



Smallholders' livelihoods in the presence of commercial farms in central Kenya

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ABSTRACT

We study smallholder households livelihood profiles in central Kenya in an area characterized by the presence of many large commercial farms. We surveyed 375 smallholder households, compared them according to three categories (employed, contract farmers, households non-engaged with commercial farms), and constructed a livelihood index. The results show that contract farmers and households employed on farms are only a small fraction of all smallholders. Employed and non-employed households show little difference in overall livelihood profiles. Results suggest that employment on large commercial farms is mainly a coping strategy for younger households or in times of need. Contract farmers were found only in a specific location and had better access to irrigation water and higher livestock holdings. Comparison with earlier data shows the persistence of precarious livelihood levels and household strategies aiming at diversification of activities, with little evolution over the last 20 years despite the presence of commercial farms. Overall, there is little evidence that the proximity to the commercial farms offers a way out of poverty for nearby smallholder farmers.

1. Introduction and objectives

The role of commercial agricultural investments in fostering innovation and contributing to technology transfer, employment creation, and poverty reduction is an important topic of debate for the development of the agricultural sector in Africa (Collier and Dercon, 2014; Deininger and Byerlee, 2011; World Bank, 2007). While the World Development Report 2008 (World Bank, 2007) prominently affirmed the importance of smallholder agriculture in development, Collier and Dercon (2014) have questioned the exclusive focus on smallholder agriculture, casting doubt on its prospects for productivity growth and a route out of poverty. They called for a more flexible approach, in which larger commercial farms – but not state-led mega projects – would play an important role. This issue gained added importance following the wave of international investments in land in Africa after the financial crisis of 2008/2009 (Borras Jr and Franco, 2012; Cotula et al., 2009). Research efforts have often tended to focus on the impact of these new land acquisitions with regard to issues such as loss of land, short-term job creation, and land use change (Alden Wily, 2012; Bottazzi et al.,

2016; Nolte et al., 2016; Oberlack et al., 2021; Oberlack et al., 2016; Schoneveld, 2017; Schoneveld et al., 2011).

But other key open questions remain: What are the more long-term effects and spillover effects of commercial farms if they are present in a region for a longer time? And what implications do such commercial investments have for the livelihood strategies in adjacent areas? There are surprisingly few studies that investigate these questions, and our study aims to help to fill this gap through the analysis of empirical data from an area characterized by the presence of such commercial farms and a large number of smallholders.

Recent studies from Africa that investigated impacts on job creation and technological spillovers found relatively modest effects, for instance in Ethiopia (Ali et al., 2019), Mozambique (Deininger and Xia, 2016), and Zambia (Ahlerup and Tengstam, 2015; Lay et al., 2021). For Mozambique, Deininger and Xia (2016) found positive short-term effects on job creation but decreased perceived well-being within a 25 km (km) band and no other additional spillovers in terms of better access or yields. For Zambia, Lay et al. (2021) and Ahlerup and Tengstam (2015) both found that yields of farmers in the adjacent areas increased, but not

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for smallholders with less than 1.4 ha (ha). Further, [Ahlerup and Tengstam \(2015\)](#) found that households with small land sizes had more to gain from employment than those with greater landholdings. [Lay et al. \(2021\)](#) suggested that technology transfer is not likely to happen as technology on commercial farms is not easily adapted to circumstances on small farms, such as is in the case of industrial flower farms, production of high-value vegetables for export, or no-till cereal farming. [Zähringer et al. \(Zaehring et al., 2018\)](#) investigated perceptions of smallholders regarding the impact of commercial farms and found only limited technology spillovers from the farms, although some adaptation to increased water scarcity did take place. They also found little involvement of smallholders as employees on the farms, but reported positive smallholder perceptions regarding the overall impact of these farms on economic development.

Regarding out-grower schemes, the literature reveals mixed findings. [Herrmann \(2017\)](#) found significant, strong positive differences in terms of income and poverty between participants and non-participants in sugarcane out-grower schemes, but more nuanced results for the agro-industry labour market channel. For a horticulture project in Senegal, [Van den Broeck et al. \(2017\)](#) found income increases of 30% among the poorest half of the population, and income increases as much as 53% among the poorest 10%. Conversely, [Meemken and Bellemare \(2020\)](#) analysed representative data from six countries and found only moderate or partly (for three countries) insignificant gains in income among contract farmers. They also did not find robust evidence that non-participating households in the community benefitted from additional income opportunities. However, they found that participating contract farmers and their households were more likely to own productive resources such as land and livestock, concluding that access to such resources could be a precondition for, or the outcome of, participation in contract farming. [Chamberlain and Anseeuw \(2019\)](#) found that imbalances in control over resources, lack of knowledge transfer, and specific characteristics of contracts being in favour of the company (rather than the smallholders) were enough to explain the modest benefits of contract farming.

We intend to link these findings from the literature on the impacts to a broader discussion regarding the question of livelihoods and livelihood diversification strategies of smallholders.

The livelihood framework ([Dfid, 1999](#)) is a well-known conceptual framework that has been used in many studies to assess well-being and resilience among smallholder households ([Baffoe and Matsuda, 2017](#); [Hall et al., 2015](#); [Marschke and Berkes, 2006](#); [Ulrich et al., 2012](#); [Zoomers and Otsuki, 2017](#)). The livelihood concept ([Antwi-Agyei et al., 2013](#); [Chambers and Conway, 1992](#); [Ellis, 1998](#)) has been developed to investigate challenges faced by rural households and to provide a more holistic perspective rather than a mere focus on monetary poverty ([Rakodi, 1999](#)). Physical, natural, human, and social capital complement financial capital in the analysis of this approach ([Scoones, 1998](#)). Based on these forms of capital, people build their livelihood and well-being. [Scoones \(1998\)](#) emphasizes that investigating all elements of the livelihood framework represents a significant undertaking and thus advocates “optimal ignorance” i.e. seeking only the information that is necessary. In this study, we use the livelihood framework and focus on “livelihood capitals”, an approach which allows us to compare our results to earlier findings in the same study area ([Ulrich et al., 2012](#)).

Diversification of livelihoods is a strategy that can aim at increasing incomes, but also to increase the capacity to withstand shocks and create greater resilience of house ([Asfaw et al., 2017](#)). A literature review of diversification strategies in Africa ([Alobo Loison, 2015](#)) found that diversification is generally occurring in contexts of gradually diminishing farm sizes, low agricultural yields, and urbanization without industrialization. Though income diversification was found to be associated with higher incomes in Mali in the early 1990s ([Abdulai and CroleRees, 2001](#); [Reardon et al., 1992](#)), a frequent finding was that diversification is often restricted by constraints to assets ([Abdulai and CroleRees, 2001](#)), and therefore incomes and livelihood assets often

remain limited. For instance, [Lay et al. \(2009\)](#) could not find evidence of diversification of farm income portfolios among smallholders in Burkina Faso ([Lay et al., 2008](#)). [Bryceson \(2002\)](#) posits that when diversification occurs, it is mainly driven by desperation. According to [Lay et al. \(2008\)](#), poor households with low asset endowments engage in multiple livelihoods, in particular non-agricultural activities. Using data from Western Kenya, [Lay et al. \(2008\)](#) showed that only high-return non-farm activities such as salaried employment had positive effects on agricultural productivity. Livelihood diversification has also been described as a strategy for climate adaption and reducing vulnerability ([Eakin, 2005](#)). For Senegal, based on large and repeated surveys by the World Food Programme, [Giannini et al. \(2021\)](#) have shown that diversification strategies shape household vulnerability, and demonstrate that households engaged in non-climate sensitive activities (employment, self-employment) and receiving remittances are more food secure than those that do not. Drawing on research in Central America on climate adaptation measures, [Donatti et al. \(2019\)](#) highlighted crop-diversification, but also emphasized the importance of livelihood diversification and social safety nets. Finally, [Eakin \(2005\)](#) described different levels of climate adaption and diversification strategies of smallholders in Mexico, highlighting the importance of institutional and economic factors that shape these diversification processes.

At the same time, the literature review cited above ([Alobo Loison, 2015](#); [Asfaw et al., 2017](#)) also indicated a lack of longitudinal data that would enable deeper, more detailed understanding of these processes. To this end, the present study helps to fill this gap with empirical data.

For our case study area, relatively good data were available with respect to diversification of household strategies. [Wiesmann \(1998\)](#) conducted a comprehensive survey of smallholders in the region and analysed their diversification strategies. He showed the importance of extended family networks, remittances through such networks, pensions, self-employment, and off-farm wage employment as a strategy to diversify risks. A smaller, qualitative follow-up study ([Ulrich et al., 2012](#)) constructed a livelihood index. It indicated a striking persistence of low asset endowments among the majority of smallholders, from an aggregated perspective, but also a high level of individual transition in and out of precarious livelihood status. Here, the unstable nature of many off-farm jobs was highlighted.

This review of the literature guided our interest in the present analysis. The geographic area under investigation offered us the chance to study the livelihood profiles among smallholder households co-existing in a region hosting an important cluster of commercial farms. We investigated a large group of households not engaged with commercial farms (hereafter called “non-engaged”), on the one hand, as well as those engaged with commercial farms either as employees or as contract farmers.

The objectives of this paper are therefore to examine the status and evolution of livelihood profiles of households that live in the proximity of these large commercial investments and the role of labour opportunities provided by these investments. First, we analyse the frequency of employment on commercial farms and contract farming amongst the smallholders in the study area. Second, we assess the wages earned in off-farm employment and specifically the wages paid on commercial farms. Third, we analyse the differences in term of livelihood profiles between these groups and discuss whether these differences were caused by the commercial farms, or whether, conversely, the differences determine people’s participation or non-participation in employment on commercial farms or contract farming. Finally, we reflect on longer-term changes to smallholders’ livelihood profiles and diversification strategies based on a comparison with older data from the same area.

2. Material and methods

2.1. The study area

Our study area was chosen based on the high number of commercial

investments in the region (Giger et al., 2020). It is located between 1800 and 2500 m above sea level, encompassing an area of 1500 km² and a population of 200,000 inhabitants. Located on the western side of Mt. Kenya, the climate of the area ranges from sub-humid to semi-arid (Wiesmann, 1992). Population increases, urbanization, and increased water abstraction for irrigation by both small-scale and large-scale farmers have greatly contribute to overuse of water resources in the area (Lanari et al., 2018).

Being suitable for intensive agriculture and relatively close to the country's capital, Nairobi, the area has been an important agricultural production centre since colonial times. It was originally inhabited by the pastoralist Maasai. Some of the Maasai were displaced as a result of colonialism by settlers during the 20th century (Tignor, 2015). The few families that were not displaced largely went to work, along with Kikuyu and Meru people, on the new farms and ranches founded by the early European settlers (Hughes, 2003). As a result, land use shifted to extensive farming, primarily for cereals and livestock production (Hughes, 2003; Kohler, 1987). With Kenya's independence in 1963, land distribution programmes led to new changes in the agricultural system. Numerous farms and ranches were subdivided into small plots measuring up to 3 ha. These smaller plots were subsequently settled by many Kikuyu and Meru ethnic groups (Kohler, 1987; Wiesmann, 1998), whereas other larger farms and ranches were maintained. The corresponding influx of people led to a high population increase in the region, with internal migrants representing 70% of adults in the region in the 1990s (Wiesmann, 1992). Smallholders practice farming on plots typically measuring 0.5–2 ha, while keeping small numbers of cattle and other animals (Wiesmann, 1998). Private property rights are usually duly registered and considered secure in this area, enabling a land market accessible to investors via purchase or long-term leases.

In the study area (Fig. 1) in 2016, a total of 48 commercial farms were identified as operational (Mutea et al., 2017). 56% of these farms were founded before the year 2000. The majority of investors (81%) in the region's commercial farms are Kenyan citizens, albeit of varying origins (Mutea et al., 2017).

Flower farms (especially roses) are the most common commercial farm type in the region, followed by vegetable farms. A few wheat farms and livestock ranches remain. The sizes of the commercial farms are

diverse: They range from 14 ha to 4000 ha, with flower farms usually being the smallest and livestock ranches the largest. In comparison with smallholder farms, however, commercial farms are clearly larger in size, investment levels, and production levels. Fig. 1 shows a map of the region indicating the location of currently operational commercial farms, as well as the areas that were surveyed.

Approximately 8000 workers are employed by the farms, including 70% on a permanent basis (Giger et al., 2020). This workforce is partly supplied by households living in the area, but also by workers commuting by foot or buses from nearby Nanyuki or other settlements (Peter et al., 2018).

Some commercial farms, mainly the vegetable farms, also contract smallholder farmers in the region through out-grower schemes (Giger et al., 2020). Some smallholder farmers were also contracted by other commercial companies engaged in retail and export. However, analysis showed that contract farmers were located in specific spatial clusters, and very few were found in our randomized survey.

2.2. Data

A socio-economic survey was designed to assess the socio-economic status of households employed on commercial farms, households not employed on such farms, and contract farmers in the study region. It was carried out between January and March 2017 in six different areas, encompassing in 13 localities, and spanning three different counties – Laikipia, Nyeri and Meru – where 48 commercial farms (Mutea et al., 2017) are found (Fig. 1).

Data were collected via a systematic household survey using closed and, to a lesser extent, semi-closed questions. In preparation for the survey (sampling frame, questionnaire design), the team conducted 16 qualitative interviews with households in the area and gleaned insights from a long-term research collaboration with project partners in the area. These qualitative interviews were conducted to better understand the context and to adapt the research questions to the field reality. The survey was coordinated by two researchers. Questionnaires were distributed using tablets by 10 Kenyan enumerators, working in teams of two, under the supervision of the two coordinating researchers. The respondents were usually men, in their role as head of the household.

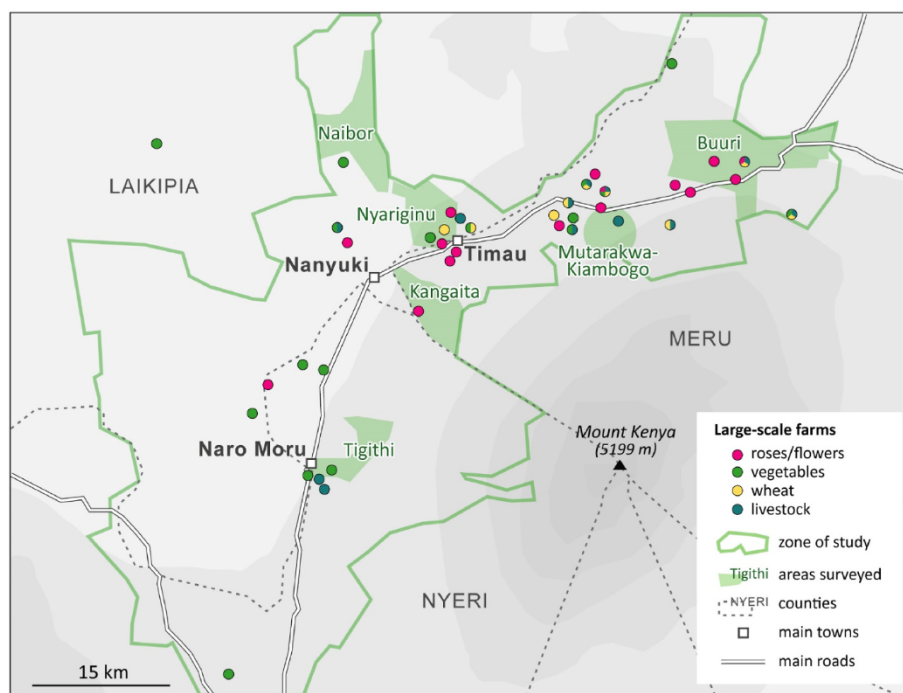


Fig. 1. Nanyuki area: large commercial farms and surveyed zones. Source: Afgroland survey (2017). In: Reys et al. (2018).

They were sometimes assisted by their wives, especially for questions related to food security.

The survey collected information at the *individual level* (age, gender, marital status, origin, occupation, wages earned, perception regarding the presence of commercial farms and labour employment, etc.) as well as at the *household level* (size of household, ownership of livelihood assets etc.).

Interviewed households were selected according to a stratified random sampling methodology. Interviews were conducted in five sub-locations: Buuri (approximately 2100 households inhabiting the sub-location), Tigithi (600 households), Kangaita (1200 households), Nyariginu (1500 households), and Naibor (600 households) (Fig. 1). These sub-locations were purposefully chosen based on the presence of commercial farms with characteristics representative of others established in the area (rose/flowers or vegetable production farms). The location of these farms was previously systematically investigated by researchers (Mutea et al., 2017). Each of the sub-locations were divided into groups of approximately 300 households. In each sub-location, interviews were conducted within only one group (Tigithi, Kangaita, Nyariginu, Naibor) or two groups (Buuri), which were randomly selected. In each group, one out of five households were interviewed in their homes. The homes were previously identified using publicly available satellite images that enable to identification of all roofs/houses in the area (20% random selection rate). As a recent formal census of households was not available, the number of households in each area was estimated by means of these satellite images.

A total of 318 out of 360 questionnaires were fully completed in this randomized sample. For each household surveyed, we attributed a weighting proportionate to the total number of households in its sub-location, so as to eliminate under- and over-representation (Table 1).

Additionally, as in this first representative sample, very few households were found to be engaged – presently or previously – in contract farming schemes (only six out of the 360 households interviewed). This was not expected, as six out of 33 farm managers said they had contracts with smallholders in a 2016 survey (Giger et al., 2020), though they indicated this practice had declined in importance. As a result, we purposefully selected 60 additional households engaged in contract farming in Timau's vicinity (sub-locations of Mutarakwa and Kiambogo). This area is known for its high density of contract farmers. According to information from VegPro, a major grower and exporter of cut flowers and fresh vegetables in Kenya, 400 of the company's contract farmers are located in this area.

We also used data from Wiesmann (1998), dating back to 1989/90 and 1997, and from Ulrich et al. (2012), for the year 2010, to investigate longer-term changes to smallholders' assets and livelihoods in the same study area. The studies differ only slightly in the exact locations of households, and have different sampling size and methods applied, but we found them to be representative of our study area and able to serve as a valid benchmark for comparison.

Ethics statement: Verbal informed consent was obtained from the entire sampled population before the study. Participants were informed that the information provided would remain confidential and would only be used for research purposes. Ethical approval was not sought for the present study because it is not required as per the University of Bern guidelines and applicable national regulations.

2.3. Data analysis

To explore the influence of commercial farms, the surveyed households were divided into three groups depending on their engagement with a commercial farm:

Employed: households interviewed in areas where large commercial farms are located (Buuri, Tigithi, Kangaita, Nyariginu, and Naibor) and who have at least one household member employed at a commercial farm;

Contract: households interviewed that are working under a farming

contract in an out-grower scheme (located in Mutarakwa and Kiambogo);

Non-engaged: households interviewed in areas where large commercial farms are located (Buuri, Tigithi, Kangaita, Nyariginu, and Naibor), but have no household members employed at a large agricultural farm. Note that non-engaged households may be engaged in other types of business or jobs not related to commercial farming.

Households that form part of the group of commercially employed or contract farmers are referred to as “engaged” households in this study.

We performed a detailed analysis of demographic and socio-economic data at the household level to assess the differences between these groups.¹ Additionally, we analysed data on wages paid on commercial farms and compared them to other labour opportunities. Besides basic socio-economic and demographic statistics of household members and assets, we applied a livelihood index (Table 2). Ulrich et al. (2012) developed the index using the livelihood approach (Chambers and Conway, 1992) to measure the livelihood capitals of the households. The index developed by Ulrich et al. (2012) is based on eight indicators that represent five different types of capital – human, natural, financial, physical, and social – that were selected and weighted by the authors with the participation of local researchers and farmers. The authors applied this methodology 10 years ago for a study in the same region, thus enabling comparison with our findings. Using the index by Ulrich et al. as a starting point was especially advantageous because the indicators and scales were developed in a participatory process with local stakeholders, who confirmed their relevance and validity based on their own perceptions (Ulrich et al., 2012). We reasoned that because their study was carried out relatively recently, the same indicators and scales could and should be used. Nevertheless, due to some differences between the type of our data available from the household survey and the ones collected by Ulrich et al. we had to adapt some of the indicators and integrate other variables. Overall, however, each indicator remains very similar to the original used by the Ulrich et al. with the exception of the community participation indicator (social capital), which was not used because of lack of information, and the subsistence indicator, which was modified. These changes led to some adjustments in the weights for household performances (Table 2).

Table 2 shows the indicators, weights and scales as applied in our study. As described above, these were chosen and weighted in a participatory exercise with smallholder and researchers (Ulrich et al., 2012). Land holdings have been attributed the highest weight, as smallholders attribute very high importance to this indicator. Education, livestock, farm income and housing are of intermediate importance, whereas off-farm income and subsistence are of lowest importance. As a proxy for human capital, we used the education status of the head of household, using the information in our survey and fitting it to the scale use by Ulrich et al.. The scale reflect the importance given to higher education by local stakeholders. We did not include health, an important aspect of human capital (Scoones, 1998), which we unfortunately lacked data for. Land size (total land owned or used by household) was used as indicator for natural capital, although obviously the quality of land and access to irrigation would also be important. The five land size intervals

¹ Because of the different type of their relationship with agribusinesses, “contract” and the “employed” groups are analysed as different groups. These groups represent two different models of how commercial farms are linked to the smallholders in the area, and may have different socio-economic characteristics. This is a question of high topical interest. These two groups are compared separately with each other and with the group of non-engaged.

Table 1

Interview details of surveys, by sub-location. Source: Afgroland survey (2017). In: Reys et al. (2018).

Type of zone	Name of the sub-location surveyed	Name of the main commercial farm found (main crop)	Total approx. no. of households inhabiting the sub-location	Total no. of households interviewed	Total of Interviews completed	Weight – total no. of households represented by one interview
STUDY	Buuri	Blooming Dale (roses)	2100	120	111	19
AREA	Tigithi (Naro Moru)	AAA Growers (vegetables)	600	60	53	11
	Kangaita	Kairiki Limited (flowers)	1200	60	52	23
	Nyariginu	Equinox (flowers)	1500	60	50	30
	Naibor	KHE (vegetables)	600	60	52	12
	Mutarakwa-	VegPro (peas)	–	60	57	1
CONTRACT FARMING ZONE	Kiambogo (Timau)					

Table 2

Weight and scales used to measure performance according to well-being indicators.

Capital ^a	Indicator	Weight	Comparably, from worse off to better off				
			0 point	1 point	2 points	3 points	4 points
H	Education level completed by the head of household	15	No school	Primary	Secondary	High school	University
N	Land size (ha)	20	<0.8	0.8–1.2	1.2–2.4	2.4–4.0	>4.0
N/F	Subsistence: Number of months (in the past 12 months) in which household did not have enough food to meet family's needs	10	7–12	4–6	2–3	1	0
P/F/N	Livestock (LSU) ^b	15	<1	1–2	2–3	3–4	>4
F	Farm crop income (USD) ^c	15	0 < 100	100–200	>200–300	>300–500	>500
F	Estimated level of off-farm income ^d	10	0	0.5	1	1.5	>2
P	Housing material	15	Mud, grass, or corrugated iron	–	Wood	–	Partly in cement or bricks

Note: the table is adapted from Ulrich et al. (2012); weights and point values have been slightly adjusted to reflect changes in purchasing power and the omission of social assets.

^a Human (H), natural (N), financial (F), and physical (P) capital.

^b Factors for livestock unit: *1 milk cow and ox; *0.25 goats and sheep; *0.02 chicken.

^c Value of crops sold in the season preceding the survey.

^d Factors for estimation of off-farm income: 0.5 commercial farm temporary/casual employee; *1 non-agriculture permanent/full time employee; *0.5 non-agriculture temporary/casual employee; *0.5 self-employment. Figures above 1 result from several household members involved in off-farm income.

correspond to the intervals chosen by Ulrich et al. Relating both to natural and financial capital, another important indicator was subsistence, as identified by Ulrich et al. (2012). We measured it based on the number of months the family was not able to meet its needs in the last year.² We made sure the scale captured the severity of the situation: 62% of the non-engaged experienced at least one month of insufficient food supply for the family. This figure was lower for the “employed” (42%) and for the “contract” group (46%). Livestock holdings were measured in standard livestock units and serve as indicators for financial, physical and natural capital.³ Further indicators for financial capital were crop sales (in the season preceding the survey), and estimation of income through off-farm employment. This estimation of off-farm employment was based on the type of employment of any household member; thus,

² “Ulrich et al. were referring to the number of months the households could cover their food needs through their own production. We did not have this data available. As a proxy, to address the dimension of subsistence, we used the information on food supply, more specifically the number of months when households did not have enough food to cover their needs. The scoring intends to trace the severity of food insecurity. Already a month or two of insufficient food supply is a severe problem for a family.

³ Livestock can be seen as contributing to different assets. (DfID, 1999; Rakodi, 1999). We follow Ulrich et al. who based on stakeholder interviews, classified it as natural and financial capital. Livestock and the manure it produces is seen by stakeholders a “natural asset”, and livestock may also be a form of saving. The classification by stakeholders is also found in the literature (Bhandari, 2013; Erenstein et al., 2010; Tran et al., 2022). However livestock can also be physical asset by providing animal traction or as a factor of production (DfID, 1999; Pour et al., 2018; Rakodi, 1999).

the total per household can reflect the earnings of more than one household member. We acknowledge that not all forms of financial capital were captured by these indicators – for example, remittances and income from sales of animal products were not directly measured (though they depend on livestock holdings). An important indicator that can serve as a gross indicator for physical capital is people's quality of housing. According to many rural studies in Kenya, it is also a general proxy indicator for well-being of smallholders (Ifejika Speranza and Wiesmann, 2006).

We applied descriptive and multivariate statistics to analyse the socio-economic and demographic data. Multivariate statistics include chi-2 tests to verify statistically significant differences between the groups. All the chi 2 tests were performed on contingency tables (Howell, 2011). However, the figures are reported in the tables as proportion data to help the reading and ease the comparison of the differences between the different groups. The Pearson Chi2 tests performed were non-parametric. The null hypothesis states that there is no relation between the variable tested and the household groups tested. (hypothesis rejected when the result is less than 0.05). A partial and preliminary analysis of our data was summarized in an internal research report (Reys et al., 2018).

We calculated the livelihood index to provide a synoptic overview of the livelihood status of smallholders. The index is composed of the indicators listed in Table 2. They act as proxies for livelihood capitals, providing a holistic representation of the livelihood assets available to households (with the exception of social capital, as noted above). We assigned each household a score for each indicator according to the scoring system (Table 2) ranging from 0 to 4. The higher the score, the better the status of livelihood assets for the given indicator. The weight

and the scores were based on Ulrich et al. (2012), with slight adaptations, and used to calculate the index for each household. The score for each group can be compared for each indicator or as a total (by adding up all the scores for the individual indicators according to their weight).

3. Results

3.1. Frequency and spatial distribution of employment and contract farming in the study area

In our study, 15% of households were involved in providing labour to commercial farms with at least one household member, and we found a strong variation among the various sub-locations (5.8–26.1%). The highest percentage was found in Buuri (26%), an area with the largest concentration of large employers (five farms with a total of 2490 workers). The second-highest percentage was found in Nyariginu (14%; four farms with 1430 workers), in the other three locations, the percentage of households involved in providing labour and the total number of workers on farms were lower (farms with an offer of 300–500 jobs). Note that commercial farms also employ staff that do not reside in the area. For example, in the area of Naibor, a study with workers of a

large farm found that the large majority were not farmers from the area, but rather commuted with buses from Nanyuki (Peter et al., 2018). Indeed, in the same location, our survey found only three households that were employed by commercial farms.

Only six households (2%) in the representative sample were contract farmers. Interestingly, though, we also found 53 households that had previously been involved as contract farmers. This confirms earlier findings (Mutea et al., 2017) that contract farming is losing importance in the area. Further investigation revealed that contract farmers are now more concentrated in a specific area that had not been included in the original survey area. Information on this group of contract farmers is also included in the results of our analysis.

3.2. Demographic and basic socio-economic characteristics of the households

3.2.1. Demographic results

Gender, marital status. Overall we find rather subtle differences in the demographic characteristics between the household groups. Most of the heads of households surveyed were men. This was also true for the employed household group, even though we know that a majority of

Table 3

Socio-demographic profiles of the households, descriptive results by groups and chi-squared tests by pairs of groups.

Notes: statistically significant differences between the groups at a 5% rate or under are highlighted in grey. Source: Afgroland survey (2017). In: Reys et al. (2018). * data weighted.

VARIABLES		DESCRIPTIVE RESULTS			CHI2 TEST (P-VALUES)		
		Employed*	Contract	Non-engaged*	Employed/ Non-engaged	Contract/ Non-engaged	Employed/ Contract
		%	%	%			
Gender HH head	male	93	89	74	0.005	0.008	0.703
	female	7	11	26			
Marital status HH head	Married	91	95	74	0.087	0.005	0.601
	Divorced	0	0	4			
	Widowed	6	4	15			
	Single	3	2	7			
Education	no school	19	16	22	0.748	0.651	0.697
	primary	48	56	49			
	secondary	30	23	23			
	higher	2	5	6			
Age HH head	<30	6	4	5	0.001	0.000	0.519
	30-39	39	35	16			
	40-49	25	32	17			
	50-59	12	19	27			
	60+	18	11	35			
Total members per HH	1-3	23	19	37	0.214	0.019	0.717
	4-6	67	72	53			
	7+	10	9	10			
Total children per HH	0	10	11	29	0.043	0.002	0.304
	1-2	58	70	48			
	3+	31	19	23			
Migrant status HH head	far	9	2	11	0.180	0.063	0.173
	nearby	71	84	78			
	no	20	14	11			

those working for commercial farms in the area are women (Table 3). Women are employed mainly for planting, weeding, harvesting, grading and packaging, whereas men are employed mainly for spraying the crops. Male household heads tended to be married, whereas a significant portion of female household heads were divorced or widowed and remained single. This is probably due to social, cultural, and religious reasons that assign men the role of household head.

However, “Employed” and “Contract” households were even more likely to be male-headed households compared to “Non-engaged” households. Married couples were also more frequently found amongst the “Contract” households, a fact which can be explained by the need for more labour availability and greater ease of managing the overall workload of the household (domestic tasks, non-agricultural off-farm work) alongside the more sophisticated farm production necessary for contract farming. We did not find statistically significant differences in the education level between the different household groups (Table 3).

The majority of jobs on commercial farms were occupied by women (54%), a figure which was also reported in another study on employment using the same data (Mercandalli et al., 2019). A total of 74% were younger than 40 years. Women were frequently wives (56%) or daughters (40%) in the household, and very rarely the household head (only 4%). Some of them were divorced (6%) or widows (2%). Men employed by a commercial farm were usually husbands (82%) in the household, or occasionally sons (18%). No widowers or divorced men were recorded. Among, the other non-agricultural off-farm employment categories, women only represented 26%–42% of the workforce.

Results at the household level (Table 3) also reflected this age structure: “Employed” and “Contract” households were younger than “Non-engaged” households (42 and 40 years, respectively, compared to 53 years). Possible explanations for this emerged from more detailed interviews which revealed that for many younger households, employment in commercial farms is perceived as beneficial to earn cash for children’s education or to consolidate household assets. Being younger, they are also in their prime working age, which makes them attractive to employers. Also emerging from our qualitative interviews, such jobs are perceived as a way to save some money to reinvest in a little business afterwards. Further, younger households find it easier to adapt to the stringent requirements of out-grower contracts.

In addition to being younger, “Employed” and “Contract” households also have more members and children than “Non-engaged households”. One reason could be that having more children increases the need for additional income.

Migration: No significant differences were found between the groups regarding migration status. Households in all groups were overwhelmingly internal migrants (80–89%), most were from places located nearby in one of the three counties where our study took place (Table 3). When asked about the main reason for migration, the search for land (approx. 80%) was given as the main reason, while only about 10% came for a job. However, immigration among the “Employed” group appeared to be more recent compared to the other two groups (10 years, as opposed to 20 years) (SI Table 1.)

3.2.2. House and home assets

House and home assets were generally very modest and displayed little difference between the groups (SI Table 2). Houses in the area studied are most commonly made of wooden walls. Only a small portion (18–26%) is made of cement or bricks. Almost all of the houses in the area have corrugated iron or zinc roofs. Virtually all the households surveyed had toilets.

About half of the “Non-engaged” and “Employed” households reported access to piped water (55% and 56%). Conversely, all “Contract” households had access to piped water. Only half of the households had access to electricity, with “Employed” households displaying a significantly lower access rate (40%) than the “Non-engaged” (56%). One possible explanation for this may be “Employed” households being younger, and thus not yet connected to the grid.

Almost all the surveyed households owned one or more beds with mattresses, as well as sofa sets and tables. Electronic devices were widely owned, including mobile phones (96–98%), radios (84–94%), and televisions (38–65%). Between 15% and 36% owned a motor vehicle. “Employed” households most frequently owned TV sets and motor cars, unlike other assets. Notably, motor vehicles also represent a productive investment in the area, as they can be used for transport services.

3.2.3. Agricultural assets

Land: The size of land owned was around 1.2 ha per household and did not differ significantly between the groups (Table 5). The majority held an individual land title that provided land tenure security. A total of 50% of plots were held through a freehold title, 28% through a lease of private land, and 16% were under traditional tribal ownership (Table 4).

There was no case of a respondent mentioning that he or she lost land due to a commercial farm. Smallholders in the area generally have secure land rights, as mentioned by many respondents, and described in the literature (Wiesmann, 1998; Ulrich et al., 2012). However, as noted in the section on data and methodology, we did not survey those who might have left the area.

A total of 49% of the “Employed” group and 33% of the “Non-engaged” group stated that commercial farms have an impact on the land. The respondents frequently cited commercial farms as a reason that land is no longer available at an affordable price for smallholders. They referred explicitly to the high cost of leasing land. Where land would still be available and affordable, the essential infrastructure to attract settlement for farming is lacking.

Irrigation: The plots owned by “Contract” farmers were 100% irrigated, far more than for “Employed” (31%) or “Non-engaged” (27%). Perceptions of irrigation differed between the groups. Changes in the performance of water management were perceived as mostly positively by those in the “Employed” (51%) group, but were perceived negatively by “Contract” farmers (31%) and the “Non-engaged” groups (28%). Interestingly, the majority of “Contract” farmers did not report a positive evolution of irrigation water management in the last 10 years. Irrigation, therefore, represents a precondition for working as a “Contract” farmer, and has not come about as a result of contract farming activities or income related to it.

Infrastructure changes in general were seen as increasingly positive by all groups in terms of quality and quantity (59–67%). About a quarter (20–27%) of households in all groups considered the changes to be related to the presence of commercial farms, as these farms seek to upgrade roads as corporate social investments and to create an enabling environment for the smooth running of their businesses.

Agricultural equipment: Manual sprayers, weeders, ploughs, and ox carts are the tools and equipment most used in the region. Related differences between household groups were surprisingly small, except that “Employed” households is more likely to hold a weeder, and “Contract” farmers are more susceptible to own manual sprayers, irrigate their land

Table 4
Land ownership, by household groups. Source: Afgroland survey (2017). In: Reys et al. (2018). (Weighted data.)

VARIABLES	GROUPS OF HOUSEHOLDS			
	Employed	Contract	Non-engaged	
% Type of land access to plot	freehold	57	46	69
	traditional	26	13	11
	leasehold	17	39	12
	other	0	3	8
% Year access to plots	>2013	32	39	26
	2008–2012	25	16	26
	2003–2007	11	16	22
	1998–2002	10	5	8
	1993–1997	3	10	8
	<1992	18	15	31

or hold a smaller cattle herd. It shows that “Contract” farmers may have a higher propensity to invest in assets bringing returns after longer periods, in contrast to “non-engaged” households who seem to rely less on such assets, and thus less able to make investments to improve their yields.

As expected, “Contract” households also spent more on agricultural inputs (SI Table 3). Interestingly, “Employed” households also invested almost 40% more in seeds, fertilizers, and other inputs than “Non-engaged” households. Around 60% of all households said they adopted new technologies, sometimes explaining that they borrowed ideas from their work on farms.

Livestock: “Contract” farmers reported owning the largest herds of cattle (Table 5) About one third of households, in each group, claimed to be less engaged in livestock keeping than 10 years prior, and cited lack of grazing land and fodder as the main reasons for this change. Among the groups, the “Contract” households were the most likely to claim to have larger herds than before (14%). They cited the availability of money to invest as the main reason for this increase. However, overall, about one third of all households claimed to have fewer livestock than 10 years prior.

3.3. Off-farm employment: opportunities and constraints

Employment on commercial farms: About 9% of the active household members (18–65 years old) reported being employed by a commercial farm. Most of these jobs were permanent positions (89%) with declared contracts (86%). In total, 55% of the contracted employees were women. Temporary or casual jobs were less common (11%).

However, jobs appeared to be a short-term option for households. Over 50% of those employed were hired only recently (two years ago or

less); only 15% of those employed in our sample were working 10 years or longer. Reasons cited by respondents to explain why they no longer worked for an agribusiness, or never sought to work for one, were often the same: low pay, preference for working as an independent farmer, illness or fear of illness from the effects of the chemicals used. People’s perceptions of the impacts of commercial farms on job creation were overwhelmingly positive: 95% of “Employed” households (and 86% of the “Non-engaged”) said that the commercial farms have a positive impact on job creation.

Wages paid by commercial farms: Median daily wages were about USD 3.20 (also reported in (Mercandalli et al., 2019) –lower than other non-agriculture employment (USD 4.20 per day) but higher than self-employment jobs (USD 2.50 per day).

Wage levels varied widely depending on workers’ position and qualifications. Unskilled jobs (56% of jobs on large farms) were paid USD 2.80 per day, only slightly higher than the minimum wage for unskilled labour in Kenya’s agricultural industry overall (USD 2.70 in 2017). These jobs are typically held by women. Jobs requiring technical skills (35% of jobs on large farms) paid around USD 4.20 per day, while lower-level managers (9%) can receive over USD 10.00 per day. At the same time, farm employees frequently obtained other benefits, such as health insurance or sick leave.

Our data revealed a gender gap: wages paid to women were 25–40% lower than men, whatever the contract type or skills required. Some of these salaries were reported to be below the minimum wage (unskilled labour on commercial farms). The type of farm did not influence wage levels. SI Table 4 provides more details on the gender gap in daily wages. Nevertheless, as noted above, women make up the majority (55%) of employees on commercial farms, in contrast to other off-farm employment opportunities (37%). So, the sector does offer women certain opportunities.

Table 5

Agriculture profiles of the households, descriptive results by groups and chi-squared tests by pairs of groups.

Notes: statistically significant differences between the groups at a 5% rate or under are highlighted in grey. Source: Afgroland survey (2017). In: Reys et al. (2018). * data weighted.

VARIABLES		Descriptive Results			CHI2 TEST (P-VALUES)		
		<i>Employed*</i>	Contract	<i>Non-engaged*</i>	Employed/ Non-engaged	Employed/ Contract	Contract/ Non-engaged
		%	%	%			
Land (surface)	>2.4 ha	1	5	8	0.296	0.585	0.564
	0.8-2.4 ha	43	44	38			
	<0.8 ha	56	51	55			
Land irrigated	yes	31	100	27	0.667	0.000	0.000
Plough	yes	14	13	9	0.188	0.756	0.353
Weeder	yes	54	38	36	0.036	0.135	0.838
OxCart	yes	6	7	6	0.853	0.856	0.649
Manual sprayer	yes	80	96	73	0.211	0.011	0.000
Cattle (heads)	>4	2	14	9	0.304	0.001	0.001
	1-4	59	75	56			
	0	39	11	36			
Sheep (heads)	>9	13	9	9	0.429	0.178	0.532
	1-9	42	60	51			
	0	44	32	40			

Fig. 2 depicts a comparison of the wages paid on commercial farms with other non-agricultural employment. It is evident from the findings that the wages on commercial farms occupy a middle ground. They are not extremely low (like many self-employment or non-agricultural jobs), but also seldom found in higher wage classes. Adherence to certain minimum standards can be attributed to the fact that the formal sector must conform to certain rules set by the government and international retailers.

Uses of income earned on commercial farms: Respondents mainly indicated using income to cover daily expenses (98% of responses). Also mentioned were savings (61%), investment in education (56%), farming (35%), and livestock purchases (7%). Women tended to invest more in education and less in livestock or other expenses. Daily expenses included a wide range of uses, including food purchases, small items for daily use, as well as small improvements in house assets. The importance of savings and investments in education shows that income through employment is also invested in the long-term – although not primarily in farming activities.

In general, there were only small differences in the socio-economic profile and assets of “Employed” households and “Non-engaged” households, also when compared to the high disparities among all the households. The differences indicated greater potential to engage in employment on farms or in contract farming among younger households, headed by men, and married. However, these households also had more children, indicating greater need for cash income than other households, possibly explaining employment on farms. In some cases, grown-up children still living in the household were employed on commercial farms.

3.4. Well-being index

The livelihood index provides a synoptic overview of the livelihood status of smallholders. The score for each group showed that “Contract” farmers had the highest score (19.7), followed by “Employed” households (16.5) and “Non-engaged” households (14.3) (Table 6).

Table 6 and Fig. 3 display the different dimensions of the well-being index and reveal marked differences in the scoring between the groups – enabling some interesting interpretations:

The contract farmers exhibited a higher overall index due to higher livestock and crop scores, a possible result of investments made using the returns from contract farming. Their performance was inferior only in terms of off-farm labour as compared with the employed, thus the

family workforce of contract farmers may be absorbed by their main contract activities. This could also be interpreted as indication of further specialization in farming activities.

The group of “Employed” households scored highest for off-farm activities, but this was due to their employment on commercial farms. Considering them in terms of other off-farm activities, they were less involved (minus 0.30 index points) and had a slightly lower self-employment level (−0.1). This can be explained by their labour being absorbed by the commercial farms. The “Employed” scored low for most other indicators, except for crop production, where they scored higher than the “Non-engaged” (Fig. 3). This could be an indication of investment made with salaries from employment or a transfer of technology and skills, for which there were some supportive statements made by respondents. Regarding subsistence, the “Employed” scored only slightly higher than the non-employed.

Those with other types of off-farm activities in turn scored substantially higher on subsistence (score of 3.5 for other employed households; and 3.5 for self-employed households). However, for other dimensions, there were no marked differences from the average of all the other households.

Three indicators showed remarkably little difference between the groups: education, subsistence, and house assets. “Employed” households were able to meet their family food needs as much as other groups, suggesting that employment helps them maintain their food security by enabling them to supplement their subsistence means via some cash income, as limited as it may be. However, as noted earlier, almost half of households (44%) in all groups experienced at least one month where there was not enough food for the family, highlighting the precarity of food security among all groups, as noted by other authors (Fitawek and Hendriks, 2021; Mutea et al., 2019).

3.5. Inequalities and evolution of livelihoods status

We found high disparities in livelihood status among smallholders. Fig. 4 depicts disparities in the largest group, the “Non-engaged” households. Marked differences were revealed especially with regards to landholdings, livestock, and crop production. These disparities were already found by Wiesmann (1998), Kohler (1987) and Ulrich et al. (2012), and are thus not new to the area. The graph also shows that the better-off households did not engage more in off-farm activities than the medium group, but were likely able to invest more in agricultural production, as they had more livestock and land and produced more crops.

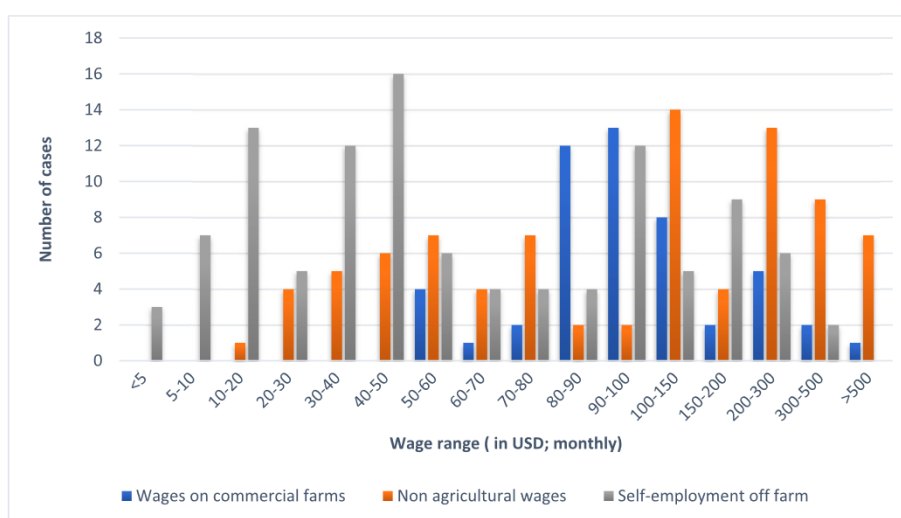


Fig. 2. Comparison of wages on commercial farms, non-agricultural wages, and off-farm self-employment. Wages were asked per day, per month, or per year. For calculation, the medians of the range were reported. For wages given per month or per year, we respectively divided by 30 or 360 to obtain the daily wage, as most respondents reported working every day. N = 50 (commercial farm wages); N = 85 (non-agricultural wages); N = 108 (off-farm self-employment).

Table 6

Individual indicator scores of the livelihood index for the different groups and total weighted score. Notes: adapted from (Ulrich et al., 2012); weights and point values have been adjusted.

Categories	Education	Land	Subsistence	Livestock	Crops	Off-farm	House	Total Score
Weights	15	20	10	15	15	10	15	
Employed	1.72	1.42	2.34	2.56	2.32	2.74	3.41	16.51
Contract	1.76	1.79	2.35	4.29	5.53	0.44	3.53	19.68
Non-engaged	1.69	1.79	2.16	2.85	1.40	1.02	3.41	14.32

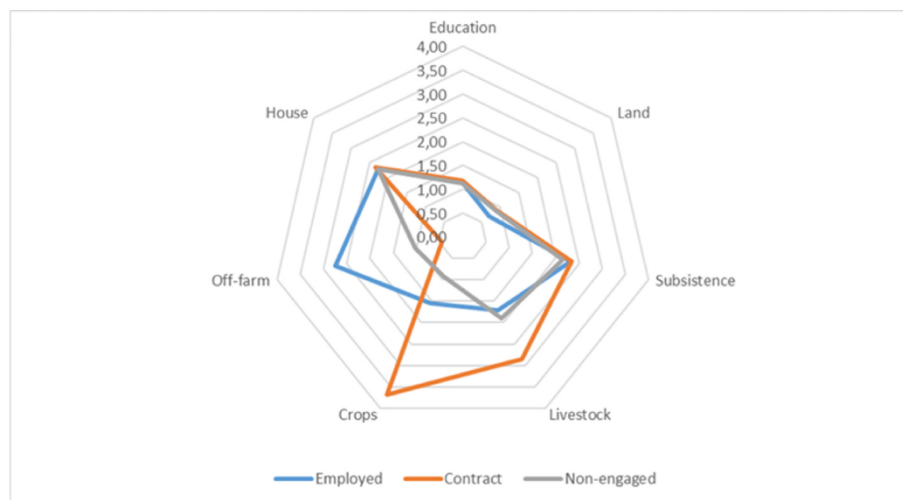


Fig. 3. Indicators by household groups. Notes: adapted from (Ulrich et al., 2012).

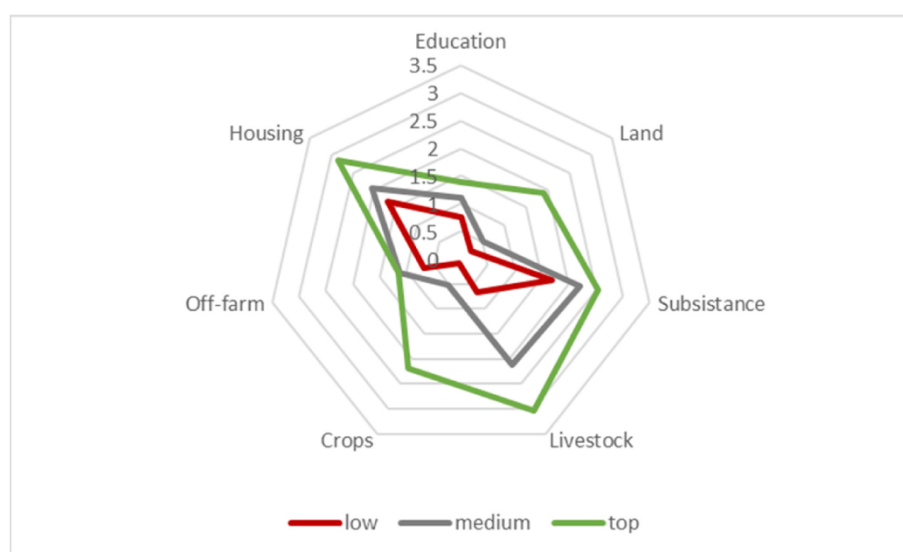


Fig. 4. Disparities among non-engaged households. Source: Afroland survey (2017). In: Reys et al. (2018). Notes: adapted from (Ulrich et al., 2012); weights and point values have been adjusted. N = 271. The three groups were formed by ranking the households according to their total livelihood score, and assigning them to three groups of equal size. The cut-offs were: Low: < 21.5, medium 21.5–42.5; top >42.5.

The distribution of means per quantile showed that while the “Employed” group had a relatively good score among the 20% of its poorest households compared to the 20% poorest in other groups, it had the lowest means among the wealthiest quantiles. This may suggest that employment on commercial farms prevents households from falling into extreme poverty, but it does not represent a path to wealth. This was echoed in personal interviews, with household respondents portraying commercial farms as an additional option for use when cash income is needed, and there are no other means to access it. However, in turn, if

there is not enough labour available, this option is not available for the poorest of households, in particular widows and the elderly. Overall, the results show a relatively low level in the livelihood status of all groups, indicating generally precarious livelihood conditions.

Comparison of the evolution of households’ livelihood assets: We compared our findings to two earlier studies that were made in the area, dating back to 1989/90 (Wiesmann, 1998) and 1997 (Wiesmann, cited by Ulrich et al. (2012)) (Table 7). Data from 1989/90 is based on a large plot-based survey of 2787 households. It was later updated based

Table 7

Comparison of data on households' livelihood assets between 1998 and 2017 in the study area. Sources: Wiesmann, 1998, Ulrich et al., (2012), Afgroland survey (2017). In: Reys et al. (2018).

Data source	1989/90 Wiesmann (1998) (n = 2728)	1997 Wiesmann, cited in Ulrich et al., 2012) (n = 170)	2010 Ulrich et al., 2012 (n = 30)	2017 own data (n = 318)
Land (ha)	2.7	1.9 (sd: 1.2)	2 (sd: 1.5)	1.2 (sd: 1.4)
Livestock (LU)	3.2	3.2	1.8	3.2
House built in stone		1% (1997)	30%	21% (brick/ cement)
Access to piped water			33%	55%
Completed secondary school (% HH members)		40% (n = 80)	26% (n = 73)	24% (n = 2098)
Beyond secondary (% HH members)		3%	4%	1%
HH with off-farm employment (%)		40% (n = 30)	93% (n = 30)	38% (n = 318)
Women in off- farm employment (%)		20%	40%	38%

on a random sample of 10% in 1997 (Wiesmann, 1998), and further exploited by Ulrich et al. (2012). Because of the small sample size used, data from 2010 (Ulrich et al., 2012) is only provided for reference.

Comparison of access to land showed that landholdings have decreased continuously since 1987, due to the influx of population and local population growth. This confirms farmers' perception of increasing difficulty in accessing new land, owing to population growth and the lack of available land, the latter in part because of commercial farms which now occupy land. Livestock numbers remained at the same level as in 1987. Ulrich et al. reported lower livestock holdings (based on a small sample), but also reported that households emphasized the importance of livestock keeping and expressed desires to invest in dairy farming – something that may have occurred in the last eight years, in some cases. Indeed, we observed that more intensive dairy farming is gradually taking place.

Data regarding housing illustrated improvements. In 2017, around 20% lived in stone/brick houses compared to 1997 (1%). In 2017, about 50% had access to piped water and over 84% considered it safe to drink, whereas less than 25% had access to safe water in 1987 (data for piped water unavailable).

Education levels showed a declining trend. While in 1997, 40% had completed secondary school, this had decreased to 28% in 2017. Higher education levels appeared to be stagnating: In 1997, 3% of all household members managed to reach beyond secondary school; in 2017, this rate went down to 1%. Nevertheless, these education data are partial: our survey did not capture family members who, based on better education, might have migrated to other areas and towns where they were able to find better living and working conditions. In this way, increased out-migration might explain some of the perceived negative trends in education levels among the local smallholder community.

Off-farm employment increased markedly, also among women: % of those engaged in off-farm activities, compared to 20% back in 1997. Indeed, Ulrich et al. (2012) already noticed that “male adults were the dominant group engaged in off-farm activities, but that the number of women working off-farm had more than doubled in the observed period”.

This comparison of livelihood profiles over the last 20–30 years

shows the persistent importance of off-farm non-agricultural employment, but also the persistence of low livelihood assets among households. While a majority of households indicated improvements in household assets (73% of “Employed”; 86% of “Contract” farmers; and 66% of “Non-engaged”), the data indicated very little asset accumulation beyond modest improvements in housing. Income earned is predominantly spent on food, education, and health.

The limited reach of contract farming: While we found only six contract farmers in our original random sample, we found 53 households in the same area who reported having quit contract farming. While the sustained practice of contract farming may benefit some farmers, and help them to accumulate livelihood assets, it may not be a suitable option for many others. These former contract farmers attributed this to difficulties in meeting the standards required, as well as to low productivity and insufficient prices. These households still had a higher number of members engaged in agriculture compared to others; thus, lack of family labour availability cannot explain their quitting contract farming. They also had as many oxen as before, and the percentage of irrigated land remained quite high compared to other households, although much less than those who continued with contract farming (Table 8). Indeed, the explanation for “dropping out” cannot be lack of these assets, as irrigation equipment is not fixed but is installed on fields when required.

There is little evidence that prior experience as a contract farmer contributed to lasting change in agricultural practices among relevant smallholders. The expenditures of former contract farmers for agricultural inputs were greatly reduced compared to those of ongoing contract farmers and were similar to the level among “Employed” households (Table 8). Obviously, former contract farmers will not continue to produce precisely those market crops (such as peas, etc.) that demand such inputs. However, we can deduce that these farmers did not apply the same quantity of inputs (or with the same frequency) to produce other crops such as maize. This suggests they returned to less intensive forms of production after quitting contract farming.

4. Discussion

The results of our study show that in an area with a major presence of commercial farms, a large number of smallholders with very small landholdings co-exist. Despite a relatively high number of jobs being offered by the commercial farms, relatively few households engage as employees (15%), and this engagement features high spatial variation. We attribute this variation mainly to the different production models of the commercial farms, which require different numbers of employees, as well as to preferences with regard to recruitment of workforce (smallholders or urban workers). Indeed, commercial farms also employ many workers from the urban and peri-urban settlements in the area. Another study in the Nanyuki area, with a different sample of households, in

Table 8

Comparison of several agriculture assets between households who had a contract and the other (weighted data). Source: Afgroland (2017). In: Reys et al. (2018).

VARIABLES	CONTRACT?		OTHER GROUPS	
	Had a contract	Have a Contract	Employed	Non-engaged
Total members engaged in agriculture (mean)	2.0	2.1	1.6	1.6
Total of people hired full-time (mean)	0.2	0.5	0.1	0.1
Total of people hired part-time (mean)	4.3	23.5	5.6	4.4
Irrigated land - %Yes	59	100	31	27
Total of ox (mean)	2.9	2.8	1.4	1.9
Seeds	2500	14,060	4800	2625
Fertilizers	3300	10,500	3500	3000
Disease products	2200	8675	2000	1740
Other inputs	1200	5000	1000	700

different sub-regions, similarly found only a small fraction of small-holder households (6%) involved in employment on commercial farms (Mutea et al., 2019). Further, we conducted additional interviews in another area further away from the commercial farms (+15 km), and found that the number of households there involved in commercial farm work was even lower (below 1%). This shows that the distance to commercial farms is important, especially considering time and the cost for employees of commuting to the workplace. Similarly, contract farming was also rare among the households surveyed (1.6%) and was found only in one specific location, mainly where smallholders have access to water for irrigation and larger landholdings.

We find some evidence that participation in the labour market may be more transitory: The wage levels that we recorded were low, and respondents often explained that the work is strenuous, and is not seen as a very attractive opportunity. Therefore, we can interpret job opportunities on commercial farms as an option to fill gaps in the household budget, according to the perception of locals. This perspective was repeatedly voiced in the individual and informal discussions with respondents. Nevertheless, the evidence also suggests that income earned on commercial farms plays a positive role in relevant households' food security, enabling families to complement their subsistence. This was found by Fitawek and Hendriks (2021) by analysing our data about food security. Käser (2018) and Peter et al. (2018) also investigated the impact and perception of employment on farms among smallholders via in-depth ethnographic research; they, too, confirmed the ambiguous impact of these employment (and contract) opportunities – wages are low, and the work is physically taxing, but it remains an important source of cash income for smallholders and employees, which would otherwise be difficult to find.

Contract farmers have more agricultural assets: in terms of land, irrigation and cattle. Access to irrigation water, in particular, represents a precondition for participation in extensive vegetable production in semi-humid conditions. The livestock holdings of contract farmers and the perception of an increased number of livestock over the last 10 years can be interpreted as evidence of modest accumulation of capital and the adoption of new technologies (e.g. stall-feeding, fodder conservation). Farmers also benefit from credit facilities and spillover benefits to community members who are casually employed by the contract farmers. This confirms the results of others. For instance, Meemken and Bellemare (2020) found that contract farmers and their households are more likely to own productive resources such as land and livestock, and concluded that access to resources is a precondition for, or the outcome of, contract farming. However, they note that contract farming may not always be beneficial. Chamberlain and Anseeuw (2019) also point to imbalances in control over resources, lack of knowledge transfer, marginal benefits, and specific characteristics of contracts favouring company interests rather than smallholder interests – all of which could explain the modest benefits to small farmers. Similarly, Käser (2018) highlighted the testimonies of farmers in our research area describing such power imbalances.

Contract farming seems to be an option only for a small fraction of the local households: often only temporarily. This is evident by our finding that only 2% of households are involved in contract farming. As this type of contract farming is very much dependent on irrigation, and access to irrigation water is scarce; only limited dynamic effects through contract farming takes place in the region. In fact, contract farming for horticulture has lost importance in the region (Käser, 2018; Mutea et al., 2017). Our findings seem to confirm this decline. This decline has been attributed to exceedingly higher standards imposed on export-oriented horticulture, and which are difficult to meet in out-grower schemes. Contract farming results in a change of farming technologies, as farmers switch from maize and other field crops to higher-value horticulture crops. However, this is driven by the requirement of the particular crops and the specific value chain. The conditions for smallholders to enrol in the scheme is ownership of land and the presence of water supply. The commercial farms aim to spread production risk and meet their

production deficit. They offer training and supply inputs on credit arrangements (pers. communication with one of the senior managers of the outgrower scheme). However, the farmers have often complained due to low prices and strict production conditions that eliminates a large number of potential participants (source: qualitative interviews). While data shows that contract farmers are slightly better off than other households, contract farming does not appear to lift farmers clearly to another level of wealth or income, and are a suitable arrangement only for a selected few.

There is a lack of reliable data on the incidence of contract farming in developing countries that could serve as a comparison. Oya (2012), based on earlier estimations for developed countries (Glover, 1990; Rehber, 2000), hypothesized that for developing countries it was probably below 15%. But Oya (2012) has also highlighted the importance of contract farming can be important for specific crops (for instance milk, cotton, tobacco) and also for certain countries (for instance in Africa Mozambique, Kenya, Zambia). He explicitly mentions the well-known case of Kenya, where contract farming was found to be important for tea, sugar and cut flowers (but where contract farms are large commercial businesses). In any case, it is notable we find such low participation of contract farmers. But the conditions are becoming stricter and more difficult to comply with for smallholders (Peter et al., 2018), and some commercial farms are also shifting away from contracting smallholder farmers due to increased transaction costs for the exporter (Giger et al., 2020). Based on these findings it seems not very likely that this type of contract schemes are acting as a vector for change in the agrarian system we have studied.

Non-agricultural off-farm employment and remittances continue to be important ways of diversification of livelihood strategies: Kohler (1987) already found in the study area that most households relied on incomes from their businesses or permanent and temporary employment. Wiesmann (1998) emphasized the importance of remittances. Our findings show a lower, but still important role of remittances and off-farm employment. Direct comparison is difficult, as much depends on the concrete formulation of the interview questions and the underlying definition of the terms. Notably, our investigation did not include the importance of family networks as support received through such networks.

Comparing our findings to earlier data on smallholder livelihoods in the area, there is little evidence of significant change in farming strategies in terms of specialization or intensification beyond a small minority of contract farmers. Generally, farmer livelihoods remain precarious and depend on rain-fed farming in small areas, a few livestock, and additional off-farm income with low wages. The food security of many households is not guaranteed for the whole year. However, in terms of incremental adoption of agricultural practices, there is indeed an adoption process going on, as evidenced in interviews on land use practices in the area (Zaehringer et al., 2018). As Wiesmann (1998) and Käser (2018) have shown, many farmers immigrated from other areas in Kenya and had to adapt their agricultural practices to local conditions on arrival. This process is continuing (Käser, 2018), but the options are limited due to climatic and soil constraints and the small surfaces available for farming. Currently, milk and horticulture production appear to be among the few options available for smallholders. More intensive milk production with stall feeding and fodder production and conservation, combined with better logistics and marketing through dairy cooperatives, could be a strategy for households who aim at a more specialized and professional production.

Limitations: Our sample includes only smallholders in the area. Consequently, those who are not settled on the land, those who are not able to access land due to high prices, or anybody who has lost access to land was not included in our sample. Regarding the loss of land, it is known that the commercial farms are located on the land owned by previous colonial and post-colonial large scale farmers and ranchers (Giger et al., 2020), hence no smallholders lost land due to these more recent investments. Nevertheless, our focus on those who have access to

land creates a possible bias that must be considered when interpreting the data.

We also lacked data on social networks, which could have complemented the analysis of livelihood assets. Participation in religious and family networks, or in exchange of labour or credit groups, can be an important element of well-being – one that deserves further investigation.

Further, without time series of data, and considering the small sample size of the group of employed and contract farmers, opportunities to explore causal relationships via statistical and other quantitative methods remains constrained.

5. Conclusion

This research complements detailed ethnographic case studies performed in the region (Käser, 2018; Peter et al., 2018) and enables generalization of certain findings from a unique location to the wider study area. Overall, we find employment on the farms provided substantial, but limited benefits to a relatively small proportion of smallholders in adjacent areas. Further, contract farming remains an option only for a few households. We find only modest evidence of a transfer of technology from commercial farms to smallholders, aside from production of selected horticulture crops and the use of certain irrigation equipment. Agricultural inputs such as fertilizers and pesticides are purchased and used by all farmers; however, this cannot be attributed solely to the presence of commercial farms, but rather to the general liberalization of agricultural input markets in Kenya (Käser, 2018).

While we found some improvements for particular livelihood indicators, there is little indication of a rapid transformation towards more specialized agriculture production. Considering the large number of NGOs and government agencies active in the region (Käser, 2018), our findings are consistent with the concerns raised by Collier and Dercon (2014) regarding the limited potential of transforming smallholder agriculture as an effective way out of poverty. However, the employment opportunities on commercial farms in the region also do not appear to represent an effective way out of poverty; they seem to function more as a safety net for households in need of income to cover basic needs. Further, as described, contract farming is practised only by a few households and is not attractive or feasible for many others. This case study, despite the continued presence of large commercial farms, therefore does not find evidence for a wide-spread multiplication of “hybrid models in which smallholders interact with larger farmers” (Collier and Dercon (2014) which would be likely to transform the smallholder sector. At the same time, options to increase agricultural production in the relatively harsh environment are limited for many smallholders.

Nevertheless, improvements in access to drinking water and quality of housing point towards modest gains in local well-being standards in the last 20 years. However, again, this progress cannot be attributed solely to the presence of commercial farms. Still, in view of economic development, public services such as roads, electricity, and other goods are being expanded locally and can be attributed – at least indirectly – to the presence commercial farms. This could in turn accelerate the emergence of new activities. Moreover, the commercial farms also contribute to tax generation. Finally, the commercial farms also employ staff from outside the adjacent area (Peter et al., 2018), thus contributing to the local labour market. However, an apparent decline in education levels among area smallholders is cause for significant concern.

Our study did not investigate the cost and benefits or the sources of funds used to invest in public services in the region. However, it is evident that the commercial farms and the change in the structure of the smallholder sector should not be considered independently, but rather as part of a broader economic development pattern. Technology transfer and improved infrastructure may ultimately offer some opportunities for either off-farm employment, successful migration, or the development of more specialized, environmentally friendly agricultural production with

higher economic returns.

Our results lead us to formulate the following policy recommendations: Policymakers should be aware that the development of large commercial farms can indeed provide benefits in terms of job creation, but may only support income generation among a small fraction of smallholder households. Without intervention, wages paid may not rise above national minimums. So far, these jobs are not great enough in number or quality to transform the livelihood of households. Similarly, the potential of contract farming to improve smallholder livelihoods needs to be scrutinized. In the case of high-value crops for export such as flowers and vegetables, it appears difficult to outsource this production to small producers, given the stringent requirements of export market in terms of quality and food safety. Considering the lack strong technology transfer from commercial farms to smallholders – confirmed by other studies in this area (Zaehring et al., 2018) – there should be more efforts to train and support smallholders in intensifying their production (e.g. milk production) and provision of help with required infrastructure, such as irrigation and services (e.g. access to credit).

Overall, we recommend investing more to support smallholders in producing for local consumption and national markets. This will require ongoing and increasing support in the form of agricultural extension services and support with appropriate infrastructure and services. Additionally, support for development of other employment opportunities outside the agricultural sector remains important, as in the given semi-arid context limited opportunities to improve livelihoods of local smallholder producers seem to prevail.

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Author contributions

Conceptualization, M.G. and A.R.; methodology, M.G. and A.R.; validation, B.K.; formal analysis, A.R. and M.G.; investigation, A.R. and E.M.; data curation, M.G. and A.R.; writing—review and editing, M.G. and A.R.; visualization, A.R.; supervision, B.K. and W.A.; funding acquisition, M.G. and W.A. All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

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