Large Agricultural Investments in Kenya's Nanyuki Area: Inventory and Analysis of Business Models

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Published in Land Use Policy. Volume 99, December 2020

Keywords: agriculture; investment; business model; determinants of business models; actors; access to land

Abstract

Many experts agree that more agricultural investment is needed in the global South to improve local food security and reduce poverty. However, there is a lack of consensus about the *types* of investment needed to achieve these goals. This paper contributes to the literature on large agricultural investments and corresponding business models by inventorying and analysing such investments in Kenya's Nanyuki area. We identify four clusters of business models that differ primarily by type of production and other distinct determinants, namely: demand from markets; access to land; land tenure regime and colonial history; actors involved; biophysical context; labour availability; and governance of the value chain via private standards. The study results shed light on the factors that help or hinder implementation of large agricultural investments and shape their impacts in the context of African land use systems. The way land is accessed represents one of the most-decisive factors determining the risks and opportunities associated with such projects. We find that most investments in the Nanyuki area occur on land bought or leased from private owners.

1. Introduction and objectives

Increasing agricultural investment in the global South has long been seen as crucial to improving local food security and reducing poverty (World Bank, 2007). However, there is a lack of consensus about the *types* of investment needed to achieve these goals (Hall et al., 2017). Some researchers see the future in large-scale mechanized, high-input commercial agriculture (Collier and Dercon, 2014; Deininger and Byerlee, 2011). Others emphasize the continuing importance of small-scale family agriculture for the livelihoods of rural populations (Holden and Otsuka, 2014; McIntyre, 2009), and highlight the threat of displacement and other negative impacts posed by agricultural commercialization in the global South (Henderson and Isaac, 2017; White et al., 2012). A growing body of research evidence is shedding light on the social, economic, and environmental impacts of large-scale international land acquisitions (Alden Wily, 2012; Anseeuw et al., 2012; Borras Jr and Franco, 2012; Bottazzi et al., 2016; Cotula, 2009; Nolte et al., 2016; Oberlack et al., 2016; Peluso and Lund, 2011; Schoneveld, 2014; Schoneveld, 2017; Schoneveld et al., 2011; Voget-Kleschin and Ott, 2013).

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At the same time, observers also emphasize the need for more nuanced understanding of the different *models* of commercial agricultural investments as well as their corresponding impacts (Cotula et al., 2011; Cramb et al., 2017; Glover and Jones, 2019; Hall et al., 2017). Vital questions include whether, and to what extent, particular models of commercial investment support broader agrarian change and sustainable rural development (Kleemann and Thiele, 2015; Messerli et al., 2013; Oya, 2013). Answering such questions can also aid understanding of how local land use changes are shaped by distant drivers (Lambin and Meyfroidt, 2011; Meyfroidt et al., 2013).

The present article contributes to the emerging literature on commercial investment models, outlined below in section 2.1, and builds a new conceptual framework for analysis upon it (Anseeuw and Ducastel, 2012; Chamberlain and Anseeuw, 2019; Cramb et al., 2017; Vermeulen and Cotula, 2010).

In Kenya, investments in commercial agriculture have been significant and are viewed by many as an economic success story. In particular, horticulture in Kenya has experienced strong growth since the 1980s, reaching a domestic value of KES 236.45 billion (USD 2.36 billion) in 2017 (Government of Kenya, undated). The value of Kenya's horticultural *exports* reached KES 115.3 billion (USD 1.15 billion) in 2017, and is Kenya's second biggest source of foreign exchange earnings (Government of Kenya, 2018). At the same time, the sector has undergone major shifts in the structure of production, moving away from smallholder models and towards large-scale production types (Dolan and Humphrey, 2000; Humphrey et al., 2004). Dolan and Humphrey (2004) describe the rise of tightly knit value chains aimed at horticulture exports to the UK especially. According to Neven et al. (2009a), most small farmers in Kenya have found it difficult to link up directly with modern supermarket-oriented value chains, but new opportunities for contract-farming and new labour markets have afforded them some benefits from increasing commercialization. Rao and Qaim (2016) point to particular opportunities and potential benefits for women workers in Kenya, but emphasize remaining barriers to entry that must be overcome. Some observers express concern that large commercial actors – in combination with more stringent standards – will gradually put local smallholders and contract farmers out of business (Dolan and Humphrey, 2000; Gachukia, 2016; Henson and Humphrey, 2010; MacGregor et al., 2014; Neven et al., 2009; Obidzinski et al., 2013; Ouma, 2010; Tallontire et al., 2014). Nevertheless, Dolan (2002) has emphasized the likelihood of positive employment effects based on the shift from smallholder production to larger commercial units. Several researchers have studied the working conditions of employees on horticultural farms in Kenya (Dolan and Sutherland, 2002; Peter et al., 2018). Kuiper (2019b) found that horticultural farms in Naivasha, Kenya, offer an increasing number of more permanent, secure jobs – in addition to many temporary, precarious jobs – but usually under strongly hierarchical conditions. Using household survey data in Kenya, Muriithi & Matz (2015) found consistently positive associations between export markets and people's incomes – but not their assets.

Agricultural investments and their impacts are intrinsically linked to land access (Oberlack et al., 2015). In Kenya, land plays an essential role both politically and socio-economically (FIAN, 2010). During the period of British colonial rule (1920–1963), many indigenous communities across Kenya's central uplands were dispossessed of their land. These areas in the "White Highlands" and adjacent rangelands were subsequently transferred to European settlers. All told, 20% of Kenya's land – including prime agriculture areas – was seized in the process. Following Kenyan independence, political leaders played a key role in maintaining systems of land patronage (Duvail et al, (2012). Land in Kenya is categorized as either public, private, or community (Government of Kenya, Land Act 2012). These categories shape the patterns of large agricultural investments in different regions of the country. Most of Kenya's intensively farmed central and western provinces were gradually subdivided and privatized after independence (Smalley and Corbera, 2012). In other areas, public land

was – and still is – used as a form of patronage and a means to maintain control and power. This explains the centralized nature of Kenya's post-independence land administration, which in turn enabled the spread of "land grabbing". In recent years, land grabbing has extended to areas of great ecological importance and has acquired a new dimension in contestations over global trends of large-scale land deals (Anseeuw et al., 2012). To date, the majority of land grabbing has occurred in Kenya's Tana region where public land prevails, but is used by local communities (Arevalo et al., 2014; Duvail et al., 2012; Smalley and Corbera, 2012). Overall, land grabbing by elites has enriched politically connected individuals and companies at the expense of the public since at least the 1980s (Manji, 2012).

The present study sought to empirically analyse large agricultural investments (hereinafter LAIs) and corresponding business models in Kenya's Nanyuki area, enabling better understanding of the implications of these business models regarding land use and spatial planning. The research sheds light on how LAIs are embedded in given agrarian structures, which can contribute to better governance of LAIs and eventually sustainable development.

This article deepens the relevant literature by analysing a comprehensive inventory of agricultural businesses in a study area that is a preferred target for large commercial investments in Kenyan land. In contrast to other studies that focus on individual case examples, we sought to identify relevant patterns at the *regional* level by taking into consideration all LAIs in the area. The findings, in turn, are relevant at the national level in Kenya, since similar investments are occurring across the country, as well as throughout Africa, since various countries on the continent have sought to attract LAIs to promote hubs or corridors of commercial agricultural growth.

In particular, we sought to answer the following research questions:

(1) What are characteristics and typical patterns of business models of LAIs in the study area and how have they changed over time?

(2) What are the determinants of these patterns of business models?

(3) What can we learn regarding general land use policies that govern LAIs and agricultural investments in tropical land use systems?

2. Conceptual framework

2.1. Conceptual framework for assessing business models of LAIs

Referring to the organization of commercial enterprises, the term "business model" is frequently used throughout the scientific literature. Nevertheless, there is no single agreed-upon definition that is applied by all researchers. Morris et al. (2005) have identified over 30 scholarly definitions of the term. Further, it is often used interchangeably with terms like "business concept", "revenue model", or "economic model" (Morris et al., 2006). However, Magretta (2002) offers a concise definition: "Business models describe, as a system, how the pieces of a business fit together". In addition, Morris, Schindehutte et al. (2005) propose that business models can be analysed on strategic, operational, or economic levels. Finally, Camisón &Villar-López (2010) suggest distinguishing business models according three basic dimensions: (1) organizational structure, (2) degree of diversification (product/market sector), and (3) management of value chain activities (vertical integration vs. cooperation).

With regard to agricultural investments in Africa, analysis of business models is an emerging field that aims to uncover the dynamics of growing commercialization of agriculture (Anseeuw and Boche, 2012; Anseeuw and Ducastel, 2012; Boche and Anseeuw, 2013). The present authors previously investigated business models of current investments in commercial farms, showing how they are shaped by complex interactions of resource flows, decisions made at different levels, and competitive pressures. Boche and Anseeuw (2013) identified six very different land acquisition-related business models, based on research in four southern African countries. These models spanned independent farmers, cooperatives, contracting arrangements, and various types of commercial business actors. Their typology, based on empirical data, was created using three sets of variables: the set-up and organizational characteristics of the business model; the results, outcome, and sustainability of the business model; and the inclusiveness and direct implications of the model for local populations and development (Boche & Anseeuw, 2013). Di Matteo and Schoneveld (2016) analysed an inventory of land investments in Mozambique and characteristics of their impacts. They found that most investments aim at domestic food markets, and stem from investors in South Africa, Zimbabwe, and northern countries. Finally, research by Hall et al. (2017) in Ghana, Kenya, and Zambia has identified advantages of commercial farming areas and contract-farming business models in creating many local economic linkages. Further, they found that larger plantations/estates create more jobs, but these tend to be of lower quality and favour casual employment conditions. Our review of business models in agriculture is limited to land-based investments, therefore we do not include commercial investments in input supplies or mechanization, for example (Houssou et al., 2013).

Another strain of relevant research focuses on the "inclusiveness" of business models (Cotula, 2009; Cramb et al., 2017; Vermeulen and Cotula, 2010). Vermeulen and Cotula (2010) assess inclusiveness according to four dimensions: *ownership* (of the business itself and key project assets); *voice* (the ability to influence key business decisions; and the presence of arrangements for review or lodging of grievances); *risk* (commercial, but also more broadly) and *reward* (economic costs/benefits, but also nonmonetary rewards). Based on this methodology, Chamberlain and Anseeuw (2019; 2018) have analysed the impact of more inclusive business models particularly in terms of the integration of smallholders into commercial value chains, highlighting weaknesses of these models such as power asymmetries between investors and farmers leading to limited empowerment and financial benefits among participating farmers. German et al. (2016) studied inclusiveness models in Mozambique and found little contribution to poverty reduction or building of community–investor relations.

Drawing on this literature on business models and our own prior research and policy engagement regarding LAIs in Africa, we developed an adapted analytical framework for interviews conducted in the present study. The resulting framework focuses mainly on the operational level, and less on the strategic or economic level (Morris, Schindehutte et al. 2006). While the management and governance of value chains (Gereffi et al., 2005; Lee et al., 2012; Peterson et al., 2001; Williamson, 2007) were not the focus of the investigation, we nevertheless identify the *position* of our studied LAIs in the value chain and the *type* of value chains they are embedded in. Our analytical framework covers the organizational structure, agricultural production model, and place and function in value chain (Table 1).

Main dimensions of business models	**Specific elements contained in analytical framework**

(1) Organizational structure	Actors, juridical structure, network of funding, certification, compliance, and taxes
(2) Production model	Investment size, ownership and access to land, labour, outgrowing and contract farming, main products, technical agricultural model
(3) Place and function in value chain	Main markets, place and function in value chain

Table 1: Analytical framework for investigation of business models

3. Methods and data

3.1. Study area

Our analysis focused on Kenya's Nanyuki area, where numerous LAIs specialized in horticulture have developed over the last 20 years (Jacobi et al., 2018; Ngigi et al., 2007; Peter et al., 2018), as shown in Figure 1. Nanyuki is one of the most important areas in Kenya for export-oriented horticulture farms. At the same time, there many large cereal and livestock farms and ranches in the area. In total, we identified 48 ranches and farms in the study area. This area of 249,147 hectares (ha) is situated in the north-western foothills of Mount Kenya, approximately 200 km north of Nairobi, and includes parts of Laikipia, Meru, and Nyeri counties. The area was chosen because it enables investigation of a cluster of LAIs already in operation that have evolved in recent decades.

While not always large by surface area (typically around 40–200 ha), the commercial farms in the study area tend to be large in terms of capital invested and labour force involved. According to our interviews, approximately 8,200 workers are employed by the 33 LAIs investigated. Unlike other regions in Kenya, most land is titled and land tenure is generally considered secure in Nanyuki. Land tenure in the area has been strongly shaped by history – especially colonial-era land grabs and post-colonial control by national elites. Many large farms in the area were subdivided and sold to smallholders during the post-colonial period, supported by government programmes and international donors. However, some farms were not subdivided, and continue to exist or were sold to new investors (Käser, 2018). Notably, there are strong competing interests regarding use of water resources in the area (Dell'Angelo et al., 2016; Eckert et al., 2017; Ngigi et al., 2007; Zaehringer et al., 2018). Using remote-sensing methods, Eckert et al. (2017) found that between 1987 and 2016, the area covered by greenhouses increased by 624 ha (from zero) and waterbodies (reservoirs) increased by 96 ha. They also found that intensified field crops increased significantly in the area (irrigated cropland increased by 18,315 ha or 7.4%), cultivated both by commercial farmers and smallholders.

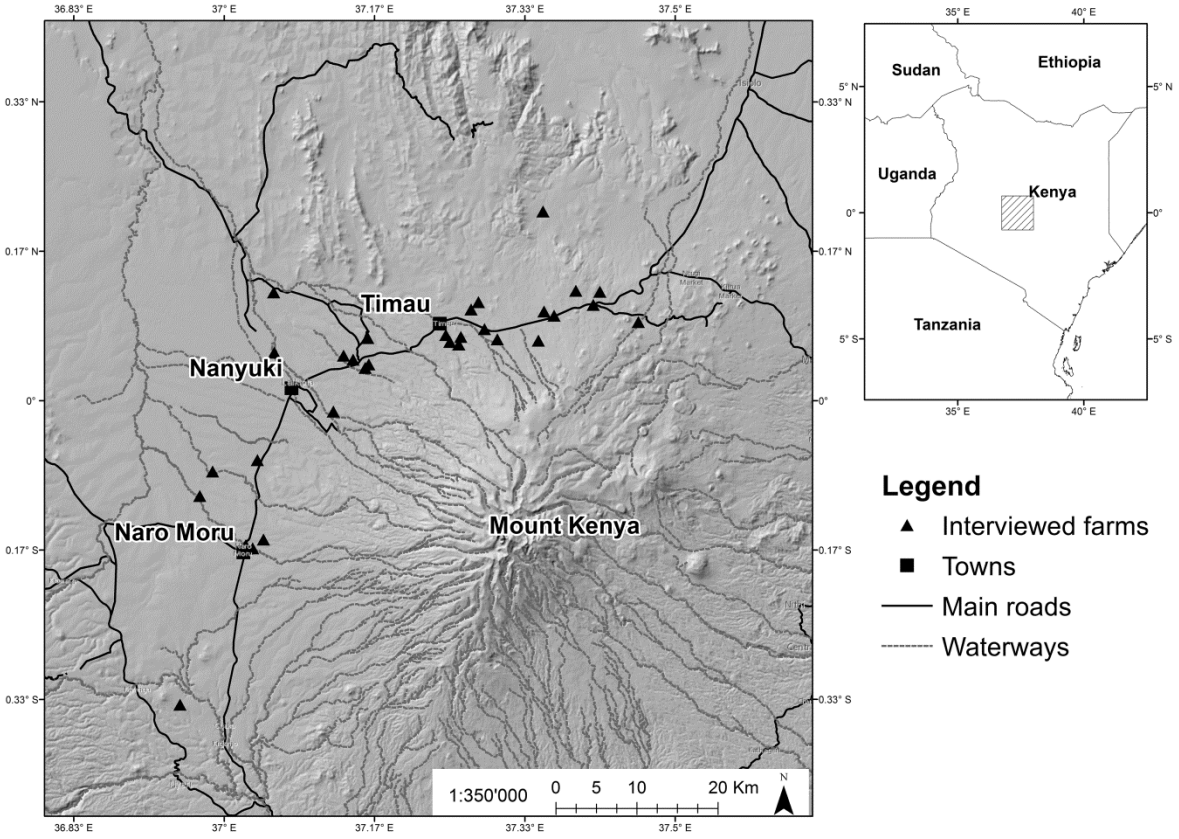

Figure 1: Map of the study area

3.2. Data collection

Our initial data sets derived from wider inventories of farms and ranches collected in 1996 (Kiteme, 1996) and 2013 (Lanari et al., 2018). By combining these two data sources, and excluding those not falling in the chosen study area, we arrived at an initial count of 59 farms and ranches. Additional LAIs were identified in exploratory field research, undertaken in January 2016. We eventually settled on a final count of 48 active farms and ranches, which we consider a complete inventory of LAIs in the study area (Mutea & Giger 2016).

To be included on the list of LAIs, the investments had to fulfil all of the following criteria: (1) featuring land-based agricultural production; (2) involving private business-oriented management and possessing an accounting system; (3) large by area (>20 ha) or capital (no precise benchmark was used regarding capital, as the available data were not robust). Investments purely focused on processing activities were not included.

We initially sought to interview representatives from every LAI. Ultimately, we conducted 41 preliminary semi-structured interviews (85% response rate) between February and April 2016. In a second round, we were able to carry out 33 in-depth interviews between June and September 2016. Overall, we consider the sample to be representative, as no systematic bias was found in terms of the distance to road, main type of production, or the size of the corresponding LAIs. The reason cited for rejection of second interviews by relevant respondents was lack of time. The 33 in-depth interview

subjects included seven LAI owners, six directors of LAIs, 18 medium-level managers, one accountant, and one supervisor of operations of respective LAIs.

We developed the questionnaires for the in-depth interviews (see Appendix A) based on literature review of business models, our prior empirical research on the topic, as well as the exploratory field visits. Interviews lasting 150–180 minutes were conducted/recorded by the second author and subsequently transcribed (Mutea & Giger, 2016).

Thanks to the long-time involvement of some of our Kenyan research partners in the study area, it was possible to obtain access to the LAIs and collect first-hand information. However, the respondents were typically reluctant to share certain information for fear of giving away business secrets, worries about possible misuse, or concerns about attracting unwanted attention from fiscal/financial authorities. As such, the researchers were not given access to business plans, profit or loss statements, audits or tax reports. In particular, it was not possible to verify data on levels of investment. Data on employment could be cross-checked with survey data in the same area (Reys et al., 2018). The perceived incidence of conflicts and local people's views/attitudes towards five specific LAIs were analysed by Zaehringer et al. (2018).

3.3. Data analysis

The questionnaire data were coded and assessed by means of descriptive statistical analysis of the most important variables. We selected a total of 20 key variables that captured the main characteristics of business models according to the analytical framework: type of actor; degree of integration; model of investment; juridical form; organization of agricultural production model; technical agricultural model; ways of accessing land; size of investment; and area used (Appendix Table A). We then evaluated correlations among all variables and eliminated those that were highly correlated. This gave rise to a final selection of ten not normally distributed variables, four quantitative variables, and six ordinal variables.

In order to further reduce the number of variables and achieve a normal distribution of data, we first performed a principal component analysis (PCA) using an approach that can handle mixed data (i.e. quantitative and qualitative variables). As part of this approach, for the qualitative variables, squared loadings are correlation ratios between the variable and the principal components, while for the quantitative variables, squared loadings are the squared correlations between the variable and the principal components (Chavent et al., 2014).

Afterwards, the resulting normally distributed principal components were used to perform a hierarchical clustering. We selected a clustering approach that performs a multiscale bootstrap resampling of the data (i.e. the individuals) using 10,000 bootstrap replications. This enables computation of approximately unbiased (AU) probability values (p-values) for each cluster. Clusters with an AU>95% are considered strongly supported by the data. We used ten PCAs to perform the clustering. They explained 87% of the data variance. The clustering was performed based on Euclidean distances and according to Ward's D2 method (Murtagh and Legendre, 2014), in which dissimilarities are squared before clustering. Ward's D2 provided the best separation of clusters and highest AU. These calculations were done using R software (Team, 2017). The pcamix package was used for PCA (Chavent et al., 2017), and the pvclust package was used for clustering (Suzuki and Shimodaira, 2013).

4. Results

4.1. Characteristics of business models of LAIs in Kenya's Nanyuki area

4.1.1. Organizational structure

Most LAIs in the study area were undertaken by domestic *actors*: 88% of the investors (n=33) were citizens of Kenya (see SI2 for an overview of key data). Five investors were from the UK, Ireland, France, South Africa, and Zimbabwe, but partnered with local investors in order to register a company, obtain access to land, and/or benefit from local technical know-how. The investors came from different sectors, but the majority (78%) had many years of experience (10–40 years) in commercial agriculture – often in Nanyuki itself. Hence, most were familiar with local agricultural dynamics and risks.

In total, 52% of the farms were private companies with shareholding, 27% were private companies without shareholding, and 21% were individually owned by entrepreneurs or farmers.

Shareholding company structures enable commercial farms to raise necessary capital. Investments are often very high, up to a total of USD 5–9 million[5] for individual farms in the last ten years. Overall, this legal structure eases the entry of new investors into Kenya. Foreign investors are simply required to partner with locals to register a company. In this way, foreign capital may be invested in local companies (Republic of Kenya, Companies Act 2015). In addition, Kenya's Companies Act 2015 stipulates that foreign companies registering in Kenya must demonstrate that at least 30% of the company's shares are held by Kenyan citizens born in the country. The private companies with shareholding in the study sample were described by respondents as independent businesses – except for in two cases, in which respondents mentioned formal links to a multinational company, on the one hand, and to an unnamed investor in Ireland, on the other. The LAIs in this business/legal category include many flower and vegetable producers, as well as ranches and wheat farms. Eight of the LAIs with shareholding were established after the year 2000, and required major investments. Nevertheless, some newer investments have opted for other business/legal structures.

Our sample also included nine private *companies without shareholding*, which is also possible under Kenya's Company Act.[6] All had Kenyan owners, with the exception of one large French cooperative that invested in an LAI to produce seeds. Two others were affiliated with larger companies, but claimed Kenyan ownership. Six of these companies produced goods primarily for export, while the remaining three were focused on local markets (avocados, cattle, sheep, cereals). Four of these LAIs were established after 2000, and the investment levels ranged between USD 0.3 million and USD 1.7 million.

Overall, these private companies typically employed management staff with long-running experience, including many of Kenyan origin, while some newer LAIs, especially horticulture farms, featured different management levels, such as boards of directors, general managers, human resources managers, farm managers, etc.

[5] KES 100 = USD 0.97423 as of 1 June 2016

[6] A company which does not have shares but limits liabilities by guarantee (Art 7, Company Act).

Finally, several farms in the sample were run by *individual entrepreneurs and farmers*, which are not legally registered as companies. These were all run by Kenyans, and involved cultivation on open fields (dairy, hay, horticulture) – not in greenhouses. The farms ranged from small to medium size, with the majority measuring around 20 ha. Only two such investments amounted to over USD 0.2 million in the previous ten years. This form of business is more appropriate for smaller operations. The individual owners must personally assume all risks and liabilities, which tends to constrain their access to large amounts of capital. Three were established after the year 2000. Two of these LAIs operated as outgrowers for other large companies (horticulture).

A combination of companies' own capital (including shareholding) and bank loans were the main source of funding for investors (42% of LAIs). A total of 49% of the LAIs mainly depended on short-term bank loans, while 9% declared other types of mixed funding. According to respondents, bank loans are very accessible and – despite high interest rates and service charges – used regularly to expand business operations more rapidly, with banks refraining from steering the precise use of funds. By contrast, companies' own capital – including funds from shareholders, parent companies, and savings – were described as long-term and subject to steering by investors who exert control over company decisions. Some companies changed ownership when growth was perceived to be too slow and more investments were seen as necessary. Specific sources of funds mentioned were national and international banks as well as other specific companies[7] (agricultural cooperatives, horticulture traders, and investment funds). Several LAIs gradually expanded and invested in different farms, generating more income for the parent company. Some of the LAIs invested in other farms in the study area, in other areas of Kenya, or in another African country (Ethiopia).

The LAIs operated according to diverse international and domestic *production standards* (Aschinger 2017). Overall, 23 LAIs (56%; n=41) obeyed at least one standard, with 21 farms (91%) following between two and five standards. The remaining two farms (9%) only mentioned one standard. In total, 18 different standards were used. In particular, 14 farms (61%) produced according to GLOBALG.A.P. guidelines. If we combine several standards considered roughly equal by observers (KenyaGAP, KenyaFlower Council, MPS-GAP), then a total of 18 farms (78%) followed similar standards. Another 16% produced according to Fair Trade standards, with four farms following a combination of GLOBALG.A.P. and Fair Trade standards.

Taken together, 45% (n=33) of respondents stated that EU standards and regulations made no difference to their business, since they either produce for local markets, have stopped horticulture, or believe other standards are more stringent and follow them instead. A total of 33% acknowledged the impact of particular pesticide standards and social norms – also highlighting corresponding costs of implementation to accommodate them. A small minority (12%) of respondents explicitly viewed such standards as negative and burdensome, while 3% reported both negative and positive aspects. Organic production was mentioned as a potential market, though only two farms produced organically and were specialized in herbs, oils, and seeds.

The *government of Kenya* has not assumed a direct role in determining the pricing or physical operations of horticultural marketing. Its role has been rather limited, mainly confined to regulatory and facilitative functions. Nevertheless, many respondents expressed criticism about governance issues, including perceived corruption, political interference, overly strict labour laws, and more. A total of 88% (n=33) of respondents described regular government inspections. Environmental rules, conditions on water use, health inspections, labour management reviews, and tax audits were mentioned most frequently. In

[7] World Bank, Standard Bank, AFC, Kenya Commercial Bank, Barclays, Standard Bank HM Clause, Wealmore and KHE

total, 70% of the LAIs declared they paid annual taxes, however we could not obtain details on the amount and type of tax in most cases.

4.1.2. Production model

Commercial investments in agriculture encompass a range of significant costs, including those for accessing land; purchasing farm equipment; building farm infrastructure such as greenhouses, water ponds and pumps, warehouses, and cooling equipment; buying inputs such as fertilizers and pesticides; employing workers; applying for various licenses and certifications; and more. We were able to obtain total cost/investment estimates from respondents with respect to 23 LAIs. For the remaining LAIs, we estimated overall costs based on comparable LAIs (type/size) in the study area and data pool. A total of 16 LAIs indicated investments totalling over USD 1 million, while three LAIs indicated investments of more than USD 10 million. The five LAIs with the highest levels of investments were flower and vegetable farms, as well as one mixed cereal/livestock farm (SI2). Average investments per hectare were highest for flower farms, followed by investments in horticulture farms (Table 2).

Our data from eleven flower farms revealed a cost range of USD 3/m^2 to USD 60/m^2 for construction of greenhouses, with differences attributable to application of different production standards – but also due to incomplete information provided by managers. One senior manager offered an estimate of USD 30/m^2 the average cost of building a modern greenhouse for production of roses. Altogether, 624 ha of greenhouses were constructed in the study area between 1987 and 2016 (Eckert et al., 2017). Taken together, total greenhouse investments in the study area during this period could be as high as USD 190 million.

Type of Production	**Number of LAIs**	**Investment**	**Area Used**	**Total Labour**	**Labour Intensity**	**Capital Intensity**
		Millions of USD in ten years	**in hectares (ha)**	**Employees/ farm**	**Total employees/ ha**	**1000 USD/ha in last ten years**
Dairy	**1**	**0.02**	**8**	**7**	**0.88**	**2**
Field crops	**3**	**2**	**829**	**34**	**0.04**	**3**

Mixed cereals/livestock	**7**	**4**	**787**	**106**	**0.13**	**5**
Vegetables	**8**	**1**	**25**	**230**	**9.31**	**39**
Vegetable seeds	**1**	**2**	**3**	**85**	**28.33**	**567**
Flowers	**11**	**4**	**25**	**467**	**18.76**	**169**
Organic herbs, oils	**2**	**0.5**	**55**	**148**	**2.68**	**9**

Table 2: Average investment, area cultivated, employees, and labour and capital intensity per type of production

When asked about future investments, most respondents had concrete plans (85%). A total of 42% mentioned expanding operations (mainly adding greenhouses), while 27% planned to upgrade technology (new machinery, solar panels, etc.). Diversification and acquisition of land were each mentioned twice.

The majority of LAIs (67%, n=33) *owned their land*, while 27% *leased* and 6% *rented*. Leasing conditions varied from three-year renewable up to 50 and 999 years (for a very large farm of over 400 ha). Renting refers to one- or two-year contracts.

The majority of privately owned land was purchased. Only three LAIs were inherited, and all three were owned by individual farmers. Investors typically find suitable land for purchase either via word of mouth; real estate agencies; networks/ties with friends, relatives, etc.; gifts; or inheritance. In most cases, remaining land available for purchase is owned by foreigners, especially British or American elites or a few influential, politically well-connected local individuals who own thousands of acres of land. From a legal point of view, purchasing or leasing land is relatively easily done through an established legal process, evidenced by the fact that land in Nanyuki is largely titled and privately owned. In practice, however, farmland is not easy to acquire because there are very few willing sellers remaining and such land is in high demand. Most new farms acquired their land from a single previous owner who possessed a sufficient amount of contiguous land (source: own survey).

Corruption at the land registry and *land fragmentation* (causing lack of contiguous plots) were the main constraints to *accessing land* mentioned by local farmers. These difficulties were not cited as influencing business models or causing project failures. According to the respondents, authorities usually welcome investments because they provide employment to locals and contribute to government revenues via payment of taxes and fees. In addition, thanks to enforcement of strict land laws, no communities have been displaced by any of the LAIs in study area. This was confirmed by all respondents as well as interviews and surveys conducted with around 400 land users living near the LAIs (Zaehringer et al. 2018; Reys et al. 2018).

Overall, land access is an important factor influencing the type of production**.** Five LAIs were established prior to 1980 when larger continuous plots were easier to obtain: all are larger than 200 ha and produce cereals or cereals/livestock. Indeed, the biggest large-scale farms in the area were mainly created in the colonial era. Newer farms are much smaller: in the last 20 years, only four LAIs larger

than 80 ha have been founded in the study area. As land access is now constrained and largely limited to purchase or lease (apart from the occasional inheritance), the situation precludes establishment of additional geographically large-scale operations.

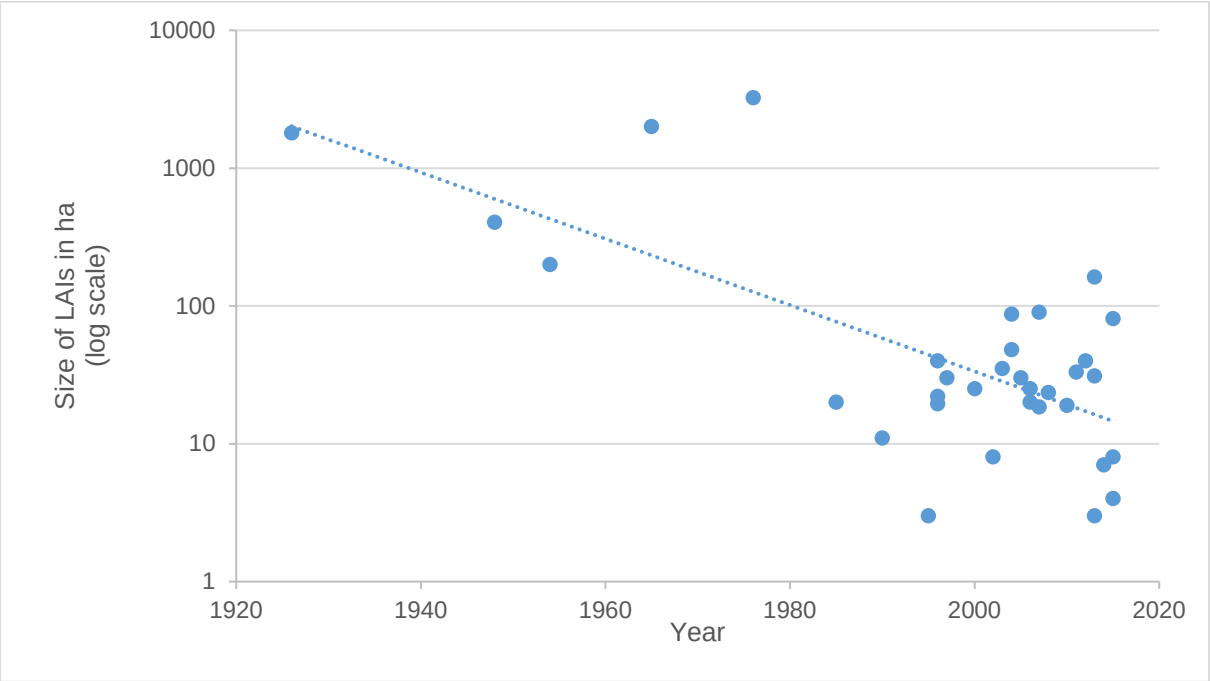

Figure 2: Size of LAIs (ha) and year of start of production of LAI

Interestingly, the data suggest that the total investment value does not show a clear trend when compared with the establishment date of firms. Older LAIs, frequently specialized in more extensive production over larger areas, generally correspond with large cost of investments, commensurate with their large size. Newer LAIs, however, which encompass a number of smaller farms displaying very different levels of investments, do not exhibit a clear trend (see Figure 3: Investments and year of production start of LAI). A closer look at more 27 recently established LAIs (since 1990) confirms this result.

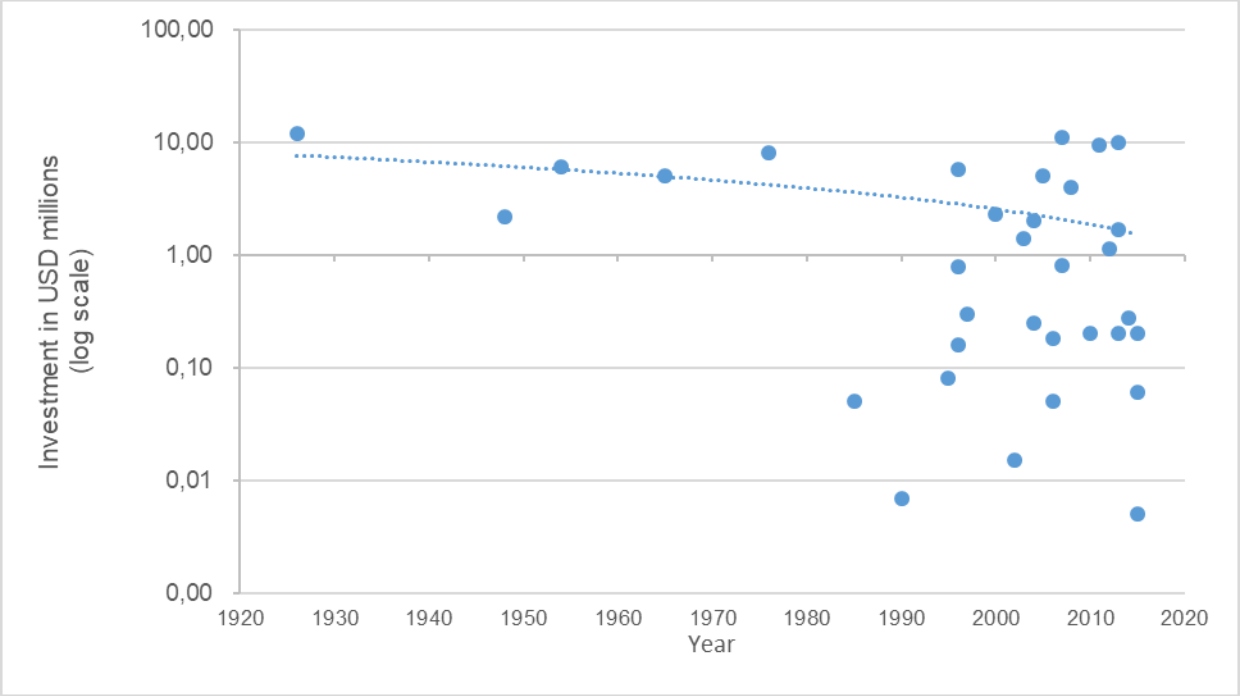

Figure 3: Recent investments and year of production start of LAI (n=33). Note that the y-axis indicates recent investments (in the last ten years), whereas the x-axis indicates the production start date.

In terms of *area owned*, the majority of LAIs (48%, n=33) in the study area were relatively small, i.e. 1–50 ha (mostly flower farms). Another 30% were 51–200 ha (mostly vegetable farms), while 21% were over 200 ha (mostly cereal farms). Notably, many LAIs did not utilize all of their land. Indeed, 36% (n=33) of the LAIs used less than 50% of their land for crop production. Some were still developing and set aside part of their land for grazing, while others had land with forest cover. Water scarcity also deterred some LAIs from cultivating all of their land, though most invested heavily in water-harvesting structures. Finally, a variety of other operational, financial, logistical, and technical issues precluded LAIs from using all of their land for production.

The 33 LAIs in the study employed 8,200 *workers* in total – 70% on permanent contracts (Mutea et al 2017). Notably, 49% of the permanent workers and 62% of the seasonal workers were women. The majority worked on horticulture farms. The extensive cereal farms and ranches employed very few people, but almost all were permanent. LAIs had a big pool of labour to draw on in terms of unskilled and skilled workers because of the large local population and high unemployment rate. General workers (seasonal and casual) were usually recruited based on prior experience; the remainder received on-the-job training. Managers and technicians were required to have a degree or diploma in relevant fields as well as professional experience.

Labour intensities were mainly dependent on the type of production. As seen in Table 1, flower farms exhibited the most labour-intensive production models by far, employing many seasonal workers. Vegetable production displayed intermediate labour intensity. Cereal farms and other field production

had the lowest labour intensity. Livestock or mixed production on large farms was also relatively low in labour demand.

According to the respondents, labour laws requiring benefits such as pensions, health insurance, and social security funds disincentivized some farms from employing large numbers of permanent workers. The LAI wages, salaries, and transaction costs were very low compared to Kenya's national standards, but workers still sought after the jobs due to their dependability (payment on time and in full). In interviews, the managers and owners were very enthusiastic about the employment benefits of the investments.

All 33 farms were *plantations (production on own farm*), with only six farms – mainly vegetable producers – contracting out some of their activities. The advantages they cited included increased production and better distributing risks. According to some respondents, however, contract farming often fails because contract farmers cannot meet certain standards. Several LAIs reported using fewer contract farmers more recently, opting solely for those capable of producing at a larger scale while meeting necessary standards. Six of the LAIs themselves became outgrowers to larger businesses.

Only five respondents reported contract-farming arrangements with smallholders (15%; n=33). One LAI engaged nine groups each consisting of 25–50 farmers. Another respondent said they had contracts with 1,000 farmers. Notably, however, several specialized contract-farming businesses in the study area bought directly from smallholders and had no production of their own (Hakizimana et al., 2017). Flower farms do not contract out production at all because of their high production standards and the required greenhouse infrastructure.

Table 3 specifies the *main products* cultivated by the farms. As shown, the LAIs were highly specialized on a narrow range of products.

Table 3: Main products of LAIs

Type of Production	**Number of LAIs**	**Area used** (ha/LAI)	**Total Labour** (employees/ LAI)	**Specific products**	**Comments**
Dairy	1	8	7	Milk	Small, individual farm
Field crops	3	829	34	Wheat, barley, canola	Large farms that were all established before 1980
Mixed cereals/livestock	7	787	106	Wheat, canola, milk and meat	Large farms that were all established before 1980
Vegetable seeds	1	3	85	Tomato seeds	Highly specialized producer
Organic herbs, oils	2	55	148	Herbs, oils	Greenhouses and open fields
Vegetables	8	25	230	Peas, beans, cabbages, broccoli	These farms usually have both greenhouses and open-field crops

Flowers	11	25	467	Roses, other flowers	Specialized producers, all in greenhouses

Many of the farms utilized advanced *technical agricultural models*. In the semi-arid Nanyuki area, irrigation is needed to produce vegetables. A total of 82% of LAIs – producing flower, herbs, and vegetables – used irrigation. The remaining 18% that did not use irrigation were focused on producing grains, fodder, oil plants, and barley. Drip irrigation was employed by 54% (n=33). Kiteme and Gikonyo (2002) have shown how the horticulture industry increased water demand in the area. Horticulture farms are required to have a 90-day water-storage facility before being issued a water license to abstract water from the river. Local farms have invested heavily in water-harvesting infrastructure. Eckert et al (2017) found that 97 ha of water ponds were installed in the last 20 years, which fill with harvested rainwater from the greenhouses during the rainy season. All the managers in the study area stressed that they have policies in place to minimize water use. Government regulations and water resource user associations (WRUAs) have been relatively successful at mitigating water problems to date (Lanari et al., 2018), as was confirmed by virtually all respondents. Service providers and dealers for machinery and equipment used on the LAIs can be found easily, especially due to the presence of numerous similar investments. The horticulture farms employed various specialized technologies such as drip irrigation, fertigation systems, greenhouse ventilation systems, net shading, pre-cooling, cold-storage facilities, grading, bouquet makers, fertilizer recycling systems to prevent wastage, wetlands for wastewater treatment, artificial lighting to increase daylight hours, grading/packaging sheds, and refrigerated trucks. A total of 36% of the LAIs use greenhouses (n=33). The rest of the LAIs – producing grains, such as canola and wheat, barley, hay and vegetables – practise minimum tillage, open-field farming, semi-mechanization, or precision cultivation.

4.1.3. Place and function in the value chain

The majority of farms claimed to be independent businesses, but ten (30%) declared affiliations with another company or the status of belonging to another company. The following links to larger businesses or funders were identified: *Kevian Kenya Limited* (Kenya-based fruit and beverage company), *Sunripe Limited* (South African, with several farms in Kenya), *Agri-Vie* (South African and international private-equity investment fund focused on food and agribusiness in Sub-Saharan Africa), *Groupe Limargrain* (Clause Vegetable Seed, French, a large cooperative), *AAA Growers* (Kenyan company that owns four farms, two of them in the study area). One of the LAIs studied was an outgrower for *Kenya Fresh* (a Kenyan grower and exporter of fresh vegetables and fruits). We did not systematically investigate the degree of independence of affiliated/subsidiary LAIs in operational and strategic decision-making. However, according to managers, parent companies of relevant LAIs controlled major decisions, for example, regarding wages, crop schedules, or infrastructure (e.g. pack house for its branches). Managers of affected LAIs were solely responsible for decisions on an operational level, such as hiring or firing of workers, provision of trainings, work plans, or supervision.

All the LAIs in the study area were engaged in production, with some also involved in packaging, distribution, and retail. Independent farms were directly engaged in production and distribution (transport and selling) of their own produce, while farms belonging to a parent company tended to focus on production and were less involved in packaging.

Some of LAIs had direct *access to markets* in specific countries, others brought their produce to auctions in Europe, and still others produced for both. Auctions enable farms to market their flowers and sometimes fetch better prices than selling directly, as well as offering flexibility. "*The auction market is flexible because one does not have to meet certain market demand, you just sell what you have produced*" (interview Farm 3), stated one respondent. But there are also downsides to auctions, as illustrated by this statement: "*We used to sell to the Dutch auction system and this made us almost bankrupt, and so we decided to maintain a direct connection with the wholesalers and this has translated into big profit margins"* (interview Farm 11). Direct marketing enables investors to sell their produce at a defined price, but is not without complications: "*Direct marketing is complex in terms of logistics involved to secure a market and meet a certain market demand, as opposed to the auction market"* (interview Farm 25).

Overall, LAIs in the study area were able to access different markets for their products. Many were exclusively focused on exports (58%; n=33), especially to the EU/UK as well as the Middle East. Another 39% sold nationally, while 12% sold both nationally and internationally. Flowers were produced solely for export, as well as most herbs and vegetables. Finally, grains, oil plants, barley, fodder, milk, and some vegetables and herbs were produced for local and national markets.

Several LAIs also aimed at *diversification of business*. Among the private companies featuring shareholding, seven out of 17 owned multiple businesses – four LAIs had over three other businesses. Among the private companies without shareholding, a few owned one additional farm or other business (e.g. construction, hotel) and one company owned several businesses. By contrast, among lone entrepreneurs and individual farm owner/operators, only one claimed to have an additional business. Individual farmers tend to lack enough capital to acquire and run additional businesses. Overall, only private companies with shareholding have the means to invest in multiple businesses, and they typically do so when it supports a wider strategy of expansive growth.

4.2. Principal component and cluster analysis of business models

The results of the principal component analysis showed that a high number (i.e. 10) of principal components (PCs) were required to explain more than 75% of the variance in the data. As seen in Figure 4, PC9 and PC10 contributed substantially to the explanation of the variability of the ten variables. Out of these ten variables, the qualitative variable *main production* explained most of the variability, followed by the three qualitative variables *access to land*, *investor origin*, and *juridical structure*. Out of the quantitative variables, *number of employees* was the most important variable and *production area* the least important.

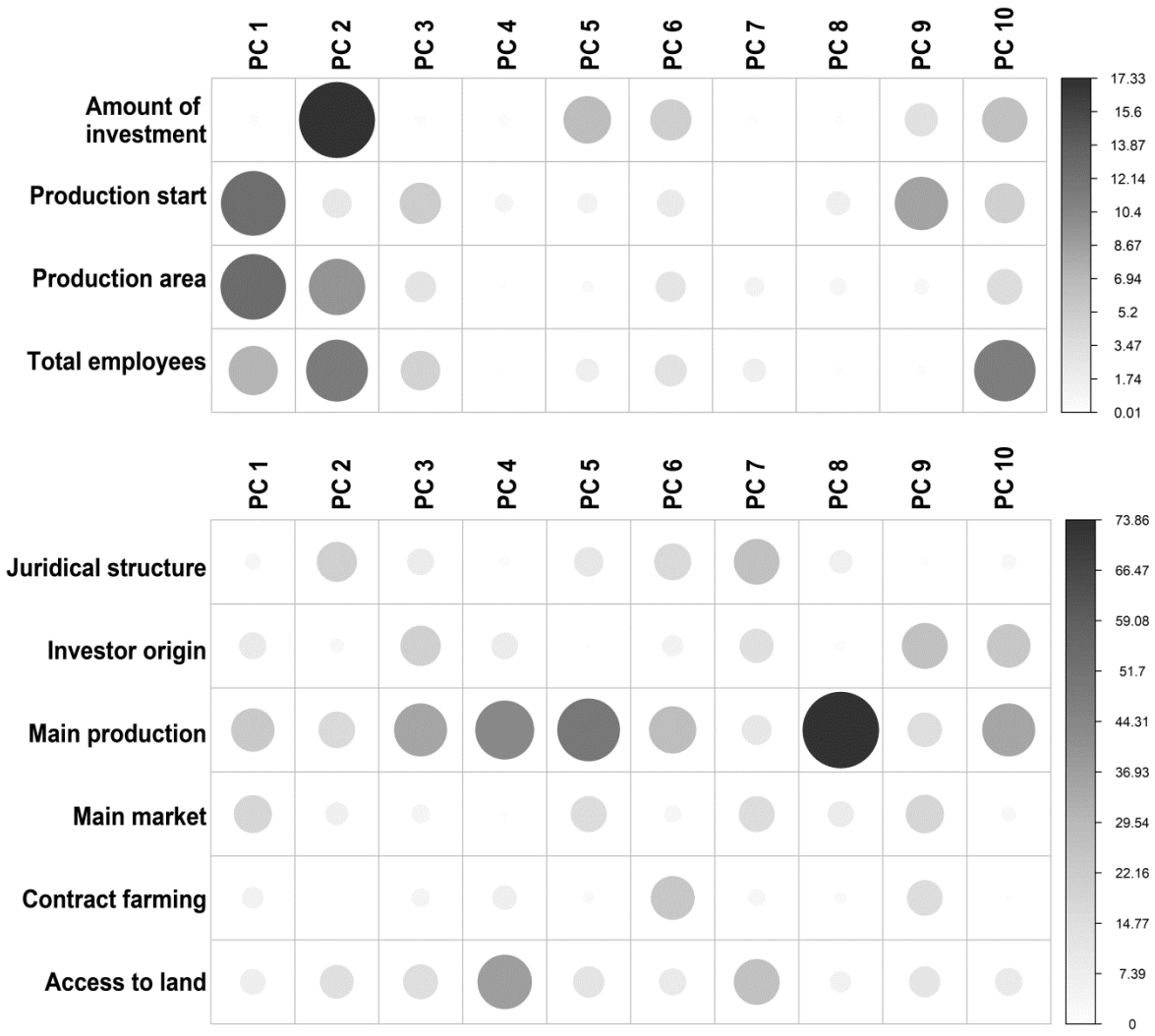

Figure 4: Correlation plots of the relative contribution of the first ten principal components (PCs), or dimensions, in explaining the variability of the six qualitative variables (bottom) and the four quantitative variables (top).

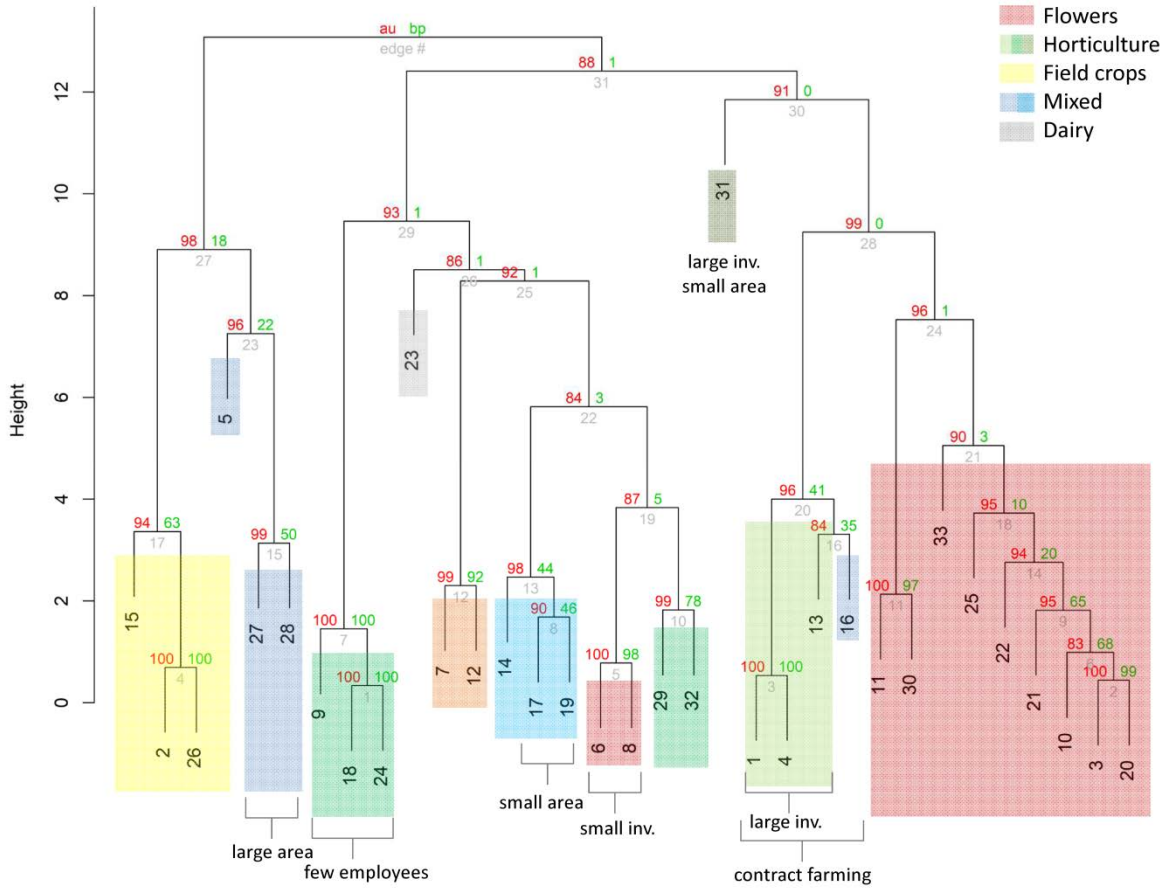

Figure 5: Dendrogram with the approximately unbiased (AU) probability values in percent (i.e. p-values) indicated in red, and the bootstrap probability indicated in green. The individual LAIs are identified with a number (and a symbol indicating their main production type). Additional information on particular characteristics which contribute to the clustering are also indicated. Two-thirds of the clusters reached an AU of 90% while one-third reached AUs between 80% and 89%.

The dendrogram in Figure 5 illustrates the main clusters and business models that were identified:

As seen in the figure, the nine flower farms appear to the far right of the dendrogram, whereas the three field-crop farms appear to the left – these two types of LAIs constitute the two most distinct business models.

The three *farms with field crops* cluster together to the far left of the dendrogram mainly due to a combination of large area, low number of employees, and national market destination. They are linked very closely, clearly showing that these farms are distinct – especially vis-à-vis the other extreme, i.e. flower farms.

The business model of *flower farms* is characterized by a combination of moderate area, high numbers of employees, and international sales. Nine such farms cluster close together to the far right of the dendrogram. Two other flower farms constituting a different subgroup cluster in the middle of the dendrogram. These are the smallest flower farms with the lowest investment levels.

Vegetable producing farms are the third clear business model, which may be further clustered into three distinct subgroups:

(1) One subgroup of three LAIs is distinguished by a combination of work with contract farmers, rather large areas, and high investments. (Another LAI producing mixed cereals and livestock also fits into this cluster, as it, too, uses contract farmers and is similarly sized).[8] These are all very commercially oriented, highly capitalized private companies both with shareholding and without it.

(2) Another subgroup consists of minimally capitalized vegetable farms with relatively few employees. All are owned by individual farmers (farms 9, 18, 24).

(3) Two other vegetable farms display intermediate characteristics (farms 29, 32).

A fourth identifiable business model clustered to the far left consists of three *large mixed farms*. These farms are highly capitalized, very large, have many employees, and were founded over 40 years ago. They are similar to the first cluster.

Another group of mixed farms is situated slightly to the left of the middle of the dendrogram (farms 14, 17, 19). These are younger and smaller than the three large mixed farms, and much less capitalized.

Two more *specialized farms* (herbs, oils; farms 7, 12) and one *dairy farm* (farm 23) are situated in the middle of the dendrogram – they do not belong to any particular cluster, but the dendrogram still indicates where they fit in most closely.

Overall, we find that the *type of goods produced* and the *technical model of production* are the most important distinguishing factors between business models. However, factors such as land area, investment level, age, and number of employees also aid distinction. Finally, factors such as actor type, juridical structure, main market destination, and presence of contract farming are of secondary importance.

4.3. Determinants of business models

As shown above, *type of goods produced* and the *technical model of production* are the main factors distinguishing different clusters of business models, with various other factors characterizing particular subgroups.

This choice between producing flowers or vegetable horticulture, and particular technical models for doing so, is largely determined by market demand and economic incentives. This emerges clearly from the interviews. We found a tendency towards more intensive production types, especially horticulture aimed at international markets. Nanyuki is ideally located for exporting vegetables and flowers to Europe and the Middle East by air. Investors identified the area as an ideal location for growing high value crops for Europe during the winter. Relatively low airfreight costs, in particular, have enabled a lucrative business opportunity. Notably, however, many of the farms in our sample

[8] One LAI (farm 31), featuring a very small operational size, is also near this cluster, but it produces very high value seeds for the international market. Its position on top of the dendrogram highlights the distinctness of this case.

also produced goods for Kenya's national market (cereals, milk, meat), for which strong demand also exists.

In addition, the two distinct clusters of vegetable horticulture LAIs and flower horticulture LAIs are undoubtedly driven, in part, by Nanyuki's ideal biophysical conditions and geographic location. Its altitude, climate, water availability, and relatively good access to the international airport present competitive advantages for commercial horticulture. In this way, the biophysical context, geographic location, and market demand – especially from Europe and the Middle East – are additional key drivers of the business models observed.

The conditions of access to land are another important factor. As our results have shown, newer farms are typically midsized (under 100 ha), reflecting the relative scarcity of available land. At the same time, Nanyuki's strong land tenure regime provides stability. This combination of high tenure security and relative scarcity of land has also driven the recently established intensive farming business models. By contrast, we found many older LAIs (cereal farms and ranches) that continue to produce on large areas and apply extensive production models thanks to their ongoing access to large tracts of land.

Our investigation and cluster analysis also show that the choice of goods produced and the technical model are correlated with the labour intensity of the farms. Local abundance of relatively cheap labour was another factor cited by many respondents as a key explanation for the presence of horticulture farms. Nevertheless, large colonial-era farms also remain that practise more extensive forms of production and require relatively few labourers. For these large farms, thanks to the existing land tenure structure, land remains cheap enough for extensive production to be profitable.

Finally, analysis also showed that businesses in the study area are mostly owned by actors with long-running experience in agriculture and in this region in particular. When occasional newcomers enter the field, they can obtain access to experienced, professional management staff. We did not find evidence of short-term speculative investments, but rather of investors who understand the risk profile and time horizons of commercial investments in agriculture.

4.4. Evolution of business models over the past twenty years

In addition, we sought to trace the recent evolution of LAIs in the research area. Comparison of inventory lists from 1996, 2013, and 2016 showed that 15 LAIs had closed down or undergone changes, such as being leased out to other farms, while new LAIs had emerged. Notably, five LAIs were subdivided among individual smallholders in this period. This shows that commercial development in the Nanyuki area is a dynamic process.

We also found evidence that smaller flower farms may no longer be viable in the long term. As the owner of one such farm put it: *"This farm is probably the last privately financed farm [likely to be] set up in the region, as now you need big money to set them up. You could previously start with around two hectares and build up, but now you need to start with at least ten hectares and build up to twenty hectares (the minimum to be financially viable)"* (interview Farm 33). Indeed, this subgroup may vanish as market pressures further consolidate the sector, reducing the competition to a handful of larger, highly capitalized farms.

The evolution of production models also displays a trend towards higher value crops that offer a better price per unit/weight ratio, which is important for airfreight. All the flower farms remained flower farms

during the period examined. By contrast, vegetable production appears to be undergoing market pressure: four LAIs switched from lower-value vegetable horticulture to higher-value flower production. In two cases, vegetable production was abandoned in favour of livestock/agriculture production. In addition, five LAIs began specializing in higher-value vegetable crops including herbs and oils. Nevertheless, three LAIs were converted from livestock/agriculture production into horticulture businesses. The respondents attributed these shifts towards higher value crops to the high standards set in the vegetable market of the EU in particular. In addition, our data confirm a trend towards less contract farming, which can be partly attributed to rising standards in export markets, as well as to the benefits of economies of scale and the extra costs associated with management of contract-farming arrangements.

Some of the LAIs' strategies for the future consist of upgrading and expanding operations – including on uncultivated land they already own (42% of the farms have less than 50% of their land under crop production) – and diversification of business.

5. Discussion

Analysis of the results enabled us to identify distinct types of business models. The main element structuring these business models was found to be the *production model* (based especially on the *crops* or *livestock* produced as well as the *technical* model of production) rather than the types of actors or financial structures involved per se. In addition, a number of other important factors that shape these business models could be identified, including: demand for horticultural products, access to land, types of investors, labour creation, and integration and governance of the value chain.

First, demand for horticultural products in Europe and the Middle East is a key factor that has profoundly shaped agricultural business models in the study area over the last 20 years. This demand enabled establishment of a horticulture industry in the study area, and it determines the types of crops grown and the conditions of production. The business models implemented by investors in the study area respond to this demand. At the same time, local conditions shape the configuration of their investments.

Second, access to land and water strongly influences the "where" and "how" of production. Access to land is deeply conditioned by the historical context and current land tenure system. It has created a tri-faced landscape featuring some very large ranches and farms remaining from the colonial era, a number of medium-sized commercial vegetable and flower companies – most of them established after 1990 – as well as a substantial smallholder and family-farm sector coexisting alongside them. Access to land for new commercial farms is limited, and this is pushing the sector towards more intensive production of higher-value goods. Water access is also essential for horticulture especially in the semi-arid environment of Nanyuki. Conflict over water use has arisen in the past and remains a risk, as smallholders and downstream users depend on the same water resources used by commercial farms. Water harvesting and storing are increasingly practised, and this has helped to mitigate conflicts to some extent. In the mid- and long-term, however, competition for land and water is bound to intensify, as the local population continues growing and the horticulture industry develops further. Additional strengthening of integrated water and land management is needed.

Third, the findings enable identification of three broad types of investors active in the study area. Above all, we find Kenyan entrepreneurs who have prior/long-term experience in the sector. Next, we find several international investors with strong experience in commercial agriculture, who partner

with local actors and focus on high-value crops using relatively advanced horticultural production methods. This latter group is small, and different means of affiliation were found with no common pattern emerging. Finally, we observe a small group of individual farmers who inherited their land and are continuing their family tradition, and have been around since the colonial/post-colonial era when land was still plentiful in the area. This type of agriculture is under increasing market pressure, especially when the farms are small and not professionally managed. Notably, our study did not find evidence of speculative, short-term focused agricultural investors. At the same time, our research did not investigate commercial actors operating at even smaller scale in the study area, including mid-sized milk producers, smaller horticulture producers, etc. Further, we did not interview actors related to investments that were sold or closed down.

Fourth, labour availability characterizes the various business models observed. Our findings confirm research in another region of Kenya (Kuiper, 2019a) showing that horticulture employs high numbers of workers, both on a permanent basis and as temporary or casual labour. Interviewees considered these jobs to be highly beneficial to the region and the local population. Intensive ethnographic research in the area (Käser, 2018) found that off-farm income – earned on LAIs and via other non-farm activities – is important for many families to support their own smallholder production and cover livelihood needs. As these family farmers have only small landholdings, they depend on external inputs to sustain their primarily subsistence-oriented production which generates little cash income (Käser, 2018). Indeed, despite competition over water, Zaehringer et al. (2018) found that most respondents in areas near LAIs favoured their presence, believing that they contribute to local economic development. At the same time, other research (Peter et al., 2018; Reys et al., 2018) suggests that many workers earn very little and their household livelihoods are often no better than those of the unemployed (Mutea et al., 2019; Reys et al., 2018). The jobs of temporary and seasonal workers, in particular, are not secure. At the time of the interviews in early 2016, several vegetable farms had to scale back their operations and dismissed workers due to a drought in the area. Existing jobs on extensive cereal farms and ranges are somewhat more secure, but fewer in number. The distinction can be explained by differing market pressures impacting these LAIs, since cereals and livestock do not need to be sold immediately and can be withheld in cases of low prices on spot markets. Overall, the many jobs created by LAIs represent an important contribution to the local labour market, helping to sustain local livelihoods and aiding economic development in the study area.

Notably, we found only a few cases of contract-farming arrangements in vegetable production, but no such arrangements in the production of flowers or field crops. The results confirm earlier findings on Kenya's horticulture sector showing that contract farming is under pressure, especially due to difficulties fulfilling the standards and guidelines set by importers. However, if and when the organization of contract-farming systems improves, the horticulture sector could eventually be developed more in this direction, especially as long as individual commercial farms continue to have difficulty accessing or purchasing additional land. One interviewee indicated this possibility, citing the relationship of their international parent company with firms in countries such as Chile, where conditions were more appropriate for contract-farming arrangements.

Sixth, horticulture farms in the study area are shaped by global value chains including input and output markets. However, very few appear to be incorporated in a vertically integrated business structure. Instead, our findings indicate that Kenya's flower and vegetable farms are integrated in a typical buyer-driven value chain (Lee et al., 2012). At the same time, the farms do not appear to be "captive" to a particular value chain, i.e. they are not totally dependent on one or two buyers (Gereffi and Fernandez-Stark, 2011). Since the goods they produce (e.g. cut flowers) are highly standardized

and codified, they also can be brought to daily auctions in Europe – more in line with a true "market" value chain (Gereffi and Fernandez-Stark, 2011). Nevertheless, many farms also reported direct links to specific large-scale buyers, and described the strong impacts of their regulations and standards on the business. Overall, we found examples of various forms of vertical coordination in the study area (Peterson et al., 2001), ranging from spot markets (auctions) to specified contracts (for large retailers), equity-based alliances, and full vertical integration. However, we did not investigate these different forms of coordination in detail to understand why different LAIs operate at different positions along the coordination continuum (Peterson et al., 2001).

Finally, the LAIs are regulated and controlled by government agencies – such as the Kenya Investment Authority (KenInvest) and the Kenya Plant Health Inspectorate Services (KEPHIS) under various laws (Investment Promotion Act, 2004, Employment Act, 2007) – and by private standards and guidelines, although effective implementation and enforcement are not always given (Kiteme et al., 2019). The respondents stressed that these laws and regulations have an important impact on their business practices.

6. Conclusions

The findings of the present study make three important contributions to the literature on business models.

Firstly, comparing our results to the business models identified by Boche and Anseeuw (2014), the study area exhibits two types of models similar to those they described as "independent farmers" and "agribusiness estates". However, our findings lead us to different conclusions about the importance of particular actors and investment structures. We found that *technical* and *production*-related elements have a greater impact on the business model established, and institutional and financial arrangements play less of a determining role. As such, there is more business homogeneity within technical production (i.e. business models seem to be more determined by the sector – for example labour-intensive highly mechanized models in the flower sector) than by financial structures and institutional frameworks. Investment in flower farms necessitates access to land, labour, specialized equipment, skilled management, and significant funds invested over a number of years; our results show that this is being done in similar way irrespective of the investment network or the type of actors behind it. We attribute this finding mainly to the relative mature stage of the sector in the study region. We postulate that market pressures, highly conditioned by the specific agrarian structures prevailing in the study region, have been advancing a very specific type of "modern" agriculture that obeys the dominant standards of commercial practices for specific products. In addition, this development is shaped by the geographic context, the abundance of cheap labour, and land tenure rules that enable transactions of land and relatively secure investment conditions.

Secondly, we find that access to land, in particular, greatly determines the prevailing business models: where large land areas are still available, investments aim at extensive agriculture and ranching; where land resources are limited, but other biophysical conditions are suitable, investments aim at intensive horticulture. Land access is also one of the most decisive factors determining the risks and opportunities associated with such projects. Many studies highlighting conflicts and negative impacts on local communities refer to cases in which contradicting and overlapping land tenure systems co-exist. The present case study focused on an area in which land rights are relatively clearly defined, and importantly, large plots of land are privately owned and can be bought or leased from a handful of owners. The data show clearly that the majority of LAIs occur on purchased or leased land, made

780 available and accessed by means of a well-functioning local land market. Unlike land used for coffee
781 production, which cannot be alienated for other purposes under Kenyan law, the relevant land in the
782 study area was used for ranching or cereal farming, and was not subject to restrictions on transforming
783 land use. For investors, these conditions greatly reduced the difficulty and costs of accessing land, as
784 it was not necessary to reach an agreement with numerous smallholders or a community with
785 customary rights over the land. The active involvement of land administration services was also not
786 necessary, further easing the process. Importantly, the strong land tenure laws also protect
787 smallholders and pastoralists from dispossession via land acquisitions by LAIs. Our results show that
788 most of the recent investments took place on relative small land areas, unlike the large-scale land
789 deals that often harm local communities elsewhere (Oberlack et al., 2016; Schoneveld, 2014;
790 Schoneveld, 2017)). At the same time, access to water is a highly relevant concern in the study area.
791 Strong governance efforts to improve water use efficiency and water storage have helped to mitigate
792 water conflicts in the area, at least somewhat. However, this remains a challenge in view of
793 population growth and increasing local economic activity. A special concern is management of
794 groundwater, which is increasingly used but poorly monitored to ensure sustainable supplies. Efforts
795 are increasing to better control and monitor this additional water use, with a new levy imposed on
796 groundwater pumping.

797 Thirdly, a "cluster effect" (Ketels and Memedovic, 2008; Martin and Sunley, 2003; Porter, 2000)
798 appears to have reinforced the success of commercial agriculture investments in the study area. The
799 emergence of specialized human resources at different levels, formed and trained via the LAIs, clearly
800 represents an important comparative advantage for Kenya. New agribusiness investors can and do
801 recruit from this existing pool of talent. These and other cluster effects drive down costs for investors,
802 helping to build forward and backward linkages (Hakizimana et al., 2017; Hall et al., 2017), and
803 provide opportunities to influence governance mechanisms in favour of the sector. The remarkable
804 performance of the industry in the study area can also be ascribed to government policies that have
805 enabled autonomy in production and marketing decisions, thus fostering significant local private
806 initiatives and dynamism in the industry. We have not investigated the cluster effect in detail, but it
807 represents a promising avenue for future research – as well as comparison with similar case studies in
808 Africa.

809 Overall, Kenya has maintained a relative stable, liberal macroeconomic environment in recent
810 decades, in which government policy has favoured foreign investment and international trade. This
811 has enabled its commercial agriculture sector to grow and advance technologically. At the same time,
812 local governance and land tenure have shaped the sector, promoting long-term investments and more
813 intensive land use. There are many challenges ahead, however, which may limit future development
814 of the sector, in particular regarding the environmental costs of intensification, increasing land and
815 water scarcity, and the external costs of airfreight upon which export business depends.

816 Our results also give rise to several *recommendations regarding land use policy*:

817 Clear land tenure rights and mechanisms for accessing land should be given priority in policies on
818 agricultural investment. In Kenya, the policies aiming at devolution of responsibilities from national
819 to county level are not yet fully implemented, creating overlaps and frictions between the different
820 levels and unclear regulatory and fiscal requirements on the part of the LAIs. This has been cited as a
821 problem by many respondents. These inconsistencies will need to be further harmonized. To enable
822 long-term investments in agriculture, commercial farmers and investors must be able to access land
823 relatively easily and obtain sound ownership or leasing rights. Transparent, reliable, and effective
824 legal processes are indispensable. At the same time, the land tenure of smallholders and communities

must also be fully secured. These conditions were fulfilled in our study area, enabling co-existence between diverse types of farmers and commercial farm enterprises. This co-existence should be possible to replicate in other regions of Kenya and Africa more broadly, though additional tenure challenges must be carefully negotiated in places where land is largely publicly or community owned.

Further, we recommend that policies aiming at promoting agricultural investment prioritize investments that are capital and labour intensive, environmentally sustainable, and require only modest land resources. In our study area, intensive horticultural production has created positive spillovers, especially for a large local workforce seeking employment. At the same time, strong governance is needed to uphold good labour conditions and protect the health of workers. It is also crucial to strengthen policies and regulations on the environmental impacts of LAIs, in particular with regard to impacts on water resources and pesticide use. The present study also highlights the reluctance of LAIs to involve smallholder farmers via contract farming arrangements, with the standards imposed by private labels and import regulations in target markets representing barriers to such models. New ways of overcoming these barriers should be sought.

Finally, policymakers should be aware that creating a cluster of highly specialized commercial farms is not an easy process and cannot be easily reproduced in other countries or regions where certain preconditions are not met. Policies aiming at creating a similar pattern of investment would need to be carefully prepared and sustained over a long period of time, including significant public investment and appropriate governance mechanisms. In particular, regional integration through well-functioning infrastructure (roads, electricity) is necessary, together with links to national and international markets.

Appendices

Appendix A: Questionnaire

Appendix Table A: Data used for cluster analysis

Acknowledgements

This research was part of the Afgroland Project. It was supported by the Agence Nationale de la Recherche (ANR), France (grant number ANR-14-JPF2-0002-01), the Swiss National Science Foundation (SNSF), Switzerland (grant number 40FA40_160405) and the National Research Foundation (NRF), South Africa. The Wyss Foundation (18.260.C75.1 WF) and the Swiss Programme for Global Issues on Development funded by the Swiss Agency for Development and Cooperation and the Swiss National Science Foundation (grant number 400540_152033) supported the development of the paper.

We thank Anu Lannen for the editing support and two anonymous reviewers for their valuable comments.

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Appendix A Questionnaire

Survey of companies

Date of interview:
Interviewers:
Interviewees:

Position:

Contact:

ABOUT THE COMPANY AND THE PROJECT

1. Company name:

2. Company type:

a) Individual entrepreneur/farmer
b) Private company (agribusiness) i. Without shareholding ii. With shareholding (Close Corporation, …)
c) Stock-exchange listed company
d) Asset management company / Investment fund
e) State-/ government(-owned)
f) Semi state-owned company
g) Other (please specify)

3. Legal form:

4. When was company established in Madagascar/Kenya/Mozambique:

5. Company's core activities:

6. Company's origin? Country of origin:
7. Is the company affiliated with a multinational company or affiliated with a local subsidiary of a multinational?
   (a) Yes (b) No

8. If yes,

Name	**Address**	**Structure of the larger corporate structure**

9. Who sits on the company's executive committee and/or board of directors?

10. What is their experience in managing agricultural projects?

11. How many (and if several – which) projects is the company involved in Madagascar/Kenya/Mozambique as an investor, manager or other roles?

12. What is the company's experience in managing agricultural projects in Madagascar/Kenya/Mozambique and/or abroad?

13. How did the company attempt to gain additional competence in the particular agro-ecological conditions, socio-political and cultural conditions of the locality it is working in (e.g. employ locals at managerial level)?

14. Why did you choose to set up the farm/investment in Madagascar/Kenya/Mozambique and the locality?
    1800 above sea level.

Regarding the ongoing agricultural investment/farm that we are studying:

15. Farm's name:

16. Start date of the farm:

17. Project objective:

18. How did you get the idea of the project?.

INVESTMENT

19. What is the total forecasted investment for this investment/farm.

20. How much has been invested in the investment/farm so far?

21. What are your sources of funding for the investment/farm? Source - Amount - Funded activities/investments. If possible give a breakdown of the investments

Breakdown of investment – what did they invest in	Amount	Name of the partner/investor/loan	Nationality	Duration of involvement/ contract	Equity share	Role in the partnership / Decision-making	Others (E.g. mechanism of profit sharing)

22. Did you contract a facility/company to establish the farm?

(a) Yes (b) No

If yes,

Why	Type of facility	From who	How much	What are the conditions

23. Did you receive support from the government, a development organization, or NGO?

(a) Yes (b) No

If yes,

Why	Type of support	From who	How much	What are the conditions

24. Are you forecasting further investments in the future?

(a) Yes (b) No

If yes,

What kind of investment	How much

25. Do you have any other partners in this investment? such as World bank, NGOs, etc.

(a) Yes (b) No

LAND USE, PRODUCTION AND MARKET

26. When did production start?

27. What is the total area (in terms of size) presently under production/used?

28. What are the agricultural activities implemented directly by the company in 2016 and 2015?

a. Direct farming

2016					
Crop/projects	**Cultivated area**	**Production period**	**Total harvest**	**Market**	**Total sales**
2015					
Crop	**Cultivated area**	**Production period**	**Total harvest**	**Market**	**Total sales**

29. What kind of farming techniques do you use (i.e. greenhouses, mechanization, etc.)?

30. Do you subcontract operational activities on the farm – for example, are some activities done by somebody else (such as ploughing, harvesting, …)? (2015-2016)

(a) Yes (b) No

If yes,

company name	**company's main activities**	**country of origin**	**Type of activity and/or subcontracted services**	**Total fee paid**

31. Why have you outsourced these activities/services? Why not done by you and your labourers?

b. Contract farming (2015-2016)

32. Do you contract out farming of some crops?

(a) Yes (b) No

Crops	**Number of farmers**	**Cultivated area**	**Terms of contract**	**Output markets**	**Sales**

c. Buying from local farmers (2015-2016)

33. Do you buy from local farmers?

(a) Yes (b) No

Crops	**Quantity purchased per year**	**Localization of purchasing markets**	**Output markets**	**Sales**

34. Why did you choose to engage in / what are the advantages of direct farming, contract farming, buying from farmers or a combination of them?

35. What is your operating profit in 2015 and 2016?

commodity	costs in ksh

36. How long after the first plantation did the project make a profit? Or, when are you forecasting your first profit?

37. Will you continue with the same business model(s) or do you plan to implement a new one? Why?

38. Was there another business model implemented in the past?

(a) Yes (b) No

If yes, why is it no longer implemented?

39. Is there another business model that you plan to implement but you have not been able to do it yet?

(a) Yes (b) No

If yes, why? How do you plan to overcome the problem?

40. Have you considered forming a joint venture with a farmers group or cooperative?

(a) Yes (b) No

41. What do you think are the advantages and disadvantages of other business models?

42. What are the agricultural projects that you plan to develop in the future?

43. Why do you plan to develop these agricultural projects?

EMPLOYMENT

44. How many **permanent employees** do you have?

Positions	**Qualifications**	**Men**	**Women**	**Salary**	**Benefits**

45. How many **seasonal employees** do you have?

Positions	**Qualifications**	**Men**	**Women**	**Salary**	**Benefits**	**Which seasons**	**For how long**

46. How many **daily workers** do you have?

Positions	**Qualifications**	**Men**	**Women**	**Salary**	**Benefits**	**Which seasons**	**For how long**

47. What is the total number of your workers?

	Permanent employees		Daily workers		Seasonal workforce	
	Men	*Women*	*Men*	*Women*	*Men*	*Women*
2016						
2015						

48. How is the labor organized – do you employ yourself? Do you use brokers or other companies to employ them?

LAND ACCESS

49. What is the size of agricultural land initially targeted?

50. What is the size of land currently acquired?

51. What is the status of the land that you manage?

Tenure	**Size**	**For how long**	**How much**	**Any special conditions?**
Owned				
leased				
Rented				
Others				

52. Who gave you the occupation permit?

53. What are the reasons of the difference between area targeted and area acquired and in operational use?

54. When did you start the exploration and how long did it take to complete it?

55. How did you do the exploration and how did you consult?

56. When did you start the acquisition/occupation process?
    (a) At the local level (local community and commune)

    (b) At the land administration

57. Who owned the land and what was the tenure before?

58. How was the land used previously?

59. In your view, why did the previous land users seize their activities here?

60. What were the steps and procedures completed to gain access to the land?

61. How did the company present the project?

62. How was/is the company's presentation perceived by

Category	**Perception**
The local community	
The local government (commune)	
The local land administration	
Others	

63. Did/does the company face resistance/opposition from

Category	Yes	No
The local community		
The local government (commune)		
The local land administration		
Others		

64. If yes, which ones? What was their position, their claims (i.e. conflict in the land usage, size of the land, benefits/compensation, etc.)?

65. How did the company respond?

66. Who were the company's main interlocutors/liaisons?

67. Did you consult the population?
    (a) Yes (b) No

If yes, how did it happen and what social groups did the attendees fall in? For example, politicians, traders, farmers, etc.

68. How did the population respond?

69. Did they have any concerns?

70. Were you required to complete a scope of work (*cahier des charges*)?
    i. If yes, what does it contain? How and by who was it established?

71. Were you or will you be regularly controlled by the government?
    (a) Yes (b) No

If yes, how often? What kind of control (i.e. tax audit, environmental assessment, labour management policy, etc.)?

72. Overall: What were all the costs incurred for accessing land (i.e. exploration fees, registration fees, titling fees, etc.)

COMPENSATION

73. Were there people displaced and have people lost their land?
    (a) Yes (b) No

If Yes, proceed to question 74; No proceed to question 81

74. Have you agreed to provide financial compensation following your acquisition?

75. If yes, who are the beneficiaries and how much have they received or will receive?

76. With whom did you negotiate the financial compensation (i.e. key individuals, local community, local government, central government, etc.)?

77. Who oversaw the negotiations (i.e. non-governmental local authority, local and/or central government, government, land officials, civil society organization, etc.)?

78. Were the terms of the financial compensation agreed to with the local community, the local government, and the central government?
79. Is the financial compensation agreement written formally (MoU-like)?
    i. If yes, is the document publicly available?

80. Have you agreed to other forms of compensation following your acquisition? (Ex. Infrastructural development such as a school, hospital, road, water access point, etc.)
    (a) Yes (b) No

If yes, what, why and how much?

If not, did you invest anyway in infrastructure? (a) Yes (b) No

If yes, what, why and how much?

81. Were there people that were (negatively) affected by your settlement/development on these lands? Pollution? Water pressure? Etc.
    (a) Yes (b) No

82. How have you mitigated impact to local farmers' land as a result of your investment/project (i.e. land restoration, offset, etc.)?
    (a) Yes (b) No

83. Are there family farms adjacent to your farm?
    (a) Yes (b) No

If yes, how far?

84. Do you know what crops do they farm?

If the affected community is pastoralists or agro-pastoralists and land is often used as grazing areas:

85. Are there some specific kinds of compensation for them?
    (a) Yes (b) No

86. If yes, what?

87. Were there specific consultations with the pastoralist communities?
    (a) Yes (b) No

INCLUSIVENESS AND LOCAL DEVELOPMENT

88. Do you pay an annual land tax?
(a) Yes (b) No

If yes, to whom and how much?

89. Do you pay other taxes such as income tax?
(a) Yes (b) No

If yes, what taxes, to whom and how much?

90. Do you contribute to the budget of the commune (local government)?
(a) Yes (b) No

91. If yes, how?

92. What kind of relationships are there between you and the local farmers/local communities?

93. Do you provide any support to local farmers in terms of (a) Yes (b) No
If yes; what/how and many beneficiaries

a) Inputs supply at fair price
b) Credit supply
c) Technical advice
d) Training
e) Technology transfer
f) Market access and procurement initiatives (i.e. storage, packaging, etc.)
g) Allocation of land

94. Do you provide support specifically to livestock farmers?
(a) Yes (b) No

If yes, what kind of support?

95. Do you provide any support to infrastructure and other initiatives?
(a) Yes (b) No

a) Road construction
b) Health facilities
c) Water supply
d) Schooling
e) NGO support
f) Biodiversity initiatives
g) Others

96. How would you assess the socio-economic and environmental impacts of your investment? Did you implement an Social Impact Assessment?

ENVIRONMENTAL ASPECTS AND NATURAL RESOURCE MANAGEMENT

97. The role which natural resource availability played in their decision to implement their investment in a certain place
98.
99. What kind of farming techniques do you use (i.e. greenhouses, mechanization, type of tillage etc.)?

100. What are your water sources for irrigation (i.e. underground water, river, lake, etc.)?

101. What is your water consumption (m^3 / ha per day or per hour)?

102. What kind of irrigation technology do you use?

103. Who defines/enforces the rules for water management and distribution?

104. Do you adhere to the local practice/institution for managing water (such as local water user associations etc.)?

105. What is your company's water management policy?

106. Do you pay a water usage fee? (a) Yes (b) No

If yes, to whom do you pay this fee?

How much do you pay per year?

107. If/when there is a lack of water, what measures have you taken or do you plan to take (i.e. better sharing with farmers)? Any initiatives you have taken (water harvesting? Water saving? …)

108. Did you set up an irrigation and drainage system for you and the neighboring small farms? (a) Yes (b) No

If yes, which one? What are the costs incurred for setting up/construction, maintenance and operation?

109. What is your assessment of the soil quality?

110. Has it been changing in recent years?

111. What are your soil fertility management strategies and how long do you think you will be able to produce on this soil? What do you plan to do after?

112. Do you replace depleted soil with something else? If yes, with what and what happens to the replaced soil?

113. Did you conduct an impact assessment? (a) Yes (b) No

If yes, when? What kind, i.e. environment, social, economic, etc.

i. Is the assessment(s) publicly available?

114. Have you considered creating/implementing a biodiversity management program (i.e. hedges, water, crop diversification, etc.)?
(a) Yes (b) No

If yes, please explain.

NORMS AND GUIDELINES

115. Which are the norms and standards you conform to?

116. Do any of the EU standards etc affect your production, exports etc. Which ones and how?

117. Do you know about the voluntary guidelines, such as VGs on land tenure, RAIs, F&G of the African Union? Any other…? And is so,
(a) Yes (b) No

If yes, how do you apply/use them?

POLICY AND REFORM

118. What do you think about Madagascar/Kenya/Mozambique's agricultural and land policies, i.e. land reform? Strengths, weaknesses?

119. In order to better promote or regulate investments in land/agriculture, what measures and/or policies are needed?

120. What are your expectations for the local and national governments as well as the local community?

GENERAL REMARKS

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Annex Table A*

ID	Investment_Mio_Ks	Year_Start_of_Production	Area_used	Total_employees	Juridical_structure	Investor_origin	Main_production	Main_Market	Contract_farming	Access_land	Year_establishment	Labour_intensity	Affillitation_w_larger_company	Year_exp_In_Ag	Source_of_funds	farming_techniques	Support_to_local_farmers	Irrigation_Technology	Standard_conformed	Effect_of_EU_standards
1	200	2004	87	800	3	1	4	3	1	2	2004	5.71	1	3	1	2	0	3	2	4
2	220	1948	405	16	3	1	2	1	0	2	1948	0.04	0	3	2	2	1	1	1	0
3	1000	2013	31	550	3	1	5	3	0	2	2013	17.74	0	1	2	3	0	3	2	4
4	500	2005	30	870	3	1	4	3	1	2	1977	2.9	1	3	2	2	1	2	2	4
5	800	1976	3237	190	3	1	3	2	0	2	1976	0.04	0	3	2	2	1	3	0	0
6	28	2014	7	125	2	1	5	3	0	2	1988	14.29	0	2	1	3	1	3	2	3
7	80	2007	90	75	1	1	7	1	0	3	2007	0.83	0	3	1	2	1	3	1	0
8	20	2010	19	375	2	1	5	3	0	2	2010	6.15	0	2	2	2	0	3	2	0
9	8	1995	3	9	1	1	4	1	0	1	1995	3	0	3	1	2	1	2	0	0
10	230	2000	25	630	3	1	5	3	0	2	1994	6.85	1	3	4	3	0	3	2	3
11	1100	2007	18.5	320	3	2	5	3	0	2	2007	10.67	0	3	2	3	1	3	2	0
12	18	2006	20	220	3	1	7	3	0	3	2006	11	0	3	2	3	0	2	2	4

13	30	1997	30	100	2	1	4	3	1	2	1997	3.33	0	3	2	2	1	3	2	4
14	20	2013	162	23	1	1	3	1	0	3	2013	0.11	0	1	2	2	1	1	0	0
15	6	2015	81	7	3	1	2	1	0	2	2015	0.09	1	3	2	2	1	2	0	4
16	25	2004	48	230	3	1	3	3	1	3	2004	4.42	1	3	4	2	1	3	2	2
17	16	1996	40	36	3	1	3	1	0	2	1995	0.9	0	3	2	2	1	3	1	0
18	5	2006	25	23	1	1	4	3	0	1	2006	0.46	0	3	2	2	1	2	2	4
19	5	1985	20	11	1	1	3	1	0	2	1985	0.28	0	3	2	2	1	1	0	0
20	570	1996	22	650	3	1	5	3	0	2	1996	5.91	0	3	2	3	0	3	2	0
21	78	1996	19.5	260	3	1	5	3	0	2	1996	5.2	0	3	2	3	1	3	2	1
22	950	2011	33	720	2	1	5	3	0	2	2011	12	0	3	2	3	1	3	2	0
23	1.5	2002	8	7	1	1	1	1	0	3	1968	0.35	0	3	1	2	1	3	0	3
24	0.7	1990	11	8	1	1	4	3	0	1	1990	0.73	0	3	1	1	1	2	2	4
25	113	2012	40	582	3	1	5	3	0	4	2011	9.7	1	1	1	3	1	3	2	3
26	500	1965	2000	78	3	1	2	1	0	2	1965	0.03	0	3	1	2	1	0	1	0
27	600	1954	200	119	2	1	3	1	0	2	1953	0.05	1	3	1	4	1	1	1	0
28	1200	1926	1800	130	2	1	3	1	0	3	1926	0.03	1	3	1	4	0	1	1	0
29	0.5	2015	8	12	2	1	4	1	0	2	2002	1.5	0	3	1	2	0	2	0	0
30	140	2003	35	420	3	2	5	3	0	3	2003	12	1	3	4	3	0	3	2	1

31	170	2013	3	85	2	3	8	3	1	4	2008	5.67	1	2	1	3	0	3	2	4
32	20	2015	4	21	3	1	4	1	0	2	1972	0.2	0	1	1	2	1	3	2	4
33	400	2008	23.5	500	2	3	5	3	0	3	2008	21.28	0	3	1	3	1	3	2	4

*Code: see below

Code

Juridical structure	Year establishment	Investor origin	Affillitation w. larger company	Year exp. In Ag	Investment Mio Ks	Source of funds	Year Start of Production	Area used	Main production	Main Market	farming techniques	Contract farming	Total employees	Labour intensity	Access land	Support to local farmers	Irrigation Technology	Standard conformed	Effect of EU standards
Categorical	Scale	Categorical	Categorical	Categorical	Scale	Categorical	Scale	Scale	Categorical	Categorical	Categorical	Categorical	Scale	Scale	Categorical	Categorical	Categorical	Categorical	Categorical
1=individual 2=private without shareholding 3=private with shareholding	year	1= Kenya 2= Africa 3= Europe	0=no 1= yes	0=no experience 1= <5 years 2= 5y+ 3=>10 y+	Mio Ks	1=own funds and savings 2=loans 3=shareholders 4=mixed	year	in ha	1=dairy 2= field crops 3=mixed cereals/live stock 4=horticulture 5=flowers 6=fruits 7=organic herbs, oils,seeds 8=seeds	1=Kenya mainly 2=Mixed 3=Internationl mainly	1=oxen, open field 2=mechanisation 3=greenhouses 4=precision agriculture	0= no contract farming 1=contract farming mentioned	Total employees	Total employees/ ha	1=inherited 2=purchased 3=leased 4= rented	0=no 1=yes	1= rainfed 2= overhead irrigation/combinations 3=drip irrication only	0=no standards 1=only Kenyan 2=Kenyan/International	0=no impact 1= mixed impact 3= negative impact 4= posive impact

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