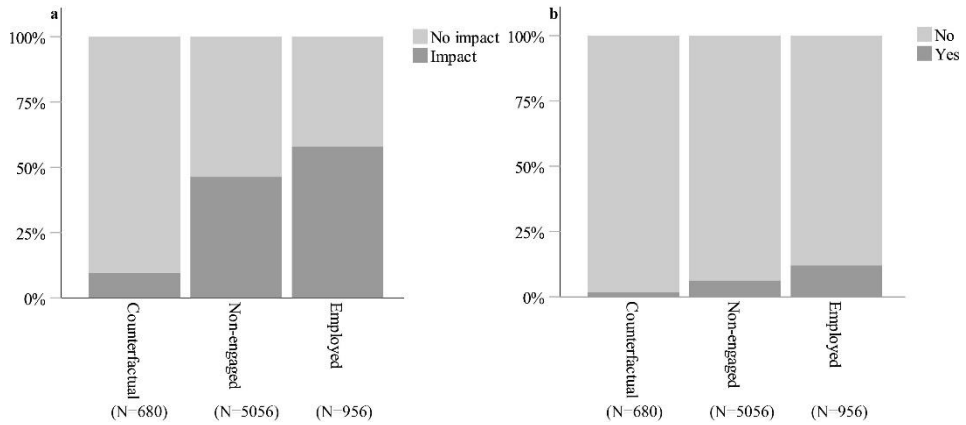


Fig. 17 Percentage of household's perceptions of land availability and land security, by household category **a**. Household's perceptions of investors impact on land availability. **b**. Household's worried about the loss of land. Weighted data. Data: Afgroland (2017)

The CF perceived the LAIs as significantly less impacting land availability compared to the employed ($p<.001$). Most of the employed (57.9%) perceived the LAIs as impacting land, compared to 9.4% of the CF and 46.3% of the non-engaged. The concerns of the HHs centred on the LAIs' land that was not available to the community and the impact the LAIs had on rising land prices. The CF and non-engaged were significantly less worried about the loss of land compared to the employed ($p<.001$). But overall, worries about the loss of land were low, at 1.8 of CF HHs, 6.1% of non-engaged HHs, and 11.9% of employed HHs. In interviews, the HHs reported their confidence in the protection of their land rights in Kenya's jurisdictional system.

2.1.6 Land changes

There were no significant differences between categories regarding change in land access over the last ten years (**Fig. 18**).[55] Land change was very high across the categories (87.7 to 91.8%). The CF had the most land changes over the past ten years (91.8%), followed by the non-engaged (88.9%) and the employed (87.7%). The most important reasons given for land changes were the difficulty of buying new land because of decreased availability of land for purchase (55.7 to 69.7% of reasons given), the difficulty of finding grazing land (12.7 to 16.9%),

[54]Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.
[55]Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

or the difficulty of obtaining land from the community (7 to 20.7). Tenure insecurity was a low driver of land change at 0 to 0.4% of reasons given.

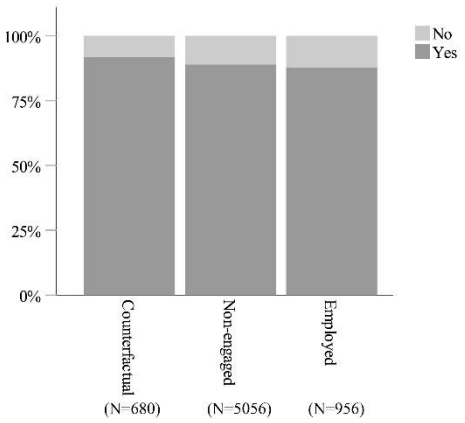


Fig. 18 Percentage of household's change of land access over the last ten years, by household category
Weighted data. Data: Afgroland (2017)

2.1.7 Overview of land access and availability

The goal of this section was to analyse the effects of LAI on land access and availability. This section showed the diversity of different land dynamics, ranging from land access to changes in land size. While some indicators were significantly different between categories, others were not. As depicted in **Chapter 3**, the concept of land has multiple variables that are of concern in the land debate. But this plurality also complicates the formulation of a single answer to hypothesis one: '*the LAIs were linked to decreased access to land'* (**Chapter 1**). First, there were few differences between the categories regarding the access and use of land (**Table 16**). However, the CF and the employed differed in their channels to access land compared to the non-engaged. Second, the CF accessed significantly more land area than the non-engaged and the employed (**Table 17**). Third, the CF lost significantly more land than the non-engaged and the employed. Also, the non-engaged lost significantly more land than the employed (**Fig. 16**). Overall, the LAIs were not responsible for any recent dispossession of land in the study areas. Fourth, the CF perceived the LAIs as significantly impacting land availability less compared to the non-engaged and the employed (**Fig. 17**). Most of the employed saw the LAIs as impacting land. While overall concern about land loss was low, the CF and the non-engaged were significantly less worried about the loss of land than the employed. Fifth, the change of land was very high across all categories. This was primarily driven by the difficulty of buying new land or finding grazing grounds.

The large agricultural investments were not linked to (direct) decrease of access to land

No HH was dispossessed of their land by the LAIs. While the CF accessed significantly more land area than the non-engaged and the employed, it is the CF that reported the largest drop in land surface. However, the LAIs might indirectly impact land access. The non-engaged and the employed perceived the LAIs as impacting land more than the CF. The land that the LAIs occupied were not available for the HHs to use and can exacerbate

land pressures on top of other dynamics such as a growing Kenyan population (van Ittersum et al., 2016). In interviews, the impact of LAIs on water availability was brought up as a more pressing issue than land.[56]

2.2 Food production

The goal of this section is to analyse the effects that LAIs have on food production. Furthermore, this section seeks to answer the hypothesis two, namely if '*the large agricultural investments were linked to decreased agricultural production*' (**Chapter 1**). It was not feasible to quantify plot or HH productivity in the classical sense, as output per ha or per worker. Although the HH survey included questions aimed to measure agricultural production, the quality of the answers was low and the data were not reliable. Therefore, the production is approached through types of crops produced; animal production; change of animal production; and engagement in agriculture.

2.2.1 Crop production

Most of the agricultural land was used for cropping (58.1 to 65.5%) (**Table 19**). The CF, non-engaged, and employed had similar rates of annual (58.1 to 65.5%), mixed-use (19.3 to 23.6%) and perennial cropping (6.6 to 17.2%). The crops grown within the annual category are depicted in **Table 20**. The six crops represented between 53 to 73.2% of reported crops grown.

Table 19 Percentage of households reporting the main agricultural use of their lands, by household category

	Counterfactual (N=916)	**Non-engaged (N=6339)**	**Employed (N=1328)**
Annual cropping	61.1	65.5	58.1
Mixed-use	22.3	23.6	19.3
Perennial cropping	13.1	6.6	17.2
Fallow	0.9	0.9	0
Grazing	0.4	0.9	0
Trees, shrub	0	0.4	2.3
Other	2.2	2.2	3.2

Weighted data. Data: Afgroland (2017).

The HHs grew mostly maize (36.2 to 39.4%), wheat (6.9 to 11.9%), and beans (2.2 to 9%). Noticeably, **Table 20** is limited to the main annual crops and thus does not reflect the full diversity of crops grown.

One proposed advantages of the LAIs is technological spill-overs, for example, making seeds and inputs available to small-scale farmers (**Chapter 2**). While the horticultural LAIs and the small-scale farmers can produce the same crops, none of the HHs reported a change in agricultural practices and land use due to the LAIs. Rather than LAIs, water and labour shortages prompted change in seeds and input use. Thus, the adoption of new agricultural skills and techniques due to interactions with a LAI was very low. However, spill-over did exist. In one interview, an agro-input store manager immediately next to a LAI said they received requests from LAI

[56] In the dry season, less water flows in the rivers that the small-scale farmers rely on. In interviews, small-scale farmers blamed the LAIs for increased water scarcity. However, LAIs relied less on the rivers as they source more from boreholes and water catchment, so their withdrawal from the rivers decreased over time. It is speculated that climate change decreased the flow of water into the rivers on which the small-scale farmers relied (Director CETRAD in Nanyuki, personal communication, August 03, 2016; Lanari, Liniger, & Kiteme, 2016).

workers for new pesticides or insecticides after the workers had used these products on the LAI. So, while the LAI might not be a major driver of agricultural practices, it can showcase new agro-inputs to small-scale farmers.

Table 20 Most prevalent main annual crops on the household's land, with the percentage of households mentioning each plant, by household category

	Counterfactual (N=960)	**Non-engaged (N=6885)**	**Employed (N=1419)**
Maize	36.2	39.4	37.7
Wheat	11.9	6.9	9.7
Beans	9.0	5.1	2.2
Potato	6.7	20.7	14.1
Peas	5.2	0.5	1.4
Onion	5.2	0.0	0.0
Other	25.7	27.5	34.9

Weighted data. Data: Afgroland (2017).

2.2.2 Animal production

Overall, animal possession and ownership were very high across all categories (89.5 to 94.1% of HHs own at least one animal) (**Table 21**).[57] Except for the ownership of cows, there were no significant differences between categories regarding their prevalence of animal possession or their animals per HH. The employed had significantly more cows than the non-engaged ($p<.001$). Overall, poultry ownership was the highest, followed by sheep and rabbit ownership. However, the non-engaged had an average of 10.9 poultry animals, the median for poultry animals per HH was 6 for the non-engaged, which was in line with the CF (median of 5) and the employed (6). Pig ownership was very low (0 to 0.1 per HH).

Table 21 Household animal ownership and the mean number of animals, by household category

	Counterfactual	**Non-engaged**	**Employed**
Household with animal	(N=680)	(N=5026)	(N=956)
%	94.1	89.5	91.6
Mean animals per household	(N=680)	(N=5056)	(N=956)
Poultry	6.6	10.9	7.9
Sheep	5.4	5.6	5.8
Rabbit	3.4	4.0	3.9
Cow	2.0	2.3^{E}	1.9^{NE}
Pig	0.0	0.0	0.1

Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Sign. difference ($p<.001$) with CF *Counterfactual*; NC *Non-engaged*; E *Employed*. Weighted data. Data: Afgroland (2017).

2.2.3 Engagement in livestock and agriculture over the last ten years

The changes in livestock and agricultural engagement of HHs is reported in **Fig. 19**.[58] There were no significant differences regarding the HHs' engagement in livestock across the categories. Most of the HHs reported a stable engagement in livestock (57.1 to 62.6%), followed by less (30.2 to 31.2%) and more engagement (7.3 to 11.7%). While the non-engaged grow their livestock engagement slightly less, livestock engagement dynamics are similar across the categories.

[57] Sign. differences between categories by study areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.
[58] Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

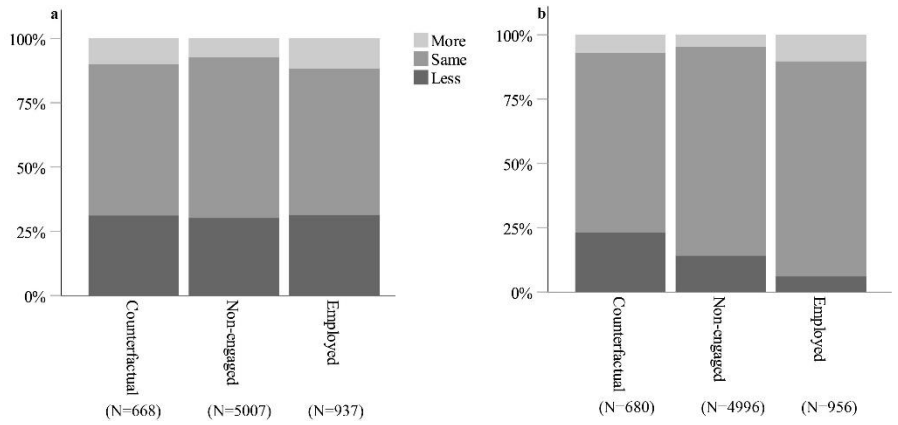


Fig. 19 Percentage of household's reporting the change of household's livestock and agricultural engagement over the past ten years, by household category
a. Engagement in livestock, past ten years. **b**. Engagement in agriculture, past ten years. Weighted data. Data: Afgroland (2017)

There were a few significant differences regarding HHs' engagement in agriculture. The CF significantly differed with the non-engaged ($p=.001$) and the employed ($p<.001$), likely due to CF's lower agricultural engagement over the last ten years. The non-engaged differed significantly from the employed ($p=.048$), likely due to less engagement for the non-engaged and more engagement for the employed. Similar to livestock engagement, most HHs (70 to 83.7%) had a stable agricultural engagement, while 6 to 22.9% had less engagement, and 4.7 to 10.4% had more agricultural engagement over the last ten years.

2.2.4 Overview of food production

The goal of this section was to inquire on the possible effects of LAI on food production and to formulate an answer to hypothesis two: '*the large agricultural investments were linked with decreased agricultural production*'. This section presented the types of crops produced; animal production; change of animal production; and engagement in agriculture. The CF, non-engaged, and employed used their agricultural land similarly and grew similar main annual crops (**Table 19** and **Table 20**). While the LAIs might not had a discernible effect on the types of crops produced by small-scale farmers, neighbouring farmers might adopt LAI's use of certain agro-inputs. The ownership of an animal was widespread across all categories, with poultry the most popular animal category (**Table 21**). The non-engaged had significantly higher ownership of cattle compared to the employed. The engagement of HHs in livestock over the past ten years was similar across the categories (**Fig. 19**). The CF differed significantly regarding their agricultural engagement over the past ten years with the non-engaged and the employed, likely due to CF's higher disengagement in agriculture. Also, the non-engaged differed significantly from the employed in their agricultural engagement, likely due to the higher agricultural disengagement of the non-engaged. The employed increased its agricultural engagement the most.

The large agricultural investments were not linked to a decrease in agricultural engagement

Hypothesis two relates to the link between the LAIs and agricultural engagement of the HHs. While there were no differences in the types of crops grown between the categories, the CF had *more* agricultural disengagement over the past ten years compared to the non-engaged and the employed. Thus, groups with LAIs in their

environment disengaged less than groups with no LAI present. As insufficient time was below 1% of the reasons given for less agricultural engagement in the employed, this result opposes the presumptions of the literature on the LAIs' effects, in which LAI employees would decrease the time available for one own's farming activities (**Chapter 2**). In the interviews and survey, a few explanations were given for the relationship between LAI presence and agricultural engagement, including the price of land, lack of funds for investment, water shortage, and division through inheritance. First, land was deemed very expensive in the area (**Section 2.1.6**). As a result, the youth raised necessary starting capital to farm by seeking employment at the LAI farms for a couple of years. Their savings could then be invested in their HH farming operations, possibly in the CF area, with added skills regarding agro-inputs and investments such as irrigation. Second, employment at the LAIs was also seen as a backup option for older people when capital was needed. Thus, the option of LAI employment could have decreased the volatility of livelihoods and averted more drastic measures, such as the selling of land. Third, the shortage of water decreased agricultural productivity, leading to a spiral of lower investments and poorer harvests. Fourth, the subdivision of land in the CF to relatives further decreased the average land size per HH, which fits a Chayanovian perspective of agricultural (dis-)engagement (**Chapter 2**). Thus, the LAIs were not linked to a decrease in agricultural engagement.

2.3 Food distribution

The goal of this section is to map the food distribution of the study sites and to compare the channels used to obtain the different food groups. The markets where the HHs sell their produce, and source some – or all – of their diets, are mapped. This section is a combination of inductive thematic analysis and between-groups analysis. Therefore, the study areas can be combined when there are limited differences between the study areas, or when not enough data is available to differentiate according to category.

2.3.1 Sale of food production

The destination of the agricultural produce of the HHs differed according to category (**Table 22**). Most of the food produced by the CF and the non-engaged was for self-consumption (51.5 to 61%), while self-consumption was lower for the employed (43.3%). The middlemen or hawker was the primary channel for sales of produce (31.6 to 43.6%), followed by the local shop (0 to 8.5%) and the spot market (1.9 to 4.6%). Overall, sales to wholesalers were very low (0 to 0.4%).

Table 22 Selling of main crops per distribution channels, by household category

	Counterfactual (N=960)	**Non-engaged (N=6885)**	**Employed (N=1419)**
No sale	51.5	61	43.3
Middlemen or hawkers	33.4	31.6	43.6
Shop	8.5	0.8	2.7
Spot market	3.3	1.9	4.6
Village	2.3	4.3	2.9
Agribusiness	0.7	0	2.9
Wholesale	0.3	0.4	0

Weighted data. Data: Afgroland (2017).

These distribution channels differed according to the type of crop produced, as depicted in **Fig. 20**. This figure showcases the main crops sold for all HHs and is weighted according to the prevalence of the crops. Overall, maize and potatoes were the most prevalent crops, and the main distribution channels were self-consumption (no sale) and sales to middlemen and hawkers. There were two clusters of crops with different channels of distribution. First, maize and beans were mostly for self-consumption (no sale), with limited sales by the HH. Maize was the main staple for Kenya, and this was reflected here as well. Second, potatoes, wheat, peas, and onion were mostly sold. The main channels for selling produce were the middlemen or hawkers, followed by direct sales (village), spot markets, shop, wholesale, and agribusiness. Only peas were sold to agribusiness, which was likely to go for export.[59]

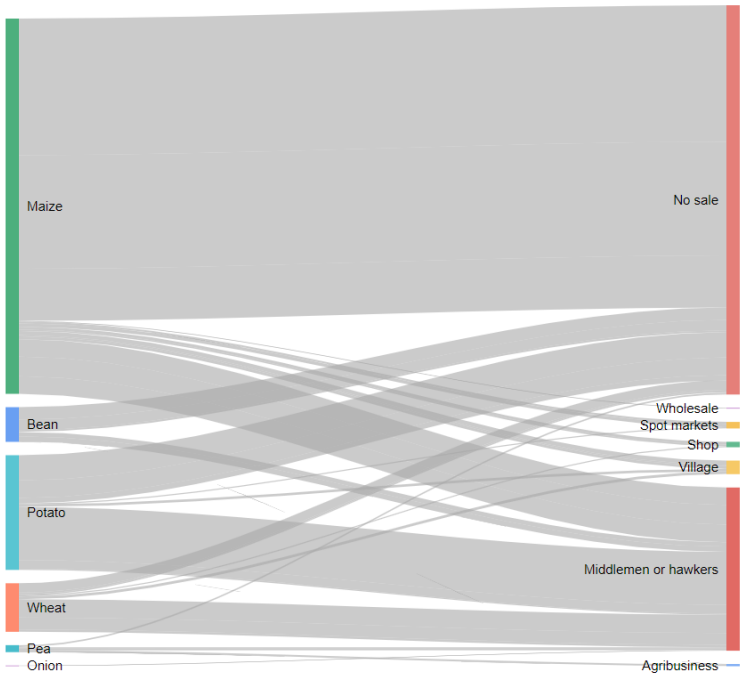


Fig. 20 Principal destination and proportion of 9967 units of main crops
Weighted data. Data: Afgroland (2017)

Poultry and sheep, the most prevalent animals (**Table 21**), were mostly kept for self-consumption (61.7 to 84.6%). Just as the crop sale channels (**Fig. 20**), animal channels are middlemen or hawkers (6.6 to 22.8%) and direct sales (4.3 to 4.9%). Through qualitative interviewing, the different food chains were mapped and summarised in **Fig. 21**.

All channels were prevalent in the Nanyuki area. Due to the absence of bookkeeping, seasonality, and the ad-hoc nature of the food businesses in the study areas, interviewee recall of items was unreliable. Thus, a simple weight (very important to less important) was assigned to the different sale channels and destinations according to the prevalence of these chains mentioned in the interviews.

[59] In interviews, some respondents indicated they hold certain certifications, such as GLOBALG.A.P.

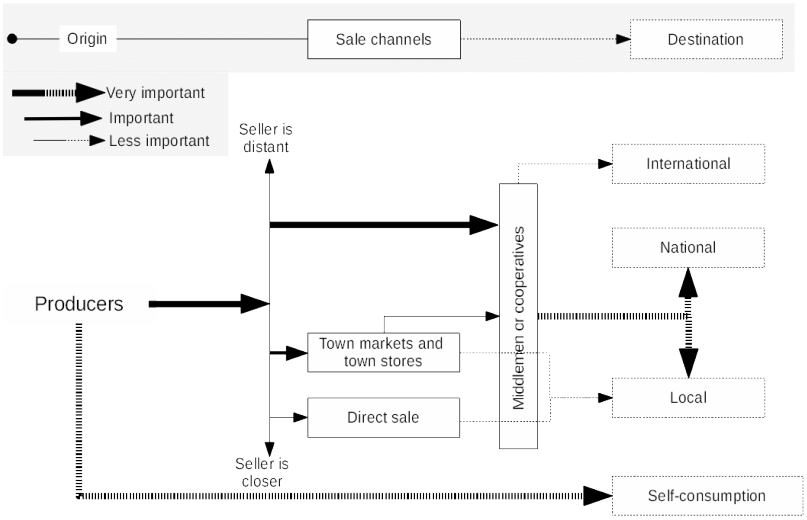


Fig. 21 Channels of sale and destination for the households' production

As cross-validated by **Fig. 20**, self-consumption was a very important channel for HH's production. But the sale of produce was very important as well. First, the HHs sold produce to neighbours (direct sale). However, neighbours were perceived as a less important and more ad-hoc channel of sale that involved limited quantities. The produce stayed within the local area. Second, town markets and town stores were an important channel for sales. The area, and especially the central town of Nanyuki, had busy markets and stores where local produce was traded. The HHs could sell their produce or animals to these markets or butcher stores. The markets themselves were specialised in fruit and vegetables, while stores sold cereals and meat. Third, the HHs that wanted to sell to markets and stores often faced transport challenges, which could be overcome by selling to middlemen ('brokers'). The middlemen were very important channels of trade. The middlemen regularly visited farms to buy products such as maize, wheat, potatoes, or peas, which could go to the town market's, other regions, or the capital Nairobi. Alternatively, these middlemen operated at the town markets as well. For farmers that were certified, certain products (such as snow peas) might ended on the international market. Fifth, the consumption of milk was high in the area (**Table 26** and **Fig. 29**). Many of the HHs reported that they were members of a milk cooperative that bought the milk. This milk was locally or nationally consumed. Examples of the different food businesses described are portrayed in **Photo 1**.

This sub-section presented the market channels of the food systems to which the HHs sold their produce to. It showed that most crops were not sold but used for self-consumption and that the market channels were similar across the areas. The next sub-section engages with the channels for diet access.

A. Market, Tigithi

B. Butcher store, Ntugi

C. Milk broker, Nanyuki area

D. Town market, Nanyuki

E. Cereal store, Nanyuki

Photo 1 Food businesses examples around Nanyuki, Kenya

2.3.2 Buying food

The different channels to obtain the diets and their differences are portrayed in **Table 23**. Overall, markets were the dominant channel for dietary access as it was used for 38.9 to 44.3% of access to all food groups. Market access was followed by shops, which provided 29.9 to 34.8% of diet access. Self-production was responsible for 18.9 to 29.5% of access, and this was notably higher for the CF (29.5%) compared to the non-engaged and employed (18.9 to 20.2%).

Table 23 Percentage of households reporting their primary channel to obtain food groups, by household category

	Counterfactual	**Non-engaged**	**Employed**
Cereal	(N=680)	(N=5014)	(N=956)
Self-production	26.5	16.6	14.6
Market	48.2	56.7	43.3
Shop	25.3	25.3	40.1
Other	0.0	1.5	2.0
Tuber	(N=672)	(N=4846)	(N=956)
Self-production	56.5	45.7	56.1
Market	33.3	45.0	38.0
Shop	4.8	8.0	4.0
Other	5.4	1.2	2.0
Orange vegetables	(N=484)	(N=4327)	(N=857)
Self-production	3.3	7.0	15.5
Market	90.1	75.0	66.4
Shop	6.6	14.5	11.4
Other	0.0	3.5	6.7

Green vegetables	(N=676)	(N=4983)	(N=956)
Self-production	57.4	32.2	35.8
Market	33.1	49.9	51.6
Shop	6.5	15.8	12.7
Other	3.0	2.0	0.0
Other vegetables	(N=680)	(N=5014)	(N=956)
Self-production	44.7	17.6	26.2
Market	46.5	67.0	71.4
Shop	4.7	14.0	2.4
Other	4.1	1.4	0.0
Orange fruit	(N=596)	(N=4464)	(N=876)
Self-production	8.1	1.1	2.2
Market	88.6	85.5	87.9
Shop	2.7	12.0	5.6
Other	0.7	1.5	4.3
Other fruit	(N=628)	(N=4706)	(N=918)
Self-production	4.5	3.2	0.0
Market	89.8	85.4	93.8
Shop	5.1	10.1	4.1
Other	0.6	1.3	2.1
Meat	(N=560)	(N=4431)	(N=872)
Self-production	7.9	6.2	7.0
Market	50.0	51.2	47.0
Shop	41.4	41.2	46.0
Other	0.7	1.4	0.0
Eggs	(N=584)	(N=4266)	(N=871)
Self-production	75.3	73.1	75.9
Market	6.2	6.8	4.4
Shop	17.8	19.2	17.6
Other	0.7	0.9	2.2
Fish	(N=28)	(N=793)	(N=223)
Self-production	0.0	4.3	0.0
Market	71.4	44.9	18.4
Shop	28.6	19.2	22.0
Other	0.0	31.7	59.6
Beans	(N=672)	(N=4954)	(N=956)
Self-production	67.9	24.5	18.6
Market	27.4	59.3	66.0
Shop	4.2	16.0	15.4
Other	0.6	0.2	0.0
Milk	(N=672)	(N=4947)	(N=933)
Self-production	64.3	50.1	44.8
Market	6.0	10.2	10.2
Shop	20.8	32.2	31.2
Other	8.9	7.4	13.8
Oil and fat	(N=672)	(N=5014)	(N=956)
Self-production	0.6	0.6	0.0
Market	22.0	12.8	9.9
Shop	77.4	86.6	90.1
Other	0.0	0.0	0.0
Sweets	(N=652)	(N=4834)	(N=922)
Self-production	0.0	0.0	0.0
Market	9.8	8.6	8.2
Shop	90.2	91.4	87.6
Other	0.0	0.0	4.1
Spices	(N=672)	(N=4973)	(N=956)
Self-production	0.0	0.4	0.0
Market	8.9	8.0	9.1
Shop	91.1	91.6	90.9
Other	0.0	0.0	0.0
Mean			
Self-production	29.5	18.9	20.2
Market	38.9	44.3	42.5
Shop	29.9	34.8	33.7
Other	1.8	2.0	3.6

Weighted data. Data: Afgroland (2017).

However, **Table 23** does not weigh the food groups according to the HHs' consumption of that group. **Table 26** shows that certain food groups were far more consumed than others. For example, while spices were used 6.9-7 days per week, the consumption of meat was far lower at 0.7 to 1.7 days per week. In **Fig. 22**, the food groups are weighted according to the number of days it was consumed in the seven days before the survey. This weighting results in 377,957 food groups consumed. When weighted, the distribution of channels remains similar to **Table 23**. Around Nanyuki, the markets and shops continued to be dominant for diet access compared to self-production. Also, **Fig. 22** shows the clustering of sources per food group. On the one hand, eggs, tubers, and milk were mainly derived from self-production, while on the other hand, oil and fat, spices, and sweets were mostly derived from the shops. The shops delivered more processed food, such as oil and fat, spices, and sweets, while the market provided less processed food such as beans, cereals, other fruit, and orange vegetables. Thus, certain food groups were sold by different channels, which were embedded in distinctive supply chains.

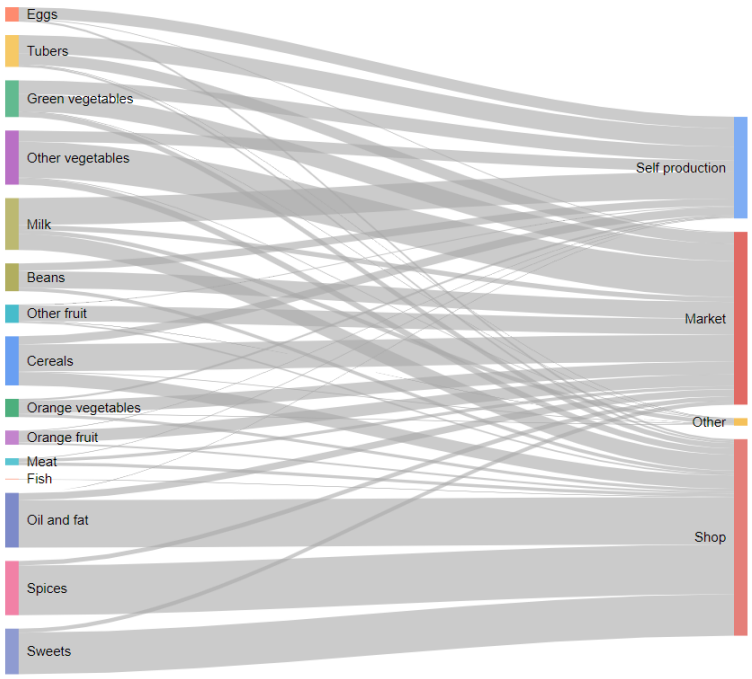


Fig. 22 Distribution of 377,957 food groups servings consumed by the households in the last week and their source
Weighted data. Data: Afgroland (2017)

BOX 9 The rise of supermarkets in Nanyuki Town

The town of Nanyuki seemed to be part of the 'supermarket revolution' that is projected to expand in SSA (**Chapter 2**). In 2016, at least four supermarkets were operating in the town, two of which opened in the last two years. These supermarkets had increased accessibility to a range of new products, including energy-dense food such as chips and sweets. Generally, the supermarkets did not compete directly with traditional wet markets. Three out of four supermarkets did not sell fresh fruit and produce as they could not compete with the prices offered by traditional

Photo 2 Supermarket in Nanyuki town

wet markets. The only supermarket that did provide fresh fruit and produce, Nakumatt, was the high-end supermarket that catered to the wealthiest layer of society. One supermarket reported the low sale of canned vegetables because they were perceived as less desirable than local produce, and consumers preferred local rice over more expensive international varieties. In 2016, the supermarkets provided mostly highly pro
cessed food and meat, and cereals such as large bags of milled maize. However, as depicted in **Chapter 2**, supermarkets tended to expand their range to include fresh fruit and produce and thus competing directly with the traditional wet markets. This expansion could have consequences for both the livelihoods of the market sellers and the small-scale farmers supplying these markets. The supermarkets rarely source food from poorer small-scale farmers due to their challenges in providing a stable, safe, year-round cheap supply of goods. For example, Nakumatt relied on commercial, albeit not large, farmers for their fresh fruit and produce. Because of their preference for larger farms, the supermarkets can be a driver of concentration within the food production sector.

2.3.3 Supply chain characteristics

In **Chapter 2**, the food supply chain typologies were presented, which included traditional, modern, and modern-to-traditional. All these food supply chains were present around Nanyuki. The type of chain, or a mix of chains, depended on the type of product. First, traditional supply chains linked small-scale farmers with consumers through traditional wet markets (**Fig. 23**). Throughout the Nanyuki area, traditional wet markets were found along the main road and in villages such as Buuri. The main traditional market was in Nanyuki town. These markets mainly sold fresh fruit and vegetables, such as cabbage.

In this example, cabbages from small-scale farmers were sold at Nanyuki's central market.[60] The cabbage seller procured the cabbages directly from the farmers with a rented pick-up truck that was shared with the other cabbage sellers of the market. At times, the seller will help the farmers to harvest from the fields. Moreover, the cabbage seller acted as a middleman who buys and then sells to wholesale buyers, who take the cabbages out of the Nanyuki area, possibly to Nairobi. Second, in modern supply chains, a domestic or multi-national food manufacturer buys from commercial farms or food manufacturers and sells through supermarkets (**Fig. 24**).[61] In this example, fresh fruit and vegetables were procured from Kenyan commercial farmers while an international chain brought processed food to the Nanyuki supermarket.

[60] Cabbage seller and middleman at Nanyuki central market, personal communication, 07 February, 2016.
[61] Nakumatt Nanyuki supermarket interview, 29 July, 2016

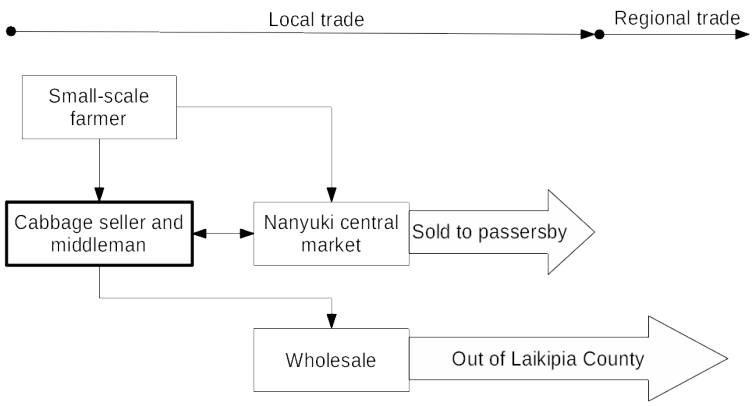


Fig. 23 Example of a traditional supply chain for a cabbage seller at Nanyuki central market

In **Fig. 24**, commercial farmers delivered to a larger company that supplied the supermarket chain throughout the country, at least for local produce. This chain includes spinach, courgette, cucumber, and tomatoes. This food is then transported to all the supermarket outlets in cooled trucks. Other items, such as canned tomatoes or fish, were part of supply chains that can span multiple countries or continents. The tracking of these items, and all their ingredients, was challenging due to the complexity of the supply chains involved. Lastly, modern-to-traditional supply chains connected domestic or multi-national food manufacturers with traditional traders and retailers. Across the Nanyuki area, small shops sold a variety of processed products, which often included sodas and sweets. The modern-to-traditional soda supply chain for a shop in Nanyuki and one in Ntugi is presented in **Fig. 25**.[62,63]

For the Nanyuki shop, the soda was directly acquired from a Nanyuki wholesaler, while the village shop buys the soda either from a middleman, who bought it from the Nanyuki wholesaler, or the shop owner travels to Nanyuki. The soda supply chain was challenging to track down. While the wholesale in Nanyuki acquires the soda from a larger distribution centre, some of the soda products were likely to come from outside Kenya. In these examples, the traditional supply chain was the mostly local embedded, with the production, sale, and consumption occurring locally. The modern supply chain was the most diverse as it provided a wide range of products, with ingredients from all over the world, to the consumers of the supermarket. But the modern-to-traditional chain was the most accessible to residents. Throughout Nanyuki town and the villages, these small shops were the closest to people's homes.

[62] Nanyuki store manager, personal communication, 04 June, 2016.
[63] Ntugi store manager, personal communication, 06 June, 2016.

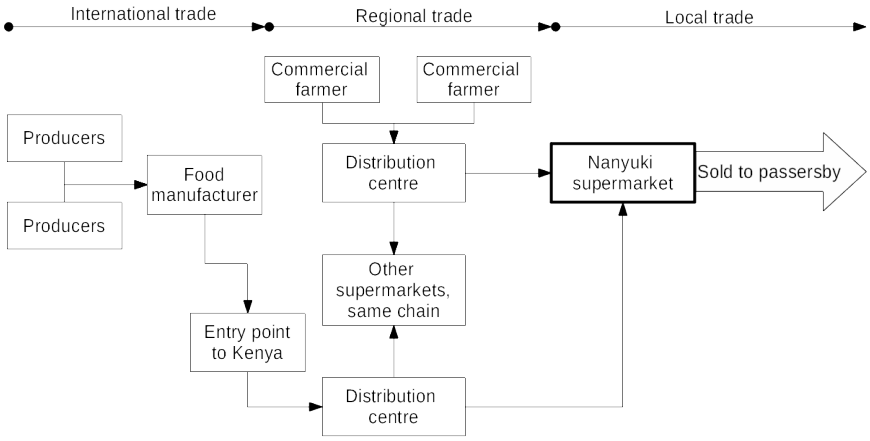


Fig. 24 Example of a modern supply chain from the perspective of a Nanyuki supermarket

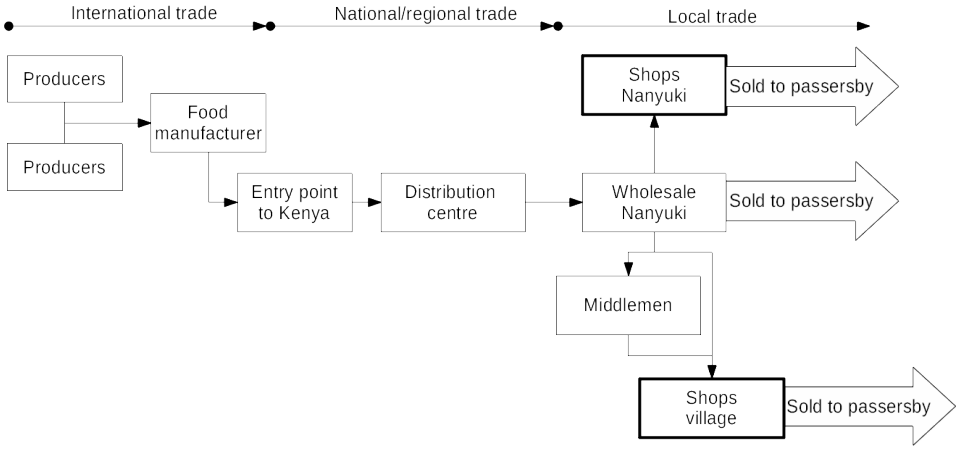


Fig. 25 Modern-to-traditional supply chain of soda
Example from the perspective of a Nanyuki shop and a village shop

Expanding supply chains under large agricultural investments: the example of Ex-Lewa (in Buuri)

In interviews, the LAIs were linked with increases in all three supply chains. These increases were exemplified by the town of Ex-Lewa in the Buuri study area. Ex-Lewa is a small town (<2,000 inhabitants) where a LAI started to develop in 2013. The proximity of the LAI and the relative size of the town compared to the LAI is depicted in **Fig. 26**.[64]

[64] Based on Google Earth images.

Fig. 26 Change in land use in the town of Ex-Lewa 2003-16
a. Ex-Lewa in 2003. The area adjoining Ex-Lewa was used for small-scale agriculture and grazing. **b**. Ex-Lewa in 2016. The large agricultural investment developed on the land adjoining Ex-Lewa and its population has grown from 2014 onwards

Before 2013, the land surrounding the town was used for small-scale farming and grazing used. The LAI bought some of this land (**Fig. 26b**) and developments started in 2013. Even though the town was growing already, the start of the LAI's operations in 2014 attracted more migrants to work at the LAI.[65] While there was no expansion of the territory of Ex-Lewa, there was a significant intensification of buildings and activities within the town. The new migrants often lacked access to land to grow their food, so more market activity developed in Ex-Lewa to supply food to these migrants. In Ex-Lewa, both the traditional and modern-to-traditional supply chain responded to the new demand created by LAI workers and opened new businesses and deeper trade relations with nearby Meru town. First, more shops that sold cereals and fresh fruit opened in the town, which received this produce from nearby Meru town through traditional supply chains. Second, the shops often offered soda, sugar, and oil and fat as well, which went through the modern-to-traditional supply chains from either the nearby towns of Timau or Nanyuki. While these products were already available before the LAI came, their availability grew after the LAI started its operations. Thus, the arrival of the LAI caused an influx of migrant and the expansion of both the traditional and the modern-to-traditional supply chains and influenced the modern supply chains in

[65] Group discussion in Ex-Lewa, personal communication, 24 January, 2016.

Nanyuki as well. For example, a supermarket manager saw an increase in sales when the farmworkers received their salaries.[66] Hence, the employment generated by the LAIs and the increased access to cash for its workers drove supermarket sales. This increase in supermarket sales is further analysed in **Section 3**.

BOX 10 The role of Nanyuki town in the distribution system of the Nanyuki study area

The town of Nanyuki played a central role in the distribution system of the Nanyuki study area. While the nearby town of Meru had a sizeable agricultural market as well, Nanyuki's market was bigger and had traditional, modern, and modern-to-traditional supply chains. Located on the road to Nairobi, which was just 168 km away, it was a busy market town with plenty of restaurants. While Meru offered space for fresh fruit and vegetables, Nanyuki had better access to a wide range of international and processed food through their supermarket chains. Much of the food found in the village shops, especially the energy-dense food, came from Nanyuki, which was a regional distribution hub. The central market was the primary source for fresh fruit and vegetables, even as hawkers and spot markets were found across the town. Everyone was free to set up a stall at the central market and start trading. It was easier to be a market seller then to be a farmer as the land was expensive in the area (**Section 2.1**) and farming without inheritance required much capital. Thus, the 'livelihood option of last resort' in the Nanyuki area was not farming but working in the distribution system.

Photo 3 Nanyuki central market

2.3.4 Overview of food distribution

This section has mapped food distribution around the Nanyuki area and compared the channels used to obtain the different food groups. For the CF and the non-engaged of residents, most of the home-produced food was for self-consumption. Self-consumption was lower for the employed. The main channels for produce sales were middlemen or hawkers, direct sales, spot markets, shops, wholesalers, and agribusinesses. The markets were the dominant channel for dietary access, followed by shops and self-production. The contribution of self-production to HH diets was larger for the CF compared to the non-engaged and the employed. The direct effects of the LAIs on food distribution of the Nanyuki area was small. From interviews, no HH indicated a direct effect of the LAIs. However, at least one supermarket noticed increased sales when farmworkers received their salaries. Furthermore, as analysed in **Section 2.3.3**, the arrival of a LAI could drive the expansion of food supply chains. Thus, there were indirect effects of the LAIs on the distribution systems. The next section further analyses LAIs' expansion of food supply chains.

[66] Supermarket manager in Nanyuki, personal communication, 21 July, 2016.

3 Food environments

The goal of this section is to analyse the food environments of the study areas.[67] First, this section will engage with the question of food accessibility within the food environments, which involves the perceived distances to roads, markets, and agricultural land on foot. Second, the affordability of food is analysed as the proportion of income that HHs were spending on food, which is a strong predictor of poverty as well (Zezza & Tasciotti, 2010). Lastly, the channels used to access the diets are analysed. Together, these three components outline the food environments of the study areas. Furthermore, this section seeks to answer the hypothesis three, namely if '*the LAIs were linked to decreased self-production and higher dependency on the market for food access*' (**Chapter 1**).

3.1 Food accessibility within the food environments

The perceived physical accessibility of stores might be one of the strongest associations between the food environments and diets (Caspi et al., 2012). The perceived distance, by foot, to either a paved road, market, and their agricultural land is portrayed in **Fig. 27**. Overall, the CF was the most connected to a paved road, with 57.6% within less than 30 minutes, and only 11.8% more than one hour away. The employed were the least connected to a paved road, with only 37.6% less than 30 minutes and 20.7% more than one hour away, by foot. The proportion of employed that were more than one hour away from a paved road was almost double the CF. But this was the opposite for distance to markets, where the 15.9% of the CF is less than 30 minutes from a market, compared to 17.7% for the non-engaged and 34.7% for the employed. Thus, the employed live much closer to markets than the other categories, with 39.4% of the CF living more than one hour away. Overwhelmingly, agricultural land was more accessible than a market or a paved road: 96.9% of the employed lived on their agricultural plot, 95.3% of CF and 95.5% of the non-engaged lived on their agricultural plots. Furthermore, 1.2% of the CF, 0.2% of the non-engaged and slightly more than 3.1% of the employed lived more than one hour from their agricultural fields.

[67] The food environments refer to the physical, economic, political, and socio-cultural contexts of the food systems in which consumer make choices about their food, and includes food entry points, the personal determinants of choice, and the norms that underlie the interactions between the contexts and food choices. This includes the physical spaces where food is obtained and the constraints of food choice (HLPE, 2017).

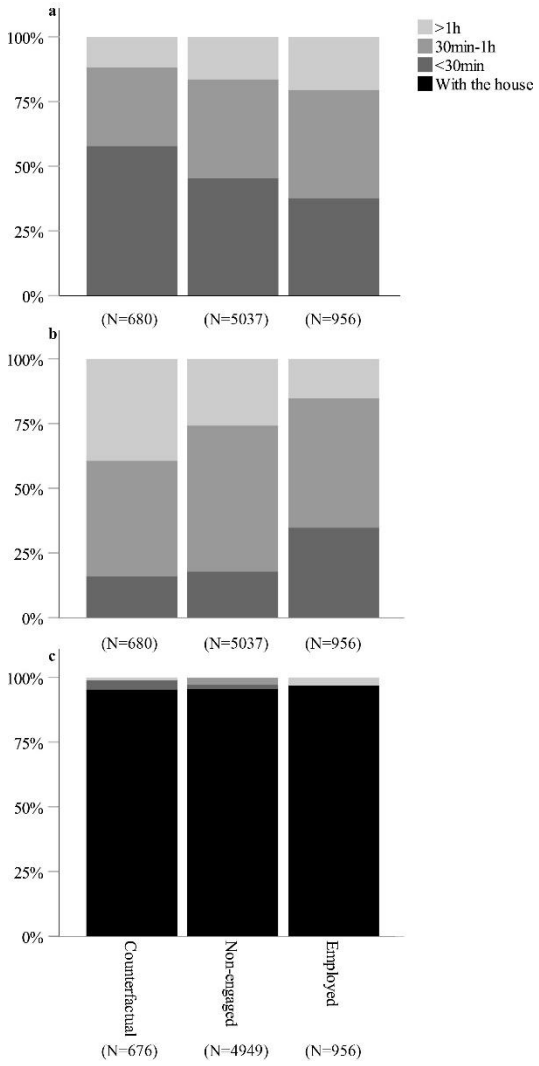


Fig. 27 Percentage of households' reporting the distances from their home to paved roads, markets, and agricultural land on foot, by household category
a. Distance to a paved road. **b**. Distance to a market. **c**. Distance to agricultural land. Weighted data. Data: Afgroland (2017)

3.1.1 The accessibility of points of sale

The food businesses that were present in the Nanyuki area included shops, wet markets, hawkers, spot markets, restaurants, and supermarkets. The type of food business influenced accessibility. Within the rural areas of the Nanyuki area, shops that operated from the sellers' homes were the most prevalent and accessible. Their customers were mostly neighbours and their operating hours were flexible to accommodate customers' schedules. Their inventory, however, was often limited to basic items such as sugar, wheat flour, cigarettes and sweets. Nevertheless, these shops were the most accessible due to their prevalence in both towns and rural areas. Wet markets were found around Nanyuki town and next to the main road. These wet markets provided fresh fruit and vegetables, often bought from nearby farmers or Meru. These markets' opening hours depended on the customers as well, but most had a general opening and closing time. The markets were not evenly distributed throughout the Nanyuki area because the farmers grew part of their fresh fruit and vegetables themselves (**Table 23**). Hawkers and spot markets changed their selling locations daily. The hawkers had mostly just a few wares, while the spot markets could have as many food items available as a wet market stall. The hawkers, spot markets, and restaurants were mostly confined to the more urban areas. Nanyuki had a busy restaurant scene, with restaurants that catered

for the meat lovers, the lunch crowd, and the tourists. Restaurants were less prevalent in the more rural areas but could be found along the main road. As described in **BOX 9**, Nanyuki experienced a strong rise in supermarkets. These supermarkets brought a wide range of items to Nanyuki and catered to different income groups. They had fixed operating hours and were confined to Nanyuki town, which limited their accessibility. However, the stock could be distributed by middlemen to the shops in the more rural areas (**Fig. 25).**

In short, a diverse range of products was sold by different types of sales points. Some types of business were more prevalent in certain areas, such as wet markets, while others, such as supermarkets, were absent in other areas. The most substantial difference regarding the types of points of sale and the accessibility of food products was between the urbanised areas, such as Nanyuki town, and the more rural areas.

3.1.2 The evolution of market accessibility for household's produce

The HHs did not substantially improve their sales over the last ten years (**Table 24**). For the CF and the non-engaged, the proportion of HHs that improved their sales is low at 8.2 and 5.4%, while it was higher for the employed at 19%. The employed had significantly higher sales than the CF ($p<.001$) and the non-engaged ($p<.001$).

Table 24 Percentage of households reporting increased sales over the last ten years and main reasons given for this increase, by household category

	Counterfactual	**Non-engaged**	**Employed**
Households with increased sale	(N=680)	(N=5056)	(N=956)
%	8.2^{E}	5.4^{E}	$19.0^{CF,NE}$
Sales increased due to[a]	(N=56)	(N=274)	(N=182)
Quantity	65	68.6	68.2
Range	25	15.7	15.9
More spot market sale	10	5.2	0
More direct sale	0	10.5	0
More agribusiness sale	0	0	7.9
More middlemen sale	0	0	7.9
More shop sale	0	0	0

Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Sign. difference ($p<.05$) with CF *Counterfactual*; NC *Non-engaged*; E *Employed*. [a]Percentage of all answers. Weighted data. Data: Afgroland (2017).

Between 65 and 68.6% of the increased in sales was driven by a growth in the quantity produced by the HHs. This is followed by an improvement in the range of products grown by the HHs and an increase in their sales to spot markets, direct sale, agribusinesses sale, middlemen, or shops. Only the employed increased their sales due to agribusinesses (7.9%). This sub-section surveyed the accessibility of food in the study area. In short, agricultural land was more accessible than markets or paved road. The urban areas had more access to points of sale than the more rural areas. While increases in HH sales were low across the categories, increases were mostly driven by an increase in quantity and range produced, rather than a change in the food environment.

3.2 Food affordability within the food environments

While it is important to look at the price of food, a better measurement of food affordability is the proportion of a HH's budget that goes towards food (Mason, Jayne, Chapoto, & Donovan, 2011). The share of a HH food budget is a frequently used measure of economic access to food (HLPE, 2017). This calculation is done using the Food Expenditure Share, which is an indicator of economic access.[68]

Table 25 Monthly budget of the households in USD and the Food Expenditure Share (FES), by household category

	Counterfactual (N=680)	**Non-engaged (N=5056)**	**Employed (N=956)**
Mean total monthly budget (USD)	421.6	359.2	407.2
% of food expenditure (FES) in total monthly budget	39.5	42.1	43.0
% of self-production in FES	$35.9^{NE**,E**}$	$23.5^{CF**,E*}$	$24.1^{CF**,NE*}$

Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. *p=.019, **p<.001 sign. difference with CF *Counterfactual*; NC *Non-engaged*; E *Employed*. USD conversion of Kenyan shilling on 31 January 2017 rates, $1=103.85 Ksh. The food budget and FES include the approximate value of self-produced goods that the households consumed in the last 30 days. Weighted data. Data: Afgroland (2017).

Overall, there were no significant differences between categories regarding the FES, which ranged from 39.5% for the CF to 43% for the employed. The FES of the surveyed HHs was low compared to the national FES of Kenya. In 2005-06, the mean FES of all Kenya was 46% (Kenya National Bureau of Statistics, 2008). The contribution of self-production to the FES was significantly higher for the CF compared to the non-engaged and employed (p<.001), while the non-engaged was significantly lower (p=.019) than the employed. Generally, the CF had a lower FES and significantly higher contribution of self-production to their food expenditures than the non-engaged and employed. The next sub-section analyses this relationship further.

3.3 Channels to access diets

This sub-section analyses the importance of self-production and purchases for dietary access. A hypothesised effect of LAI relates to a decrease in self-production and a higher dependency on the market for food access (**Chapter 1**). To calculate this, the number of food groups consumed in the past week that were sourced from self-production was divided by the total number of food groups consumed in the past week. This method differs from **Table 25** as it focuses on the importance of self-production and purchases for diet access rather than the monetary value of food consumed, and it is more robust than estimating the monetary value of one's self-produced food. The results are portrayed in **Fig. 28**.[69]

[68] Calculated as the expenditure on food, including value of self-production, divided by the total expenditure and multiplied by 100.
[69] Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

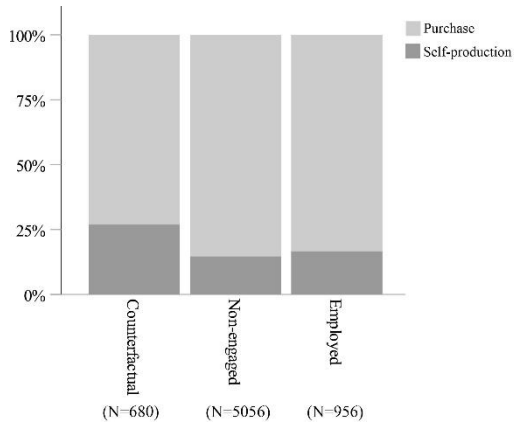


Fig. 28 The proportion of food purchases and self-production for dietary access, by household category
Weighted data. Data: Afgroland (2017)

There were significant differences between categories regarding the proportion of the diets that are derived from self-production. The CF group had significantly higher self-production ($p<.001$) than the non-engaged and the employed, while the non-engaged had significantly lower self-production ($p<.001$) than the employed.

3.4 Overview of the food environments

The goal of this section was the analysis of the food environments of the study areas using food accessibility, the affordability of food, and the channels used to access diets. This sub-section overviews the food environments and formulates an answer to hypothesis three '*the LAIs were linked to decreased self-production and higher dependency on the market for food access*'. First, agricultural land was more accessible than markets or paved roads.[70] The urban areas had more access to points of sale than the more rural areas. While increases in sales of HHs were low across the categories, the increases were mostly driven by more quantity and range of food groups produced, rather than a change in the food environment. Second, the CF spend more income on food while home-produced food was more important to CF diets than was the case for the non-engaged and the employed.

The large agricultural investments were linked with decreased importance of self-production

Hypothesis three relates to the link between the LAIs and the importance of self-production. Both the contribution of self-production to the FES (**Table 25**) and the proportion of self-production for dietary access (**Fig. 28**) was higher for the CF compared to the non-engaged and the employed. Thus, the groups with a LAI present derived less of their diet from self-production and were more dependent on the market for dietary access. Whether differences in the contributions of home-produced food influenced the food security of the respondents is analysed in the next section.

[70] As most HHs lived on their agricultural land and a large portion of the crops produced go towards self-consumption (**2.3.4**), the 'food miles' of these specific crops could be very small. This configuration is the shortest and plainest forms of a food system possible: the production of one's food in the area around the house and for the HH's consumption. When the food is marketed or bought from the market, the food system gets rapidly more complex (**Section 2.3.3**).

4 Food system outcomes

This section analyses the food consumption and food security of the HHs and overviews the livelihood options and changes in relation to the LAIs. Furthermore, this section addresses hypothesis four, namely whether '*LAIs were linked to differences in the diet composition of HHs, especially with higher processed food consumption'* (**Chapter 1**).

4.1 Food consumption and diets

The HHs were asked to provide the number of days in which a food group was consumed in the last week (**Table 26**). Most food groups (54.3 to 59.2%) were consumed daily. There were many differences between categories regarding the daily consumption of food groups during the last week, even though the magnitude of the differences were often small. The employed consumes fewer cereals, orange vegetables and beans, but more orange fruit, meat, oil and fat, and sweets than the CF group. The employed consumes fewer beans, green vegetables, other vegetables, other fruit, fish, and beans than the non-engaged. Furthermore, the employed does consume tubers, orange fruit, meat, milk, oil and fat, sweets, and spices than the non-engaged.

Second, the non-engaged consumes fewer beans and milk, two highly nutritious food groups, than the CF, but consumes more orange vegetables, orange fruit, and oil and fat. Third, the CF consumed more beans. Lastly, the mean number of days in which a food group was consumed is alike across the categories (3.8-3.9). For the CF, 54.8% of all food groups are consumed daily, 54.9% for the non-engaged, and 54.3% for the employed.

Table 26 Mean days in which 13 food groups were consumed over the last week, by household category

Food group	Counterfactual (N=680)	Non-engaged (N=5056)	Employed (N=956)
Cereals	6.6	6.3	5.8
Tubers	4.4	4.0	4.3
Orange vegetables	1.1	2.3	2.5
Green vegetables	4.5	4.7	4.5
Other vegetables	6.8	6.9	6.8
Orange fruit	1.5	1.8	2.0
Other fruit	1.9	2.4	2.0
Meat	0.7	0.9	1.0
Eggs	2.0	1.8	1.8
Fish	0.0	0.1	0.0
Beans	5.0	3.6	3.0
Milk	6.8	6.6	6.8
Oil and fat	6.8	7.0	7.0
Sweets	5.6	5.8	6.0
Spices	7.0	6.9	7.0
Mean	3.8	3.9	3.8

Weighted data. Data: Afgroland (2017).

Overall, there are differences in the diets of HHs per category, especially in comparison with the employed. However, differences were not large, with the possible exception of bean consumption, so diets are relatively similar across the categories. Interestingly for hypothesis four, the CF has lower consumption of oil and fat than the non-engaged and the employed, although the numerical differences between the means are small.

4.2 Food security

This sub-section analyses the food security of the HHs through the Household Dietary Diversity Score (HDDS) and the Food Consumption Score (FCS).[71]

4.2.1 Household Dietary Diversity Score

The HDDS is an economic indicator of availability and access. Its score is calculated by the sum of 11[72] food groups over a 24h recall period. The mean score and the prevalence of the HHs in the HDDS categories are presented in **Table 27**.

Table 27 Mean Household Dietary Diversity Score (HDDS) and the percentage of households per HDDS category, by household category

	Counterfactual (N=668)	**Non-engaged (N=4972)**	**Employed (N=895)**
Mean Household Dietary Diversity Score	6.8	6.8	6.7
Household Dietary Diversity Score categories			
High	87.4	89.5	81.0
Medium	12.6	10.5	19.0
Low	0.0	0.0	0.0

Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Categories: low <3, medium 3-5, High >=6. Weighted data. Data: Afgroland (2017).

There were no significant differences between the categories for their mean HDDS. Overall, most (81 to 89.5%) of the HHs were part of the 'high' HDDS category, which indicates that their food group intake over the last 24h included more than six groups. The non-engaged had the most HHs in the 'high' category (89.5%) compared to the employed, which had the lowest (81%). No surveyed HH reported a 'low' HDDS, meaning less than three food groups consumed in the past 24 hours.

4.2.2 Food Consumption Score

The FCS, a composite score based on dietary diversity, food frequency, and relative nutritional importance, is presented in **Table 28**. While the HDDS reflects economic access, the FCS indicates diet quality. The FCS of the CF was significantly higher ($p<.001$) than the non-engaged and employed. Overall, most HHs were part of the FSC 'Acceptable' category (96.5 to 98.8%), with few 'Poor' (0 to 1.5%). The FCS is a composite score based on the contribution of different food categories, which are presented in **Fig. 29**.

[71] **Chapter 3** briefly unpacks these indicators.
[72] The cereal food group was excluded as almost all HHs consumed this.

Table 28 Mean Food Consumption Score (FCS) and the percentage of households per FCS category, by household category

	Counterfactual (N=680)	**Non-engaged (N=5056)**	**Employed (N=956)**
Mean Food Consumption Score	79.3^{NE,E}	72.9^{CF}	73.9^{CF}
Food Consumption Score categories			
Acceptable	98.8	97.1	96.5
Borderline	1.2	1.4	2.4
Poor	0.0	1.5	0.0

Sign. differences between household categories were evaluated by the Kruskal-Wallis H-test post hoc Dunn-Bonferroni correction. Sign. difference (p<.001) with CF *Counterfactual*; NC *Non-engaged*; E *Employed*. Category: poor <22, borderline 22-35, acceptable >35. Weighted data. Data: Afgroland (2017).

Consumption of milk by the HHs was the most important contributor to the FCS score for all categories, ranging from 26.3 (non-engaged) to 27.3 (CF). While the categories had similar scores on staples and animal proteins, the CF had a much higher consumption of pulses (15.7) compared to the non-engaged (10.8) and the employed (8.9). The contributions of vegetables, oil, fruit, and sugar to the FCS were similar across the categories.

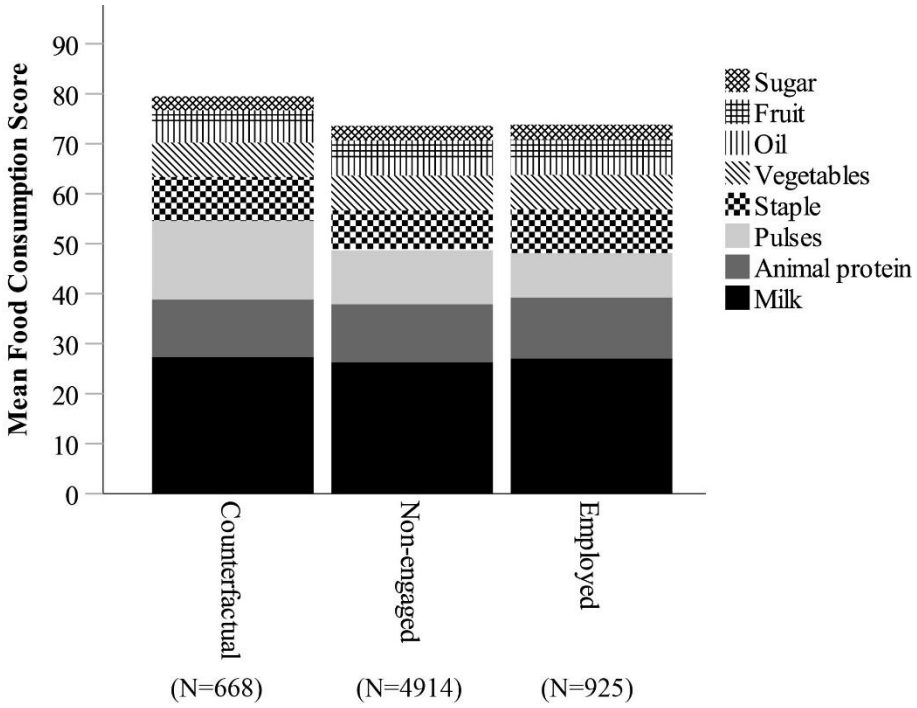


Fig. 29 The contribution of the different food categories to the Food Consumption Score, by household category
Weighted data. Data: Afgroland (2017)

This sub-section analysed the food security of the HHs through the HDDS and the FCS. The HDDS was not significantly different across the categories, but the CF's FCS was significantly higher than the non-engaged and the employed, likely due to CF's higher consumption of pulses. The other FCS food groups were similar across categories. In general, the numerical differences in diets were small and may not be biologically important. Thus, differences between the HH categories in terms of food security were small. This similarity may be attributable to the relatively high HDDS and FCS scores among all of the HHs, which suggests that their diets were generally nutritionally adequate.

4.3 Livelihoods

This section will overview the livelihoods in connection to the LAIs. The livelihoods include the HHs engagement in non-agricultural work, migration, employment at the LAIs, and changes in economic situation over the last ten years.

4.3.1 Engagement in non-farm work

The prevalence of HHs engaged in non-agricultural wage work (excluding LAIs) and self-employment (excluding HH farming) is presented in **Table 29**. As this relates to the availability of HH labour in the productive years, the size and the median age of the HHs are presented as well.

Table 29 Gender of households' head, mean household' size, median age of household members, and percentage of household's members that have non-agricultural work, by household category

	Counterfactual	**Non-engaged**	**Employed**
Female-headed households[a]	(N=680)	(N=5056)	(N=956)
%	21.8	25.9	6.7
Size of household[a]	(N=680)	(N=5056)	(N=956)
Mean	3.9[E]	4.2[E]	4.6[CF,NE]
Age of members[a]	(N=2660)	(N=20737)	(N=4427)
Median	25[E]	24[E]	23[CF,NE]
Work engagement	(N=1364)	(N=9902)	(N=2322)
Exclusive agriculture[a]	73.3	61.1	79.2
Non-agri wage work	19.4	17.9	9.6
Self-employed	8.8	22.3	11.2

[a]Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Sign. difference (p<.001) with CF *Counterfactual*; NC *Non-engaged*; E *Employed.* [a]Excluding work at the investors. Weighted data. Data: Afgroland (2017).

There were far more female-headed HHs in the CF and the non-engaged compared to the employed.[73] The size of the HHs ranged from an average of 3.9 to 4.6 members. The employed had significantly higher (p<.001) HH size compared to the CF and non-engaged. The CF and the non-engaged had significantly (p<.001) higher median age of HH members than the employed, but the differences were small. The CF and the non-engaged were more involved in non-agricultural wage work (19.4 and 17.9% respectively) than the employed (9.6%), probably as the latter were already engaged at the LAIs. The most important sectors for non-agricultural wage work were services (32.7% of all answers), education (14.3%), transportation (10.4%), construction (10.4%), administration (5%), or 'other' (27.2%). The non-engaged was more involved with self-employment (22.3%) than the other categories (11.2 to 22.3%). Self-employment included transportation, small-scale mining, handicrafts, wood collection and the sale of charcoal, or food businesses, such as a butchery. Overall, agriculture was the exclusive provider of livelihoods (besides work at the LAIs) for most (65%) of the HH members, but the non-engaged participated less in agriculture (61.1%) than the CF (73.3%) and the employed (79.2%).

[73] Due to time constraints, gender is not analysed separately (see limitations in **Chapter 6).**

4.3.2 Migration and employment at large agricultural investments

Migration

The HHs' migration status and reasons for migration are shown in **Table 30**. Based on the previous location of the HH head, the HHs were categorised into local residents, nearby migrants (another locality but within Laikipia, Nyeri, or Meru counties), and faraway migrants (counties besides Laikipia, Nyeri, and Meru).

Table 30 Percentage of the household's head migration status and the reason to migrate to the study area, by household category

	Counterfactual	**Non-engaged**	**Employed**
Migrant status	(N=672)	(N=5037)	(N=956)
Local resident	25.0	11.5	19.9
Nearby	71.4	77.6	70.7
Far	3.6	10.9	9.4
Reasons for migration	(N=496)	(N=4409)	(N=747)
Land	83.9	80.7	77.8
Family	12.9	5.3	8.2
Work	3.2	13.5	11.0
Other	0	28.5	29.6

Weighted data. Data: Afgroland (2017).

The CF had fewer faraway migrants than the non-engaged and the employed, while the employed had more local residents than the non-engaged. Overwhelmingly, access to land was the dominant reason (77.8 to 83.9%) for migration, followed by family (5.3 to 12.9%), work (3.2 to 13.5%), or other (0 to 29.6%). While most of the migrants moved for land across all categories, they more often migrated for family reasons (eg, marriage) in the CF than in the non-engaged and employed categories. For the non-engaged and employed, migrants were more attracted by work opportunities.

Employment

In **Table 31**, the reasons to work at the LAIs and its quality compared to other jobs is presented.

Table 31 Job rating at the investors as perceived by employed household members and the primary reason to work at the investor (N=1081)

Rating and work attraction	
Job rating	
Better	56.5
Similar	30.0
Worse	13.5
Reason for work at investor	
Steady income	53.2
Better paid	24.6
Sole option	13.2
Extra benefits	7.3
Other	1.8

Weighted data. Data: Afgroland (2017).

Most of the employed (53.2%) worked at the LAIs for the regular income. For 24.6% of the employed, the LAIs also paid better than other jobs. Working at the LAIs was the only option available for 13.2% of the employed, and 7.3% did it for the extra benefits it provided, such as possible maternity care. Jobs at the LAIs were perceived as 'better' than other paid jobs by 56.5% of the surveyed employees. It was only worse for 13.5% of employed HHs.

4.3.3 Livelihood change under large agricultural investments

The percentage of HH members that reported a change in their economic situation over the past ten years is displayed in **Fig. 30**. Overall, most HH members (81.3%) reported a change. The employed changed more compared to the CF and the non-engaged. Thus, the employed was the most economically volatile. The economic change was mostly the level of remuneration (generally decreased income, although increases were frequent as well) and its stability (production decreased due to the drought were often cited).

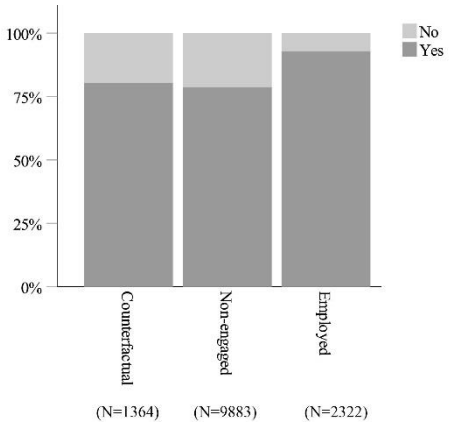


Fig. 30 Percentage of household members that reported a change in their economic situation over the past ten years, by household category
Weighted data. Data: Afgroland (2017)

There were few differences in livelihoods between the categories that relate to the LAIs. First, the CF was more likely to depend exclusively on agriculture for their livelihoods (73.3%), compared to 61.1% for the non-engaged and 0% for the employed. Second, the non-engaged and the employed had more faraway migrants than the CF, as these migrants were attracted by work. Third, work at the LAIs was mostly rated as better than other work, and people were attracted to the LAIs as they provided a steady income. Fourth, the economic situation of the employed changed more than that of the CF and non-engaged.

4.4 Overview of food systems outcomes

This section analysed the food consumption and food security of the HHs and overviewed the livelihood options and changes concerning the LAIs. Based on this analysis, this sub-section surveys the food systems outcomes and formulated an answer to hypothesis four, namely whether '*LAIs were linked to differences in the diet composition of HHs, especially with higher processed food consumption'*. First, the food consumption of HHs differed by category, but, aside from bean consumption, the differences are small, so diets are similar in composition. Second, the CF had significantly higher FCS than the non-engaged and the employed. While significant,

the differences were small, and composition of FCS groups was similar, bar a higher CF pulses consumption. Overall, the food security situation of the HHs was similar. Third, non-engaged and employed were less dependent solely on farming than the CF. The non-engaged and the employed had more faraway migrants who were attracted by work. Lastly, the employed had more economic changes than the other categories.

The large agricultural investments were not linked to food consumption change

Hypothesis four relates to the diet composition of HHs, especially regarding the consumption of oil, fat, and sweets as examples of processed food. The CF consumed sweets and oil and fat less than the employed. However, these differences were small. The CF consumed oil and fat 0.2 days less per week than the employed, and 0.4 days less for sweets. Furthermore, the HDDS was quite similar for the categories, including the composition of the FCS. Thus, a link between the LAIs and consumption changes has not been established. It is important to note that this analysis is limited to the number food groups consumed, not the actual quantities.

5 Outlining the food systems

5.1 A factor analysis of the main variables

This section typifies the food systems in the studied areas. These food systems can range from traditional to mixed and modern food systems (**Chapter 2**). Through a Principal Component Analysis (PCA), the variables outlined in this chapter were analysed. A rotation method was used as the variables were likely correlated. The goal of PCA is to identify the factors that are most important in explaining variance among the variables through components (**Chapter 3** for a definition of PCA). The outcome of a PCA is depicted in **Table 32**. The more a correlation of a variable differs from zero, the stronger the relationship with the component.

Table 32 Correlation of selected variables with the components created through principal component analysis (n=488)

Variable	Component	
	1	2
Sum of days of food group consumption	.882	.078
Consumption of eggs per week	.720	.101
Consumption of beans per week	.489	.405
Food Consumption Score	.925	.206
Share of self-production in diet	.061	.883
Share of self-production to food budget	.198	.843
Variance explained (%)	40.5	28.5

Rotated Component Matrix of Principal Component Analysis. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Data: Afgroland (2017).

In the end, six variables were selected that explained 40.5% of the variance (component 1) and 28.5% of the variance between HHs for the selected variables (component 2).[74] Together, these two components explained

[74] Rotation Sums of Squared Loadings.

69% of the variance between HHs for the selected variables. Component one correlated with the size and diversity of food group consumption. It related to the consumption of 'other' vegetables, eggs, and beans per week, coupled with the total sum of food group consumption (**Table 26**). It included the FCS as well (**Table 28**). Component two related to the importance of self-production. It was positively associated with an increase in the share of self-production in the diet (**Fig. 28**) and the share of self-production in the food budget (**Table 25**). In discussing food systems change in **Chapter 2**, a traditional food system would be characterised by a high amount of self-production and low diet diversity. On the contrary, a modern food system would have low self-production and high dietary diversity. From the outset, none of the researched food systems could be typified as only modern. But within the categories, certain HHs can have *more* modernity or modern characteristics than others, showcasing a *relative* traditional-to-modern transition. Based on this relative positioning of *more* or *less* traditional-to-modern, the HHs are placed within four categories or quadrants (**Fig. 32** and **Table 32**). The means of the two factor scores are depicted in **Fig. 31**.

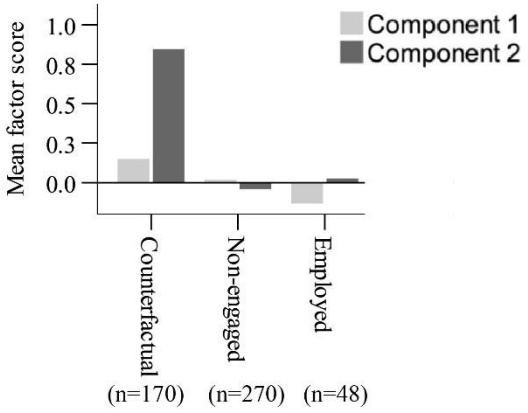


Fig. 31 Mean of the factor scores of Principal Component Analysis, by household category
Data: Afgroland (2017)

There were significant differences between categories regarding the mean factor score of components one and two.[75] The CF was significantly higher ($p<.001$) for both components compared to the non-engaged and the employed, while the employed was significantly higher ($p=.048$) for component two compared to the non-engaged. The two components are depicted in a scatterplot (**Fig. 32**), which was divided into four quadrants.

[75] Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

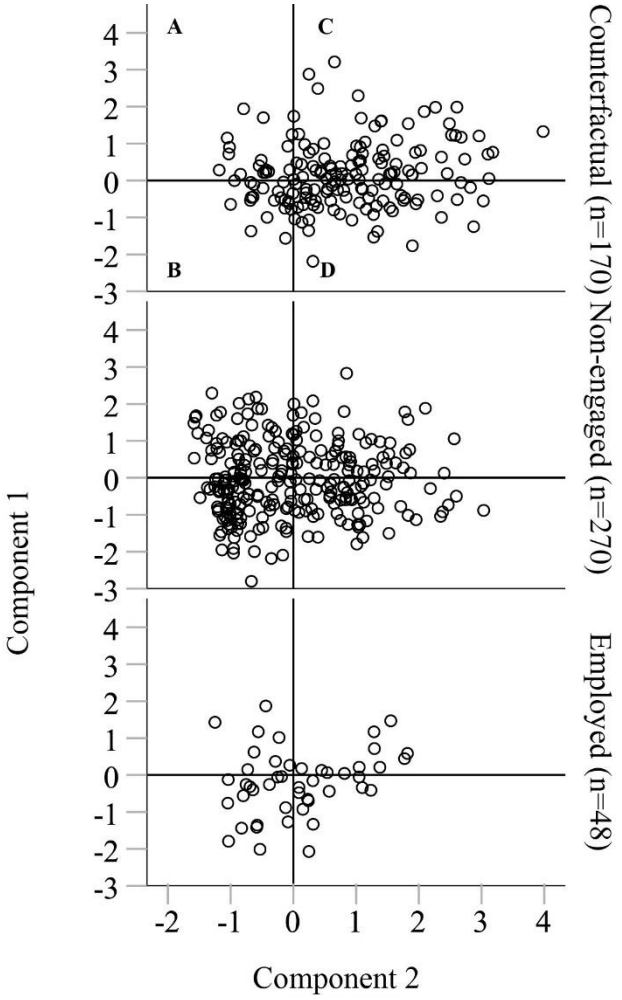


Fig. 32 Components 1 and 2 of the principal component analysis divided into four quadrants, by household category
Quadrant A indicates 'Higher food diversity with 'Lower self-production'; Quadrant B indicates 'Lower food diversity' with 'Lower self-production'; Quadrant C indicates 'Higher food diversity' with 'Higher self-production; and Quadrant D indicates 'Lower food diversity' with 'Higher self-production'. Data: Afgroland (2017)

Quadrant A can be typified as the most modern of food systems (**Chapter 2**), in which HHs have high market reliance and high diet diversity. On the opposite side, quadrant D can be typified as the most traditional food system, in which the reliance on self-production is high and the diversity of the diets is low. Quadrant B can be described as a 'poor consumer', with low diet diversity and self-production, while quadrant C is 'successful farmer', where diet diversity and self-production are high. The prevalence of the HHs in each quadrant is presented in **Table 33**.

Table 33 Percentage of households in the food system types, by household category

Quadrant	Counterfactual (n=170)	Non-engaged (n=270)	Employed (n=48)
A	23.4	20.7	25.5
B	14.4	37.2	30.4
C	39.5	17.3	20.1
D	22.8	24.8	24.0

Quadrant A indicates 'Higher food diversity with 'Lower self-production'; B indicates 'Lower food diversity' with 'Lower self-production'; C indicates 'Higher food diversity' with 'Higher self-production; and D indicates 'Lower food diversity' with 'Higher self-production'. Weighted data. Data: Afgroland (2017).

The CF was more part of a 'successful farmer' (C) food system (39.5%) compared to the non-engaged (17.3%) and the employed (20.1%), while the prevalence of 'poor consumer' (B) food system is higher for the non-engaged (37.2%) and the employed (30.4%) compared to the CF (14.4%). The prevalence of HHs in the 'traditional' (A) and 'modern' (D) food systems was similar across the categories.

5.2 Overviewing the food systems

This section typifies the food systems in the studied areas through PCA. Two clusters that maximise variance, one associated with self-production and the second with diet diversity, were used in the analysis of four food system types, 'modern', 'poor consumer', 'successful farmer', and 'traditional'. These clusters were associated with the HH' categorisation, which are CF, non-engaged, and employed. Overall, the food system type of the CF differed from those of the non-engaged and the employed regarding their food system type. The CF differed significantly from the employed and non-engaged regarding component one and two, while the employed differed significantly with the non-engaged on component two. As a result, the prevalence of HHs in each food system differed according by category. The CF were more part of a 'successful farmer' food system than the non-engaged and the employed, which were more present in the 'poor consumer' food system. This section provided a multivariate analysis of the variables presented in this chapter and described four different food systems. The next section summarises this chapter.

6 Summary

This chapter's goal was to analyse the effects of LAIs around the Nanyuki area, Kenya. To this end, data were collected between February 2016 and March 2017 through a survey, (un-)structured, and semi-structured interviews. This data was analysed through inductive thematic analysis and between-group analysis. The food supply chains (**Section 2**), food environments (**Section 3**), and food systems outcomes (**Section 4**) of three categories, namely counterfactual, non-engaged, and employed were compared. These sections were followed by a principal component analysis (**Section 5**) whose components typified households into four food systems types, including 'modern', 'poor consumer', 'successful farmer', and 'traditional'.

Food supply chains

The food supply chains section analysed the effects of the LAIs on land, food production, distribution, and consumption. First, the LAIs were not linked to a (direct) decrease in access to land, as no HHs was dispossessed of their land by the LAIs. The CF accessed significantly more land area than the non-engaged and the employed. It was the CF that reported the largest drop in land area of all categories. However, the LAI did impact land access indirectly through its land pressure. Second, the LAIs were not (directly) linked to a decrease in agricultural engagement. The CF had *less* agricultural engagement over the past ten years compared to the non-engaged and the employed. Thus, groups where a LAI operated in their environment decreased their agricultural engagement less than the groups where there was no LAI present. Third, the LAIs influenced the expansion of supply chains in the areas in which it operated and drove periodic demand for supermarket products.

Food environments

The food environment section explored the topics of food accessibility, affordability, and the channels to access the diets. The LAIs were linked with decreased importance of self-production. Both the contribution of self-production to the FES (**Table 25**) and the proportion of self-production for dietary access (**Fig. 28**) is higher

for the CF compared to the non-engaged and the employed. Thus, the groups with a LAI present derived less of their diet from self-production and were more dependent on the market for dietary access.

Food systems outcomes

The outcomes of the food systems were analysed through the food consumption and food security of the HHs and an overview of the livelihood options and changes in relation to the LAIs. The LAIs were not linked to food consumption change. The CF consumed sweets and oil and fat less than the employed. However, these differences were small. Furthermore, while the FCS was significantly higher for the CF, the food security was quite similar, including the composition of the FCS.

Outlining the food systems

Through a PCA, two components were constructed that aligned with the size and diversity of food group consumption and the importance of self-production in the diet. The CF differed significantly from the employed and non-engaged regarding component one and two, while the employed differed significantly with the non-engaged on component two. As a result, the prevalence of HHs in each food system differed according to category. The CF was more part of a 'successful farmer' food system than the non-engaged and the employed, which were more present in the 'poor consumer' food system. This chapter analysed the effects of the LAIs in the Nanyuki area, Kenya. The next chapter analysed the effects of LAIs in the Mozambican study areas of Gurué, Monapo, and Ruacé.

Chapter 5 - Food systems change under large agricultural investments in Gurué, Monapo, and Ruacé, Mozambique

The goal of this chapter is to analyse the effects of Large Agricultural Investments (LAIs) on food systems change in Gurué, Monapo, and Ruacé, Mozambique. This chapter builds on the objectives outlined in chapter 1, the literature review and conceptual framework of Chapter 2, and the methodology explained in Chapter 3. The analysis of the data was through inductive thematic analysis and between-group analysis. The food supply chains, food environments, and food systems outcomes were compared for three categories. This was followed by a principal component analysis whereby components classified households into four food systems types, including relatively traditional and modern food systems. Lastly, this chapter is summarised. The results indicate that groups with LAIs present had less land access and availability and were less engaged in agriculture. The direct effects of LAIs on household's food sales were limited. Groups with LAIs present were more dependent on the markets for dietary access, but this was not reflected in the diets consumed. Furthermore, groups with LAIs present were more engaged in more 'modern' food systems. This chapter is followed by the conclusion of this dissertation.

Keywords land, food supply chains, food environments, food security

1 Introduction

The data to analyse the effects of LAIs in Gurué, Monapo, and Ruacé was collected between September and October 2016 and involved both a survey and unstructured and semi-structured interviews. The analysis of the data was through inductive thematic analysis and between-groups analysis, which classified the survey households (HHs) in three categories, namely counterfactual (CF), non-engaged, and employed (**Chapter 3**). The results are presented in four main sections. First, in the section of food supply chains the analyses of land, food production, and food distribution are presented. Second, in the food environments section the accessibility, availability, and affordability of food with the channels to access the diets are analysed. Third, the diets, food security, and livelihoods indicators are analysed in the section on food systems outcomes. Lastly, a principal component analysis classifies the households into four food systems types, including relatively traditional and modern food systems. The next section analyses the food supply chains of the study areas and compares the land, food production, and food distribution between the CF, non-engaged, and employed.

2 Food supply chains

2.1 Land

2.1.1 Land access and use by the households

The goal of this section is to analyse the effects that the LAIs have on land access and availability. This is attained through a comparison of the land access and availability between categories in each region. Furthermore, this section aims to answer hypothesis one, namely if '*the LAIs were linked with decreased access to land'* (**Chapter 1**). The access to land and its use is portrayed in **Table 34**.

In Gurué, there were few differences between categories regarding land access, land access type, land securisation and primary land use. Most HHs (97.3 to 100%) had access to land, which was dominantly governed through customary (traditional or tribal) ownership across the categories (82.7 to 92.9%). Customary rights have full equivalence to DUAT if some conditions are met (**Chapter 3**). Although freehold land rights were the second most used type of land tenure, it was far less used (7.1 to 10.8%). However, the term 'freehold' is problematic. As stipulated in the Mozambican constitution of 2004, all land belongs to the government (LANDac, 2012). In interviews with community leaders and HHs, it emerged that the rights to land access can be (informally) sold and resold within the community, including traditional or tribal land. Even if this transaction might be governed by customary practices, the land was legally still owned by the state. Only one plot was accessed through a private lease, and sharecropping was absent. The securitisation of land access was mostly customary (76.5 to 96%). The non-engaged had 19.5% less customary access than the CF, and this was mostly due to the higher prevalence of

the 'other' choice (0% for the CF, 32.5% for the non-engaged, 5.4% for the employed.[76] Lastly, the land was mostly used for farming, forestry, or grazing (69.9 to 76.1%), followed by housing (12.3 to 17.7%). No land was rented out in Gurué.

Table 34 Percentage of households' that have access to land, with the land access type, land security, and primary land use per unit of land, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF	**NE**	**E**	**CF**	**NE**	**E**	**NE**	**E**
Land access[a]	(n=100)	(n=22)	(n=37)	(n=118)	(n=29)	(n=60)	(n=104)	(n=24)
Plots	98.2	95.5	94.6	100	96.6	96.7	90.4	100
Communal	0.0	4.5	2.7	0.0	0.0	0.0	0.0	0.0
None	1.8	0.0	2.7	0.0	3.4	3.3	9.6	0.0
Land access type[b]	(n=397)	(n=81)	(n=113)	(n=340)	(n=65)	(n=136)	(n=189)	(n=51)
Traditional, tribal	87.9	82.7	92.9	88.5	80.0	77.9	86.8	78.4
Freehold	10.8	17.3	7.1	10.0	16.9	11.8	7.4	11.8
Private lease	0.3	0.0	0.0	0.6	3.1	0.7	3.7	9.8
Sharecropping	0.0	0.0	0.0	0.0	0.0	0.7	1.1	0.0
Other	1.0	0.0	0.0	0.9	0.0	8.8	1.1	0.0
Land securitisation[b]	(n=397)	(n=81)	(n=112)	(n=340)	(n=65)	(n=136)	(n=189)	(n=51)
Customary	96.0	76.5	92.0	95.0	76.9	80.1	67.7	74.5
Informal paper	2.5	0.0	1.8	3.2	10.8	5.1	28.6	19.6
Title deed	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0
Other	0.0	23.5	5.4	0.3	1.5	6.6	1.1	0.0
Don't know	1.5	0.0	0.9	1.5	10.8	8.1	1.1	5.9
Primary land use[b]	(n=397)	(n=81)	(n=113)	(n=340)	(n=65)	(n=136)	(n=188)	(n=51)
Farming, forestry, grazing	76.1	75.3	69.9	75.3	67.7	67.6	59.0	62.7
House	13.9	12.3	17.7	22.6	29.2	30.1	38.3	37.3
House and farm combined	8.3	6.2	10.6	2.1	1.5	1.5	2.1	0.0
Fallow	1.8	4.9	0.9	0.0	1.5	0.7	0.0	0.0
Rented out	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Other	0.0	1.2	0.9	0.0	0.0	0.0	0.0	0.0

CF *Counterfactual,* NE *Non-engaged,* E *Employed.* [a]Per household. [b]Per unit of land. Data: Afgroland (2016)

Land access and use in Monapo was like Gurué. First, access to land was dominated by plots (96.6 to 100%), but with a higher prevalence of no access to land in the investor area (3.4% for the non-engaged and 3.3% for the employed compared to 0% for the CF). Like Gurué, land access was mostly through customary (77.9 to 88.5%), followed by freehold (10 to 16.9%). Generally, the securitisation of land was through customary rule (76.9 to 95%). However, the share of HHs that didn't know about their land securitisation was much higher in the investor area than in the CF (1.5% CF, 10.8% non-engaged, 8.1% employed). Like Gurué, most land was used for farming, forestry, and grazing (67.6 to 75.3%). The prevalence of land used solely for housing was higher than in Gurué (22.6 to 30.1% in Monapo, 12.3 to 17.7% in Gurué).

In Ruacé, the access to land and land access type was like Gurué and Monapo. Land access was more problematic for the non-engaged, in which 9.4% did not have access to land (compared to 0% for the employed). It was the highest prevalence of no land access of all categories. The land access type was mainly customary (78.4 to 86.8%). Like Gurué and Monapo, most land was securitised through customary rule (67.7 to 74.5%), but the prevalence of informal paper was much higher (19.6 to 28.6% compared to 0 to 2.5% in Gurué and 3.2 to 10.8% in Monapo). Unlike Gurué and Monapo, more land was also used solely for housing (37.3 to 38.3%).

[76] When the 'other' choice was taken, a follow-up question should have captured what the other mode of land securitisation was. However, due to a mistake in the survey, this did not happen and thus this data is not available.

Overall, the land was similarly governed and used throughout the areas. Regarding land access, 96.4% of all HHs had access to land, which ranged from 92.2% in Ruacé to 100% in Monapo's CF. Ruacé had more than double the proportion of HHs without any plot of land than the other studied areas (9.6% for the non-employed in Ruacé, 3.4% for the non-engaged in Monapo). The communal access to land was non-exist outside of Gurué, where it ranged from 0 to 4.5%. Land access was mostly through customary rule, followed by a problematic interpretation of freehold land access. The securitisation of land was mostly customary, but Ruacé had a higher prevalence of informal paper than Gurué and Monapo. For Gurué's non-engaged, 23.5% of HHs did not know how its land was securitised. Most lands were used for farming, forestry, or grazing, but the prevalence of land used solely for housing was higher in Ruacé than in Gurué and Monapo. The next sub-section will analyse the channels to access land.

2.1.2 Land access channels

Generally, the channels to access land were inheritance, donations, traditional access, or purchases (**Table 35**). These channels often gave right to use the land, rather than outright ownership. In Gurué, land was mostly accessed through inheritance (50 to 69.1%). The inheritance of land was recognised by the Mozambican constitution (LANDac, 2012). Second, donations provided 21 to 37.5% of land access, followed by traditional at 5.4 to 8.6%. The donations and traditional land access categories were tied to the customary land tenure arrangements of the researched communities. Within these arrangements, a HH head could ask at the community meeting for land. If there were free plots available, the community could decide to donate this land to the HH. Alternatively, a HH head could buy and sell land to others within the customary arrangements. Rarely were those transfers written down.[77] Few plots were accessed through purchases (0 to 3.6%), and even fewer through leases (0 to 0.8%) or new land expansion (1.2 to 1.8%). The median years of land access was slightly higher in the CF (12 years) than the non-engaged (9 years).

Table 35 Proportion of channels to access land with the median years of access to the land, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF (n=397)	**NE (n=81)**	**E (n=115)**	**CF (n=340)**	**NE (n=65)**	**E (n=136)**	**NE (n=189)**	**E (n=51)**
Inheritance	52.4	69.1	50.0	39.1	12.3	5.9	9.5	11.8
Donations	33.2	21.0	37.5	39.1	20.0	43.4	23.3	35.3
Traditional	6.5	8.6	5.4	9.4	9.2	3.7	2.6	9.8
Purchase	2.0	0.0	3.6	5.3	35.4	25.7	47.6	27.5
Lease	0.8	0.0	0.0	0.9	6.2	4.4	8.5	11.8
New	0.0	1.2	1.8	3.8	3.1	6.6	3.2	3.9
Other	4.8	0.0	1.8	2.4	13.8	10.3	5.3	0.0
Median years	12.0	9.0	11.0	7.0	11.0	10.0	5.0	11.0

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

In Monapo, land was less often accessed through inheritance in the investor area (5.9 to 12.3% compared to 39.1% for the CF). The investor area relied more on purchases (25.7 to 35.4% compared to 5.3% in the CF). But these tenure arrangements seemingly provided longer access to land, as the CF had a median of 7 years of land access compared to 10 and 11 years for the investor area. In Ruacé, inheritance (9.5 to 11.8%) was less used

[77] Community leaders of Muela, Ramiane, Canacué, personal communications, October 10-17, 2016.

than in Gurué and Monapo. The HHs in Ruacé relied more on purchase (27.5 to 47.6%) and donations (23.3 to 35.3%) for land access. The non-engaged had the shortest duration of land access, at five years. Overall, the areas differed in their channels to access land, with inheritance more important in Gurué than in Monapo and Ruacé, while purchases were more important in Monapo and Ruacé. There were differences between the categories as well, with differences in the importance of purchases between Monapo's CF and the investor area. Compared to **Table 34**, there were more differences in the channels to access land compared to the land use and access.

2.1.3 Land size

On average, a HH had between 2 and 3.9 plots at their disposal (**Table 36**).

Table 36 Mean number of plots and land size, by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Mean units of land	3.7	3.9	3.2	2.9	2.3	2.3	2.0	2.1
Mean total land size (ha)	2.4	2.4	1.9	2.4^{E}	1.9	1.7^{CF}	1.6	1.9

CF *Counterfactual*, NE *Non-engaged*, E *Employed.* Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Sign. difference (p<.05). Data: Afgroland (2016)

In Gurué and Ruacé, there were no significant differences between categories regarding the number of plots and mean land size per HH. In Monapo, there were no significant differences between categories regarding the number of plots available to the HHs, but the CF had significantly (p<.05) higher mean land size than the employed. Overall, the CFs had a larger plot size than the investor's sites. But only Monapo's CF was significantly different (p<.05) from the employed.

BOX 11 A gender perspective on inheritance and land size

Customary practices regarding land access can discriminate against women in Mozambique (LANDac, 2012). Overall, 11.5% of all HHs were identified as female-headed HHs. In the investor area of Monapo, female-headed HHs had a significantly smaller (p=.004) land area (1.4 ha) than male-headed HHs (2.6 ha).[78] Oddly, female-headed HHs relied more on inheritance to access land than male-headed HHs, except in Monapo's CF. This success of women's access to land through inheritance is in opposition to the literature on discriminatory inheritance practices in customary rule (LANDac, 2012). Except in the investor area of Gurué, man-headed HHs purchased land more than female-headed HHs.

2.1.4 Land loss

Most of the HH reported stable land size over the last ten years (73.8%), while 24.4% reported a decrease and 1.8% an increase (**Fig. 33**).[79] Gurué's CF and non-engaged differed significantly (p<.001) regarding their land area changes over the past ten years, which was likely due to the much higher rate of land loss for the non-engaged

[78] Sign. differences between categories by study areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.
[79] Sign. differences between categories by study areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

(0.9% for the CF, 36.4% for the non-engaged). Increased access to land was low (0.9 to 8.3%), but the Gurué area still had the largest increase in land access compared to Monapo and Ruacé. Monapo's CF was significantly different from the non-engaged ($p<.001$) and the employed ($p<.001$). Similarly, this might be attributed to the higher land loss in the investor's sites (2.5% in the CF, 44.8% for the non-engaged and 30.0% for the employed). The increase access to land was low (0.8 to 3.4%). For Ruacé, there were no significant differences between the categories, who had similar levels of land loss (54.8 to 62.5%). Overall, the CF had a much lower rate of land loss than the other categories (1.8% for the CF, 50.3% for the non-engaged, 34.2% for the employed). The lost land area had been overwhelmingly used for crop production. Only one HH – part of Monapo's employed - lost the land on which their house stood.

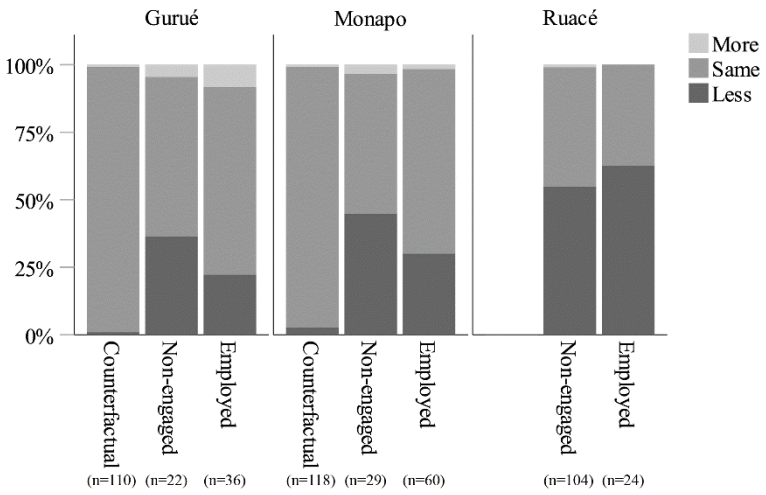


Fig. 33 Percentage of households reporting land area changes in the past ten years, by study area and household category
Data: Afgroland (2016)

Large agricultural investments and decreases of land

Generally, the LAIs were responsible for 81.25% of the land decreases in Gurué and 62.9% in Monapo and Ruacé. In Gurué and Monapo, no HH was compensated for their land losses, while 72.2% of Ruacé' HHs that lost land got compensated. In Ruacé, LAIs compensate HHs more for the loss of land than other actors as 74.1% of HHs that lost land due to LAIs got compensated, compared to 64.3% for land loss by other actors. Although there were common conflicts between neighbours regarding land in all the studied areas[80], HHs lost land surface at a higher rate in the investor areas. The differences in number of plots and total land size between those HHs that lost land to investors and those that did not is presented in **Table 37**.

[80] Community leaders of Manlé, Muela, Canacué, Ramiane, and Ruacé town, personal communications, September 17-October 27, 2016.

Table 37 Percentage of households that did not lose land to investors with the mean units of land and mean area lost, compared with households that lose land to investors, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
% of HHs that lost land to investor	0.0	31.8	16.2	0.0	41.4	23.3	45.2	45.8
Mean units of land								
No loss by investors	3.7	4.3*	3.4**	2.9	2.4	2.3	2.0	2.0
Loss by investors	-	2.8*	2.1**	-	2.0	2.3	2.0	2.2
Mean total land size (ha)								
No loss by investors	2.4	2.6	2.0	2.4	2.3	1.8	1.7	2.1
Loss by investors	-	1.7	1.4	-	1.3	1.1	1.4	1.5

CF *Counterfactual*, NE *Non-engaged*, E *Employed*, HH *Household.* Sign. differences within categories by study area were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. *p<.05, **p<.01. Data: Afgroland (2016)

In the investor area of Gurué, 22% of all HHs lost land to investors. Those that lost land by investors had significantly fewer plots, but there was not a significant difference in their total land size. In Monapo and Ruacé, there are no significant differences, but those HHs that lost land to investors had generally fewer plots and less total land. Interestingly, Ruacé' employed that lost land to investors have slightly more plots than those that did not lose land.

2.1.5 Perceptions on land security

The HHs' perspective on investor's impact on land availability and the HH's perspective on land loss are shown in **Fig. 34**. In Gurué, 36.4% of the non-engaged HHs and 30.6% of the employed HHs perceived that the LAIs affected land availability, compared to just 1.8% of the CF HHs. Furthermore, while 17.3% of the CF HHs worried about loss of land, this was much higher in the investor area with 50% of non-engaged and 47.2% of employed HHs. These figures were like Monapo, which had similar perception of investor's impact on land availability (0.8% for CF, 37.9% for non-engaged, and 25% for employed) and worries about land loss (16.9% for CF, 55.2% for non-engaged, and 45% for employed). In Ruacé, the perceptions of land availability were worse, with 49 to 50% of HHs perceived that land availability was impacted by the LAIs. The non-engaged worried less about land loss (33%) than the employed (62.5%). Overall, CF areas perceived that LAIs had less impact on land loss compared to the investor areas, particularly in Ruacé, and the investor areas worried more about land loss than the CF areas. All the communities in the investor areas had discussions and disputes about land access with the LAIs, which were rooted in the historical context of colonisation (**Chapter 3**). However, recent investments and new arrivals added new dynamics due to land pressures.

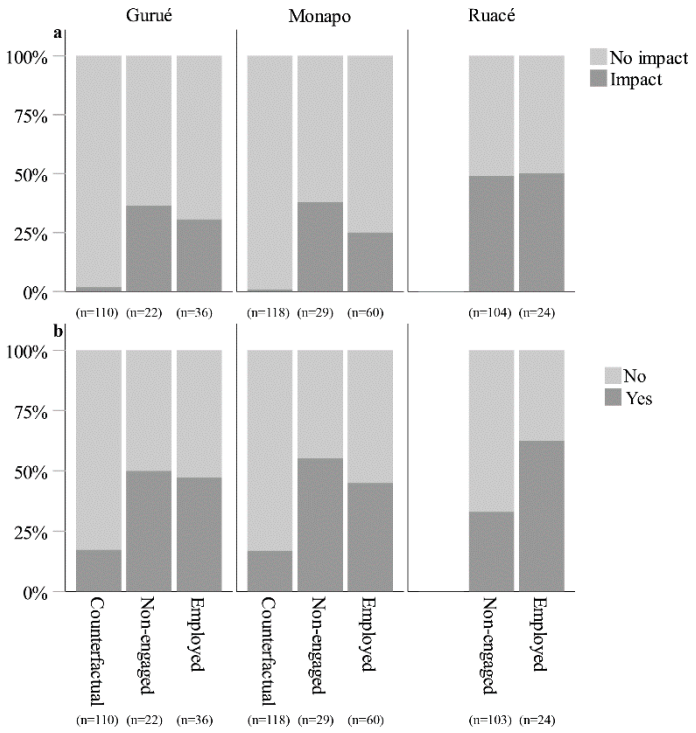


Fig. 34 Percentage of household's perceptions of land availability and land security, by study area and household category
a. Household's perceptions on investors impact on land availability. **b**. Household's worried about loss of land. Data: Afgroland (2016)

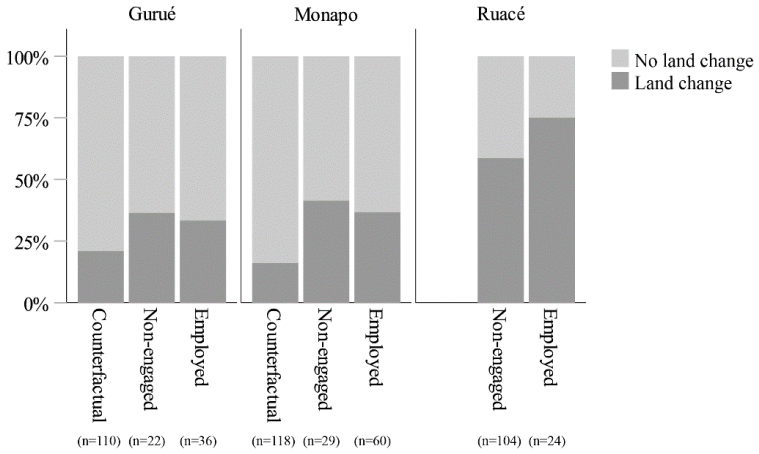


Fig. 35 Percentage of household that reported land access change over the last ten years, by study area and household category
Data: Afgroland (2016)

2.1.6 Land changes

The prevalence of HHs that reported a change in land access over the last ten years is presented in **Fig. 35**. Gurué's CF had slightly fewer land changes (20.9%) than the non-engaged (36.4%) and the employed (33.3%). This was similar to Monapo, where the CF had fewer (16.1%) land changes than the non-engaged (41.4%) and the employed (41.4%). The highest rate of land changes were in Ruacé, where 58.7 to 75% of HHs reported land changes. The most important drivers of land access changes were the difficulty of finding new land (241 to 48.5%), the difficulty of obtaining land from the community (15.2 to 48.4%), and the difficulty of buying land due to higher prices or less availability (0 to 24.5%).

2.1.7 Overview of land access and availability

The goal of this section was to analyse the effects of LAI on land access and availability and to answer hypothesis one '*the LAIs were linked with decreased access to land'* (**Chapter 1**). A few key messages could be identified that relate to hypothesis one. One, generally, the investor areas had more changes in access to land than the CF areas and thus more land volatility. The loss of land was higher in investor areas and was mostly caused by investors. Two, Monapo's employed had significantly less land than the CF. Three, HHs were not necessarily compensated for land loss caused by an investor. Four, investors areas had larger land changes and less security regarding land rights. But there were a few confounding factors in this analysis as well. For instance, there were no significant differences between HHs that lost land to investors and those HHs that did not lose land to investors. For Ruacé's employed, those that lost land had a slightly *higher* number of plots than those that did lose land to investors. This dynamic might indicate that, in Ruacé, land pressures operate against a backdrop of broader changes than LAIs, which might include poverty, no inheritance, migrant status, or rising costs of land. The power and class differences within a community might explain this phenomenon, as more resource-rich HHs could have more plots of land and have higher chances of losing at least one plot of land to an expanding LAI.

The large agricultural investments were linked to decreased access to land

However, the LAIs did influence land access. The LAIs caused 35.1% of all HHs to lose land area in the local near LAIs. In Ruacé, 5.5% of HHs were dispossessed of *all* their land by investors. These dispossessions created added pressures. In Ruacé, the HHs that were expelled from their land started to search for new land. This influx of demand for land appreciated land prices, adding further pressure on land access. If investors claimed land (Gurué, Monapo, Ruacé) without compensation (Gurué, Monapo), reduced the size of land for HHs (Monapo), and took all land from certain HHs (Ruacé), this could have negatively affected the production capacities of HHs and ultimately changed their livelihoods and food security. The production changes are addressed in the next section.

2.2 Food production

The goal of this section is to analyse the LAIs effects on food production. Furthermore, this section seeks to answer the hypothesis two, namely if '*the large agricultural investments were linked to decreased agricultural production*' (**Chapter 1**). It was not feasible to measure plot or HH productivity in the classical sense, as output per ha or per worker. Although the HH survey included questions aimed to measure agricultural production, the quality of the answers was low and the variables were not reliable. Therefore, the level of production was approached using data on types of crops produced; animal production; change in animal production; and engagement in agriculture.

2.2.1 Crop production

The main agricultural use of the land last year is depicted in **Table 38**. Overall, there were few differences between categories and across areas. The annual crops dominated (88.3 to 97.3%). The planting of perennial corps (0 to 2.2%), trees or shrubs (0 to 4.3%), fallow (0 to 4.4%), and forests (0 to 3.3%) were low. However, in Monapo

the mixed use of crops was notably higher (4.6 to 8.9%) than in the west of Mozambique, with Gurué (1.2 to 2.2%) and Ruacé (0 to 2.6%).

Table 38 Percentage of households reporting the main agricultural use of their lands, by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=335)	**NE (n=60)**	**E (n=90)**	**CF (n=261)**	**NE (n=45)**	**E (n=94)**	**NE (n=115)**	**E (n=32)**
Annual cropping	97.3	90.0	94.4	90.4	86.7	88.3	92.2	96.9
Perennial cropping	1.2	1.7	2.2	0.0	0.0	1.1	0.9	0.0
Mixed-use	0.9	0.0	1.1	4.6	8.9	4.3	2.6	0.0
Trees, shrubs	0.0	0.0	0.0	3.4	0.0	4.3	0.0	0.0
Fallow	0.0	1.7	1.1	1.5	4.4	1.1	2.6	0.0
Forest	0.0	3.3	0.0	0.0	0.0	0.0	0.9	0.0
Other	0.6	3.3	1.1	0.0	0.0	1.1	0.9	3.1

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

Because annual crops are dominant, **Table 39** presents the prevalence of the main annual crops. The occurrence of annual crops was broadly associated with the areas and less so with the categories. Overall, the top seven crops planted in the areas were manioc, maize, beans (such as green beans or pigeon beans), sorghum, rice, peanuts, and sesame. The two most prevalent crops, manioc and maize, comprised 31-67.8% of all main annual crops. There were few differences between categories. Gurué's employed had higher manioc than the others, while the CF had higher maize production than the investor area. On the other hand, the CF had lower rice production than other areas. Monapos's CF had the highest peanut production, which was to the detriment of its maize production. In Ruacé, small differences in sorghum and rice production between the categories could be noted.

Table 39 Most prevalent main annual crops on the household's land, with the percentage of households mentioning each plant, by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=397)	**NE (n=81)**	**E (n=115)**	**CF (n=340)**	**NE (n=65)**	**E (n=136)**	**NE (n=189)**	**E (n=51)**
Manioc	25.5	24.1	42.3	31.2	37.3	30.4	4.9	2.7
Maize	17.1	6.9	7.2	21.1	30.5	32.0	58.7	59.5
Bean	18.7	10.3	10.3	14.1	15.3	16.8	15.4	13.5
Sorghum	20.8	32.8	22.7	2.8	6.8	5.6	6.3	0.0
Rice	12.1	24.1	16.5	1.8	0.0	0.0	0.7	5.4
Peanuts	0.5	0.0	0.0	15.9	8.5	6.4	0.0	0.0
Sesame	0.0	0.0	0.0	8.9	1.7	2.4	0.0	0.0
Other	5.3	1.7	1.0	4.3	0.0	6.4	14.0	18.9

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

Compared to Ruacé, Gurué and Monapo had far more manioc production (24.1 to 42.3% in Gurué and Monapo compared with 2.7 to 4.9% in Ruacé), while maize dominated in Ruacé (58.7 to 59.5% in Ruacé compared with 6.9 to 32% in Gurué and Monapo). Moreover, Ruacé and Monapo had a similar prevalence of sorghum, which was much lower than in Gurué (0 to 6.8% in Ruacé and Monapo compared with 20.8 to 32.8% in Gurué). Overall, the combination of manioc and maize represented 31 to 49.5% of main crops planted in Gurué, 52.3 to 67.8% in Monapo, and 62.2 to 63.4% in Ruacé. Sesame and peanuts were infrequently grown as the main crop outside the Monapo area. Monapo, close to the coast, lacked rice production (0 to 1.8%). In Ruacé, the high 'Other' category (14 to 18.9% in Ruacé compared to 0 to 5.3% in Gurué and Monapo) included sunflowers which

were turned into cooking oil by a processing unit. One of the proposed advantages of the LAIs include technological spill-overs such as seeds and inputs like the ones used by the LAIs (**Chapter 2**). The reported crops grown by the interviewed HHs did not reflect spill-overs. Although immediately next to a eucalyptus plantation and residing within a district that attracted soy producers from as far away as Brazil, none in Gurué's investor area reported growing either eucalyptus or soy. In Gurué's CF, one HH reported growing soy. In Monapo, the LAI grew the non-food plant sisal, but none of the interviewed HHs grew sisal either for personal use or commercially.

In Ruacé, 15% of main annual crops was soy, which was also grown by the adjoining LAI named Hoyo-Hoyo. However, the small-scale production of soy preceded Hoyo-Hoyo's large-scale production of soy. The soy in Ruacé was introduced between 2003-05 and supported by the International Institute for Tropical Agriculture (IIAT) and the non-governmental organisation NCLUSA[81], which also helped with sesame and carrot production from 2008 onwards (IIAT, 2016). The HHs in Ruacé produced a more extensive variety of recently introduced plants than the other areas, such as soy, carrots, and sunflower. Noticeably, **Table 39** is limited to the main crops and thus does not reflect the full diversity of the crops grown. For example, across the areas, pumpkin leaves, sweet potatoes and sugarcane were frequently grown. Also, **Table 39** does not distinguish varieties within one category. For example, many HHs grew multiple local varieties of beans, including *feijão cute, holoco, boer*, and *jugo*. However, across the areas, the emphasis was on the production of staples. As the next sub-section shows, animal production was low.

2.2.2 Animal production

The ownership of at least one animal and the number of animals per HHs across areas and categories is portrayed in **Table 40**. Overall, most HHs did not own an animal (63.9% have no animals compared to 36.1% who are animal owners). According to the FAO, the north of Mozambique has less livestock than the centre and south (FAO, 2013). Within the investor areas of Monapo and Ruacé, there were no significant differences between the categories.

Table 40 Percentage of households' animal ownership and the mean number of animals, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=2)**
Household with animal (%)	58.2	18.2^{NE*}	54.1^{E*}	32.2	31.0	23.3	26.0	25.0
Mean animals per household								
Poultry	4.9	1.0	3.1	1.6	0.8	0.6	1.7	2.3
Pig	0.0	0	0.0	0.2	0	0.0	0.2	0.8
Sheep or goat	0	0	0	0.2	0.4	0.0	0	0

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. Sign. difference (p<.01). Data: Afgroland (2016)

Gurué's non-engaged had significantly lower (p<.01) animal ownership than the employed, while the CF had significantly higher (p<.05) animal ownership than the investor area. There were no differences in mean animals per HH for the other areas and categories. This difference was mostly driven by particularly low animal

[81] Director of NCLUSA in Gurué, personal communications, September 29, 2016.

ownership of the non-engaged. Generally, other livestock in the area was low, with no HHs reporting to have ownership of a single cow, limiting the self-production of milk by sheep or goats.

2.2.3 Engagement in livestock and agriculture over the last ten years

The changes in livestock engagement of HHs is reported in **Fig. 36a**.

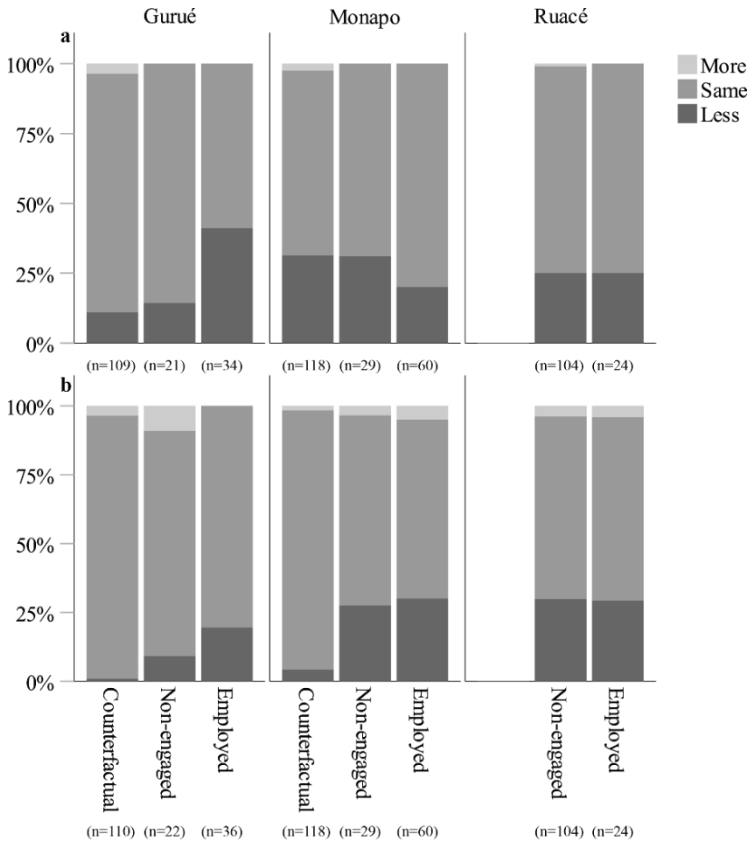


Fig. 36 Percentage of household's reporting the change of household's livestock and agricultural engagement over the past ten years, by study area and household category
a. Engagement in livestock, past ten years. **b**. Engagement in agriculture, past ten years.
Data: Afgroland (2016)

Regarding the HH's engagement in livestock and agriculture, there were no significant differences between categories. Generally, most HHs reported a stable engagement in livestock (74.5%), followed by less engagement (23.8%) and few increases (1.6%). Of the 154 reasons given for a decrease, most were related to diseases (57.1%) and less money available (16.2%), but lack of time (4.5%) and inadequate access to grazing lands (3.2%) were also given. 'Other' reasons were responsible for 18.8% of the other decreases. The only small increase (1.6%) in livestock production took place in CF areas, but this difference was not significant compared to the investor areas. The HH's engagement in agriculture over the past ten years is captured in **Fig. 36b**. Increases in agricultural engagement were low across all categories and areas (0 to 9.1%) compared to the same engagement (66.3 to 95.5%) or less engagement (0.9 to 30%). Gurué's CF was significantly different from the employed ($p=.016$), likely due to the latter's higher prevalence of lower agricultural engagement. Monapo's CF was significantly different from the non-engaged ($p=.004$) and the employed ($p<.001$), also likely due to the lower engagement in agriculture of the non-engaged and employed. In Ruacé, there were no significant differences between the categories.

2.2.4 Overview of food production

The goal of this section was to inquire the possible effects of LAI on (food) production and to formulate an answer to hypothesis two '*the large agricultural investments were linked to decreased agricultural production*'. For the reasons given at the beginning of **Section 2.2**, it was not possible to measure output per ha or worker. But this section presented the types of crops produced; animal production; change of animal production; and engagement in agriculture. Regarding the main agricultural production, few differences can be noted across areas, with slightly higher use of mixed cropping in the Monapo region (**Table 38**). The prevalence of annual crops differed across regions, but there were fewer differences between categories within the regions. More interestingly, the proposed spill-over effects of LAI technology and inputs seemed to be absent, as no HHs reported personal or commercial growing of crops produced by their nearby LAIs.

In comparison with crop production, animal production was generally low, with most HHs not owning any animals. Gurué's CF differed in possession of at least one animal compared to the investor's site ($p<.05$). This difference was mainly caused by the non-engaged's significantly lower ($p<.01$) animal ownership. These two significant differences were mainly caused by higher poultry ownership by the CF and low poultry ownership by the non-engaged. For other areas, there were no significant differences, but Gurué had markedly higher animal ownership than Monapo or Ruacé. Although most HHs reported stable ownership of animals over the past ten years, the meagre increase in animal production (1.6%) was striking considering that most HHs do not own an animal; thus animal ownership keeps being low. Regarding animal production changes, there seemed to be little discernible effects of the LAIs.

The large agricultural investments were linked to a decrease in agricultural engagement

Hypothesis two relates to the link between the LAIs and agricultural engagement of the HHs. There were significant differences between the categories regarding their engagement in the last ten years. There were no differences within the investor sites, but overall the agricultural disengagement of HHs was higher in investor areas. All the CFs had significantly lower disengagement in agriculture than the employed (Gurué and Monapo) and the non-engaged (Monapo). This lower disengagement could have indicated two dynamics. First, the investors provided alternative employment opportunities (such as employment at the LAI) and this decreased agricultural work. This was a positive dynamic as it involved more off-farm employment choice and livelihood options. But there were no significant differences between non-engaged and employed regarding agricultural engagement. This brings us to the second possible dynamic, in which the LAIs decreased the agricultural engagement of HHs through loss of land area. When LAIs were present, there was lower access to and availability of land (**Section 2.1.7**). Likewise, areas with the LAIs were less likely to engage in agriculture. The lower availability and access to land due to LAIs might have caused a shift from self-production to market purchase to access food, which is what the next section analyses. The loss of self-production to access food could have created a reinforcing dynamic between market development and market dependence, in which increased market dependence of HHs created stronger and more diverse market environments. In turn, these stronger markets might have contributed to more market purchases.

2.3 Food distribution

The goal of this section is to map the food distribution of the studied areas and to compare the channels used to obtain the different food groups. This section is organised into two parts. First, the markets where the HHs sold produce were mapped, and second, the market where the HHs derived parts, or all, of their diets from were constructed. This section is a combination of inductive thematic analysis and between-groups analysis. In cases where there were few differences between the study areas, or when not enough data was available to differentiate according to study area or household category, the study area data were combined. The next section depicts the food environments of the studied areas.

2.3.1 Sale of food production

Table 41 Percentage of channels of distribution to which the household has sold their main crops, by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=397)	**NE (n=81)**	**E (n=115)**	**CF (n=340)**	**NE (n=65)**	**E (n=136)**	**NE (n=189)**	**E (n=51)**
No sale	56.8	86.2	81.1	42.8	82.2	51.2	48.6	41.7
Spot market	25.2	10.3	9.5	32.4	13.3	21.7	22.0	14.6
Village	7.8	3.4	7.4	10.7	4.4	10.9	8.7	10.4
Shop	1.4	0.0	1.1	2.0	0.0	4.7	9.2	6.3
Middlemen or hawkers	5.9	0.0	1.1	10.7	0.0	7.0	7.5	18.8
Wholesale	2.8	0.0	0.0	1.4	0.0	4.7	4.0	8.3

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

The different market channels to sell the produced food is portrayed in **Table 41** (**Table 39** presents data on the main crops produced). Overall, most crops were not sold (54.4%), and those that were sold through spot markets (23.6%), village or direct sale (8.7%), middlemen or hawkers (7.1%), or wholesale (2.5%). Few sold to agribusinesses (0.7%) or supermarkets (0.1%).[82] Gurué's CF sold fewer main crops (56.8%) than the non-engaged (86.2%) and employed (81.1%), but had a higher use of spot markets and middlemen. Monapo's CF had fewer sales (42.8%) than the non-engaged (82.2%) and the employed (51.2%) as well. Like Gurué, the use of spot markets and middlemen was higher in the CF (32.4 and 10.7%) than the non-engaged (13.3 and 0%) and the employed (21.7 and 7%). Ruacé's non-engaged sold fewer crops (48.6%) and were more involved in selling to a spot market (22%), but they sold less to middlemen (7.5%), than the employed (41.7, 14.6 and 18.8%). In comparison with the other areas, Ruacé had more wholesale sales (4.82% compared to 2.1% in other areas). Few sold to agribusinesses, although this channel was markedly more used in Ruacé at 2.5% than in other areas, where it was between 0 and 0.6% of sales. These channels of distribution differed according to the type of crop produced (**Fig. 37**).

Overall, the main channel for crops was self-consumption (no sale). It becomes clear that crops such as sorghum and rice were mainly used for self-consumption, with only a small part sold on the spot markets or in the village (**BOX 13** for an in-depth view of these spot markets). The channels were mixed for crops such as manioc,

[82] Except for one HH in Ruacé, none sold to supermarkets. Bearing the absence of supermarkets in Ruacé in mind, it is likely that a relatively well-stocked shop was confused with a supermarket (see **Appendix 2** for a definition of a supermarket).

maize, and beans. For those, important portions went towards self-consumption, but almost half were sold to spot markets, hawkers, the village, or middlemen. Few of the peanuts and sesame were for self-consumption. Of those crops that were sold, the most commonly used channel is the spot market.[83] After a good harvest, the village could attract large professional middlemen that came to the villages to buy in bulk. For smaller quantities of crops, either the small-scale farmer went to the professional middlemen in the cities or sold to the small-scale middlemen in the community. The middlemen then took the food to the towns or cities.[84]

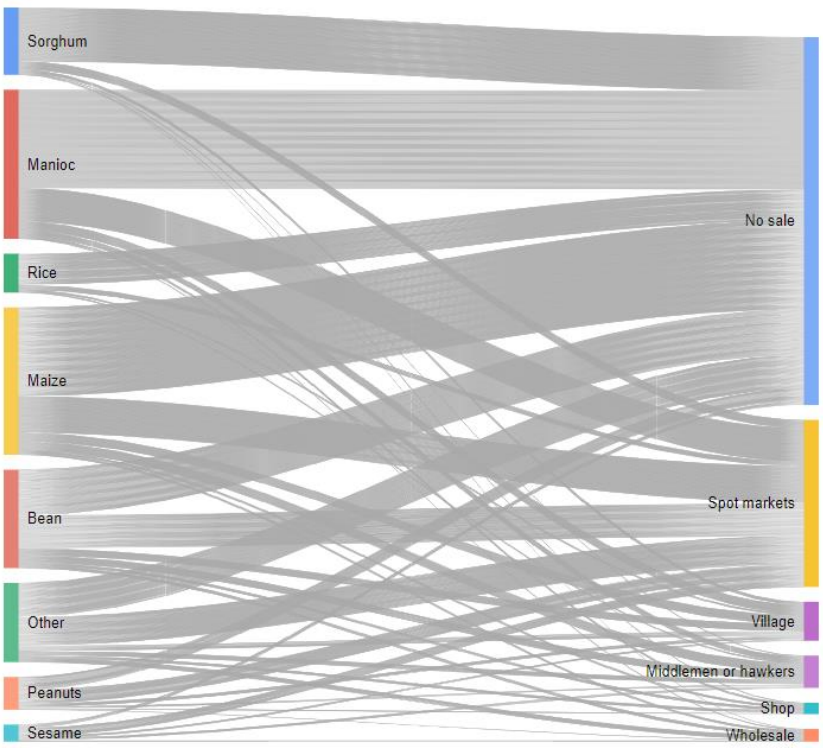


Fig. 37 Principal destination and proportion of 1449 units of main crops
Data: Afgroland (2016)

The main reasons respondents gave for the higher sale of manioc, maize, beans, peanuts and sesame compared to sorghum were taste and robustness. Sorghum was considered less tasty, more challenging to sell, and as such was consumed when maize and potatoes were not available anymore. Maize and beans were easily traded due to their long shelf-life. Frequently, the beans and maize were taken, through a cascading web of mostly informal traders (**Photo 4**), to Maputo after harvest season. Their long shelf-life, if they were appropriately dried, ensured that their desirability prevails through the perilous journey of more than 2,000 km to the capital.

The ownership and production of animals in the areas were generally limited (**Table 40**), and the number of animals sold was too small to compare between categories. Most animal owners did not sell any animals (63.6%). If they did sell, it was to the middlemen (19.4%), spot markets (11.6%) and the village (neighbours) (3.2%). Through qualitative interviewing, the different food chains were mapped and summarised in **Fig. 38**.

[83] However, the distinction between spot markets, middlemen and village are not always clear, so confusion between the categories cannot be excluded in the admission of the surveys. For example, a popular method of selling produce was through a small-scale seller in the community that acted as intermediates to 'professional' (full-time traders) middlemen. As the transaction happened on the spot, this channel can be regarded by respondents and the enumerators as being spot market, village, and middlemen in one, dependent on the respondent or the enumerator. See **Appendix 2** for a definition of spot markets and middlemen.
[84] Middlemen in all study areas, personal communications, September-October 2016.

Except for a weekly market in Gurué's CF, all channels were prevalent in all the study areas. Due to the absence of bookkeeping, the presence of seasonality, and the ad-hoc nature of the food businesses in the areas, the number of items sold was challenging to recall for the interviewees. Thus, the different sale channels and destinations were given a weight (very important to less important) according to the prevalence of these chains mentioned in the interviews.[85]

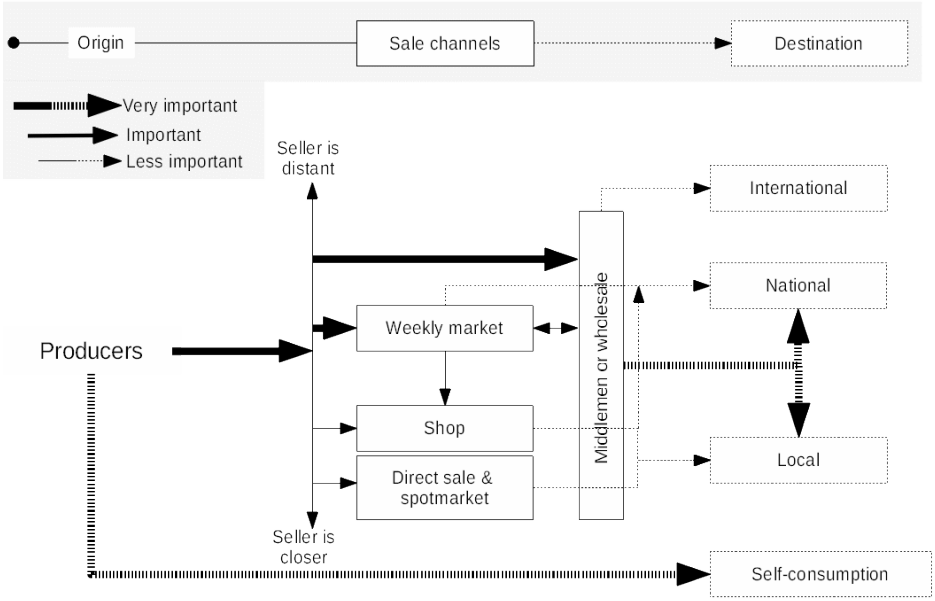


Fig. 38 Channels of sale and destination for sales of the households' production

Several channels were available at varying distances from the HHs' locations where the HHs can sell some or all produce, with varying advantages and disadvantages. First, as outlined in **Table 41** and **Fig. 37**, most of the main crops produced were used for HH consumption, but significant amounts go to the markets as well. Second, HHs sell to neighbours or other HHs in the community. These were rather small exchanges that occurred throughout the year, which could have included a few missing products or an animal for important celebrations. Third, sales to shops in the village were a relatively small part of the sales as the shops mostly sold the products that were not produced in the communities, such as sugar, salt, and oil. Nevertheless, the shops regularly acted as middlemen.

Fourth, the spot markets were the most popular sales channel. This channel included the popular weekly markets, or feiras (**BOX 13**), but also involved small stalls or a sheet on which some basic items, such as a few pieces of manioc, were sold. Also, hawking falls into this category, which seemed to be more prevalent in urban areas than rural ones. Fifth, wholesale involved the sale of larger quantities which were then bought by others. In the studied areas, the wholesalers were included in the 'middlemen' category and were the main actors that brought food in and out of an area. These wholesale middlemen operated differently according to the crop. For

[85]An important limitation concerns the 'seasonality' of markets. This research was conducted three to four months after the harvest of manioc, the main staple (**Table 20**), for the region (FAO, 2010). At that point, HHs might still have enough reserves of manioc. In the lean season, which can run from October until April in Mozambique (FAO, 2017c), the HHs reserve can be depleted and thus create more demand for markets that supply manioc. There is a constant flux between 'harvest' and 'lean' seasons. In the harvest season, HHs sell their produce. However, in the lean season, they might buy back the same produce at much higher, frequently more than triple, prices. It is the lack of storage facility and the need for cash that was most frequently cited for selling immediately after harvest.

example, cash crops like sesame and cashew were generally sold less often to smaller traders because there were Indian and Bangladeshi wholesale traders who bought up crops destined for export.

Sixth, not all middlemen were wholesalers. Even a few kilograms of produce in a relatively isolated community could have made it onto a truck loaded with maize heading to the capital thanks to the cascading web of traders and middlemen. Middlemen included small-scale buyers in a community, who gathered a few bags of maize for sale to larger traders in the towns. On the other end were large-scale middlemen in towns who bought large quantities of bags, which were primarily trucked to Maputo. These traders often worked together to fill up a truck and, in the Gurué area, the top echelons were dominated by female traders, which was an exception to male domination among the small-scale traders. These female traders were sending trucks of maize or beans to the capital. Outside of harvest season, these female farmers lived in Mozambique's capital.

A. Small-scale weighting, Gurué B. Professional traders, Gurué C. Trucks to Maputo delivering maize, Gurué

Photo 4 Middlemen or traders on different scales

The destination of the produce varied according to the crop. Sesame and cashew were regularly exported. Certain legumes, such as *feijão boer* (pigeon peas), were sold to middlemen and could have ended up on the international market as well. Others, such as maize and beans, generally stayed within the national borders of Mozambique. For manioc, the market seemed smaller and more confined to the local area. This sub-section presented the market channels to which the HHs sold their produce. Most crops were not sold but were for self-consumption, and the market channels were similar across the areas. The next sub-section describes the channels for obtaining the dietary ingredients.

2.3.2 Buying food

The different channels used to obtain the different types of food groups are portrayed in **Table 42**. Overall, no significant differences could be calculated due to a low expected cell count. When all areas were considered together, markets were the dominant channel of food group access at 48.9%, followed by self-production at 26.4%, 'other' at 21.8% and shops at 2.9%. The 'other' category was mostly non-consumption. Thus, most food groups were accessed through purchases. Gurué's CF had slightly higher average self-production (37%) than the non-engaged (32.1%) and the employed (29.1%). The employed used the market more for diet access (40.2%) than the CF (28.9%). This higher market dependency was similar to Monapo, where the CF had higher self-production (28%) than the non-engaged (20%) and the employed (19.6%), while the employed had more market purchases (55.4%) than the CF (46.9%). In Ruacé, there were small to no differences between the categories.

Table 42 Percentage of households reporting their primary channel to obtain food groups, by study area and household category

		Gurué			Monapo			Ruacé	
		CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Cereal	SP	92.7	86.4	73.0	85.6	72.4	78.3	72.1	83.3
	Market	4.5	13.6	18.9	9.3	24.1	18.3	25.0	16.7
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Other	2.7	0.0	8.1	5.1	3.4	3.3	1.9	0.0
Tuber	SP	87.3	90.9	89.2	91.5	82.8	71.7	20.2	25.0
	Market	9.1	4.5	8.1	5.1	13.8	11.7	67.3	62.5
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other	3.6	4.5	2.7	3.4	3.4	16.7	12.5	12.5
Orange vegetables	SP	82.7	81.8	75.7	81.4	27.6	36.7	25.0	25.0
	Market	6.4	9.1	16.2	12.7	62.1	56.7	65.4	58.3
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other	10.9	9.1	8.1	5.9	10.3	6.7	9.6	16.7
Green vegetables	SP	70.0	68.2	62.2	70.3	27.6	30.0	21.2	20.8
	Market	7.3	9.1	16.2	14.4	51.7	50.0	60.6	58.3
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Other	22.7	22.7	21.6	15.3	20.7	20.0	17.3	20.8
Other vegetables	SP	40.0	22.7	13.5	3.4	3.4	6.7	3.8	8.3
	Market	45.5	63.6	73.0	90.7	93.1	93.3	93.3	91.7
	Shop	8.2	4.5	2.7	0.0	0.0	0.0	0.0	0.0
	Other	6.4	9.1	10.8	5.9	3.4	0.0	2.9	0.0
Orange fruit	SP	13.6	18.2	13.5	7.6	6.9	8.3	1.0	0.0
	Market	12.7	13.6	27.0	18.6	31.0	16.7	33.7	41.7
	Shop	6.4	0.0	2.7	0.8	0.0	0.0	1.9	0.0
	Other	67.3	68.2	56.8	72.9	62.1	75.0	63.5	58.3
Other fruit	SP	35.5	27.3	21.6	20.3	13.8	15.0	4.8	4.2
	Market	15.5	45.5	48.6	35.6	44.8	31.7	68.3	66.7
	Shop	2.7	0.0	2.7	0.8	0.0	0.0	0.0	0.0
	Other	46.4	27.3	27.0	43.2	41.4	53.3	26.9	29.2
Meat	SP	27.3	9.1	13.5	8.5	6.9	0.0	2.9	8.3
	Market	34.5	59.1	51.4	72.9	62.1	78.3	80.8	83.3
	Shop	8.2	4.5	5.4	0.0	0.0	3.3	1.9	0.0
	Other	30.0	27.3	29.7	18.6	31.0	18.3	14.4	8.3
Eggs	SP	51.8	27.3	45.9	13.6	13.8	3.3	2.9	4.2
	Market	20.0	36.4	27.0	49.2	48.3	66.7	58.7	75.0
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Other	28.2	36.4	27.0	37.3	37.9	30.0	37.5	20.8
Fish	SP	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Market	74.5	81.8	81.1	98.3	100	100	92.3	95.8
	Shop	9.1	0.0	5.4	0.0	0.0	0.0	2.9	0.0
	Other	15.5	18.2	13.5	1.7	0.0	0.0	4.8	4.2
Beans	SP	84.5	77.3	48.6	61.9	62.1	63.3	43.3	33.3
	Market	7.3	13.6	40.5	32.2	34.5	35.0	53.8	62.5
	Shop	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
	Other	8.2	9.1	10.8	5.9	3.4	1.7	1.9	4.2
Milk	SP	0.9	0.0	0.0	0.8	0.0	0.0	0.0	0.0
	Market	10.0	18.2	21.6	22.9	27.6	18.3	26.9	37.5
	Shop	10.0	13.6	5.4	1.7	0.0	5.0	8.7	4.2
	Other	79.1	68.2	73.0	74.6	72.4	76.7	64.4	58.3
Oil and fat	SP	0.9	0.0	5.4	0.8	0.0	0.0	1.9	4.2
	Market	73.6	72.7	54.1	88.1	96.6	96.7	83.7	87.5
	Shop	13.6	9.1	21.6	6.8	0.0	3.3	12.5	4.2
	Other	11.8	18.2	18.9	4.2	3.4	0.0	1.9	4.2
Sweets	SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Market	48.2	40.9	51.4	68.6	79.3	76.7	69.2	79.2
	Shop	10.9	22.7	16.2	8.5	0.0	0.0	10.6	4.2
	Other	40.9	36.4	32.4	22.9	20.7	23.3	20.2	16.7
Spices	SP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Market	80.0	68.2	73.0	93.2	100	100	92.3	100
	Shop	12.7	13.6	10.8	5.9	0.0	0.0	6.7	0.0
	Other	7.3	18.2	16.2	0.8	0.0	0.0	1.0	0.0

Mean	SP	37.0	32.1	29.1	28.0	20.0	19.6	12.4	13.8
	Market	28.9	36.4	40.2	46.9	56.5	55.4	64.1	65.1
	Shop	5.7	4.5	4.7	1.5	0.0	0.8	3.1	0.8
	Other	28.4	27.0	26.0	23.6	23.5	24.2	20.4	20.3

CF *Counterfactual*, NE *Non-engaged*, E *Employed*, SP Self-production. Data: Afgroland (2016)

However, **Table 42** does not weight the food groups according to the HHs' consumption of that group. **Table 46** shows that certain food groups were consumed in higher quantities than others. For example, the consumption of meat was low across all areas and categories (between 0.5 and 1.4 days per week consumed) compared to cereals (3.8 to 5.8 days per week consumed). In **Fig. 39**, the food groups were weighted according the number of days, over the past seven days, in which this food group was consumed, across all the HHs.

Compared to **Table 42**, the market remained dominant, but the 'other' category is reduced as a channel for actual food group access. Similarly to the market channels for selling produce (**Fig. 37**), there were clusters of food groups and channels.

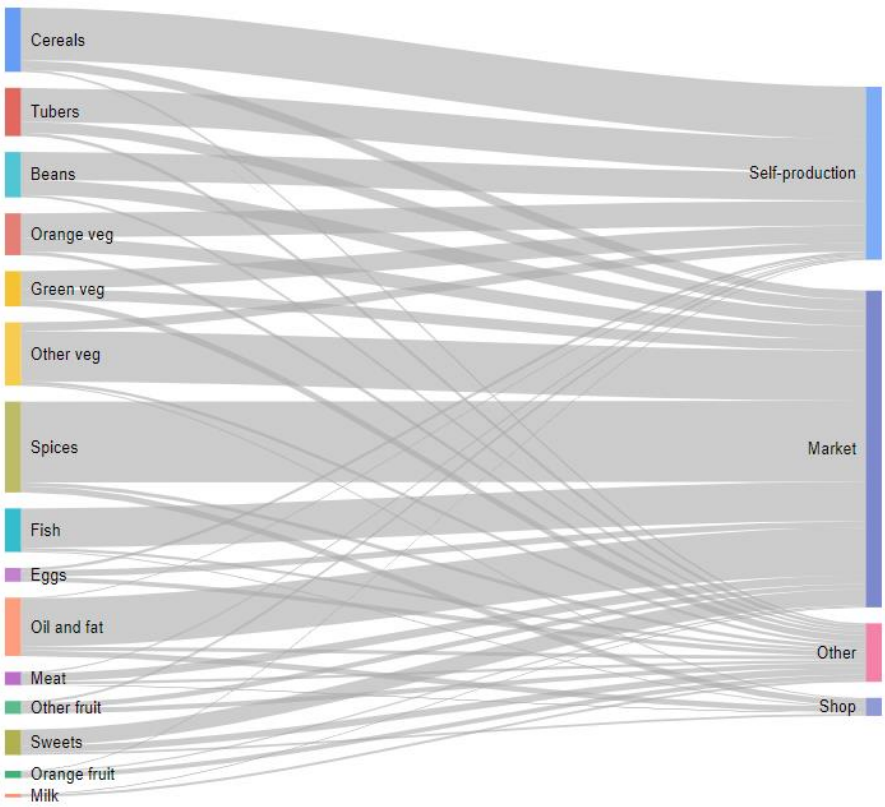


Fig. 39 Distribution of 20,870 food group servings consumed in the last week and their source across all the study areas and household categories
Data: Afgroland (2016)

For example, cereals, tubers, beans, and orange vegetables were mostly self-produced, while the market provided most of the other vegetables, other fruit, eggs, fish, oil and fat, sweets, and spices. Milk was the only food group that was mostly 'other', but this might have been due to the low consumption of milk as 89.1% of HHs across the study areas were not consuming any milk in the past week. No HHs produced milk themselves. Nevertheless, the market provided most food groups and was the main channel for dietary access. The next subsection analyses the supply chains behind the markets and shops in the study areas.

2.3.3 Supply chain characteristics

Based on the typology of food supply chains in **Chapter 2**, the food supply chains in the studied areas could be typified as traditional and modern-to-traditional. The type of chain, or a mix of chains, depended on the type of product. First, sweets and spices were the food groups that were almost exclusively traded through modern-to-traditional food supply chains, in which these products originated from larger corporate actors and were more likely to be processed (Gómez & Ricketts, 2013). Second, oil and fat, fish, meat, and milk could be part of both chains. For example, dried fish in the Gurué area could come from places such as Pebane and Beira and caught by small-scale fishers through traditional channels. However, industrially caught frozen fish was available as well. This industrially-caught fish came from a large modern fish corporation in Namibia and was sold through the traditional channels (**Photo 5**). Milk was derived from small-scale sheep, goat, cow, or powdered milk bought from a large multinational food company. The most prevalent oil and fat found was palm oil from Mozambican companies with little to no self-production outside of Ruacé, where a processing machine to extract oil from seeds, such as sunflower seeds, was present. Third, cereals, tubers, vegetables, fruits, and beans were mostly part of the traditional supply chains.

A. Traditional market seller, Gurué town

B. Modern-to-traditional shop seller, Monapo area

C. Dried fish at market through traditional supply chains, Gurué

D. Frozen fish at market through modern-to-traditional supply chains, Gurué town

Photo 5 Examples of actors and products in different food supply chains

The supply chains differed in their product range, in the range of actors involved, and in the geographical origin of their produce. Examples of actors and products in the different supply chains are shown in **Photo 5**. The next sub-section provides examples of the supply chains found in the studied areas.

A traditional supply chain:

An example of a traditional supply chain was interviewee A from **Photo 5**. As a seller on the road of Gurué town, she provided manioc, sweet potato leaves and cabbages to passers-by. She was getting her produce from the weekly Gurué market, which was at the end of her road. The sellers at the weekly Gurué market were generally small-scale producers or small-scale middlemen from the areas around Gurué town (**Photo 4**).

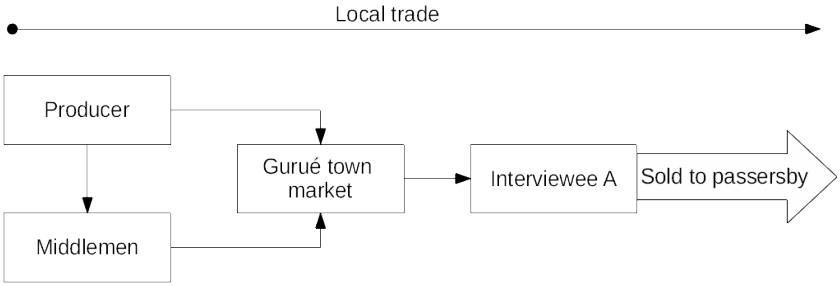


Fig. 40 Example of traditional supply chain

A mixed-supply chain

Fish can be derived from either a traditional or a modern-to-traditional supply chain. The dried fish came from Mozambique's coast and Lake Malawi, which was across the border. The frozen fish came from a Namibian corporation, although it was unclear where the fish were originally caught.[86] Both of these types of fish travelled through a similar chain, with the only difference that the frozen fish originated from a large trawler and a foreign-based company, while the dried fish was mostly small-scale fishers. The dried and frozen fish were then traded along a cascading web of informal traders. While the larger company might have upset small-scale fishers on the production site because of their economies of scale, the rest of the chain was a traditional set-up akin to **Fig. 40**.

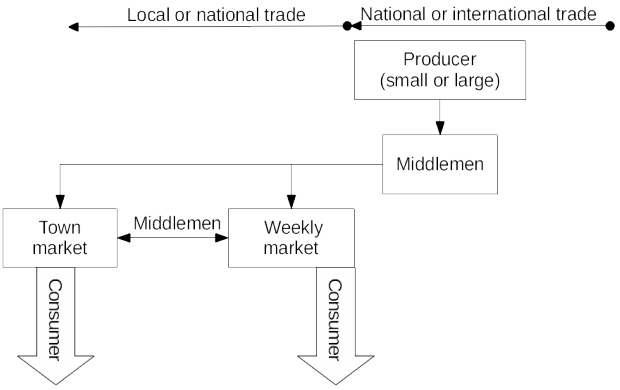


Fig. 41 Dried and frozen fish supply chains

As a general rule, the longer the distance between the point of production and consumption, the more middlemen and marketplaces were involved in the value chain. However, there were subtle differences between value chains for dried and frozen fish that were due to differences in the products. For instance, the traders who

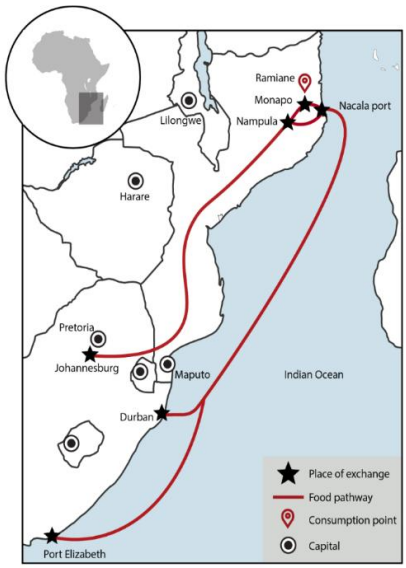
[86] A catchment area for this fish, the Atlantic Mackerel, was the South-East Atlantic right of the coast of Namibia.

focused on the frozen fish regularly collaborated to rent a car and to buy the ice needed to create a cold chain. These were traders who delivered to the markets in the towns, such as Ruacé and Gurué.[87] Maintaining the cold chain was challenging when the smaller middlemen delivered the frozen fish to the villages. In the case of dried fish, the market was dominated by smaller middlemen from the start.

A modern-to-traditional supply chain

The origin of the ingredients in 'modern' food products that were sold by interviewee B from **Photo 5** were difficult to track. For instance, the soda sold in the shops may have contained more than ten ingredients from around the world. The modern-to-traditional supply chain will thus be presented to the extent that the respondents in the study areas were able to track down the origins of the products. In **Fig. 42**, the food pathways of the products that were sold by interviewee B are portrayed.

Fig. 42 Reported food pathways of a modern-to-traditional supply chain destined to Monapo



This figure features an example of a modern-to-traditional food supply chain. Interviewee B bought his products, such as oil, pasta, sugar, and salt, from a shop *(lodge)* in Monapo, to which he travelled to by foot or motorbike. The shop in Monapo was getting the goods by truck either from Nacala port or another shop in Nampula. The Nacala port received the goods either from Durban or Port Elizabeth in South Africa, while the Nampula store was getting their products from trucks that came from the Johannesburg area.[88] Thus, the furthest traceable origin of the supply chain that delivered 'modern' food products to interviewee B was South Africa. South Africa and regional distribution hubs such as Nampula, Monapo, and Nacala port played a key role in the supply chain that brought international and processed products to the villages. It was surprising to note that villages which lacked electricity and running water were connected to the global supply chain. While far removed from paved roads (**Fig. 43**), the 'modern' food products such as frozen fish from across the continent could still make inroads to the village.

[87] Monapo accesses fresh fish due to its proximity to the coast.
[88] Shop manager of Monapo central market, Monapo, personal communications, October 15, 2016.

BOX 12 The central role of towns in the distribution system: the example of Gurué town

The towns in the studied areas played a central role in the distribution system of the area. Almost all the food that went in and out of the regions passed through the towns. The town of Gurué was the central distribution hub for both Manlé and Muela. Almost all products that were consumed but not produced in the study villages came from Gurué town, and many traders sold the crops of Manlé and Muela to larger traders at the Gurué market. A three-year-old tarmac road and better transport options overcame previous travel problems.[89] Services such as access to water, roads, health facilities, electricity and education were concentrated in the urban areas, which attracted migrants from villages such as Manlé and Muela to Gurué. The commercial heart of Gurué hosted the main market, which included market stalls, spot markets, hawkers, and large traders. Although the market was large, the diversity of items sold was rather small and included sections for sale of oil, frozen and dried fish, meat, vegetables, and dried beans. While the cereals and beans may have been coming from nearby small-scale farmers, the dried fish came from the coast of Mozambique or Lake Malawi.

Gurué's traders sat next to the main market and aggregated cereals and beans from smaller traders until a truck was filled and sent to Maputo. Women dominated the higher echelons of the trade and collaborated to fill up trucks. Only cereals and beans were sent on the long trip to Maputo as other food would be spoiled on the journey.

Photo 6 Butcher at the central market of Gurué town

Although a supermarket chain was absent, a store dedicated to the selling of supermarket items opened in 2009 and offered products such as pasta, coffee, wheat, oil, sodas, and milk powder. The products were trucked in from either a larger distributor in Nampula or straight from South Africa (**Fig. 42**). From these points onwards, the supermarket products, especially popular products like sugar, oil and salt, were distributed to smaller sellers. There was a marked difference in the meat market of the regional towns of Gurué and Monapo. In Gurué town, a small section of the market was devoted to butchery and the sale of meat. The market traders were required to pay a market, slaughterhouse and 'placement' tax. In Monapo, the butchery section was much smaller, and the market focused more on the sale of fresh fish from the coast.

[89] Director NCLUSA Gurué, personal communication, September 29, 2016

2.3.4 Overview of food distribution

In this section, the food distribution of the study areas were mapped and the channels used to obtain the food groups were compared. Although most of the locally produced crops were used for home consumption, those sold were sent primarily to a weekly market (including spot markets) or middlemen. Maize and beans were likely to be transported over long distances. Most of the diet came from purchases, which could go through a traditional, mixed, or modern-to-traditional supply chain. In Gurué and Monapo, the CF relied more on self-production to access food than the non-engaged and the employed, while the employed purchased more of their food from the market than the CF. Generally, the LAIs had only a limited direct effect on the selling of production. Very few respondents sold to the agribusinesses, and the agribusinesses rarely sold to the local markets. However, as LAIs generate employment, this could have driven more market activity as employees produced less food and buy more. The next section analyses this relationship.

3 Food environments

The goal of this section is to analyse the food environments of the study areas. First, this section will explore food accessibility within the food environments, with an emphasis on the perceived distances to roads, markets, and agricultural land on foot. Second, the availability of food was approached by studying the store's inventories. Although use of an inventory approach to determine food availability is criticised because the causal relationship between food availability and store inventory is often weak, it is more robust in restricted environments such as the study areas in Mozambique. Third, the affordability of food was analysed by studying the proportion of income that HHs were spending on food, which is a strong predictor of poverty as well (Zezza & Tasciotti, 2010). Lastly, the channels to access the diets were analysed. Together, these four components outline the food environments of the study areas. Furthermore, this section seeks to answer hypothesis three, namely if '*the LAIs were linked to decreased self-production and higher dependency on the market for food access*' (**Chapter 1**).

3.1 Food accessibility within the food environments

The perceived distance, by foot, to either a paved road, market, and their agricultural land is portrayed in **Fig. 43**. Gurué's CF travels much longer to the markets than the non-engaged: the proportion of CF HHs who had to travel more than one hour to a market was more than four times higher than the travel times of the non-engaged and the employed (80% vs 18.2 and 10.8%). In Monapo and Ruacé, travel times were similar. Overall, the access to paved roads was dire, with 61.7% (Ruacé) to 94.4% (Monapo's investor area) of HHs having to travel more than one hour to reach a paved road.

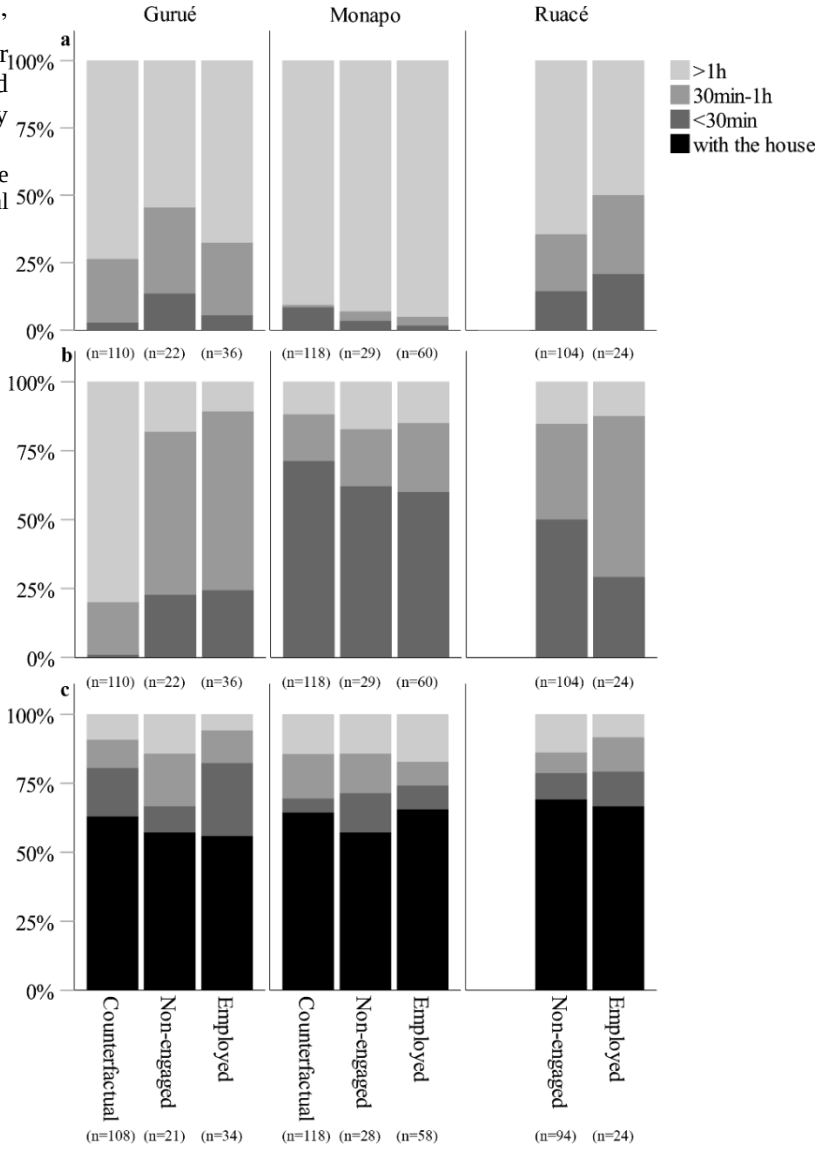


Fig. 43 Percentage of households' reporting the distances from their home to paved roads, markets, and agricultural land on foot, by study area and household category
a. Distance to a paved road. **b**. Distance to a market. **c**. Distance to agricultural land. Data: Afgroland (2016)

The absence of paved roads was making transport especially tricky in the rainy season when road conditions deteriorated. Except for Gurué's CF, markets were more accessible than paved roads, with most HHs (71.6%) living less than one hour from a marketplace. Thus, while travelling often was a challenge, this lack of roads did not impede access to markets. Few HHs were more than one hour away from their agricultural plot (12.6%), with most HHs (63.9%) living on their agricultural land. Except for Gurué's CF, access to markets and agricultural land was much better than the access to a paved road. Market access has improved by the weekly markets or *feiras* (**BOX 13**). The only study area without a weekly market was Gurué's CF, which might have explained their low market access.

3.1.1 The accessibility of points of sale

The accessibility of the points of sale in the study areas depended on the type of business. The markets in the towns of Gurué and Monapo were the largest and provided opportunities to buy and sell year-round (**BOX 12**). However, the sales of certain produce at those town markets depended on the time of the year, with large-

scale traders of maize and beans that were only present in the months after the harvest. These towns were also the farthest to travel from the study areas and were busy throughout the day. Closer to the HHs were the weekly markets, which provide a wide range of opportunities to buy and sell, but they were open only one day per week. The weekly market that was visited near Monapo's investor area did not last the entire day but was decisively busier in the morning. The advantages to the weekly markets were numerous (**BOX 13**) because they provide opportunities to buy and sell to remote areas and to places that cannot support a permanent market. The shops in the studied areas were small structures that sold mostly international and processed food (**Photo 5B** for an example of such a shop), as well as local produce (**Photo 7**). Although the shops were open all day, they could sell items on request after those hours as well. In many ways, these shops provided similar access to food as buying from the neighbours or other people in the village, as these shops were informal, close to the houses, and highly accessible.

Photo 7 Shop in Ramiane selling local produce and oil

3.1.2 The evolution of market accessibility for household's produce purchases

The market environment for the sale of HHs produce has not improved greatly over the last ten years (**Table 43**). A minority of HHs increased produce sales, from 3.4% of Monapo's non-engaged to 33.3% for Ruacé's employed. In Gurué, there were no significant differences between the categories regarding the number of HHs that increased sales, but the CF had a higher prevalence (26.4%) than the non-engaged (9.1%) and the employed (14.3%). The most frequent reason given for increased sales, across all categories except the non-engaged, was increased production. In Monapo, there were fewer differences between the CF (14.4%), the non-engaged (3.4%), and the employed (13.3%), with increases in quantity as the main driver for increased sale. For the non-engaged, there was increases due to more village sales. Ruacé's non-engaged had a significantly lower ($p<.05$) increase in sales than the employed. Again, the increases in quantity produced was the main driver for increases in sales. In short, increased production drove increased sales, not an improved market environment. The non-engaged reported the lowest increases in sale, and this was significantly different in Ruacé. Increased access to direct sales, shop, market, and middlemen channels raised new opportunities for selling produce but were less important reasons than quantity and range. This sub-section surveyed the accessibility of food. In short, there was much better access to markets and agricultural plots than to paved roads, except in Gurué's CF.

Table 43 Percentage of households reporting increased sales over the last ten years and main reasons given for this increase, by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=110)	**NE (n=22)**	**E (n=35)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Households with increased sale	26.4	9.1	14.3	14.4	3.4	13.3	14.4*	33.3*
Sales increased[a]								
Quantity	57.1	50	100	47.1	50	72.7	58.3	100
Range	16.7	0.0	0.0	20.6	0.0	9.1	8.3	0.0
More direct sale	7.1	50	0.0	11.8	50	0.0	12.5	0.0
More shop sale	7.1	0.0	0.0	2.9	0.0	9.1	12.5	0.0
More market sale	7.1	0.0	0.0	8.8	0.0	9.1	4.2	0.0
More middlemen sale	4.8	0.0	0.0	8.8	0.0	0.0	4.2	0.0

CF *Counterfactual*, NE *Non-engaged*, E *Employed.* Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. *p<.05. [a]Percentage of all answers. Data: Afgroland (2016)

The long travel times in Gurué's CF was likely due to the absence of a weekly market. Improvements in quantity produced drove increased sales primarily, with improved village sales a secondary driver. The non-engaged reported the smallest increase in sales of all categories, and this was significantly lower in Ruacé. The next sub-section analyses the food that those markets provide.

3.2 Food availability within the food environments

The food availability in the food environments is approached through a study of the markets' inventories. A study of supposed linkages between food availability and consumption comes with important caveats (Lytle & Sokol, 2017). To put it bluntly, availability does not equate consumption. Therefore, any list of food items found in the food environments of the research areas should be approached with the consumption of different food groups in mind (**Table 46**). Nevertheless, accessibility and consumption necessitate availability. The different food items found in the studied areas are categorised according to their FAO food group in **Table 44**.

Table 44 Food products for sale in the study areas (at the time of interviewing), by food group

Food group	**Product**
Cereals	sorghum, maize, wheat, rice, pasta, bread
Tubers	manioc
Vegetables	sweet potatoes, pumpkin, pumpkin leaves, peas, okra, tomato, onion, garlic cabbage
Fruit	mango, papaya, banana
Meat	chicken, pig, goat, rat, duck
Eggs	chicken eggs
Fish	dried, fresh, and frozen fish, sardines
Beans	beans, peanuts, sesame, soy, sunflower, cashew
Milk	condensed milk, yoghurt
Oil and fat	palm oil, sunflower oil, butter
Sweets	sugar, juice, biscuits, candy, energy drinks, sugarcane
Spices	salt, alcohol, stock, spices (general), chilli, tea

With few exceptions, all the food items present in one area were found across other study areas. A notable exception was milk powder, which was not found in the Monapo areas. The variety of fish depended on the area.

In Monapo, fresh and dried fish could be found, while in Gurué and Ruacé, frozen and dried fish was available, but not fresh fish.

The availability of new food items in Muela and Ramiane

Due to the debate concerning a 'supermarket revolution' or the influx of internationally traded products into the food markets of SSA (**Chapter 2**), special attention was given to new and processed food products. The influx of (novel) food that was not produced in the study areas is described through the examples of Muela (Gurué's CF) and Ramiane (Monapo's investor area), as the influx dynamics of novel food were similar across the CF and investor areas.

In the past, the HHs of Muela had no shops that sold oil, sugar, and salt, so each HH had to travel individually to Gurué town to buy the products and sell their wares. While a few shops started to open after 1992, the food choices were few. As Muela is the only village that did not have a weekly market close by, it was the most restricted area in terms of food choice (**Fig. 43**). However, in this remote village, some Namibian frozen fish were found. This frozen fish made a remarkable journey that started off the coast of Namibia and in Mozambique at the port of Quelimane. From that point onwards, a cascading chain of informal traders brought the fish to Muela, closing a supply chain that linked a boat from a Namibian company through the dirt roads of Muela with its consumers. But this was an exception. The availability of new and outside products, such as energy drinks or salt, was the lowest in Muela. Especially the absence of a weekly feira contributed to restricted food availability (**BOX 13**).

In Ramiane, the nearby plantation provided workers in the colonial times with a ration of oil and sugar. During this study, the plantation did not provide a shop. Instead, a market area with shops and a nearby weekly market provided an array of new foods, such as biscuits, soda, yoghurt, and condensed milk. Due to the plantation, the village of Ramiane was already more integrated into the global market, both at the supply and demand side. When compared to Muela, this deeper integration seemed to continue today. One possibility that caused Ramiane to have more shops and market activity as the employment at the LAI. The LAI provided a cash flow to the HHs who worked there. In Muela, off-farm employment and access to cash were more limited indeed.

BOX 13 (Spot-)markets in the study areas of Mozambique: *feiras* or weekly markets

A sizeable portion of the produce that HHs sold went to the markets rather than to the shops. Most of these markets were spot markets, meaning that the food was sold on the street without the fixed infrastructure that is found in the shops and central markets in the towns. An example of a spot market are feiras, which changed the market environment in many of the research communities. Feiras were weekly markets that sold a range of food products and household items such as wheat flour, onions, capulanas (traditional clothing), and small solar panels. The feiras provided a place and opportunity for communities to buy items in locations where demand is too low to warrant a permanent shop. Feiras provided more diverse and cheaper food options than the shops. Small-scale farmers saw the feira as an opportunity to sell some of their food crops, such as cabbages or caught wild animals (**Photo 8**).

Photo 8 Caught animals for sale at weekly market

Also, larger middlemen came to the feiras during the harvest season to buy their crops of choice. An example is the Itocula feira, which was close to the investor area of Monapo and started in 2005. In October 2016, heaps of cashew nuts cluttered the market as Indian middlemen bought up most of the local cashew production for export. Besides these cash crops, there was generally little food bought or sold except for some onion and tomatoes. Pots, pans, and other household items occupied the largest part of the market.

In Gurué's investor area, the feira was established as well in 2005. Before this, the nearest feira was 50 km away with serious transport difficulties in the rainy season. The establishment of a nearer feira and the tarmac road to Gurué town meant that there was a reported decrease in demand for shops in the community. The feiras were very popular. Communities that initially did not have easy access to a feira, such as Monapo's CF, expressed a desire to set one up and wrote for the authorities' permission. Together with the towns, the feiras acted as a central community point for the sale of their own produce and the import of food that was not grown by the HHs.

This sub-section analysed food availability in the food environments. In short, the occurrence of food items across the areas was, with few exceptions, similar. There were new products and their availability differed by to each area, with weekly markets playing important roles in their distribution. More traditional products seemingly dominated the inventory space of markets, shops, and spot markets. Improved access to shops did not solve all the problems of food access, because HHs were frequently unable to afford available food; hence availability did not ensure access. Thus, the next sub-section analyses the affordability of food within food environments.

3.3 Food affordability within the food environments

In **Table 45**, the food budget, differences between the study communities and the national rural average of Mozambique, and the contributions of self-production to the food budget are presented. In Gurué, food took up a very high proportion of the total budget, ranging from 73.8% for the employed to 85% for the CF and 85.1% for the non-engaged. The CF and non-engaged had significantly higher ($p<.01$) FES than the employed. The large share of the HH budget that food commanded had an impact on other expenses. For example, the CF had only 15% of their total budget to spend on expenses such as building materials, medicine, rent, transport, water, soap, energy, education, debt, or special events. Even considering the Mozambican national context, the share of the HH budget that was spent on food was very high. According to the FAO, food expenditure accounted in 2003 for 70% of total HHs expenses in rural Mozambique (FAO, 2004).

Table 45 Monthly budget of the households in USD and the Food Expenditure Share (FES), by study area and household category

	Gurué			Monapo			Ruacé	
	CF (n=110)	**NE (n=22)**	**E (n=35)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Mean total budget (USD)	35.0	58.9	59.4	36.0	38.3	45.1	50.1	42.8
% of food expenditure (FES) in total monthly budget	85.0^{E*}	85.1^{E*}	73.8^{CF*,E*}	85.9	82.2	80.0	79.9	80.2
% of self-production in FES	69.1^{E*}	63.5	56.3^{CF*}	58.7^{E**}	51.1	43.7^{CF**}	32.8	37.5

CF Counterfactual, NE Non-engaged, E Employed, FES Food Expenditure Share. Sign. differences between categories were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction. *p<.01, **p<.001. USD conversion of Metical on 28 September 2016 rates, $1=77.41 MT. The food budget and FES include the approximate value of self-produced goods that the households consumed in the last 30 days. Data: Afgroland (2016)

Monapo did not have significant differences between the categories for their FES, which was very high as well at 80 to 85.9%. Again, the CF had a significantly higher (p<.001) share of self-production in the food budget than the employed. For the CF and the non-engaged, self-production contributed most to the food budget (51.1 to 58.7%), but most of the food budget for the employed was through purchases (43.7% self-production). The contribution of self-production to the food budget was lower than the other areas, ranging from 32.8 to 37.5%. In Ruacé, there were no significant differences, and self-production and FES were similar.

Generally, the average proportion of an HH budget that went towards food was very high across all areas and categories. According to the World Food Programme, a HH is vulnerable and considered food insecure when it has a FES over 75% (WFP, 2014). Except for Gurué's employed, all categories had an average FES above 75%. Self-production was most important in Gurué, and purchases most in Ruacé. In Gurué and Monapo, the CFs had significantly higher contributions of self-production to their FES than the employed. The next sub-section analyses this relationship further.

3.4 Shifting channels to access diets

This sub-section analyses the importance of self-production and purchases for dietary access. A hypothesised effect of LAI relates to decreased self-production and a higher dependency on the market for food access (**Chapter 1**). To calculate this, the number of food groups consumed in the past week that were sourced from self-production was divided by the total number of food groups consumed in the past week. This method differs from **Table 45** as it focuses on the importance of self-production or purchases for diet access rather than its monetary value, and as it is more robust than estimating the value of one's self-produced food. The results are portrayed in **Fig. 44**.[90]

[90] Sign. differences between categories within areas were evaluated by the Kruskal-Wallis H-test with post hoc Dunn-Bonferroni correction.

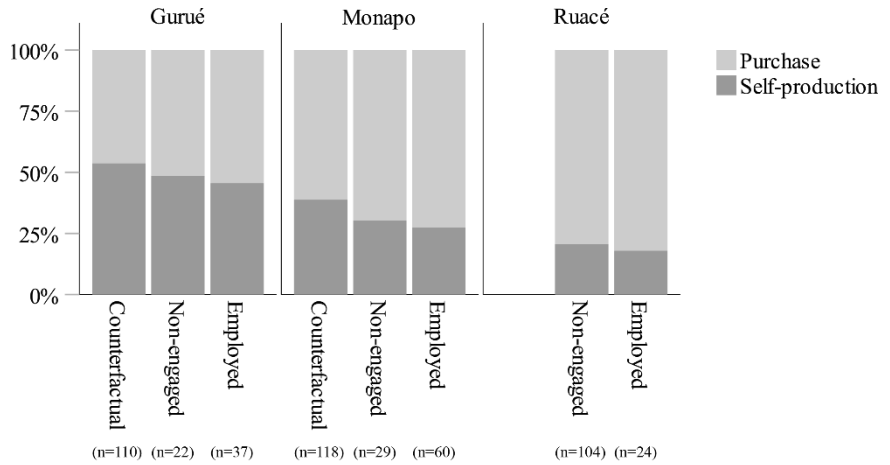


Fig. 44 The proportion of food purchases and self-production for dietary access, by study area and household category
Data: Afgroland (2016)

In Gurué, there were no significant differences between the categories, but the CF had a higher self-production share (53.6%) than the non-engaged (48.4%) and the employed (45.5%). Gurué's CF was the only category that derived most of its dietary access from self-production. Monapo's CF had a significantly higher ($p<.001$) share of self-production than the employed. While CF's mean was 38.8%, it decreased to 30.2% for the non-engaged and 27.4% for the employed. In Ruacé, there were no significant differences between the categories, but the non-engaged had a higher mean share of self-production (20.5%) than the employed (17.9%).

This sub-section analysed the importance of self-production and purchases for dietary access. Only Monapo's CF had a significantly higher share of self-production than the employed ($p<.001$). However, the mean share of self-production decreased in relation to the categories' distance with the LAIs, with lower self-production share by non-engaged and employed than the CFs.

3.5 Overview of the food environments

The goal of this section was the analysis of the study area's food environments through study their food accessibility, the availability of food, the affordability of food, and the channels to access diets. This sub-section overviews the food environments and formulates an answer to hypothesis three '*the LAIs were linked to decreased self-production and a higher dependency on the market for food access*'.

The accessibility of markets and agricultural plots was much higher than access to paved roads, except in Gurué's CF. A minority of HHs increased their sales, which was mostly driven by increased food production and more sales in the village. Regarding availability, almost all food items were found across the areas, with a notable exception for fresh and frozen fish. The weekly markets were key to the availability of different food items. While there were new processed food items available, access was more constrained by poverty than by availability. Food affordability was problematic because the FES was very high across all areas. The CF had significantly higher contribution of self-production than the employed.

The channels to access diets were different across the areas. The proportion of self-production for dietary access was significantly higher in Monapo's CF than the employed. Generally, the importance of self-production decreased in relation to the categories' distance to the LAIs, with lower self-production share by non-engaged and employed than the CFs.

The LAIs were linked with decreased importance of self-production

Hypothesis three relates to the link between the LAIs and the channels to access diets. Generally, the LAIs were linked with decreased self-production for dietary access. In Gurué and Monapo, the CF had significantly higher contribution of self-production to the FES than the employed. The importance of self-production to the diet was higher (but not statistically significant) for the CF than the non-engaged, and higher for the non-engaged than the employed in each area. The next section analyses the food system outcomes.

4 Food systems outcomes

This section analyses the food consumption and food security of the HHs and overviews the livelihood options and changes in relation to the LAIs. Furthermore, this section seeks to answer hypothesis four, namely if '*LAIs were linked to differences in the diet composition of HHs, especially with higher processed food consumption'* (**Chapter 1**).

4.1 Food consumption and diets

The HHs were asked to provide the number of days in which a food group was consumed in the last week (**Table 46**).

Table 46 Mean days in which 13 food groups were consumed over the last week, by study area and household category

	Gurué			Monapo			Ruacé	
Food group	**CF (n=110)**	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Cereals	4.8	4.1	4.4	3.8	4.0	4.7	5.8	5.5
Tubers	3.9	4.2	4.1	4.7	4.2	3.8	1.6	1.5
Orange veg	3.4	4.0	4.0	3.0	2.2	2.3	3.0	2.6
Green veg	2.8	2.9	2.8	2.6	2.0	2.0	2.8	2.1
Other veg	3.7	3.7	4.4	4.4	4.9	5.3	5.3	6.0
Orange fruit	0.6	0.9	1.0	0.4	0.5	0.2	0.6	0.5
Other fruit	1.1	1.5	1.5	0.6	0.9	0.7	1.0	0.8
Meat	0.7	1.2	1.0	0.9	0.5	0.8	1.4	1.0
Eggs	1.2	1.1	1.6	0.7	0.8	1.0	1.0	0.5
Fish	1.7	2.2	1.7	4.4	4.2	4.6	3.0	3.3
Beans	3.8	3.5	3.6	2.8	3.3	3.2	3.4	2.8
Milk	0.1	0.4	0.3	0.1	0.1	0.2	0.4	0.6
Oil and fat	3	3.4	3.3	4.4	4.4	5.1	5.0	5.7
Sweets	1.2	1.6	1.9	1.5	2.3	2.4	2.4	2.2
Spices	6.7	4.5	5.2	7.0	7.0	7.0	6.9	7.0
Mean	2.4	2.5	2.6	2.6	2.6	2.7	2.8	2.6

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

Between 34.8 and 39.8% of all food groups were consumed daily. Overall, while there were differences between categories, the magnitude of the differences remains small. Gurué's CF had a lower milk consumption than the employed, while the employed had lower spice consumption than the CF. Monapo's CF had lower consumption of other vegetables and sweets consumption than the employed. In Ruacé, diets were similar. Overall, there were few differences regarding food consumption between categories and very few differences between CF and the non-engaged. Furthermore, there are only small differences regarding the average number of days that any food group was consumed.

4.2 Food security

This sub-section analyses the food security of the HHs using the Household Dietary Diversity Score (HDDS) and the Food Consumption Score (FCS).

4.2.1 Household Dietary Diversity Score

The HDDS and the prevalence of the HHs in the HDDS categories are presented in **Table 47**. In Gurué, there were no significant differences regarding the HDDS or the HDDS categories. Monapo's CF had a significantly lower ($p<.05$) HDDS than the employed, but not in the HDDS Categories. In Ruacé, there were no significant differences. Overall, Gurué had the highest prevalence (16.2 to 18.2%) of HHs in the HDDS 'low' category compared to Monapo (6.9 to 12.7%) and Ruacé (8.7 to 8.8%).[91] Ruacé had the highest prevalence (49 to 52.2%) of HHs in the 'high' category compared to Gurué (33.6 to 40.5%) and Monapo (33.1 to 51.7%).

Table 47 Mean Household Dietary Diversity Score (HDDS) and the percentage of households per HDDS category, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Mean Household Dietary Diversity Score	5.0	4.8	5.4	5.0^{E}	5.4	5.4^{CF}	5.5	5.4
Household Dietary Diversity Score categories								
High	34.3	36.4	40.5	33.1	44.8	51.7	49.0	52.2
Medium	48.1	45.5	43.2	54.2	48.3	36.7	42.2	39.1
Low	17.6	18.2	16.2	12.7	6.9	11.7	8.8	8.7

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test post hoc Dunn-Bonferroni correction. Sign. difference ($p<.05$). Categories: low <3; medium 4-5; High >=6. Data: Afgroland (2016)

4.2.2 Food Consumption Score

The FCS of the areas and categories is presented in **Table 48**. Overall, there were no significant differences in the FCS between categories in any area. Gurué had the highest prevalence of 'poor' FCS (0 to 5.4%) compared

[91] Denoting a less than three (out of twelve) food groups consumption in the last 24h.

to Monapo (0%) and Ruacé (0 to 1%). The FCS 'acceptable' category was more prevalent than the 'High' category of the HDDS, which suggests a relatively low diversity of food group consumption but better nutritional profile and frequency of food groups.

Table 48 Mean Food Consumption Score (FCS) and the percentage of households per FCS category, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF (n=110)	**NE (n=22)**	**E (n=37)**	**CF (n=118)**	**NE (n=29)**	**E (n=60)**	**NE (n=104)**	**E (n=24)**
Mean Food Consumption Score	49.3	53.4	51.1	53.8	54.3	57.4	56.1	53.7
Food Consumption Score categories								
Acceptable	79.1	90.9	86.5	96.6	96.6	100	93.3	95.8
Borderline	16.4	9.1	8.1	3.4	3.4	0.0	5.8	4.2
Poor	4.5	0.0	5.4	0.0	0.0	0.0	1.0	0.0

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test post hoc Dunn-Bonferroni correction. Categories: poor <22, borderline 22-35, acceptable >35. Data: Afgroland (2016)

The contribution of each food category to the FCS is presented in **Fig. 45**. The most important contributor to the FCS score was animal protein, followed by staples, pulses, and vegetables. Fruit, milk, and sugar contributed less. Most of the animal protein category consisted of fish consumption. There were no significant differences in the contribution of different food groups to the FCS between categories.

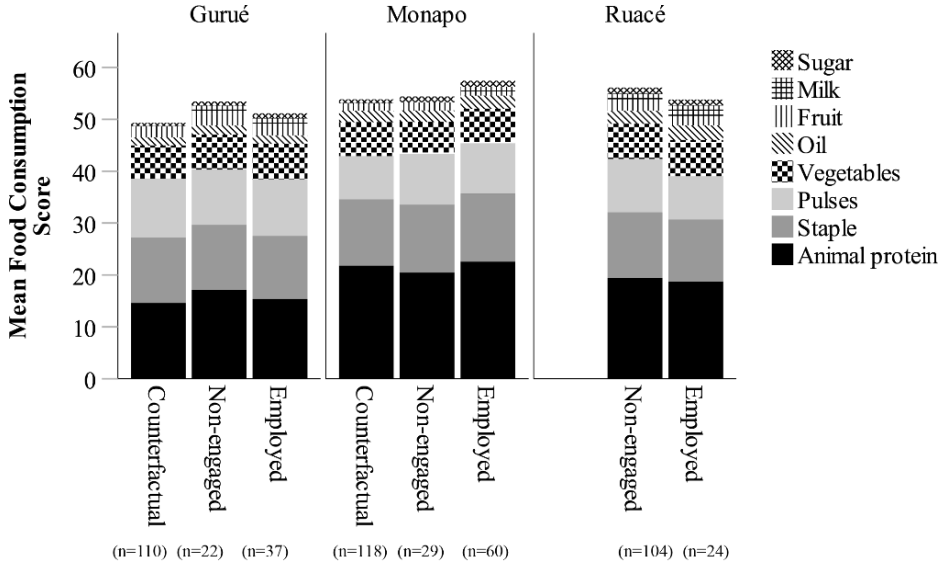


Fig. 45 The contribution of the different food categories to the Food Consumption Score, by study area and household category
Data: Afgroland (2016)

This sub-section analysed the food security of the HHs through the HDDS and the FCS. Monapo's CF had a significantly lower HDDS than the employed. There were no significant differences for the FCS. In short, besides the HDDS of Monapo, food security through the HDDS and the FCS were similar for the categories.

4.3 Livelihoods

This section reports on the relationships between livelihoods and the LAIs, which includes the HHs' engagement in non-agricultural work, migration, employment at the LAIs, and change of economic situation over the last ten years.

4.3.1 Engagement in non-farm work

The prevalence of HHs engaged in non-agricultural wage work (excluding LAIs) and self-employment (excluding their HH farming) is shown in **Table 49**. Work engagement was omitted as only four non-engaged HHs in Gurué answered this successfully. As employment relates to the availability of HH labour in the productive years, the size and the median age of the HHs is presented as well. Monapo's employed has far less female-headed HHs than the CF and non-engaged.[92]

Table 49 Gender of household's head, mean household' size, median age of household members, and percentage of household's members that have non-agricultural work, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF	**NE**	**E**	**CF**	**NE**	**E**	**NE**	**E**
Female-headed households	(n=110)	(n=22)	(n=37)	(n=118)	(n=29)	(n=60)	(n=104)	(n=24)
%	14.5	27.3	10.8	10.2	24.1	1.7	9.6	8.3
Size of household	(n=110)	(n=22)	(n=37)	(n=118)	(n=29)	(n=60)	(n=104)	(n=24)
Mean	4.9	4.5	5.0	4.7	4.3	4.7	5.0	4.9
Age of members	(n=535)	(n=96)	(n=185)	(n=556)	(n=118)	(n=279)	(n=519)	(n=117)
Median	15	17	19	14	16	18	15	16
Work engagement	(n=39)		(n=42)	(n=45)	(n=14)	(n=68)	(n=68)	(n=25)
Exclusive agriculture[a]	28.2		73.8	13.3	0.0	75.0	17.6	68.0
Non-agri wage work	17.9		7.1	28.9	7.1	2.9	42.6	16.0
Self-employed	61.5		19.0	57.8	92.9	22.1	44.1	16.0

CF *Counterfactual,* NE *Non-engaged,* E *Employed.* Sign. differences between categories by study area were evaluated by the Kruskal-Wallis H-test post hoc Dunn-Bonferroni correction. [a]Excluding work at the investors. Data: Afgroland (2016)

First, there were no significant differences between categories regarding the size and median age of the HHs. All categories, bar Monapo's non-engaged, have larger HH sizes than the average Mozambican, which was 4.4 members in 2011 (UN ESA, 2017). Second, there were no significant differences in the median age between categories. In Gurué, the prevalence of non-agricultural wage labour was higher for the non-engaged (50%) than the CF (17.9%) and the employed (7.1%). This non-agricultural wage work included work in construction, middlemen, education, or administration. However, data collected for the non-engaged was problematic and resulted in only four HHs that answered this question successfully. Self-employment was much higher in the CF (61.5%) than employed (19%). This self-employment included the selling of wood, charcoal, small-scale mining, and handicraft. In all, agriculture was the exclusive provider of livelihoods (besides work at the LAIs) for 28.2% of HHs in the CF and 73.8% in the employed.

The HH members in Monapo's CF were more engaged in non-agricultural wage labour (28.9%) than the non-engaged (7.1%) and the employed (2.9%). But the involvement of the non-engaged in self-employment was

[92] Due to time constraints, gender is not analysed separately (see limitations in **Chapter 6).**

very high (92.9%) compared to the CF (57.8%) and the employed (22.1%). In total, no non-engaged HHs conducted agricultural work outside their HH farms. Up to 75% of employed HHs derived their livelihood from their own farming and the LAIs. Only 13.3% of HHs in the CF had no other job than their own farm. In Ruacé, most non-engaged HHs (82.4%) had work beyond their HH farm, while 32% of the employed HHs had at least three different income streams (their own farm, work at the LAIs, and either non-agricultural wage employment or self-employment). Overall, HHs that earned wages exclusively derived from agriculture ranged between 0 to 50% (excluding the employed). Thus, most HHs have work outside of their own farm.

4.3.2 Migration and employment at large agricultural investments

Migration

In **Table 50**, the migration status and reasons for migration are portrayed. Based on the previous location of the HH's head, the HHs were categorised into local, nearby migrants (another locality but within the same district), and far away migrants (another district).

Table 50 Percentage of the household's head migration status and the reason to migrate to the study area, by study area and household category

	Gurué			**Monapo**			**Ruacé**	
	CF	**NE**	**E**	**CF**	**NE**	**E**	**NE**	**E**
Migrant status	(n=110)	(n=22)	(n=37)	(n=118)	(n=29)	(n=60)	(n=104)	(n=124)
Local	55.5	63.6	56.8	66.1	48.3	36.7	34.6	50.0
Nearby	14.5	4.5	16.2	17.8	10.3	15.0	16.3	8.3
Far	30.0	31.8	27.0	16.1	41.4	48.3	49.0	41.7
Reason for migration	(n=34)	(n=6)	(n=15)	(n=31)	(n=14)	(n=36)	(n=65)	(n=11)
Family	76.5	33.3	60.0	90.3	64.3	38.9	52.3	63.6
Work	2.9	50.0	33.3	6.5	28.6	55.6	29.2	18.2
Land	20.6	0.0	0.0	3.2	7.1	2.8	15.4	9.1
Other	0.0	16.7	16.7	0.0	0.0	2.8	3.1	9.1

CF *Counterfactual*, NE *Non-engaged*, E *Employed*. Data: Afgroland (2016)

In Gurué, there were no large differences in migrant status. In the CF, the HHs migrated to create a family (eg, marriage) and for land. For the non-engaged and employed, family and work were important, and no HH was attracted to land acquisition. Monapo's CF attracted considerably fewer faraway migrants than the employed, where work was the most important driver for migration, while family drove migration for the non-engaged. For the CF HHs, family concerns drove more than 90% of the migrants. In Ruacé, there were not many differences, and most migrants migrated for family reasons and work. Against a background of land dispossession (**Section 2.1**), migrants were still attracted by land in Ruacé (9.1 to 15.4%). Overall, investor areas attracted, on average, farther away migrants that came for work than the CF areas. Monapo's CF had significantly less far away migrants than the employed.

Employment

The reasons for working at a LAI and the rating of the job are displayed in **Table 51**.

Table 51 Job rating at the investors as perceived by employed household members and the primary reason to work at the investor, by study area

	Gurué (n=41)	**Monapo (n=62)**	**Ruacé (n=24)**
Job rating			
Better	14.6	19.4	4.2
Similar	65.9	48.4	33.3
Worse	19.5	32.3	62.5
Reason for work at investor			
Sole option	70.7	75.8	79.2
Better paid	9.8	11.3	8.3
Steady income	7.3	4.8	0
Extra benefits	4.9	4.8	8.3
Other	7.3	3.2	4.2

Data: Afgroland (2016)

In Gurué and Monapo, most (70.7 to 75.8%) workers saw the LAI as the only option available, followed by its better pay (9.8 to 11.3%). In Gurué, the job was mostly (65.9%) like other jobs, with 19.5% reporting the LAI work as worse than other jobs. In Ruacé, most workers perceived the LAI as their only option (79.2%) as well, but a small minority (4.2%) reported LAI work as better than other options, with 62.5% reporting LAI work as worse than other jobs. More than 8% saw the LAI as extra salary rather than their primary source of income. Overall, most worked at the LAI as it was the only option available, followed by better pay and extra salary. In Gurué, most HHs reported that LAI work had a similar rating to other jobs, but Monapo (32.3%) and Ruacé (62.5%) had a lower opinion of LAI work.

4.3.3 Livelihood change and large agricultural investments

The change of the economic situation over the past ten years is displayed in **Fig. 46**.

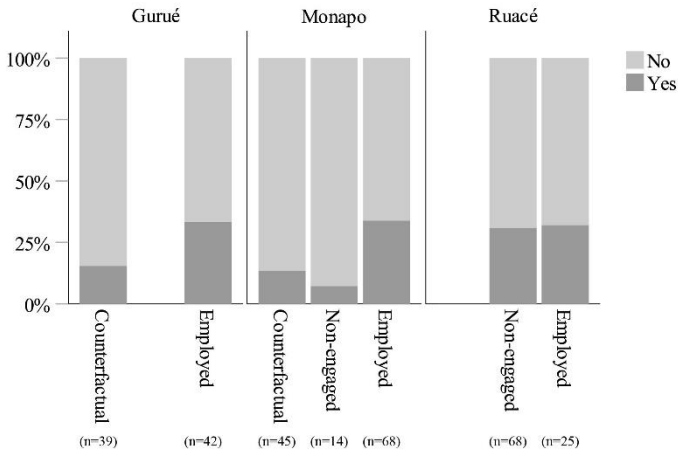


Fig. 46 Percentage of households that reported a change in their economic situation over the past ten years, by study area and household category
Data: Afgroland (2016)

Gurué's non-engaged was removed as only four respondents successfully in this category. Gurué's CF reported less economic changes compared to the employed. Monapo had a lower prevalence of economic change for the non-engaged (7.1%) than the CF (13.3%) and the employed (33.8%). Ruacé's non-engaged had fewer

changes in economic status compared to the employed (30.9 compared to 32%). In short, bar Ruacé, the employed had the most economic changes, which were primarily driven by change in the level of remuneration and job stability.

4.4 Overview of food systems outcomes

This section analysed the food consumption and food security of the HHs and overviewed the livelihood options and changes in relation to the LAIs. This sub-section studied the food systems outcomes and formulated an answer to hypothesis four, namely if '*LAIs were linked to differences in the diet composition of HHs, especially with higher processed food consumption'.*

First, while there were differences between categories regarding food group consumption, the magnitude of the differences remains small. Second, except for the HDDS between Monapo's CF and employed, there were no significant differences between categories for the HDDS and the FCS. Lastly, investor areas attracted more migrants from outside the district to work than the CF areas, where the family was a more important pull factor. Monapo's CF had considerably fewer faraway migrants than the employed. Most HHs worked at the LAIs because there were other options, the pay was better, or for extra salary. The job rating of LAI jobs differed by area but was lower in Ruacé. Bar Ruacé, the employed had the most economic changes, which were primarily driven by change in the level of remuneration and job stability.

The large agricultural investments were not linked to food consumption change

Hypothesis four relates to the diet composition of HHs, especially their consumption of oil, fat, and sweets as examples of processed food. There were not many differences in the mean of food group consumption between categories. While Monapo's CF had lower consumption of sweets compared to the employed, this was not much different from the non-engaged. In Ruacé, there were no differences in oil, fat and sweets consumption. Therefore, the link between the LAI presence and increased consumption of processed foods cannot been established.

5 Outlining the food systems

5.1 A factor analysis of the main variables

This section characterises the food systems in the study areas. These food systems can range from traditional to mixed and modern food systems (**Chapter 2**). Through a Principal Component Analysis (PCA), the variables outlined in this chapter were analysed. A rotation method was used as the variables were likely correlated. The outcome of the PCA is depicted in **Table 52**. The PCA analysis resulted in the identification of nine variables that explained 36.3% (component 1) and 17% (component 2) of the variance between

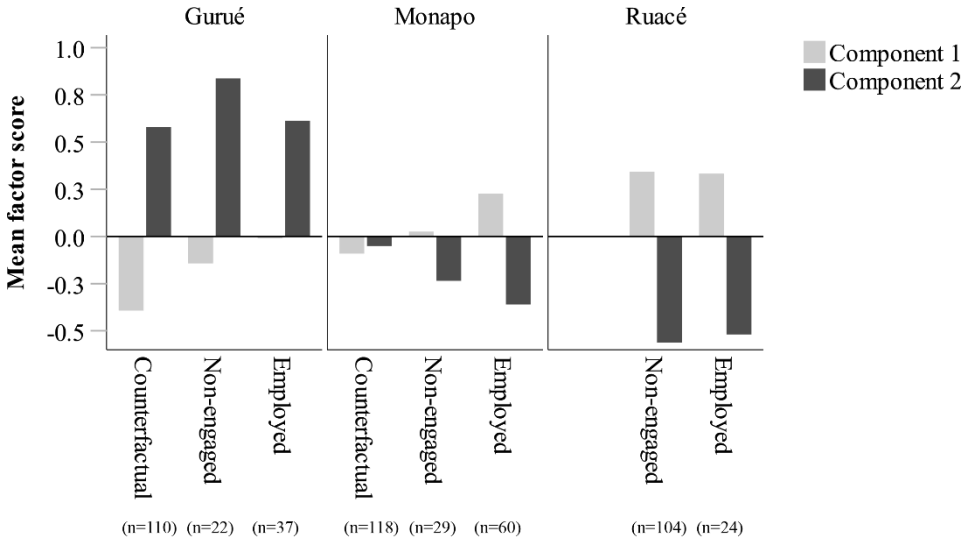
HHs for the selected variables.[93] Together, these two components explained 54.3% of the variance between HHs for the selected variables. Component one was associated with the size and diversity of food groups consumption. Particularly, the food groups that are less consumed (**Table 46**), including meat and other vegetables, signify more differentiation between groups than commonly consumed groups such as tubers. The Food groups that included highly processed food, such as oil and sweets, were also prevalent. Component two related to the importance of self-production, and less strongly, to the absence of animal-sourced food such as meat, milk, or fish.

Table 52 Correlation of selected variables with the components created through principal component analysis (n=499)

Variable	Component	
	1	**2**
Sum of days of food group consumption	.771	-.093
Oil consumption per week	.763	-.289
Sweets consumption per week	.753	-.114
Other vegetable consumption per week	.695	-.247
Household Dietary Diversity Score	.637	.211
Meat consumption per week	.525	-.094
Sum of self-production values	.237	.804
Share of self-production in diet	-.417	.676
Animal-sourced food in diet	.365	-.455
Variance explained (%)	36.3	17.0

Rotated Component Matrix of Principal Component Analysis. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Data: Afgroland (2016)

Traditional food systems (**Chapter 2**) have a high amount of self-production and low diet diversity. On the contrary, modern food systems have low self-production and high dietary diversity. While all the study areas could have been characterised as traditional or mixed food systems, some of these food systems had *more* modern characteristics than others, showing their relative modernity. Based on this relative positioning of *more* or *less* tradition-to-modern, the HHs were placed within four categories or quadrants (**Fig. 48** and **Table 53**). The means of the two factor scores are depicted in **Fig. 47**.



[93] Rotation Sums of Squared Loadings.

Fig. 47 Mean of the factor scores of Principal Component Analysis, by study area and household category
Data: Afgroland (2016)

While the average factor scores of **Fig. 47** broadly follows certain hypothesised relationships of the effects of LAI on local food systems, such as low self-production and higher access to diet diversity, there were a few caveats. In Gurué, there were no significant differences between the categories for the two components, but the CF has a lower (-.39) component one (size and diversity of consumption) than the non-engaged (-.14) and the employed (-.01). Gurué's non-engaged had the highest (.84) component two (self-production) compared to the employed (.61) and the CF (.58). Monapo's CF has a significantly (p=.009) higher mean (-.05) of component two than the employed (-.36). The means of both components changed according to their distance from the LAI. In Ruacé, components one and two were quite similar (.34 and -.56 for non-engaged, .33 and -.52 for employed). **Fig. 48** is a scatterplot with four quadrants of the two components.

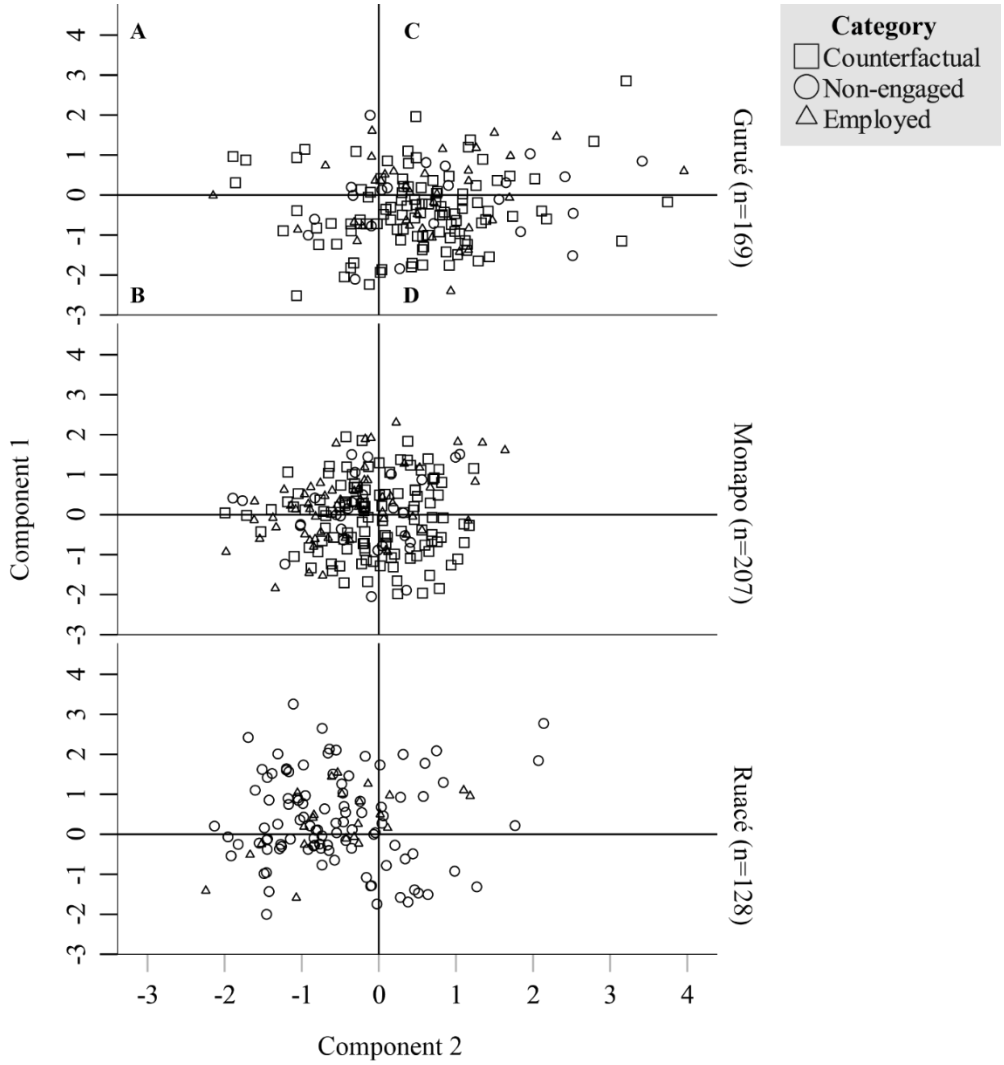


Fig. 48 Components 1 and 2 of the principal component analysis divided into four quadrants, by study area and household category
Quadrant A indicates 'Higher food diversity with 'Lower self-production'; Quadrant B indicates 'Lower food diversity' with 'Lower self-production'; Quadrant C indicates 'Higher food diversity' with 'Higher self-production; and Quadrant D indicates 'Lower food diversity' with 'Higher self-production'. Data: Afgroland (2016)

Quadrant A could be typified as the most modern food systems (**Chapter 2**), in which HHs depend heavily on markets for food and have high diet diversity. On the opposite side, quadrant D could be typified as the most traditional food system, in which the reliance on self-production was high, and the diversity of the diets was low. Quadrant B can be described as 'poor consumer' food system, in which diet diversity and self-production were low, while quadrant C was a 'successful farmer', where diet diversity and self-production were high. The prevalence of the HHs in each quadrant is presented in **Table 53**.

Table 53 Percentage of households in the food system types, by study area and household category

Quadrant	Gurué			Monapo			Ruacé	
	CF (n=110)	NE (n=22)	E (n=36)	CF (n=118)	NE (n=29)	E (n=60)	NE (n=104)	E (n=24)
A	7.3	9.1	11.1	28.0	31.0	40.0	44.1	43.5
B	16.5	22.7	13.9	24.6	31.0	28.3	32.4	34.8
C	23.9	40.9	41.7	21.2	20.7	20.0	12.7	21.7
D	52.3	27.3	33.3	26.3	17.2	11.7	10.8	0.0

Quadrant A indicates 'Higher food diversity with 'Lower self-production'; B indicates 'Lower food diversity' with 'Lower self-production'; C indicates 'Higher food diversity' with 'Higher self-production; and D indicates 'Lower food diversity' with 'Higher self-production'. CF *Counterfactual*, NE *Non-engaged*, E *Employed.* Data: Afgroland (2016).

Gurué's CF had more HH in the 'traditional' food system (52.3%) than the non-engaged (27.3%) and the employed (33.3%) (**Table 53**), while the proportion of HHs in the 'modern' food system was similar (7.3, 9.1 and 11.1%). Monapo's CF had a higher proportion of a 'traditional' food system members as well (26.3, 17.2 and 11.7%), but the number of HHs that were part of the most 'modern' food system (28, 31 and 40%) was higher than that of Gurué. For Ruacé, the 'modern' food system dominated, with no HHs of the employed in the 'traditional' food system.

5.2 Overviewing the food systems

This section typifies the food systems in the studied areas through a PCA. This analysis identified two clusters that maximised variance, one associated with self-production and another with diet diversity. Four food system types were classified using the PCA factor scores. There was only one significant difference between the categories in the areas (between Monapo's CF and employed). Except for component two of Gurué's non-engaged, the means of the components changes in Gurué and Monapo were related to the distance of the categories to the LAIs. Overall, the percentage of HHs that were part of the most 'modern' food system was aligned with the distance of the categories to the LAIs. The CF was more traditional while the employed HHs were more part of a transitional modern food system. This section provided a multivariate analysis of the variables presented in this chapter and describes four different food systems. The next section summarises this chapter.

6 Summary

This chapter's goal was to analyse the effects of LAIs in Gurué, Monapo, and Ruacé. To attain this goal, data was collected between September and October 2016 and involved both a survey and unstructured and semi-structured interviews. The analysis of the data was through inductive thematic analysis and between-group analysis (**Chapter 3**). The food supply chains (**Section 2**), food environments (**Section 3**), and food systems outcomes (**Section 4**) of three categories, namely counterfactual, non-engaged, and employed, were compared. These sections were followed by a principal component analysis (**Section 5**) whose components typified households into four food systems types, including relatively traditional and modern food systems.

Food supply chains

The food supply chains delved into the issues of land, food production, distribution, and consumption. The access to land was a hotly debated topic within the LAI debate. Compared with the CF groups, the non-engaged and the employed had less land available and less land access. Where they operated, LAIs decreased the land size of 16.2 to 45.8% of HHs. The employees of the LAIs were significantly less engaged in agriculture compared to the CF groups, and in Monapo significantly less engaged with the non-engaged group as well. Overall agricultural disengagement of HHs was higher in investor areas. The direct effect of the LAIs on the sale of HH production was limited or non-existent.

Food environments

The food environments analysis considered food accessibility, availability, and affordability of the study sites and the channels used to access diets. First, the accessibility of markets and agricultural plots was much better than paved roads, except for Gurué's CF. A minority of HHs increased their sales driven by an expanded production or more sales in the village. Second, almost all food items were available across the areas, with a notable exception of fresh or frozen fish. The weekly markets were key to the availability of different food items. While there were new processed food items available, access was constrained more by poverty than by availability. Third, food affordability was problematic as the FES share was very high across all areas. The CFs had significantly higher contribution of self-production than the employed. The channels to access diets differed across the areas. Monapo's CF had a significantly higher proportion of self-production for dietary access than the employed. Generally, the non-engaged and the employed had less self-production.

Food systems outcomes

The outcomes of the food systems were analysed through the food consumption and food security of the HHs and an overview of the livelihood options and changes in relation to the LAIs. First, there were only small differences regarding food group consumption and mean number of food groups consumed. Second, except for the HDDS between Monapo's CF and the employed, there were no significant differences between categories for the HDDS and the FCS. Lastly, investor areas attracted more faraway migrants to work than the CF areas, whereas the family was a more important pull factor. Monapo's CF had considerably fewer faraway migrants than the employed. Most HHs worked at the LAIs as there were no other options, better pay, and extra salary. The job rating at the LAIs differed per area but was lower in Ruacé. Bar Ruacé, the employed had most economic changes, which were mostly driven by change in the level of remuneration and job stability.

Outlining the food systems

The food systems were typified through a PCA. Overall, the percentage of HHs that were part of the most 'modern' food system was aligned to the distance of the categories to the LAIs. There were higher numbers of HHs in the CF that were part of the more traditional food system and more employed HHs that were part of the more modern food system. This chapter analysed the effects of the LAIs in Gurué, Monapo, and Ruacé. The next chapter concludes on the effects of LAIs in the study areas of Kenya and Mozambique.

Chapter 6 - Conclusion

This chapter entails the conclusion of this dissertation based on the results of Chapter 4 and 5 and places these results within the broader discussion on food governance. Also, the limitations of this research are discussed and recommendations for future focus areas are provided. The main objective of this dissertation was to analyse the effects of large agricultural investments on food systems change using selected study areas in Kenya and Mozambique. In these areas, the food systems changed through hybrid modernity rather than linear modernity. This complexity requires more adaptive forms of governance with more inclusive local participation. Future research should focus on the missing intermediate links, such as class, age, gender, or migration, to better understand the variation of effects that large agricultural investments bring.

Keywords food governance, food systems change, Kenya, Mozambique, large agricultural investments

1 Introduction

In this dissertation, the effects of large agricultural investments (LAIs) on food systems change in regions of Kenya and Mozambique were analysed. This dissertation used a food systems approach to embed food in its numerous relationships, such as production, distribution, consumption, land, livelihoods and food security. The hypotheses formulated in **Chapter 1** were tested around Nanyuki and in the Nacala corridor. The literature review in **Chapter 2** provided the context of the study. **Chapter 3** provided the framework for the research approach while **Chapters 4** and **5** tested the hypotheses in the study areas of Kenya and Mozambique. Finally, this conclusion challenges certain assumptions of Modernity theory, a liberal food governance framework, and food sovereignty. In the end, several recommendations for actions are made.

2 Overview of food system change and large agricultural investments

The tested hypotheses of the Kenyan and Mozambican study areas are summarised in this section. For the Kenyan analysis, data were collected between February 2016 and March 2017 and involved both a survey and (un-)structured and semi-structured interviews. For the Mozambican analysis, data were collected between September and October 2016 and involved both a survey and unstructured and semi-structured interviews. The analysis of the data involved inductive thematic analysis and between-group analysis. The survey households (HHs) were grouped into three categories, namely counterfactual (CF), non-engaged (NE), and employed (E). The following hypotheses were formulated in **Chapter 1** and tested in **Chapter 4** and **Chapter 5** based on the methodology explained in **Chapter 3**. This section further discusses the tested hypotheses in relation to the literature review of **Chapter 2**.

2.1 Land access change and large agricultural investments

2.1.1 Land access change in the Kenyan study areas

In the study areas of the Nanyuki area, the LAIs were not directly linked to decreased access to land. No HHs were dispossessed of their land by the LAIs. The HHs in the CF had the largest average land size and the greatest loss of land area. The CF accessed significantly more land area than the non-engaged and the employed. However, the LAIs could have a substantial indirect impact on land access. The land that the LAIs occupied was not available for the HHs to use and could exacerbate existing land pressures. For example, the non-engaged and the employed perceived LAIs as having more impact on land compared to the CF. This finding showed the multiple facets of the LAIs and the importance of contextualising LAIs as a complex phenomenon. In the Kenyan case, the land taken was already dispossessed through British colonisation and then grabbed by Kenyan elites after

independence. Then, mostly foreign corporations leased the land. The LAIs were largely absent from land listings such as the Land Matrix.[94] This absence obscured the scale and nature of the impacts of LAIs.

2.1.2 Land access change in the Mozambican study areas

The LAIs were linked to decreased access to land in Gurué, Monapo, and Ruacé. The LAIs caused 35.1% of all HHs to lose some land area in the investor areas. In Ruacé, 5.5% of HHs were dispossessed of *all* their land by investors. These dispossessions created additional land pressures. In Ruacé, the HHs that were expelled from their land by investors started to search for new land. This surge in demand for land appreciated land prices, which added further pressure on land access.

The popular and academic interest in LAIs was prompted by the concern over the LAIs' pressure on land, a concern that was warranted in the Mozambican case studies. For example, in Ruacé, 45.3% of all HHs lost land to the adjoining LAI. In the studied cases, the dispossessions by investors had a historical dynamic that dated back to the Portuguese colonisation of Mozambique. In other words, there was a link between previous colonial dispossession and the LAIs today. Before the activity of the recent LAIs, most of the land was used for colonial plantations. From an International Food Regime (IFR) viewpoint, the LAIs dynamic was part of the third food regime (corporate) but also related to the first food regime (colonial or imperial). From the perspective of a dispossessed local citizen, the LAI must have been eerily reminiscent of times before independence.

The issue of land is central to the LAI debates. As land is an asset for reproduction, the effects of the LAIs were more detrimental when they impeded a HH's reproduction or did not provide viable alternative livelihood options. For example, in Ruacé, more HHs were dispossessed of their land than gained employment. Against a background of rapid population growth, it is doubtful if the squeeze on the livelihoods of small-scale farmers is the way forward. However, except Ruacé, the communities were supportive of the LAIs because they provided employment in an area where there were few options for non-farm employment. Rather, the debate had centred on a better trade-off between the disadvantages and the advantages of the LAIs, including land pressure, employment remuneration, and investments in the communities. Thus, land dispossession did not necessarily translate to hostility with the local communities or livelihood destruction. It depended on the local benefits and disadvantages of the LAI, which seemed to differ on a case-by-case basis.

2.2 Agricultural engagement change and large agricultural investments

2.2.1 Agricultural engagement change in the Kenyan study areas

The LAIs around Nanyuki were not linked to decreased agricultural engagement. On the contrary, the CF had less agricultural engagement over the past ten years compared to the non-engaged and the employed. Thus, groups with a LAI operating in their locality decreased their agricultural engagement less than the groups with no LAI present. This result refutes a key assumption of Modernisation theory, namely the reduction of small-scale farmers and their transition to jobs as labourers in either the commercial farming or non-agricultural sectors.

[94] Query on 09 October 2018.

Rather, employment at the LAIs is used to start small-scale farming or to overcome lean periods in their small-scale farming activities, to continue small-scale farming. The assumption that employees would have less time to do their farming was not correct over the last ten years.[95] This does not validate the IFR narrative of a small-scale farming system *versus* an industrial farming system either, as there was an economic synergy between the two systems. But this synergy operated with minimal economic competition as the LAIs rarely produced for local markets. If the LAIs would produce for the local markets, a squeeze on small-scale farming might be observed.

2.2.2 Agricultural engagement change in the Mozambican study areas

For the study areas in Mozambique, the LAIs were linked with a decrease in agricultural engagement. All the CFs had less engagement in agriculture than in the employed (Gurué and Monapo) and the non-engaged (Monapo). The lessened agricultural engagement fitted the assumptions of both the Modernisation theory and IFR theory, but their validity depends on the drivers of change. The Modernisation theory suggests that less agricultural engagement could be the result of alternative employment choices that allow HHs to specialise and depend less on the grind of small-scale agriculture. For IFR theory, small-scale farmers could be further marginalised by the decreased access to land due to LAIs, which contributes to their poverty traps. Unable to sustain their families, these small-scale farmers might ultimately join the expanding cities as urban poor.

In this case, there were no significant differences regarding agricultural (dis-) engagement between the non-engaged and the employed, which could signify that the LAIs decreased agricultural engagement of HHs through land area loss rather than providing alternative choices. The employees perceived LAIs as their only option for off-farm work, but they rated LAI work more negatively than other similar work. Thus, employees were reluctant to work at the LAIs. But other wage work options may just have been lacking. The LAIs attracted migrants to work as well, which suggested that finding alternative wage employment opportunities was challenging in other areas as well. For migrants, in the absence of more non-farm work, employment at the LAIs may have been better than depending only on small-scale farming. This might indicate the willingness of migrants to partake in a more modern food system, with some reluctance over the benefits it currently provides.

2.3 Self-production change and large agricultural investments

2.3.1 Self-production change in the Kenyan study areas

Self-production for food access was less important for the categories where a LAI was present, resulting in greater dependence on the markets. Self-production was more important for the CF, both as a share of the food budget and for dietary access. Thus, groups with a LAI present derived less of their diet from self-production and were more dependent on the market for dietary access. At the same time, the mean number of days an average food group was consumed was not higher between the CF and the non-engaged and employed.

The decrease in self-production and the subsequent increase in market dependence are an indication of a more ‘modern’ food system. Whether this is a desirable dynamic depends on the food governance frame used. On

[95] Less than 1% of reasons given for agricultural disengagement.

the one hand, a liberalist food governance frame supports the increased choice that consumers have between self-production or market purchases. A stronger market could enhance the resilience of a HH to local production shocks or adverse environmental conditions. The availability and access to non-local products could enhance dietary diversity and adequacy. Also, a more expansive distribution system could provide alternative livelihood options to farming. Thus, employment at the LAIs is part of a labour specialisation that enables HHs to reduce their dependence on self-production and provides benefits to all involved. On the other hand, a food sovereignty framework decries the diminishing control of HH over their food as traders gain more power than farmers. The establishment of non-local supply chains opposes the prioritisation of 'local' food systems. Besides, the vulnerability of HH to local conditions is replaced with an exposure to non-local or international conditions, such as rising food prices on the world market. Furthermore, the shift from self-production to market reliance might contribute to the marginalisation of small-scale farmers.

The validity of the two food governance frames depends on the drivers of this diminished self-production. In the liberalist frame, the decreased dependence of the non-engaged and the employed could indicate an increase in choice and a stronger economic position. The CF, with higher self-production, might just be poorer. However, food security situations were similar. Instead, the CF could have enough access to land to produce sufficient food for an adequate diet, which would lessen food market purchases. In short, the liberalist assumption that more self-production equates to less food security was not true in this case.

2.3.1 Self-production change in the Mozambican study areas

Generally, the LAIs were linked to decreased self-production for dietary access. For Gurué's and Monapo's CF, the FES had significantly higher self-production than the employed. The number of food groups consumed was not different between the categories.[96]In the study areas, there might have been a self-reinforcing loop between the LAIs and the supply chains. The LAIs increased wage employment opportunities and access to money to the HHs. Compared to the CF areas, access to money was less restricted to the availability of wage employment. This access to finance enticed shops and markets to open and supply chains to develop. As a result, the shops and markets made food purchases more available in the investor areas compared to the CF areas, where the presence of multiple shops and markets was lower. These shops usually brought in processed and international trade food, while the traditional wet market sold (mostly local) food and HH goods such as solar panels.

For a liberalist frame, the decreased dependence on self-production signifies increased choice and might result in a better dietary diversity.[97] The availability and access to food outside of the region shields the HHs against local production shocks. But the deepened integration with the global market is opposed by a food sovereignty frame that prioritises local food systems. The decreased dependence on self-production for dietary access seemed to have been driven by a stronger economic position of the non-engaged and employed HHs and a better integration into the markets. While there were differences regarding the prevalence of shops between the areas, these differences were small. Generally, the study areas had a high prevalence of poverty and low diversity of produce. In this context, higher availability and access to more diverse food were needed. So far, the decreased

[96] Measured by the sum of the days in which a food group is consumed over the last seven days.
[97] The HDDS and the FCS were higher for the non-engaged and the employed compared to the CF, but only significantly so for the HDDS between the CF and the employed in Monapo.

self-production and increased market purchases fit a liberalist approach, but can be approached through a food sovereignty frame as well.

While food sovereignty prioritises local food systems, it does not negate international trade. As the shops that offered processed and internationally traded food increased, the weekly markets, operating through a more traditional food supply chain, flourished as well. The entrance of more international supply chains was not followed by the marginalisation of more traditional supply chains. Rather, these two supply chains developed side by side in what was still a neglected region.

2.4 Consumption changes and large agricultural investments

The LAIs in the study areas of the Nanyuki area were not linked to food consumption changes. The CF consumed sweets, oil and fat less than the employed. However, the size or magnitude of these differences was small and may not be biologically meaningful. The CF consumed oil and fat 0.2 days less per week than the employed, and 0.4 days less for sweets. Furthermore, while the FCS was significantly higher for the CF, the food security was quite similar, including the composition of the FCS.

The body of literature presumed differences in consumption patterns, particularly regarding energy-dense food, between HH that were more dependent on the market compared to those that were more dependent on self-production. However, the limitations of the food security measurements to determine changes need to be considered as well. The FAO food groups, HDDS, and FCS score are not ideal measurements of processed, energy-dense food intake, but are rather instruments to gauge food insecurity of a population. These limitations are further addressed in **Section 4.1.2**. In Mozambique, the LAIs were not linked to differences in diet composition and the consumption of processed food, as there were almost no differences between categories in Gurué, Monapo, and Ruacé. In this instance, this result might be explained by a combination of low availability of, and access to, processed food and, as was the case in Kenya, the limitations of the food security measurements.

2.5 Added discussion

2.5.1 Added discussion for the Kenyan study areas

The four hypotheses tested in this dissertation were approached through a univariate analysis of the effects of LAIs on food system change. But this approach is limited in its strength to describe food systems change as one hypothesis can confirm, and another contradict, certain presumptions of theorised food systems change. A PCA is a multivariate analysis that overcomes the constraints of a univariate approach by identifying sets of variables that explain maximal variance. In this case, two components were identified with seven variables. These components explain 69% of the variances between the HHs on the selected variables. Component one explained 40.5% of the variance and was aligned with the size and diversity of food group consumption while component two explained 28.5% of the variance and relates to the importance of self-production to the diet. The CF differed significantly from the employed and non-engaged regarding component one and two, while the employed differed

significantly with the non-engaged on component two. Thus, the LAIs were linked to different food systems, one of which reflected a 'poorer consumer' food system and the other a more 'successful farmer' food system. The prevalence of HHs in the 'traditional' and 'modern' food systems was similar across the categories. The prevalence of HHs that were part of the 'poor consumer' food system, with lower dietary diversity, was higher in areas with a LAI, leaving the HHs generally worse off in terms of diet diversity compared to the CF. This might indicate that the LAIs were linked with increased differentiation between HHs within a food system when they enter, a feature of a more 'modern' food system.

2.5.2 Added discussion for Mozambican study areas

For the PCA analysis of the Mozambican HHs, two components were identified with nine variables. These components explained 54.3% of the variances between the HHs on the selected variables. Component one explained 36.3% of the variances and was aligned with the size and diversity of food group consumption, particularly those that were less commonly consumed. Component two explained 26.3% of the variance and related to the importance of self-production to the diet and, to a lesser extent to the absence of animal-sourced food such as meat, milk, or fish in the diet. Except for the CF and the employed in Monapo for component two, there were no significant differences between the mean component scores and the categories. However, the categories had different mean scores, and when differentiated within quadrants (more/less), there were differences between the categories regarding their prevalence in the different food systems. First, the CF had a higher prevalence in the more 'traditional' food system. Second, the non-engaged and employed were more part of the 'modern' food system. Third, both the non-engaged and the employed were more prevalent in the 'poor consumer' food system than the CFs, with a slightly higher prevalence of the non-engaged in this food systems in Gurué and Monapo. In Gurué, most of the HHs were part of a food system with high self-production. The non-engaged and employed featured more in the 'high diversity' food system (50-52.8%) compared to the CF (31.2%). This was due to their prevalence in the more 'modern' (9.1-11.1%) and the 'successful farmer' (40.9-41.7%) food system than the CF (7.3 and 23.9%, respectively). Thus, in Gurué, areas where a LAI was present had a food system that delivered better diets compared to the CF, irrespective of whether the HHs were integrated into the market or dependent on self-production.

In Monapo, most of the non-engaged and employed HHs were part of a 'high diversity' food system (51.7-60%), while a slight majority of HHs in the CF was part of a 'low diversity' food system (50.8%). The non-engaged and the employed were more prevalent in the 'modern' food system (31-40%) while the CF was more aligned with the 'traditional' food system (26.3%). In Ruacé, prevalence of 'modern' and 'poor consumer' food systems was similar across the categories, but had the highest prevalence of 'poor consumers' of all regions.

Generally, the non-engaged and the employed' higher prevalence in the more 'modern' food system was assumed by linear modernisation. However, bar Gurué's employed, the non-engaged and the employed also had the highest number of HHs in the 'poor consumer' food system. Thus, while the non-engaged and the employed had a higher prevalence of HHs in the 'higher diversity' food systems, there was also a more differentiation between 'rich' and 'poor' consumers. In Gurué, more HHs were 'poor' rather than 'rich' consumers.

It may be that the LAIs provided opportunities to obtain scarce wage employment and that this increased the access of HHs to a more diverse diet, which shifted HHs more to a 'modern' food system. But the pressure of

the LAIs on land might have resulted in a group of HHs in which loss of land was not offset by sufficient employment at the LAIs, which could have caused a higher 'poor consumer' food system.

In the CFs, the traditional food system were more prevalent than in the investor areas. But the better access to land did not necessarily translate into stronger farmers. In Gurué, the number of HHs that were part of the 'successful farmer' food system was higher than in the CF, which might have indicated the challenges of farming in Gurué's CF. The CF's weaker food systems cannot be linked to LAIs, a link that is necessary to support IFR's argument that a corporate food system suppresses a traditional food system. Rather, the presence of the LAIs might have resulted in slightly stronger food systems in their areas, which underscores the Modernisation theories of food systems change. But these slight changes came at a cost as well, including less land availability and access, and in the case of Ruacé, more poor consumers. However, there are important limitations to this argument, including the absence of a CF for Ruacé, which is further described in **Section 4.1.2**.

3 Food governance in Kenya and Mozambique

This section reflects on the implications of the food systems change related to LAIs to the food governance frames of liberalism and food sovereignty. The next section explains the (additional) limitations of the dissertation. This is followed by recommendations for Kenya and Mozambique that are based on the results from the study areas, reflections on food governance, and the limitations of the dissertation. Derived from **Chapter 2**, food governance includes the formal and informal rules and processes through which interests are articulated and decisions are made that relate to a food system. The explicit study of food governance arrangements was too ambitious for this dissertation, due to the number of study areas and the complexity of the food systems. Furthermore, research on food system governance has conceptual challenges as well (Delaney et al., 2018). However, the results of these case studies are useful to reflect on the food governance frames discussed in **Chapter 2**, namely liberalism or food sovereignty, in the context of the LAIs and the future of the studied food systems in Kenya and Mozambique. The decision to allow LAIs is taken at the national level, but most of the consequences of this decision are felt locally. In short, the entrance of the LAIs partially changed the configuration of the local food systems. The effects of the LAIs on food systems were not restricted to the local level, and the issues raised forms part of the debates on the future of the Kenyan and Mozambican food systems. As shown in **Chapter 2**, SSA's social, environmental, and economic history and present are strongly linked to the food systems, especially regarding livelihoods. Against this background, the debates on food governance of the LAIs and changes in food systems intersect with the debates on structural transformation in SSA, which will have important social, economic, and ecological impacts for generations of Africans. Here, governance of the researched food systems is discussed through the liberal and food sovereignty perspectives.

3.1 Discussing food governance frames

On the one hand, the presence of LAIs in a local food system is an indication of a more liberal-oriented food governance frame. A liberal food governance frame anticipates that the growth of the farming sector comes

from large farms and supports competition, rather than collaboration, between producers. The driving forces of change are the market and technology, while food can originate from anywhere (van der Ploeg, 2017). On the other hand, the areas without a LAI might indicate a more food sovereign arrangement than those areas with a LAI presence. The absence of a LAI does not necessarily presume a food sovereignty frame, which requires devolution of power and control to local communities. But the presence of a LAI is a distinct liberal and anti-food sovereign element, which can make its absence, in comparison, a sign of a more food sovereign arrangement. This spectrum is present in the study areas. First, the LAIs are the only large farms in the investor areas. Thus, while the investor areas have both large and small farms, the CFs are dominated by small farms. Second, investor areas have less self-production and more modern and concentrated supply lines compared to CF areas. These characteristics decrease the local embeddedness and the food sovereignty of that food system. Thus, on a spectrum between liberal and food sovereign food systems, areas with a LAI are positioned closer to the liberal system while the CF areas are situated closer to the latter.

So far, the 'framing' of a reduction of the food sovereignty of a food system under LAIs through a liberal food governance frame is in line with the literature on food governance discussed in **Chapter 2**. However, there are two reflections that emerge from the study areas that both complicate and enrich this discussion. First, the food systems do not change through linear modernity but rather through 'hybrid' changes. Generally, the concept of linear modernity overlooks processes in which traditional elements are strengthened, such as 'repeasantisation'.[98] This results in a hybrid food system instead of a transition between traditional to modern food systems. Second, HHs' support of LAIs in certain areas creates a tension between the democratic elements of food sovereignty, which could enable a local community to accept LAIs in their local food system, and the food sovereignty programme, which explicitly scorns LAIs.

3.1.1 Food systems trajectories through hybrid change

The trajectories of food systems under large agricultural investments around Nanyuki and the Nacala corridor did not automatically follow key assumptions of Modernisation theory, especially regarding land, agricultural disengagement, and consumption. The hypotheses developed for this research were conventional (ie, within a liberal food governance frame), but several of these hypotheses were not confirmed. On the contrary, some processes ran counter to linear modernity in each country. For example, agricultural disengagement was lower in the groups were a LAI was present than in the CF. The HHs used the salaries earned at the LAIs to invest in their small-scale farm. Rather than decreasing their farming activities to work in wage employment at the LAIs, the HHs used the LAIs to strengthen their small-scale farming. Another example was the weekly markets in Mozambique. Even with an increase in more modern food supply chains, the traditional markets flourished as well.

Against this background, one could argue that the food systems change through 'hybrid modernity' instead of a pure liberal conception of modernity. This hybrid modernity fits between a traditional and a modern conception of food systems and negates the linear pathway between the two. In hybrid modernity, actors have agency over their interactions with food systems and can shape the food system. In this case, the concept of hybrid modernity differs from a mixed food system type. A mixed food system type has elements of both a traditional

[98] Repeasantisation includes both a quantitative increase in the numbers of peasant farmers and a (qualitative) increase in the autonomy of these farmers (van der Ploeg, 2008).

and a modern food system, but is seen as a 'transitional' type as it shifts from the former to the latter. In this view, the establishment of a modern food system is just a matter of time. However, from the analysis of the study areas, some counter-processes include stronger traditional elements. The outcome is then a negotiated and locally shaped food system that combines elements from both traditional and modern food system types, with no automatic pathway between the two. Instead, it is local actors who negotiate their place and interaction within these two system types. As a result, food governance, rather than being driven by Modernity assumptions and a liberal governance frame, should pivot towards a more locally grounded approach that recognises the power and autonomy of the local communities. A proposed new approach by Pereira & Ruysenaar centres on 'adaptive' governance, which '*…has the goal of developing new concepts of governance that can handle the inherent complexity and unpredictability of socio-ecological systems*'(2012, p. 42).[99] These governance arrangements can include food sovereignty elements in combination with other food governance frames.

3.1.2 Local food democracy and large investors in food sovereignty

As unpacked in **Chapter 2**, food sovereignty has a tension between its devolution of power and control over local food system to peoples and communities, and a fully developed programme of the structure and function of that local food system. This comes to the fore in the contentious debate on LAIs. In each investor study area, interviewees had critiques of the nearby LAIs. However, aside from Ruacé, the overall opinion was not against the LAI, which provided employment opportunities, even when there are legitimate criticisms of the LAIs, including land dispossession, low wages, irregular pay, the difficulty of taking leave, and competition for natural resources. Thus, in these study areas, the peoples or communities might allow the LAIs to continue even if they are empowered within a food sovereignty framework. It is a conflict between food sovereignty as a slogan (the inclusion of people in the governance of their food system) and as a utopian aspiration (an equal, democratically governed food system centred on agroecological small-scale farming with the exclusion of LAIs).

As proposed in **Chapter 2**, food sovereignty should reflect on its applicability in increasingly pluralistic, complex food systems. The different business types and the diverse impacts of LAIs on nearby communities are part of this complexity. As the programme of food sovereignty is part of a dynamic process rather than a set of fixed principles (Edelman et al., 2014), this might signal that there could be local sovereign food systems with the inclusion of LAIs.[100] However, it is likely that in a space of increased power and control for peoples and communities, the relationship between the community and the LAIs will change. Here are just a few changes that could occur in the relationships between LAIs and local communities in a more sovereign food system.

First, the people and communities are likely to constrain the pressures of LAIs on land. Now, the decisions regarding land governance for LAIs in Kenya and Mozambique are frequently taken at the national level. In a food sovereignty system, land governance decisions would shift towards the local level. In food sovereignty, land could be governed by the peoples or communities as well, opening the possibility that the LAIs pay rent for the land to the communities directly. This could counteract speculative dynamics in LAIs and push towards less land extensive production systems, and thus reducing the resource competition between LAIs and small-scale farmers. Second, in Mozambique, the ratings of the jobs generated by LAIs were low. More involvement and power to the

[99] An example of a complex socio-ecological system is a food system.
[100] Jansen (2015) develops similar argumentation for FS's objection to genetically modified organisms.

communities could strengthen their bargaining position regarding labour conditions and wages. Third, governance of a food sovereignty system extends beyond land governance or LAI governance. For example, the increased power and control could, in Kenya, drive the inclusion of local small-scale producers into the supply chains of the rising supermarkets or exclude supermarkets from competing with the traditional wet markets.

This negotiated inclusion of LAIs and supermarkets is rejected in food sovereignty, although these ideas are implicitly part of a discussed revision of the centrality of an idealised version of small-scale farming in food sovereignty (Bernstein, 2014; Dekeyser et al., 2018; Jansen, 2015). This debate on LAIs, and the perceptions of those living in the vicinity of an LAI, could enrich food sovereignty thought because this debate shows the importance of local contexts in the construction of food systems. As a result, food sovereignty should be flexible and locally interpreted.

4 Limitations and recommendations

Additional limitations and challenges were encountered in the collection and analysis of the data. Based on the results and the limitations of this dissertation, several recommendations are made regarding LAIs and food systems change around Nanyuki and the Nacala corridor. Lastly, a few recommendations for future research are outlined.

4.1 Limitations of the research

4.1.1 Prior stated limitations

The limitations of the research in this dissertation include the low external validity of case studies, the low predictability of food systems research and the blurred boundaries of the food systems under study. The data collected through interviews and surveys come with their own set of limitations and challenges, including enumerator biases, recall period and the period during which the survey or interview was administered. Besides these limitations and challenges, several additional limitations were encountered in the collection and analysis of the data.

4.1.2 Additional limitations encountered

Additional limitations relate to the scope, collection, and analysis of the data. First, there was the absence of a suitable CF for Ruacé, which was analysed separately from the Gurué area because it was more urban. This absence of a CF hampers an important analytical strength of this research, namely comparison with an area without a LAI. Second, due to the (arbitrary) boundaries set on the elements researched in this dissertation, important topics such as environment, gender, class, the agency of the HHs, and outward migration were not analysed. The environmental impact of food systems is a hotly debated topic (Dekeyser et al., 2019; Springmann et al., 2018), but this facet could not be incorporated into this research due to a lack of expertise regarding environmental impact

assessment and time constraints. Third, the system under study had geographical boundaries. This means that, for example, the data were collected at those HHs that chose to stay in the studied areas, while those who migrated out of the area, for example for work, were not considered. Fourth, the food security surveys were a one-shot design, which means that their answers depended on the season in which the data were collected. For example, the contribution of self-production to a diet will be higher after the harvest season than during the lean season. As the surveys were conducted in the same month, it did not impede the comparison between categories. But it does matter for the absolute values of self-production involved. Fifth, the survey involved hundreds of variables. In this complexity, certain dynamics are not represented due to time constraints.

Sixth, the study areas, especially in Mozambique, were challenged by issues such as low literacy of the respondents. As a result, the reliability or accuracy of certain variables was low, and those variables needed to be discarded. Seventh, the food security scores used were not apt to measure the consumption of processed food. For example, refined-grain bread is a highly processed food but is not distinguishable within its food group 'cereals', which include minimally processed food such as cassava as well. There is no method to retroactively distinguish within the various food groups the different processed items. Also, food security was analysed through food group consumption, which does not measure food intake directly. Lastly, no differentiations were made according to the business type or model of the LAIs. Different business models likely have different effects on the nearby communities, but this differentiation was out of the scope of this dissertation. Due to these limitations and challenges, the findings of this research are a snapshot of the effects of LAIs and food systems change. The scope to generalise for all LAIs is neither warranted or the objective of this research. This research' findings are limited to specific case studies in Kenya and Mozambique.

4.2 Recommendations for action

While the effects of the LAIs on food systems have been observed in all the study areas, there are important similarities and differences between Kenya and Mozambique. This sub-section presents recommendations for action regarding the LAIs and food systems in Kenya and Mozambique and a proposal for future research.

4.2.1 Recommendations for Kenya

The effects of LAI on land are reduced through better land governance in Kenya compared to Mozambique. The land rights of small-scale farmers are enforceable even as the access to land is under pressure by rising prices and population growth. None of the nearby communities had a say in the arrival of the LAIs, even though these operations take up considerable natural resources. However, instead of facing a threat of land loss from LAIs, the small-scale farmers might be increasingly excluded from their markets due to a concentration of value chains. The government should prioritise market spaces, such as the central market of Nanyuki, that are inclusive of small-scale farmers compared to the concentrated value chains that generally exclude these farmers (HLPE, 2011).

4.2.2 Recommendations for Mozambique

Compared to Kenya, Mozambique has more adverse effects from the LAIs due to a poorer land governance system. The community rights to the land were rarely demarcated and officially recognised in DUAT. When combined with a lack of access to justice, the lack of land rights and demarcation cause conflict between communities and the LAIs. This jurisdictional environment needs to be strengthened to purge abuse and land speculation by LAIs in the study areas of Mozambique. Furthermore, the community in Ruacé was informed, but could not change, the arrival of the LAI.

For most of the workers, the LAIs are the only option but they rarely pay well. There are no differences in food security between workers and non-workers, which indicate that LAIs' low wages provide limited poverty reduction. Increased bargaining power and better protection could improve the relationships between the community and the LAIs. With a background of rapid population growth and widespread poverty, investments should prioritise small-scale farming as it is the backbone of the country's economy and food security. This prioritisation includes reduced land speculation of land by investors, providing credit and inputs to small-scale farmers, and expanding storage, processing, and market space for small-scale farmers.

4.2.3 Recommendations for future research

Several gaps in the literature that relate to the dynamic of LAIs, food systems change, and food governance were identified in this dissertation. There are a few research approaches that could diminish several limitations of this research and expand the significance of the results. First, further analysis of the existing data could contribute to the understanding of the linkages between LAIs and topics such as class, age, gender, and migration. This analysis would add different layers of information to this dissertation. Second, an in-depth study on (informal) food governance could provide a better understanding of how the food governance arrangements influence the food systems and its adaption to changes. For example, does stronger support of better organised sellers in informal market provide more competition to concentrated supply chains? Does stronger local governance create better conditions for workers at the LAIs? Lastly, an ideal study of food system change includes a longitudinal approach. This longitudinal approach is particularly relevant for this study, in which detailed closed-question information about HHs is captured and an in-depth description of the food systems is given.[101] In a few years, a sample of HHs from the study areas and new interviews with actors in the food systems can not only shed light on the continuing effects of LAIs on food systems change, but provide a longitudinal case study on food system change in general.

[101] The survey data will be released under an open source licence after the AFGROLAND project is finished.

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Appendix

1 Declaration of originality and ethical clearance

Full name	Koen Dekeyser
Student number	14172594
Degree	PhD in Political Sciences
Title of dissertation	Food systems change under large agricultural investments in Kenya and Mozambique

I declare that this dissertation is my own original work. Where secondary material was used, this has been carefully acknowledged and referenced in accordance with university requirements. I further declare that this dissertation has not been submitted previously, in its entirety or in part, for obtaining any qualification. The proposal of this research was approved by the Research Ethical Committee of the Faculty of Humanities, University of Pretoria, with reference number GW20160520HS.

18/12/2018

2 Breakdown of food businesses types

Type	Description	Example	Image
Supermarket	Self-service, one-stop shopping, large variety of different food and non-food products, large variety of brands, small to very large packaging sizes (Rischke, Kimenju, Klasen, & Qaim, 2015). Also, '*A self-service retail market selling especially foods and household merchandise'* (Merriam-Webster, 2018, p. 1).	Budget supermarket, Nanyuki, Kenya.	
Store	Small selection of different food or non-food products, small variety of brands, small packaging sizes.	Local store in Ramiane, Mozambique.	
Restaurant	Sells cooked food that is served on the spot.	Restaurant in Nanyuki, Kenya.	
Wholesale	Sells large quantities that is retailed by other people.	Wholesale seller in Ntugi, Kenya .	
Spot market	Sale of food on the street but without fixed market infrastructure, location can vary by day.	Maize spot market, Nanyuki, Kenya.	

Hawker	Sells food or non-food without fixed infrastructure.	Tomato hawker, Nanyuki, Kenya.	
Middlemen or broker	Buys goods (including from producers) and sells them to retailers or consumers.	Milk broker, Nanyuki area, Kenya.	
Self-production	When the food consumed is grown by a household member.	Farmer, Ruacé, Mozambique.	
Processing	Transforms raw ingredients to marketable food products.	Oil processor, Ruacé, Mozambique.	

3 Informed consent for interviewees

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Department of Political Sciences

Informed consent for interviewees

Record number: Random

Researcher: Koen Dekeyser
Institute: Department of Political Sciences, University of Pretoria, South Africa
Research project: Evolution of local food systems under large agricultural investments: a case study in Mozambique, Kenya, and Madagascar

I am Koen Dekeyser, a doctoral student from the Department of Political Sciences at the University of Pretoria. I am doing research on the impact of large agricultural investments (LAI) on local food systems. I am going to give you information and invite you to be part of this research. This interview will take around 2 hours. Please note that there is no direct benefit to you for participation in this interview, as this is voluntary. By agreeing to this interview, you acknowledge that your answers will be stored or used for scientific purposes. You can refuse any question and can stop this interview at any time without consequences. There are no right or wrong answers. **Your answers are confidential**.

Purpose of the research

The impact of LAI on local food systems is unknown. While proponents claim that LAI provides livelihoods opportunities, such as employment, other claim that LAI takes away their access to land and ability to produce food. I am here to find out what goes on, and to what effect.

Research type and participant

I like to ask you questions on the production, distribution or consumption of your food in your local area. You are being invited because I feel that your participation in the local system of food production, consumption, processing or buying/selling can contribute to a better understanding of the food system in your area.

If you need more information, or do not understand the purpose of this investigation, I will gladly answer any questions.

You can contact me to modify or remove your answers, contact details are below. Please note your record number. Any comments are welcome. Thank you for your participation.

Kind regards,

Koen Dekeyser

Name participant

Signature

Date/month/year

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