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FRUIT FOR FOOD

The Food and Nutrition Security Impacts of
Inclusive Export-Oriented Avocado Farming
in the Upper Mara River Basin, Kenya

Daniel Uosukainen

Cover page images by Daniel Uosukainen: maize on smallholder farm in Narok County, Kenya (left), Hass-avocados maturing on a smallholder farm in Bomet County, Kenya (middle), githeri (local dish) with avocado eaten on market day in Bomet County, Kenya (right).

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Master's Thesis

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Executive summary

Like in much of Sub-Saharan Africa, food security in Kenya is under pressure from a growing population and a dependency on climatically vulnerable rain-fed maize. At the same time, the Kenyan government seeks to boost its economic growth and food security through developing the agricultural sector, which employs most of the population and where most of the production is in the hands of low-income smallholder farmers. Foreign agribusiness plays an important role in this, as it brings much needed investment, knowledge, crop diversification and giving smallholders the opportunity to participate in value chains oriented towards the lucrative export market. Horticulture and the fruits sub-sector is in this regard in a crucial position as an important income earner but also because of its great potential to diversify both crop production and the diet. Despite this potential to improve Food and Nutrition Security (FNS), local impacts of export-oriented fruits production are poorly known.

This thesis assesses direct and indirect impacts of inclusive export oriented avocado farming on Food and Nutrition Security (FNS) among smallholder farmers in the Upper Mara River Basin, divided between Bomet and Narok counties in southwestern Kenya. It adopts a comprehensive approach to FNS by considering the availability, accessibility, utilization and stability dimensions of food security and nutrition security through the diversity of available food as well as the diet of households.

The study area is increasingly dependent on important grain staples, such as maize and millet, from other areas. Also, fruits and vegetables, including avocado, are in increasing local demand, many of which are brought in from other regions. To date, however, smallholders who farm avocado for the export market cannot be shown to be better off in terms of diet or income than the control group and do not have better access to food on the market. Although grafted avocado for the export market is new to most of the farms, it negatively impacted crop diversity and the quantity of food available on these through own production, while avocados are still not producing enough to compensate for these losses. Payment delays and a refusal to grant advances or loans by the export company have further negatively impacted farmer incomes and loyalty, undermining value chain efficiency.

Although the development of avocado trees has been delayed by a serious drought, avocado production and prices are increasing at a fast rate which can be expected to improve the food access of export avocado farmers to a wider diversity of purchased foods, which more and more often come from outside regions. Optimistic future projections for avocado farming in the area are encouraging local governments to improve infrastructure, which is expected to lower transaction costs and improve food availability at local markets as well as travel access to them. This will have a positive food security impact for all smallholders in the area.

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List of Abbreviations

ACD	Agri Chains Development
AFT	Alternative Finance Technologies Ltd.
CBS	Centraal Bureau voor de Statistiek
DMFA	Dutch Ministry of Foreign Affairs
FAO	Food and Agriculture Organization of the United Nations
FCS	Food Consumption Score
FFV	Fresh Fruits and Vegetables
FGD	Focus Group Discussion
FNS	Food and Nutrition Security
GoK	Government of Kenya
GVC	Global Value Chain
HCD	Horticultural Crop Directorate
HDDS	Household Dietary Diversity Score
HFSP	Horticulture and Food Security Programme
IB	Inclusive Business
IFAD	International Fund for Agricultural Development
ITC	International Trade Centre
KARI	Kenyan Agricultural Research Institute
KNBS	Kenyan National Bureau of Statistics
MaMaSe	Mau-Mara-Serengeti
MMA	Match Maker Associates
MoA	Ministry of Agriculture

SNV	SNV Netherlands Development Organization
UNICEF	United Nations International Children's Emergency Fund
WBCSD	World Business Council for Sustainable Development
WFP	World Food Programme
WHO	World Health Organization
WTEEx	World's Top Exports
WWF	World Wildlife Fund

1.0 Introduction

1.1 Background

After a steady decrease of many decades, global food insecurity is on the rise again. While the chronically undernourished are still counted to be below 900 million people in the year 2000, negative regional developments are resulting in setbacks for the attainment of global goals, such as the Millennium Development goal for hunger reduction and Sustainable Development Goal nr. 1 (zero hunger). An increase in conflicts and climate change related alterations in weather patterns are expected to pose challenges to the achievement of these goals (FAO, IFAD, UNICEF, WFP and WHO 2017; Kennedy 2009, 2; Koppmair et al. 2016, 325). Sub-Saharan Africa is one of the regions that is especially vulnerable to these challenges (FAO, IFAD, UNICEF, WFP and WHO, 2017, 2).

While long term indicators show decreased undernourishment in Kenya in recent decades (FAO, IFAD, UNICEF, WFP and WHO 2017, 77), serious vulnerabilities to food security persist. Kenya is heavily reliant on rain-fed agriculture with maize as the main staple (Irungu 2011, 27). The effort to feed an increasing population is therefore severely challenged by climate change (Kronenburg Garcia et al. 2015, 7). Crop diversification is arguably needed to improve the stability of the domestic food supply (Irungu, 2011, 27; KARI 2017, 7; Lemba et al. 2013, 239; Muthoni and Nyomongo 2010, 47). The Kenyan government seeks to develop and improve its economy through the agricultural sector, which employs most of the population (GoK, 2007, 13). Facilitating foreign agribusiness investment is central to the plan of the Kenyan government which aims to develop the agricultural sector diversifying crops and marketing high-value produce for export. Improvement in both food security and poverty reduction are expected (GoK 2007, 13; KARI 2017; Larsen et al. 2009; 1-2).

Foreign agribusiness investment is often viewed in terms of landgrabs, negatively impacting inclusive local development and natural resource use (Klopp and Lumumba 2014, 54, 66; Kronenburg Garcia et al. 2015; Muraoka et al. 2017; Ulrich 2014). However, agribusiness consists of more than just investments into land property and its positive impacts, such as providing employment and therefore improving access to food, are also recognized (Van Westen et al. 2013, 61; Kirigia et al. 2016, 22). Kenya has long been an important exporter for European markets and the involvement of actors from these markets play a key role in the development of the Kenyan agricultural sector. The Netherlands, for example, has recently aimed to transform its relationship with Kenya from “aid to trade”, and taken an interest in expanding Dutch agribusiness in Kenya, especially in the horticulture sector (DMFA 2011, 2017; MMA 2017; van Westen et al. 2013, 10).

A focus on the fresh fruits and vegetables (FFV) sub-sector has the potential to play important additional roles in improving food and nutrition security (FNS). Not only FFVs high-value crops with higher returns, but in contrast to staples for example, their production has a higher potential to diversify crops and improve nutrition security by contributing to a more diverse diet (Irungu 2011, 27; Koppmair et al., 2016, 325; Lemba et al. 2013, 239; Wambui et al. 2015, 66). However, outside of employment and income impact, relatively little is known about how foreign agribusiness in the FFV sector affects FNS on a local level (Joosten et al 2015). So far, foreign interventions have often focussed on linking small-scale fruit and vegetable farmers, which represent the vast majority of FFV production in Kenya (Wambui et al. 2006, 2), with larger enterprises in so called inclusive business (IB) models. Apart from a good export business case, IBs are expected to help smallholder farmers access better markets, inputs and benefit from economies of scale, leading to an expected increase in production and farmer incomes (Chamberlain and Answeeuw 2017a, 1; Joosten et al. 2015, 5, 29; Trienekens 2011). This expectation is echoed in the export horticulture sector in general, where promoting export horticulture works under the assumption of a guaranteed improvement of household food security (Wambui et al. 2015, 66). However, FNS indicators to measure their impacts have often not been used (Joosten et al. 2015, 5). The impacts on local food availability and its stability thus remain largely unexplored, as well as on food accessibility, utilisation and dietary diversity.

1.2 Research aim

This thesis aims to shed light on how foreign agribusiness impacts FNS locally in rural Kenya. To do this, it will focus on an inclusive business case in the Upper Mara River Basin in the Narok and Bomet counties (Figure 1), involving a Dutch export company sourcing avocado from smallholder outgrowers. This research is guided by the main research question,

How has inclusive export-oriented avocado farming impacted the food and nutrition security among smallholder households in the Upper Mara River Basin?

To answer this question, this thesis relies on data collected during research in the Upper Mara River Basin between February and May 2018, conducted as part the NWO funded research project *Follow the Food*, carried out by the Utrecht University International Development Studies group and hosted in Kenya by Solidaridad East and Central Africa. It adopted a comprehensive mixed-methods approach to studying the direct and indirect local impacts of growing avocado for the export market, using market surveys, focus group discussions and interviews were used to investigate possible impacts to the availability, access, stability and utilisation dimensions of food security. On a household level,

socio-economic data was collected including the use of a dietary diversity score (HDDS), which is an indicator for both micronutrient intake and socioeconomic well-fare, providing a holistic indicator for FNS (Bellon et al. 2016, 2; Joosten et al. 2015, 25; Kennedy et al. 2011, 5, 7).

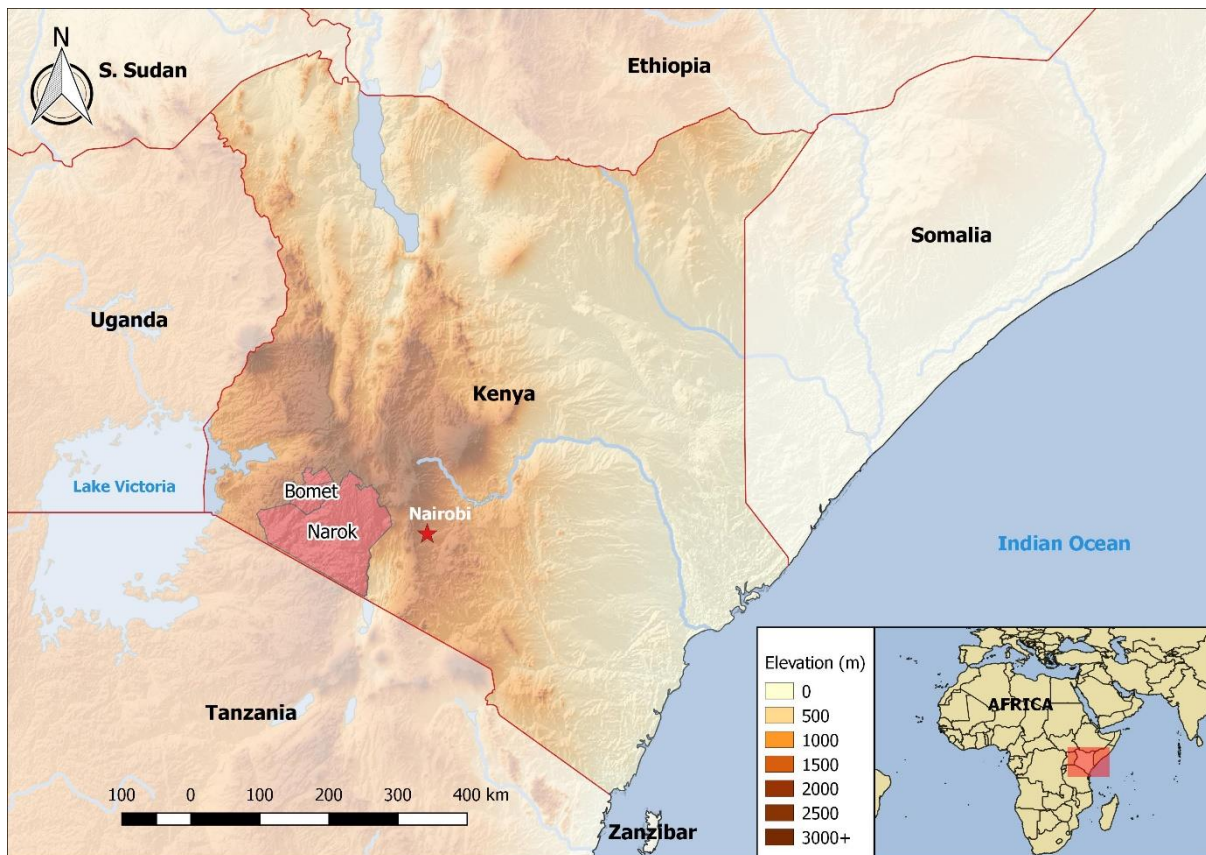


Figure 1, Bomet and Narok counties, Kenya. Data from Natural Earth (2018) and GMTED2010 by Danielson and Gesch (2011).

1.3 Thesis structure

The following, first chapter will introduce the theoretical framework informing this thesis and its research design. It will discuss central concepts regarding food and nutrition security, value chains, inclusive agribusiness and the institutional approach.

The second chapter will provide an overview of relevant contextual information regarding the region and the topic of study. This will include a discussion of food security and agribusiness in Kenya, geographic, demographic and agro-ecological particularities of the study area, and the history of interventions, including the one that created the business case that has provided this thesis with a case study.

The following chapter discusses the research design of this thesis. It presents the conceptual model, informed by the theoretical framework in the first chapter and study area-specific information presented in the second chapter, accompanied by a discussion of the sub-questions that guide the

research process leading towards answering the main research question. Next, the methodology that has shaped the data collection strategy and resulted in the body of quantitative and qualitative data which this thesis draws upon, will be presented and discussed. This is followed by an overview of how these methods were executed in the field and the resulting dataset. A reflection on the methodology will take into account the appropriateness and limitations of the research design.

Next, the chapters discussing the results of the research are divided into three chapters, all in which impacts of export-avocado growing are discussed. The first one will present the data gathered from local markets, detecting the availability and accessibility of different foods in different seasons, as well as important in and outflows of crops in the study area. The second chapter will analyse the FNS impact of inclusive export avocado farming on a household level. The third chapter considers inductive material emerging from the qualitative data which is relevant to the equitable sustainable development and FNS on both a local and household level and to answering the research question.

A discussion and conclusion chapter is dedicated to bringing together the main findings. It will evaluate the results and their significance in light of the literature and theory reviewed as part of this thesis. Finally, it will end with an answer to the main research question and provides recommendations for future research and interventions aiming to improve FNS through agribusiness.

2.0 Theoretical framework

The aim of this chapter is to provide a theoretical framework that is relevant to this thesis and its topic. It will explain key concepts and theory that is important to understand the literature that discusses food and nutrition security and agribusiness, which is reviewed in the next chapter in a Kenyan context and that of the study area. This framework also serves to guide the research design as well as the interpretation and discussion of the data, contributing to formulate the answer to the research question.

2.1 Food and Nutrition Security

The concepts of food and nutrition security (FNS) have been through a process of interrelated evolution that has been well documented starting from the first half of the last century. From 1940's, ideas of global food concerns have included both micro and macro-level definitions and orientations that focus on the sufficiency of the food supply, access to food as well as food as a right and a freedom (Klennert et al. 2005, 3; Lemke and Bellows 2013, 366). A long process of conceptual evolution resulted in up to 200 different but similar definitions of food security by the end of the 20th century (Klennert et al. 2005, 4; Maxwell and Frankenberger 1992, 8, 64-66). The modern and widely accepted definition combines many aspects of previous ideas leading to the following definition (Klennert et al. 2005, 4; Lemke and Bellows 2013, 366,

“Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit, 1996).

Nowadays, the four key dimensions are commonly used to consider food security and nutrition security are *availability*, *access* or *accessibility*, *utilization* or *use* and *stability* or *sustainability* (Ecker and Breisinger 2012, 3; FAO 2008; Klennert et al. 2005, 5; Kennedy 2009, 2; van Westen et al. 2013, 61). Some of these dimensions are already explicitly present in the widely used definition given above, but Klennert et al. (2005, 5) provide a close but adapted definition including these dimensions more clearly in a holistic definition of food and nutrition security or FNS (four dimensions underlined by author),

“Food and Nutrition Security is achieved, if adequate food (quantity, quality, safety, socio-cultural acceptability) is available and accessible for and satisfactorily utilized by all individuals at all times to live a healthy and happy life” (Klennert et al. (2005, 5).

Availability represents the supply of food that physically exists at a given location (usually used for national scale) as result of local production, import or aid. Accessibility refers to the ability of people (as individuals, households or larger groups) to access the food supply physically, economically or by other means. Use addresses the way in which the food and its nutrients are made use of. This covers the socio-economic and cultural aspects of food regarding food choice, preparation under clean conditions, consumption, etc. Finally, stability looks at the balance and sustainability of the three previous dimensions over time as seen in Figure 2 (FAO 2008; Joosten et al. 2015, 14; Klennert et al. 2005, 5).

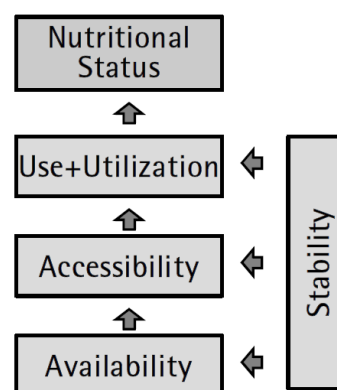


Figure 2, Food and Nutrition Security according to Klennert et al. (2005, 5)

Although the adapted definition by Klennert et al. (2005, 5) explicitly addresses both food and nutrition security, it is the first definition of food security formulated during the World Food Summit in 1996 that more closely points to need for “nutritious food that meets dietary needs”. This correctly implies that ensuring food and nutrition security is more than just making sure everyone has a sufficient dietary energy intake, a fact that a sole consideration of the four basic dimensions could overlook (Kennedy 2009, 2). A sufficient dietary intake for humans older than 6 months include an adequate micronutrient intake from a variety of food groups (Kennedy 2009, 3). A full consideration of nutritional status goes beyond the four basic dimensions of food security and sufficient dietary intake to consider the health status of an individual, as micronutrient intake is crucial to a good health and well-being (Kennedy 2009, 2-3; Klennert et al. 2005, 5,8; Koppmair et al. 2016 325).

Indeed, the nutritional dimension is nowadays recognized as central to the idea of food security (Ecker and Breisinger 2012, 3). Dietary diversification has become a central recommendation for both food security improvement (diversifying the supply) and nutrition security (consuming a variety of foods and nutrients, improving the quality of the diet) (Kennedy 2009, 3). As a concept, dietary diversity looks at food consumption by measuring the variety of foods and food groups present in the diet of an individual or household. On the latter level, two most commonly used indicators stand out, Food Consumption Score (FCS) used by the WFP, and the Household Dietary Diversity Score (HDDS) promoted by the FAO (Kennedy 2009, 9). The Individual Dietary Diversity Score (IDDS) is closely related to the latter indicator but is seen as a better and more direct indicator for micronutrient intake

and nutrient adequacy, whereas the HDDS is a more indirect indicator for nutrient adequacy, but also socio-economic well-fare, as well as the availability, access and use (as far as food choice is concerned) dimensions of food security (Kennedy et al. 2011, 5, 9). Bellon et al. (2016, 3) provide a conceptual model of how dietary diversity can be taken as a central and holistic indicator for FNS, presented in Figure 3.

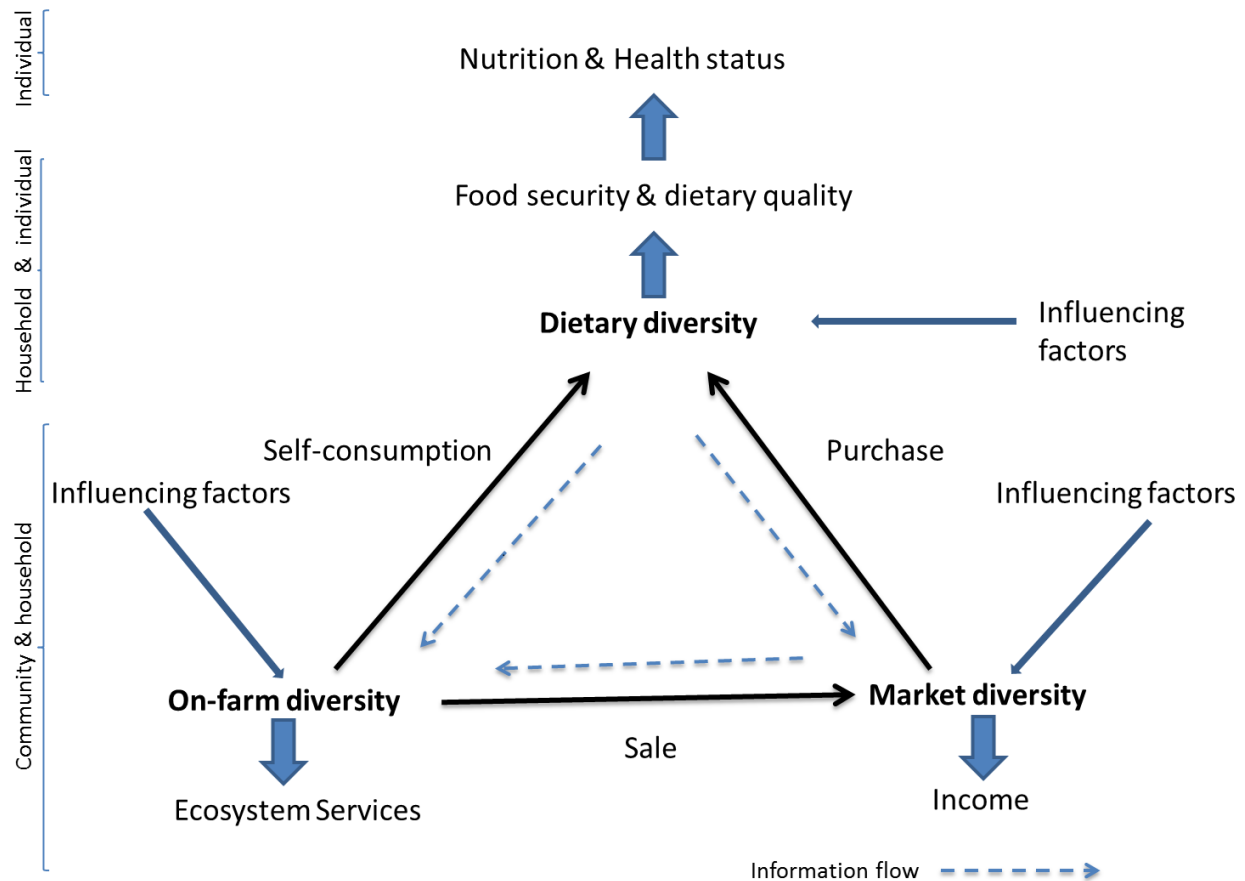


Figure 3, Conceptual model of dietary diversity and related factors (Bellon et al. 2016, 3).

In this model (Figure 3), dietary diversity directly informs FNS, and shows some of the factors influencing the dietary diversity on the individual and household level. Recently, studies have shown the importance of studying dietary diversity not only in terms of the diversity of food offered by their farms, but also in terms of what is offered the local market they have access to (Bellon et al. 2016; Koppmair et al. 2016).

By and large and over time, there has thus been a move from considering food security in terms of the sufficiency of the food supply towards considering a more complex set of factors and the quality of the food (Kennedy 2009, 4). Dietary diversity is thus a central aspect to focus on when looking at FNS and has been shown to be a viable indicator for nutrient quality, adequacy, socio-

economic status and associated with anthropometric outcomes (Bellon et al. 2016, 2; Joosten et al. 2015, 25; Kennedy et al. 2011, 5, 7). In order inform FNS holistically, dietary diversity is therefore best measured when also measuring other socio-economic indicators and taking into account other relevant factors that influence food access, availability, use and stability. What ends up on the daily plate of a household is nevertheless an invaluable focus around which a holistic conceptual framework of food and nutrition security can be formulated.

2.2 Agribusiness, value chains and inclusive business models

Agribusiness is important for food security, as it essentially represents an integrated view of the food production system (Heiman et al. 2002; King et al. 2010). Davis and Goldberg provide a classic definition of agribusiness,

“The sum total of all operations involved in the manufacture and distribution of farm supplies; production operations on the farm; and the storage, processing, and distribution of farm commodities and items made from them” (1957,2).

Because most of the food distribution happens through business, agribusiness is tightly related to the concept of the value chain. Although this concept is used in most business sectors, it is widely used by institutional and private actors involved in international agribusiness, including the export-oriented horticulture sector in Kenya. Quite simply put, value chains represent the “full range of activities that firms and workers perform to bring a product from its conception to end use and beyond” (Gereffi and Fernandez-Stark 2016, 7; Larsen et al. 2009, 6). Depending on the industry and the product, these activities can be divided between several producers and companies or dominated by a few or even one firm. In any case, the chain perspective is similar to the one in the definition of agribusiness itself and is viewed in terms of the activities, each of which adds value to the product.

For the purposes of this thesis, value chains are best explained by examining models that have especially been made to present FFV value chains, which are partially based on the Kenyan horticulture sector (Fernandez-Stark et al. 2011, 2; Joosten et al. 2015, 29). The models in Figure 4 are useful as they consider local and domestic markets (types A and B), as well as export markets (type C). Although FFVs have the potential for being high-value agricultural products with significant returns to the producers, the income made also depends much on what value chains the producers participate in and what markets they have access to (Joosten et al. 2015, 29-30). The highest returns are generally

found in the value chains supplying the export market in higher income countries. Such international value chains are referred to as Global Value Chains or GVCs.

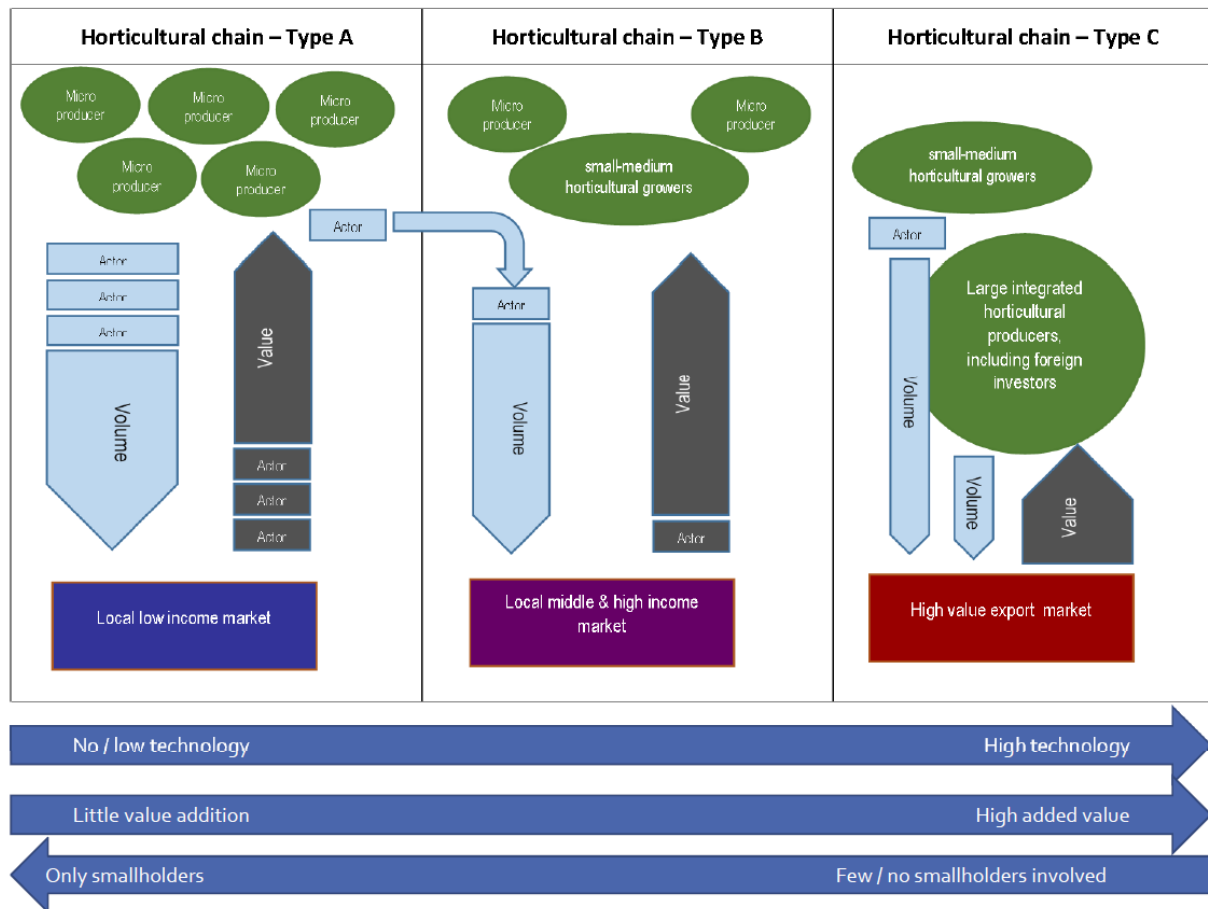


Figure 4, Horticultural chain types (Joosten 2014, 5).

In the GVC approach, the emphasis lies on looking at how value-adding activities are organized and distributed internationally across regions and countries as a chain and which entities or “lead firms” dominate this chain. In terms of developing countries, the focus lies on the governance of the GVC and detecting “upgrading opportunities”, or how producers and local actors can shift their position within the chain and improve their bargaining power (Gereffi and Fernandez-Stark 2016, 7; Trienekens 2011, 52, 57). This focus is particularly important for international development, as the global trend is leading towards ever fewer lead firms and a higher potential of excluding small-scale low-income producers, such as smallholder farmers (Chamberlain and Answeeuw 2017a, 1).

Looking after the interest of the low-income actors is the concern of inclusive business (IB). IB models include low-income actors in the value chain as e.g. producers, distributors or consumers in a way that is beneficial to their livelihoods and that is commercially viable (Chamberlain and Answeeuw 2017, 3; WBCSD 2017). From an agribusiness point of view, IBs are often about including small-scale low-income producers (smallholders) into value chains with higher returns, which often supply the export market. Access to better markets is a matter of technology, inputs, economies of scale,

bargaining power and market knowledge (Chamberlain and Answeeuw 2017a, 1; Larsen et al. 2009, 8; Trienekens 2011, 55). In practice, the position of smallholders is therefore upgraded through trainings and organizing farmers into groups (e.g. cooperatives) or linking them to larger producers (outgrower schemes), as can be seen in Figure 5. In larger entities, economies of scales can be achieved to facilitate access to inputs and higher volumes necessary for the export market are accumulated more easily.

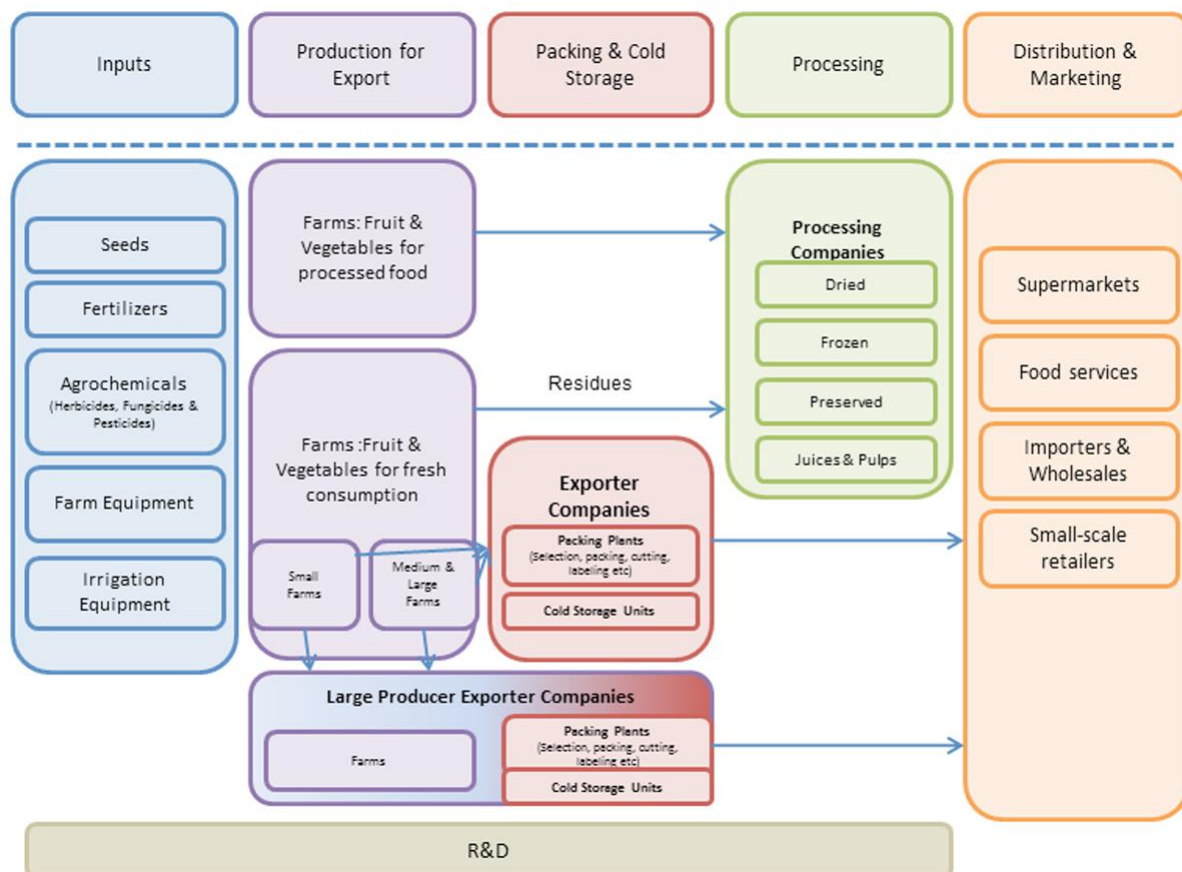


Figure 5, Export-oriented GVC of FFVs, with small farms linked to larger producers and export companies (Fernandez-Stark et al. 2011, 2).

To conclude, the concepts of agribusiness, value chains and inclusive business help mapping out how the fruits and vegetables production is organized, what markets are catered, what the relationships are between the actors involved in the same chain and why it matters from a development point of view. Value chains are highly relevant as they are also used to strategize where interventions are needed to improve food security (Fernandez-Stark et al. 2011; Joosten 2014, 14; Larsen et al. 2009, 8; Miruka et al. 2012). When considering the availability and accessibility dimensions of food security, different models have different implications on local food flows and the purchasing power of the producers. For example, if IB models also imply shifting to the export market, who will cater local needs? Although this thesis is not aiming at a full-fledged value chain analysis to

answer such questions, the above concepts help map food flows, their destinations and the actors involved.

2.3 Institutional Approach

Institutions are highly relevant actors in the context of food security, agribusiness and value chain upgrading, especially within GVCs (Gereffi and Fernandez-Stark 2016), for which an institutional perspective warrants discussion here. North (1989, 1321) defines institutions as the “rules, enforcement characteristics of rules, and norms of behaviour that structure repeated human interaction”. The focus here is on the consequences that these rules and norms have on the choices that individual actors make (North 1989, 1321). When referred to, institutions, as the shapers of these rules and norms, are usually state institutions. However, one can also see value chains as institutions, as they imply a set of contracts and standards that guide the behaviour of the actors involved.

High transaction costs, or barriers to the desired economic interaction between human agents, can occur because of the uncertainties of human interaction, such as opportunism and fraud. This necessitates institutions to provide a fair and stable playing ground by creating and enforcing rules (North 1989, 1324). However, institutions should not exist merely as the constrictors of human behaviour. An excess of restrictions and unnecessary and inefficient bureaucracy often even increases transaction costs. Amartya Sen would argue that,

“Arbitrary restrictions of the market mechanisms can lead to a reduction of freedoms because of the consequential effects of the absence of markets. Deprivations can result when people are denied the economic opportunities and favorable consequences that markets offer and support” (Sen 1999, 26).

Indeed, this implies that institutions should also play an important role as facilitators and develop themselves to facilitate transactions, production and exchange (North 1989, 1324). A very straightforward example of lowering transaction costs is facilitating investment into infrastructure, which itself facilitates the interaction of economic agents (Renkow et al. 2004). However, an institution usually balances between the two extreme roles to find the lowest possible cost of transaction. Institutions are therefore often assessed in terms of these facilitating and constraining factors in terms of a desired outcome. For example, state institutions might shape both constrictive and facilitating policies to achieve the outcome of a favourable investment climate for agribusiness or facilitated formation of cooperatives and to help smallholders upgrade within value chains (Joosten et al. 2015; Larsen et al. 2009; Miruka et al. 2012; Sindi 2008; van Westen et al. 2013).

Like value chains, institutions operate from the local all the way to the international level intermeshing governments, state institutions and their policies with the private sector and civil society. International conventions or the geo-political and economic state create fluctuating policy landscapes promoting some types of behaviour while constricting others. Murray and Overton (2016) for instance, argue that the current age regime (post-recession and 2010s), which they call Retroliberalism, is characterised by active state-led initiatives in which aid donors are mobilised to facilitate trade through the private sector. The “aid for trade” relationship between the Netherlands and Kenya is an example of this.

The institutional approach is essential to understand the current context which runs at the background of inclusive agribusiness activities. Indeed, the setting in motion of IB initiatives often necessitates the involvement of complex networks involving state institutions, aid donors and development NGOs in order to overcome the high transaction costs faced by the interaction between smallholders and other actors (Kilelu et al. 2016). The Kenyan context is discussed further in the following chapter.

3.0 Regional and Thematic Context

This chapter discusses background information that is necessary for the understanding the regional thematic context of this thesis. It will outline the current Kenyan food security situation and the role of foreign agribusiness in improving FNS, with a specific focus on the fruits and vegetables sector. Relevant information on avocado production and value chains will be introduced here, drawing on both global and Kenyan experiences. The chapter will also introduce the study area and its development context, presenting relevant geographic and demographic information as well as outlining the recent history of relevant interventions in this area. Finally, it will present the avocado business case, whose impacts FNS are the focus of this thesis.

3.1 Food and Nutrition Security in Kenya

According to longer-term macro-scale indicators, Kenya has appeared to have had an improving food security situation. For example, the proportion of undernourished people has been falling steadily according to a recent report (FAO, IFAD, UNICEF, WFP and WHO 2017, 77). In addition, the overall food supply has steadily been increasing in the country (Figure 6). Recently, however, Kenya’s food security is showing serious vulnerabilities in the face of processes which it largely shares or has in common with the rest of East Africa. These include conflicts, climate change and population pressure (FAO, IFAD, UNICEF, WFP and WHO 2017, 2; Kennedy 2009, 2; Koppmair et al. 2016, 325).

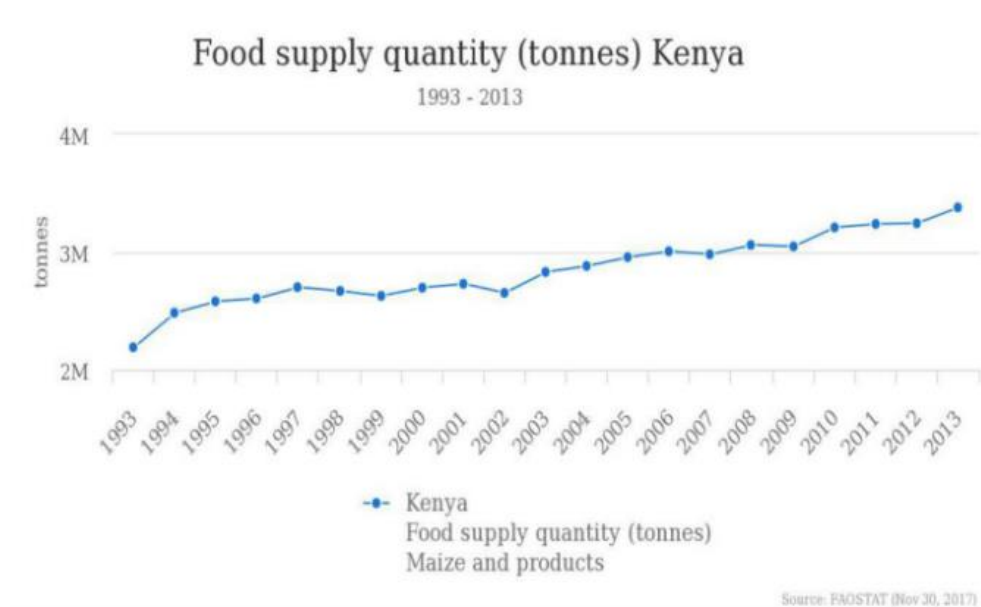


Figure 6, Total maize supply in Kenya (FAOSTAT 2017).

Population pressure and conflicts, especially those in neighbouring Somalia, are taking a toll on the food supply in Kenya. Kenya’s population has increased by more than 27% in less than a decade (Figure 7). Kenya also hosts refugees from the Somalian conflict, which put further pressure on the food and water supply (FAO, IFAD, UNICEF, WFP and WHO 2017, 46-47). Indeed, it can be considered remarkable that undernourishment has decreased in the country when the food per capita has been showing a steady decrease (Figure 8). Other staples and horticultural products as well as imports have compensated for the lacks in the supply of maize. However, maize still represents the main staple in the country and remains the most important indicator for overall food supply.

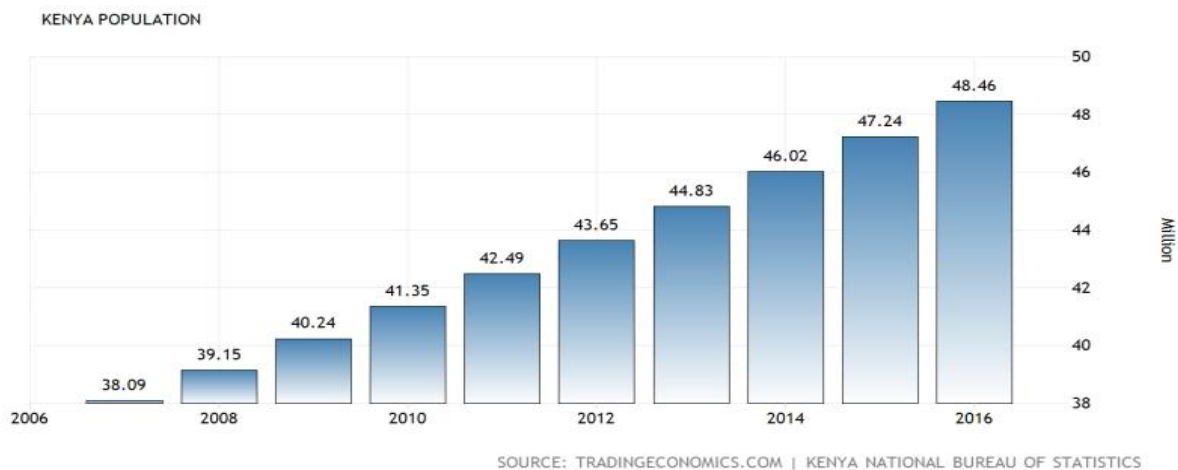


Figure 7, Kenya’s total population count, characterized by a steady and rapid increase (Kenya National Bureau of Statistics, 2018 in Trading Economics, 2018).



Figure 8, Maize supply per capita in Kenya (FAOSTAT 2017).

In a time where climate change is altering weather patterns, the overdependence on maize is especially worrying because most of the cultivated in Kenya is rain-fed, increasing the risk of crop

failure due to unpredictable weather and related difficulties (D'Alessandro et al. 2015). The recent decades (Figure 9) have been marked by consecutive droughts, which apart from negatively affecting maize production has taken its toll on livestock as well (Kronenburg Garcia et al. 2015, 7). As Kenya is largely dependent on maize as a staple, problems related to the maize production causes food security issues, as the maize supply cannot keep up with the increasing demand for maize. Moreover, an overreliance on maize has constrained dietary diversity (Kirigia 2014, 29). A diversification of crops and diet has been called upon to both stabilise the supply as well as to improve nutrition security (KARI 2017; Muthoni and Nyomongo 2010, 47; Lemba et al. 2013, 239).

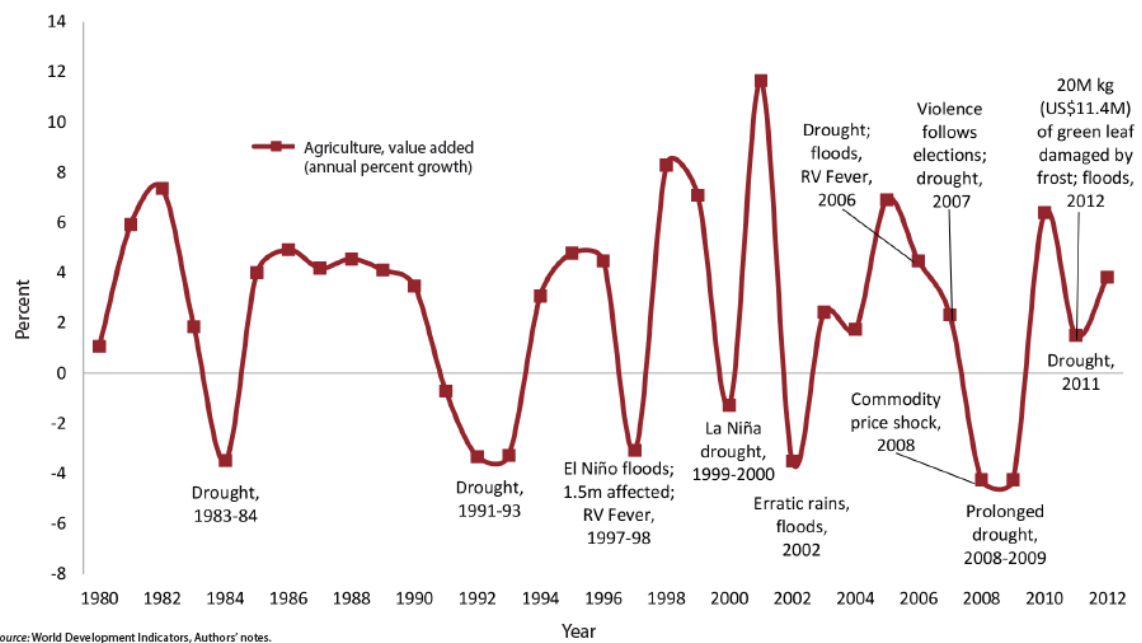


Figure 9, Timeline of major agricultural production shocks in Kenya (D'Alessandro et al. 2015, 2).

3.2 The Kenyan institutional context for agricultural development

In addition to FNS related reasons, the Kenyan agricultural sector has been targeted for transformations because of economic development as well. As part of the Kenyan *Vision 2030*, the Kenyan government is aiming to transform the country into a middle-income country with an annual growth rate of 10%, mainly through developing the agricultural sector that employs the majority of the population (GoK 2007, 2; KARI 2017). The private sector in agribusiness is seen to have a role here by developing agricultural know-how, diversifying crops and decrease climate vulnerability through the introduction of new crop varieties and irrigation technologies. It is also expected to create jobs and therefore improve food access through income (KARI 2017; Larsen et al. 2009, 1-2). The government of Kenya has therefore moved to facilitate foreign investment into the agricultural sector (KARI 2017; Kirigia 2014, 29; van Westen et al. 2013, 53).

In terms of general facilitations of agribusiness, a number of notable institutional factors and changes merit mentioning. One of the main pillars of Vision 2030 addresses market access, where an overall improvement of rural infrastructure and the promotion of private-sector participation are key (van Westen et al. 2013, 53). Further facilitation of public-private partnerships (PPPs) are also important with an eye on IB, as these link private sector investments with ODA and civil society, as is the case of some of the Dutch agribusiness development initiatives for instance (Larsen et al. 2009, 123; Pfisterer et al. 2009). Furthermore, land policy reform is high on the Vision 2030 agenda, where (the lack of) land policy has been seen from various standpoints as an impeding factor for successful agricultural operation (GoK 2007, 13; Larsen et al. 2009, 124).

Some constraining, or rather obligating, institutional factors are also important to mention. These include the Vision 2030 goal to root more of the value adding activities along the farm product value chains into Kenya for higher returns (GoK 2007, 13; Miruka et al. 2012). Also, the private sector is expected to adhere to the high environmental standards of the National Environmental Management Authority (NEMA), as well as taking corporate social responsibility over the employees. However, high discrepancies are reported in adhering to the latter requirements as well as the institutional enforcement of them (van Westen et al. 2013, 54).

Kenyan institutions have also been adaptive to changes in the international sphere. For example, the Horticultural Crop Directorate (HCD), formerly known as the Horticultural Crop Development Authority (HCDA) founded in 1967, has switched its main role of promoting and selling Kenyan horticultural produce to regulating production so that it adheres to current export standards imposed by certification schemes (Larsen et al. 2009, 27-28; Webber 2007, 81). Although this constraining role has become highly important, the facilitative functions of the HCD are of equal importance in the current liberal market climate, such as enabling investments to make the horticulture sector more competitive (Larsen et al. 2009, 28). This has resulted in well-developed platforms for public-private coordination and dialogue, such as the Fresh Produce Exporters Association (FPEAK) (Pfisterer et al 2009, 17, 19; Webber 2007, 82).

3.3 The Kenyan fresh fruits and vegetables sector and the avocado value chain

The horticultural sector consists of the cut flowers, fruits and vegetables sub-sectors. FFVs are one of the most important income earners for Kenya, ranking third after tourism and tea, contributing roughly 30% of the agricultural GDP up till 2013 (Krishnan 2018, 242; Pfisterer et al. 2009, 17; Wambui et al. 2015, 66). Although exports represent only about 10% of the total production, they make up more than 80% of all the revenues (Krishnan 2018, 242). The export-oriented horticultural sector is thus immensely important for the Kenyan economy.

Kenya is well-placed as an international exporter, especially for the European market. Apart from the abovementioned institutional responsiveness and facilitative abilities, Kenya has had other advantages pushing the competitiveness of its horticultural and FFV produce. It benefits from its geography and agricultural climate, being able to provide its produce to European super markets during the off-season, especially temperate products such as green beans (Webber 2007, 81). Tourism and plentiful northbound flights have also greatly facilitated the transport of FFV (Ibid).

Apart from these advantages, the Kenyan horticulture sector also has shortcomings. A high participation of smallholder farmers (over 80% of the production) in the export sector provides many technical, participatory and coordination challenges, especially with strong standards for production and tracing, such as GlobalGAP (Wambui et al. 2015, 61). Further development is necessary throughout the value chain for better management, strengthening of business relations and value addition (Pfisterer et al. 2009, 19).

Although Kenya has lost business to Ethiopia in the overall horticultural sector (Pfisterer et al. 2009, 17), it continues to dominate in the fresh fruits sub-sector in East Africa (Figure 10). Avocado is

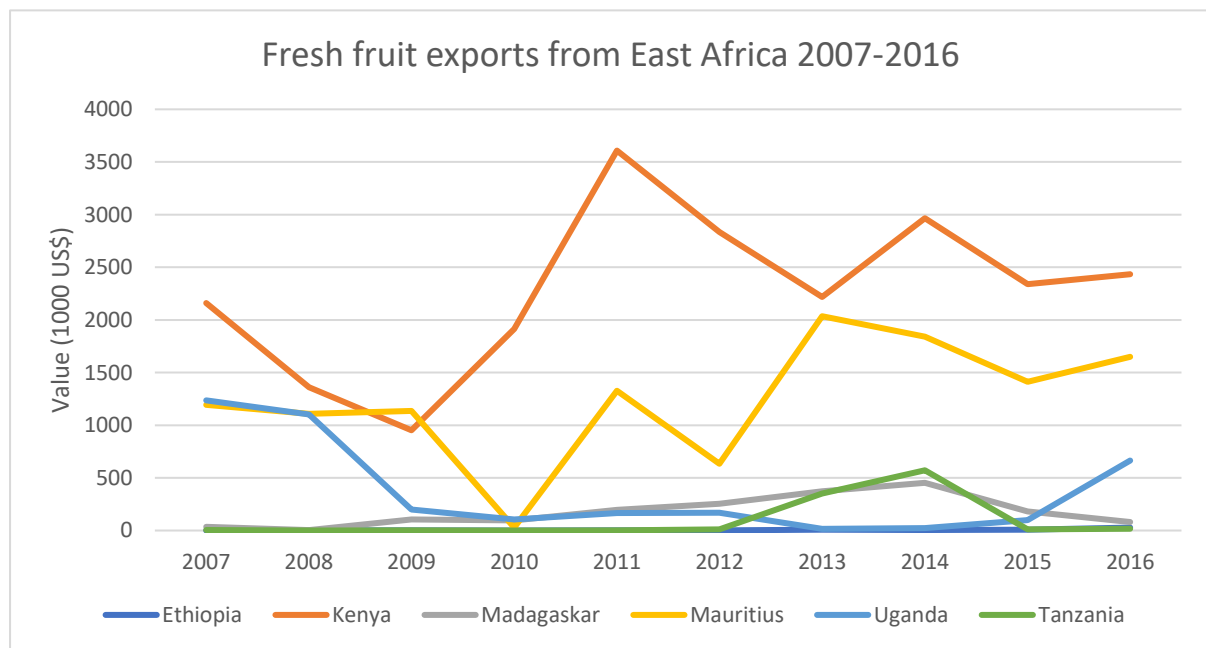


Figure 10, Fresh fruit exports in East Africa in the recent decade (FAOSTAT 2018).

an important contributor to this sub-sector, representing 74% of total value of fruit exports in 2016 (HCD 2016). In 2017, Kenya was the 7th largest producer and 8th largest exporter in the world and has the largest markets for its avocados in Europe, with the Netherlands occupying the second position as the largest importer after France (CBS 2018; FAOSTAT 2018; ITC 2018; WTEEx 2018). Production and export are on the rise in Kenya as is global demand for avocado, having grown consecutively for the past decade (AFT 2012; HCD 2014; 2016; Wasilwa et al. 2003;). Like with many FFVs, Kenyan avocados

occupy a special niche as it can export when all other major avocado exporters are off season, being located on other continents and time zones (AFT 2012, 49). Avocado farming in Kenya will therefore continue to play an important role for Kenyan horticultural exports in the coming future and attract further investment.

As with most FFV production in Kenya, smallholders are important in Kenyan avocado production, representing roughly 80% of the producers and holding 60% of the production (AFT 2012, 20; Wasilwa et al. 2006, 2). An avocado value chain analysis conducted in 2012 (AFT 2012) identified that 19% of the total avocado value goes to the producer when participating in the export value chain (Figure 11). The margin going to brokers and pickers (9%) is seen as an inefficiency, but also as a necessary evil as sourcing from various small producers is a challenge at the lower end of the chain (AFT 2012, 36, 39). Organising farmers into groups is seen as the solution to decrease reliance on brokers and improve economies of scale, increasing returns to producers (AFT 2012, 55). Development agencies are identified as crucial actors in farmer organization (AFT 2012, 53)

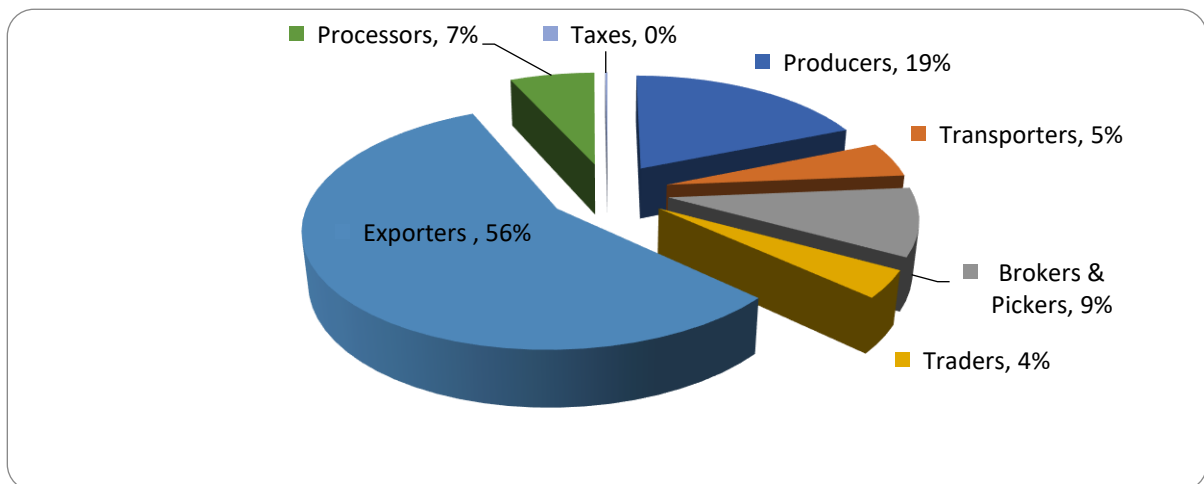


Figure 11, Share of total avocado value according to the SNV/AFT Avocado Value Chain Analysis Study in Kenya (AFT, 2012).

Apart from the GVCs, the grafted avocados preferred by export chains (such as Hass and Fuerte) also end up in regional and local chains (AFT 2012, 16, 20; Krishnan 2018). Local consumption (rural households and markets) takes up 10% of the overall production, while 19% of the grafted avocados end up in urban regional markets (Figure 12). According to Krishnan (2018), some of these regional and local chains for grafted avocados have emerged opportunistically as a result of GVCs, making use of spill over produce (rejects). However, more independent and targeted chains have developed as well, supplying regional supermarket chains with their own flexible standards (AFT 2012, 21; Krishnan 2018, 238). It is important to note that actors at the lower end of the chain are often involved in overlapping chains and “hybrid interactions” (Krishnan 2018, 238). From a GVC perspective, this type of operating (especially when brokers are involved) is an inefficiency in the value

chain. However, the existence of multiple chains partially as a result of GVCs means that a portion of the grafted avocados contribute to the local and regional food supply and diversity.

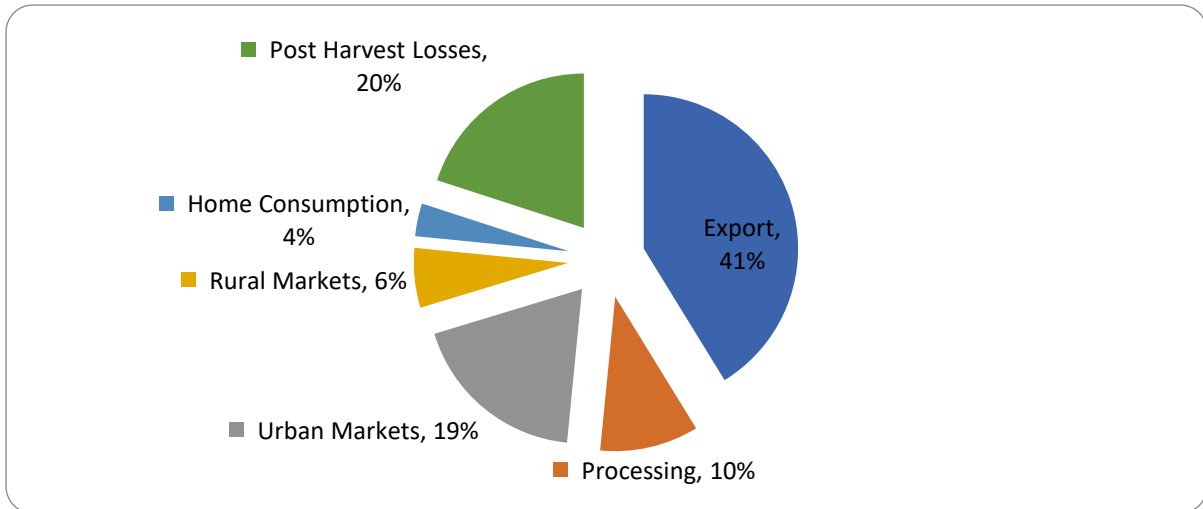


Figure 12, Demand analysis of for total volume of grafted avocados in Kenya (AFT 2012, 16).

3.4 The Upper Mara River Basin

The Mara River Basin is defined by the Mara river and its tributaries, flowing into Lake Victoria. Most of the water originates from the Mau forest, which is one of the last standing East African rainforests. The Upper Mara River Basin (Figure 13) is characterised by this rugged highland terrain. Towards the

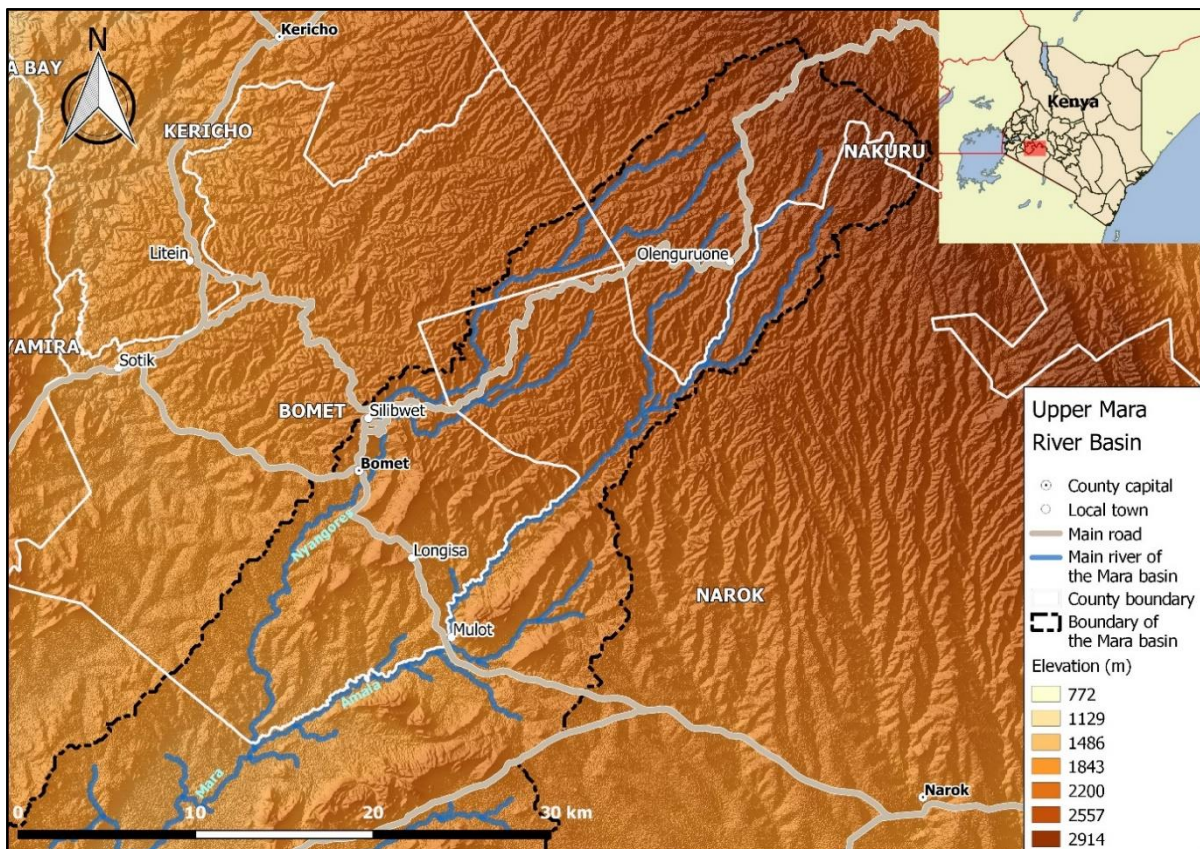


Figure 13, The Upper Mara River Basin. Administrative data from Natural Earth (2018) and elevation data by NASA JPL (2013).

south south-west the terrain turns into plains, much of which is protected as part of the Masai Mara and Serengeti (Tanzania) National Parks.

The change from what locals recognize as “highland” and “lowland” or “upper zone” and “lower zone” corresponds with an agroecological divide roughly cutting the study area in an east southeast – west northwest direction at Longisa (see Figure 13). This is defined as the divide between the LH 3 and LH 2 Lower Highland zones classified by Jaetzold and Schmidt (1983, 72). The LH 1 zone defines the upper arable highland zone within the Mara Basin (table 1), which is still mostly forested (Figure 14). Another roughly defined divide in the study area represents an ethnic one, where the Kalenjin have historically inhabited the north-western area of the Amala river (Bomet county) and the Maasai the plains towards the south and south-east (Narok county). The Kalenjin have longer sedentary tradition in agriculture than the predominantly pastoralist Maasai. According to the latest census (KNBS 2009) the population density in Bomet county is significantly higher than in Narok county (293/km² versus 47/ km² respectively).

The study area of this thesis is delimited by the Upper Mara River Basin within the counties of Bomet and Narok and within an approximate radius of 25km from Mulot, close to which the nucleus farm of the Dutch export company is located. The background and placing of the avocado business case is further explained in the next section.

Table 1, Agro-ecological zones after ACD (2015, 51) and Jaetzold and Schmidt (1983, 72-80).

Agro-Ecological Zones (Classification)	LH1 (Tea/ Dairy)	LH2 (Wheat/Maize/ Pyrethrum)	LH3 (Wheat/Maize/Barley)
Altitude	1900-2350	1900-2350	1850-2150
Rainfall- Annual, average (mm p.a.)	1400-1800	1200-1500	850 - 1100
Temperature – Mean annual (°C)	18.7 -15.7	18.4-15.4	17.4-15.0
Soils	Sandy loams or clay loams of moderate to high fertility		Clay soils of moderate to high fertility
Drainage (Major Rivers)	Nyangores, Amala	Isei	Amala, Enkare Ngito
Agricultural potential (major suitable enterprises)	Tea, dairy, maize, beans, Irish potato, vegetables	Tea, dairy, beef, livestock, maize, beans, Irish potato, vegetables, pyrethrum, coffee	Wheat, maize, beef, Pastures, Livestock

3.5 Food security, conservation and business-oriented interventions in the Upper Mara River Basin

Between 2011 and 2015 a consortium of Dutch NGO’s implemented the *Horticulture and Food Security Program* (HFSP), including Solidaridad, SNV, Hivos and AgriProFocus, financed by the Embassy of the Kingdom of the Netherlands in Nairobi (Fair and Sustainable 2015). The overall objective of this program was to improve the income and food security of smallholder farmers through enhanced sustainability and efficiency along the value chain (AFT 2012, v; Solidaridad 2015, 15). Key targets included improving access to healthy food through supporting producers in the production and marketing of quality horticultural produce to domestic, regional and export markets (Ibid).

The programme introduced avocado cultivation (Hass variety) in Narok and Bomet counties, which would link smallholder farmers with an existing large-scale farmer (Dutch-owned Mara Farming Ltd., known locally as Songoroi Ltd., which manages the nucleus farm) and lucrative markets in the Netherlands, more specifically the Albert Heijn supermarket chain (AFT 2012, v; Solidaridad, Hivos and SNV, n.d., 8). Apart from financing the value chain upgrading and the necessary training for farmers, the programme financed 50% of each avocado seedling, of which the other 50% was paid for by farmers themselves. The participating farmers were organized into two cooperatives (Isei and Mulo). The second horticulture business case developed in the same area by the HFSP was potato of superior, longer preserving Dutch varieties for national markets, involving farmers of the Isei cooperative (Fair and Sustainable 2015, 36).

The avocado business case, implemented by SNV, was evaluated as one of the few successful cases introduced by the HFSP in Kenya (Fair and Sustainable 2015). Since 2015 this was expanded in another ongoing programme also financed by the Dutch embassy, the *Mau Mara Serengeti Sustainable Water Initiative* (MaMaSe). The focus of this programme lies in introducing more climate and environmentally friendly agricultural practices with a business incentive (ACD 2015). As can be seen in Figure 14, the landscape of the Upper Mara River Basin has been shaped by diverse but intensive smallholder farming. Targeting this smallholder landscape in the Upper Mara River Basin is

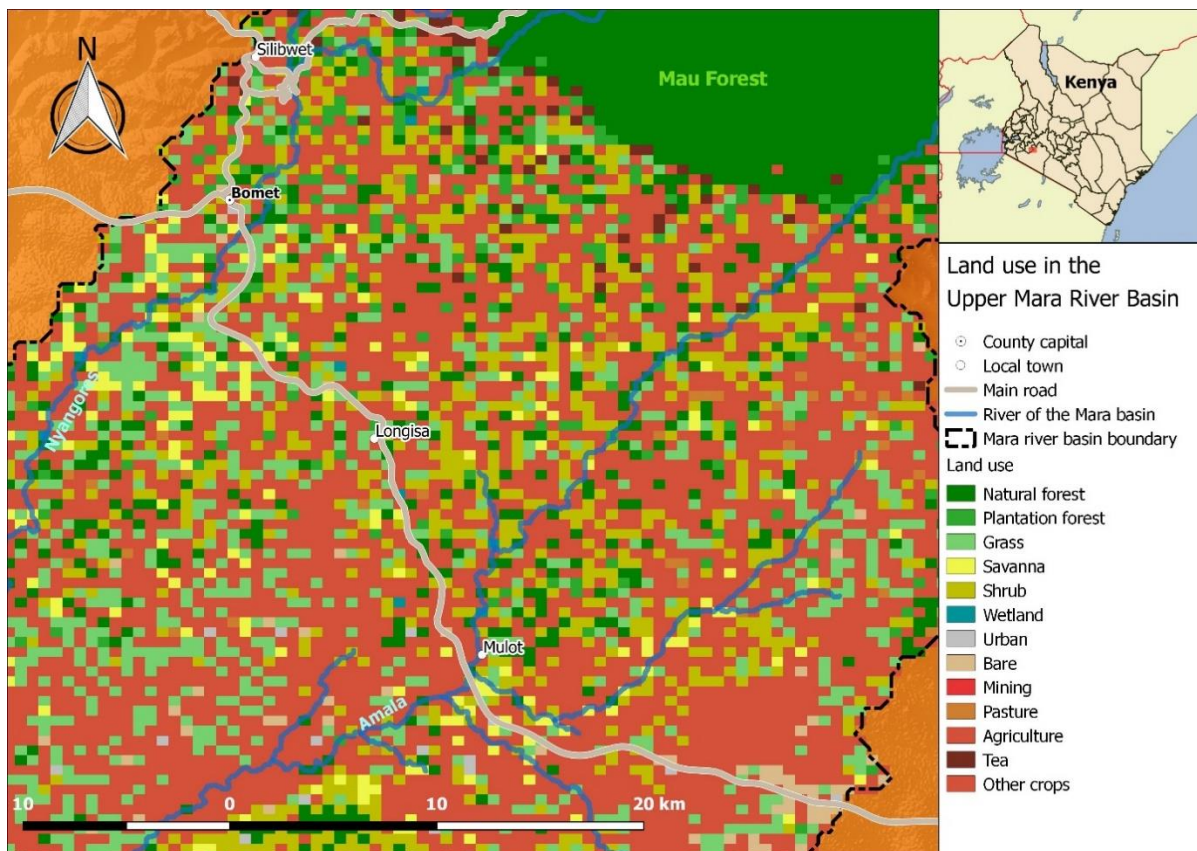


Figure 14, Land use pattern formed by smallholder farming in the intervention area of Dutch projects. Land use classification by the MaMaSe (2018) project.

seen as crucial to increase forest cover at the foot of the Mau forest, benefitting the entire watershed downstream. In practice, the implementation has been highly similar to that in the HFSP. Again, SNV has linked smallholder farmers in the same area, this time members of water user and community forest associations, to Songoroi Ltd. and the Dutch market. For farmers participating in the MaMaSe programme, seedlings have been planted in 2015-2016 and the first harvest is expected in 2018.

To improve organization at the lower end of the horticultural value chains established during the HFSP, SNV has conducted further training to the farmers, cooperatives and relevant service providers in the Narok and Bomet area as a part of the market-led horticulture programme HortIMPACT. This programme is financed again by the Dutch embassy and implemented together with Dutch partners; Solidaridad, Hivos and Delphy.

3.6 Avocado farming for the export market in the Narok and Bomet area

This thesis focuses on the avocado business case introduced by the HFSP, where the bulk of the seedlings were planted in 2013. As a result, farmers have been harvesting avocado since 2015. To date, 413 Global GAP certified avocado farmers remain (163 in Isei cooperative and 250 in Mulot cooperative, see Figure 15) from the 647 farmers originally recruited. Although export-oriented avocado farming is still fledgling in the area, the impacts on food and nutrition security as well as other socio-economically important areas can already be explored as three harvest cycles (2015, 2016 and 2017) have passed.

Baselines have been established for this area by a study for the HFSP in 2012 (Alternative Finance Technologies 2012) and later in 2015 for the MaMaSe programme (ACD 2015), but final results of the project could only be assessed to a certain extent. Although the avocado case has been taken as a success, the actual performance of the business case in terms of income to the farmer has not been measured yet and is based on projections

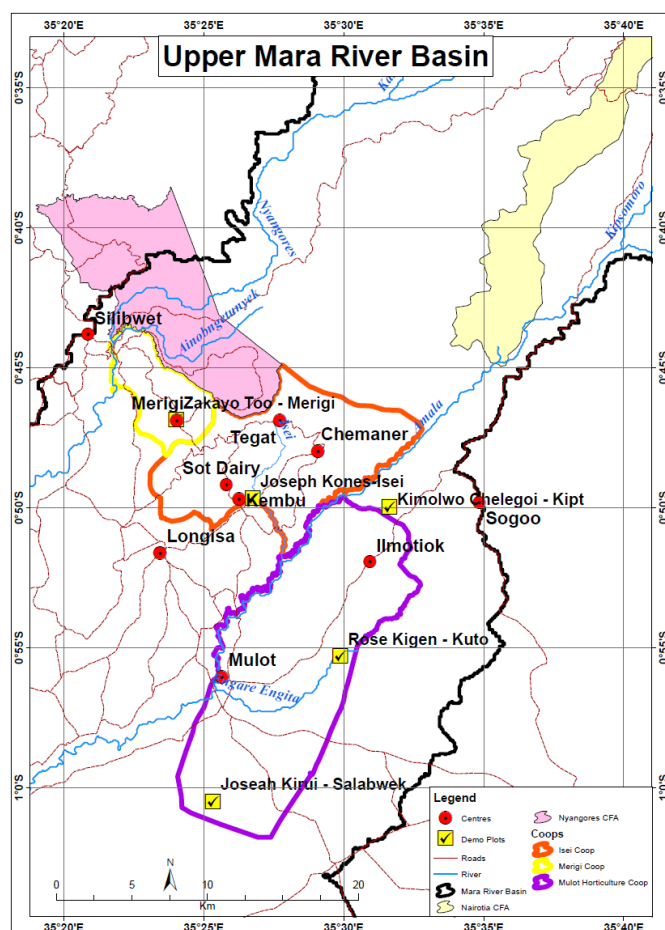


Figure 15, Participating cooperatives in the Upper Mara River Basin.

of potential incomes (ACD 2015, 19; Fair and Sustainable 2015, 23). The external evaluation report on the HFSP (Fair and Sustainable 2015) scrutinised the claims of improvement in FNS among the smallholder farmers resulting from the programme, as these improvements had not actually been measured using appropriate indicators (Fair and Sustainable 2015, 22). The evaluation itself found some indications for these improvements based on FGDs but found that this could not be validated without direct FNS indicators (Fair and Sustainable 2015, 22). As with most cases of fruit and vegetable sector interventions (Joosten et al. 2015), there is thus a large knowledge gap in the understanding of the FNS impacts of the avocado business case.

3.7 Stakeholders

Several stakeholders of the avocado business case can be identified as informed by the project reports. The actors ranging from local to international and from state to private have been outlined in Table 2. This list of stakeholders seems as complex as could be expected for an inclusive avocado business case (see previous chapter). A myriad of local actors involves the farmers, but also small-scale market actors. The larger private business component is owned by the same owner (Mara Farming), which controls the value chain operations from the nuclear farm (Songoroi Ltd.) to exportation, dominating much of the value chain. Apart from WWF, this main company, the NGOs and the main funder (embassy) are all Dutch. Together with Kenyan state actors, the institutional sphere is thus strongly present on a bilateral international level.

Table 2, Avocado Business Case main stakeholder overview (AFT 2012; Noble consultants 2012; SNV 2012).

Stakeholder	Entities and organizations	Role and relation
Smallholder farmer households	Participants (export avocado growers)	Smallholders participating in the export value chain, selling grafted avocados.
	Non-participants	Smallholders indirectly impacted by the spillover effects of the interventions.
Farmer groups	Isei cooperative	Aggregation of produce and negotiating role on behalf of farmers.
	Mulot cooperative	
	Community Forest and Water User Associations	
Exporter	Songoroi Ltd. (Mara Farming)	Export company with main farm in the area, sourcing from the outgrower smallholders.
County governments	Bomet County	Counties with the participating smallholders. Play a role in improving infrastructure and improving market
	Narok County	

		facilities. Lobbying and facilitation. Receive tax income from actors in their territories.
Kenyan Government Institutions	HCD and Ministry of Agriculture (MoA)	Permits, contracts and other facilitatory and regulatory services. Training and extension services.
	National Environmental Management Authority (NEMA)	Water monitoring, regulation of irrigation water from the Mara river and related permits.
	Kenya Agricultural Research Institute (KARI)	Support in selection and supply of seedlings from mother stock.
Dutch consortium members	Solidaridad	Development agencies responsible for arranging training and certification for the farmers, as well as organizing them into cooperatives during the interventions. In addition, part of the inputs are facilitated.
	SNV	
	Hivos	
	Delphy	
	AgriProFocus	
Funding organs	Embassy of the Kingdom of the Netherlands (Ministry of Foreign Affairs)	Main financing organ of the interventions.
	World Wildlife Fund (WWF)	Finance and support.
Market actors	Local market traders	Local market or kiosk vendors impacted by spillover produce or price changes.
Brokers	Brokers	Mostly independent local or translocal actors sourcing produce and picking and transporting it to markets.
	Pickers	

Many of the most important stakeholders are taken into account in the conceptual model discussed in the beginning of the next chapter.

3.7 Summary and conclusion

Food security in Kenya has generally been improving but its food supply is under pressure from multiple sides. There is a need to both increase and diversify production because of a growing population as well as climate change. At the same time, a diversified production is expected to improve nutrition security.

The horticultural sector is an important income earner for Kenya and avocado is the lead export fruit. Demand and prices are increasing globally for avocado, and avocado farming has great potential to improve incomes and diversify production, both for the potential benefit of local FNS. As a tree crop, it can in addition add to much needed tree cover for positive climate impacts and soil conservation.

As is known from previous cases, it is likely that grafted avocados introduced for the export market will spill over to local and regional markets, with important FNS impacts. Given the context,

the avocado business case in the Upper Mara River Basin is well suited for the research purposes outlined in previous chapters, as avocado growing is new in the area and both direct and indirect FNS impacts are fresh. Furthermore, research using specific relevant FNS indicators is timely and necessary to evaluate whether the market-led and business-oriented value chain upgrading efforts and investment into a new crop in the area have had the intended consequence of improving incomes and FNS.

4.0 Research design

The following chapter outlines the research design of the study conducted on the avocado business case in the Upper Mara River Basin. The research questions that have guided data collection are discussed and a conceptual model is presented, which visualises local FNS at the lower end of overlapping value chains. The methods and data collection tools used during field research are explained, and a brief overview of the data collected is provided. Finally, a reflection of the research limitations as well as on the fieldwork experience will be given to evaluate strengths and weaknesses in the dataset on which the following chapters will be based.

4.1 Research aims, questions and conceptual model

As explained in the previous chapters, the FFV sector could be key to improving FNS among smallholder farmers. However, the FNS outcomes of the business-oriented interventions in the FFV sector have not been properly evaluated beyond an income impact which assumes improved FNS as a result of increased incomes. This thesis aims to contribute to bridging this knowledge gap through the study of an avocado business case in the Upper Mara River Basin with the following main research question,

How has inclusive export-oriented avocado farming impacted the food and nutrition security among smallholder households in the Upper Mara River Basin?

The comprehensive approach to FNS (see paragraph 2.1), considers both direct and indirect impacts on both a household and local level. To answer the main question, the following sub-questions guide the study so that these dimensions can be accounted for,

1. *How has inclusive export avocado farming impacted the availability of different foods on local markets?*

This question is important for looking at impacts that inclusive export avocado farming may have had on local food availability, which is relevant to the entire study area. Food availability is mainly assessed through looking at the diversity of different produce on local markets and outlets and their seasonality, informing the local food stability dimension of the overall FNS analysis of this thesis.

Answering this question includes understanding the origin of the food on the markets. Similarly, it is important to know what other outside markets the study area supplies and what

the most important crops are in this regard. Although it is likely that a comprehensive understanding of translocal impacts is beyond the scope of this thesis, it is essential to probe into them. This is because introducing export avocado farming might happen at the expense of other crops, which has implications on the local food availability and incomes.

2. *How has inclusive export avocado farming impacted the accessibility of different foods on local markets?*

Apart from looking at how export avocado might have affected the availability of different foods in the area, possible direct or indirect impacts are also examined through the food accessibility dimension. The means of accessing food on a local level of the study area is assessed in terms of the pricing of foods, and the surrounding infrastructure which facilitates travel to the market. Answering this sub-question is related closely the previous one.

3. *How has inclusive export-oriented avocado farming affected FNS on a household level?*

FNS on a household level is considered here through the four main dimensions of food security and nutrition security. Food availability will focus on the food produced on the farm. Food access is evaluated in terms of the income of individual households allowing to buy food and also and factors that might regulate farmers from accessing food grown on their own farm. Nutrition security is mainly evaluated through the diet and its diversity, using the HDDS. This will be compared with other socio-economic indicators as it may also be an important socio-economic indicator. These factors have been chosen according to their relevance to FNS and the dietary diversity indicator used (HDDS), such as income (and different income sources), education, farm and household size, etc. Furthermore, a qualitative understanding of the choices, preferences, social-cultural dimensions and practical aspects that influence the diet are important in regard to the dimension of food use or utilisation. Finally, seasonality and food stability are kept in mind throughout the analysis across all FNS dimension.

4. *What other direct and indirect impacts has avocado farming had on local equitable and sustainable development and FNS in the study area?*

This question probes for inductive material in the data concerning the impacts of inclusive export avocado farming which is not directly considered by the other sub-questions. Implications in relation to the other sub-questions and the overall analysis of the impact on FNS on both a local and household level will be assessed.

The conceptual model (Figure 16) reflects the content of the theoretical and thematic overview provided in previous chapters as well as the research areas covered by the sub-questions. It presents the research subject with the smallholder households embedded in both local, regional and export value chains. FNS is assessed from various aspects that result from many factors that are often in a systemic relationship with one another. Therefore, both direct and indirect relationships are looked at.

The availability of different foods is assessed at the local markets (vendors and traders) as well as at the farms (production system). This production system is influenced by training and avocado growing introduced by the export value chain actors, possibly at the expense of other crops and livestock. As the production system supplies both the local markets as well as the farms themselves, this has implications for FNS at a household level and beyond.

The production systems also supply outside regional and/or national chains, in which intermediaries or brokers play an important role. Therefore, different value chains possibly compete for the grafted avocados as farmers are engaged in hybrid relationships with overlapping chains. This has implications on the price paid for grafted avocados, and export value chain efficiency.

The role of income in access to food for individual households is visualised, as is the importance of income to other needs. The quantity and quality of the diet is therefore impacted by different household priorities. Through an income impact, participation in the export value chain thus

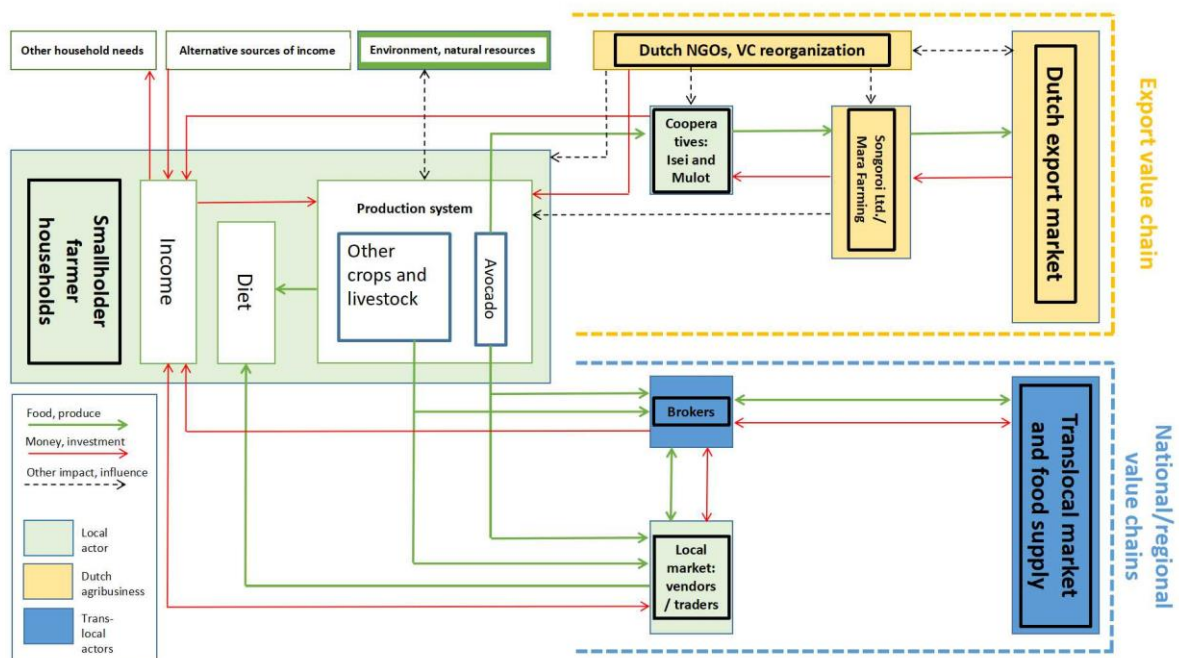


Figure 16, Conceptual model for FNS and the avocado business case, highlighting the smallholder households.

has possible indirect impacts on expenditures. Other indirect impacts can be expected through the change in the production system on the environment, as intended for example by the MaMaSe project.

This model highlights the smallholder and includes the most immediate stakeholders that are most relevant to an FNS evaluation. This thesis considers possible direct and indirect impacts on stakeholders not visualised in this model, such as government agencies, but these are not prioritised for visualisation in the model.

4.2 Methods and research tools

Research into the avocado business case has been conducted using a mixed methods approach, combining quantitative and qualitative tools and methods. This methodology has been chosen because it allows for the comprehensive FNS approach sought for, integrating appropriate quantitative indicators with qualitative data, allowing for cross-evaluation and triangulation. The first phase of research consisted of desk research conducted mainly in the Netherlands prior to the field research phase in Kenya, which started in February 2018. This desk research has informed the previous chapters, formulating the theoretical and contextual framework, as well as the conceptual model specific to the study case. The field methods used include questionnaires with quantitative and qualitative questions, focus group discussions (FGDs), semi-structured market surveys and unstructured interviews. These are outlined below in further detail, discussing their underlying strategy, execution, and time prioritisation. The full list of questions, codes and interview guides that were used are annexed to this thesis.

4.2.1 Semi-structured market surveys

The design of a semi-structured market questionnaire was preceded by a preliminary survey on the Mulot market (largest local market with widest variety of produce) aimed to document all the different food products sold there, their names in Kalenjin (Kipsigis dialect) and Swahili and preliminary information on availability and main harvests. Based on this draft, a simpler version was designed (see appendices) with only the most essential questions and to minimize the time spent with each vendor (who expect returns and are serving customers). Qualitative questions, such as those on perceived market impacts, were kept as open as possible in the survey questionnaire and in practice were accompanied by probing and/or clarification where necessary. An outline of the contents of the market survey form is given in Table 3.

Table 3, Market survey questionnaire topics.

Topic	Content
Produce or food product	The food product or produce that is the main object of the survey.
Origin of produce	Origin of the produce to the most detailed knowledge of the respondent.
Vendor	Type of vendor, local farmer, outsider, butcher etc.

Customer/Destination market	The customers and destination markets of the produce sold by the vendor if known, such as local villagers or farmers, local schools or hospitals or brokers from Nairobi etc.
Price peak	Months in which the price of the produce is highest and the price in Kenyan shillings per unit used by the vendor, such as cup or 90L bag.
Price low	Months in which the price of the produce is lowest and the price in Kenyan shillings per unit used by the vendor, such as cup or 90L bag.
Changes in the past 5 years	Changes in the supply, market and price of the produce as perceived by the vendor.
Future expectations	Future expectations about the supply, market and price of the produce as perceived by the vendor.

Due to time restraints and the large number of vendors, a purposive sampling strategy chosen, aiming to collect information on each food product present at the market from at least two vendors and if the information was highly inconsistent or other quality concerns were present, three. The markets themselves were chosen according to what markets were being visited by the households surveyed (next section). The market survey was conducted with the help of the local enumerators translating for the author. Seven markets were surveyed between March and May 2018 at the following locations, Mulot, Longisa, Youth Farmers, Chemaner, Merigi, Ilmotiok and Kambu.

4.2.2 Household survey, questionnaires

The survey questionnaire questions on general socio-economic and food security data from a previous design used in the Follow the Food research project, and many questions were included for later use by Follow the Food. After adaptations and testing in the field, it was coded to be used in data collection software (KoBo Toolbox) on mobile devices provided by Solidaridad. Two enumerators, local BSc graduates from agriculture related disciplines, were hired after an interview and trained to conduct the survey. The areas covered in the questionnaire are listed in Table 4.

Table 4, Household survey questionnaire contents.

Topic	Content	Nr. of questions
Time and location	Time and place of questionnaire, name of the enumerator. Household material.	11
Demography	Personal details of the respondent and his/her household	16
Agriculture and household assets	Specifics about the crops and livestock managed by the household, sources of income and assets.	29
Avocado business case	Information about avocado growing and participation in the avocado value chain.	24
Potato business case	Questions included for an exploratory study as part of the Follow the Food programme into the potato business case introduced by the HFSP.	25
FNS	Quantitative and qualitative questions on FNS. Largely after the instructions of Kennedy et al. (2011) on measuring HDDS, looking at what has been eaten in the past 24h and how many times a day. Qualitative questions include the ones used by USAID household food security surveys (USDA 2012).	44
Shocks, credit and savings	Additional questions for Follow the Food purposes on household resilience against shocks and financial management.	19
Perceptions on farming and food security related experiences	Statements with which the respondent can express agreement with between a range of 1 (strongly disagree) to 5 (strongly agree).	34

A stratified systematic random sample was used to sample a minimum of 10% from the certified avocado farmer population participating in the export value chain, based on the farmer list provided by Songoroi (participant population). For both cooperatives, these farmers were sub-divided into clusters according to the location of their farm. Sampling at least 10% from each cluster would ensure spatial coverage and representativeness. One household for each sampled certified avocado farmer would be sampled for the control group (non-participant population). The enumerators would ask each sampled avocado farmer for a list of community households not belonging to the local avocado cluster, from which to randomly choose (systematic random sample by number of samples for that cluster) a household and ask directions to it. It was hoped that probing for a longer list and using the random sampling method on it would minimize bias, while sampling a control group member near each household growing for Songoroi, which would ensure the same spatial coverage for the control group¹. This resulted in the following sample (Table 4). A total of 101 questionnaires were filled, safely surpassing the 10% of the export avocado growing population.

Table 5, Household questionnaire population sample.

Farmer group ²	Nr. of respondents sampled	Percentage sampled of certified avocado farmers
Isei cooperative (163 members)	19	11.6
Mulot cooperative (250 members)	31	12.4
Non-participants (control group)	51 ³	-
Totals	101	12

The household survey was prioritised to be initiated immediately from the start of the fieldwork period for seasonal reasons. This was because for FNS purposes it is recommended to collect HDDS data before important harvests, during which diets often vary from the typical. A “baseline” diet and food security situation is more visible during the “hunger” months before the important harvests, which in the study area start towards the end of April (Kennedy et al. 2011, 13). The surveys were completed by the 26th of April.

Originally, the research proposal had suggested attempting to include Songoroi plantation workers’ households into the survey sample. However, multiple sources strongly advised against including the plantation workers’ households. Main reasons include breach of company privacy and jeopardizing relations between the company and partner organizations.

¹ Originally, GIS software would be used to assign random points equal to the number of farmers sampled in the area of each cluster, to which the enumerators would navigate using GPS coordinates and choose the closest household not growing avocado for Songoroi. However, this method was found to be too impractical in the field.

² The original research proposal had suggested attempting to include the households of the plantation workers from the Songoroi nuclear farm into the survey sample. However, multiple sources strongly advised against including the plantation workers’ households. Main reasons include breach of company privacy and jeopardizing relations between the company and partner organizations.

³ The control group is one larger than the 50 required because one of the test cases of the final questionnaire version was included as the questionnaire proved to meet the standards during this test and the survey went well.

4.2.3 FGDs

The main objective of the FGDs was to obtain qualitative data from the certified avocado farmers about their experience of participating in the export avocado value chain and the changes in their life, households, farm and community since the introduction of avocado farming. Additionally, it was a channel for inductive data to emerge, which could be taken into account when relevant to the research questions. The issues discussed during the FGDs are listed in Table 5.

Table 5, FGD issues discussed.

Issue	Content probed for
Changes	Changes (any) at the farm, household and community level experienced in the last 5 years.
Avocado farming	Expectations, motivations, experiences, key benefits and challenges.
Impacts on quality of life	Impacts and changes explicitly due to avocado farming on income, farming practices, foodways and household members.
Temporalities	Information on how different months of the year are experienced in terms of income, food security and workload.
Future and expectations	Further discussion on how the farmers believe participation in the avocado value chain will evolve and what could be done to improve the situation.

Along with the household questionnaires, the FGDs were conducted in March and April, as in May farmers were less likely to be willing to leave their farms as the avocado harvest was predicted for that month. Half the clusters (four out of eight clusters from the Isei cooperative, five out of nine from the Mulot cooperative) were chosen for FGDs. Apart from an equal representation clusters within each cooperative, the selection of the FGD groups (table 6) aimed for coverage in study area as well as availability within the months of March and April.

Table 6, FGDs conducted and participation.

Nr.	Name of cluster	Cooperative	Nr. Participants	Nr. of female participants	Nr. of male participants
1	Chemaner	Isei	14	2	12
2	Kongotik	Isei	13	5	8
3	Chepkitwa	Isei	7	4	3
4	Kiptenden	Mulot	15	2	13
5	Kaporuso	Isei	12	4	8
6	Olokin (Mengit)	Mulot	9	2	7
7	Kuto	Mulot	13	7	4
8	Mosimowo	Mulot	13	5	8
9	Laluk	Mulot	12	8	4
Totals			98	39	59

Two additional FGDs were conducted in May, in order to obtain further food related data from women, who are usually charged with preparing and purchasing food in the study area (Table 7). This was to gain additional insight on food preference, market access and the local diet. A separate FGD guide was drafted, which apart from open questions included a pairwise matrix ranking exercise (Gay

et al. 2016), in which different foods available for purchase at the local market were ranked and prioritized in a hypothetical situation.

Table 7, Food FGDs conducted and participation.

Nr.	FGD location (cluster)	Nr. of participants ⁴
1	Mosimowo	9 (1 male)
2	Kaporuso	11 (5 male)

4.2.4 Unstructured interviews

The aim of unstructured interviews with key stakeholder representatives was threefold. The first aim was fact-finding in order to complement the desk research on the avocado business case. The second aim was to obtain additional information on impacts observed and felt by the stakeholders. Third, many of the later interviews served to follow up on patterns emerging from the questionnaire data preliminarily analysed by that time. The conducted interviews have been listed in Table 8.

Table 8, Unstructured interviews.

Nr.	Occupation	Topic
1	Solidaridad representative and advisor for HortIMPACT (Solidaridad counterpart)	Organizations and company's involvement in the horticulture sector in Kenya
2	Horticulture advisor 1 for HortIMPACT (SNV), consultant for Delphy Crop Advisors	Horticultural value chains in Kenya
3	Horticulture advisor 2 (SNV)	Horticultural value chains in Kenya
4	Meru Greens representative	Horticultural value chains managed by Meru Greens, green beans
5	Advisor HortIMPACT (SNV)	HortIMPACT project
6	Horticulture advisor 3 (SNV)	The avocado business case and background data
7	Horticulture advisor 2 (SNV)	Potato business case
8	Director of Mara River Water Association and former Mara Basin Project (WWF) official	MaMaSe, avocado production and conservation agriculture
9	Extensionist for Songoroi Ltd.	Avocado farming (technical aspects) and trainings provided to farmers
10	Agronomist, official for the MoA Mulot office	History of avocado growing in the area, current trends in agricultural development in the area, MoA perspective on export-oriented avocado farming
11	Bomet County CSA, representative of the Kiprerer ward (Olokyn area)	County perception and infrastructure improvements
12	Chairman of Isei cooperative	Role and experience of the Isei cooperative in the avocado value chain
13	Chairman and treasurer of Mulot cooperative	Role and experience of the Isei cooperative in the avocado value chain
14	Chairman of the Nyangores-Masase Community Forest Association	Avocado growing and forest conservation
15	Extensionist for Songoroi Ltd.	Experience of Songoroi Ltd. managing relationship with value chain partners and the performance of the outgrower model

⁴ Although women were recruited for these food related FGDs, some men did eventually (and quite unexpectedly) participate. This did not, however, prevent a fruitful discussion of the topics as planned or obstruct women to speak to the extent they wished. In fact, this prompted some interesting discussion as to the role of men in influencing diet.

4.3 Data distribution

The spatial distribution of the data collected using market surveys, household questionnaires and FGDs is presented in Figure 17. Isei members represent the upper agro-ecological zone (LH 2 and 1), and Mulot members the lower zone (LH 3). The control group (non-participants) counterparts for the avocado growers are distributed throughout the study area, very close to the avocado growers. The FGDs are also distributed so that they cover most of the study area and cluster locations. An exception to this is the middle of the study area along the Amala river, but which was included in the household surveys. As the markets chosen for survey were those visited by the household study population, these are also naturally situated across the study area.

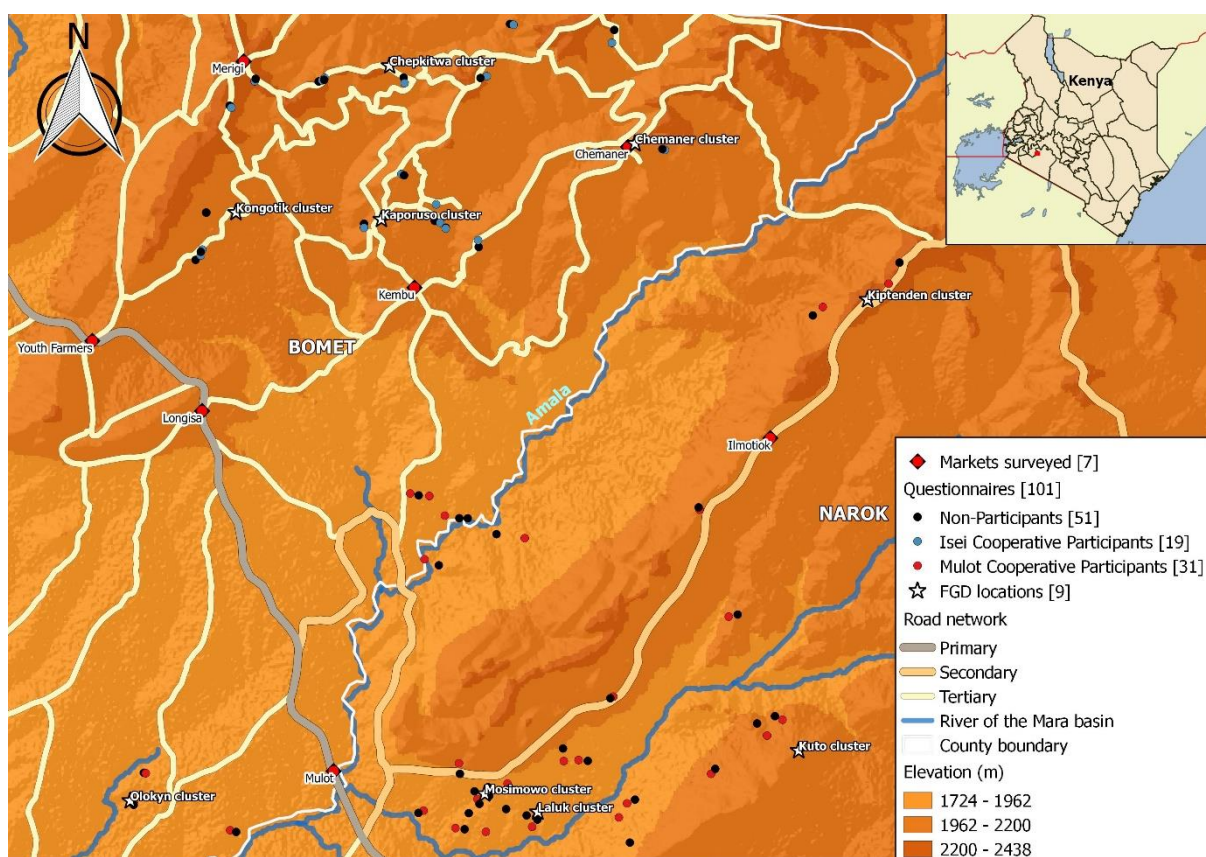


Figure 17, Distribution of data collection points for market surveys, household questionnaires and FGDs.

4.4 Data analysis and presentation

Quantitative data from the household survey were explored and analysed using Microsoft Excel data analysis and exploration tools as well as the Statistical Package for Social Sciences software (IBM SPSS Statistics 24) for statistical analysis. Where appropriate, results are presented in tables and graphs.

Transcribed qualitative data from the FGDs and interviews were coded using NVivo 11 software and analysed. The data is mostly presented textually per topic, integrated with paragraphs also discussing related quantitative data.

4.5 Reflection

4.5.1 Data quality and limitations

Some challenges and quality concerns to the data need to be mentioned. The first one concerns the data distribution of the household survey. The fact that each export avocado grower in effect chooses his/her counterpart for the control group, even when handing a list of option that the enumerator then chooses randomly from, introduced a bias into the data distribution. Although this ensures equal spatial coverage between the control group and the avocado growers, it cannot be known exactly on what grounds the export avocado growers have listed non-growers and how this affects the data.

The second one concerns the market surveys. These were extremely challenging to conduct. Market vendors are busy people with little time to spare on seemingly trivial questions. Often, some reward is expected in return for their time. In terms of data quality, the most concerning part is that there are many reasons to suspect that the price information given to the surveyors is unreliable. This is because of a large recall period (aiming for a year-round understanding) and likely because of the presence of the author as a foreign (white) researcher, prompting the vendors to report high prices in the hope of a good sell. The irony is that when the local enumerators or translators attempted the survey alone, they were turned down more often or given shorter and more superficial answers than when the author is present. Prices information given by market vendors should be taken as indicative only. Finally, only a few of the vendors were able to give more detailed information on market changes, which might generally reflect a poor level of market information among vendors.

The third concern regards the FGD data. The FGDs were organized on a day when the clusters were to meet with the Songoroi extensionist to discuss issues relating harvest and payments. All FGDs except for one were conducted first before these meetings with the Songoroi staff not present to minimise bias and let the farmers speak freely. Despite all of the practical benefits of organising the FGDs in unison with meetings involving Songoroi, the context alone elicits certain topics and issues to be emphasized even if Songoroi staff is not in the room when the FGDs are being conducted. It is, however, likely that these issues would have been raised anyway, as harvesting season was near, and the participants were eager to get the income from avocado after expensive months. The comparison of the FGD results, easily inflated due to contextual reasons, with the questionnaire data mitigated the over-emphasis of some issues to some extent.

Fourth, this research measured HDDS data only once in the 12-month agricultural cycle. Luckily, the research period coincides with the end of the “hunger months” during which the most rudimentary diet is visible as well as any lacks in the consumption of important food groups. Optimally another measurement would have been conducted later the same year during more well-faring

months for comparison but as the research period could not be extended to cover these seasons, specific dietary improvements will have to be assessed based on the projections from the qualitative data.

Lastly, not all listed stakeholders could be reached even for just one interview, despite the effort to try to arrange this. Important meetings and interviews that could not be arranged within the time frame include those with the HCD and the Narok county government.

4.5.2 Positionality and relations

There were unexpected and expected aspects regarding the author's role in the field. Locally, being the only foreigner and Caucasian sets one in a high profile in rural Kenya. Special relationships and favours are often expected which the author cannot or is unwilling to provide. There was a conscious effort to spend no more time in public places than is necessary, which reinforces a certain liminal position. This is also emphasized by a clear language barrier in this region as the author does not speak Kalenjin, and most locals don't speak a lot of English.

With local key informants and colleagues however, cooperation was pleasant. Applying the proposed methodology would have been unfeasible given the time period and has only been possible thanks to fruitful cooperation with the local internship supervisor and the employed enumerators helping to gather data. Where a more individual research period was expected, the experience was in practice a team effort which involved more (data) management and coordination instead of direct interaction with locals. These skills are necessary to operate in areas where language and cultural barriers, like the ones mention above, are considerable and cannot be expected to bridge sufficiently within a limited time period.

5.0 Local food availability and accessibility

This chapter addresses the first two sub-questions focusing on the food availability and accessibility impacts of export-oriented avocado farming on the local level of the study area. In order to do so, this chapter refers mostly to data obtained from the market surveys, and to a complementary degree to data from the household survey, FGD's, unstructured interviews and own observations made during research.

5.1 Food availability and accessibility on local markets and outlets

As depicted in the conceptual model, this thesis considers food to be mainly available to the smallholder farmers through purchase or own produce. The importance of these in relation to other possible means of acquiring food (exchange, borrowing, etc.) can be seen in Figure 18, confirming that food is mainly made available through purchase and own production. The availability of purchased products is discussed below, and the availability of self-produced food is discussed on a household level in the next chapter.

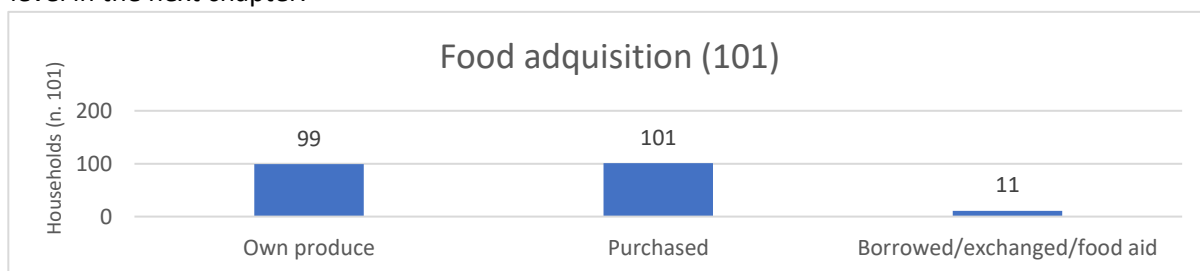


Figure 18, Primary ways of acquiring food in the study area.

As can be seen in Figure 18, the different outlets for purchased food are of immense importance for food availability in the study area as all interviewed households rely on purchased food in addition to their own produce. Food can be bought from market places, shops and at times from neighbouring farmers. The importance of these sources for purchased food to smallholder household interviewed during the survey are shown in Figure 19, according to which markets are the most important source for food purchase.

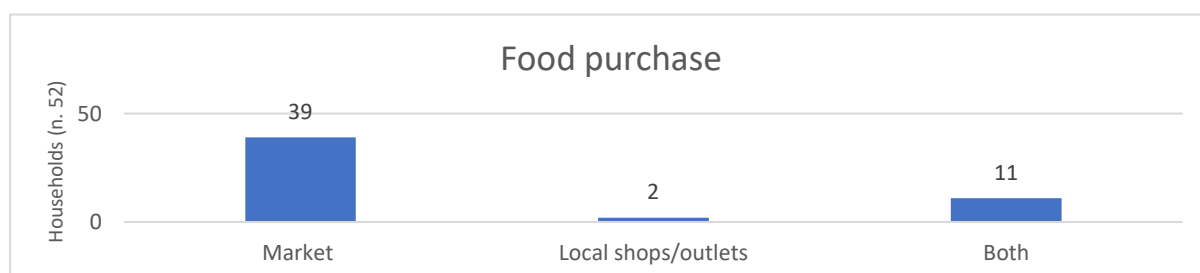


Figure 19, Use of outlets for food purchase that smallholder households rely upon in the study area (question answered by 52 households).

The availability of different foods on local markets is informed by the market surveys. Most of these food products are fresh foods, originating from local farms (within the study area) or elsewhere in the region, which were sold at the market places on market days, occurring twice a week at each location. The informants interviewed during these surveys were local farmers selling their own produce or vendors sourcing from local farms, brokers or other nearby and better supplied markets. In some cases, vendors were non-local, settling at larger markets such as Mulot, as was the case for mango and avocado vendors from Western Kenya. Brokers themselves were in most cases hard to find or unwilling to talk, except for maize brokers who often were willing to share information and were present at every market. Table 9 provides an overview of the food products available in the study area, as well as their origin and pricing throughout the year.

Table 9, The origin and pricing of food products sold on markets in the study area. Rainfall data from Climate-Data.org (2018).

FAO food group	Produce	Origin (in order of importance)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Cereals	Millet	Uganda and local												
	Wheat	Narok (lowland)												
	Sorghum	Local												
	Maize	Western Kenya, Uganda and local												
2. White roots and tubers	Potato	Local												
	Sweet potato	Local												
3. Vitamin A rich vegetables and tubers	Pumpkin	Local												
	Butternut	Local												
	Carrot	Local												
	Beet root	Local												
4. Dark green leafy vegetables	Indigenous green, Isageg	Local												
	Indigenous green, Chelwanda	Local												
	Indigenous green, Nderemyat	Local												
	Indigenous green, Managu	Local												
	Kale	Local												
	Spinach	Local												
5. Other vegetables	Tomato	Narok (lowland)												
	Red onion	Local, and Narok (lowland)												
	Cabbage	Local												
	Hot pepper	Local												
	Obergine	Local												
	Spring onions	Local and Narok (highlands)												
	Garlic	Local												
6. Vitamin A rich fruits	Mango	Eastern and Western Kenya and Uganda												
	Papaya	Local												
7. Other fruits	Tree tomato	Local												
	Passion fruit	Local												
	Lime	Local												
	Green pepper	Local												
	Pineapple	Western Kenya												
	Guava	Local												
	Banana	Local and Western Kenya												
	Oranges	Uganda and local												
	Avocado	Local and Western Kenya												
9. Flesh meats	Chicken	Local												
11. Fish	Dried fish	Western Kenya												
12. Legumes, nuts and seeds	Peas	Local												
	Bean, Rose Coco	Local and Narok (highland)												
	Bean, Chepiriroik	Local												
	Bean, Mutamanya	Local												
	Bean, Cheptolelio	Local												
15. Sweets	Sugar cane	Western Kenya												
16. Spices, condiments, beverages	Ginger	Local												
Average rainfall (mm) between 1982-2012			77	91	139	221	147	80	54	72	69	72	119	106
Pricing					Price peak				Intermediate prices				Price low	

The information in Table 9 is consolidated from the 7 different market surveys, combining as much information for each food product as possible to provide an overview of food sources and pricing.

Almost all the FAO food groups (Kennedy et al. 2011) are represented in the local markets of the study area. The vast majority of fruits, vegetables and legumes sold on the markets are produced locally. In March-May however (data collection period), most of the cereals come from Western Kenya and even Uganda. Regions west of the study also appear important as suppliers of dried fish, sugar cane and fruits, including avocado during this period. The normal seasonality of pricing probed for during the survey and depicted in Table 8 is almost invariably a result of local rain-dependent production seasons according to the informants. Therefore, for example, West Kenyan avocados (maturing earlier in the year) can be sold in the Upper Mara River Basin for a good price before local avocados start maturing in the end of April and flooding the local markets. Mango, on the other hand, is not produced locally and its price is unaffected by local production seasonality. The different seasons of the Western and Eastern Kenyan mango suppliers complement each other, keeping prices in the study area balanced. Other foods that retain a relatively stable pricing are those that have continuous production (garlic, lime or hot pepper) or more than 2 seasons in a year (potato and cabbage for example).

Table 9 shows that prices are highest for most food products from January to March, which is related to the dry period before the so-called long rains starting in March-April. For this reason, this three-month period constitutes the “hunger months” and was identified as the most difficult period of the year by all FGDs. However, according to the pricing/availability information provided by market vendors, no food product was found to be completely

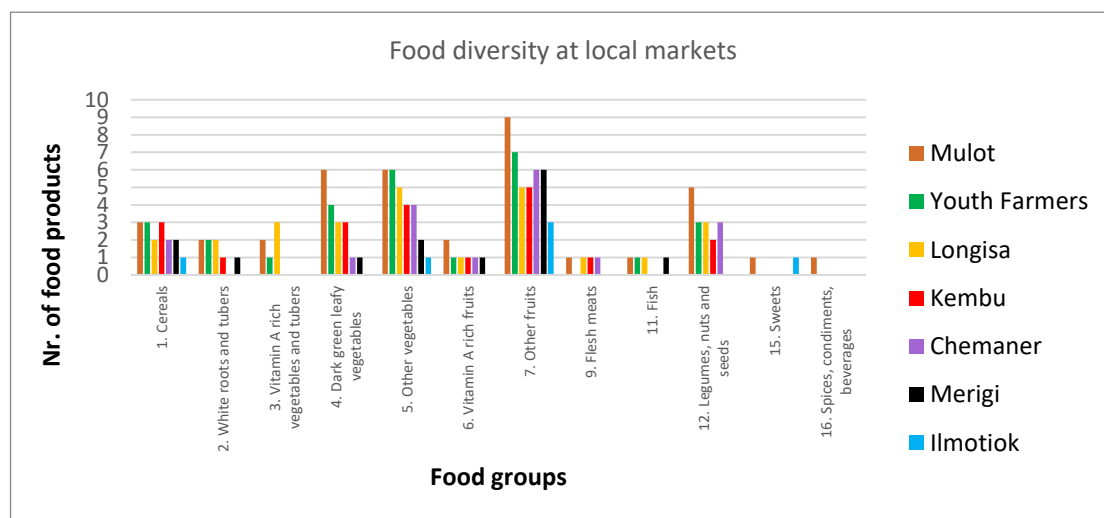


Figure 20, Food diversity at local markets in the study area.

unavailable at any point of the year in the study area as a whole, as regional sources fill in gaps left by local production. Nevertheless, individual markets do have a differing degree of availability, as can be seen in Figure 20. The highest diversity of foods is found at Mulot market followed by Youth Farmers, which are situated right on the primary road connecting Nairobi with Western Kenya (see Figure 17 in the previous chapter), and which are the largest markets in the study area. As can be seen in Figure 17, Merigi, Chemaner and especially Longisa and Kemu markets are situated within a fairly developed road network in Bomet county, facilitating supplier access to the market which affords an intermediate degree of food diversity. Still, the tertiary gravel road network is prone to seasonal damage by rains that affect market availability, as pointed out by vendors at Merigi market, where for beans were temporarily out of supply. Lastly, Ilmotiok market stands out as being isolated from the easier access enjoyed by other markets, and only a few different foods available for purchase.

Food is also sold at these locations in shops and kiosks on a daily basis, although with a more restricted selection. These outlets were not consistently included in the market surveys and the information regarding the availability of food at these outlets is mostly based on unstructured collection of local information and own observations made opportunistically when exploring the study area. Nevertheless, these outlets merit attention here as that sell many of the important food products not sold by market vendors, which account for some of the food groups not provided by market vendors, such as organ meat (food group nr. 8), eggs (10.), milk and milk products (13.) and oils and fats (14.). These important outlets have been listed in Table 11.

Table 11, Availability of food at other food outlets.

Outlet	Description
Kiosks/small shops	Small shops usually situated in village centres (where markets are held) but occasionally along the road or at important crossings. They sell sugar, tea, rice, wheat and maize flour, cookies, sweets, vegetable fat and oil, spices and seasonings, as well as some seasonally available fruits and vegetables. Eggs and sometimes milk are also sold when availability (wetter seasons) is high.
Super markets	Only two of these have been observed, both in Mulot. These sell a wider selection of the products also sold by kiosks, except for fruits and vegetables which have not been observed in their selection.
Butchers	These mainly sell beef, goat and their organs (chicken are sold live by different types of vendors on market days). Prices and availability of meat are usually stable year-round but can be affected by drought as lack of fodder leads to the selling and butchering of livestock and a consequent lowering of meat prices.
Neighbouring farmers	Neighbouring farmers are also a common source for food. Milk is especially important in this regard, as the freshest milk is often obtained close by right after milking.
Tea houses and eateries	Locally referred to as "hotels", tea houses, like shops, are found commonly throughout the study area serving chai (tea boiled in milk) and ndazi (deep-fried wheat pastry). Eateries are usually found closer to village centres serving local staple food, such as maize pudding (ugali) vegetable stew with kale (sukumawiki) or local greens, and the occasional beef stew.

Many of the products provided by these outlets that are not otherwise provided at markets are in some way or another processed (sugar, tea, oils etc.). The availability and pricing of these products is relatively stable as it is not linked to local production seasonality, but more to packhouses and providers based in the larger cities. However, the availability of these products is again unevenly distributed. In Ilmotiok many of the outlets, including butcheries, were not found operational, whereas in other areas these outlets were present and functioning. Locals informed that at the time of the survey Ilmotiok market was unusually silent. Also, the only road connection to Mulot (which, having supermarkets, had the widest variety of these products) was being repaired at the time, complicating mobility.

5.2 Changes to food availability and accessibility on local markets and food outlets, and the impact of export-avocado farming

Market vendors were asked an open question about changes they had experienced in the past five years in the supply and pricing of the foods they sold. The most significant changes mentioned at the markets for any product are listed in table 12.

Table 12, Important changes affecting local food availability in the recent 5 years and future expectations.

Issue	Description
Drought	The area has been affected by a serious drought, especially during 2015-2017, increasing maize prices. This has been felt most heavily with the cereal crops, increasing dependency on imports even when cereals would normally be in season locally. During the interviews however, hopes for better rains in 2018 made vendors expect more favourable availability and pricing of local cereals, especially maize and millet.
Disease	White Flies and Maize Lethal Necrose Disease have further affected the production and availability of maize, potato and beans. The recent introduction of disease resistant Monsanto DK 777 maize further promised improvements of the local maize supply in 2018, which would decrease prices.
Seedling potatoes	Quality seed potatoes are scarce, and many of the potatoes found on the markets were undersized and replicated from old seeds. To this issue there was no foreseeable change in sight.
Increasing demand for certain fruits and vegetables	Fruit and vegetables vendors often expressed optimism as demand for their product was increasing. This included oranges, mangoes and avocado, but also lime, hot and green pepper. Many farmers were therefore starting to grow these to sell on the market.
Importance of institutions as bulk buyers	Increasing demand for staples (cereals, leafy greens, cabbages etc.) was partially introduced by both local and regional schools and hospitals coming to buy food in the study area both at the market and at farm gates.

The above information explains some of the data provided earlier, such as the prevalence of cereals from outside region on local markets (table 9) and perhaps also the general high diversity of fruits and vegetables (Figure 20). However, the introduction export-oriented avocado has gone unmentioned by most vendors as an important change. In beginning May, however, some rejects from grafted Hass-avocados (rejected from export for small size or damage) were being sold at Merigi, Chemaner and Kembu markets in small quantities. These

were sold at double the price of local varieties or those from Western Kenya and were said to be in high demand for their superior taste. One vendor from Merigi market said grafted avocado rejects were pushing down the price of other varieties, but this was contested by other vendors from the other markets, seeing no relation between the differentiated pricing. A vendor from Chemaner said local avocados were priced low as this made them attractive to bulk buyers from Nairobi, whereas grafted rejects were more likely to sell locally in small quantities. High demand for Western Kenyan avocados from Nairobi was also mentioned by avocado vendors at Mulot market, who even worried whether any would be left for local consumers. If it is true that these few grafted rejects are pushing down the price of other varieties, this would mean these varieties would become more accessible to consumers. This could potentially improve simple diets of consumers, but at the expense of the income of traditional avocado growers. There is, however, currently not a sufficient amount of evidence to suggest this is happening.

The views provided by market vendors (Table 13) have been confirmed and complemented by unstructured interviews, adding that the increased demand for vegetables and fruits was a longer-term trend tied to regional demand, which has seen increases in Nairobi brokers and institutions sourcing food from the study area⁵. Taking into account regional exports from the study area is important when looking at local food availability and accessibility, since these exports help smallholders afford important foods from other areas, such as cereals. Important exports and their trends are listed in table 13, based on market survey data and unstructured interviews.

Table 13, Important regional and international exports from the study area.

Crop	Main destination(s)	Trend
Cabbage	Nairobi	Growing demand and production, important staple sold in bulk to institutions and brokers.
Spring onion	Nairobi	Growing demand and production, sold in bulk to brokers.
Fresh maize	Nairobi	Important pre-main harvest cash crop, common grilled street food in larger cities
Green pepper (capsicum)	Nairobi	Increasing demand, both locally and in the city
Tomatoes	Nairobi	Increasing demand, both locally and in the city. One of the only cash crops for the Narok lowlands.
Potatoes	National markets, Tanzania	Production stalling due to disease and lack of seed potato, but Bomet/Narok highlands is still the main Kenyan production area.
Indigenous dark green vegetables	Nairobi	Increasing demand especially by institutions.

⁵ Interview, Agronomist, Ministry of Agriculture Mulot office

Green beans	International export	Mainly in Narok (Songoroi/Mara Farming), not wide-spread cultivate in the study area.
Sorghum	International export	Small, unimportant quantities.
Tea	National markets and international export	Continues to be an important cash generating a small stream of continuous income for smallholder farmers, but only in the Bomet highlands.

Crops such as cabbage, green pepper and tomato have been introduced in the past 30 years and are gaining popularity locally, showing that local and regional tastes are linked. Grafted avocado is also mentioned in this sense in unstructured interviews and by market vendors but constitutes a case where an introduced crop can quickly gain local popularity as well regional demand. This shows that new fruits and vegetable introductions can impact local nutrition security by adding variety to the local food supply and demand for these foods.

An important difference lies between avocado and the other fruit and vegetable cash crops. Many of these crops, such as spring onions and potatoes, can potentially be planted and harvested multiple times a year, which exhausts the soils if crops are not rotated often enough. With small land sizes complicating crop rotation and a need for income, smallholders are pressured to do so despite the consequences, which is an important concern brought forward in interviews⁶. Avocado as a tree crop is in this sense seen as a sustainable alternative for soil conservation and income generation. This is an important point for longer term food availability and accessibility, especially when considering their sustainability.

5.3 Summary and Conclusions

To conclude, the information provided in this chapter gives an overview of locally available foods that are both produced locally and imported from other regions as informed by the market surveys. The availability of purchasable food in the study area is prone to seasonal fluctuations based on local production cycles, which in turn affect pricing and therefore food accessibility. Prices for most foods hike during the dry season, between January and March. The availability of food also differs from market to market, where this difference is arguably influenced by centrality within the existing road network, which to a far extent determines access to farms and outside suppliers and buyers. In addition to local production seasonality, the importance of infrastructure to food availability and accessibility is therefore highlighted in this analysis.

Looking at purchasable food outlets on the scale of the study area offers no clear sign of an immediate impact as a result of export-avocado farming on food availability and

⁶ Interviews, Agronomist, official for the MoA Mulot office and Director of Mara River Water Association

accessibility. It is unlikely that rejects alone would significantly improve the availability of avocado locally, and therefore overall FNS, even if export-oriented production increased. It is also possible that since the production of export-oriented avocados is still limited, it is premature to expect visible signs of impact on the local level, except that of a strong demand for grafted avocados for local consumption. On a longer term however, avocado might prove a significant, more sustainable cash crop with positive environmental externalities.

This chapter has outlined the food security context shared by smallholders in the study area. In the next chapter, the impact of export-oriented avocado on food availability and accessibility considered further on a household level.

6.0 Impacts of export-oriented avocado farming on smallholder FNS on a household level

This chapter aims to answer the third sub-question. Whereas the previous chapter focussed on the availability and access dimensions on the local level of the study area, this chapter will focus on FNS a household level. Apart from continuing the examination of these dimension on a more detailed level, it will also consider the use or utilization dimension of food security and the diversity of the diet. The main sources for the data informing this chapter are the household survey and the FGDs.

6.1 Household food availability

As seen in the previous chapter, households rely mostly on food made available by local markets and their own produce. The latter will be focussed on here, looking for impacts through direct involvement in the export-avocado value chain on the farm's production system and the foods produced on it.

Outgrowing avocado for Songoroi can be expected to have had an impact on the production volume and diversity of other crops grown on the farm. While the household questionnaire did not ask to quantify production metrics for each crop (Figure 21), a nominal

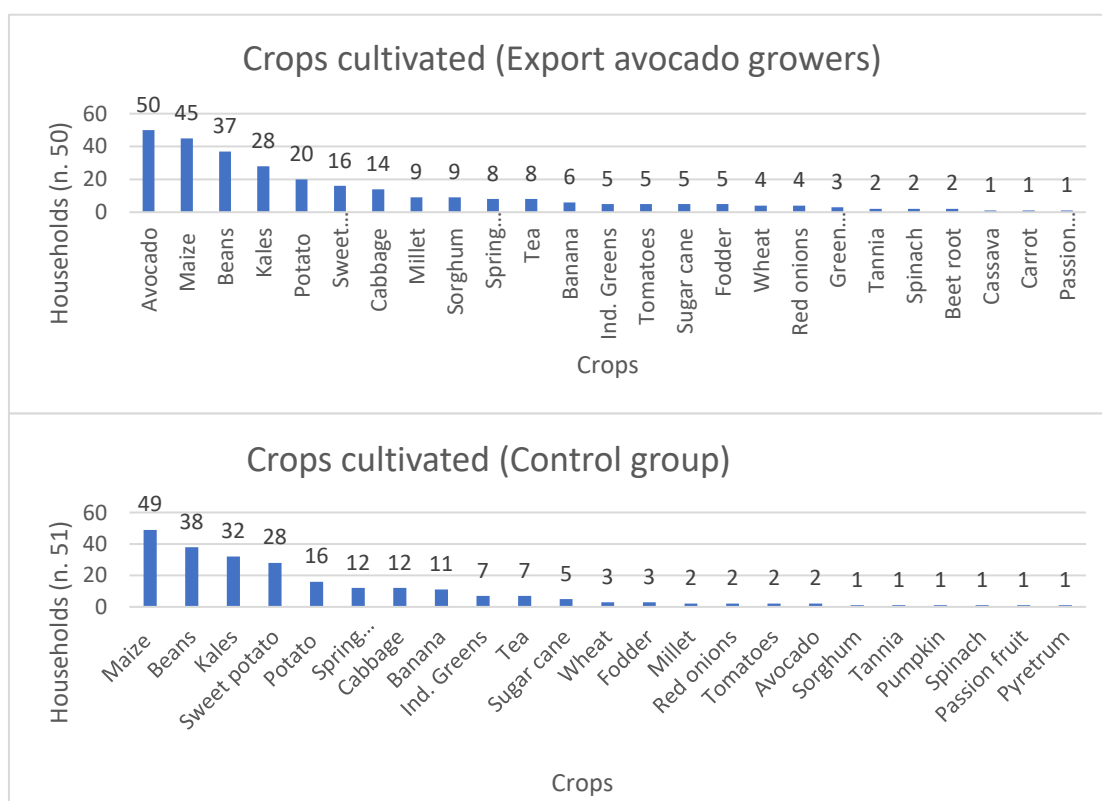


Figure 21, Crops produced by households in the study area.

comparison between what is grown by the export-avocado growers and the population can be made. As can be seen in this comparison, however, there are little significant differences in the commonality of crops grown by the two populations, other than that avocado is being grown by each export grower.

Two reasons can be given for this largely unaffected crop diversity. Firstly, many of the export avocado growers were still intercropping avocado with filler crops, which is done while the avocado trees are still small and haven't reached full productive age, many of which have been the same main staple crops farmers traditionally plant (maize, beans, potato, kale and sweet potato). Secondly, the export-avocado farmers generally have more farm land (Table 14). This is because of the selection of process for outgrowers, where land availability and tenure rights were essential. Older farmers fitted this profile more often than younger farmers because they had not subdivided their land and had more secure tenure⁷. More casual conversations with farmers revealed that older farmers also had more time to receive trainings and patience to wait for the avocado to mature. Land size correlates significantly with food crop diversity (although moderately, Pearson's r 0.32) and export-avocado growers have more food crops available on the farm. All in all, intercropping and larger land sizes thus likely obscure visible effects on the overall food crop diversity on the farm, other than the adoption of avocado growing itself.

Table 14, Land size and food crop diversity on smallholder farms in the study area.

Group	Average age of household head	Average land size (acres)	Average number of food crops	Average number of food groups available on farm
Isei	53.1	4.6	5.6	4.4
Mulot	55.2	6.9	5.7	4.0
Control Isei	44.7	2.2	4.7	3.6
Control Mulot	41.1	3.8	4.5	3.3

All comparisons of means statistically significant (ANOVA, <0.05)

Although data from the household survey doesn't show a significant impact on food availability in terms diversity on the farm, qualitative data from FGDs mentions some explicit impacts. The more direct ones that affect food availability on the farm have to do with the intercropping regime and standards imposed by Songoroi for export farming. Intercropping has been allowed and even recommended by Songoroi. during the first 3-4 non-productive years of the avocado trees, so farmers would not lose income. However, no chemical

⁷ Interview, Extentionist for Songoroi Ltd.

pesticides and fertilizers can be used on the crops in the avocado orchards, because of standard and quality concerns and Songoroi’s plans for organic certification in the future. Five of the nine FGDs, both in the lower and upper zones, say that this has negatively affected crops that would be intercropped with avocado, as many pests and disease are around. Two of the upper zone FGDs also revealed that where avocado trees had matured to the extent that would no longer permit intercropping, the impacts were felt on crop diversity also, especially those providing income more than once a year (potato for example).

Both the inability to use chemical pesticides and fertilizers, as well as the eventual inability to intercrop at all would also explain why maize, potato and beans has become less important as an income generating crop among the avocado growers than compared to the

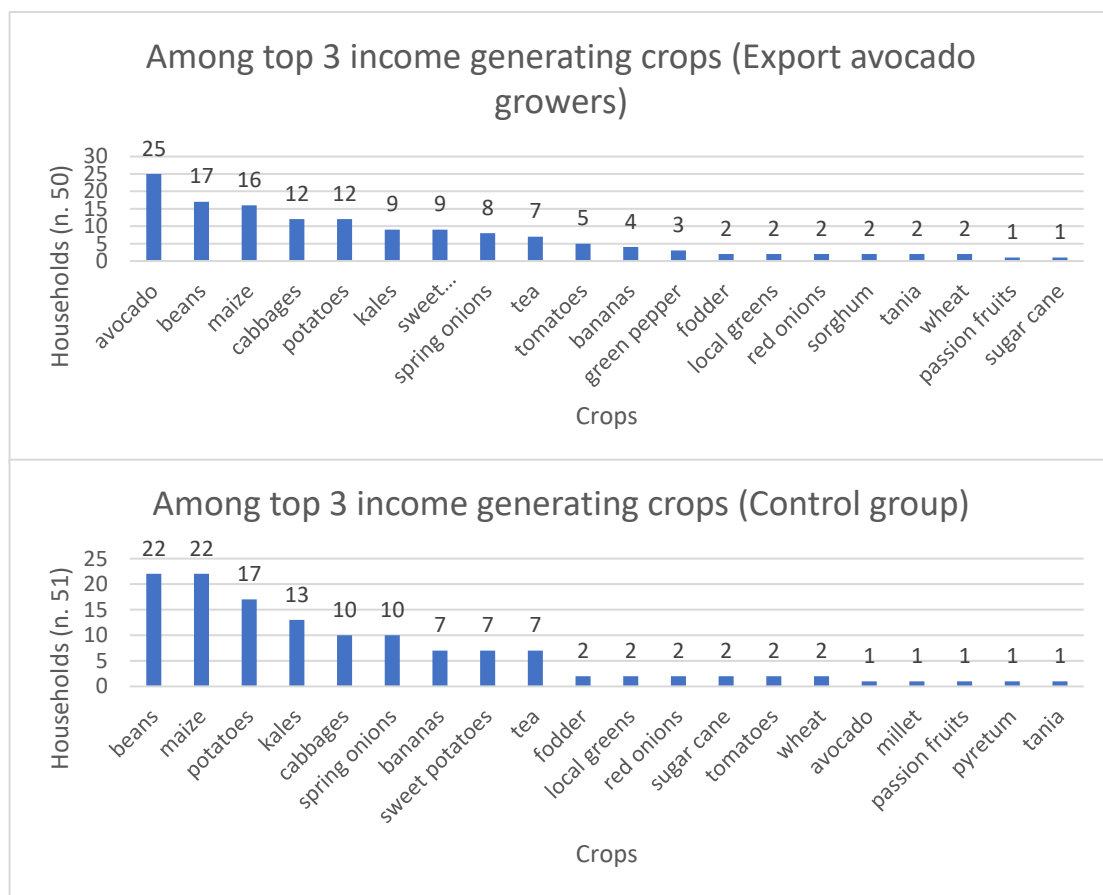


Figure 22, Number of times a crop was mentioned in the top 3 income generating crops by the smallholder households.

control group, as can be seen in Figure 22. The only common intercropping crop option that is not less important (and even slightly more important) among avocado growers is sweet potato. This according to Songoroi⁸ as well as one of the enumerators (extensionist by training) is also the only one of these crops that is not affected by diseases and needs no chemical fertilizers or pesticides. Although income information is perhaps more relevant to

⁸ Interview, Extensionist for Songoroi Ltd.

the next section (food access and income), it might be an important proxy to production quantities (and therefore food availability on the farm) for which exact information is currently lacking, and which links well with quantitative information.

To conclude, it would seem that apart from increasing the availability of avocado itself, export-avocado growing is negatively affecting the availability of other food crops on a farm level, both in quantity and diversity. This is especially harmful now, as the cultivation of important local crops, already tested by pests, drought and disease, are downplayed to optimize avocado growing. In the future, as avocado trees mature, food crop diversity can be expected to decrease on the farms of export-avocado growers as intercropping is no longer possible. By then, avocado production might provide enough income to afford a sufficient and stable diet in the households through purchase. This consideration falls into the dimension of household food access, considered further in the next section.

6.2 Household food access

Household food access is examined here first and foremost through income. This is because all households rely on purchased food and because income is the main factor which is believed to make a difference for household FNS by the project interventions. Additionally, the distance and travel to markets is taken into account, as are rights to access the produce grown on the farm.

6.2.1 Income

The household questionnaire asked to list income from different sources in the past 12 months, including that made from avocado, which is listed in Table 15.

Table 15, Income from smallholder production systems and avocado.

Group	Average total annual income per farmer (Ksh)	Total average income from crops per farmer (Ksh)*	Average income per farmer from crops per acre (Ksh)**	Average number of avocado trees per farmer*	Average income per avocado tree (Ksh)**
Isei	283758	110084	23931	56.3	275
Mulot	108055	32374	4692	33.4	178
Control Isei	263591	89725	40784	0.5	1800
Control Mulot	164266	22945	6038	0.0	-
*Comparison on means statistically significant (ANOVA, <0.05)					
**Calculated based on statistically significant means					

At a first glance, the differences between agroecological zones is highlighted by this data. Despite generally smaller land sizes, the upper zone is more productive and has better

drained soils and more rainfall, which favours important income generating crops such as cabbage, spring onions and potato. Drained soils and an adequate water supply are also important for avocado, which also are more productive in the upper zone. In addition to the drought and hailstorms affecting avocado growth in both zones, qualitative data from the household questionnaires, unstructured interviews⁹ and FGDs (Laluk and Kuto clusters) point to problems regarding poor drainage and salty water in the lower zone, leading to a higher mortality rate of seedlings than in the upper zone. Problems in the lower zone have been so severe that 26% of the export avocado growers from Mulot cooperative reported no income at all from avocado, compared to 11% with Isei cooperative. This might also be reflected in the total income of export avocado growers for Mulot cooperative being lower than that of the control group, although this comparison is statistically non-significant.

The data presented leaves much to hope for from the income generating capabilities of the production systems with avocado. Although both export avocado growing groups do earn more from crops compared to the control groups, they make less income per acre than the control group. It is possible that this is partly because of the intercropping related reasons mentioned in the previous section valid for both agroecological zones, and because the control groups have had more maize available (better protected from pests and disease) to sell at good prices increased by recent shortages. Some of the blame goes to problems concerning avocado alone, however. When a further comparison of the average income made from avocados per farmer in 2017 (9935 Ksh) with what was expected for the first harvest in 2016 (14225 Ksh) is made (Fair and Sustainable 2015, 23), it becomes evident that avocado has been underperforming. However, this low average is not only because of low production due to drought and hailstorms, but also because of late payments (reported in all FGDs) and low pricing (eight out of nine FGDs). These problems along the value chain have caused farmers in four out of nine clusters sell to brokers who offer a better price with two other clusters having expressed an interest to do so.

A closer look at the relative importance of income sources gives a better understanding of the role of avocado within the total annual income made by smallholder farmers. This is depicted in Figure 23. Among export avocado farmers growing for both Isei and Mulot cooperatives, avocado makes up 5.5% the total income made. This is 14% and 18% respectively of the income made from crops. This shows that despite lower production in the lower zone, avocado has become economically more important to growers there (Mulot) than in the upper zone (Isei). The control groups rely more on wage and especially formal

⁹ Interview, Extensionist for Songoroi Ltd.

employment, which makes sense as the household heads are in better working age and the land sizes do not afford a sufficient income. This has been well said by a member of the Olokyn FGD group,

“There is no other way that those communities and villages can earn income than with avocado. Unless he or she is doing a formal job”.

This quote also underlines the hope that is invested in avocado growing, despite some of the pessimistic numbers for current circumstance presented above. In fact, a promising future for avocado was expressed in six out of nine FGDs. This is mostly because farmers have seen the yields improve and trees grow, despite the drought. This is also visible in data shared by Songoroi¹⁰ in Table 16, showing that the average income from avocado per farmer almost tripled within a year. It is unlikely this is explained by the increase of production and price¹¹ alone. Songoroi suspects that almost 50% of the avocados were sold to brokers in 2017¹². The average income from avocado per farmer based on the household survey would in this case make sense, as this asked for income made from selling to any party, and because farmers admitted selling to brokers.

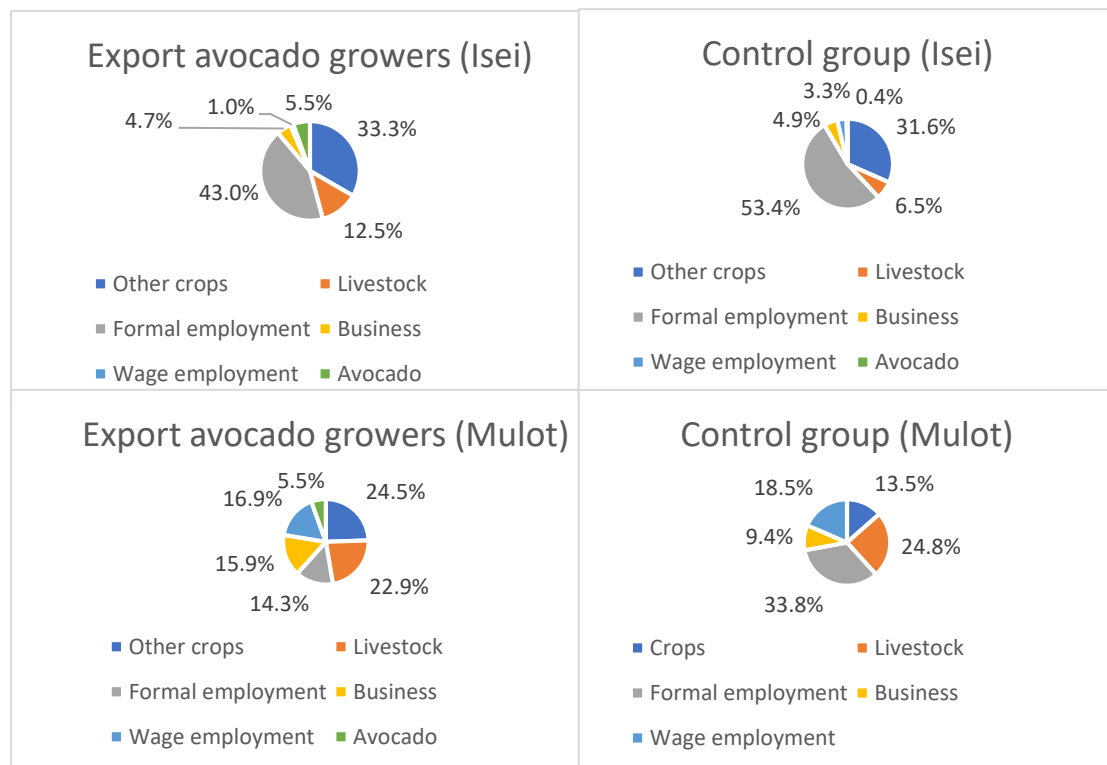


Figure 23, Proportional importance of different income sources for smallholder farmers.

¹⁰ Interview, Extensionist for Songoroi Ltd.

¹¹ Assuming the number of farmers selling to Songoroi stayed the same, the average net income per farmer would have been 7491 Ksh and 3673 Ksh for Isei and Mulot members respectively.

¹² Interview, Extensionist for Songoroi Ltd.

Table 16, Avocado production and sales to Songoroi Ltd.

Year	Cooperative	Total production sold to Songoroi (Kg)	Price (Ksh)	Total paid (Ksh)	Average net avocado income/farmer (Ksh)
2016	Isei	18250	28	510986	5494
	Mulot	7301	28	204442	2130
2017	Isei	20057	35	696674	15511*
	Mulot	10052	35	352569	5937*

*The number of farmers Songoroi paid to in 2017 is missing, for which this average is based on the income from avocado farming reported in the household survey

Since the drought has ended and rains are good, hopes are high for a good harvest in 2018. Also, Songoroi has further increased prices from 35 Ksh (average Ksh/Kg payed in 2017) per kilogram to 48 (partly in response to competition from brokers and other buyers) and promised to pay advances. If the grafted varieties will at any point be as productive as the older trees of traditional varieties held by two of the control group members in the highlands (Table 15), export avocado growers can be expected to significantly increase their incomes per acre. It also merits mentioning that the research team, as well as export avocado growing farmers, have often been approached by other farmers in hope of acquiring grafted seedlings, reflecting the reputation of success that grafted avocado has built in the region.

In conclusion, there is no evidence that avocado has yet improved food access through income, and it is even likely that through adopting export avocado farming, food access through income has been worse in comparison to the control groups during the time that avocado trees have been approaching productive age. This is also likely to change in the near future in favour to the export avocado growers, as both production and prices are increasing.

6.2.2 Household access to the market

Food access is also about the facility of access to the source of food. As can be seen in Table 17, the distance to the closest market is shorter in the upper zone (Isei). This because there are more markets in that area and the road network is denser (Figure 17).

Table 17, Travel distance to local markets.

Group	Average distance to closest market (Km)
Isei	3.0
Mulot	5.6
Control Isei	3.2
Control Mulot	5.2

Comparison of means statistically significant (ANOVA, <0.05)

One might expect differences between the zones in terms of how the ease of access is experienced based on differences in income and distance to market. Surprisingly, the data shows little differences (Figure 24) between how market access is experienced and how markets are travelled to. In both zones, the vast majority of households makes use of a vehicle at least at some point, which implies costs. Therefore, travel access is linked to income access. Since the patterns observed between the zones in Figure 24 are so similar, it is hard to use the upper zone as a reference point to the lower to evaluate how income from avocado growing might improve market access in the lower zone, or at least the experience thereof.

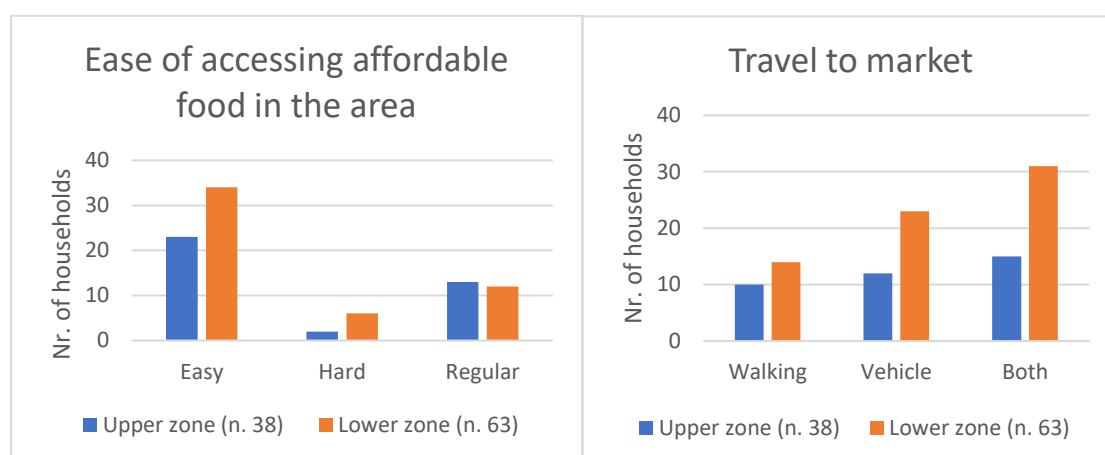


Figure 24, Accessing markets in the upper and lower zones.

6.2.3 Accessing fruits on the farm

Although avocado is available on a farm because it is grown there, it is not necessarily directly accessible by the household. In principle, the avocados grown by the contract farmers are meant for the export market but in practice, access to the avocados on farm are not regulated other than by the farmers themselves. As another farmer from the Olokyn cluster puts it:

“I would like to eat avocado any and every day. Sometimes I would like to go to the farm and get some, but I’m afraid I would consume everything in the farm”.

Fruits are quite new to the area, especially the lower zone (including Olokyn), and that people prioritized every fruit for sale¹³. This attitude was confirmed during food oriented FGDs, where farmers in the lower zone (Mosimowo) would mainly access rejects, whereas farmers from the upper zone (Kaparuso) where avocado has been grown traditionally claimed more

¹³ Interview, Agronomist, official for the MoA Mulot office

freedom in accessing their avocados for everyday consumption when in season. All clusters said to both eat rejects or sell them locally. In some cases, dropped fruit were eaten by cows or dogs, but none were considered to go to waste. Songoroi estimated rejects only made up 5-10% of the harvest, and that as the trees matured and farmer became more skilled to prevent them, this percentage would drop¹⁴.

Access to fruits on the farm is thus highly dependent on the agency of the farmer, and that if farmers only eat rejects, access to avocado on the farm can be expected to drop in the future. As access to the export crop on the farm is dependent on farmer initiative and choice, it is also very relevant to the food use dimension. This is emphasized further in the next section.

6.3 Diet

This section looks at the sufficiency of the household diet in terms of frequency (meals per day) and diversity (HDDS) in order to evaluate how household FNS manifests on the plate. In order to evaluate how export avocado growing might impact how smallholder are eating, different factors in relation to the frequency of meals and HDDS need to be understood. This includes qualitative data related to the food use dimension.

6.3.1 Meals

Following Kennedy et al. (2011), collecting data for the HDDS entails recording food eaten during the three main meals, but also anything eaten in between, listed as snacks, with a 24h recall period. Figure 25 shows that virtually every household surveyed eats the three main meals a day during the hunger months, setting an average of 2.96 meals per day. Additionally, most households enjoy at least two snacks in between the meals. Shortly, food insecurity cannot be detected by looking at the frequency of meals eaten per day. Differences between groups are minimal and appear to be statistically insignificant.

¹⁴ Interview, Extensionist for Songoroi Ltd.

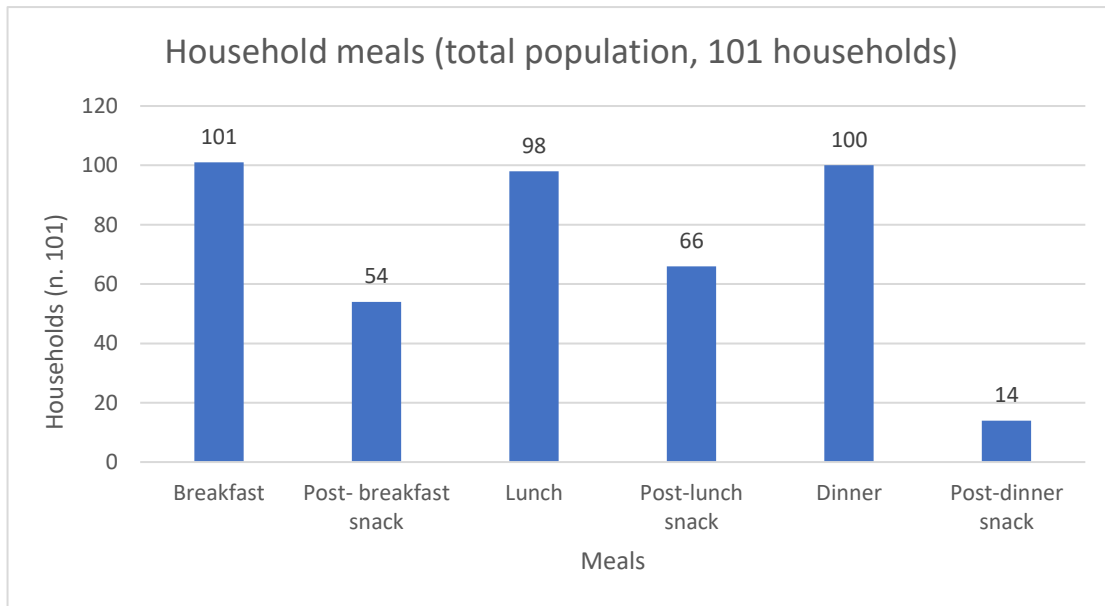


Figure 25, Meals consumed by smallholder households in the study area.

The baseline study for the Avocado case reported three averages for three communities in the lower zone, which are listed in Table 18. As the communities are not the same and the exact sample size of the groups listed in the report are unknown, a perfect comparison cannot be made. With averages as low as 2.25 for some communities, it seems there has been a slight, general improvement in the number of meals consumed per day.

Table 18, Consumption of three essential daily meals in 2012 and 2018 in the lower zone of the study area (Noble Consultants 2012, 57).

	Community	Mosimowo		Enelera		Amalo Mara	
	Group	Export avocado grower	Control	Export avocado grower	Control	Export avocado grower	Control
2012	Meals per day	2.8	2.67	3	3	2.64	2.25
2018	Group (lower zone)	Export avocado grower (Mulot cooperative)				Control group	
	Meals per day	2.97				2.94	

6.3.2 Dietary diversity

The ingredients present in the meals eaten by the households were divided into food groups, which in case of the HDDS consolidates fruit, vegetable and meat groups arriving to a total of 12 categories. The foods present in the diet of smallholder households has been listed in Figure 26. These show that six basic categories are present in the diet of practically every household. Eating *ugali* (maize pudding with kale stew including oils) and drinking *chai* (milk, tea and sugar), found to be eaten by almost every household in the same 24h period, would

achieve including these six categories into the diet, which in that case would arrive to a HDDS score of 6 for the household.

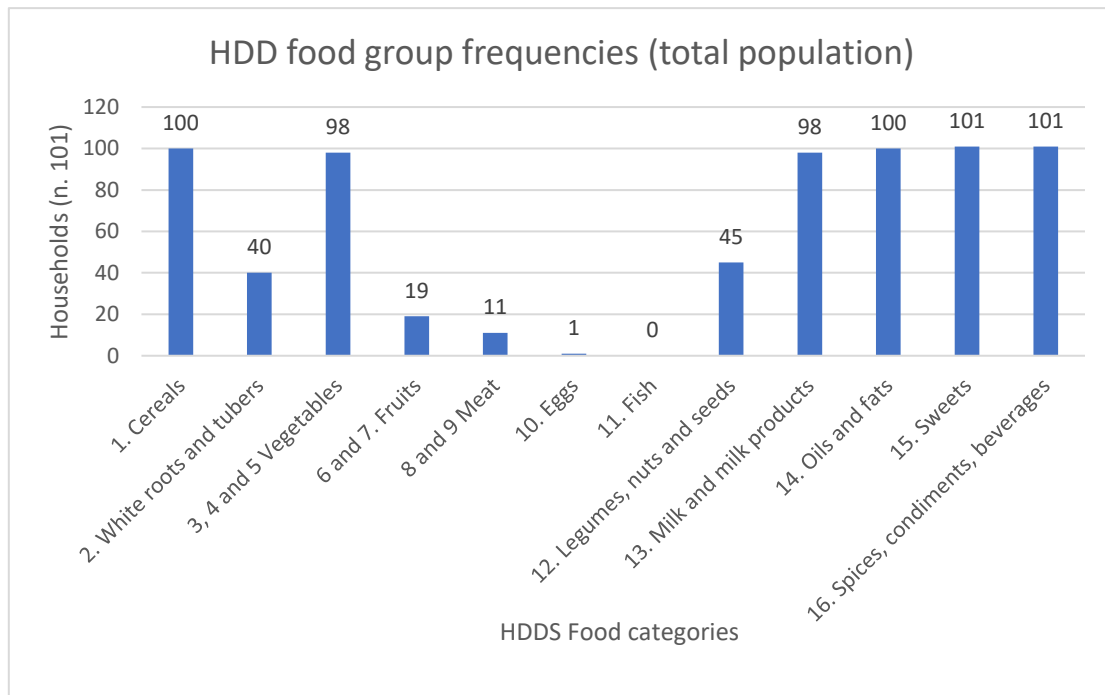


Figure 26, Food groups consumed by smallholder households in the study area.

As can be seen in Figure 27, the most common score is 7. This is because most households also eat potato, sweet potato (white tubers) or beans (legumes) on a daily basis and adding just one of these would increase the HDDS by one. Although the control groups seem to have a slightly higher (< 0.5) HDDS than the avocado growers, no statistically significant comparison could be made.

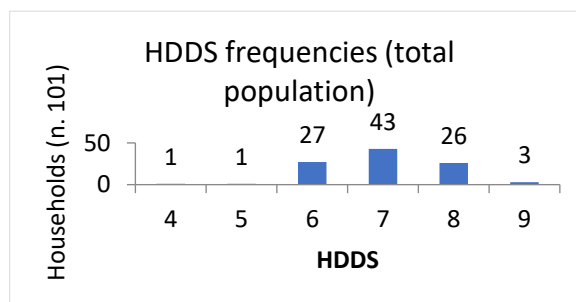


Figure 27, Frequency of HDDS among smallholder households in the study area.

It is evident that fruits and important protein groups (meats, eggs, fish) are rare in the daily diet, although they are available on the market at this time, as demonstrated by the previous chapter. Meats and fruits are often mentioned as coveted foods by household respondents (73% and 34% respectively¹⁵), which were found to be beyond the access of the household due to price and income related reasons (81% of the respondents¹⁶). Also, both food oriented FGDs agreed that those who had a better (more diverse) diet were those who had the income to afford it. Lacks in nutrition security would therefore appear to be related to food access, both from a pricing and an income point of view.

¹⁵ 91 households answered this question.

¹⁶ 70 households answered this question.

The relationship between HDDS and income, as well as other socio-economic variables was tested for statistical correlations, which are listed in Table 19. HDDS seems indeed to correlate

Table 19, Correlation between HDDS, nr. of meals consumed per day and socio-economic variables.

Correlations									
		Education level (1=Pri., 2=Sec., 3=Ter.)	Total annual income (Ksh)	Age of the household head (years)	HDDS	Nr. of meals per day	Distance from market for food purchase (Km)	On farm food group diversity	Total number of household members
Education level (1=Pri., 2=Sec., 3=Ter.)	Pearson Correlation	1	.438**	-0.155	.261**	0.035	-0.143	0.055	-0.006
	Sig. (2-tailed)		0.000	0.123	0.009	0.730	0.155	0.587	0.953
	N	101	101	101	101	101	101	101	101
Total annual income (Ksh)	Pearson Correlation	.438**	1	0.012	.216*	0.190	-0.183	0.092	0.131
	Sig. (2-tailed)	0.000		0.903	0.030	0.057	0.067	0.359	0.190
	N	101	101	101	101	101	101	101	101
Age of the household head (years)	Pearson Correlation	-0.155	0.012	1	-0.107	-0.095	-0.089	.218*	.228*
	Sig. (2-tailed)	0.123	0.903		0.285	0.346	0.375	0.029	0.022
	N	101	101	101	101	101	101	101	101
HDDS	Pearson Correlation	.261**	.216*	-0.107	1	.293**	-.205*	-0.101	-0.079
	Sig. (2-tailed)	0.009	0.030	0.285		0.003	0.039	0.317	0.435
	N	101	101	101	101	101	101	101	101
Nr. of meals per day	Pearson Correlation	0.035	0.190	-0.095	.293**	1	-0.034	0.093	-0.061
	Sig. (2-tailed)	0.730	0.057	0.346	0.003		0.735	0.353	0.545
	N	101	101	101	101	101	101	101	101
Distance from market for food purchase (Km)	Pearson Correlation	-0.143	-0.183	-0.089	-.205*	-0.034	1	0.008	0.141
	Sig. (2-tailed)	0.155	0.067	0.375	0.039	0.735		0.935	0.158
	N	101	101	101	101	101	101	101	101
On farm food group diversity	Pearson Correlation	0.055	0.092	.218*	-0.101	0.093	0.008	1	0.003
	Sig. (2-tailed)	0.587	0.359	0.029	0.317	0.353	0.935		0.973
	N	101	101	101	101	101	101	101	101
Total number of household members	Pearson Correlation	-0.006	0.131	.228*	-0.079	-0.061	0.141	0.003	1
	Sig. (2-tailed)	0.953	0.190	0.022	0.435	0.545	0.158	0.973	
	N	101	101	101	101	101	101	101	101

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

significantly with income as well as education, number of meals eaten per day and distance from the market. However, all these are correlations seem to be weak (< 0.3 Pearson's r). The strongest correlation can be found between education level and income, which both correlate with HDDS. A partial correlation test was run in order to test for spuriousness among the variables correlating with HDDS. This revealed that income did not correlate significantly with

HDDS independently from education level or distance to market. The stronger correlation between education level and income as well as the covariance between them invites to think that income improves dietary diversity only when informed by a higher education level.

To further explain the variance of HDDS using available variables, a linear regression was made in stepwise fashion. The only variables independent enough to be accepted into the final model (Model 2 in Table 20) were education level and the number of meals eaten per day. The others were rejected due to covariance and statistical insignificance. As said above, education level is likely to stand out as might guide the use of income and composition of a balanced diet, and the number of meals also matters as this increases the chance of consuming fruit or sweet potato as a snack aside the standard staple meals. Even then, these two variables only explain 0.131 (Adjusted R square) of the variance of HDDS. It would seem that HDDS cannot be explained by the data available for statistical analysis, and that dietary diversity is mostly determined by other, perhaps social and cultural factors, which were not operationalized in the household survey.

Table 20, Results of the linear regression model performed in step-wise procedure.

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.293 ^a	0.086	0.077	0.849	0.086	9.309	1	99	0.003
2	.386 ^b	0.149	0.131	0.823	0.063	7.223	1	98	0.008
a. Predictors, (Constant), Nr. of meals per day									
b. Predictors, (Constant), Nr. of meals per day, Education level									
Excluded Variables ^a									
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics			
						Tolerance	VIF	Minimum Tolerance	
1	Total annual income (Ksh)	.167 ^b	1.721	0.088	0.171	0.964	1.037	0.964	
	Distance from market for food purchase (Km)	-.196 ^b	-2.067	0.041	-0.204	0.999	1.001	0.999	
	Education level	.251 ^b	2.688	0.008	0.262	0.999	1.001	0.999	
2	Total annual income (Ksh)	.068 ^c	0.638	0.525	0.065	0.778	1.286	0.778	
	Distance from market for food purchase (Km)	-.163 ^c	-1.752	0.083	-0.175	0.979	1.022	0.979	
a. Dependent Variable, HDDS									
b. Predictors in the Model, (Constant), Nr. of meals per day									
c. Predictors in the Model, (Constant), Nr. of meals per day, Education level									

Moreover, the statistical analysis of dietary diversity provides only “half the story” as this is recorded during the hunger months only. This is when incomes are strained and do not allow

the purchase of foods which would significantly increase the HDDS, such as meat or fruits, which are often considered beyond inaccessible by households as discussed above.

Although income doesn't seem to lead to a statistically evident improvement of dietary diversity or addition to the frequency of meals per day, food does constitute the most commonly mentioned expenditure, both for the total annual income of the entire population, as the income made seasonally from avocado (Figure 28). This is broadly consistent with data from FGDs, where school fees and food are the most commonly and firstly mentioned expenditures¹⁷. Specific mentions on what foods are bought only include maize, beans and livestock. Since livestock is mostly kept for milk, none of these foods would increase the dietary diversity score. However, these food purchases, especially in the case of livestock and if staples are bought in bulk to last across the seasons as one mention explicitly indicates¹⁸, show that avocado income contributes to food security and stability around the year.

6.3.3 Role of avocado in the household diet

As has been observed in data from the market survey, the local popularity of fruits and

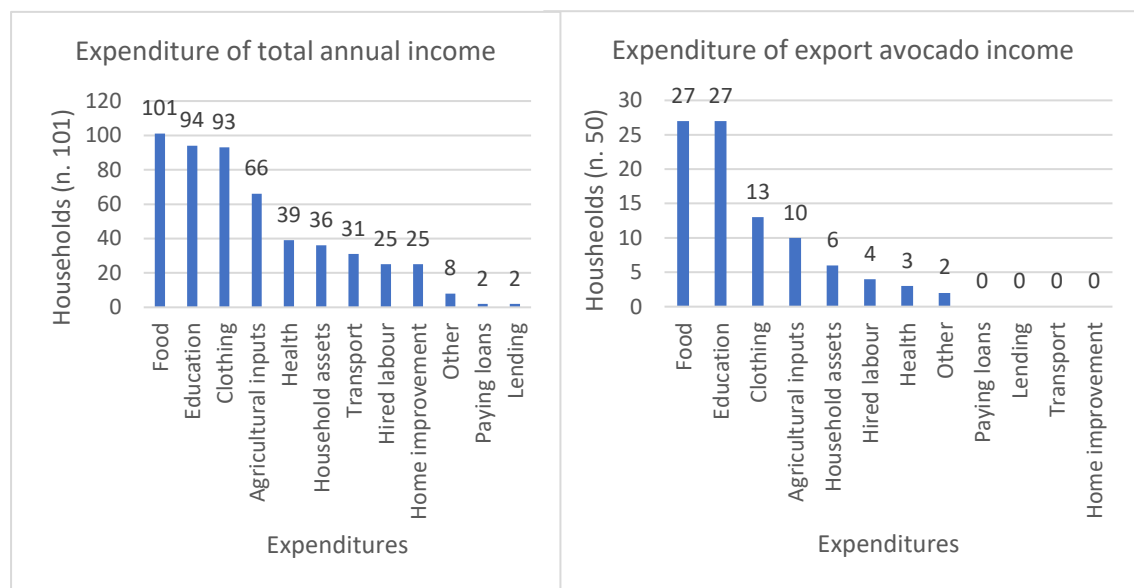


Figure 28, Comparison of expenditures from total annual income and income from export avocado farming.

vegetables has been increasing. The trend is described as follows by a lady from the Cheptkitwa cluster:

¹⁷ For the nine FGDs conducted, 22 references for school expenditures, 20 for food and 31 for all other categories combined.

¹⁸ Kongotik cluster

“For me, I would say, we as Kipsigis [a Kalenjin group], we have learned that food is not only Ugali, in the past we only ate Ugali. Nowadays, rice, Githeri [boiled maize, beans and potato], there is also avocado, bananas; we did not see that as food. But since avocado were introduced, plus we (farmers) were educated, we started to depend on other things not just maize.”

Fruits seem to be part of a wider trend of dietary diversification, which is good news for nutrition security. The reference to education is interesting as this is factor stands out in the statistical analysis as explaining the variation of dietary diversity as well, at least to a small degree. Despite the increasing popularity of new foods including avocado, staples are clearly still prioritised, at least during the hunger months when fruits are expensive and a rare component in the diet. Indeed, according to the household survey data (collected at the end of the hunger months) only two households consumed avocado.

However, both food oriented FGD groups said to consume avocado on almost a daily basis when in season locally (starting in May). Avocado has become a highly popular fruit not just for its taste, but also the versatility of its use. Both food oriented FGDs in the upper and lower zone indicated that avocado is in most cases added to staple dishes such as *sukumawiki* (kale stew) or *githeri* to add taste. It is also often spread on bread as a supplement or alternative for butter of vegetable fat. Additionally, according to the preference exercise conducted during the FGD, both groups indicated to be more likely to buy avocado over any other fruit if income permitted. Therefore, avocado plays an important role in diversifying the diet, at least among avocado growing households, during the avocado season which lasts the better part of the year (May – December).

6.4 Conclusion

Export avocado farming has different impacts on the different dimensions informing household FNS. In terms of food availability on the farm, avocado has not completely substituted other crops. However, there are strong indications that the yields of important staples have been affected, which is likely to have negatively impacted the availability of maize, beans and potato on the farm. Although more diverse and often larger, the production system of export avocado growers are to date less productive per acre in terms of income than that of the control group. The incomes of avocado farmers are expected to increase drastically, however, as avocado trees are still reaching their full productive capabilities and prices for the produce is increasing. Although there is no statistical proof that export avocado growers are better or worse off now, the improving returns from export avocado growing will

likely differentiate this group from non-growers in terms of income, and this development is indeed catching the interest of the latter.

There is no statistical evidence of income improving diets in frequency or diversity during the hunger months, and there is no significant difference between the groups in this regard. Qualitative data does however show that avocados improve dietary diversity mainly through access to these fruits during the productive season among export avocado growers, improving their nutrition security. However, it is impossible to tell whether they are notably better off in terms of diet in comparison to other smallholder farmers, whose harvests and returns from more productive maize, beans and potato farming might well translate into an increase in dietary diversity during the same season.

7.0 Impacts on local equitable and sustainable development and FNS

This chapter makes use of qualitative inductive material that has emerged in FGDs, observations and unstructured interviews, combining it with data presented in the previous chapters. The aim is to examine the impacts of export avocado on a wider scope of local equitable and sustainable development, so that impacts on these areas can be taken into account in the overall FNS evaluation of this thesis.

7.1 Environment and water resources

Export avocado growers from both zones (two clusters per zone) have recognized the environmental benefits of avocado growing. Specifically, this refers to the mitigation of soil erosion and increase of tree cover, which is believed to increase rainfall.

Although the latter would imply an improved situation in terms of the availability of water, it seems the fledgling orchards have not eased the drought, which is an issue brought forward by most FGDs (eight out of nine). Three clusters (two of them from the lower zone) reported difficulties in irrigating the water hungry avocado seedlings. Three clusters (two of them in the upper zone) also wished the help of the government or the company (Songoroi) in arranging irrigation.

Although complaints regarding the lack of access to water come from both zones, the head of the Mara River Water Association has emphasized that the climate vulnerable lower zone has suffered the brunt of the water shortages. About the increase of tree cover with avocado in the study area he comments the following:

“How good are these solutions [avocado farming] conservation wise (even if you increased the forest cover by 0.5%) if they are burning charcoal in the Mau?”

The positive environmental impacts reported by some of the FGDs would indicate some successes aimed for by the MaMaSe project through the introduction of avocado. However, the real environmental impact is yet to be measured and as the quote suggests, the expectations for climatic improvement (rainfall) in the study area are likely to not to be met if the deforestation of the adjacent Mau forest won't stop.

7.2 Workload

All FGDs agree that avocado farming requires little work. After the initial input of planting, watering, weeding around the seedlings, the workload is said to be less in comparison to other crops especially when harvesting and transporting are done by Songoroi. The latter is, however, a bit more of an issue for some of the clusters in the upper zone where the terrain is more rugged and slippery during the rainy harvest period and where the company trucks couldn't reach the farms. Farmers from Chemaner and Kongotik clusters reported having to transport the produce to cooling houses which were prepared for the Isei company as part of the potato business case.

All in all, however, the decreased workload is a welcomed benefit from avocado farming. In one FGD, the chemical-free aspect of (organic) avocado growing was appreciated, as this reduced health risks coupled with the lower workload. In two FGDs, farmers reported hiring labour, as avocado income was enough to pay for the little work to maintain the orchard. These benefits are important for a more vulnerable age group that needs more rest (see Table 14).

7.3 Roads and infrastructure

As touched upon in the previous paragraph and elsewhere in this thesis, roads and infrastructure are an issue in the study area, as they are in most rural areas in Kenya. Although the upper zone has more roads, four out of five groups complaining about the poor conditions of roads come from there. Two of these upper zone clusters emphasize the responsibility of the government to improve these roads, and indeed, some lobbying has taken place with promising results in Bomet county. Coupled with the promising prospects avocado farming has had in the upper zone, the country government has started to improve roads¹⁹. This has already taken place in the Olokyn cluster and is anticipated in other avocado growing areas in Bomet county.

Apart from the perceived success of export avocado farming, the lobbying by the avocado farming seems to have played an important role in this²⁰. One of the export avocado farmers appears to be a member of the Kenyan parliament representing Bomet country with considerable influence over the county budget²¹. No such plans could be confirmed for Narok

¹⁹ Interview, Bomet County CSA, representative of the Kipreres ward (Olokyn area)

²⁰ Interview, Chairman of Isei cooperative

²¹ Interview, Chairman and treasurer of Mulot cooperative

country as a result of avocado growing and unfortunately a meeting with a Narok county official could not be realized despite the effort. However, infrastructure improvements on the main roads are taking place here, as mentioned in chapter 5.

7.4 Value chain roles and relations

In the study area, export avocado value chain relations discussed mainly concern those between the farmers, cooperatives, the company and brokers to the extent that they affect the relations between the three main actors. In the qualitative data from FGDs and unstructured interviews, the relations with development organizations are mentioned minimally.

The relationship between farmers and the cooperative is worrying because the only FGD that mentioned benefits from cooperative operations was the one in which the cooperative chairman himself participated. However, most clusters from both cooperatives and zones complained about the lack of transparency, lack of farmer participation and late payments (Table 21). Much of the lack of transparency angered farmers as the cooperatives deduct 3 Khs per kg of avocado produced, without explaining farmers what happens with the money. Regarding the late payments that went through the cooperative, two clusters (one from each cooperative) even saw the cooperative as completely redundant and hoped for payments to come straight from the company.

Table 21, Farmer-cooperative relationship issues according to FGDs.

Issue	Mulot cooperative (5 clusters)	Isei cooperative (3 clusters ²²)
Lack of information, transparency and communication with farmers	3	2
Lack of farmer participation in meetings and price negotiations	3	2
Delayed payments	4	1
Lack of cooperative services	1	1

The cooperative leaderships themselves cite troubles covering operating costs due to the drought²³. This is especially troublesome for Mulot cooperative, where many farmers lost most if not all their seedlings²⁴. Transition to alternative crops (back to maize and beans) has been difficult for Mulot cooperative, as the cooperative lacks capital to invest, which comes

²² Isei cooperative in reality has four clusters in which FGDs were conducted. In one of them, however, the Isei cooperative chairman participated and translated most of the discussion regarding issues with the cooperative, generating biased data which has been excluded from this table.

²³ Interviews, Chairman and treasurer of Mulot cooperative and Chairman of the Isei cooperative

²⁴ Interview, Chairman and treasurer of Mulot cooperative

mainly from farmers paying their fees to become full cooperative members. Isei cooperative has been less unfortunate and has even invested in an AgriVet shop with the money made from avocado²⁵. However, the lack of transparency and communication between the cooperative and the farmers is partially the cause for some of the cooperative services rendered to go unnoticed by the farmers. Historically, there also is deep mistrust in cooperatives among farmers, rooting from the colonial period²⁶.

Positive things about the company are mentioned in four of the nine FGDs, including gratitude for the opportunity to grow avocado, training and extension services. As with the cooperative, however, most clusters mention many ongoing issues in their relationship with the company (Table 22). In the eyes of most of the clusters, the company shares responsibility with the cooperative for late payments, which is the most commonly mentioned grievance during the FGDs. In the upper zone, clusters have a reference from coffee and tea companies giving bonuses and advances, which is also expected from Songoroi. Delayed harvests are less of an issue in the lower zone, as this is within easier reach of the Songoroi plantation, whose personnel also harvests the avocados grown by outgrowers. The lower zone also expects the company to help replace some of the dead seedlings, which according farmers in the Olokyn cluster died partially because of bad advice given by company extensionists²⁷. As the cooperatives are not yet functioning optimally, responsibilities to farmers such as extension services, collection, bulking etc., have fallen to the company. However, the area to cover is large for the small team lead by the Songoroi personnel, which is unable to provide these equally and on time to all clusters.

Table 22, Farmer-company relationship issues according to FGDs.

Issue	Mulot cooperative (5 clusters)	Isei cooperative (4 clusters)
Delayed payments	3	3
No bonuses, advances or loans	1	2
Delayed harvests and rejects	0	2
Intercropping and chemical use restrictions	1	1
Lack of inputs, fertilizers, seedlings	2	0
Low prices	0	2

The abovementioned challenges also complicate the relationship between the company and the cooperatives, especially that between Mulot cooperative and Songoroi. Mulot cooperative leadership often feels sidelined by Songoroi and fears that the company

²⁵ Interview, Chairman of the Isei cooperative

²⁶ Interviews, Chairman and treasurer of Mulot cooperative and the Agronomist, official for the MoA Mulot office

²⁷ Also, interview, Agronomist, official for the MoA Mulot office

engages in direct relationships with the farmers which undermines cooperative leadership²⁸. The company, on the other hand, is frustrated with the incapacity of the cooperatives and burdened by keeping the value chain with smallholder farmers together²⁹. This issue is slightly less with Isei cooperative, whose chairman is a former employee of Songoroi (Mara Farming) and with whom communication is more stable³⁰. It also helps that Isei's returns in the upper zone have been better, which gives an incentive for the company to invest more in the relationship with farmers in this zone.

It is clear that value chain relations are strained and that the functioning of the cooperatives plays a big role in the grievances mentioned. Cooperative functioning has been affected by the low initial returns, which especially in Mulot cooperative has rendered operations nearly impossible³¹. Although direct contracts between farmers and the company are a possibility, even the Songoroi extensionist worries about what this would mean for farmer representation in fair price negotiations as well as the local management of services, such as extension, upon which farmers rely. However, the ease and familiarity of price negotiation farmers experience with brokers is one of the reasons for opting to sell to them instead of the export value chain³². With the low degree of communication and negotiating power farmers experience with the cooperative and the company, side-selling has become a negotiating tool which has worked since, as again mentioned in the previous chapter, this has made the company increase its prices.

7.5 Replicating the inclusive business model

Complications with managing the lower end of the export value chain would probably discourage Songoroi from replicating the inclusive business model, unless significant outside help or investment was involved³³. However, multiple parties are now trying to replicate the experience in the Upper Mara River Basin either within the study area or in adjacent areas.

The grafted variety is central to these planned initiatives and the difficulty of acquiring seedlings is a barrier to many of these plans. Isei cooperative has been negotiating with Fair Trade with a plan to establish a nursery with newly trained avocado farmers in the area. However, lack of training in keeping the nursery and grafting seedlings was undermining this

²⁸ Interview, Chairman and treasurer of Mulot cooperative

²⁹ Interview, Extensionist of Songoroi Ltd.

³⁰ Interviews, Extensionist for Songoroi Ltd. and Chairman of the Isei cooperative.

³¹ Interview, Chairman and treasurer of Mulot cooperative

³² Interview, Agronomist, official for the MoA Mulot office

³³ Interview, Extensionist for Songoroi Ltd.

initiative³⁴. Bomet county is also seeking to subsidize seedlings to smallholder farmers, but it had trouble finding a supplier³⁵. Potential suppliers in Eldoret and Kericho were already engaged in outgrowing schemes that were being set up there and were in turn seen visiting successful farmers in the upper zone of the study area during research³⁶. Some competitors have tried to directly access the avocados of the existing certified growers in the study area³⁷. These competitors offer direct contracts (without cooperatives) with competitive prices³⁸.

The difficult value chain relations have thus not discouraged inclusive business models, but the other initiatives do not necessarily involve cooperatives. It is likely that as soon as the seedling shortage has been overcome locally, more smallholders will be farming grafted avocados. However, it is still unsure whether these avocados are sold to the export market.

7.6 Subdivision, land purchases and the agriculturalization of Narok country

76% of all household survey respondents agreed that subdivision was a problem in the community. Although this is a trend throughout the study area, this is especially pressing in the upper zone of Bomet county where the already smaller plots (see table 14, previous chapter) are shrinking at a faster rate. During the FGD in the upper zone Kongotik cluster, this was said to be caused by a fast population growth in a zone where population density is already high. The farmers explained that smaller land sizes complicated productivity due to unsuccessful intercropping and the inability to rotate crops. The white flies pest, for example, was suspected to have appeared partly due to the lack of crop rotation³⁹. Kongotik farmers elaborated that avocado helped overcome the crop rotation problem, but that a diverse production upon which they relied would not be possible on the small land sizes.

Despite the shrinking land sizes, 81% of all respondents said to be likely to allocate land to their children in the future. The export avocado growers, who are older in comparison to the control group, are likely to face the problem of subdivision sooner. Very few land purchases show up in the household survey as this only asks for expenditures in the last 12 months. However, the tendency for upper zone Kalenjin from Bomet to buy cheaper land in the less intensified Narok county has been an ongoing trend for many decades. The

³⁴ Interview, Chairman of the Isei cooperative

³⁵ Interview, Bomet County CSA, representative of the Kipreres ward (Olokyn area)

³⁶ Interview, Extensionist for Songoroi Ltd.

³⁷ Interviews, Horticulture advisor 2 (SNV), Extensionist for Songoroi Ltd.

³⁸ Interview, Extensionist for Songoroi Ltd.

³⁹ Interview, Agronomist, official for the MoA Mulot office

enumerators of the research themselves were recent descendants of this migration, and some of the export avocado farmers in Bomet mentioned having purchased land for their children in the lower zone during casual conversations. The MoA official, who is based in Narok but also originates from the Bomet highlands, said it was likely that as the income from avocado increased, this would facilitate land purchases in Narok county.

The Kalenjin are not the only ones transforming the once predominantly pastoral Maasai plains into maize-dominated agricultural land. East of the study area, vast expanses of wheat have appeared, partially with foreign money according to locals. The author met Maasai in Mulot, interested in either selling their or transition into agriculture in order to move away from pastoralism, in which they see no financially attractive future. Within the study area, however, the “land grab” in the lower zone mainly takes the form of relatively smaller land purchases by upper zone Kalenjin. The nuclear farm operated by Songoroi is one of the only larger foreign invested plantations in the study area.

7.7 Evaluation, local sustainable and equitable development and FNS implications

The impacts on local sustainable and equitable developments are many. As the above data is based on limited qualitative data, much of it is only indicative of certain FNS implications. Nevertheless, they are worthwhile to list here as they illustrate the systemic fashion in which FNS impacts may occur. Table 23 summarizes these both positive and negative impacts described in this chapter and outlines their FNS implications.

Table 23, Impacts on local sustainable development, equity and FNS implications.

Issue	Sustainability	Equitability	FNS implications
Environmental impact	(+) Mitigated soil erosion and increased tree cover. (-) Water hungry avocado might consume water resources on the expense of other crops.	(+) Positive environmental externalities (soil and climate) with benefits to everyone in the basin. (-) Straining of water resources felt mostly in areas which are already tested (lower zone).	(+) Possible climate benefits contribute to food stability through stable production. (-) Strained water resources decrease production of other crops (food availability).
Workload	(+) Decreased workload with health benefits.	(+) Benefits especially the elderly, who are less able to manage intensive crops or engage in formal employment.	(+) Time can be allocated to tending other crops, possibly improving production (food availability).
Roads and infrastructure	(+) Road improvement facilitates transportation and the distribution of foods across the area. Lowers transaction costs.	(+) Road improvement occurring where most asked for (upper zone) due to slippery and rugged terrain. (-) Road improvement occurring where road network is already most developed.	(+) Improved food availability on local markets. (+) Improved food access through facilitated travel to market.
Value chain relations	(-) Generally poor relations between value chain actors cast doubt on the sustainability of these	(-) Relations between company tend to be worse with the cooperative that needs the most assistance (lower zone).	(+) Side-selling to brokers might increase the chance that more avocados stay on the local market (food availability).

	relations and renewal of contracts.		(-) A discontinued export value chain might force farmers to sell to a less reliable buyer, further jeopardizing incomes and stability.
Replication of inclusive business model	<p>(+) Amplified abovementioned positive impacts.</p> <p>(+) Alternative experiences increase lessons learned that can be adopted by everyone.</p> <p>(+) With more initiatives, there are potentially more alternative buyers to which farmers can turn to.</p> <p>(-) Amplified abovementioned negative impacts.</p>	<p>(-) Based on the current experience, avocado is likely to be introduced in areas that already have many cash crop alternatives instead of the areas that need one.</p>	<p>(+) Increased number of actors in the area increase competition and prices paid for farmers, as well as alternatives to turn to (increased food access and stability).</p>
Sub-division and land purchases in Narok	<p>(+) Introduces an alternative to crops requiring space for rotation, which is hard due to small land sizes.</p> <p>(+) Generates income which makes land purchase elsewhere an alternative for sub-division.</p> <p>(-) Decreases crop diversity upon which farmers rely, adding to the pressure to buy land elsewhere.</p> <p>(-) Transforming the plains into grain dominated agricultural land creates a challenge for sustainable land use and watershed management in the Mara basin.</p>	<p>(+) Avocado income provides solution for older farmers facing sub-division sooner than the younger control group, which is in turn in a better position to meet the problem through formal employment.</p> <p>(-) Fragmentation of pastoral land might complicate traditional livestock keeping and pressure some of the Maasai to change their lifeways against their wishes.</p>	<p>(+) Transforming pastoral land in the lower zone into grain-dominated agricultural land would bolster local cereal production and lower dependency on further away regions and possibly lower prices locally.</p> <p>(-) Decreased crop diversity in the upper zone with possible consequences for local food availability. Dependency on other areas</p> <p>(-) The lower zone is more climate vulnerable and as it is mainly suitable for cereals. Agriculture with a lower crop diversity would increase vulnerability to pests and disease. This is a food stability issue, especially for those living and depending on this productive area.</p>

8.0 Discussion and conclusion

This thesis has examined the impact of export oriented avocado farming on FNS among smallholder farmers in the Upper Mara River Basin. It has done so by taking into account the classic dimensions of food security and has considered nutrition security through the diversity of available food as well as the diet of households. The research conducted for this thesis looked for FNS impacts by examining smallholders through their households as well as the local markets in their area. FGDs and unstructured interviews have provided valuable qualitative data, complementing and informing the household and market surveys as well as revealing important inductive material. By looking at impacts at both a local and household level, the thesis has aimed for a comprehensive approach which considers possible indirect impacts which relevant to the FNS of the predominantly smallholder farmer population of the study area.

In this final chapter, the results of the research will first be summarized and reformulated into an answer to the main research question. The findings of this thesis are then discussed in terms of the wider framework presented in the first chapters on this thesis. Based on the findings, recommendations will be made regarding FNS and the sustainable and equitable implementation of horticulture business cases through new export-oriented value chain arrangements.

8.1 The FNS impact of inclusive export-oriented avocado farming on smallholder households in the Upper Mara River Basin

The impact areas for an FNS evaluation have included food availability, food accessibility, food use, the stability through these dimensions and nutrition security, which was assessed through the diversity of available food as well as the diet. Both direct and indirect impacts were accounted for.

Impacts on food availability was looked at on market and household level. Grafted avocado rejects were sold on local markets but these were only found in trace amounts and only in the upper zone markets. Although these were in high demand and sold at double the price of a normal avocado, no strong evidence was found that the price fluctuation of other foods could be attributed to grafted avocados. The direct impact on food availability on markets in therefore found to be minimal. However, the diversity and stability of available food on local markets might be indirectly improved in the near future thanks to export avocado farming in the upper zone. Due to the promising prospects of export avocado growing, Bomet county has prioritised the improvement of roads in this zone, which is likely

to improve food availability through lowered transaction costs and facilitated travel and food distribution.

On a household level, food availability was looked at through the production system. Grafted avocado was often intercropped with important staples, namely maize, potatoes, beans and kale. Although little impact was found on crop diversity, the production volume of these staples had decreased due to avocado. This is because the avocado trees were growing bigger and using more resources during a period of drought and because their orientation for organic certification did not allow the use of chemical pesticides and fertilizers, which the other crops intercropped in the orchard needed for optimal growth. Therefore, food availability at the household level has been negatively impacted.

The lower production of the crops that were integrated in the avocado orchard has also impacted the income made from these crops. Indeed, the production system of export avocado growers generates less income per acre in comparison to the control group. Therefore, a period of lowered food accessibility is detected when avocado trees outcompete other crops but do not yet produce optimally. Furthermore, payment arrangements have until now caused a stability concern for food accessibility. The payments to farmers for avocado have often arrived late, and no advances or loans have been provided. Although some farmers have spent avocado income in bulk amounts of dry staples (maize and beans) and livestock improving their food security round the year, the late payments and lack of advances has been problematic for many farmers especially during the hunger months. These culminate between January and April, when avocado is not yet producing and when prices for most foods are high. Fortunately, the income made from grafted avocados is rapidly increasing due to improved production and prices and the export company buying the avocados has promised advances during the hunger months. This will undoubtedly improve food accessibility and rectify stability issues for these households in the future.

Dietary diversity data shows that while almost every household surveyed in the study area has three main meals a day during the hunger months, fruits and important protein groups such as meat, eggs or fish are missing from the diet for most households. While fruits, including avocado, are available on local markets and are highly coveted, they are also found too expensive, which pointing to an accessibility problem regarding nutrition security. However, statistical testing finds no evidence that household income alone leads to a more diverse diet. Instead, education and the consumption of food in between meals were found to be the only independently significant, yet weakly correlating to dietary diversity. Although this would suggest that food use or utilization is more important for nutrition security than

food access, this is not entirely true. Farmers have relatively free access to the avocados on their farm, the rejects of which are either sold or eaten. In peak seasons, avocado is consumed on almost a daily basis and is easily integrated in many meals. Although a dietary diversity score could not be recalculated during this season, the fact that fruits are a rare component in the diet and would now be consumed, would very likely increase this score for export avocado growers. Therefore, export avocado farming contributes to nutrition security, but mainly when in season.

The abovementioned FNS benefits are emphasized in the upper zone, whereas the lower zone has suffered the brunt of problems related to the recent drought and avocado farming. The lower zone has suffered under a recent drought, which has killed avocado seedlings and limited production more in comparison to the upper zone. Furthermore, value chain relations in this zone are more strained due to the cooperatives inability to operate adequately. Therefore, the established link to the export market for the lower zone avocados is currently uncertain. Although the production of the surviving seedlings in this zone is increasing and there are likely to be willing buyers for the produce, farmers rely on current value chain relations to access seedlings and optimize production in the future.

In conclusion, although overall food availability on the farm is decreased, export avocado farming can be said to have a positive net FNS impact on smallholder households in the Upper Mara River Basin. This is because of improved food availability on markets, household accessibility to purchased food and nutrition security through access to avocado on the farm. However, most of these benefits haven't materialized yet and a period of vulnerability to food insecurity persists during the time when avocado trees are still reaching maturity. Moreover, the positive impacts are not evenly distributed across both zones and the nutrition security improvements mostly coincide with the harvesting period of avocado. Nevertheless, the success of export avocado farming has convinced locals and will spill over to non-growers when local governments work to enhance this success through improved infrastructure. Grafted avocado will likely become one of the most important cash crops in the study area and beyond, providing a much-needed income option for those who have little alternatives in terms of intensive crops or employment.

8.2 The income approach to food security

Export avocado growing has been introduced by Dutch initiatives as a business case with a goal to improve food security through the efficient production of horticultural crops for a better paying market. Value chain efficiency, improved production and higher returns have

been the core aims of this initiative, which expected improvements in farmer access to “healthy food” (Solidaridad 2015). Although “healthy food” has not been defined in detail, let alone what kind of access is referred to, the study of the avocado business case does afford some discussion as to the assumption that income improves FNS, which according to Joosten et al. (2015) so often has gone untested.

Indeed, it seems that in case of export avocado farming in the Upper Mara River Basin, this direct relationship between income and FNS indicators used (meals eaten per day or HDDS) cannot be proven. Even during the hunger months, virtually every household has three meals a day and it is hard to argue for food insecurity in the area. Although income is spent on food, it is distributed among existing expenditure priorities such as education, and not the purchase of food groups which are missing in the diet. But even if most of the income was invested into education, this would most likely be a wise choice for long term FNS. Therefore, this thesis cannot invalidate the rather vaguely defined logic of the HFSP that income improves food security.

In fact, an income approach to food security in this sense may have important benefits in the long term, by aiding in the adaptation to pre-existing trends. For example, export avocado farming will decrease the variety of crops of farms that incorporate it, such as grains, potato and beans. Therefore, dependency on other regions to import these crops will be strengthened. However, most farm sizes are shrinking to the extent that crop rotation, and therefore staple production, is becoming harder. High future income may also help farmers purchase land in the lower zone, which is more adequate for grains, such as maize. There is therefore potential for these adjacent zones to engage in important interzonal trade on a local level, which will help avocado income from the upper-zone benefit the lower zone. Since this development is based on rather scant indicative evidence at this point, it will require future research, especially in terms of how this will affect pastoralist livelihoods which are often in the spotlight of landgrab debates (Hall et al. 2015; Klopp and Lumubma 2014). However, both the investment in education and land are examples of how an income helps smallholders adapt to the current developments with potential long-lasting benefits for food security.

8.3 The inclusive business model and value chain asymmetries

It is a tremendous task to overcome the high transaction costs of sourcing avocado from hundreds of farmers spread across a rugged terrain with infrastructure complications, and then ship them to a market thousands of kilometres away with demanding standards. The promise of high returns is useful for rallying the complex network of actors necessary to

achieve the inclusive business model because it is the common denominator in the list of shared (self) interests among most of the stakeholders involved, whether it's the farmers with their many needs, the institutions of the Kenyan government and its ambitious economic development goals or Dutch agribusiness seeking a stake in a profitable crop with increasing domestic and global demand. In this regard, good business is the key to a successful market-led multi-stakeholder approach, where diplomacy, aid and trade are integrated, as put by Murray and Overton (2016, 258). Inclusive business is therefore an important institutional tool for aligning agendas for development.

All IB models may be unique and hybrid (Chamberlain and Answeeuw 2017a, 259), but all rely on commercial success. The implications of using inclusive business models to achieve food security, social justice or environmental sustainability, is that commercial success must come first for it all to work. In the HSFP this priority is perhaps reflected in the absence of a more meticulous food security strategy and rather an emphasis on the business plan. This, again, implies the conviction that commercial success will automatically improve FNS. It also plays in the background of not making an equitable extra effort to support avocado farmers in the agronomically more challenging lower zone, where a cash crop is direly needed. Indeed, "Letting go" of an unpromising case was listed as a lesson learned from the private sector by the project implementors (Solidaridad, Hivos and SNV, n.d., 8).

As value chain relations are uncertain in the lower zone, mostly due to lower returns, a discontinuity of contracts is possible. But cutting losses would mean cutting out those who are economically most challenged. Excluding those in most need for profitability contradicts the intent to include the lower-income actors, at least on the scale of the study area. Ironically, lower returns cannot only be blamed on the challenging agro-ecological zone and the drought, but also the company itself. Value chain inefficiencies occurred due to side-selling, which in turn was caused by late payments and inflexibility in giving advances to farmers. It is possible that having a large and productive central farm makes cutting off relations that are non-productive an easier choice for Songoroi Ltd. However, cases elsewhere in sub-Saharan Africa have shown that higher offtaker dependency on the smallholder stimulates reciprocates through smallholder fidelity, with positive effects on value chain efficiency (Chamberlain and Answeeuw 2017b). Poor value chain relations are bad for business and side-selling does not just occur because a competitor has a more convenient offer, but also because it gives leverage for negotiation when facing unfair arrangements and asymmetric relations.

Based on an IB case in neighbouring Tanzania, West and Haug (2016) conclude that enforceable "rules of the game" are needed to fulfil both development goals as well as

commercial goals. In the case of the Upper Mara River Basin, this applies as well, as these goals depend on good business, which depends on value chain efficiency. Currently, breaches of contract by both sides have complications relations and fidelity, and therefore undermine the success of intended goals. If IB is to be a successful tool, institutional supervision of these contracts and their fulfilment will be needed to make good agribusiness work for development goals.

8.4 Recommendations

8.4.1 Water harvesting and small-scale irrigation to boost water security

Avocado is a relatively water hungry crop in comparison to many of the other important crops grown in the study area (Mekkonen and Hoekstra 2010; Mekkonen and Hoekstra 2011). Increased water consumption, especially in the upper basin, could have negative impacts downstream where surface water sources are fewer. Introducing avocado together with a water harvesting project could secure water resources locally and relieve reliance of rain-fed agriculture (Senay and Verdin 2004). This would not only safeguard the steady development of the seedlings but provide water for other crops and farmer needs. Water harvesting could be implemented on a farm level together with small-scale irrigation inputs. Positive impacts of water harvesting in the Kiptenden cluster had already been observed for all crops and needs.

8.4.2 Intercropping and organic certification

The risk for lowered income and FNS during the period in which avocado is not producing optimally but undermining other crops is considerable. Eventually, other crops will have to give way to avocado, but during the intercropping period the application of organic standards should be reconsidered, at least for pesticides. This would allow better protection of intercropped staples and maximise the availability of food on the farm and potential incomes from these crops.

8.4.3 The business model

Cooperatives have the potential to render important services to farmers, but also to complicate matters and make the value chain inefficient. This is due to lack of transparency and subsequent value chain relationship problems, which is common for actors on this level of inclusive value chains (Chamberlain and Answeeuw 2017a, 262). If they are to be included, sufficient support and training should be given on a longer time frame. In the study area this is currently being done through the HortIMPACT initiative, but other fledgling inclusive

avocado initiatives do not include cooperatives at all, which might be more practical to implement. As cooperatives have an important representative function of farmer interests, the lack of cooperatives does emphasize the need for institutional oversight and “enforcement of the rules of the game”.

8.4.3 Institutional oversight

As mentioned above, this is needed to improve value chain efficiency and lower transaction costs. The outreach and capacity of relevant Kenyan institutions, such as the HCD in this case, or even local municipal government is currently limited, and an efficient enforcement of terms and contracts is likely to be a challenge. Another challenge is the hybridity and complexity of IB models, and standardisation (often going hand in hand with rule formulation) could harm the experimentation with new forms of IBMs. Nevertheless, these should be encouraged in all ways possible if inclusive business models are to be successful and more widespread. Even the simplest “rules for the game” and support for enforcement could have important positive impacts.

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Appendices

Appendix 1 – Market Survey

Date:	Place:			Enumerator:				
#	Food product /crop name (Eng, Swa, Kalenjii)	Origin of produce (where does the produce come from?)	Vendor (who is the person selling the produce?)	Customers (where is the produce going to?)	Prices High (What months what price)	Price Low (What months what price)	Changes past 5 years: prices, market, supply	Future expectations (prices, market, supply)
1								
2								
3								
4								
5								
6								

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Slots repeat according to foods/produce present on market

Appendix 2 – Household survey

Questions	Answer format (if not specified in question)
Starting information	
md1. start time.	
md2. end time.	
md3. date	
md4. GPS coordinates (WGS 84)	
md6. Enumerator's name	
md9. Name of the sub-location	
md10. Name of the village	
md11. Household house material	Choose one or more: Timber, Stone/Concrete, Bricks
Demography	
d1. Name of respondent	
d2. Age of the respondent	
d3. Respondent's telephone number	
d4. Gender of the respondent	
d5. Respondent's relationship to household head	
d6. Age of the household head (years)	
d7. Gender of the household head	
d8. Marital status of household head	
d9. Highest level of education completed by household head	1: Primary education, 2: Secondary education, 3: Tertiary education
d10. Total number of household members	
d11. Household members below 5 years	
d12. Household members between 6-12 years	
d13. Household members between 13-17 years	
d14. Household members between 18-35 years	
d15. Household members between 35-60 years	
d16. Household members above 60 years	
Agriculture and income	
ag1. How much land does this household own (in acres)?	
ag2. What is the ownership/user right?	Choose one or more: Title/inheritance, Rented, Borrowed/Sharecropping
ag3. How do you water your crops?	
ag4. Is/are the source(s) reliable?	
ag6. What crops did you cultivate in the previous 12 months? (in order of importance)	
ag7. Were the harvests more or less comparable to the year before; and how?	
ag8. What crops were for subsistence?	

ag9. What crops was for sale?	
ag10. Market/buyer - what crop, to whom and where?	
ag11. List 3 most important crops in terms income	
ag12. What was the household's total annual income from CROP PRODUCTION in the last 12 months? (Ksh.)	
ag13. What was the household's total annual income from LIVESTOCK in the last 12 months? (Ksh.)	
ag14. Besides agriculture, what was other household's sources of income in the last 12 months? (Ksh.)	Choose one or more: Formal employment, Business, Wage employment, Remittance
ag15. Total income - formal employment (Ksh.)	
ag16. Total income - business (Ksh.)	
ag17. Total income - wage labour (Ksh.)	
ag18. Total income - remittance (Ksh.)	
ag19. On what did the household spend the income on in the last 12 months?	Choose one or more: Food, Education, Health, Clothing, Agricultural inputs, Hire labour, Paying loan, Lend to friend/relative, Transport, Assets (Tv, Radio, etc.), Home improvement, Other
ag19. On what did the household spend the income on in the last 12 months?/Hire labour	
ag19. On what did the household spend the income on in the last 12 months?/Paying loan	
ag19. On what did the household spend the income on in the last 12 months?/Lend relative/friend	
ag19. On what did the household spend the income on in the last 12 months?/Transport	
ag19. On what did the household spend the income on in the last 12 months?/Assets (e.g, Tv, radio etc)	
ag20. Specify other	
ag21. Please list the crop you NO LONGER grow and why	
ag22. Please list the NEW crop you STARTED GROWING and why?	
ag23. Are you/this household a member to a farming group(s)/association(s)?	
ag24. Please list them and crop/livestock involved	
ag25. What role does farming group(s)/association(s) play in your farming and livelihood?	
ag26. Are you/this household a member of cooperative society(ies)?	
ag27. Please list them and crop/livestock involved	
ag28. What role does cooperative society(ies) play in your farming and livelihood?	
ag29. Do you do return on investments (costs-benefit analysis)?	
Avocado farming	
ac1. Do you farm avocado?	

ac2. How many avocado trees do you have?	
ac3. Avocado trees variety?	Choose one or more: Hass, Traditional, Other
ac5. Do you farm avocado for a cooperative/company?	
ac6. What is the name of the cooperative/company?	
ac7. Why DON'T you farm avocado for a cooperative/company?	
ac9. Did you farm avocado before farming for X?	
ac10. Since when have you been farming avocado for X?	
ac11. What expectation did you have for farming avocado for X?	
ac12. Has your expectation for farming avocado for X been met?	
ac13. Why not?	
ac14. What challenges have you experienced while farming avocado for X?	
ac15. What benefits and opportunities have you gotten from farming avocado for X?	
ac16. What was the total avocado income in the last 12 months? (Ksh.)	
ac17. Did you make profit from the last 12 months??	
ac18. How much profit? (Ksh.)	
ac19. What did you spend your income on? (Ksh.)	Choose one or more: Food, Education, Health, Clothing, Agricultural inputs, Hire labour, Paying loan, Lend to friend/relative, Transport, Assets (Tv, Radio, etc.), Home improvement, Other
ac19. What did you spend your income on? (Ksh.)/Hire labour	
ac19. What did you spend your income on? (Ksh.)/Paying loan	
ac19. What did you spend your income on? (Ksh.)/Lend relative/friend	
ac19. What did you spend your income on? (Ksh.)/Transport	
ac19. What did you spend your income on? (Ksh.)/Assets (e.g, Tv, radio etc)	
ac20. Did you incur loss?	
ac21. How much loss? (Ksh.)	
ac22. What would you attribute the loss you incurred to?	
ac23. How have your FARMING PRACTICES changed since you started working for X?	
ac24. How have your relationships to other farmers in this community changed since you started working for X?	
Potato farming	
pc1. Do you farm potato?	
pc2. What is farm size you cultivate potato?	
pc3. Potato variety?	

pc3. Potato variety?/Dutch Robiyn	
pc3. Potato variety?/Shangi (traditional)	
pc3. Potato variety?/Other	
pc4. Specify other	
pc5. Do you farm potato for a cooperative/company?	
pc6. What is the name of the cooperative/company?	
pc7. Why DON'T you farm potato for a cooperative/company?	
pc8. Where do you sell your potato?	
pc9. Did you farm potato before farming for X?	
pc10. Since when have you been farming potato for X?	
pc11. Have you always farmed potato in the past?	
pc12. What expectation did you have for farming potato?	
pc13. Has your expectation for farming potato been met?	
pc14. Why not?	
pc15. What challenges have you experienced while farming potato?	
pc16. What benefits and opportunities have you gotten from farming?	
pc17. What was the total potato income in the last 12 months? (Ksh.)	
pc18. Did you make profit from the last 12 months?	
pc19. How much profit? (Ksh.)	
pc20. What did you spend your income on?	Choose one or more: Food, Education, Health, Clothing, Agricultural inputs, Hire labour, Paying loan, Lend to friend/relative, Transport, Assets (Tv, Radio, etc.), Home improvement, Other
pc20. What did you spend your income on?/Food	
pc21. Did you incur loss?	
pc22. How much loss? (Ksh.)	
pc23. What would you attribute the loss you incurred to?	
pc24. How has your FARMING PRACTICES changed since you started working for X?	
pc25. How has your relationships to other farmers in this community changed since you started working for X?	
Food and Nutrition Security (primary household member involved in cooking and food purchase preferred)	
fs1. Name of respondent (if other)	
fs2. Gender of respondent (if other)	
fs3. Age of respondent (if other)	
fs4. Did you go to a celebration or were you very sick yesterday?	
fs5. Did you have breakfast yesterday?	
fs6. Please describe the foods (and ingredients) that you ate and/or drank for breakfast at home or outside the home	
fs7. Did you eat or drink anything in between breakfast and lunch yesterday?	

fs8. Please describe the foods (and ingredients) that you ate and/or drank in between breakfast and lunch at home or outside the home	
fs9. Did you have lunch yesterday?	
fs10. Please describe the foods (and ingredients) that you ate and/or drank for lunch at home or outside the home	
fs11. Did you eat or drink anything in between lunch and dinner yesterday?	
fs12. Please describe the foods (and ingredients) that you ate and/or drank in between lunch and dinner at home or outside the home	
fs13. Did you have dinner yesterday?	
fs14. Please describe the foods (and ingredients) that you ate and/or drank for dinner at home or outside the home	
fs15. Did you eat or drink anything after dinner yesterday?	
fs16. Please describe the foods (and ingredients) that you ate and/or drank after dinner at home or outside the home	
fs17. In the past 4 weeks, did you worry that your household would not have enough food?	
fs18. How often did this happen?	
fs19. In the past 4 weeks, were you or any household member not able to eat the kind of foods you preferred because of a lack of production and/or money?	
fs20. How often did this happen?	
fs21. In the past 4 weeks, did you or any household member have to eat a limited variety of foods due to a lack of production and/or money?	
fs22. How often did this happen?	
fs23. In the past 4 weeks, did you or any household member have to eat some foods that you really do not like to eat, because of a lack of production and/or money to obtain other types of food?	
fs24. How often did this happen?	
fs25. In the past 4 weeks, did you or any household member have to eat a smaller meal than you felt you needed, because there was not enough food?	
fs26. How often did this happen?	
fs27. In the past 4 weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	
fs28. How often did this happen?	
fs29. In the past 4 weeks, was there ever no food to eat of any kind in your household because of lack of production and/or money?	
fs30. How often did this happen?	
fs31. In the past 4 weeks, did you or any household member go to sleep at night hungry, because there was not enough food?	

fs32. How often did this happen?	
fs33. In the past 4 weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	
fs34. How often did this happen?	
fs35. How did you obtain the food that you consumed during last week?	Choose one or more: Own production, Purchased, Borrowed/Exchanged/FoodAid
fs36. How far is the market where you purchase food (km)?	
fs36B. Where do you purchase food?	
fs37. How do you get to the market? (1.Walking; 2. Motorbike/vehicle)	Choose one or more: Walking, Motorbike/vehicle
fs38. How easy is it to get affordable food in the area you live?	Easy, Regular or Hard
fs39. How much money does your household spend on food per week on average? (Ksh.)	
fs40. Who within your household decides most often what type of food is bought? (1=Husband, 2=Wife, 3=Children)	
fs41. What is the main types of food consumed in your household? (3 types in order of importance)	
fs42. Does the type of food consumed vary monthly/seasonally?	
fs43. Is there types of food you are unable to consume, but would like to?	
fs44. What food, and why are you unable to consume?	
Saving, credit and shocks	
scs1. Have you experienced major loss of crops due to poor rains in past 12 months?	
scs2. Have you experienced major loss of crops due to too much rain/flood/hailstorm in the past 12 months?	
scs3. Is there a time where you could NOT market crop produced for the market in the past 12 months?	
scs4. Has the household lost income due to illness, injury or loss of a job past 12 months?	Choose one or more: Illness/injury, Job loss
scs5. Have you had dispute anyone for whatever reason(s) in the past 12 months?	
scs6. What was the reason(s) for the dispute(s)?	
scs7. Have you ever received any loan in the past 12 months	
scs8. How much? (try convert to Ksh. if in kind)	

scs9. What was the purpose for the loan?	Choose one or more: Food, Education, Health, Clothing, Agricultural inputs, Hire labour, Paying loan, Lend to friend/relative, Transport, Assets (Tv, Radio, etc.), Home improvement, Other
scs10. Specify other	
scs11. Have you paid back?	
scs12. Why not?	
scs13. Does this household save money?	
scs14. Through what form of saving scheme(s)?	Choose one or more: Mary go around (rotating saving scheme, SACCO, Banking, Other
scs15. Specify other	
scs16. For what purpose?	
scs17. What is the saving time frame?	
scs18. Specify other	
scs19. How much do you save every time?	
Perceptions on farming and food security	
p1. In the past 5 years, due to farming, my livelihood has improved (Strongly disagree, Disagree, Neutral, Agree, Strongly agree)	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p2. Farmers that are able to do commercial farming are better off economically than those that are not	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p3. In the future, I am likely to allocate part of my land to my child/children	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p4. My land is too small to be economically viable	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p5. Land subdivision is bad for the future of agriculture in this community	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p6. Access to water is a major challenge for farming in this community	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p7. Farming on credit via contractual arrangement has benefits	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p8. I focus expertise and investment on one crop	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p9. I choose to diversify production on my land	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p10. I want to supply to multiple clients/markets	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p11. Farmer that produce own food crops is more food secure/resilient	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p12. Farmer that produce for market is more food secure/resilient	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p13. Farmer that produce own food crops and for the market is more food secure/resilient	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p14. Youth are happy not engaging in farming (Youth - person younger than 35)	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p15. Married women in this community are more involved in farm work than their husbands	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p16. Men (husbands) should make decision on how income from farming is to be spent	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p17. Women (wives) should make decision on how income from farming is to be spent	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p18. Being part of a farmer's group/association is beneficial	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p19. Being part of a cooperative is beneficial	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p20. The food that this household consumes is of good quality	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p21. The food that this household consumes supports our health	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p22. Buying food is expensive	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p23. Food in the market are seasonally priced	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p24. We buy MOST of the food consumed in this household	Strongly disagree, Disagree, Neutral, Agree or Strongly agree

p26. I am able to FIND any food items I may need from the local market (availability aspect)	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p27. I am able to BUY any food items I may need from the local market (cost aspect)	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p28. I believe that adding green leafy vegetables to my meals, makes my meals healthy	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p29. When I add green leafy vegetables to my meals, my household members are happy	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p30. The food we eat in the household depends on what the household members prefer to eat, what they like to eat	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p31. The food we eat in the household depends on the income we have, the amount of money we can spend on food	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p32. The food we eat in the household depends on our habit and is part of our culture	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p33. The food we eat in the household depends on what is available in the shops/ markets/ hawkers	Strongly disagree, Disagree, Neutral, Agree or Strongly agree
p34. The food we eat in the household depends on what we have produced ourselves	Strongly disagree, Disagree, Neutral, Agree or Strongly agree

Appendix 3 – Focus Group Discussion Guide: Export Avocado Farmers

We would like to have a group discussion on the experience of being an avocado farmer and participating in the avocado VC. We would also like to know about the changes you have experienced in the past 5 years.

- If possible, arrange the space so that participants can face each other.
- If not already done as part of the meeting, please have the participants introduce themselves before starting with the questions.
- Remind that participation in the FGD is voluntary and it will be recorded in order to better document the forthcoming information and views. The recording and transcript will not be used beyond research purposes and the views and names of the participants will be anonymized.

1. Opening questions: Changes

- a) If **a visitor would have visited** your farm and this community 5 years ago and now again, what would have been the **changes he/she would have noticed?** (please list)

Probes: Any other views? - Crops – House – Landscape – People

- b) Which would be the **most striking change** that this visitor would notice? (please list)

- c) **What** do you think **caused** this change?

Probes: Inside factors – Outside factors

2. Avocado farming

- a) What were/are your **expectations (motivations)** for engaging in avocado value chain? Please elaborate

- b) To what extent have these expectations been met?
- c) What have been the **key benefits** of participating in the Avocado value chain?

Probes: Farm and production – VC relations – market access

- d) What have been the **main challenges**?

Probes: Farm and production – VC relations – market access

- e) Has **everybody benefitted equally**?

If not, why have these people not benefitted as much as others?

3. Impacts on quality of life

- a) How has avocado farming **impacted your income** in the last 5 years?

Probes: If only positive/negative views, ask for any other views

- b) How has avocado farming **impacted your time management** in the last 5 years?

Probes: If only positive/negative views, ask for any other views

- c) How has avocado farming **impacted the way you eat** in the last 5 years?

Probes: Is there something you eat more or less? Why?

- d) How has avocado farming **impacted the lives of other members of your household** in the last 5 years?

- e) What are the **best months of the year** for you? Why?

Probes: Income – Food – Workload

- f) What are the **hardest months** of the year for you? Why?

Probes: Income – Food – Workload

4. Closing questions: Future and sustainability

- a) Do you think that the **changes** experienced over the last 5 years **will persist** into the future?

Probe: positive changes – negative changes

- b) What would be an **ideal situation** for you **as an avocado farmer**?

- c) In your opinion, **what can (realistically) be done to improve** your lives as part of the Avocado value chain?

Probe: At the farm – VC relations - other

- d) Who do you think is **responsible** for making these improvements?

- e) Any further comments or questions?

This has been an enlightening discussion. Thank you very much for your participation and cooperation.

Appendix 4 – Codebook for FGD qualitative analysis

Code	Type	Description	Sub-codes	In-text example
Changes	Deductive	Changes observed in the past 5 years by the participants on the farm, the community and relationships within the VC, community or household		Environment has changed; poor weather has led to poor production of previously commonly produced crops such as maize, potato and even animal feeds. Drought has become more frequent.
Expectations and projections	Deductive	Expectations regarding avocado farming and participation in upgraded VCs	Future (Deductive)	Plants are bearing more as time go, before the plant was young, and bearing very little. Not it is maturing, so we expect bigger harvest and so will be the income.
Benefits	Deductive	Benefits from farming avocado and participating in upgraded VC	Environmental benefits (Inductive), Equality of benefits (Deductive)	tree can give up to 3 creates – 50 kilos. That's not bad. The trees are easy to manage. Also harvesting
Challenges	Deductive	Challenges regarding avocado farming and participating in upgraded VC	Land size (Inductive), Roads and transport (Inductive)	challenge is early maturity; if it is a small quantity; nobody is collecting from the company. Perhaps a cooler could help with that problem. Some place has a cooler.
Income	Deductive	Income related changes and issues	Payments (Inductive)	If I combine how much I have sold, both to brokers and songoroi, I have made 60,000k
Food and food security	Deductive	Issues and changes related to food and food security		The program was attractive as a source of income; that would help meet household needs including education, health care, food shortage.
Relations and social impacts	Deductive	Impacts and changes observed by the participants regarding the lives and relations between household and community members		It was payed according to what I harvested. Used it to take care of my family needs. This is good, because we harvest 2 times a year,

				we get this money, it is be great.
Temporality and seasons	Deductive	Mentions of specific seasons and times of the year in which specific issues manifest		August-October is the best month, climax for the harvests; October – tea bonus (for those with tea).
Price and market	Inductive	When prices and market issues are discussed	Brokers (Inductive)	Another problem, we have been waiting for the price to improve. There is heavy competition, and you know black market(brokers) take all, including small ones. So we are wondering what to do.
Inputs	Inductive	Used for anything related to inputs to improve production, including effort, extension services, fertilizer and other inputs	Irrigation (Inductive), Time and workload (Deductive)	We were promised additional nutritional materials to improve the quality of the land for avocado trees, but we didn't receive any
Rejects	Inductive	Used to code for issues regarding rejects and their use		Another problem, reject; small though it is ready. For me they reject upto 100 pieces. So I told the kids to go sell to the local market; and eat
Expenditure	Inductive	Used to indicate what farmers use or intend to use the income generated by avocado for		Money received, a member paid school fees – 16,000. Secondary schools;
VC relations	Deductive	Issues related to the relationships and events between value chain actors	Cooperative (Deductive), Songoroi (Deductive)	You know such thing as this which involves money, regular meeting is important. People from ISEI should take contact of every farmer and be sending one message to every farmer. For instance, such is the issues of harvesting where farmers fail to get information on time about harvesting period and their fruits are not taken. That has been very bad; it is creating a lot of problem, especially in this area.
Responsibility	Deductive	Used to highlight perceived responsibility for occurred or expected changes or events	Government (Inductive)	It is the responsibility of the Songoroi to fix money delay, harvest and price issue, and cooperative (ISEI) to fix these cooperative issues. For the roads, as indicated earlier,

				government should take charge
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Appendix 5 – Focus Group Discussion Guide: Food

Intro:

- **Topic on food and diet**
- **What you find important and what you would define a “good diet”**
- **How you make choices on what to eat and where to buy it**
- **Role of avocado in your diet**

Opening:

1. Who cooks the food in your household?
2. How do you acquire the food you eat in your household?
3. Who decides on what to eat?

Diet:

4. What would you describe as your typical diet?
5. Which of these elements are traditional (before your lifetime/since your childhood)?
6. Which of these are new (have become part of it during your lifetime)?
7. What do you find important about your current diet?
8. What do you find lacking in your current diet?
9. Who are those that eat best in your community? Why?
10. In the recent 5 years, what have you been eating more? Why?
11. In the recent 5 years, what have you been eating less? Why?

Avocado:

12. How does avocado fit into your diet?
13. What do you find it adds to your diet?
14. When do you eat avocado?
15. Do you ever buy avocado for food?
16. Currently (harvest season), how often do you eat avocado?

Availability:

- 17. What food crops do you think should always be available on the farm?
- 18. What foods should always be available on at your closest market/food store?
- 19. How do you think avocado has affected the availability of food on your farm?
- 20. How do you think avocado has affected the availability of food at the market?

Matrix-Ranking and preference exercise (Gay et al. 2016):

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Score	Rank
		Maize	Potatoes	Kale	Bananas	Meat	Eggs	Dried fish	Beans	Milk	Cooking fat	Soda	Tea	Avocados	Wheat	Oranges		
1	Maize	■																
2	Potatoes		■															
3	Kale			■														
4	Bananas				■													
5	Meat					■												
6	Eggs						■											
7	Dried fish							■										
8	Beans								■									
9	Milk									■								
10	Cooking fat										■							
11	Soda											■						
12	Tea												■					
13	Avocado													■				
14	Wheat														■			
15	Oranges															■		

Discussion:

Why does x score so high?

Why does y score so low?

Why is avocado ranked as it is?