CONCERNS OF SMALLHOLDER COFFEE FARMERS IN GATUGI, KENYA

INTERDISCIPLINARY LAND USE AND NATURAL RESOURCE MANAGEMENT (5440-B3-3F18)

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Our group, with host Jane and our interpreter John

WORD COUNT 10818

All pictures in the report are taken by members of the group We are all responsible for writing the report

ABSTRACT

Our research team gathered data on coffee production in Gatugi village, in Kenya's Central Highlands, in order to find ways in which coffee farmers' livelihoods could be improved in terms of income, health and knowledge. Coffee farmers in Gatugi struggle with poverty, complex and inscrutable production and marketing systems, and agricultural chemicals that are potentially dangerous and ineffective. A lack of information flow - between research institutions, the marketing system, co-operatives, and farmers - was the most common theme that emerged from our research. Many coffee farmers we interacted with do not understand the way their product is marketed or how the prices are determined, resulting in a lack of confidence in the entire system. Heavy and indiscriminate use of pesticides is mandated by the Othaya Farmers Co-operative Society to which nearly all Gatugi coffee farmers belong, leading many farmers to the conclusion that there is collusion between agrochemical companies and the Othaya Farmers Co-operative Society, and farmers do not always have the knowledge and training required to safely apply the pesticides. Research on improved management practices is conducted in Kenyan institutions but the results do not seem to reach the farmers who could benefit from it.

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LIST OF ABBREVIATIONS

Abbreviation	Abbreviated word/phrase
Batian	<i>Coffea arabica</i> cv. Batian
CBD	Coffee Berry Disease
СВК	Coffee Board of Kenya
CLR	Coffee Leaf Rust
CRI (CRF)	Coffee Research Institute
FFS	Farmers field school
GOK	Government of Kenya
KALRO	Kenyan Agriculture & Livestock Research Organisation
KPCU	Kenya Planters Cooperative Union
KSH	Kenyan Shilling
masl	Meters above sea level
MFG	Men's focus group
OFCS	Othaya Farmer Cooperative Society
Ruiru 11	Coffea arabica cv. Ruiru 11
SL	Coffea arabica cv. SL 28 and/or Coffea arabica cv. SL 34
SLF	Sustainable Livelihood Framework
SSI	Semi-structured Interviews
UoC	University of Copenhagen
UoN	University of Nairobi
WFG	Women's focus group

1. INTRODUCTION

Coffea arabica was introduced to Kenya in 1896. From independence in 1963, coffee was the nation's leading exchange commodity until it was surpassed by tourism in 1989. Coffee production peaked in the 1970s and 1980s, due to high world coffee prices and the state-regulated production and marketing systems; today, the coffee sector finds itself in difficulties due to substantial yield decline (Karanja, 2002 cited in Mude, A.G., Omiti J. M. & Barrett, C.B., 2007). This decline in yield can be explained by factors including policy changes, disease pressure, changing climate and declining world market coffee prices (Asayehegn, Temple, Sanchez & Iglesias, 2017; Mitchell, 2012).

In 2007, around 60% of Kenyan coffee was produced by small-scale farmers, organised into co-operatives that facilitate marketing, regulations, credits and inputs (Mude, 2007). Since the 1990s, some smallholders have abandoned coffee production due to the lack of profit, and those who remain face major challenges. This report aims to understand these challenges, particularly among coffee smallholders in Nyeri county, as well as how the management policies defined by the Othaya Farmers Co-operative Society (OFCS) affect the farmers; it also suggests ways to improve farmers' livelihoods, as referred to in the Sustainable Livelihood Framework (SLF) explained by Scoones (1998). Thus, the aim of our study, after considerable modifications, is to answer the following research question:

How can livelihoods of smallholder coffee farmers in Gatugi be improved?

Chambers & Conway (1991) define livelihoods as comprising "the capabilities, assets and activities required for a means of living". The sustainable livelihood framework (SLF) is a tool which we have used to guide our thinking about farmers' livelihoods.

It was brought to our attention that income is an important topic to the farmers, which led us to adopt this as one of our focus points. Income can be seen as part of the financial capital, but also as an outcome in the SLF. It is thus influenced by many other factors which makes it an interesting focus for our research. The focus on knowledge can be explained by stating that knowledge sharing has been a recurring theme throughout our research and that it is an important influence on farmers management strategies and capabilities. Health issues became a focus, due to the excessive use of agrochemicals by the farmers. Although we realise that there are many other components needed for a complete view of sustainable livelihoods, the scope of the project compelled us to focus on a few aspects.

The following four objectives are based on the aforementioned aspects, as they were the ones which emerged from our fieldwork as immediate and significant, both to us and to the people with whom we interacted during our stay in Gatugi.

- Understand farmers' concerns related to the income from coffee production and identify ways of improving their financial outcomes, hence reducing poverty.
- Understand the relationship, particularly the transfer of knowledge, between coffee farmers, the OFCS, and coffee researchers. Moreover identify potential sources of information to increase their expertise, incorporating aspects of both social and human capital.
- Understanding the influence of institutions and organisations on coffee farmers' outcomes.
- Understand farmers' health risks in relation to chemical use and identify ways to reduce them, as an aspect of human capital and enhancing the well-being of farmers.

GATUGI

The study focuses on Gatugi village, which is at 1850 masl, about 2.5 km northeast of the town

of Othaya, in Nyeri County, Kenya (*Figure 1*). The village lies along the paved road between Othaya and Karima forest, and contains several churches, schools, and businesses. Gatugi has about 200 households (Personal communication, 2018), almost all of whom are engaged in agriculture, such as livestock, coffee, tea and other horticultural crops, mainly vegetables, avocados and macadamia.





Figure 1, map of the studied area



2. BACKGROUND

THE BEGINNING OF COFFEE IN KENYA

Coffee cultivation in Kenya commenced around 1896, when British colonialists founded the first plantations, in the highlands of Central Kenya. Growing coffee was a restricted privilege to white settlers, a policy "aimed at keeping the locals out of the most lucrative sector of the economy" (Varqa, 2008).



TIMELINE COFFEE AND POLITICS

The British established the Coffee Board of Kenya (CBK), which was responsible for quality control, promoting Kenyan coffee internationally, and regulating the industry (Varqa, 2008). In 1955, agricultural policies in Kenya were reformed by the Swynnerton Plan, a scheme to accelerate agricultural development, as well as to restore order and prevent further revolt during the Mau Mau emergency (Thurston, 1987). The plan included distribution of land to native Kenyans, enabling them to sustain themselves and to generate income from cash crops. Growing coffee, a privilege formerly restricted to white colonialists, was from that time no longer prohibited (Collier & Lal, 1986; Ogot, 1995). Under the new plan, small-scale farmers were legally obliged to register with co-operatives and become members of the Kenya Planters and Cooperative Union (KPCU), Kenya's sole marketing agent. This scheme enabled coffee farmers to share the burden of inputs, marketing and processing, but its purpose was to create a state-run system, primarily controlled by the CBK. Under the Swynnerton Plan, coffee production, and consequently the role of CBK, expanded (Varqa, 2008).

INDEPENDENCE 1963

The coffee sector continued to be controlled by the state after Kenya gained independence. The new Kenyan government governed by top-down management, with regulations and policies that came from the Ministry of Agriculture, to the CBK, to the KPCU, and subsequently to local co-operatives (Varqa, 2008). Between 1976 and 1979 the Kenyan coffee sector boomed, benefiting coffee farmers throughout Kenya. A severe *frost* in Brazil instigated a supply shortage, but the price increase was only temporary, since the Brazilian coffee bushes recovered after a few years (Bevan, Collier, & Gunning, 1987).

THE MOI ERA

The presidency of Daniel arap Moi (1978-2002) has been criticised for the entrenchment of politics into the coffee sector, for promoting government-centered policies and for rent-seeking behaviours, problems which many argue are still present today. The period from 1991 to 1993 was the most repressive, politically and economically, in Kenya's post-independence history; political influence was pervasive in all state institutions, including the coffee sector (Okibo & Mwangi, 2010; Varqa, 2008). As a result, the opposition in the Parliament, NGOs and civil society pushed for democratic rights and accountability from the GOK. Until the election in 2001, won by Kibaki, efforts to reform the coffee sector continued to be unsuccessful (Varqa, 2008).



Figure 3, the coffee sector experienced a severe decline in yield between 1980s and 2000s (FAOSTAT, 2017)

LIBERALISATION

When Kibaki became president he initiated anti-corruption acts to clean up government institutions and to improve the quality of governance. The new government privatised virtually the entire utilities and commodities sectors, formerly under government control, including the coffee sector (Varqa, 2008). The object of liberalisation was to deal with economic problems, corruption, political interference and insufficient development within the sector (Okibo & Mwangi, 2010).

PRESENT DAY KENYAN COFFEE

In present day Kenya, coffee is still marketed and managed via a system of co-operatives. It is obligatory for small-scale coffee farmers with plots less than five acres, to be members of a co-operative (Mude, 2007). Decentralised co-operatives now link many small-scale farmers with centralised marketing agents, who undertake procedures such as packaging and export (Varqa, 2008). Nonetheless, it is argued that coffee and politics are still deeply interconnected, implying that post-liberalisation is still infested with poor management and chronic levels of corruption (Okibo & Mwangi, 2010).



Figure 4; Although the area of planted coffee remained stable until 2010, production levels have decreased drastically. The decline in production, then, was not due to farmers giving up coffee production but to declining yields beginning in the 1980s

OFCS

The co-operative in our research area is the OFCS, first registered in 1956. Initially comprising 250 members, now around 11.000 small-scale farmers are registered. The OFCS possesses 19 wet mills and has a management committee that is elected by the farmers (SSI 3, 2018). The OFCS is certified by Fairtrade (OFCS, 2015), and runs Farmer Field Schools (FFS) which seek to enhance and improve coffee production. Farmers are taught by *trained facilitators* at regular intervals at members' farms (OFCS, 2015).



Figure 5, The OFCS Dry mill in Gatugi

POLICIES AND REGULATIONS

According to the policy document "Gatugi Coffee Growers Biashara Group" (appendix IV) all members of the group are obligated to follow the recommended coffee practices, which include proper weeding and pruning, proper and adequate application of fertiliser and chemicals; intercropping is not allowed (Appendix IV; SSI 2, 2018). The more specific points of the policies, e.g. amounts and timing are not clear.

Farmers receive a membership card, enabling them to sell their coffee to the wet mills, if they follow the regulations (SSI 3, 2018). Compliance with the regulations is monitored by *promoters*. Promoters are local farmers who have been selected as the best farmers by the group for a period of three years. In this period they host the FFS, make inspections and report potential offences to the management committee (OFCS, 2015; SSI 2, 2018).

CULTIVARS

Four different cultivars of *Coffea arabica* are grown in Gatugi. SL28 and SL34 are grown by the majority of the farmers surveyed (Questionnaires, 2018), and are considered the highest quality coffee of Kenya. They are however highly susceptible to Coffee Leaf Rust (CLR) and Coffee Berry Disease (CBD). The cultivars Ruiru 11 and Batian are resistant to both CBD and CLR, while producing good quality coffee (OFCS, 2015).

3. METHODOLOGY

Data for our research was collected between the 2nd and the 12th of March 2018. The research team consisted of five MSc students from the University of Copenhagen (UoC), the authors of this report, and two students from the University of Nairobi (UoN). We were supported in the field by two local guides, a local elder, and university staff from both Copenhagen and Nairobi. In addition, we had three host families who acted as informal guides to the area.

A transect walk was conducted to familiarise the research team with the geography of the village. During the transect walk, a GPS was used to collect spatial data. 35 questionnaires were conducted with coffee farmers. Three pilot questionnaires were conducted on the 3rd and 4th of March, after which we determined that no major changes to the questionnaire form were required. The questionnaires were designed to capture information about household demographics, respondents' farms and coffee management practices, and perceptions about climate change (Appendix V). All farmers who were respondents to questionnaires, the researchers divided into three teams, each starting on different roads around the village. Initially, houses were randomly selected, but the sampling strategy was subsequently changed to interviewing every third farm; when a farm either had no coffee or had nobody home, the next farm was sampled. Spatial data were gathered on places where the questionnaires were conducted.

Twelve semi-structured interviews (SSI) were conducted: five were with managers and officials of the OFCS, one was with a professor at the UoN, and six were with farmers. We produced an interview guide prior to the fieldwork, but it was heavily modified by the interviewers for each individual interview.



Figure 6, Spatial data on questionnaire

We conducted two focus group discussions with coffee farmers, one women's focus group (WFG) and one men's focus group (MFG). The farmers were contacted and organised entirely through the efforts of the village elder who was assisting our team.

A single life story interview was conducted with a farmer who seemed experienced and knowledgeable about the historical perspective during the questionnaire.

Four members of the research team engaged in participant observation, helping coffee farmers one day. We also gathered information through observations made throughout our time in Gatugi.

For the soil samples, seven sites were selected because they used different management strategies. Composite samples were made from two or three profiles. Samples were taken from the A-horizon, at a depth of 20 cm. We took samples close the coffee bushes and in between rows because chemicals are not spread evenly. Two replicates were made for both of these locations. At site 5, an additional sample was taken close to a banana plant. We used the volumetric ring (100 cm3), a piece of wood, a hammer and shovels. The samples were dried soon after they were obtained. Back at UoC, the

samples were weighed and crushed to a fine powder to measure pH, nitrogen content and carbon content.

Data processing included the transcription of SSIs, coding of questionnaires and digitising field notes in Google Drive, making them accessible for everybody. Furthermore, we triangulated the data by comparing information from different sources.

4. RESULTS

INCOME

When we asked which factors influence the farmer's choice in terms of coffee management strategy, every farmer mentioned the desire to increase their income as being one of their main drivers. (MFG, 2018; Questionnaires, 2018).

DECREASING YIELD

The income of coffee farmers is dependent on their yield, and many farmers reported that last year's yield was relatively low, while some reported a long-term decline in yield. Some farmers attributed low yields to the berries dropping before maturity, a phenomenon associated mainly with CBD and frost (Personal communication during questionnaires, 2018). One farmer believes that CBD and frost are caused by changes in the weather (Q14, 2018).

INCOME SOURCES

94% of the questioned coffee farmers had additional income sources (Questionnaires, 2018), but coffee production is the main income source of 68.5% of the respondents. Gerald specified that his other income sources helped him overcome the challenge of receiving only one main payment per year for his coffee (SSI 9, 2018). Tea, dairy cows and poultry are common income sources (Questionnaires, 2018). Payments for some crops, like tea, are monthly rather than yearly, providing a more stable income (Personal communications, 2018; SSI 9, 2018). In the women's focus group, one farmer who was frustrated about her income stated that "*it is better to grow macadamia*," and many are thinking about growing Napier grass instead of coffee, because it is in high demand (WFG, 2018). On the other hand, an elderly widow whose only

income source was coffee, said she chooses to only produce coffee because other crops are too labour intensive for her (Q16, 2018)



Figure 7, a coffee farmer with Napia grass and a dairy cow

TIMING OF PAYMENTS AND LACK OF TRANSPARENCY

Farmers usually bring their coffee berries to the factory in October or November, but are not paid until September, almost one year after delivery (Personal communications, 2018; WFG, 2018). The reason is that the OFCS waits until they have received and marketed all the coffee beans before paying the farmers (SSI 10, 2018). As payments are scattered, farmers need to apply for loans from the OFCS. In January, they can get a loan of 25 KSH per kilogram of coffee berries they delivered, out of which 20% goes directly to the OFCS. If farmers have a debt with the OFCS, this debt is deducted from the loan (WFG, 2018; SS 9, 2018).

One farmer (Q30, 2018) expressed that he prefers other crops over coffee, because of the fact that coffee only pays once a year. Furthermore, the timing of payments can sometimes lead to

the younger generation abandoning coffee, since a more frequent and secure income is more attractive:

"The younger generation would be more engaged in coffee farming if the payments were instant because they love jobs that pay fast" (MFG, 2018).

"By themselves they don't like to stay here. They want to build their house there [in Nairobi]. Because the experience they have seen with me, they do not appreciate that. So that is why they stay away. They don't want to be like me." (Tommy, Life story, 2018)

David, the manager of the dry mill, informed us that farmers receive text messages after bringing their coffee to the mill about the amount they can borrow, which is based on the amount of coffee delivered (SSI 10, 2018). While this type of communication is fast and efficient, the farmers do not know anything about when and how much money they will actually receive for their coffee after it has been delivered (SSI 10, 2018). The women's focus group felt that there is poor communication between the OFCS and the farmers.



Figure 8, Coffee drying benches in Gatugi factory

They wish to have some form of communication after delivery, explaining where their coffee is in the value chain and how it will be sold (WFG, 2018).

Two farmers who moved out of coffee production mentioned both the irregularity of payments and the lack of transparency as reasons they were displeased with the OFCS (SSI 5 & SSI 6, 2018). One of them, who turned to horticulture, explained that in horticulture, payments come three times per year, there is more transparency about the prices and there are less intermediaries.

DISSATISFACTION WITH THE COFFEE PRICES

A few farmers are satisfied with the current prices for coffee (SSI 8 & SSI 9, 2018), but the majority was displeased (Life story, 2018; SSI 6 & SSI 8, 2018; WFG, 2018). Tommy, a farmer, sees coffee prices as extremely low especially in the context of the entire supply chain. He believes that money is lost at different organisational levels, including marketers, brokers and supermarkets.

"You see, when you cultivate coffee, you take to the society, the society takes it to the buyers, or the millers and then the millers sell it abroad, supermarkets, in Germany or wherever. They get a lot of money from this coffee but they bring very little to the farmers. [...] I grow coffee since 1979, I'm still as poor as I was and even worse! " (Tommy, Life story, 2018)

He also thinks that the low price of coffee is the main reason that farmers give up coffee production (Life story, 2018). Indeed, we talked to a former coffee farmer who stopped producing coffee after he "*did the math*" and realised that he was in fact owing money to the factory "*so it was not profitable to work so much for it*" (Leo, SSI 6, 2018).

Another farmer, Adelynn, agrees with Tommy's statement. She thinks her coffee is worth more than she gets and *"money is lost"* at the OFCS (SSI 8, 2018). If Adelynn was head of the OFCS, she would do something about the payments.

IMPACT OF THE OFCS' POLICIES ON FARMERS INCOME



Figure 9 & 10, at the Gatugi factory, John the security guard and chemical prices

Through the OFCS, farmers can buy subsidised chemicals on credit, at a lower price than they would pay at a shop; the price and interest will be subtracted from the payments farmers get for their harvest (SSI 9, 2018). However, one farmer was getting chemicals from other sellers because it was cheaper when interest was included (Q29, 2018). Many farmers consider fertiliser and pesticide prices to be too high in relation to their income from coffee, and to the money they have available.

"Sometimes you get 50 [KSH]. And for that pay 50 [KSH], you have to get chemicals, manure, fertilisers... What do you get then after that? You don't get anything." (Tommy, Life Story, 2018)

One woman in the focus group stressed that, if they were to spray coffee strictly as required they would end up in debt. A consensus among them surfaced that following the policies from the OFCS would lead to "*driving farmers out of business*" due to the high prices of the chemicals (WFG, 2018).

On the other end of the spectrum were the promoters and representatives of agrochemical firms: "When farmers do not do well it is due to lack of chemicals." "You cannot succeed without chemicals." (Personal communication at FFS, 2018). A farmer in the men's focus group said that lack of finance is no excuse for not spraying, as they can buy agrochemicals on credit from the OFCS. He adds "*if all the management practices are observed* [...] No other crop planted in such a small area of land can match coffee profit margins," even considering the cost of inputs (MFG, 2018).

TRANSMISSION OF KNOWLEDGE

We observed problems in communication between farmers and the OFCS. The following section will discuss the transmission of knowledge between different stakeholders.

ROUTINE SPRAYING

There seems to be inconsistency and confusion among farmers regarding what and when to spray. Some spray a lot, while others cannot afford it. While conducting the questionnaires, some farmers seemed to be confused about the different chemicals. Many are unsure of the names and have problems distinguishing the purposes of the different chemicals (Questionnaires, 2018). For instance, one farmer said he sprays *Copan* but he does not know if it is an insecticide or a fungicide (Q22, 2018).

On the other hand, we talked with a large coffee-growing family which were not part of the OFCS. Several years ago, they replaced all of the SL bushes on their farm with Ruiru 11. Since then, they have only used small amounts of pesticides by understanding the pests and diseases which may affect coffee. They warned against the indiscriminate use of pesticides, both for financial and agroecological reasons:

"Each chemical, you need to know why you are spraying, but in the society, it is a routine, you have to spray these, insecticide, whether there is an insect or not [...] it's a mandatory exercise [...] what you need to do is you do spot spraying if there is anything bad, but not a routine." (Steve, SSI 12, 2018)

The calendar is mentioned in several interviews and questionnaires. The agricultural officer, Rufus M. Kamau, explained it is a guide on what and when to spray and at which doses, following the coffee crop cycle. He told us the governmental Kenyan Agriculture & Livestock Research Organisation (KALRO) is doing all research on coffee, certifying the chemicals for coffee production and producing the coffee calendar (SSI 4, 2018). However, we observed different calendars at the dry mill, FFS and the wet mill. Different calendars are produced by various chemical companies and one by the Coffee Research Institute (CRI); all calendars we encountered were in English (Observations, 2018).

SPRAYING CALENDARS



Figure 15, Othaya dry mill

THE FARMER FIELD SCHOOL

The OFCS organises free monthly trainings for its members, called FFS (SSI 1, 2018). During these trainings, hosted by promoters, farmers are taught about the practices to be done during the ongoing month, following the *calendar* instructions (Participant observations, FFS, 2018, MFG, 2018). Among the various respondents, there were different answers on who was training the farmers at the FFS.

"The promoter [...] participate in the training with two trainers from agrochemical companies, fair trade certification officers and/or NGO members" (SSI 1, 2018).

"We have agricultural officers who give advice and give instructions on pesticide" (SSI 10, 2018)

"During the training we attend, there are pesticides sellers that anything else just competing for the farmers, whose quality of pesticides is not known" (WFG, 2018)

The men's focus group explained that NGOs used to be a part of the training, but now the



promoters do most of the teaching. The factory manager gives advice on how to measure the correct amounts of herbicides and pesticides, or farmers get the information from the agrochemical packaging (MFG, 2018).

During our stay in Gatugi, we attended a FFS. Different chemical companies were attending

Figure 16, Spraying calendar from the FFS

the training while promoting their chemicals. We observed that the trainers praised people who bought a lot of chemicals. The *calendar* used at this FFS was from the fertiliser company Tradecorp (figure 16) suggesting that the FFS do not utilise the calendars made by KALRO, as Rufus mentioned (SSI 3, 2018). Some of the farmers complained that "*the agricultural officer never showed up*" (Personal communication at FFS, 2018). Indeed, the men's focus group indicated that they preferred to be trained by Rufus instead of promoters. The locals hold him in high esteem due to his education in agricultural science and thus farmers practice what he teaches (MFG, 2018, SSI 4, 2018).

The OFCS manager, Catherine, told us that Rufus is training the farmers. However, she later admitted that it was the agrochemical companies who were training the promoters and the OFCS managers, whom she calls "*special people who have that knowledge*". We then asked her if she thinks farmers can grow coffee free of chemicals, to which she answered "*it is not possible*" (SSI 3, 2018). We got the same answer at the dry mill when interviewing the manager (SSI 2, 2018).

Rufus explained that he initiated the FFS in Othaya. He has been training farmers for more than 10 years, and has a diploma in agricultural education. But he no longer participates in the OFCS training.

"It reached a point where they said [the OFCS] that they didn't want my officers to go and teach them". (Rufus, SSI 4, 2018)

He further explains that the OFCS wanted him to train the promoter farmers to become FFS trainers in just two days. Rufus explained to them that a four year education could not be taught in a few days; as a result, the OFCS employed their own extension worker. After this transition, he explains "*they* [the OFCS] *have left us out of the program* [FFS]" and all the former 56 FFS groups are now terminated.

Katrine: "So you [...] or any of your employees didn't participate in the FFS yesterday?"

Rufus: "No, never any more because of that hindrance from management."

[...]

Rufus: "The farmers that we trained for two days, they are the ones who coordinate. They have three in every factory." (Rufus, SSI 4, 2018)

During our visit to the FFS, we observed that trainers from agrochemical companies advised against Ruiru 11 while promoting the cultivars SL28 and SL34, which are grown by most farmers, for their high yield (*Figure 15*) (Participant observations at FFS, 2018; MFG, 2018; Questionnaires, 2018). Again, we heard contradictory information. While Catherine, the manager of the OFCS, was promoting the SL cultivars (SSI 3, 2018), Lucy, the manager of the Thuti factory, was in line with the government who recommends Ruiru 11 and Batian (SSI 1 & SSI 4, 2018).

At the FFS, the general opinion on intercropping among promoters and agrochemical companies, reveals that intercropping is perceived as weeds competing with the coffee bushes, and furthermore that food crops will be too toxic when intercropped with coffee (Participant observations, FFS, 2018).



Figure 17, *Coffea arabica* cultivars grown among respondents in Gatugi, farmers can have multiple cultivars (Questionnaire, 2018)

FFS ATTENDANCE

When asked if they have access to training, 85% of the farmers stated a clear 'yes' (Questionnaires, 2018). Indeed, these trainings are free and are within walking distance of participants' homes. Furthermore, the training is done in the local dialect and notice is given early enough (at the end of meetings and during church services) to help participants to prepare and organise their household chores to avoid missing the training (WFG, 2018). Going to the FFS seems to be a source of pride for some farmers. One farmer claimed to go to the FFS every month (Q30, 2018), and another had completed the course and had her FFS diploma proudly hanging above her sofa (Q10, 2018). We noted that only 25 of approximately 600 members of the factory attended the FFS (Participant observations, FFS, 2018). This might be explained by ineffective notification of the meetings.

"It is not well publicised since not all the farmers are aware of when and where the trainings should happen" (MFG, 2018)

Secondly, there is a lack of incentive for participating as farmers, especially women, are busy and it is difficult for them to spare some time for the training. Adelynn told us that every hour away from the farm is less food for her kids. She does not have time to go to training because she has to work. If they were getting paid she would go (SSI 8, 2018).

EFFECTIVENESS OF THE CHEMICALS

Many respondents expressed distrust towards the effectiveness of the chemicals they are obligated to use by the OFCS. Some farmers blame the OFCS and the agrochemical companies for selling them ineffective chemicals.

When the women in the Focus Group discussed chemicals and their effectiveness, they expressed frustration and dissatisfaction. When they spray, they believe that their yields get worse.

"We wonder if it's global warming or ineffective pesticides, we really sprayed last year but in September all the coffee was affected by CBD. [...] We are worried of using the pesticides [...] neither do we trust our society because they do not pre-test the pesticides to analyse their effectiveness to address the CBD." (WFG, 2018)

It was suggested that the OFCS test chemicals on their own plot, suggesting significant doubt on the effectiveness of pesticides. One of the farmers said that she did not have sufficient chemicals to spray their whole coffee plot last year, so part of it was left unsprayed. At harvest time she noted the unsprayed coffee bushes were the ones doing best (WFG, 2018). While conducting the questionnaires the same concerns were present. *"There is an issue with coffee: the pesticides are not working, and that is a problem"* (Q32, 2018). One woman farmer stated in the old days, before chemicals, they earned more and had higher yields. Today even manure does not help (WFG, 2018).

The fungicide Cabrio was discussed during the Women's Focus Group, with most of the women expressing a clear dissatisfaction towards that exact brand. Some of the farmers even blame the chemicals for the appearance of diseases.

"The coffee that was sprayed was later affected by the CBD." (WFG, 2018)

"We were introduced to a pesticide called Cabrio, which worked perfectly well for a few years, the last 2 years however we have noticed that whenever we use it, the coffee suffers from CBD." (WFG, 2018)

One farmer saw all the berries dropping from the coffee bushes overnight after spraying, although she had followed the spraying guides from the *calendar* (WFG, 2018).

We asked the manager at the wet mill, about the challenges many farmers encounter with berries falling from the bushes before they are ripe. He stresses that the CBD strikes in April – July, and argued that because of the CBD it is necessary to use stronger chemicals, "*Like Cabrio. Farmers should spray every 2 weeks in April-July, otherwise every 4 weeks*" (Ndegwa Wangai, SSI 2, 2018).

MISSING LINK BETWEEN THE OFCS AND THE FARMERS

Several farmers reported satisfaction with the OFCS. One farmer stated that the OFCS provides security and has good management (Q11, 2018) and an elder women commented she would not know which chemicals to apply without advice from the OFCS (Q16, 2018). Moreover, the farmers have control over the adoption of new OFCS by-laws:

"Before the laws are enforced there has to be public participation and the farmers vote democratically [...] and can either accept or reject a law proposed in the AGM." (MFG, 2018)

However, some farmers feel pressured to follow the policies. Adelynn said she feels intimidated by the rules (SSI 8, 2018). Another woman explained that the factory is keeping an eye on her, so she has to use the pesticide or the OFCS will not accept her coffee (Q24, 2018). The women from the focus group got frustrated when talking about the OFCS and expressed their desire for a better support.

"We farm our coffee with a lot of problems, sometimes without the money to help us hire some labor for pruning and harvesting. The society is not putting its best effort to improve the quality of life of the farmers" (WFG, 2018)

They reported that the policy against intercropping was experienced as oppressive and driving many into food insecurity (WFG, 2018). Some were concerned that the OFCS and chemical companies were conspiring secretly.

"Chemical companies are not interested in helping the farmers, they are just there to earn money" (WFG, 2018)

"Chemical companies compete at the meetings, there are often more people from chemical companies than farmers." (WFG, 2018)

We asked Tommy why the OFCS was not listening to the farmers, to which he answered:

"They do listen to them but they don't act. The society is elected by the farmers but when they reach that office they don't work for the benefit of the farmers but for the benefit of the union, of the government." (Tommy, Life story, 2018)

THE NEED FOR EXTENSION SERVICES

Dr. Cecilia Onyango¹ believes that agrochemical companies are trying "to push their products to the farmers" without sufficient knowledge of what they are doing. She furthermore reported that research on different coffee cultivars and management practices was occurring in Kenyan universities and at the CRI, but that the knowledge produced from this research was not being effectively transmitted to coffee farmers. She said that the extension system, which previously had been "very strong," with agricultural graduates "directly placed within the farmers' reach," had been dismantled in the 1990s. As a result, there is only one extension officer for each 1800 farmers in some areas, so it is difficult for the research results to reach farmers and most of the coffee management information the farmers receive comes from agrochemical companies (SSI 11, 2018).

A family of coffee producers in Gatugi said that they would be very interested in the results of this type of research, and would even like to visit the sites where research is conducted:

"What [researchers] can do, once they have the information, they can call farmers' field days, only for coffee. [...] Then when the farmers come, they can tell them what they have found out, what is good, what is bad, and the farmers would appreciate that." (SSI 12, 2018)

HEALTH ISSUES

This section will focus on the coffee farmers' health in connection with the use of agrochemicals. The OFCS requires its members to use several types of chemicals. Hence, we asked the OFCS manager, Catherine, what support they provide regarding protective gear for the farmers. Catherine explained that each village has two professional sprayers whom the farmers can hire, and they have *"all have the protective layers"* (SSI 3, 2018). We also asked Rufus about these professional sprayers, and he told us that in 2015 he partnered with an agrochemical company to facilitate a spraying training for the youth in the area, *"So that they could be used by the community. That the farmers can hire to do the work effectively [...] but in 2017 we never trained and 2018 has not had anything apart from the field day"* (SSI 4, 2018). Furthermore, Rufus explained that during the training week in 2015, the young sprayers never bought any of the protection gear which was available for sale although Catherine said otherwise in a previous interview.

¹ Senior lecturer in the Department of Plant Science and Crop Protection at the University of Nairobi

On the other hand, we met a coffee farmer carrying a spraying pump (Figure 16) who was only wearing gumboots and a rain jacket as protection gear. David, another coffee farmer (SSI 7, 2018), mentioned he had *"been in coffee for too long,"* already helping out in the field when he was still in school. Later in life, he learned from his doctor that exposure to agrochemicals was harming his health.

Due to conflicting stories and observations in the field, we posed questions regarding the agrochemical protection to the farmers. A woman farmer (Q28, 2018) told us she uses nothing to cover her face, when she is spraying. Conjointly we also raised the matter of protection during our two focus groups. In the men's group they explained that only a few farmers have the protection gear even though they are aware of the health risk brought by the agrochemicals. The reason behind this is the cost of the gear being too expensive for them (MFG, 2018), an argument that we also heard from another farmer (Adelynn, SSI 8, 2018). Therefore, we raised the issue of cost during a lengthy interview with agricultural officer Rufus:

Cecilie: "Is the price fair for the income of a farmer?"

Rufus : "No the price is very high"

Cecilie: "So it make sense, that they didn't buy any?"

Rufus: "No they are supposed to buy them because of the effect of the chemicals"

Cecilie: "But if they cannot afford it, then what to do?"

Rufus: "They improvise. The improvisation they normally use is old clothes. Now my major problem is, that they don't protect their nose and their eyes. They just spray. We normally train them in how to use a good pump that is not leaking [...] If you go to most of these farms apart from the estates they don't use the gears [...]" (SSI 4, 2018)

It became clear the protection gear is costly for the farmers. Unfortunately, those few farmers who have protective gears do not share with the rest of the farmers. They see it as unhygienic to share some of the gadgets and the gas masks (MFG, 2018). Moreover, the women's group revealed that people aged over 65 and women are not advised to spray (WFG, 2018) which coincided with what the trainers were saying at the FFS (Participant observations, FFS, 2018).

Thus, we asked, if they used the professional sprayers available to them. The majority of the woman shook their head - No. There only exist two professional sprayers per village. All the farmers in the village need them at the same time as they follow the same *coffee calendar* (cf. Chapter 4), which

according to both groups creates an availability problem. In addition, some farmers simply cannot afford the services of the professional sprayers who charge 500 KSH per day whereas the non-trained sprayers only cost 250 KSH a day (MFG, 2018; WFG, 2018). As a result, many of the farmers we spoke to were doing the spraying themselves, including women, ignoring the health recommendations. The majority of them without any proper protection gear, sometimes with improvised ones. Lucy the elder told us, her husband covers his face with oil, and "when he sprays, he protects himself with a mask, which she explains is a scarf and he does not wear gloves" (WFG 2018).

One of the few farmers who actually has protection gear, claimed that when you spray, you sweat too much to wear the protections. He uses a piece of cloth in order not to breath in the chemicals and adds in connection with wearing a mask *"the people who design these protections* [they] *don't know about the reality* [of the field]" (David, SSI 7, 2018). Being uncomfortable thus influences David's choice related to the use of protection gear. Interestingly enough Rufus also referred to this as an issue and emphasised not to blame the price alone. Rufus claimed, they do not use it because they do not see its essence and that they normally sweat, when they use the gear (SSI 4, 2018). The following extract of our interview with Rufus illustrates our effort in clarifying, how come the farmers do not see the importance of the gear:

Katrine: "But are they taught how dangerous the product they use are? To their health?" Rufus: "Yeah they are taught"

Katrine: "Who teaches them the health consequences of the pesticides?"

Rufus: "Like now we have partners with the chemical suppliers"

Katrine: "So it is the chemical companies, who teaches them about how dangerous their products are?"

Rufus: "Yeah and how they are supposed to protect themselves and again of those labels of the chemicals. It is clearly stated. You must use gear. Gumboots."

Cecilie: "Is that said in Kikuyu or in English?"

Rufus: "It is said in English"

Cecilie: "A lot of the farmers do not know English?"

Rufus: "And Swahili. It is written in two languages"

Katrine: "Can they read the Swahili?"

Rufus: "All of them speak Swahili" (SSI 4, 2018)

Building on this knowledge we wanted to learn more about the agrochemicals' effects on



Figure 18, Coffee farmer with agrochemical pump

farmers' health. In the men's focus group they said that today, people have fewer adverse effects from agrochemicals since they have been educated about the health risk the agrochemicals pose. However, farmer George said he got irritated eyes when spraying. He now suffers from a terminal eye problem condition and has skin problems which he suspects are due to the chemicals (MFG, 2018). Also, elder Lucy's husband, who covered his face with a scarf, has allergies and eye problems around the time of spraying (WFG, 2018). Adelynn explained how she gets a flu and itchy eyes after spraying, and if she had an alternative to the agrochemicals, she would use it (SSI 8, 2018)

5. DISCUSSION OF METHODS

REFLECTING ON THE FIELDWORK

Knowledge obtained during lectures and presentations in Copenhagen, together with a review of relevant literature, provided the basis for our fieldwork synopsis (Cf. Appendix II). The synopsis worked as a tool to present our research ideas and objectives to our two group members from UoN, and helped to coordinate expectations during the first days in the field. In our study of coffee production in Gatugi, we experienced the great value of fieldwork first hand. As Reyes-García & Sunderlin (2011) explain:

"Field research can reveal new or related problems that the researcher was unaware of. Researchers often go to the field with a preconceived idea of the scientific or social problem they want to address. Upon arrival to the field, they often discover that the problem of interest for the researcher is not the most urgent priority of the people in the area." As stated in the results section, we were surprised by the enforcement power of the OFCS's management policies. In result, we had to rework our research question, questionnaires and interview guides, since the research question dealt with the management strategies the farmers were utilising and the reason behind those choices. Since the management strategies were dictated by the management policies of the OFCS, this question was not the most interesting one to answer. Yet again we had to find common ground for how to go onwards with the study. Consequently, we decided to look at how the life of coffee farmers can be improved.

POSITION: MZUNGUS IN GATUGI

"No research can take place in a philosophical vacuum. It is important to know where you fit in as it makes design, practice and the defence of your arguments far easier." (Murray & Overton, 2003)

Our ability to accumulate enough relevant data in 10 days depended on the *access* granted through the SLUSE course. As the above quote indicates, *positionality* is important. Our access, made possible by agreements between our supervisors and local officials, host families, elders etc., made it possible for us to collect data. The position *Mzungu* (white) students was naturally given to us at the very start



Figure 19, Lucy our elder, helping us to gain access to farmers in Gatugi

of our fieldwork. As will become apparent through the present section, these pre-arranged agreements rendered it possible for us, in a short amount of time, to reach out to people otherwise difficult to access, such as the manager of the OFCS, Catherine. Yet this given *access* and *position* created a set of worries for us. In regard to questions about the coffee management strategies posed to the farmers, we were concerned whether or not the farmers answers were influenced by the policies of the OFCS. Consequently, we found it important to build trust with our informants and make sure that they knew our research agenda and goals. Lastly, it is important to mention, that what we have presented in our results and what is to come in the discussion are *partial* *truths*² (Clifford, 1986). What we have written here is a product which approaches the truth, and even though it does not cover it all, is applicable in many ways.

INTERPRETING AND TRANSLATING SOCIAL LIFE

We arrived in Gatugi with very limited knowledge of rural life in Kenya. Additionally none of us spoke Swahili nor Kikuyu. To overcome this cultural barrier it was a great asset having two Kenyan students on our team. We find it relevant to incorporate Burja's (2006) argument that,

"Translation is more than a technical exercise; it is also a social relationship involving power, status and the imperfect mediation of cultures."

Translation is not simply a matter of different languages, it also has to do with the ability to interpret the environment in which the translation takes place. Our Kenyan counterparts, besides being group members, were also cultural brokers mediating cultural differences.

In addition to our two Kenyan group members, we were allocated two local guides. We found the two guides had very different levels of experience in terms of translation jobs. We had to think carefully about how to use the guides, as one of them was young, shy and had trouble setting the stage in the field. The other guide was very competent and became what Burja (2006) defines as an *ethnographic informant*³. Also, the Swahili and Kikuyu speakers of our team were a mix of locals and non-locals to the Gatugi area. It granted us different levels of social understanding of the area, which we believe have been enriching for our data collection.



Figure 20 & 21 Gatugi village



² We are agreeing with anthropologist James Clifford's argument, that there exist no universal truth in ethnographic fieldwork (1986).

³ A local interpreter is far more than a translator of language [...]. They can become intermediaries who will open doors; they can also help to unravel why people behave as they do, who is related to whom or why the next village is different" (Burja 2006)

TEAMWORK AND WORK ON TEAMS.

"Issues involved in sustainable land use can best be understood by studying the biophysical, socio-economic, institutional and policy considerations in combination" (Hill & Birch-Thomsen, 2005)

Multiple times before, during, and after fieldwork we realised how true the above quote is. Our group was a wickerwork of people with various academic, cultural and ethnic backgrounds, turning our fieldwork in to an epistemological braid, which made it possible to triangulate the data (Bob, Moodley, Traynor, Gausset & Chellan, 2005). We also learned from each other while working together. We kept this in mind, when dividing the group into three smaller teams. That is to say we always made sure to have a Kiswahili or Kikuyu speaking person on each team as well as mixing the academic and ethnic backgrounds. Additionally, returning to an informant we found it important to have at least one familiar face within the team, allowing a stronger relation between the informants and us.

In order to stay coordinated, we had long *evening meetings* catching up with each other, revising research questions and planning the coming day's work. The group was able to work around difficulties and fulfil what Bob et al. term as an insurance of a quality fieldwork (Bob et al., 2005).

6. REFLECTION ON THE APPLIED METHODS

QUESTIONNAIRES

Due to a limited time frame, we allocated only two days to questionnaires. We conducted 35 questionnaires, not enough to generalise the results, but useful for understanding the demographics and coffee management strategies in the area.

Our primary sampling strategy was to survey every third household along the roads designated to each group, but one group met the elder Lucy and accompanied her to a women's group where they interviewed 11 women. After conducting pilot questionnaires, we modified some questions, such as differentiating tea from other farm income sources, and removed others where we were always obtaining the same answer. Our Kikuyu-speaking team member shared some technical vocabulary with our interpreters to avoid systematic errors from translation.

SSI

Due to the change of research question and limited possibilities to talk with key informants, we conducted some of our SSIs with interview guides edited at the last minute. Our lengthy *evening meetings* were valuable in guiding our thinking and making sure the SSI questions were keeping in line with the research findings and direction. We also conducted some spontaneous SSIs, where questionnaires developed into longer interviews. Most of our time was spent in the field and on *evening meetings*; as a result, we only had limited time to digitise fieldnotes and review SSIs. This may have created bias in our notes due to loss of memory, misunderstandings between interpreter, informant and researcher or purely lost in translation in regard to the interviews conducted in English. Apart from SSIs with farmers we also conducted SSIs with officials, whose limited availability certainly shaped the data collected. We only had one chance of interviewing the OFCS manager and agricultural officer, and it was at a rather early stage of the fieldwork. This left us with unanswered questions, which may be considered a weakness in our data. For example, we needed clarification on the payment systems to the farmers, more specific knowledge concerning the professional sprayers and also questions in regard to the health of the farmers and the kind of responsibility the OFCS have towards the farmers.

FOCUS GROUP DISCUSSION

To triangulate our data from questionnaires, interviews and observations, we conducted two focus groups. We decided to have one group of women and one of men, out of concern that men might dominate the conversation. Marcun & Posel (1998) highlight two areas of concern with focus groups: *"the nature of the group moderation [...] and the mechanisms of data collection"*. Following Marcun & Posel (1998), focus groups require skilful moderators which can cultivate and control the discussion. As conducting a focus group with an interpreter was new to us, it took time to work out the details. We ended up with a team consisting of a *moderator, translator* and an *observer*. We put a lot of effort into the focus groups, but were still dependant on fairly inexperienced interpreters. It is important to acknowledge the effects they may have had on the data generated. Despite these challenges, we learned a great deal and made some interesting discoveries. The women's group was interrupted and had to move position:

"After we moved from one place in the garden to another the discussion took of. Lise [supervisor] suggested that we [...] sat behind the circle instead of in it [...] it actually worked a lot better, and we could ask Patricia [guide] what they were saying without interrupting the conversation." (WFG, 2018).

The quote indicates how the position and spreading of people had an effect on the ongoing conversation. Another key element, we must take into account, is the fact that the farmers who participated in the focus groups were in some ways connected to elder Lucy. She helped us contact farmers and managed to assemble two groups within a short period of time which may have introduced bias into the selection, as our knowledge was limited in regard to groupings or potential disputes amongst the farmers. Lastly it is significant to reflect upon whether it was a good idea to have the focus groups late in the fieldwork or at the beginning (Marcun & Posel, 1998). The reason for placing the focus group at the end was that we needed to first gain knowledge of the area and research topic, thus enabling us to present topics for discussion. The group discussion generated some interesting data and raised new questions, but having the focus groups at the end of the fieldwork eliminated the possibility of interviewing new key informants. Another week in the field would have allowed us to pose these follow-up questions.

TRANSECT WALK

As planned in the synopsis (Cf. Appendix II), we began our fieldwork with a *transect walk* in the Gatugi area in order to gain spatial knowledge of our research area. During our *transect walk* with the GPS in hand, we were accompanied by elder Lucy who helped us defining the boundaries of Gatugi while describing the surrounding area. During the walk a handful of children came along. At the top, we discovered many eucalyptus trees blocking the desired overview of the landscape. Moreover, we failed to type in various essential way points. A consequence of being too occupied by climbing a muddy steep hill and answering our young companions' many questions. By the end of



the day, we became familiar faces to locals in Gatugi as well as creating contacts to potential informants, though the quality of the *transect walk* is questionable.

Figure 22, Transect walk at Karima forest

OBSERVATION AND PARTICIPANT OBSERVATION

Throughout the fieldwork, observation played a key role. Each day we paid attention to the surroundings in different ways. By observing we were also able to compare data from interviews to the reality on ground. Specifically referring to the use of protection gear (Cf. Chapter 4), there were inconsistencies between what was said and done. In Gatugi we were living with farmers. Thus, we were by default doing *participant observation* when at "home". Getting insight to the daily routine of a farmer has created context and added value to the data collected, e.g. questions from the field could be answered during dinner.

Also, our ambitions for *participant observation* were reduced, although we offered several hours of labor to two of our female informants. This should be understood as a means to give something back for the time they have spent on us, rather than embodying coffee farmer practices. In short, it put a face on our research.



Figure 23-24, Getting blisters, while weeding, participant observation

FRA

We intended to use Forest Resource Assessment to estimate biomass content of the researched area, by measuring diversity and density of species on the different coffee plots (FAO, 2016; Reams & de Freitas, 2015), with the assumption that different management strategies would have different impacts on soil fertility, coffee quality and income. However, we soon became aware that farmers were not allowed to intercrop, and the only two species permitted between coffee bushes were *Grevillea robusta* for shade and macadamia. Consequently, we decided that FRA was no longer an appropriate method, since presence of other species were very limited in the field.

SOIL SAMPLING

The results of the soil sampling were not incorporated to our results because they do not help us to answer the new research question. Furthermore, due to the heterogeneous nature of the soil, distinguishing natural differences from the influence of the management practices is difficult and the number of samples realised does not allow us to draw conclusions on the different management strategies isolated.

In a bigger research project, a detailed analyses of the nutrients present in the soil would have allowed us to look for nutrient accumulation and interactions. This could have helped us to evaluate if the fertilisers are appropriately used. Moreover, measuring copper residues and other potentially toxic elements in the soil between coffee rows would have indicate if intercropping were safe under these management conditions.

Finally, we would like to emphasise that we carried out the soil sampling as a way to share knowledge and give back to the community as a token of gratitude for the time they have spent with us.



Figure 25, a farmer carrying Napia grass, a coffee field on the right

7. DISCUSSION

Our results have shown several ways in which farmers livelihoods can be improved in terms of income, health and knowledge. A recurring theme in our results is the knowledge gap between the OFCS and the coffee farmers, which will be the focus of this discussion.

MALFUNCTIONING OF OFCS AND INFLUENCE OF AGROCHEMICAL COMPANIES

There are multiple reports criticising the functioning of coffee co-operatives in Kenya (Mude, 2007; Okibo & Mwangi, 2013). Criticism has mainly been aimed at the lack of enforcement mechanisms, public voting systems and the monopoly that requires members to market their coffee through the cooperative (Mude, 2007). A general lack of transparency, mismanagement, poor farming practices, decline in application of inputs and an increasing distrust in the management of coffee are some key factors contributing to the malfunctioning of co-operatives (Okibo & Mwangi, 2013). We argue that a stronger link between the farmers and the OFCS is needed. As has been stated in the results section, many farmers' incomes are significantly reduced by low yields, low prices and high costs of the fertilisers. Furthermore, farmers experience many health issues that are related to spraying pesticides without proper protection. These issues negatively influence the relationship the farmers have with the OFCS. Therefore, measures aimed at improving the link between the OFCS and the farmers should focus on the aforementioned issues. We argue that the influence of the agrochemical companies on the policies of the OFCS should be reduced, since we believe that the commercial interest from the agrochemical companies negatively influences farmers' livelihoods. The agricultural officer, the CRI and universities should be given a voice in the FFS to limit the influence of the agrochemical companies on management policies. The agricultural officer's influence on the training agenda has been decreased to zero over time, while simultaneously the agrochemical companies and promoter farmers (with limited education) gained more influence on farmer's training (Cf. Chapter 4). Our results also show that a connection with universities was lacking. Including research institutes and universities in the FFS would lead to trainings that are better in line with current scientific knowledge on coffee management strategies.

These recommendations are in line with a recent scientific publication, Liebig et al., 2016 state the following in their report about coffee research in Uganda:

"Another consequence of the poor extension service is the role which pesticide sellers are assigned to. As the ones being present and accessible on the ground, they are often asked by farmers for advice, a situation which is well known in many developing countries. A more objective training on pesticide use, promoting not only economic and environmental, but particularly human health benefits, would be preferable." (Liebig et al., 2016)

As the quote indicates, Ugandan farmers struggle with the lack of access to extension services, which is affecting the livelihood of farmers negatively (Liebig et al., 2016). Without comparing the reasons for the poor extension services, it should be noted that farmers in both countries suffer from the influence of agrochemical companies. As earlier stated, the policy restraining farmers from intercropping has been experienced as oppressive and led some farmers into food insecurity (WFG, 2018). To the best of our knowledge, little research has been done on intercropping with coffee in Kenya since 1995⁴. In addition, we cannot recommend intercropping as we do not know which impact the chemicals currently used on coffee would have on food crops (SSI 11, 2018).

The current coffee pest control strategies have been criticised for ignoring effects on the total pest complex and on the agro-ecosystem. Furthermore, it has been linked to increased environmental problems, health risks and increases in costs of coffee production (Nyambo, Masaba, & Hazika, 1996). These conclusions are supported by our own results, revealing the many negative effects of a heavily chemical based pest control strategy. Communication is vital and recommendations for integrated pest management have to be made adequate for farmers to understand. Especially since we observed that instructions on labels and spraying calendars are in English. We recommend that including the mentioned other voices at the FFS goes together with a generally more holistic approach towards coffee farming, limiting the influence of the agrochemical companies. The implementation of 'experimentation plots', as has been suggested by farmers (WFG, 2018), could be part of this holistic approach. Experimentation plots could be used to test chemicals that are supplied by the agrochemical companies. This would increase farmers currently low trust towards these chemicals (Cf. Chapter 4). Furthermore, they can be used to explore different management strategies, thereby increasing knowledge on the effectiveness of those strategies. This measure would be best implemented in collaboration with either the CRI or a university. We recommended the OFCS to increase farmers access to soil sampling, since farmers could benefit from more targeted recommendation in terms of fertiliser. Soil sampling can help to gain insight in nutrient availability in the soil, thus it can show which fertiliser is needed to increase certain nutrients. Strengthening the

⁴ We are referring to the paper by Njoroge & Kimenia, where they state, that intercropping young coffee with certain food crops is economically beneficial and increases their food security for the farmers (Njoroge & Kimenia, 1995)

link between coffee farmer and the OFCS, improving extension systems and improving the link between research and farmers can help successful implementation of intercropping policies (Nyambo et al., 1996). A stronger link between coffee farmer and OFCS can be obtained by creating incentives for farmers to attend the FFS. It has been shared with us that e.g. serving food and drinks at the training would increase attendance (Cf. Chapter 4). Serving their own freshly brewed coffee has the co-benefit that farmers could potentially create a better connection with the crop they are producing. As stated earlier in this report, colonial governance has contributed to low levels of local consumption of coffee, as Kenyans were restricted from growing coffee for commercial purpose during these times. Serving coffee at the FFS would be in line with the objective of the OFCS to enhance local coffee drinking culture (OFCS, 2015).

Recommendations for specific cultivars from the government, OFCS and agrochemical companies are often not synchronised. While the government recommends Ruiru 11 and Batian, the agrochemical companies recommend SL28 and SL34. As can be read in the results section, farmers told us that extensive use of chemicals as recommended by the agrochemical companies negatively affected both their income and their health. Ruiru 11 and Batian are resistant to both CBD and CLR, which are commonly occurring diseases. The use of the cultivars Ruiru 11 and Batian could lead to less extensive spraying which solves some of the problems the farmers are experiencing. There are some advantages to the use of SL28, such as drought tolerance, but it still requires pesticides to overcome the problems of CBD and CLR. The chairman of the OFCS has recommended farmers to use Ruiru 11 and Batian, because these cultivars were resistant to climate change related diseases. This recommendation is in contradiction with what we heard from the manager of the factory, which means the OFCS lacks clarity in this area. In conclusion, we think a cultivar that is resistant to CBD and CLR (like Ruiru 11 or Batian) might benefit the farmer.

DIVERSIFICATION

We recommend that farmers adopt a diversification strategy, adding income sources other than coffee. Common crop choices for a diversification strategy were avocado and macadamia (Questionnaires, 2018; Observations, 2018). Diversifying income sources increases resilience to changes in climate, coffee prices, labour and other changes affecting the coffee sector in Gatugi (McCord et al., 2015), and is perceived by farmers to add a sense of security (Cf. Chapter 4). The fact that about 71% of the questioned farmers were worried about changes in climate (Questionnaires, 2018), mainly because of the increase of CBD, drought and frost (personal communication, 2018), suggests that farmers are willing to adopt strategies that increase resilience to those changes. Climate change will most likely affect the livelihoods of small scale farmers in Kenya, however the exact way

in which it will is still uncertain (Ochieng, Kirimi & Mathenge, 2016). The long-term effect will be larger than the short-term effect, increasing the need for diversification. Adger et al. (2009) and Mertz, Mbow, Reenberg & Diouf (2009) argue that farmers are likely to be guided by their own perception of climate change and associated risks, rather than by actual scientific predictions in climate patterns. Bryan et al. (2013) points out that even diversification faces challenges in Kenya, such as lack of suitable land, poor access to extension services and to improved seeds, issues which we also noticed while conducting our fieldwork in Gatugi. Diversification in crops might be a challenge for some farmers, since some other crops (e.g. tea) require more labour than coffee. Avocado seems to be an option that requires minimal labour, since avocados are picked up from the farm. The only necessary labour for Avocado is fertilisation and pruning (Q5, 2018).

In conclusion, arguments have been given for the following actions:

- Reducing the influence of agrochemical companies
- Strengthening the link between the coffee farmers and the OFCS
- Applying a diversification strategy
- Using cultivars which require low input of chemicals
- The implementation of incentives for farmers to attend the FFS

8. CONCLUSION

This report aimed to answer how coffee farmers livelihoods in Gatugi can be improved. We have drawn a range of conclusions based on fieldwork and literature reviews. During our fieldwork we discovered several issues within the coffee management and production in Gatugi. The link between the OFCS and the farmers should be reinforced as unclear communication has negatively influenced the relationship between the two. The management policies of the OFCS are strongly influenced by agrochemical companies as governmental bodies have been left out of the FFS. The result is a reduction in farmers income and health problems related to the spraying of agrochemicals. Other voices such as the agricultural officers and CRI should be included in the FFS. The OFCS should also provide access to soil sampling. It will benefit the farmers because they can get more targeted recommendations in terms of fertiliser.

The OFCS should also include the universities' knowledge in their management policies and FFS. This will result in training being more in line with current scientific knowledge and will create a more holistic approach towards coffee management. Following this argument, we recommend further research on intercropping and its consequences on health, since it is currently lacking.

Recommendations for specific cultivars from the government, the OFCS and agrochemical companies are not consistent. A cultivar that is resistant to CBD and CLR (like Ruiru 11 or Batian) is a good solution for farmers in Gatugi. Moreover, we recommend that farmers continue the trend of diversification as it makes them more resistant to changes in climate, access to labour power, coffee prices etc., adding a sense of security. As diversification can be challenging, we suggest avocado or macadamia, which require less labor and low inputs.

In order for the OFCS to strengthen their relationship with their farmers, they should create incentives for farmers to attend FFS, e.g. serving food and coffee. Drinking their own coffee will create a relation to the crop they produce and more importantly contribute to the objective of the OFCS to enhance local coffee drinking culture.

Finally, we advise the OFCS to include the farmers in the journey of their coffee cherries from crop to cup. It will establish transparency, hence understanding and trust between the OFCS and farmers.

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Appendices

Appendix I: Overview of applied methods

Date	Applied Methods
03-03-18	Presenting project to our guides and elder Lucy
03-03-18	Walking to Gatugi factory and Pilot testing questionnaire
03-03-18	Evening meeting: Revising questionnaire
04-03-18	Transect walk through town and up to Karima Hill
04-03-18	Evening meeting: Debriefing, planning and dividing teams for the next day
05-03-18	Questionnaires with GPS. Three teams
05-03-18	Setting up meeting with manager of OFCS and manager of drying mill
05-03-18	SSI with the manager of Thuti factory, SSI with the manager of Gatugi factory and
	SSI with farmer Gerald
05-03-18	Supervisor meeting
06-03-18	Questionnaires with GPS.
06-03-18	SSIs with former coffee farmers Leo and Martin
06-03-18	Evening meeting: Knowledge sharing, revising research question, dividing teams, SSI
	revised, setting criteria for SSI informants and planning the next days.
07-03-18	SSI with manager of OFCS and SSI estate coffee farmer David
07-03-18	Observation at FFS at Gatugi factory.
07-03-18	Evening meeting: Knowledge sharing and planning the next days
08-03-18	Soil-sampling
08-03-18	SSI with agricultural officer Rufus, SSI with Adelynn and SSI with coffee brothers
	Elliott and David
08-03-18	Typing in GPS points and questionnaires
08-03-18	Supervisor meeting
09-03-18	SSI with lecturer Cecilia
09-03-18	Focus group men and women
09-03-18	Evening meeting: Focus group debrief. Translation and knowledge sharing.
10-03-18	Participant observation by helping out on Adelynn's farm
10-03-18	Life Story interview with Tommy
10-03-18	Soil sampling
10-03-18	Translating focus groups
11-03-18	Supervisor meeting: Planning presentation.
11-03-18	Translating focus groups
11-03-18	Preparing presentation

Appendix II: Recommendations

Recommendations to the farmers

1. Varieties

Switch to Ruiru 11 or Batian, if you have the possibility. They are officially recommended by the government and the society. They are both resistant to Coffee Berry Disease (CBD) and Coffee Leaf Rust which is not the case of the SL varieties. It will allow you to save money from the cost of chemicals and labour used to control these diseases.

Both grafting on the SL stems and planting siblings are good methods. The advantage with planting siblings directly in the soil is that Ruiru 11 and Batian can be planted more closely than SL. The spacing between each tree should be 2 meters. As a consequence, we can have 2.500 trees per hectares compared to 1.300 trees per hectare for SL varieties. This will allow you to produce more coffee if you are using the same area or to use some of the space to grow food crops if you keep the same number of trees but put them closer together. Ask your neighbours who are already growing these new varieties for help to get the siblings or graftings.

2. Mulching

Using mulch is very beneficial for coffee. The effects are not perceived on the short term but the benefits will be great on the long term. Mulch helps keeping humidity in the soil, provides micronutrients for the coffee bushes and increases the content of organic matter which is necessary for a healthy soil. Mulching can be done with any kind of plant materials: dead leaves, green leaves branches, banana stems, ferns, etc. It should be applied in a good layer.

3. Diversification

Having other crops on your farm can be helpful when coffee is not doing well, for example when prices are low or when the harvest have been bad. Avocado trees and Macadamia trees are a good option since they do not require that much labour. They can be planted on the hedge of your coffee plot or anywhere else where they will have the space to grow to their full size.

Grevillea robusta is also a good tree to plant since it makes the soil around it more healthy and produces valuable timber. It is also a great source of mulch.

4. Get involved in the society

The role of the Society is to help you produce more and better coffee. Don't be afraid of expressing your concerns. Remember that you have the power to vote for the by-laws so it is important to participate in the Annual General Meeting (AGM) so you do not miss this opportunity to express your doubts about a new law. Your vote counts!

5. Go to the Coffee Research Institute (CRI)

Organize yourselves in groups and elect a local leader. He/she should know every coffee farmer in Gatugi and be available. He/she will be the link between the society and you, he/she will make sure that your concerns are being heard.

Visiting the CRI is free if you can arrange transport. Your local leader can get in contact with the agricultural officer Rufus or the society to ask them to facilitate the trip.

Agricultural management strategies for coffee production in Nyeri County, Kenya

Synopsis for the course Interdisciplinary Land Use and Natural Resource Management (5440-B3-3F18)

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Abbreviations

- FRA Forest Ressource Assessment
- masl meters above sea level
- SLF Sustainable Livelihood Framework
- SSI Semi-Structured Interviews

INTRODUCTION

Coffee production in Kenya

Coffee was introduced to Kenya in the 1890s, and by the 1920s it was Kenya's leading export, a position it continued to hold after the country became independent in 1963 (Mude, 2007). The most valuable and widely grown species of coffee, *Coffea arabica*, has been an important crop in Kenya for over a century. Production peaked at 129.000 tons in 1988, but has since sharply declined, with an average of only 47.000 tons per year produced between 2001 and 2016 (*Figure 1*). As *Figure 1* shows, the area planted in coffee remained fairly stable until 2010, even as production levels fell drastically.



Figure 1. Coffee production, 1961-2016. Source: FAOSTAT, 2018.

The decline in production, then, was not due to farmers giving up coffee production as much as to significantly declining yields beginning in the 1980s (*Figure 2*). *Figure 3* shows the severity of the decline in yield. In the 1970s and 1980s, farmers were harvesting over 700 kg of coffee beans per hectare, but by the 2000s, yields had fallen by over half, to under 300 kg per hectare (FAOSTAT, 2017).



Figure 2. World and Kenya coffee yield, 1961-2016. Data from FAOSTAT, 2018.



Figure 3. Kenya coffee yield by decade. Data from FAOSTAT, 2018.

Other factors which may negatively affect Kenya's coffee industry include changing climatic conditions and increased disease pressure (Asayehegn, Temple, Sanchez & Iglesias, 2017); falling coffee prices; and corruption in Kenya's cooperative system, through which farmers are legally obligated to sell their coffee (Mude, 2007). Despite these challenges, many farmers in the central

highlands have continued to produce coffee. These farmers employ management techniques ranging from intensive to extensive systems to giving up on coffee production altogether.

We want to better understand the ways that farmers have adapted to the various challenges to coffee production, and specifically the reasons that they have chosen different management strategies. Thus, the aim of our study is to answer the following research question:

Which coffee management strategies do farmers choose in the area around Gatugi (Nyeri County, Kenya) and what are the key drivers of those choices?

We have divided the research question into two sub-questions. To answer each of them, the data collection and analysis will be guided by different objectives:

What are the coffee management strategies among coffee smallholders in the area of Gatugi?

• Objective 1: Identify broad categories of coffee management strategies.

What are the key drivers influencing farmers' choices of coffee management strategies?

- Objective 2: Understand the context in which coffee farmers operate
- Objective 3: Understand the differences in access to capitals among coffee farmers
- Objective 4: Understand how the institutions and organisations are influencing farmers' choices

Relevance of the study

The study focuses on gaining insight into coffee agricultural management strategies related to coffee production and understanding the multiple and diverse challenges the farmers face in the specific regional context of the Kenyan central highlands. With a combination of environmental and socioeconomic stresses there is an increasing need for options that could lead to improved livelihoods. If this can be done in a sustainable manner, coffee farmers can continue to use their land in the future as well. There are several ways in which agricultural management strategies can aid Kenyan farmers in improving their livelihoods. It is unclear which strategies will be most effective. Thus our study will focus on filling this apparent knowledge gap and moreover we find it important, that our findings bring benefits for the coffee farmers.

Furthermore, strategies used by coffee farmers in the region around Gatugi can be applied by other farmers in Kenya as well and might even be applicable in other regions of the world, since some of the challenges the farmers face are not location specific (Damatta & Cochicho Ramalho, 2006).

Study area

Research for this study will be conducted in an area around Gatugi village, in Nyeri county in the Central Highlands of Kenya. Agriculture is one of the main economic activities of Nyeri County and includes tea, coffee, dairy farming, milk processing, maize and cabbage (Nyeri County, 2018). The study area for this research can be seen in *Figure 4*. Some general characteristics of Nyeri County can be found in *Table 1*.



Figure 4 : Study area Table 1: Characteristics of Nyeri County

Geographical setting, Climate and Location

Coordinates		36° - 38° E and 0° - 0°38' S
Area		3.337 km ²
Average elevation		1.500 masl (with significant variability)
Average rainfall		500 mm – 1.500 mm during short rains 1.200 mm - 1.600 mm during long rains (higher rainfall near Mount Kenya)
Average temperature		17,1°C
		_
Population, Land and Food		
Population	639.558	
Gender distribution	51%/49% (M/F)
	• • • •	

Population density 208 people/km²

Main agricultural characteristics

Percent of population in agricultural production	53%
Average landholding area	0.64 Ha

Data from: Google Earth, 2018; Nyeri County, 2018; Nyeri County Investment Portal, 2018; Kibet et al., 2009.

Nyeri County's topography is highly variable and characterized by hills, steep ridges and valleys, which can cause soil erosion (Kiome & Stocking, 1995). The top of Karima hill (2008 masl) is the highest point in the study area.

METHODS

Coffee production has many facets and affects various aspects of the human world, from planting coffee bushes in the highlands of Kenya to the roasting and brewing of a perfect espresso at a café in Rome. In studying coffee production, it is therefore essential to incorporate different science traditions. Thus, our methods in the field will be a braid of different techniques and approaches.We are venturing into the field to learn from each other but also to interact and learn from the coffee

farmers and not just gaining information from them. In this section, we will describe how we will use our selected methods to answer our research question.

Analytical methodology: The Sustainable livelihood framework (SLF)

As the earlier section describes coffee production is a complex field of study and our time in the field limited. Following this, we are using *SLF* as an analytical methodology and as described in the appendix I, *SLF* will serve as a guide for our thought (Scoones 2015). *SLF* will help us to understand how the farmers' different levels of capitals affect their coffee management strategies within the context they operate. Additionally the *SLF* allows us to identify how institutions and organizations mediate processes and structures which able or unable the farmers to follow certain strategies. During fieldwork, it is easy to focus on one or a few aspects and thus overlooking others. The *SLF* will help us to overcome this challenge and be a reminder of the unexpected.

Literature Review

We conducted a *literature review* (Bernard, 2011; Mikkelsen, 2005) to obtain background knowledge on our research topic and study area, and to serve as a foundation for our research question and objectives. Additionally it has broadened our perspectives on coffee production, informed us about current issues specific for the area, and provided context for our research. In this way the *literature review* served as guide in constructing and planning the upcoming fieldwork.

Questionnaire

We will initiate the research project with a *questionnaire*, to obtain basic demographic and socioeconomic information, and additionally to gain rudimentary data on farming management strategies and climate change. The sample will include current and former coffee farmers in Gatugi. The *questionnaire* will be used to recognize relevant capitals, organizations and institutions. Furthermore the results will be used as a base to identify and categorize different coffee farmer groups, in terms of farming intensity and management strategies. We will triangulate the results from the *questionnaires* with our *direct observations* and *transect walk*.

Based on the analysis we will set up specific criteria and define categories of coffee management strategies among the farmers in Gatugi.

Direct observation

In the starting phase of our fieldwork, we will make use of *direct observation* (Bernard, 2011; Mikkelsen, 2005) to gain an overview of Gatugi village. Subsequently, *direct observation* will help us to identify different coffee management strategies used among the farmers in Gatugi. The method will also play a key role throughout the fieldwork, in attaining descriptive notes, which can be fruitful for the later analysis after the fieldwork.

Transect Walk using GPS

As an element to the understanding of the site we are researching, a *transect walk* with a local participant could help us gain valuable insight of the Othaya area, both physically and culturally. In a quest of understanding how people make sense of the place they inhabit, we see this method as an essential method to gain knowledge of the area (Strang, 2010).

To obtain the spatial geographical context we will use the GPS equipment to track our path around the field site in Othaya, and then subsequently import the data to Google Earth to produce a map with relevant data. Furthermore, we will do a hike to the highest point of the area to get a dimensional overview of the landscapes, villages and ecosystems surrounding us.

Semi-structured interview

As mentioned, we will select farmers from the different categories and conduct *SSI* with them (Bernard, 2011). For this purpose we have developed an interview guide as a means to understand the rationales of the different strategies, henceforth allowing us to identify key drivers behind their choice of strategy. Additionally, we will use *SSI* to learn more about the context in which the farmers operate. By including questions regarding environmental and socio-economic aspects, we expect to get an idea of the farmers' access to capitals.

In connection with interviewing, we will incorporate *ranking* exercises (Mikkelsen, 2005, pp. 89-90). We will ask the farmers to rank their challenges in connection with coffee production. The *ranking* will illustrate the perceived gravity of different challenges the farmers are currently facing. Besides interviewing farmers, we are planning to conduct *SSI* with an official from the coffee co-operative. We want to incorporate the perspective of the coffee co-operative in order to learn about their policies but also to get an idea of the kind of relationship they have to the coffee farmers of Gatugi.

Lastly, it is important to mention, that we are expecting new questions and puzzles to arise along with our findings as our fieldwork evolve. As a result, we will develop yet another interview guide, to address such questions.

Participant observation

As mentioned, it is important for us to learn from the farmers and give something back for the time, they have spent answering our questions concerning their coffee management strategies. To offer our labor power in the field is a way to address that goal. Additionally, *participant observation* (Bernard 2011, p. 260) can aid us (being the *craftsmen* we are) in setting up criteria for the different categories of coffee management strategies. To that, it can also help us to grasp the way the context influence the farmers. Finally, by spending time with the farmers, it will help us to identify the farmers' differences in levels of access to capitals. Which in turn can shed light upon whether or not the different levels of access determine/dictate/connected to the key drivers behind chosen coffee management strategies.

Life story interview

Depending on our time schedule, we will conduct one or two *life story interviews* (Brockington & Sullivan, 2003; Horsdal, 1999, p. 103; Mikkelsen, 2005, p. 92) with coffee farmers with whom we have developed a stronger relationship. A *life story interview* can create a more intimate space, thus allowing the farmers to share topics which are more sensitive, such as factors related to feelings, hopes and dreams, which can play an important role in their choice of coffee management strategy. Furthermore, the *life story interview* could provide us with more information about power dynamics that might be present.

Focus Group

As a part of a multi-method approach in our field work, we will incorporate *focus groups*. This could facilitate an understanding of community dynamics, interactions and especially knowledge sharing, and identifying different management strategies among coffee farmers in Othaya. A discussion regarding the Othaya Coffee Co-operative could reveal inside knowledge and perspective on attitudes, access to different capitals, organizations and institutions.

The *focus groups* could facilitate a good setting for conducting *social mapping* to identify different strategies, decisions and resources among farmers.

Forest Resource Assessment (FRA)

We want to incorporate parts of the FRA method, more specifically *biodiversity indexing* and *growth model development* (Treue, 2018), on coffee farmer plots. The latter is applied to identify which species are used as a agroforestry management strategy in Othaya coffee farms, if any. We will utilize the method to categorize which species potentially are valuable economically in coffee farmers livelihood strategies, and furthermore beneficial environmentally as an intercropping or agroforestry strategy to avoid pests and diseases, or used to provide nutrients to the soil fertility. The former will be used to assess the density, height and diameter within the different coffee plots, to observe what the connection is between the biomass and the yield of the coffee farmers.

Soil Sampling

In order to triangulate the qualitative data on soil fertility obtained through questionnaires, interviews and/or observations, we will make composite soil samples in several coffee plots representing each of the broad categories established. We may observe that some farmers have a poorer soil than others, thus showing differences in the natural capital that they have access to. The soil quality might also be a factor influencing farmers' choice in terms of coffee management strategies. Furthermore, different coffee management techniques, such as agroforestry or intercropping, might have an impact on soil properties and composition (namely pH, C and N content) and such parameters may influence farmers' choices of coffee management strategies.

Week 1	Activities	Purpose
	Arrival and settling in with families in Gatugi	First impression of the area and culture.
	Meeting and planning with Lilian, Gituanja and interpreters Pilot testing the <i>Questionnaires</i>	Organising the upcoming fieldwork. Do the <i>Questionnaire</i> need revision?
	<i>Transect walk</i> <i>GPS mapping</i> of the area Identifying coffee farmers <i>SSI</i> interview with official from coffee cooperative	Documenting the area: Descriptive notes, drawings, photos, etc. Produce a map Make first contact with coffee farmers Organise fieldnotes

Fieldwork Time schedule

	Questionnaires Observations GPS mapping farmers plots	Organise the gathered data from <i>Questionnaires</i> Organise fieldnotes Add GPS data to map Identifying informants for <i>SSI</i>		
	Analysis meeting Any "aha" experiences Strategy meeting	Initial analysis of findings Leads to focus on Revise <i>SSI</i> guide? Exclude or include questions. Plan for the last week		
Week 2	Activities	Purpose		
	SSI with selected farmers Participatory observations Livestory interviews FRA Soil sampling	Transcribe interviews Calculate biomass List species richness Dry soil samples Organize fieldnotes		
	Evaluation meeting	How is the group dynamic? People feel good about the project		
	Continuing: SSI, participatory observations Livestory interviews FRA and soil sampling	Transcribe interviews Calculate biomass List species richness Dry soil samples Organize field notes		
	<i>Focus Group</i> with farmers <i>Social mapping</i> Wrapping up meeting	Transcribe Focus Group audio Organise field notes Saying goodbye to informants		
	Goodbye to host families	Packing up and flying home.		

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Appendix a – Data matrix

Main research question: What agricultural management strategies do coffee farmers choose in Nyeri South District, Kenya, and why?

Sub-question Objectives	Data collection	Data analysis	<u>Methods</u>
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1 - What are the coffee management strategies among coffee smallholders in the area of Gatugi?	1.1 Identify broad categories of coffee management strategies	 Data on: Agroforestry Intercropping Use of fertilizer: Manure vs. chemical fertilizer Use of pesticides Use of mulch Intensification / Extensification Soil fertility Plot size 	Make a choice concerning criteria for the different categories	All farmers: Questionnaires (w. observations) Transect walk GPS mapping <u>Selected</u> <u>farmers:</u> SSI Participant observation FRA (tree density) Soil sampling SSI with coffee cooperative
2 - What are the key drivers influencing farmers' choices of coffee management strategies?	2.1 Understanding the context in which coffee farmers operate	Data about: • History • Climate Change • Politics • Culture • Tradition • Macro-economy • Demography • Pest and diseases	Determine the aspects of the local context that affect farmers' management strategies	SSI Life story interviews Participant observation Literature review
	2.2 Understand the differences in access to capitals among coffee farmers	Data on: Natural capital Physical capital Financial capital Human capital Social capital	Determine key differences in access to capitals	GPS mapping Participant observation SSI Soil sampling Focus group Questionnaires Social mapping

2.3 Understand how the institutions and organisations are influencing farmers' choices	 Data on: Othaya Farmer Cooperative Local government Farmer Unions Farmer Field schools Other institutions and organization 	termine key luences and riers related to titutions and anizations	SSI Life story interview Focus groups Literature Review
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Appendix b- Method descriptions

Sustainable Livelihood Framework (Analytical methodology)

"A framework is only a simplified heuristic model of how things might interact [...] It is a guide to thinking rather than a description of reality" (Scoones, 2015).

Within the realm of development studies, there have been many debates through the years on how to study livelihoods. Spanning from local agency-focused analysis to wider structural analysis, it is hard not to forget factors which can have pivotal implications for the lives of the people we study (Scoones, 2015). Different kinds of livelihood frameworks emerged during the 1990s for the purpose of getting a grasp of the complexities livelihoods is interwoven with. Ian Scoones underlines how *SLF* is merely a flexible frame with the possibility of being expanded, confined, refined etc., hence *SLF* enables a more dynamic study not confined in to different boxes of analysis (Scoones, 2015). *SLF* incorporates the context in which people live. Within this context the *SLF* links peoples' room of maneuvering with their levels of access to various assets and capitals such as natural, economic, human, social etc. Finally *SLF* includes institutions and organizations in order to understand how they mediate structures and processes through politics, customs, rules and law. Consequently how this in turn affect people's' livelihood (Scoones, 2015). We will include physical capital to the SLF which we will use in our study.

Literature Review

The first thing to do when commencing on a research topic is to review existing literature (Mikkelsen, 2005). A strategy suggested by Anthropologist H. Russell Bernard (2011) is to start with volumes of Annual Review for a specific field (e.g. Psychology, Economy or Anthropology) as authors invited to publish in these volumes, are expects in their field (Bernard 2011). After discovering some key references, it is easier to uncover existing studies and align your own research with it. Consequently, the research conducted will fill knowledge gaps instead of duplicating already existing knowledge (Mikkelsen, 2005).

Direct observation

Bernard (2011) argues how interviewing is a, "great way to find out what people think they do. When you want to know what people actually do, however, there is no substitute for watching them [...]." Doing direct observation in the field make room for taking detailed notes, as you are 'just' observing. 'Just' is in quotation marks, as observing is not merely observing. To study human behavior is not an easy thing to do and as Bernard (2011) emphasizes, in doing direct observation people are aware of your gaze, thus they show us, only what they want to show us. Consequently, Bernard (2011) describes, how there exist a palette of different observing strategies, which concerns how you direct your attention but also how you want to incorporate yourself in the field.

Semi-structured interviews

According to anthropologists, Kirsten Hastrup, Cecilie Rubow and Tine Tjørnholm-Thomsen (2011) an interview gives you the opportunity to combine the observed and experienced with the articulated. *SSI* is useful, when the length of a fieldwork is short and therefore limit the amount of interview situations. In order to get the best out of these situations, it can be important to keep an interview in tune with its aim (Hastrup et al., 2011). Bernard (2011) describes how a *SSI* is based on an interview guide. He stresses, that the guide help the interviewer in demonstrating control of the interview and keeps the aim of the interview in sight. Moreover a *SSI* allows for flexibility in the way it is open for new and interesting leads for the interviewer and the interviewee. If the interview is stalling, the guide also serve as a help to get the conversation flowing again. In developing an interview guide, it is therefore important to consider the characteristic of the questions, but also the type of techniques to employ during an interview. Just to mention a few, the following techniques can be fruitful: *Being silent*, where you wait a bit to ask the next question, *repeating* what has just been told or the famous "*tell me more*" question, in order for you to get an answer elaborated (Bernard, 2011).

Participant observation

The reasons to include *participant observation* in your portfolio of methods are many. Bernard (2011) describes how *participant observation* allows the researcher to go out and stay out or in and experiencing the lives of your informants. By doing *participant* observation, it is possible to look into some of the non-verbal aspects of social life. Additionally Bernard underlines how *participant observation* is a bodily investment, which demonstrates a sincerity towards the informants you work with. By participating and taking an active part in the daily activities your presence in the field becomes less and less awkward and at the same time you as a researcher can still walk around conducting interviews, administers GPS, clipboard and camera (Bernard, 2011).

Life-story interview

Anthropological knowledge is depending on more than the distance - it depends on relation. To be in relation to another human involves making the other *present* and being able 'to imagine', hence having empathy for the other (Gammeltoft, 2010). Moreover, anthropologist Marianne Horsdal (1999) describes how a life story is a self-portrait. She adds, it is important for people to share their experiences with others and through the story of themselves add meaning to their life. A *life-story* distinguish itself from a normal interview by creating a space for the interviewee to tell their story, but also allowing an exchange of intimacy and trust happen between interviewer and interviewee. A *life-story* can help to incorporate what cannot be seen or measured in the field. Insights, which can direct the attention to otherwise overlooked factors of importance (Horsdal, 1999). As Brockington & Sullivan says, *"stories have a context [...] treated properly they are as strong, relevant and interesting as data that are numerical [...]"* (Brockington & Sullivan, 2003).

Focus Group

A *focus group* is a method where different topics are discussed among respondents. A moderator is present to facilitate a smooth interaction between participants, rather than control the conversation. The method is often used as part of a multi-method approach in field research (Lloyd-Evans, 2006). The method can be used in an attempt to balance out the common unequal power relation between interviewer and interviewee, Eurocentricity and positionality which frequently appears in Majority / Minority world field research. The method can be empowering among participants, as they find strength in numbers, and can lead to collective actions as a result of the shared experiences (Lloyd-Evans, 2006). It is important to be aware of the limitations of *focus groups*, e.g. peer pressure, dominating participants and the risk of a misleading group consensus (Lloyd-Evans, 2006). Being aware of the limitations of the method, we assume that a *focus group* could facilitate some useful insight on the dynamics, difficulties and strategies of coffee farming.

Transect Walk

The method consist of gathering data while walking, listening and observing. A *transect walk* is a combination of gathering area specific information as resource distribution, ecological and topographic information, while trying to understand the local participant spatial interaction, history and cultural perception of the area (Strang, 2010). The object is as Strang (2010) emphasizes ..*to gain an in-depth, holistic view of people's engagements with the places that they inhabit, and to illuminate particular cultural and ethnohistorical landscapes* (Strang, 2010).

Forest Resource Assessment

The *FRA* method is used to collect, analysis and interpret information on the status and trends of forests and forest resources. The method can be used on a global, regional or local scale, to determine forest cover and to assess how the forest is changing, particularly it is used to reveal deforestation rates. *FRA* uses a wide variety of approaches in measuring, monitoring and regulating forest loss or gain, e.g. aerial photographs, satellite imagery and ground-based measurements (FAO, 2016; Reams & de Freitas, 2015) or as simple observations while in the field (Treue, 2018).

FRA is applied in forest management planning, in REDD+ schemes, and as we intend to use it; to assess the diversity and density of tree or plant species on a plot, by doing biodiversity indexing, and a growth model development which is used to estimate the biomass content of the research area (Treue, 2018).

Questionnaire

A *Questionnaire* is a research instrument, frequently used to gather standard information from the population studied. *Questionnaires* can be done as a face to face interview, where the interviewer ask questions and records the respondents answer, thus participants literacy is not of importance. To gain the best results Smith et al. (2015) stresses that a *Questionnaire* should be reasonable short, logically sequenced and have a pleasant layout, while not exceeding 30 minutes. While doing *Questionnaire* one must be aware of its limitations, it is not a optimal tool to gain attitudes and beliefs as respondents often have a limited option for answering questions, elaboration and in-depth answers are better suited in e.g. *SSI*.

While designing a *Questionnaire*, one must be aware of the order of questions, a *questionnaire* should initiate with introductory questions, less sensitive and less specific questions, before asking more sensitive questions. Leading questions, vague wording, redundant and hypothetical questions, should be avoided. Furthermore the questions should relate to the objectives of the study. To detect to all questions are relevant, and to detect mistakes, misleading questions etc a pilot test is necessary before going into the field (Smith et al., 2015).

Soil sampling

We will collect *composite samples* from the different broad categories identified (with low to high biodiversity and tree density, presence or absence of intercropping). Samples of 100 cm3 will be taken from top soil at different points of the plot and mixed into a *composite sample*. The samples will be dried on the spot and they will be transported to the University of Copenhagen for analysis, where we will measure pH, density and nutrient composition.

Appendix IV: OFCS policies "Gatugi Coffee Growers Biashara Group"



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Only members with minimum production of 200kg will participate in defiberations during members moetings subject to review after one

FARM INPUTS

- All members shall, be supplied with farm inputs according to (1) their crodit limit.
- (10) Where carrent farm production domands more inputs them allowed by the credit limit the field promoters shall visit a members farm and make necessary recommondations.
- (III) All members shall make orders for each seaton at the factory before end of august.

FIELD PROMOTERS

- The group shall have field promoter's not exceeding 12 persons elected by m the group members for a term of 3 years.
- Any vacancy which occurs due to resignation or removal for any reason 100 shall be filled by holding elections for the affected zone.
- The field promoters shall be free to visit members farms without (11) hindrance.

The field promoters shall make inspection reports to the management (in) committee and group members meeting for necessary action.

CONDUCT

- coffee cherry hawking u.g. buying on selling will not be allowed in the 0) group
- No politics are allowed in the group. 003
- (III) ponctuality will be observed strictly
- No hawking of farm inputs is allowed in the group. (IN)

7 ADMINISSON INTO GROUP

AMONAGER COMP

- (i) Members of society to apply through the zonal field promoter who will forward the same to the group promoters before 30th September.
- 8. All members coffee farms will be required to have uniform coffee -bushes
- The field promoters will be visiting any member's farm without notice.
- 9. Co-ordination of the 6 group zones will be done by the factory chairman and Maringer,

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Appendix V: Questionnaire (rev. 5 Mar 2018)

Introduction and Objective: Good day. We are students from Nairobi University and the University of Copenhagen in Denmark. We would like to interview you about the different types of coffee management strategies that you practice, and the way that you decide which ones to apply. We are presenting our findings with a poster presentation. If you are interested, you are more than welcome to join this meeting and hear about what we did with the results of this questionnaire.

Confidentiality: Your responses are confidential. You do not have to state your name if you want to stay anonymous .

Duration: The interview should last about 30 minutes.

Voluntary Participation: Your decision to participate in this interview is completely voluntary. It is not necessary to answer any question you would rather not answer. You can stop participating in the interview at any time. You should be eighteen years old or more to participate in this study.

Questionnaire N°	Date & Time: / / ::
Location:	GPS coordinates: x: y: z:
Interviewer:	Interpreter:

Section I: Personal information

- 1. Name:
- 2. Gender: M____ F____
- 3. Age:
- 4. What is your role in the household?_____
- 5. Marital status: [] Never married [] Married [] Widowed [] Divorced
- 6. What is your highest level of education?
 - [] Never attended school
 - [] Primary school
 - [] Secondary school
 - [] College / University
 - [] Other (specify)

Section II: Income

7. What are your income sources?

- [] Coffee
- [] Tea
- [] Other farming income
- [] Off-farm activities, *please specify*_____

[] Financial support from family members outside the homestead

8. What is your **main** income?

- [] Coffee
- [] Tea
- [] Other farming income
- [] Off-farm activities, *please specify*_____
- [] Financial support from family members outside the homestead

Section III: Household & Land ownership

9. Who is the head of the househoregarding[] Dual (male and female)	old? (Who is the dec coffee?) [] Male	ision-making member of the househol [] Female	d		
10. How many people live in your ho	ouse all year around? _				
11. Do you own the land where your	farm is located? []	Yes [] No			
12. What is the type of land ownership in your household? (Tick all that apply)					
 [] Private [] Community land [] Leased land [] Customary land [] Other (Specify) 13. What is the size of your land ? (So 14. What is the size of the plot where 	Ownership Specify units) e you grow coffee? (Sp	(With title	;)		

Section IV: Coffee production

15. Which coffee varieties do you grow?

16. How long have you been growing coffee? ______ years

17. For how many generations have you been growing coffee?

[] 1 (you started) [] 2 (your parents started)	[]	3	(your	grandparents	started)
[[] 4 (your great grandparents started)] mor	e			
[] I don't know						

10 Da way have	+	asffas mlat? If way		da wax hawa in	wave as ff as mlat?
18. Do you nave	trees in your	conee plot? If yes	s, which tree species	a do you nave in	your conee plot?

[]	Yes	:	
[]	No			

19. [If yes on #18] for which purpose do you have trees? (You can tick several answers)

[] Shade [] Food	[] Firewood[] Soil improvement	[] Timber[] Other, specify	
20. Do you grow othe	er plants in between your coffee	e bushes? If yes, specify which ones:.	
[] Yes : [] No	:		
21. [If yes on #20] wh	hat is their purpose?		
[] Food [] Other	[] Ground cover	[]	Fodder
22. What kind of ferti	ilization do you use on the coff	ee bushes?	
[] Chemical fertilize[] Other organic fer	ers [] Compost tilizers [] Mulch	[] [] None	Manure
23. Do you use insect	ticide on your coffee? If yes, wh	hich ones and how often?	
[] Yes : [] No	:		
24. Do you use fungio	cide on your coffee? If yes, wh	ich ones and how often?	
[] Yes : [] No	: 		
25. Do you use herbic	cide to control weeds? If yes, w	which ones and how often?	
[] Y [] No	es:		
26. Do you consider o	coffee rust or coffee berry disea	ase to be a problem?	
[] Yes, both[] Neither	[] Yes, coffee rust [] Yes, coffee berry	disease
27. Do you hire labor	for managing coffee? [] Yes	6 [] No	
28. If yes, w	/hen?		
29. How many pe year?	ople in your household pa _	articipate in coffee farming throug	hout the
30. Do you have acce	ess to sufficient water for irrigat	tion?	
[]Yes []No [] I don't use irrigation		
31. [If no on #29] Wh	ıy?		_
32. What factors a cooperative/factory, p	ffect your choice of coffee bests/diseases, tradition, financi	management strategies? (changing al, other)	weather,

Section V: Climate change

33. Are you worried about the effect of future changes in the climate on your coffee production?[] Yes, I am worried []No, I am not worried

Section VI: Organisations

34. Are you a part of farmers organisations, other than the coffee cooperative? If yes, please specify_____

35. Do you have access to coffee management training? Yes [] No []