

Farming in Transition in East Africa: Financial Risk Taking and Agricultural Intensification

Thesis submitted in accordance with the requirements of the University
of Liverpool for the degree of Doctor in Philosophy by Eleanor Balchin

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Declaration

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

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FARMING IN TRANSITION IN EAST AFRICA: FINANCIAL RISK TAKING
AND LIVESTOCK INTENSIFICATION

Abstract

This thesis contributes to understandings of the intensification of livestock production in Busia County, Western Kenya. Livestock production here has been intensifying in the recent past, and became a key strategy in Kenya for meeting the growing demand for livestock source foods here whilst simultaneously raising smallholder farmers out of poverty.

How smallholders juggle insufficient incomes with a variety of expenditure needs is rarely considered in the context of smallholder livestock production in great detail. This study utilises the Financial Diaries Methodology to harness a great depth of information from 15 smallholder livestock farmers in Busia to establish the ways in which they attempt to intensify their production, understand how they engage with financial providers to achieve this, and establish the risks they face in their production. Research took place between November 2018-February 2020, with around 20 months spent in the field.

The results from this study find that overall, the participants make a profit from their livestock production, save for those who are categorised as subsistence farmers. However, there is a great variation in the size of these profits, even when expenditure on inputs (the resources used in livestock production, such as feed and veterinary care) is similar. Dairy cattle in particular tend to be far more lucrative, whilst chickens often resulted in financial losses for all participants, particularly due to very high mortality levels that prevent significant rises in the number of chickens owned at households that can be sold. Additionally, inputs the participants invest in plays a significant role

in the incomes derived. However, despite large profit margins, this often equates to low levels of income in terms of money. The participants never accessed finance specifically for livestock production needs, and expressed fear of taking loans.

Thus, this study recommends that if individual farmers are to intensify, they require access to higher yielding livestock and to inputs in a way that will not cause them any further financial burdens, as well as access to livestock production education.

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List of Acronyms

ADC	African Development Bank
AI	Artificial Insemination
ASAL	Arid and Semi-Arid Land
ASCA	Accumulating Savings and Credit Association
CBK	Central Bank of Kenya
CMA	Capital Markets Authority of Kenya
CRB	Credit Reference Bureau
CV	Coefficient of Variation
FSD Kenya	Financial Sector Deepening Kenya
GDP	Gross Domestic Product
GHG	Greenhouse Gas Emissions
ILRI	International Livestock Research Institute
IRA	Insurance Regulatory Authority
IREC	International Livestock Research Institute International Research Ethics Committee
KARI	Kenya Agricultural Research Institute
KMC	Kenya Meat Commission
KNBS	Kenya National Bureau of Statistics
MAMSL	Meters Above Mean Sea Level
MFI	Microfinance Institutions
NACOSTI	National Commission for Science, Technology, and Innovation
NHIF	National Hospital Insurance Fund
RBA	Retirement Benefits Authority
ROSCA	Rotating Savings and Credit Association
RVF	Rift Valley Fever
SACCO	Savings and Credit Cooperative
SASRA	SACCO Societies Regulatory Authority
SI	Sustainable Intensification
SIDA	Swedish International Development Corporation Agency

SLA	Sustainable Livelihoods Approach
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
VSLA	Village Savings and Loans Association

Glossary

<u>Term</u>	<u>Definition</u>	<u>Source</u>
Chama	‘Chama is the general word for a savings or investment group in Kenya. A single group can serve different financial functions’. A chama can be either a Merry Go Round, Table Banking, Welfare Group, or any combination of the three.	(Zollmann, 2014: p.7)
Excluded from Financial Providers	‘Individuals who reported using financial services and products only through family, friends, neighbours or keep money in secret places or not using any form of financial service’	(CBK, KNBS and FSD Kenya, 2019: p.7)
Fundi	KiSwahili word meaning a handyman	
Harambee	Translating to ‘pulling together’, Harambee is the official motto of Kenya, appearing on the coat of arms. Often it refers to ‘voluntary contributions in cash and kind (e.g. labour) to community amenities such as schools, water projects and health clinics’. In this study however, Harambee refers to individual fund-raising events, such as to raise college fees for a child.	(Waiguru, 2006: p.252)
High-Income Country	Economies with a GNI per capita of \$12,696 or above calculated using the World Bank Atlas Method	(World Bank, no date)
Informal Financial Providers	‘Financial services offered through different forms not subject to regulation, but have a relatively well-defined organizational structure’	(CBK, KNBS and FSD Kenya, 2019: p.7)
Lower-Middle-Income Country	Economies with a GNI per capita between \$1,046-\$4,095 calculated using the World Bank Atlas Method	(World Bank, no date)
Low-Income Country	Economies with a GNI per capita of \$1,045 or below calculated using the World Bank Atlas Method	(World Bank, no date)
Matatu	Public transport mini buses	
Merry Go Round	‘Members contribute regularly, usually but not always a fixed amount, and take turns giving the entire pot to one member on each round’	(Zollmann, 2014: p.7)
Money Lender	Used in place of what is typically termed in Kenya (as well as other countries) as a ‘Shylock’, due to the negative connotations the latter may bring unto the Jewish community. Taking their name from the character of Shylock from Shakespeare’s ‘Merchants of Venice’, a shylock is an informal money lender, often predatory in nature offering	

	high interest rates, in some instances known for enforcing repayment through blackmail or threats of violence. May be considered as comparable to a Loan Shark.	
Non-Prudential Formal Financial Providers	‘Financial services and products offered through service providers that are subject to non-prudential regulation and supervision (oversight) by Government Ministries/ Departments with focused legislations’	(CBK, KNBS and FSD Kenya, 2019: p.7)
Prudential Formal Financial Providers	‘Financial services and products used through prudentially regulated and supervised financial service providers by an independent statutory Government Agency including CBK, CMA, IRA, RBA and SASRA’	(CBK, KNBS and FSD Kenya, 2019: p.7)
Registered Formal Financial Providers	‘Financial services and products offered through providers that are legally registered legal persons and/ or operate through direct Government interventions’	(CBK, KNBS and FSD Kenya, 2019: p.7)
Table Banking	‘Tend to either start a round with members making one lump-sum contribution for the year or contributing slowly and regularly to build a fund from which the group makes loans to members. Members later divide the savings and earned interest through a share-out, typically once a year’	(Zollmann, 2014: p.7)
Upper-Middle-Income Country	Economies with a GNI per capita between \$4,096-\$12,695 calculated using the World Bank Atlas Method	(World Bank, no date)
Shamba	KiSwahili word meaning the farm	
Welfare Group	‘Act like informal insurance for group members. These can stand alone or be part of another group, and the rules vary from group to group. There may be fixed regular contributions to a group fund that is used in emergencies, members may be required to contribute to one another only in the event of an emergency, and in some cases, unclaimed funds are redistributed to members at the end of some period.’	(Zollmann, 2014: p.7)
Mobile Money	An electronic wallet service that allows users to access a range of financial services through their mobile phone, such as peer-to-peer transfers, insurance products, loans and savings, and mobile banking.	(Donovan, 2011)

CHAPTER I: INTRODUCTION

1.1 Poverty and Agriculture

Some 1.3 billion people globally, around 22% of the population in developing countries, live in multidimensional poverty. This measure of poverty is calculated by considering the three dimensions of poverty: health, education, and standard of living, measured by considering levels of nutrition, child mortality, years of schooling, school attendance, cooking fuel, sanitation, drinking water, electricity, housing, and assets (OPHDI and UNDP, 2020). A little under 700 million (9.27% of world population) of these live in extreme poverty, as measured by the earning of under \$1.90 a day, rising to 1.8 billion (24.3% of the world's population) when considering the alternative rates of \$3.20 as the national poverty lines of lower-middle-income countries, and 3.27 billion (43.5% of the world's population) when measured at \$5.50 as the national poverty line for upper-middle-income countries (World Bank, 2020b). Due to the impact of the COVID-19 pandemic from the year 2020, an additional 150 million people are expected to fall into extreme poverty, eight in ten of which will be from middle income countries (World Bank, 2020a). Despite a period of decreasing poverty rates between 2010-2018 (UNCTAD, 2021), calculations of the estimated increase in the number of people living in poverty in 2020 alone place the global increase at an estimated 68.6 million people. This increase is feared to rise even higher, up to 100 million, should the resulting recession be more severe than initially expected. Sub-Saharan Africa (SSA) is the region most severely affected by an increase in extreme poverty rates in the world, with an increase of around 31.2 million people in 2020 (Valensisi, 2020).

Poverty and malnutrition (the deficiency, imbalance, or excess of nutrients consumed) exist as a vicious cycle, causing and exacerbating one another. Nutritional status, human capital (education, training, skills, and health), and economic standing are closely linked, and can be both causes and effects of one another. Poverty can increase the risk of food insecurity (lack of access to the kinds and quantities of food required), and thus malnutrition, and malnutrition can have negative impacts on people's physiological and mental capacity, making them more susceptible to poverty (Siddiqui *et al.*, 2020). The setting of poverty lines, by calculating the cost of a minimal standard

of living, focuses significantly on the ability to afford food. For the poorest people living in the poorest countries, the majority of income can be spent on food, thus, a lack of money directly translates to a lack of food (Deaton, 2006).

Both extreme poverty and malnutrition tend to be concentrated in rural areas, with around two thirds of those living in extreme poverty living in rural areas, increased prevalence of child stunting in rural areas of 1.7 times that of children from urban areas, and 2.2 times higher in children from the poorest wealth quintile than the richest (FAO, 2015c).

Global agrifood systems are an enormous global enterprise, producing around 11 billion tonnes of food each year, valued in the region of \$3.5 trillion in 2018, and accounting for an estimated 25% of global employment (FAO, 2021). Yet, hunger is a significant issue faced by many. An estimated 768 million people around the world suffered from hunger in 2020, an increase of 118 million since 2019, and 153 million since 2015 (*ibid*). Globally, roughly one billion people lack access to sufficient food to meet energy requirements, whilst an additional two billion suffer from micronutrient deficiencies (Godfray and Garnett, 2014).

In Africa, agriculture is expected to enable the achievement of food security and eradicate undernutrition, whilst simultaneously raising people out of poverty (GoK, 2008; World Bank, 2008; Djurfeldt, 2013). Reducing both poverty and hunger have often dominated national policy concerns for over 50 years in SSA due to the high frequency of both (Muyanga and Jayne, 2014). This combining of poverty and food security challenges here is the result of the typically high yield gaps in African agriculture. When comparing grain yields for example, whilst African yields almost doubled between 1961-2014, the global average almost tripled (Tian and Yu, 2019). Focusing more narrowly on SSA, many of the approximately 33 million smallholder farms (those characterised by small plots of land, often thought to be 2acres or less (Rapsomanikis, 2015), focus on family labour, and using production at least in part for family consumption) are failing to meet the yield potentials that could be achieved with the adoption of improved agricultural inputs and technologies in a process of agricultural intensification, and many of these farmers live below the poverty line (Dercon and Gollin, 2014). An estimated 213 million people in SSA were undernourished between 2014-2016, equating to 23.3% of the population, the highest

regional proportion of population in the world, followed by South Asia with an estimated 257 million undernourished, equivalent to 14.9% of the population (FAO, 2015c).

The transformation of agriculture from a subsistence model (where production is used solely for household consumption) to a commercial enterprise (where the purpose of production changes to a money making business) through higher productivity then is said to lead to increased farmer incomes and rural cash flows which can result in rural development (Sachs, 2015). Gassner *et al.* (2019) are concerned however that this expectation is unrealistic, and that food-security and economic growth should be considered as two separate development challenges with different intervention needs, as well as acknowledging the differing wants of the individual farmers, who may want to intensify their production and increase yields to differing degrees. For many smallholder farmers in SSA they say, the financial incentives of adopting technologies to increase yields is often insufficient to attract them to do so, particularly within the context of diversified livelihoods. As examples, they state that for the average agricultural household in SSA, consisting of five members and a land size of 2 hectares, to reach the extreme poverty threshold of \$1.90 a day per person, the farm must make a profit of \$1730 per hectare per year. This varies widely, such as requiring a profit of \$4440 per hectare in Ethiopia where average household size is 7.2 and farm size is 1.1 hectare, \$1470 in Zambia where average household size is 5.5 and farm size is 2.6 hectares, and \$980 in Senegal where household size is 16.8 and farm size is 11.9 hectares. Using the same statistics, Harris and Orr (2014) calculated a *de facto* limit to net returns from rainfed crop production of around \$1700 per hectare per season, with a median of \$558.

When considering small landholding sizes by many SSA farmers, the increase in income that can be derived from adopting new technologies and intensifying production may not be enough to encourage them to engage with these new ways of farming. Agriculture as a part of people's livelihoods cannot be considered in a vacuum. Smallholder farmers often have diverse livelihood portfolios, involving both on and off-farm, and non-farm income generating activities, as well as remittances (Ellis, 2007). Diversification of income sources may come as a result of calculated planning to increase the household income or reduce livelihood risk, but in other cases may simply be a result of desperation (Zollmann, 2014). For many smallholder

households, agriculture alone is not sufficient to make ends meet, and the frequent lack of social safety nets means that smallholders must not only diversify, but also nurture social networks (Ellis, 2000), and engage with financial providers to leverage investment opportunities and smooth incomes (IFAD, 2019; Zollmann, 2020).

In the same way that farmers have diversified incomes, they also have a variety of expenditure needs. Regular financial needs can include household needs, agricultural needs, school fees, emergency spending, and family milestones such as weddings (Anderson and Ahmed, 2015). Thus, to increase expenditure on agricultural inputs, reducing credit constraints is often thought to be key, with commercialised smallholders requiring both short term working capital for seed and fertiliser for example, and long term capital for investments such as crop renovation and irrigation systems (Dalberg Global Development Advisors, 2016). However, smallholder farmers are a notoriously risky group to lend to, with low asset bases and the risky nature of agriculture among the supply side barriers, and high cost and high risk of borrowing among demand side barriers (Oluoch-Kosura, 2010).

The first financial services specialising in smallholder farming were developed in the 1950's, when the first government led agricultural development banks were formed to lend to smallholder farmers at below market rates (Rural and Agricultural Finance Learning Lab and ISF Advisors, 2019). However, these financial services evolved over time, due to high default rates and misaligned incentives, leading to the growth of microfinance in the 1970's (*ibid*). Microfinance itself proved to be inappropriate for the agriculture-specific and seasonal needs of farmers, and this again developed further to include financial services developed by a community of practitioners across sectors to become social lenders, focusing on producer organisations, of which around 10% of smallholders are members (Dalberg Global Development Advisors, 2016). Further, liberalisation and privatisation dismantled many government farm credit programmes in the 1990's (Adjognon, Liverpool-Tasie and Reardon, 2017). In all, smallholders are a financially underserved group with limited access to agricultural credit (Carranza and Niles, 2019).

A lack of access to financial services is linked both with poverty and rural living. Globally some 77% of those living on below \$2 a day lack an account with a formal financial provider, and up to 72% of those living in rural areas are financially excluded

(IFAD, 2019). Improving access to appropriate smallholder finance is said to foster agricultural innovation and reduce vulnerability to shocks (Miller and Yoon, 2022), and yet, there is currently an estimated shortfall of around \$170 billion in smallholder agricultural financing (Rural and Agricultural Finance Learning Lab and ISF Advisors, 2019). In much of the world many people instead utilise informal financial providers to meet their financial needs, in part due to their low or non-existent entry barriers (Masinde, 2019).

1.2 Why Livestock Intensification and Finance in Kenya?

Increasing food and nutritional security whilst enhancing the purchasing power of Kenyans is a priority element of Kenya's development plans, and was one of the "Big Four" initiatives for the Third Medium Term Plan (GoK, 2018) of Kenya's Vision 2030 (Government of Kenya, 2007). Vision 2030 is Kenya's development blueprint for the period 2008 to 2030, in which improvements to household and private sector agricultural growth play a role.

The predicted rise in Kenya's population, from 53.77 million in 2020 to 91.58 million by 2050 and 125.42 million by 2100 (UNDESA, 2019), will lead to a significant increase in demand for livestock products. This is due not only to increasing population, but as a result of a growing middle class and globalisation. The increasingly affluent and urbanized population are expected to demand larger quantities of animal source foods in the future, with projections of increases between 46%-503% between 2010-2050 (FAO, 2017a). The largest projected increase is the demand for eggs (503%), followed by pork (268%), milk (175%), poultry (174%), beef (173%), and mutton and chevon (46%). Some 7 million households own livestock in Kenya, representing 60% of the total population, with livestock currently accounting for some 4.4% of the country's GDP, 14.4% of agricultural value added, and 2% of export earnings (FAO, 2019).

Defined as 'the increased use of external inputs and services to increase the output quantity and/or value per unit input' (Bebe, Udo, & Thorpe, 2002, p.114), the intensification of livestock production in Kenya is said to have the potential to meet these growing demands. Smallholder farmers are ideally suited here due to the fact that many already keep livestock, and it is estimated that smallholder farmers already account for 70% of the country's beef production, 80% of milk production (GoK,

2013a), and 80% of poultry production (GoK, 2008). Intensifying and commercialising their production therefore is said to provide an opportunity not only to meet this growing demand for livestock products, but also improve their livelihoods (State Department for Livestock, 2019).

Also within Vision 2030, plans for financial services are considered under the economic pillar, the goal of which is to ‘maintain a sustained economic growth of 10% p.a. over the next 25 years’, which will help meet Vision 2030’s overarching vision to create ‘a globally competitive and prosperous nation with a high quality of life by 2030’ (Government of Kenya, 2007, p.2). The government of Kenya vowed to create a globally competitive financial sector that will not only create jobs, but also promote a high level of savings, from 17%-30% GDP by the end of the second medium term plan period. The financial sector is critical to meeting the 10% p.a. economic growth through the mobilisation of both domestic and international resources. In part, to achieve this, the number of people lacking access to finance are to be reduced, and informal financial providers, Savings and Credit Co-operatives (SACCOs), and microfinance institutions are to be streamlined.

By the second medium term plan for Vision 2030, Kenya had failed to meet its goals for the first term. This was attributed to major shocks that occurred during this time, including post-election violence in 2007/2008, adverse weather which impacted the agricultural sector, and the global financial crisis (GoK, 2013b). The banking system dominates the financial system in terms of net assets, and is the fourth largest banking system in SSA (International Finance Magazine, 2020). However, in 2012 Kenya had 44 banks, on top of 8 deposit taking microfinance institutions, and 5 representative offices of foreign banks (GoK, 2013b), with a population at the time of 44 million people. This equates to 10 banks per ten million people, compared to 0.3 banks per ten million in South Africa, and 0.1 banks per ten million in Nigeria, two of the largest banking systems in SSA (International Finance Magazine, 2020). The Architecture of Financial Sector policy was therefore drafted to promote consolidation of the banking sector (GoK, 2013b). By the onset of the third medium term plan, which runs from 2018-2022, significant improvements had been made to financial services in Kenya. The proportion of people using banks increased from 29% to 38% between 2013-2016, capital markets saw significant growth, access to formal financial services more

generally increased from 66.9% in 2013 to 75.3% in 2016, and gross national savings increased from 11.2% of GDP in 2013 to an estimated 18.3% in 2017 (GoK, 2018). However, significant challenges remain, including weak consumer protection, low insurance penetration, low pension coverage, low utilisation of many services, and limited competition in some segments (*ibid*).

Kenya leads in formal financial inclusion in SSA, with 82.9% of the population having access to formal financial providers (CBK, KNBS and FSD Kenya, 2019). These formal financial providers include prudential, non-prudential, and registered formal providers, such as commercial banks, microfinance banks, insurance providers, SACCO's, and mobile money. However, Kenya's financial system is divided into formal and informal finance. The informal financial providers in Kenya are those which are not subject to regulation but have a well-defined structure. They include merry-go-rounds, in which a group of people deposit a set shilling value at set intervals (e.g., monthly), and take it in turns to receive the groups full sum; table banking, in which people can purchase 'shares', which are pooled and available for group members to take loans, the shares then grow in value with the payment of loan interest; shop keepers and supply chain credit; and money lenders. For those who are excluded from both formal and informal financial providers, social networks and individual arrangements through, for example, saving money in a secret hiding place, are the only available forms of finance (CBK, KNBS and FSD Kenya, 2019).

Data collected in the 2019 FinAccess survey shows how mobile money is the most commonly used financial provider, at 19.9 million users, or around 38% of the population (CBK, KNBS and FSD Kenya, 2019). This is followed by banks (including commercial banks, mobile banking, Post Bank, and microfinance banks), at around 19% of the population, informal groups at 14%, and insurance providers at 13%. SACCO's, pension providers, and microfinance institutions are not well used in Kenya, with only 5%, 6%, and 0.8% of adults utilising these providers respectively.

1.3 Statement of the Problem

Whilst much research has been conducted on specific elements of livestock intensification, such as the impacts of improved breeds on household income, or the impact of various inputs on productivity, and on access to finance, such as the barriers to accessing formal providers, very little research has been conducted to consider the

overall impact of intensifying livestock production on smallholder homesteads. Smallholder farmers have complex lives, often affected by low incomes, high levels of risk, gender and cultural norms, and high levels of competition for available financial resources that span a multitude of areas of life, such as education, health care, familial duties, agricultural investments, and other business investments, as well as overall improvements in quality of life. Livestock intensification is not a standalone area of farmers lives', but rather one aspect of many competing areas, with the potential to worsen or improve other aspects of their lives.

This Ph.D. aims to fill some of this gap in the literature, of how intensifying livestock farmers manage this process of intensification. In order to understand this, the study considers how livestock intensification is afforded, the barriers that are faced, and whether intensification proves a profitable venture capable of improving livelihoods. This will allow the study to establish whether the process of intensification can achieve the expected goal of both increasing production to meet growing demand whilst simultaneously increasing incomes and raising people out of poverty.

By adopting a mixed-method approach and focusing on a relatively small sample of intensifying livestock farmers, this study is able to delve deep into the inner workings of the homesteads, to understand how livestock production and intensification fits into their wider lives.

1.4 Study Overview

1.4.1 Project Partners

University of Liverpool

Primarily this Ph.D. is conducted under the University of Liverpool's Institute of Infection, Veterinary and Ecological Sciences, a global leader in One Health research (<https://www.liverpool.ac.uk/infection-veterinary-and-ecological-sciences/>). The institute addresses a number of societal challenges such as emerging infectious diseases, antimicrobial resistance, and food security, both nationally and globally

The International Livestock Research Institute- The ZooLink Project

This Ph.D. was conducted as part of the Zoonosis in Livestock in Kenya (ZooLinK) project (<http://www.zoonotic-diseases.org/project/zoolink-project/>), led by the

University of Liverpool and the International Livestock Research Institute (ILRI). The project aim was to develop a surveillance programme for zoonoses in Kenya's western counties. Located in Busia town, the ZooLink lab was the base from which research for the ZooLink project, and this study, was conducted. The increased intensification and commercialisation of livestock here has created a change in the risks of zoonoses, with changes to trading patterns, herd structures, input supply systems, and production systems (Thomas *et al.*, 2021).

This study provides a social science perspective to the ZooLink project, enhancing the understanding of how smallholder farmers individually are engaging with the intensification process, to provide a wider context to how farmers intensify their production, whilst linking this with the wider understanding of how livestock intensification impacts upon smallholder livelihoods.

Financial Sector Deepening (FSD) Kenya

FSD Kenya (<https://www.fsdkenya.org/>) served as the industrial partner of this research, contributing funding, and with a keen interest in the area of study of this Ph.D. FSD Kenya are an independent trust that works with the Government of Kenya, the financial services industry, and other partners, to develop financial solutions, particularly for low income households, enterprises, and underserved groups such as women and youth.

1.4.2 Study Aims and Scope

Aim

The overall aim of this study is to understand the financial risks associated with livestock intensification in Busia County, Kenya. With livestock intensification heralded as a pathway with which to improve the livelihoods of smallholder farmers, whilst meeting the growing demands for livestock products, this study uses a combination of qualitative and quantitative data collection methods in the form of an adapted Financial Diaries Methodology in order to:

1. Understand the role livestock plays in smallholder livestock farmers' livelihoods;
2. Understand how smallholder livestock farmers access finance for livestock intensification;

3. Explore the other ways in which smallholder livestock farmers attempt to intensify their livestock production;
4. Explore the impact of risks associated with livestock intensification.

Research Questions

In order to meet these objectives, the following questions are asked:

- 1(a). What livelihood strategies do smallholder livestock farmers employ?
- 1(b). What expenditure needs do smallholder livestock farmers have?
- 2(a). Which financial providers and services do smallholder livestock farmers engage with?
- 2(b). Why do smallholder livestock farmers engage with some providers and services and not others?
- 3(a). What livestock inputs do smallholder farmers prioritise?
- 3(b). What benefits do smallholder livestock farmers gain from their production?
- 3(c). Does livestock production represent a financially beneficial aspect of smallholder farmers livelihoods, or a burden?
- 4(a). What risks are faced by smallholder livestock farmers to their production?
- 4(b). How do intensifying smallholder livestock farmers mitigate against risk?

1.4.3 Overview of the Study Location and Sampling

Location

As a study conducted with the ZooLink project, it focuses on Busia County in western Kenya, specifically on the sub-counties of Teso South, Matayos, Nambale, and Samia. 78% of the labour force in Busia is employed in the agricultural sector, which contributes approximately 50% of household incomes (MoALF, 2016). Some 64% of the population in Busia lives below the poverty line and 54% are food insecure, with 34% of children being stunted, and an additional 3% being wasted (*ibid*). Busia county has the highest human and animal population densities in East Africa, with 83% of people engaging with livestock production (Kemp *et al.*, 2021), making it an ideal area for this Ph.D. study, considering livestock intensification from a household level financial and livelihood stand point.

Sample

18 participants were selected from homesteads for the study, with 3 dropping out during the study period. These 18 participants were selected for their desire to intensify their production, and the variety in their levels of intensification. The participants selected were all members of the Luo tribe, due to their being the only homogenous tribe residing across the whole of Busia County.

1.4.4 Overview of the Study Methodology

This study makes use of the Financial Diaries methodology, a mixed method methodology utilised by studies looking into the financial lives of the poor around the world. With a longitudinal study design, involving a panel of participants, the methodology makes use of cash flow statements and balance sheets as its foundation, supplemented with topic specific ‘add-on modules’- cross sectional surveys that can delve deeper into topics of particular interest. The cash flow statements and balance sheets are enhanced by being delivered as interviews, allowing for a wealth of information relating to participant livelihoods to be uncovered.

1.5 Structure of the Thesis

The following chapters of this thesis will begin with a literature review (chapter 2), in which I will consider smallholder livelihoods more generally, before focusing on the primary topics of this thesis, livestock intensification and financial risk taking.

The methodology will then follow in chapter 3, in which I will detail the Financial Diaries methodology, and the individual methods that have been utilised in this study, and ending with a breakdown of the analysis that was used for each of the following chapters of the study.

Chapter 4 marks the beginning of the results chapters, and will consist of an overview of the background data collected for the participants, including looking at land holding, household demographics, and livestock populations. This will act as a background for the results chapters to follow.

The main results and discussions begin with chapter 5. This chapter focuses on understanding the participants overall livelihoods: their incomes profiles and expenditure needs. This gives an understanding of how livestock fits into the

participants livelihoods financially, and answers the research questions 1(a)-1(b). Whilst all the participants have highly diversified income portfolios, there are a few core income sources utilised by all the participants in some combination, though these are not always the largest source of income. They also frequently share in expenditure needs, such as food, healthcare, and agricultural inputs. This chapter details these income and expenditure sources.

Chapter 6 will then focus on the topic of finance, looking at the overarching themes that attract and detract the participants from using particular providers, allowing for a deeper understanding of the factors that should be considered when creating products and services to assist smallholder farmers with the process of intensification, and answering research questions 2(a)-2(b). The chapter shows how the participants are drawn to those providers in which they can easily access their money and services, which provide a sense of community, in which their money can grow through shares and dividends, and that they perceive as trustworthy, whilst being detracted by those which are not deemed as trustworthy, that do not allow for small transactions, that they do not understand, and which have the potential to cause disagreements with their peers.

Chapter 7 will introduce the topic of livestock intensification, looking at how the participants, all of whom wish to intensify their production, go about livestock production: which animals and breeds they keep, whether they are zero-grazing, free range, or somewhere in between, what they are fed, and whether additional labour is hired to assist with the animal care. This chapter answers research questions 3(a)-3(c). This will give an insight into how the participants invest in inputs for their livestock, and give an understanding of the process of livestock intensification. With livestock intensification often heralded as a way to both meet the increasing demand for livestock products for consumption whilst increasing the incomes of poor people and improving livelihoods, this chapter will analyse whether livestock production and attempted livestock intensification is proving profitable for the participants, or whether livestock production constitutes just another financial burden.

Chapter 8 then considers the risks faced in livestock production, looking at which risks the participants have faced in the past, which they consider to be most likely to occur in the future, and how they mitigate these, answering research questions 4(a)-4(b). The

CHAPTER I: INTRODUCTION

chapter shows how there are particular risks that are commonly faced by the participants, and which they consider most likely to occur in the future. The top 3 risks for both are livestock death due to disease, drought, and increased cost of inputs. The chapter also shows how mitigation strategies are limited, often involving strategies such as keeping a close eye on livestock, and ensuring shelters are secured. However, often there are no strategies the participants use to mitigate against risk.

Chapter 9 is the concluding chapter of this thesis. It provides a summary of the overall findings of the study, of livestock intensification and financial risk taking, and factors that impact on this. With heavy competition for the often limited and lumpy incomes between health care, education, and agriculture, I will consider how the desire to finance livestock production is hindered by the uncertainties presented by other aspects of their lives, and how this affects the livestock production. The chapter ends with an outline of recommendations and areas for further research that have come to light.

CHAPTER II: LIVESTOCK INTENSIFICATION AND FINANCIAL RISK TAKING: CONCEPTS AND LITERATURE REVIEW

2.1 Livestock Production in Kenya

A growing population and changing diets have resulted in the need to increase the country's food security and food sovereignty. A net food importer at present (Kamau, 2018), Kenya's economy is still highly reliant on its agricultural production, accounting for 25% of GDP directly, and another 27% indirectly (Kenya Markets Trust, 2019).

Livestock itself plays a significant role in the agricultural economy, accounting for 42% of total agricultural output (Otieno, Hubbard and Ruto, 2012), accounting for 12% of national GDP (Kenya Markets Trust, 2019), and around 65% of the total population owning livestock (Kenya National Bureau of Statistics, 2014; Thumbi *et al.*, 2015). Smallholder farmers in Kenya represent a significant proportion of the counties poor, as well as the primary workforce behind Kenya's agricultural production, accounting for 75% of agricultural output, and 70% of marketed agricultural produce (Kuyiah *et al.*, 2006).

2.1.1 The Role of Livestock to Smallholder Farmers

Livestock is often kept in Kenya in small backyard systems, which are often inefficient and resource poor. Livestock keeping in Kenya has often been, and in many cases still is, subsistence based, kept for an array of reasons including nutrition, drought insurance, draft power for crop production, and cultural/social uses such as dowries and traditional ceremonies (Bettencourt, Tilman, Narciso, da Silva Carvalho, & de Sousa Henriques, 2015; FAO, 2018; GoK, 2008; Kristjanson, Krishna, Radeny, & Nindo, 2004). Livestock are often kept in mixed crop-livestock systems, whose production they complement by providing manure, draught power, and transport (Powell, Pearson, & Hopkins, 1998).

Smallholder farmers are ideally situated to become the drivers to meet the country's growing demand for animal source foods, due to the frequency with which they already own livestock at their homes, and the role they already play in meeting current

demands for livestock products. However, there has long been concerns around the ability of smallholder farmers to maximise their production potentials through increasing yields, even outside of conversations relating to intensification, and concerns of the impact this intensification may have are abound. Livestock production plays a valuable role in both the national economy of Kenya, as well as having a range of benefits to the farmers themselves. Livestock can bring both tangible and intangible benefits to farmers, with this multifunctionality making them a key component to many livelihoods. Tangible benefits of livestock include the income or meat, milk, and eggs for consumption and thus nutrition that they provide. Intangible benefits include their ability to act as a credit buffer, as they can be sold to provide an interest free source of finance, or acting as an insurance policy as they can be sold during emergencies.

One benefit that can be gained from livestock production at the household level is increased food security and nutrition. Livestock is linked to improved nutrition through a number of pathways, including consumption of animal source foods, income generation, women's empowerment, and livestock contribution to crop production through draft power and fertiliser production (Smith *et al.*, 2013; FAO, 2020). However, livestock can also lead to higher nutritional demands due to increased labour, with various levels of increase depending on the production system utilised (*ibid*). For instance, free-range poultry systems are less physically demanding than zero-grazing dairy cattle systems. Zoonotic disease transmission can also have a negative impact on nutritional gains from livestock production by impacting nutrient absorption or causing nutrient loss through diarrhoea. For example, dietary exposure to mycotoxins have been found to be a likely contributing factor to child stunting (Smith *et al.*, 2015; Trevino *et al.*, 2022). Diseases within animals can also negatively impact on their productivity, thus impacting on the availability of animal source foods for consumption, and the income generating ability of the livestock (FAO, 2020).

Livestock production can also serve a social function for farmers in Kenya. Bridewealth is a social dimension of livestock keeping that has received particular attention within the literature. The nature of bridewealth differs between the different cultural groups in Kenya (Hakansson, 1994; Borgerhoff Mulder, 1995; Price, 1996; Ohta, 2007), though often involves the giving of cattle from the groom and his family

to the family of the wife, with the ability to accumulate sufficient bride wealth having the ability to dictate the age at which a man can marry (Sharma, 2021). For some societies, bridewealth payments can be extremely high, such as for the Turkana in north-western Kenya, who transfer the highest number of livestock as bridewealth payments recorded in Africa, which can be as high as two-thirds of the property owned by the grooms family (Ohta, 2007). As well as their use for bridewealth, livestock can play a role in indicating social status, demonstrate wealth, be used in cultural ceremonies, enable the feeding of guests, strengthen social connections through the loaning of livestock to start new herds or provide others with animal traction, and enable social links in crises, especially in pastoral societies (Ouma, Obare and Staal, 2003; Mutsotso and Kimaiyo, 2014; Dumas *et al.*, 2017).

Livestock can also contribute to gender balance, due to the gendered nature of livestock production. With regards to this, ILRI (2008) state:

“Poverty has a woman’s face. Women do two-thirds of the world’s work and produce half the world’s food yet earn only a tenth of the world’s income and own less than a hundredth of the world’s property. Of the 600 million poor livestock keepers in the world, around two-thirds are women”.

Livestock care duties often fall onto the shoulders of women, however gendered socio-cultural norms often limit their participation in livestock production decision-making, livestock ownership, control of livestock incomes, and consumption of animal sourced foods, and thus the benefits of livestock production may disproportionately be gained by men (Dumas *et al.*, 2017). In a study of pastoralist livestock holdings, Gitungwa *et al.* (2021) find female controlled livestock holdings have been positively related to food security and greater dietary diversity, whilst male controlled livestock holdings were not found to be related to food security. Poultry production in particular offers women the opportunity to own livestock and reap the benefits from small-scale indigenous chicken production (Moyo and Swanepoel, 2010). Women are generally considered to be time limited, with a large number of household responsibilities (Hyde, Greene and Darmstadt, 2020), and with larger livestock tending to be time and labour

intensive, as well as being more valuable and thus requiring a higher initial investment, chickens offer a low effort and low cost option for women (Dumas *et al.*, 2017).

The direct economic benefits of owning livestock include the role as a risk buffer, income generator, and savings system. Livestock are able to act as a buffer against risk in mixed crop-livestock systems, representing a saleable or consumable asset should crops fail, or should insecure off-farm income activities fail, with smaller livestock such as sheep, goats, and poultry having advantages over larger livestock here due to being more convenient in terms of sale or consumption (Upton, 2004). Related to the role of livestock as a risk management strategy, they are a source of income, through either the sale of animals or of milk and eggs (Ouma, Obare and Staal, 2003). In a study of small ruminant production in pastoral/extensive production systems, it was found that the sale of small ruminants was particularly valuable when it came to meeting educational and food expenditures, with sale income spent on school fees (32%), food (22%), farm investment (18%), medical expenses (10%), off-farm investment (9%), social activities (5%), and restocking (4%) (Kosgey *et al.*, 2008). Finally, as an easily liquidatable asset, the purchase of livestock allows their cash value to be saved, particularly useful in areas where access to savings products is limited (Pell, Kristjanson and Stroebel, 2010).

Livestock in mixed crop-livestock systems are able to contribute to crop production through the creation of manure and provision of draught power, the contribution of which to more sustainable and efficient crop production cannot be overstated (Herrero *et al.*, 2010). The use of manure improves soil fertility, soil structure, and water-holding capacity of soils (Moyo and Swanepoel, 2010), whilst a lack of mechanisation within smallholder farming systems (just 10% of global agricultural land is managed this way), has resulted in low yields and efficiency due to 65% of global agricultural land being managed manually (FAO, 2013). However, the remaining land is managed through draught power (the use of an animal to draw carts, plow etc), which whilst not as productive as mechanisation, provides an improvement to manual management (*ibid*).

2.1.2 Livestock Production Systems in Kenya

Livestock production systems vary in their classification between the different forms of livestock. The below classifications are those utilised by this study to understand the production systems of the participants.

Cattle

The 2019 FAO report ‘The Future of Livestock in Kenya: Opportunities and Challenges in the Face of Uncertainty’ (FAO, 2019) has detailed the production systems for cattle and poultry in Kenya. With a total of 31% of homesteads in Kenya owning cattle (FAO, 2017a), cattle production varies between beef and dairy production. Beef cattle number significantly more than dairy cattle, accounting for 76% and 24% of cattle respectively (FAO, 2019). Dairy production is concentrated in the Rift Valley and Western Kenya, high potential agro-ecological zones where fodder and pasture are available, whereas beef production is often produced in the arid and semi-arid areas (ASAL).

FAO (2019) list beef production systems in Kenya as:

- Pastoral

A low input low output system practiced in arid and semi-arid areas. Characterised by the keeping of indigenous breeds grazed on communal lands. Herds tend to range from around 20 head to hundreds, and produce milk and meat.

- Agro-pastoral

Practiced in semi-arid areas where cattle both graze and are fed on crop residues and by-products from mixed crop-livestock systems. Cattle provides manure and draught power to increase crop productivity. Cattle provide milk and meat in this system.

- Ranching

A large-scale commercial system with an average of 1,000 head of cattle. Ranches tend to have the infrastructure for disease control, feeding and water storage. The main product here is beef for both local and export markets.

- Feedlots

A capital-intensive commercial system where cattle are kept for a short period of time (around 3-6 months) when they are fattened before being sold to local and export markets.

Dairy production systems differ from beef production systems. FAO (2019) list dairy production systems as:

- Intensive dairy

Exotic (grade) cattle are stall-fed on high quality feed, concentrates and supplements. 85% of intensive dairy systems in Kenya keep between 5-15 cows. These production systems tend to be located in mid to high altitude agro-ecological zones.

- Semi-intensive dairy

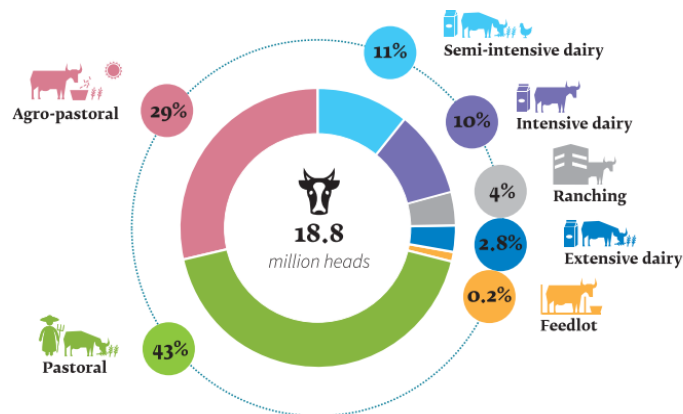
Typically consist of between 3-20 head of cattle, which are part of a wider diversity of animals including ruminants and poultry. Cattle tend to graze during the day, and are provided with some feed supplements, especially when in milk.

- Extensive dairy

A pasture-based system where between 20-200 cattle are grazed on natural and improved pasture. Cattle are provided with hay and mineral supplementation during dry periods.

As seen in **Error! Reference source not found.**, the most common cattle production system in Kenya is the pastoral system, accounting for 43% of production. This mixed meat and milk production is an extensive system, which accounts for 41% of total household income for those who utilise this system. The second most common system is the semi-intensive agro-pastoral system, accounting for 43% of total household incomes. Semi-intensive production is also the most common dairy system in Kenya, accounting for 11% of total production, 46.2% of dairy production, and accounting for 48% of total household incomes.

Figure 1: Frequency of Different Cattle Production Systems in Kenya



Poultry

Poultry production, like dairy production, has been categorised into three production systems: intensive, semi-intensive, and extensive. 47% of all Kenyan households own chicken (FAO, 2017a). This rises to 75% of all rural households, and 96% of households in Nyanza and Western regions (FAO, 2019). FAO (2019) lists these production systems as:

- Intensive

This is a market-oriented system typically practiced in the urban and peri-urban areas around Nairobi, Mombasa, Nakuru, and Kisumu. Exotic (grade) chickens are raised confined in large shelters, and are properly fed and vaccinated.

- Semi-intensive

In this system improved chickens are housed in shelters at night, and allowed to graze during the day, and provided with some feed supplementation and vaccination against major diseases. The majority of chickens are sold after around 4-6 months and some consumption of chicken by the households may occur.

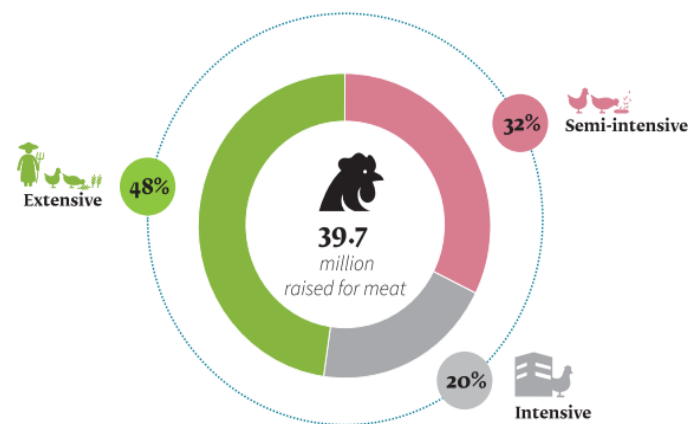
- Extensive

A low input and low output system where indigenous (local) birds are left to roam, are rarely vaccinated, or treated when sick. Women and children are often responsible for these chickens, which are kept largely for egg production, and may be sold

opportunistically in informal markets. This system is most common in Western Kenya, some parts of lower Eastern, North Rift Valley, and coastal areas.

Across Kenya the most common system, as seen in **Error! Reference source not found.**, is extensive production, which accounts for 36% of total household income for those in these systems. Semi-intensive production follows, and accounts for 44% of total incomes, with intensive production being the least common at 20%, though accounts for 63% of total income for households using this system.

Figure 2: Frequency of Different Poultry Production Systems in Kenya



Pigs

The pig sector in Kenya is relatively small and undeveloped, with a low populations in Kenya relative to other forms of livestock. Western Kenya has the second largest pig population (87,838), only slightly less than the highest population in Central Kenya (91,977) (FAO, 2012). Within the same report on the state of the pig sector in Kenya, FAO (2012) have categorised pig production into three systems:

- Industrial/Integrated production

Only one company in Kenya is involved in this highly intensive system, Farmer's Choice, the largest pig farm in the country with between 25,000-30,000 pigs. The farm comprises 65 Large White/Landrace/Duroc crossbreeding boars and 2,500 sows, which are used to breed the stock for their production.

- Intermediate (commercial) systems

These are medium-sized intensive farms which may own their own slaughter slabs and sell meat from their own butcheries, or sell pigs for slaughter. Breeding stock is purchased from government institutions such as the Agricultural Development Corporation (ADC) and Kenya Agricultural Research Institute (KARI), from Farmer Choice, or from other commercial farms. Commercial feed tends to be used, with some intermediate producers owning factories to produce their own feed. Others buy raw materials for home-made feed rations.

- Scavenging and backyard systems

Within this system there are a number of free range and scavenging styles, as detailed by (FAO, 2012). The first is the free-range system which is often found in slum areas. The owners of these pigs do not own land, and the pigs rely on refuse found in the area, such as kitchen leftovers and spoiled foods from markets. These pigs are then usually sold at low prices. This is a low investment system. Another free-range system involves the pigs being left to scavenge during the day or night, and housed in a shelter and fed with kitchen leftovers and water for the remaining time. This system tends to occur outside of these high human density areas where the systems had resulted in a number of conflicts in the past. An example provided by the FAO (2012) report tells of pigs wandering into crop land neighbouring a prison in Nakuru. The police confiscate these pigs, with local people rarely claiming them. These pigs are then fed to the prisoners. These free-range systems lack bio-security measures, and thus pose a high disease risk.

Another free-range system popular in Western and Nyanza regions involves the tethering of pigs on the homestead during the plant growing season, and their release to roam during harvest and post-harvest (*ibid*). These pigs are not provided with a shelter, and feed on pasture, kitchen leftovers, and crop by-products. They tend to be low weight pigs due to frequent underfeeding.

Small Ruminants

Goats and sheep are some of the more populous livestock in Kenya, with a total of 28 million goats, and 18 million sheep, and 24% and 14% of total households in Kenya for those owing goat and sheep respectively (FAO, 2017a). Much less is available in

the literature detailing small ruminant production systems in Kenya, though suggestions have been made which include the following four categories:

- Smallholder Mixed Crop-Livestock Production Systems

Mixed crop-livestock farmers in Kenya, those farms in which crop and livestock are grown and raised alongside each other, are an agricultural production system within which small ruminants are often kept in small numbers (Kosgey *et al.*, 2008). Small ruminant production in this system is characterised by small land holdings, low input use, and a focus on subsistence, rather than commercialisation and profitability (Muigai, Okeyo and Ojango, 2017). Goats here are often fed on crop residues, cultivated forage, and graze on bushes and shrubs. They are tethered or herded during cropping seasons so not to damage crops (*ibid*).

- Extensive Pastoral and Transhumance Systems

These production systems occur in the arid and semi-arid areas of Kenya, where pastoralists practice communal land systems on which small ruminants are grazed and herded (AU-IBAR, 2014), with typically large herds of local breeds (Opiyo *et al.*, 2015; Muigai, Okeyo and Ojango, 2017). Within the transhumance system the herds are more sedentary and feed on crop land after harvests (Namgay *et al.*, 2013). Small ruminants within this systems are affected by inadequate feed, disease, and environmental challenges such as drought and flooding (Fantahun, Alemayehu and Abegaz, 2016).

- Large Scale Commercial Ranching Systems

Large commercial ranching systems are owned by individuals, government, and private organisations, with small ruminants fed on pasture, fodder, and occasionally commercial supplements (Muigai, Okeyo and Ojango, 2017). These typically crossbred small ruminants are housed within shelters but allowed to graze freely (AU-IBAR, 2014).

- Smallholder Intensive Systems

Small ruminants in this system are housed in shelters on relatively small parcels of land with typical intensive and semi-intensive management practices (such as with

regard to the purchase of inputs), with farmers usually keeping grade (exotic) and cross breeds (Muigai, Okeyo and Ojango, 2017).

2.2 The Luo and Their Livestock

2.2.1 The Role of Livestock in Livelihoods and Culture

The domestication of livestock in Kenya has been traced back to around 4,500-5,000 years ago, after Saharan herders are thought to have migrated south from the Sahara with its once wet and highly vegetated land, down to the Sahel as the climate changed and the land began to dry out 7,000-8,000 years ago (M'Mbogori, 2017). It is thought these Cushitic speaking herders arrived in Kenya in the north, with several archaeological sites finding clear evidence of domestic cattle remains (Grillo and Hildebrand, 2013).

The Luo people and their ancestors have had a varying relationship with livestock. After the slow migration east into the Bahr-el-Ghazal region, bringing with them west African agricultural practices and crops, this small group of Luo ancestors adopted pastoralism at some time between 1,000BC-0AD (Collins, 2006). Here they built their settlements on high ground to avoid flooding, and left the vast grasslands available for the grazing of cattle, moving their herds to the river flood-plains during dry season, which additionally provided the opportunity for fishing (Ogot, 1967).

This pastoralism continued during the southward migrations of many of the groups as they searched for water and pasture. Various migrations of these Luo ancestors occurred, centred in modern Uganda. The lingering pastoralism of the Padhola, from which many of the Kenyan Luo are descended, influenced the location of their settlement in Bukedi district near Tororo in eastern Uganda. Ogot (1967) describes how the high altitude, heavy forest cover, and tsetse fly infection in some of the areas around Bukedi district, which extends to the foothills of Mt. Elgon straddling the modern Kenya/Uganda border, would have been a stark contrast from the low, scrubby woodland to which they had become accustomed, and unsuitable for cattle. The western area was that of primary settlement, being that with the lowest altitude, highest soil fertility, and thickest forest cover.

This focus on pastoralism remained well into the Luo migration into western Kenya, though over time shifted towards an increasing focus on crop agriculture. This is thought to have been due to natural disasters such as disease outbreaks, including the Rinderpest epidemic in the 1890s (Ndeda, 2019), and the restrictions of movement of the Luo due to the freezing of borders under colonial rule, and the resulting land pressures (Ogot, 1967).

The mixed crop-livestock systems that these people had developed was vital for food security; livestock was an important food source for when crops failed. As a result, livestock surpluses were rarely sold (Ochieng', 1988). The agricultural factors of production and livestock were family owned, with production focusing on subsistence rather than accumulation (Ndege, 2009).

Livestock also play a large role in the culture of the Luo people both in the past and present. In his detailed description of the Luo culture in the early colonial period, Northcote (1907) describes how whilst livestock were not a significant component of the food consumed, though the drawing of blood from living cattle for drinking was common, livestock played a significant role in cultural traditions. In inheritance, a husband was to have allocated some of his cattle herd to each of his wives, the cattle and the wife would then be passed down in ownership to her sons upon the husband's death. Should he have had no sons, all property, including his wife and children, were passed onto his brother or nearest male heir. Livestock also played an important role in marriage ceremonies. Once a man had chosen a wife, and after his father had met with the prospective bride's family to arrange the dowry, the husband attended a feast with the bride's family, taking with him a bull or goats as a gift. The feast included the making of an offering to the sun-God, consisting of meat and chicken amongst other food. The dowry, negotiated between the families of the betrothed typically included cattle and goats, and was said to have involved a larger number of animals prior to the Rinderpest epidemic than it did afterwards. Livestock also played a role in funerals. Upon a death, the men partaking in the funeral ceremony attended the deceased's village, bringing with them their best bull, which was used for the tradition of charging through the village whilst holding onto the bull's tail. At the final burial, chicken was amongst the offerings to be placed on the grave.

Livestock were also an important tradeable commodity for the Luo. Frequent droughts affected crop production, with the Luo producing less grain than neighbouring Gusii (also known as the Kisii) tribe in the east, and possibly the Teso to the north of Busia, who were known as being exceptional cultivators. Livestock could be traded for grains from neighbouring communities in times of need (Hakansson, 1994).

2.2.2 The Impact of Colonial Rule

During colonialization, the British administration implemented a number of policies which lead to great social change and the introduction of a monetary economy, with the aim of protecting settler interests and boosting British global power during the industrial revolution and beyond (Kipsang, 2004; Parsons, 2011).

British interest in East Africa came in the form of economic, religious, philanthropic, strategic, and political need at the turn of the century. Raw materials were required to maintain Britain as the global leader in the provision of manufactured goods and investment capital, the agricultural potential of the lands provided an another opportunity to provide agricultural outputs and an alternative site to European settlement, the missionary movement of the 1880's put pressure on Britain to spread the word of Christianity, and the opening of the Suez Canal in Egypt meant control of the source of the Nile in Uganda was of strategic and economic importance due to Egyptian control of British trade to the far east through the canal, with Kenya being situated between the already well established port of Mombasa and Uganda (Wolff, 1974).

The financial difficulties of the Imperial British East Africa Company (IBEAC), and subsequently the British Foreign Office, and the colonial ambition of the creation of the railway from Mombasa to Lake Victoria resulted in the colonial administration raising the tax burden of Kenyans, whilst also encouraging settler populations to the area to provide taxable and tradable goods. In the early years, much of the cost of the Kenyan administration was covered by grants-in-aid from the British government, something highly unpopular among the British taxpayers. Settlers from Britain, South Africa, Canada, and New Zealand, among others moved to Kenya, and many set up substantial farms, dealing in tea, coffee, and cattle ranches (Kipsang, 2004).

The need to make the Kenyan colony financially profitable, able to cover the costs of its own administration, meant that native Kenyans would be required to join the waged labour force, allowing them to be taxed (Elkins, 2005). This resulted in the implementation of the hut and poll tax, and a system of waged labour. Collected in rupees, the dominant currency in use in Kenya at the time, a hut tax of 1 rupee per year was introduced first at the coast in 1901, raised to 2 rupees per year in 1902, and was then spread in implementation across the districts at these same rates (Clayton and Savage, 1974). Punishment for tax default was for the hut to be burned down, imprisonment, and/or death (Karari, 2018).

This introduction of taxation occurred at the same time as the Kenya-Uganda border was redrafted, and the area that is now western Kenya was released from Uganda to become part of Kenya. Here taxation had already been implemented at a rate of 3 rupees, which was extended to Kisumu and Naivasha provinces in 1903 (Gardner, 2010). Whilst payment was initially allowed in-kind, in 1904-1905 pressure from the settler population to enforce payment in coin resulted in the increased need for Kenyan's to engage in wage labour, particularly on settler farms. This not only met the need for taxation in cash, but also benefitted the settlers in the forcing of the population to work as labour on their farms.

The colonial administration also enforced ethnic geographies within Kenya through the creation of 'native reserves'. These reserves forced people of the same ethnic group to reside within a territory owned by the tribe, deemed to be their 'tribal homelands', in areas typically having lower quality soils, so reducing the crop yields of the native Kenyans, reducing their land rights and again forcing them into low wage labour (Parsons, 2011; Austin, 2016; Fibaek and Green, 2019). It was illegal for a member of one ethnic group to settle or own land outside of their own tribal reserve, creating a divide between the ethnic groups. In time, to combat the problems of overpopulation within some reserves, a system was created to allow members of one tribe to relocate into the land of another, so long as they 'converted' to the host tribe (Parsons, 2011). As a result of this overpopulation, some farms managed to intensify their production, increasing yields on ever dwindling land holdings in a rather Boserupian fashion (referring to the theory of intensification due to population pressure posed by Ester Boserup) (Boserup, 1965). However, for many this only lead to reduced yields and

increased land degradation, making subsistence more difficult (Fibaek and Green, 2019).

Whilst many relate the above with negative impacts to Kenyans, more recent research has suggested that this labour on settler farms may have resulted in more highly commercialised agriculture and more diversified livelihoods back in the reserves, particularly those which were more heavily utilised for labour, due to the seasonality of agriculture and the deeper integration of farmers into the cash economy (Fibaek and Green, 2019).

Further impacting still on migration, the amended Native Authority Ordinance of 1919 established a system of compulsory recruitment in Kenya, the implementation of which was devolved to appointed chiefs. This ordinance required the chiefs to enlist their citizens for paid labour in government works, such as road construction, for a maximum of 60 days per year.

2.3 Livestock Production in Kenya: A Political Context

A range of laws exist in Kenya relating to livestock production. However, this system is often characterised by dysfunctionalities and anti-poor biases which date back to the colonial rule in Kenya (Mcsherry and Brass, 2007). The pre-independence regime in Kenya systematically neglected arid and semi-arid lands (ASAL) in the country, which created regional disparities in educational development, civil service administration, and infrastructure.

The first livestock policies developed in Kenya came in the 1920's. Policy from then into the 1940's focused on the control of livestock disease, which posed a considerable threat to the colonial interest, both in meeting colonial needs directly, and ensuring Kenyans would be able to pay their taxes (Conelly, 1980).

The lack of focus on ASALs in Kenya policies was continued in the post-independence regime through the Sessional Paper No. 10 in 1965 on 'African Socialism and its Application to Planning in Kenya'. In this paper it is stated that:

“One of our problems is to decide how much priority we should give in investing in less developed provinces. To make the economy as a whole

grow as fast as possible, development money should be invested where it will yield the largest increase in output. This approach will clearly favour the development of areas having abundant natural resources, good land and rainfall, transport and power facilities, and people receptive to and active in development. A million pounds invested in one area may raise net output by £20,000 while its use in another may yield an increase of £100,000. This is a clear case in which investment in the second area is the wise decision because the country is £80,000 per annum better off by so doing and is therefore in a position to aid the first area by making grants or subsidized loans.” (GoK, 1965, p.46-47)

Policy therefore benefitted the settler population with regard to agriculture significantly. It was the mid-1980's when political liberalisation led to important changes in the direction taken by livestock policy. In their political economy analysis of livestock production in Kenya, Kenya Markets Trust (2019) state that this liberalisation resulted in a number of changes. Firstly, is the privatisation of veterinary services, which resulted in the removal of subsidies for veterinary services and artificial insemination, and lead to prohibitive prices for the majority of livestock producers. Secondly, the privatisation of the meat industry and the creation of the Kenya Meat Commission (KMC) to provide welfare services to pastoralists. However, this was hampered by poor management, and the commissions competing goals of profitability, equity, and welfare services remain today. The liberalisation of the meat industry also resulted in the privatisation of quarantine facilities, and the lack of ability to police these quarantines ultimately lead to the closing of export markets, particularly within Europe and the Arabian Peninsula. Whilst in 2006 the KMC and other exporters were granted rights to export products to Saudi Arabia, the outbreak of Rift Valley Fever (RVF) at the time prevented this market from opening.

Livestock production in Kenya is a devolved function. The 2010 constitution of Kenya created a two-tier system with devolved units (Kashindi, 2020). Whilst national government has authority over economic planning and policy in the agricultural sector (as with all sectors), local governments are responsible for animal husbandry, livestock sale yards, abattoirs and disease control and management (Kenya Markets Trust, 2019).

The transformation of the livestock sector from a subsistence to a commercial enterprise is the aim of the National Livestock Policy (State Department for Livestock, 2019), which guides the livestock sector to meet the goals of other government strategies such as Vision 2030 and the Big Four Agenda. Acknowledging the importance of livestock production to livelihoods and food security both within ASALs, where livestock are the primary source of livelihoods, and in non-ASAL areas, the policy provides strategies relating to breeding, feed and nutrition, livestock disease control and management, financial services, public health, extension, and research services, whilst considering concerns of social inclusivity.

2.4 Risk in Livestock Production and Intensification

2.4.1 An Overview of Intensification

Borne from the growing global food demand, and the need to maintain food security both now and in the future in the face of climate change and environmentally damaging agricultural practices, the sustainable intensification (SI) approach has provided a way in which food production can be increased on existing farmland in ways that cause less environmental pressure, and therefore secure production capacity in the future.

Having attracted criticism within the literature due to the apparent narrow focus on production and contradiction of terms, Garnett *et al.* (2013) have defined four underpinning premises that underline SI:

- i. The need to increase production, not only through supply side production increases, but also through the moderation of demand side factors such as the demand for meat and dairy, reducing food waste, and developing systems of governance to improve the efficiency and resilience of the food system.
- ii. Increased production must be achieved through higher yields, rather than extending existing agricultural land, because this extension of land would come with serious environmental costs. With much of the land suitable for agriculture currently in the form of wetlands, forests and grasslands, its conversion to agricultural land would result in an increase in greenhouse gas (GHG) emissions, and a loss of biodiversity and ecosystem services.
- iii. Food security requires equal attention as environmental sustainability and raising productivity. Rather than a ‘business as usual’ approach to production

with marginal improvements to sustainability, SI requires a radical rethinking of production to ensure major reductions in environmental impacts.

- iv. SI is a goal, though no priori of how it should be achieved is stated. Whether through high-tech agro-ecological approaches or organic, the appropriate way forward should be tested whilst considering the biophysical and social contexts of the area, to develop context-dependant SI strategies.

Sustainability is defined in the Brundtland Report simply as the ability to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (WCED, 1987). With livestock production contributing significantly to global greenhouse gas (GHG) emissions, responsible for approximately 15% of total emissions globally, and therefore a key contributor to climate change (Gerber *et al.*, 2013), as well as utilising, directly and indirectly, 70% of global agricultural land (30% of the ice-free terrestrial surface of the planet) (FAO, 2006), there is a great need to focus efforts for intensifying production sustainably.

Within livestock production there is often considered to be a 'livestock ladder', the idea that by starting with low value livestock, often poultry, profits can be utilised to purchase more valuable and profitable livestock such as pigs, sheep, or goats, up to cattle (Dolberg, 2003). There has been evidence of livestock keepers achieving this, for instance in the case of beneficiaries of a chicken project supported by the Swedish International Development Corporation Agency (SIDA), who utilised the profits of their chicken sales to purchase goats. It was concluded from this case study that the rearing of small livestock provides the opportunity to rise up the livestock ladder (Botswana Network of People Living with HIV and AIDS, 2010). However, questions have been raised as to whether this simple trajectory of livestock ownership can really be achieved. In a study of agricultural intensification in Rwanda, interviewed farmers were not convinced of the reality of the livestock ladder for numerous reasons, including that the livestock higher up the ladder required larger input investments (including veterinary fees, feed, labour etc), which farmers would struggle to meet, and the need to own land rather than renting a home (Kim, 2017). The length of time farmers saw it taking to rise up the livestock ladder, coupled with the low profits and high costs that would be incurred along the way, and the impact of shocks that would undoubtedly occur during this time, made many question whether using the livestock

ladder method to reach higher profitability livestock would be worth it. One interviewed farmer in the study was quoted as saying:

“I think the idea of livestock ladder is feasible, but considering all the costs that would incur over the long periods of livestock development, it would end up costing the same as buying a cow. I prefer buying a cow now (by taking a loan) instead of going through the trouble of starting from chicken.” (Kim, 2017, p170)

To transition from poultry production, which is typically low-input and low-profit, may seem to logically lead to the production of more profitable livestock. However, the idea of the livestock ladder does not consider the extent of how resource poor low-income smallholder farmers often are. The impact of constrained access to finance and labour availability in particular, as well as the frequency with which shocks are experienced, may have a serious impact on people moving up the ladder.

Intensification of livestock requires the increased use of inputs, something that resource poor individuals struggle with. Often being low income people, smallholder farmers employ a variety of livelihood strategies to make ends meet. Within the Sustainable Rural Livelihoods approach, Scoones (1998) states that rural livelihoods are made through a patchwork of income generating activities involving a combination of agricultural intensification/extensification, livelihood diversification, and migration. Successful intensification may require a combination of natural capital in terms of land and water resources, financial capital for the access to credit and technologies, and possibly even social capital in the form of labour sharing arrangements.

Livelihood diversification has itself received much attention from researchers and policy makers in recent decades due to its expected ability to provide a pathway out of poverty (World Bank, 2008). Livelihood diversification has a number of definitions referring to various levels of economy. In terms of ‘diversification of the rural economy’, this refers to a shift in activities from farm to non-farm, which is associated with the expansion of the rural non-farm economy, which is different, though linked, to the diversification of a household or individual economy, which can refer to the increasing mix or multiplicity of activities regardless of sector (Start, 2001). Non-farm

income accounted for 34% of rural incomes in Africa (excluding Namibia) (Haggblade, Hazell and Reardon, 2010). A number of push and pull variables are said to result in the diversification into non-farm income activities, including higher returns and lower risk (pull variables), and seasonality of farm incomes, risk associated with shocks such as weather related events, market volatility, and credit access (push variables) (Reardon *et al.*, 2007).

A positive relationship has been found between non-farm income and household welfare (Barrett, Clay and Reardon, 2001) as there has between income diversification from farm to non-farm activities and income levels (Barrett, Reardon and Webb, 2001; Canagarajah, Newman and Bhattamishra, 2001; Lanjouw, Quizon and Sparrow, 2001). However, the effect of off-farm income from livelihood diversification on agricultural production has been more difficult to establish, and has had relatively little attention within the literature. Pfeiffer, Alejandro and Taylor (2009) consider this to be due to the difficulty in establishing the directionality of causes and consequences. Off-farm income may lead to income security and available finance for investments in productivity enhancing technologies when access to credit may be limited, or the removal of family labour away from on-farm activities may reduce productivity, especially if income earned from non-farm activities is spent on non-farm investments and consumption. In their study of the impact of off-farm income on agricultural productivity in Mexico, Pfeiffer, Alejandro and Taylor (2009) found that off-farm income had a significant negative impact on agricultural production due to the loss of family labour, an effect so significant that it outweighed the lesser positive effect of increased purchase of inputs.

2.4.2 Negative Impacts of Livestock Intensification

Concerns about the impacts of livestock intensification relate to resulting environmental degradation through land clearing (Barona, Ramankutty and Hyman, 2010), negative impacts to terrestrial and freshwater ecosystems (Beschta *et al.*, 2013; Batchelor *et al.*, 2015), soil pollution (Gerssen-Gondelach *et al.*, 2017), greenhouse gas emissions (Swain *et al.*, 2018), animal welfare concerns (Webster, 1994), and zoonotic disease concerns (Jones *et al.*, 2013).

There is the need then to ensure that livestock intensification is done in a way that is sustainable, to mitigate these risks. Livestock intensification has in some ways been touted as a way in which environmental pressures of livestock can be mitigated, by reducing the number of animals and improving feed quality to improve the yields achieved from each head of livestock (FAO, 2006). However, as previously discussed, some of the additional benefits derived from livestock are not derived from their increased production per head, but rather from quantity. Use in cultural ceremonies; availability of livestock to feed guests; production of manure, draught power, and transport; and use as financial assets would not necessarily benefit from improving production per head.

For those who do wish to intensify production, a vast array of constraints to increasing livestock productivity have previously been found within the literature. These include environmental, resource, and institutional constraints. Environmental constraints relate to the land and climate. Hot and humid conditions such as those of Busia can have the direct ability to lead to heat stress in animals, such as in higher yielding grade (exotic) dairy cattle, resulting in the reduction of their productivity and low cow replacement rates (Moran, 2005; King *et al.*, 2006). Drought and flooding are other particular environmental constraints to livestock production, not only through their impacts on livestock themselves, but also on the availability of water, and subsequently, on availability of feed (Onono, Wieland and Rushton, 2013; FAO, 2017b). Land availability is another major constraint, particularly for those farmers with access to relatively small plots of land, as this limits the quantities of feed such as Napier grass that can be grown on the farm (Zander *et al.*, 2013). This constraint is of great importance when considering livestock intensification, as intensification of smallholder livestock production involves farmers often farming on relatively small plots of less than 2 hectares (World Bank, 2003), and ever shrinking land sizes that come with growing populations can be the cause for the need for intensification in the first place (Fischer *et al.*, 2012; Headey, Dereje and Seyoum, 2014), as was dictated by Boserup's Theory of agricultural intensification (Boserup, 1965).

These environmental constraints then directly impact on resource constraints, particularly that of water and land. A host of resources are required by livestock farmers for production. Labour, finance, feed, veterinary services for animal health,

water, land and genetics are all required (Brown, 2003). Livestock production is labour intensive. Where feed is grown by the household, harvesting must occur, the animals are fed, penned, tethered, grazed, milked, marketed, and their health monitored. The availability of family labour will impact upon the possible herd sizes, and influence which animals are owned. There is also a likelihood that intensifying, and thus adding to the required workload, disproportionately negatively impacts women, due to the gendered nature of the divisions of labour in livestock ownership (Mullins *et al.*, 1996; Tangka, Ouma and Staal, 1998; Okitoi *et al.*, 2007).

To outsource this labour demand, allowing the ability to increase herd sizes, changes this into capital-intensive production (FAO, 2019). Capital, whether from financing or surplus income, is not readily available to smallholder farmers, thus resulting in financial constraints. The 2019 FinAccess survey shows that the most common source of agricultural finance comes from social networks, followed by the sale of assets (CBK, KNBS and FSD Kenya, 2019), with acquired money subject to competing needs of the homestead. With available capital, many other resources which are constrained, such as improved feed and veterinary care, could be sourced at a price (Upton, 2004). However, the lack of capital prevents this.

A lack of available feed, or quality feed, for livestock is a great concern for livestock production in much of the world (Tsegaye and Tolera, 2008; Belay *et al.*, 2013), and growing competition for water and land requires increased efficiencies in the use of these resources (Thornton, 2010). Market volatility and high feed prices can render this a constraint to livestock production even when it is otherwise available (Ayantunde, Fernandez-Rivera and Mccrabb, 2005). Low quality feed can lead to lower yields from lower feed conversion rates (Kategile, Said and Dzwowela, 1985).

Veterinary services are also vital for improving livestock production. Livestock diseases pose a significant threat to production around the world (Rich and Perry, 2011), with sick animals proving less productive, and the risk of death preventing any returns on capital which has already been spent on their upkeep. This also poses a risk from zoonotic and food-borne diseases (Brown, 2003). Free range and scavenging systems of livestock production can pose high levels of risk of zoonotic disease transition. Open defecation was practiced by 9.9% of the national population in 2014,

and of these households, 96% were classified as poor, with open defecation being the most common sanitation method amongst Kenya's poorest (Njuguna, 2019).

And finally, livestock genetics can play a large role in livestock production and intensification. Grade (exotic) breeds may not be suitable in some places where quality feed availability, veterinary care, water, and climate are not sufficient for these breeds to thrive (Brown, 2003). Often instead 'improved local' breeds, or crossbreeds, which have been bred for specific attributes may prove to be the most productive breeds in certain areas.

2.4.3 Outcomes of Livestock Intensification

Investment in different aspects of livestock production, such as feed quality and quantity, housing, or veterinary care, does not produce equal benefits for farmers. Previous research has shown how intensification of some livestock can produce relatively low financial benefits, whilst others offer far greater returns. In Tigray, Ethiopia, models show that vaccinations against New Castle Disease could double the financial benefits of production. However, housing chickens to protect from predators would actually negatively impact this benefit, as it would result in the need for additional feeding and watering, costing both money and time for the farmers (Asgedom, 2007). Intensifying production of small ruminants has been shown to have very little benefit for farmers, largely due to the high levels of labour time required for their care (Budisatria, 2006). It is instead suggested that their primary benefit comes for those with high levels of available family labour where alternative employment opportunities do not exist. Intensifying dairy production has been found to often be limited by quality feed availability, with little difference resulting from free-grazing to zero-grazing farms (Bebe, 2003). In terms of financial benefit, the livestock ladder can again be considered, with the least benefit being derived from poultry, and the most from dairy cattle (Udo *et al.*, 2011).

2.4.4 Risk in Livestock Production

Risk has been defined by Harwood (1999) as:

“the possibility of adversity or loss, and refers to “uncertainty that matters.” Consequently, risk management involves choosing among

alternatives to reduce the effects of risk. It typically requires the evaluation of trade-offs between changes in risk, expected returns, entrepreneurial freedom, and other variables. Understanding risk is a starting point to help producers make good management choices in situations where adversity and loss are possibilities” (p.2)

Hardaker (2000) lists three common interpretations of risk: 1) the chance of a bad outcome, 2) the variability of outcomes, and 3) uncertainty of outcomes. Risk is an inherent part of agricultural production, due to the variable economic and biophysical environment in which farms operate.

There are five overarching sources of risk characterised within agricultural production; market risk, production risk, institutional risk, human risk, and financial risk (Ullah *et al.*, 2016). **Market risks** are those risks which related to the uncertainties of prices, costs, and market access, and may be caused by production risks or institutional risks (Ullah *et al.*, 2016). **Production risks** are those which result from the natural growing processes of crops and livestock, and typically include weather, climate, and pest and disease risks, as well as other yield limiting factors (Komarek, Pinto and Smith, 2020). **Institutional risks** relate to policies and regulation which affect agriculture, as well as from informal institutions such as informal trading partners, producer organisations, and social norms (Harwood, 1999). **Human risks** are those which affect human health and relationships as they affect agriculture. Risks may include ill health, accidents, and death, the consequences of which may impacted by the personal relationships, but also institutional risks, such as land rights in the case of the death of a husband and whether land is passed down to his widow (Kristjanson *et al.*, 2014). Finally, and the focus of this study, **financial risk**, which relates to the way the farm is financed. Farmers may experience fluctuations in interest rates or face cash flow difficulties for farm investment or credit repayments (Harwood, 1999).

D’Alessandro *et al.* (2015) of the World Bank have in their report of the agricultural sector risk assessment of Kenya identified the primary agricultural risks in Kenya. These include the production risks of drought, flooding, frost, other weather-related events such as hailstorms, climate change, crop pests and diseases and livestock pests and diseases, the market risks of crop price fluctuations, livestock price fluctuations,

input price volatility, exchange rate volatility, interest rate volatility, and counterparty and default risks, and the institutional risks of policy risks, instability, conflict and insecurity, and crop and livestock theft.

In relation to livestock in particular, the primary risks in terms of probability and impact in Kenya were found to be severe drought, price volatility, and cattle rustling (D'Alessandro *et al.*, 2015). Whilst disease and floods were found to be important risks, they were of lesser priority than those previously mentioned.

Financial risk, being that related to the financing of the farm, with a particular focus on financing through credit, is of particular interest when considering areas where access to credit is poor.

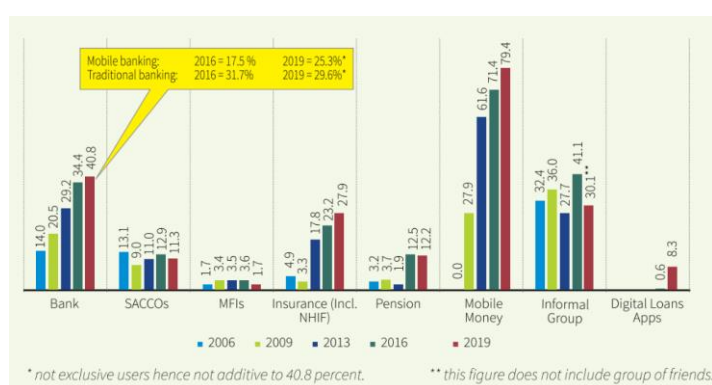
2.5 Access to Finance in Kenya

The formality of financial providers is classified by 5 categories: formal (prudential), formal (non-prudential), formal (registered), informal, and includes the category of financially excluded (CBK, KNBS and FSD Kenya, 2019). Formal (prudential) providers are those prudentially regulated, meaning that these financial providers must control risk and maintain adequate capital to meet the financial commitments it has made to its customers to maintain the health of the financial system (Mwega, 2014; White, 2014). Non-prudentially regulated financial providers then are those that are not bound by this prudential regulation, but by non-prudential regulation and supervision by government ministries or departments with specific legislation (CBK, KNBS and FSD Kenya, 2019). Those financial providers that are only registered are those which legally registered and/or operate through government interventions or oversight (*ibid*). Informal financial providers are those which are not legally registered or regulated, such as informal store credit, community finance groups, and employers (*ibid*). People who are financially excluded are those who lack access to any of the above.

Financial inclusion has been improving in recent years in Kenya, with 43.9% of Kenyans having access to formal prudential financial providers (those regulated and supervised by an independent statutory government agency) such as commercial banks, microfinance banks, and deposit taking Savings and Credit Co-operative's

(SACCO's), up from 15% in 2006, with 11% of the country financially excluded, down from 41.3% in 2006 (CBK, KNBS and FSD Kenya, 2019). The latest FinAccess survey, which occurred in 2019 (CBK, KNBS and FSD Kenya, 2019), found that the 11,000 participants across Kenya are increasing their memberships with formal financial providers, with significant growth in the use of mobile money since the inception of M-Pesa in 2007, with 79.4% of the participants utilising this provider in 2019 (see Figure 3).

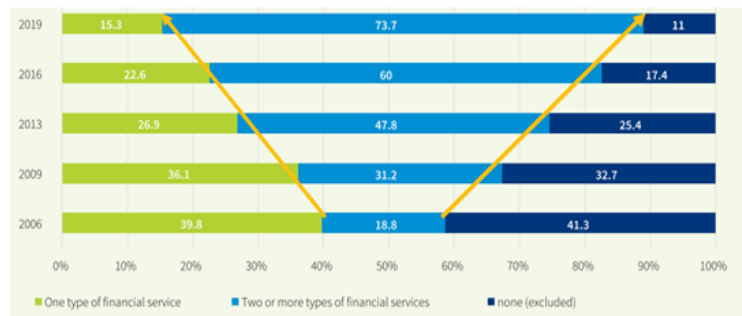
Figure 3: Changing Landscape of Financial Service Providers in 2006-2019 (%)



There has also been a steady rise in those using banks (both mobile banking and traditional banking), insurance, and digital loans. SACCOs, MFIs and informal groups on the other hand have seen a reduction in users since the first FinAccess survey in 2006. There has simultaneously been an increase in the number of participants who utilise two or more financial providers from 18.8% in 2006 to 73.7% in 2019, with an equally large fall in the number of those who are financially excluded (see **Error! Reference source not found.**).

Smallholder farmers require access to finance for the purchase of agricultural inputs and assets, and to assist in the management of shocks. Simply because people hold an account with a formal financial provider does not mean they are benefitting from their services, or even that they understand what is available to them. The 2019 FinAccess survey (CBK, KNBS and FSD Kenya, 2019) found that on average the most common source of agricultural finance for relevant respondents came from their social networks at 22.1%, with this being more common for women (28.7%) than men (14.8%). The second most common source of agricultural finance comes from the sale of livestock,

Figure 4: Number of Financial Providers Utilised by Kenyan's Between 2006-2019



(CBK, KNBS and FSD Kenya, 2019: p.21)

crops, and other assets, with 22.4% of men and 19.3% of women using this as a source of agricultural credit. Men are more likely to use formal savings than women (20.2% and 14.6% respectively), with women more likely to use informal savings than men (12.8% and 8.6% respectively). Men are also more likely to use formal borrowing than women (23.5% and 13.4% respectively), with this accounting for the majority of the sources of agricultural finance for men. Informal borrowing is not a common source for agricultural finance for either men or women, with just 2.8% and 3.9% of respondents accessing this source for agriculture.

With the increasing breadth of available financial providers, we must look at how, and why, smallholder farmers choose to build their financial portfolios in order to be able to provide tailored services that can assist in the intensification and commercialisation of the livestock sector, simultaneously meeting the growing demand for meat and dairy whilst improving farmer livelihoods.

Advancement of agricultural finance is an often-used policy initiative in the aim for improving rural and agricultural development. For decades research has pinpointed poor access to credit as one of the major constraints to increasing farm productivity and decreasing poverty (Freeman, Ehui and Jabbar, 1998; Karanja, Mwangi and Nyakarimi, 2014), due to the need for liquid cash for intensification through purchase of inputs and labour. Formal financial providers are often reluctant to supply credit for agriculture due to the high levels of risk and uncertainty associated with the sector, and this is often thought to result in the lack of available finance required by smallholder farmers. It is therefore also deemed a major reason for the relatively low

level of agricultural commercialisation in developing countries (Freeman, Ehui and Jabbar, 1998).

Access to finance is determined by a range of factors. Higher levels of education reduces demand for informal finance, as with more steady formal employment and higher incomes comes a greater awareness of the benefits of formal providers and the risks of informal providers (Shem, Misati and Njoroge, 2012). Larger household sizes reduce demand for formal financial providers as they are more likely to experience more rapid expenditure requirements, something which benefits from the convenience of informal providers more due to them tending to be less bureaucratic in nature (*ibid*). This also reduces their savings potential. Other factors influencing access to credit and savings include income and age. However, when discussing access to finance for livelihood improvement it is important to consider previous research suggesting that with increased access to credit comes decreased savings (Kibet *et al.*, 2009). Whilst credit is able to provide the lump sums required by smallholders for agricultural requirements or other household needs, it does so at a cost, with interest charged and the threat of farmers incurring severe consequences should they default on a loan.

From the perspective of formal credit providers, smallholder farmers are a risky segment of the population to lend to. Despite a legal requirement in Kenya for banks to dedicate a minimum of 17-20% of their portfolios to the agricultural sector, only 4.04% was allocated here in 2015 (Maloba and Alhassan, 2019).

CHAPTER III: METHODOLOGY

3.1 Background

This study considers the role of livestock in people's lives and livelihoods. A livelihood refers to people, their capabilities, and their means of living, which includes food, income, and assets (Chambers and Conway, 1991). In terms of earning income, previous literature states that rural people in Africa rarely specialise in one activity, such as livestock production, at the exclusion of all other income generating activities. Rather, they diversify their income generating activities. Rural livelihoods have therefore been represented as constructed from portfolios of activities (Unni, 1996; Adams and Mortimore, 1997).

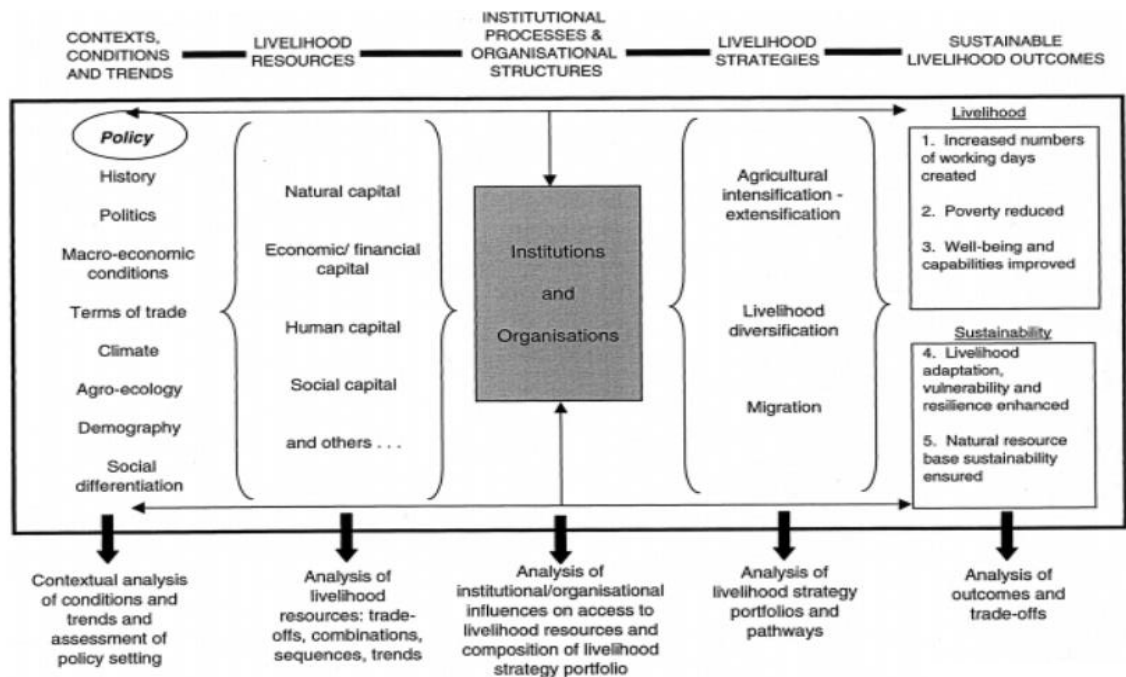
There have been many theories relating to farm household production. Profit-maximising peasant theories were popular in the past. Considering farm households in developing countries as 'poor but efficient', Schultz (1964) understood smallholder production as profit-maximising. However, criticism grew as the theory doesn't consider the existence of trade-offs between profit maximisation and other household needs and goals, or the role of risk and uncertainty in agricultural production systems (Lundahl, 1987). Utility maximisation theories differ in that they consider smallholder households and both families and firms, and so account for consumption and profit simultaneously. The neoclassical farm household model became popular in the 1960's to explain how farm households simultaneously make decisions regarding consumption and production, and assume the households allocate labour according to comparative advantage, that income is pooled, and preferences regarding consumption and leisure are shared between the household members (Koopman, 1991). A third popular theory is that of the risk-averse peasant, which sees farmers as producing under high levels of uncertainty, and are inherently risk averse as they must secure their household needs from current production or risk starvation (Ellis, 1992). Such farmers cannot aim for higher incomes by making risky decisions (Lipton and Longhurst, 1989).

Popular among development agencies, the Sustainable Livelihoods Approach (SLA) outlines the ways in which people build their livelihoods. It is defined as '...the capabilities, assets (including both material and social resources) for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks

and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base' (DFID, 1999).

The development of the SLA can be traced back to the work of Amartya Sen, with his study of famine and entitlements, and introduction of the idea of household capabilities, being defined by 'what people can do or be with their entitlements' (Sen, 1981, 1984). Within the development sector the World Commission on Environment and Development published 'Our Common Future' in 1987, better known as the Brundtland report, which is credited with the shift in focus from market liberalisation to poverty alleviation and the environment. It isn't until 1991 that SLA makes its way firmly into the literature, with Robert Chambers and Gordon Conway's work 'Sustainable Rural Livelihoods: Practical Concepts for the 21st Century' (Chambers and Conway, 1991). In the following years SLA was incorporated into the work of Oxfam, CARE, UNDP, and SID (Solesbury, 2003). The SLA Framework itself was developed in 1998 by Ian Scoones (Scoones, 1998) as is seen in Figure 5.

Figure 5: IDS Sustainable Rural Livelihoods Framework



(Scoones, 1998)

Livestock intensification fits within the livelihood strategies available to rural people, within a highly diversified livelihood. Many forms of capital are involved in the production of livestock. Livestock require land, whether for growing feed crops or

grazing, as well as water (natural capital), access to finance whether it be income, savings or credit (financial capital), knowledge and skills, and the capacity to work (human capital). In addition, social capital in the form of networks and connections (patronage, neighbourhoods, kinship), relations of trust and mutual understanding and support, formal and informal groups, and mechanisms for participation in decision-making, can all benefit production.

The approach sees a households context, livelihood resources, and institutional processes and organisational structure together influencing the livelihood strategies they take.

3.1 Research Methodology

In order to answer the research questions of this study, the methodology to be used needed to be able to delve deeply into the financial lives of the participants. This study is concerned with exploring a range of experiences smallholder livestock farmers have whilst attempting to intensify their livestock production, and understanding the investments and benefits that are derived from livestock production and intensification, and the barriers faced by the farmers. This exploration not only aimed to uncover the underlying, more nuanced aspects of each participants lives, that would best be collected through qualitative research techniques to answer the ‘what’, ‘why’, and ‘how’, but also needed to collect the data of ‘how many’ and economic value that is better collected through quantitative research (Ormston *et al.*, 2014).

In order to understand the financial risks farmers take in intensifying their livestock production, the study needs to establish each farmers financial life in detail. This way, livestock production can be viewed as part of their livelihoods, rather than a standalone component. Livestock income and expenditure, as well as other important factors relating to livestock production, can be analysed against the backdrop of livelihood strategies and competing needs, which may affect their ability to invest in their livestock production. The addition of qualitative data collection allows for an insight into the farmers perceptions, understandings, and experiences of successes and barriers in livestock intensification (Ryan, Coughlan and Cronin, 2013).

The data would also benefit from being collected over a longer period of time, through a longitudinal study design. The benefit of this, over a cross-sectional study design, is

that recall period can be reduced, which would negatively impact the internal validity of the study (Hassan, 2005). When recalling large amounts of data for a longer period of time, participants can shift from summing total individual events to estimating overall totals (Beegle, Carletto and Himelein, 2012). Another benefit of longitudinal data collection over cross-sectional data collection is that cross-sectional data tend to collect data of current circumstances well, but often provide relatively limited retrospective data (Gayle and Lambert, 2018). Longitudinal data collection therefore allows this study to collect detailed data over time that shows the journey the participants take whilst attempting to intensify their production.

Piecing together a methodology in this way positions this study centrally on the scale of the existing literature. Much of the existing literature is highly qualitative, and considers in depth just one aspect of finance, such as anthropological work by the likes of Ardener (1964) detailing rotating credit associations, and Bouman's (1991) studies into the informal finance market. At the other end of the spectrum are the large scale quantitative surveys such as the World Bank's Living Standards Measurement Survey programme, the RAND Family Life surveys, and FinScope surveys which focus on breadth but not depth of data. At both ends of the spectrum these studies tend to be cross-sectional, and are unable to consider the ever-evolving nature of personal finance. These studies often involve the use of long-term recall methods, and a lack of trust by the participants towards the researchers, affecting the responses given about what is often a sensitive topic, finance (Collins *et al.*, 2009).

A methodology that suited the aims and research questions of this study was the Financial Diaries methodology, a mixed-method longitudinal methodology specifically developed to gain insight into the lives of the world's poor. This methodology provides a framework to data collection that includes all the above mentioned considerations, combining quantitative surveys and financial record keeping with interview techniques in particular, for the purpose of understanding people's financial lives in detail.

Earlier Financial Diaries studies were highly ethnographic, based on qualitative data with supplementary quantitative data (Collins *et al.*, 2009). However, as the methodology has developed, it evolved into a positivist approach based on the quantitative data with supplementary qualitative data. Whilst this study uses the

quantitative data as its foundation as a whole, the ways in which data is analysed varies depending on the question being answered. For example, chapter 5 of this thesis, which focuses on how people piece together their livelihood, primarily analyses the quantitative data to understand incomes and expenditures over the study period. However, chapter 6, which focuses on why people choose to utilise particular financial providers and services, primarily relies on qualitative data collected through interviews.

3.1.1 The Financial Diaries Methodology

Devised by Stuart Rutherford (a researcher in microfinance working and living in Bangladesh) and David Hulme (Professor of Development Studies at the University of Manchester), the Financial Diaries methodology was developed in response to the lack of systemic research into the precise methods utilised by the poor to manage their money. Since its development the methodology has been used in studies across the world, including China, India, Kenya, Mexico, Mozambique, Pakistan, Rwanda, South Africa, Tanzania, Uganda, and the United States.

The methodology involves three main elements: initial interviews, diary questionnaires, and add-on modules (for instance see Morduch, 2016). The diary questionnaires are usually implemented over a year, though shortened versions of the methodology have been conducted. The initial interviews are used to gather background information on the household, such as a household roster, incomes sources, and financial instruments, and are often spread across 3 or 4 interviews. The data from these interviews are able to inform personalised diary questionnaires and provide context to the homestead. The diary questionnaires are comprised of cash flow statements and balance sheets to continuously track the participant's incomes, expenditures, and use of financial devices, and questionnaires for any other data the study wishes to collect on an on-going basis, such as wellbeing and disruptive goings on. Whilst there may be a concern that this continuous tracking of data affects participant behaviour, and thus financial outcomes, evidence from a randomized experiment of whether financial diaries affected financial outcomes finds no evidence that numeracy skills, loan repayment, reported income, or food consumption are impacted (Smits and Günther, 2018).

The add-on modules, which can be referred to with a variety of names, such as special modules, are individual cross-sectional interviews/questionnaires which are conducted in addition to the diary questionnaires to delve deeper into specific topics related to the study. Past add-on modules have included the topics of:

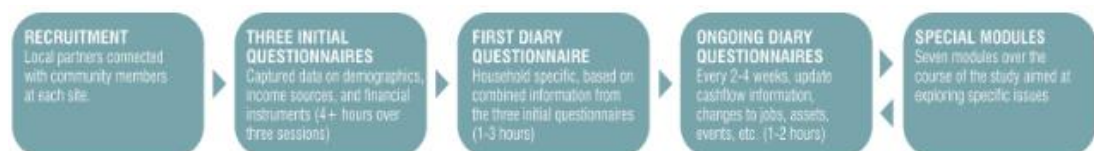
- Aspirations and attitudes
- Financial choices and knowledge
- Financial instruments
- Tax
- Income
- Health
- Decision making in income choices
- Decision making in agricultural production
- Working conditions

As with some previous Financial Diaries studies, in this study the methodology has been adapted to be able to answer the research questions. For example, the work of Dattasharma, Kamath and Ramanathan (2015) specifically used the methodology to assess how household cash flows are impacted by the presence or absence of microfinance loans, and thus focused on participants who were members of microfinance institutions. This study adapted the Financial Diaries methodology to focus in on how smallholder farmers intensify livestock production.

3.2 Data Collection Methods

The standard Financial Diaries methodology was adapted in this study to make it more suitable for the small sample size and research questions. Figure 6 shows the methodology schedule utilised by the American financial diaries (Morduch, 2016), whilst Figure 7 shows that utilised by BFA Global for their Financial Diary studies in general (BFA Global, no date).

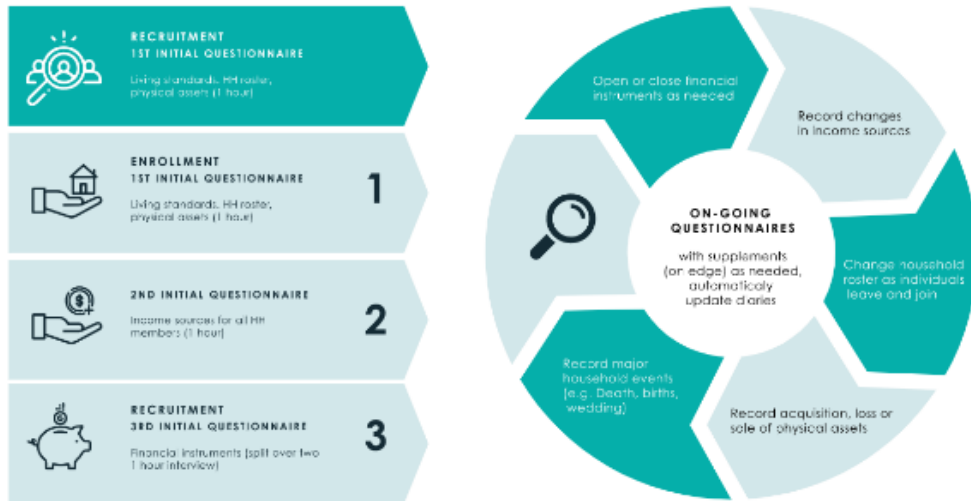
Figure 6: American Financial Diaries Survey Process



(Morduch, 2016)

CHAPTER III: METHODOLOGY

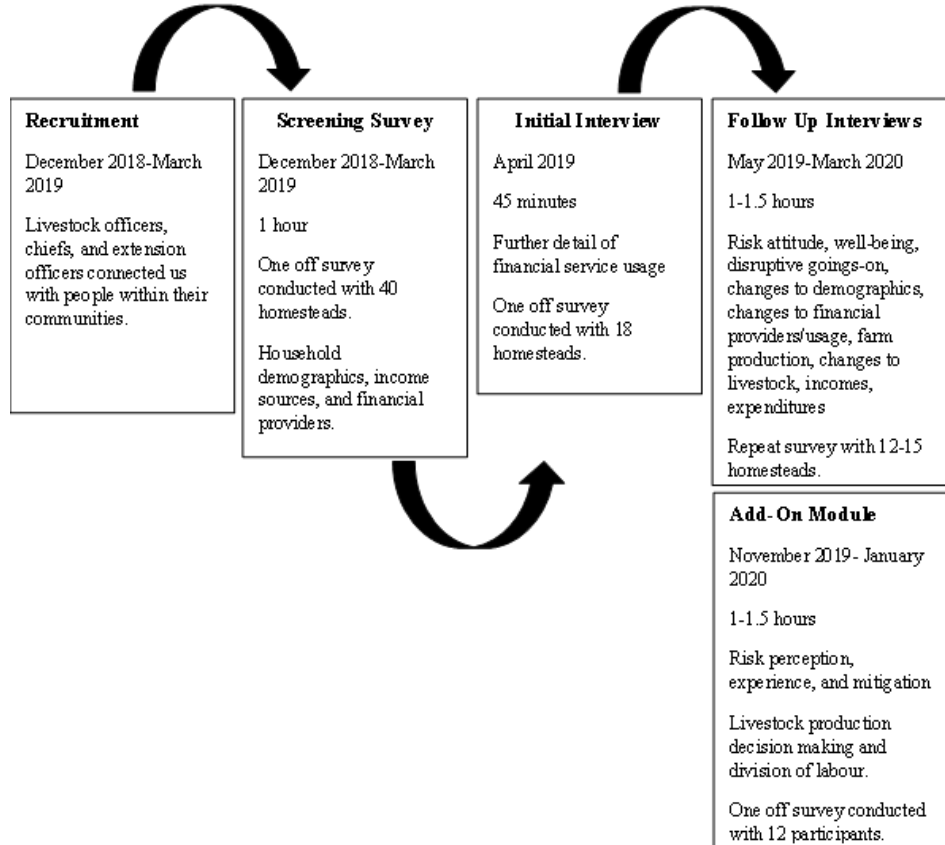
Figure 7: BFA Global General Survey Process



(BFA Global, no date)

Data collection involved five stages; recruitment of the participants, screening surveys, initial interview, follow up financial diary interviews, and add-on module. The survey process utilised in this study, including the timelines in which they occurred, can be seen in Figure 8.

Figure 8: Methodology Schedule



3.2.1 Screening Surveys

The screening surveys (available in appendix B) were designed to collect background data on the participating homesteads that can be used both to inform participant selection and provide background data to those selected participants.

The surveys were conducted face to face in Kiswahili, in an informal setting within the participants home, or outside in the shamba. They were carried out in an informal manner, with the conscious attempt to build a rapport with the participants so that potentially sensitive information could be shared with greater trust in its confidentiality. All data gathering activities (screening, initial interviews, financial diaries, and add-on module) were conducted in this way.

The surveys were conducted by the both the research assistant and the author. The research assistant conducted the survey whilst supervised by the author, translating the questions and writing responses, whilst the author wrote field notes. In all methods utilised by this study, questions were first written in English, and then discussed in depth with the research assistant to ensure she would be able to translate to KiSwahili whilst portraying the intended meaning.

The survey was divided into two sections. The first section was designed as single respondent surveys conducted with the head of the homestead or other knowledgeable adult, which in this study proved to be the husband (head of the homestead) or wife (other knowledgeable adult, or head of the homestead in the case of being widowed). This single respondent survey collected data on:

- Homestead demographics
- The homesteads largest source of income
- The homesteads smallest source of income
- Minimum monthly income required for the homestead to survive
- The average monthly income earned by the homestead
- Desire to intensify livestock production

The second section of the screening survey was designed as a multiple respondent survey, collecting data for all knowledgeable adult members of the homestead who were present at the time of the data collection. This section of the screening survey collection data on:

- Access to land, tenure, and use
- Use of financial service providers 5 years ago, 3 years ago, and at present
- Livestock ownership 5 years ago, 3 years ago, and at present
- Livestock ownership practices at present
- Estimated income sources in the past year.

3.2.2 *Initial Interviews*

The initial interviews were conducted with the head of the homestead in April 2019 (available in appendix C). These semi-structured topical interviews gathered further data related to the participants access to, usage, and perceptions of various financial devices and services. The topic was explored with pre-determined questions written on an interview sheet, with the intention of developing follow-up questions as the interview proceeds. Topical interviews involve the researcher taking a fairly active role in directing the interview and maintaining focus of the research question at hand (Rubin and Rubin, 2011). Background reading on the topic of formal and informal finance informed the questioning, and this semi-structured approach to the data collection allowed the participants to expand their responses as they saw fit, and for the interview to flow like that of a casual conversation, allowing additional information to come to light which could be expanded on during follow-up interviews.

This interview gathered data to provide a deeper understanding of the financial instruments used by the participants, for example, how their chama works and how often they contribute, and their perceptions of various financial instruments, such as what they like about their chama. This data could then act to both assist in the creation of follow up interviews, as well as be used as stand-alone data relating to perceptions of financial providers and services.

Detailed field notes of participants responses were recorded by the author whilst the research assistant was delivering the interviews in Kiswahili, and these assisted where possible in expanding on answers and following up on information provided in subsequent interviews.

3.2.3 Financial Diary Interviews

The bulk of the data collected in this study came from the financial diary interviews, which occurred between May 2019 and March 2020 (available in appendix D). Participants were interviewed at their homesteads once per month with a single standard survey being utilised each month. The interviews varied in the length of time taken both between and within homesteads, with the shortest interview taking around 30 minutes, and the longest around 2 hours. The participants were questioned on a host of topics, as detailed below. Tracking this range of data monthly provides clarity and depth of the relationship individual homesteads have with their livestock production, how they achieve what they do, and the barriers that they face when trying to intensify their production.

The following sub-chapters detail the data collection of each individual topic listed above, in the order in which they were asked during the interviews.

Well-Being Indicators

This first set of questions in the financial dairy interview relates to Subjective Well-Being, a measurement of well-being associated with the concept of life satisfaction based purely on the subjective view of the participant (McGillivray, 2007). The participants were asked to rank their:

- Financial satisfaction
- Livestock production satisfaction
- Confidence in the future of the livestock production.

Self-reported levels of financial satisfaction given by the participants quantifies their opinions of overall financial success each month, taking into consideration all income generating and expenditure activities. Tracking participants financial satisfaction is of benefit to this study due to the focus on the financial aspects on the lives of intensifying livestock producers. By asking participants their satisfaction in their financial situation each month the data are able to show the determinants and impacts of various levels of financial satisfaction, allowing analysis to understand the role livestock production can play in relation to other income generating and expenditure activities. Tracking satisfaction in livestock production allows this study to understand the participants subjective opinion of the success of their livestock production each month, the

situations that affect their satisfaction in this aspect of their work portfolio, and the impacts varying levels of satisfaction has on their production. These two questions relate to how the previous months experiences has affected the levels of present satisfaction. The final well-being question presented to the participants on the other hand relates to how past experiences affect confidence in the future success of their livestock production. By asking this question the study is able to access the perceived future impact of various recent experiences on livestock production. This can be related to hope for the future where livestock production plays a significant role in the livelihood of the participant.

All three of these questions had their responses measured using a simple 10-point scale. It was decided to collect the data this way, rather than using a 5- or 7-point Likert scale, due to the fact that the Likert scales tend to group responses, leaving the risk that we would see little variation in an individual's data over the study period, that 5-7 point Likert scales tend to offer results with higher mean scores, as participants favour the positive end of the scale, and that reliability and validity are not negatively impacted by a larger scale (Dawes, 2008). The Likert scale assumes that the range of possible responses fits within a small range of categories (in the case of the 5-point Likert scale, responses can fit into either 2 negative responses, a neutral response, or 2 positive responses), and portrays responses as unidimensional (Ho, 2016). The use of the 10-point scale was combined with a discussion around participant responses, to provide an explanation that cannot be done by the use of a numerical scale alone.

Risk Indicators

The next questions in the financial diary consist of self-reported risk indicators, measured again using a 10-point Likert scale, tracking the participants willingness to take risk. In order to understand the decisions made by the participants over the study period, we must understand their willingness to take risk, as this has long been known to significantly impact decision making as individuals weigh up the pros and cons of a particular decision, and perceived chance of a good or bad outcome.

Whilst the use of incentivised experiments has previously been considered the 'gold standard' of measuring risk preferences, due to the ability to observe real choices with real incentives and are comparable across individuals (Schildberg-Hörisch, 2018), more recently economists have been increasing their attention to validating their measure of risk preferences in other ways. Dohmen *et al.* (2011) for instance have used

regressions to compare large samples of risk questionnaires and risk lotteries, and have found that self-reporting of general risk preferences does in fact predict actual risk-taking behaviour. In the same study Dohmen *et al.* also tested self-reported risk questionnaires for context-specific risk preferences finding that context matters in self-reported willingness to take risks, with participants most willing to take risks in general, and least willing in financial matters. They found that whilst self-reporting of general risk preferences is the best all-round predictor of risk attitudes, context specific risk questions are the strongest measure of context-specific risk attitudes. Additionally, self-reported risk questionnaires are able to be carried out at a lower monetary and time cost than experimental measures. This is of great benefit for use in panel studies.

For this study then, self-reported risk preferences were utilised within the Financial Diary survey. We collected this data monthly from the fifth round of data collection. It was decided during data collection to continue collecting the risk preference data, which was initially only intended to be collected once, due to the apparent link between the responses to the risk questions and the well-being and disruptive goings on data. Though much of the literature agrees that risk preferences do not change over time, there are studies that find risk preferences are affected by shocks (Necker and Ziegelmeyer, 2014; Gerrans, Faff and Hartnett, 2015).

The questions were:

- How willing are you to take a financial risk?
- How willing are you to take a risk in your livestock production?
- How willing are you to take a risk in general?

Disruptive Goings-On

Disruptive events at the homestead have the ability to impact upon livelihoods, household welfare, and competition between sources of expenditure (Porter, 2012; Arouri, Nguyen and Youssef, 2015; Pradhan and Mukherjee, 2018). This study asked 8 questions each month relating to a variety of potential situations as follows:

- Have you needed a doctor but had to go without?
- Have you needed a vet or animal medicine but had to go without?
- Has any member of the homestead been too ill to work?
- Have you had any assets taken to repay debts?

- Has any child at the homestead been sent home from school for any reason?
- Did you expect an income that did not come?
- Have you gone to bed hungry?
- Have you experienced any other disruptive goings-on?

This range of topics allows us to understand what disruptive events have occurred at the homestead since our last visit, and the detail that surrounds them. The questions were formulated based on those asked by other studies, particularly the Kenyan Financial Diaries (FSD Kenya, Bankable Frontier Associates and Digital Divide Data, 2014) and the standard questionnaire utilised by farmer diaries conducted by researcher Jamie Anderson (Anderson and Ahmed, 2015).

They are all disruptive events that can have a significant impact on the participants incomes and expenditures and affect the ability of the participants to plan how to spend their expected income (Sarap, 1991; Schmidt and Robert, 2013; Zollmann, 2014; Combarry, 2016; Ahmad, 2017; Lem, 2019).

By asking whether there were any other disruptive goings-on that occurred we ensure that there is space for the participant to inform us of any situation that occurred that we had not yet questioned that they felt was disruptive to them.

Changes to Financial Instruments and Homestead Demographics

During the study period participants were likely to make changes to their financial providers and services, with the opening and closing of accounts, joining, or leaving informal groups, new borrowing or clearing debts. It was important for this study to specifically track this information in order to ask additional questions that may be overseen in the cashflow statements and balance sheets, such as querying any registration fees, interest rates, and reasons for making the change.

It is also likely during the study for there to be changes to homestead demographics, in terms of which individuals live at the homestead. This is important to track as the addition or removal of a homestead member can have a serious impact on the homestead's livestock production or finances in many ways. Household labour may be reduced, or medical expenses may have occurred. Only changes perceived as permanent were recorded here. Trips to temporarily visit family or children going back to boarding school were not recorded. These goings-on are expected and captured in

other areas of the data collection. This section gave us the ability to focus questioning on more permanent changes.

Changes in Livestock Ownership

Being focused on livestock production, specifically tracking the changes to livestock ownership was a priority in this study. In this section of the data collection, data were collected relating to the animal for which the change occurred, and exactly what this change was, whether it be a purchase, sale, birth, death, gift given or received. The cause of the change was also discussed.

Some of the changes that occur to livestock populations at the homestead are not captured by the transactional data collected elsewhere in the survey. Changes such as death or birth of an animal on the homestead is vital information for this study.

It became apparent that participants were often not very accurate when recording births and deaths of their livestock, particularly for lower value animals such as chickens or local breed animals. The high rate of births and deaths among chicken further impacted the accuracy of the data related to them. When possible, we asked the women of the homestead for data relating to the lower value livestock, as it is the women who are often tasked with their care. However, clear inaccuracies were still present in the data for low value livestock, particularly chicken. Most commonly we found that participants were not reporting the true extent of chicken deaths.

Livestock Product Consumption

In this section data were collected relating to the livestock product consumption habits of the participants. We ask each month about which products they have consumed, the frequency, and where the livestock product was obtained. The ownership of livestock by smallholder farmers has been considered as a signifier of increased livestock product consumption, and a key to increasing household welfare (Carletto, Jolliffe and Banerjee, 2015). From this data the study could assess the subsistence nature of the livestock production, to understand the demand for livestock products amongst the participants and how they utilise their own livestock production to meet this demand. In addition, this data allowed for assessing whether livestock product consumption is related to other factors occurring at the homestead, and see what markets they are accessing to meet their demands for livestock products.

Farm Production

In this section of the survey, data of all produce harvested from the farm in the last month were collected. This allows us to gather information of what the participants harvest for subsistence, for their livestock, and for sale.

This data was collected monthly through farmer recall, as opposed to farmer predication or the crop-cut method that can also be utilised to measure farm production (Sapkota *et al.*, 2016). Farmer recall has been shown to be an accurate measure of farm production (Sapkota *et al.*, 2016; Lobell *et al.*, 2018). Within the literature, studies looking at farm production often collect their data every three months, annually, or after harvest, however this has been shown to produce inaccuracies in the data relating to low value produce (such as fast commodities like onions, peppers and tomatoes), or those with long harvest periods (such as cassava, which is often grown in-case of crop failure) (Carletto, Jolliffe and Banerjee, 2015).

The financial diary survey as a whole provided us the opportunity to reduce these inaccuracies by collecting the data monthly. Instead, a problem we did have with this element of the data collection was the lack of consistency in units of measurement both between and within homesteads. Participants would measure their produce in terms of kilograms, wheelbarrows, sacks, bunches, handfuls, Kenyan Shilling value, individual pieces, acres, and gorogoros (a measuring tin) amongst others. Having the participants convert their measurement units to kilograms for example is not possible, since the homesteads lack weighing scales, and having them guess would be an inaccurate measurement. How to convert units of measurement in the study of farm production was a matter for discussion in the 2004/5 Malawi Integrated Household Survey. This study calculated this in an attempt to improve their own measurements, and found that whilst 50kgs of Maize fit within a 50kg sack, these weights can range from 43.2kg of ground bean, to 77.6kg of beans (Malawi National Statistics Office, 2005). Standardising production can therefore be difficult. Typically, studies utilise local weight conversion factors, which are context specific as local weights can vary between district, villages, and even farmers; something experienced by this study, and calculation of context specific conversion factors can be a highly labour-intensive process (Fermont and Benson, 2011), something beyond the scope of this study.

The data we have gathered here then is limited in its uses. We use this data in the study to understand each individual homestead in better detail, such as knowing how much

napier grass (the primary livestock feed grown at the participants homesteads) the homestead is producing, and the amount sold vs the amount fed to own livestock, or how much milk is produced, and the amount sold vs the amount consumed by the homestead. The data collected here cannot be used in combination with the data from other homesteads to calculate more generally the production of smallholder farms in Busia.

Cash Flow Statements and Balance Sheets

The primary section of the monthly financial diary is that of the cash flow statements and balance sheets. Here the survey first collects all incomes, followed by all expenditures, including dates (which are often estimated) the location of the income or purchase, the cost, and includes deposits and withdrawals from financial tools. It is this section of the data collection that most relies on the trust built with participants.

Whilst the study is concerned with livestock, and the related incomes and expenditures, we collected the data for all incomes and expenditures that occurred each month. For the first financial diary we had attempted to have the participants provide all incomes, since income from all sources can be invested into livestock production, and focus the expenditure data collected on livestock related expenditure, whilst having other sources of expenditure, such as food and electricity estimated as a monthly cost, so to reduce the effort required in recall by the participants. We found however that this led to high inaccuracies, with significant differences between incomes, expenditures, and balance sheets. From the second financial diary onwards, we instead had the participants detail each and every expenditure that occurred, as is common with Financial Diaries studies (for example see FSD Kenya, Bankable Frontier Associates and Digital Divide Data, 2014; Zollmann, 2014; CGAP, 2016; FSD Zambia, 2016; Morduch and Schneider, 2017). Having this level of detail had the added benefit of situating the livestock related expenditures within the overall financial lives of the participants.

A copy of this section of the survey was left with the participants, though only a few chose to regularly record their incomes and expenditures. It had been expected that whilst many participants would be willing to complete the survey throughout the month at the beginning of the study, that as the study progressed the number willing to do so would reduce (Sudman and Ferber, 1971; Brzozowski, Crossley and Winter, 2017). However, from the beginning of the study very few participants were willing

to complete the survey themselves, and so the study continuously relied on participant recall.

Participants recall in relation to incomes and expenditures has been heavily researched in the literature. Three forms of recall error are typically discussed within the literature; telescoping (the incorrect identification of the date of a transaction), heaping (the incorrect identification that places numerous transactions at specific points), and recall delay (the forgetting of event details) (Beegle, Carletto and Himelein, 2012), all of which are potential concerns for this study. Food related expenditure has been found to be particularly problematic for these such studies with longer recall periods. Participants are likely to forget certain expenditures after long periods of time. Scott and Amenuvegbe (1991) find that reported expenditure on frequently purchased items fell by 3% each day added to the recall period, levelling out at 20% after two weeks. Gibson (2002) found that reported expenditures were 26% higher when participants were questioned daily, rather than weekly.

It was not logistically possible in this study for participants to be visited for data collection more frequently, as occurs with many Financial Dairies studies. Instead, efforts were made to reduce these inaccuracies. At the end of the interviewing of incomes and expenditures we used our knowledge of their usual incomes and expenditures to probe further, and compared income and expenditure totals against the balance sheets to ensure as much money had been accounted for as possible. In the first round of data collection the average discrepancy between income and expenditure was 30.9%, reaching 11.4% as an average over the entire study. This discrepancy is likely caused by a combination of recall error, and the 'hiding' of data should the participant not wanted to disclose information, particularly during the first diary round as the process was new to them. The discrepancies found in other Financial Dairies is rarely reported. The Kenyan Financial Diaries report their discrepancy as falling to 8% by the fourth round of data collection (Zollmann, 2014).

Ethnographic Interviews

The method of ethnographic interviews was used alongside the financial interview to gather deeper data each month relating to livestock production in particular. The ethnographic interview has been likened by Spradley (1979) to a friendly conversation, a way of collecting data with knowledgeable informants in an informal, natural setting

providing a way of uncovering the participants underlying feelings, assumptions, and beliefs (Palmer, 2001).

This occurred predominantly before or after the completion of the financial interview whilst sitting with participants, sometimes over a cup of *chai* (usually a masala tea) and a snack such as *mandazi* (a sort of savoury donut), peanuts, or bread should the participants offer us these. These conversations would range from being everyday chit-chat not necessarily related to the topics of finance or livestock, to more focused, highly relevant conversations that did directly relate to the study. The data collected for all these conversations were considered valuable as providing either background knowledge about the participant, and context to the study, or a source of further relevant data from the participant without the constraints of formal questionnaires. These conversations also precludes the interviewer from appearing rude or ‘data hungry’ (Madden, 2017). As stated by Cohen (1984), these conversations had the underlying objective of probing the participant for further information, whether this be new information or clarification. He states:

‘the proper ethnographic interview is a conversation in which ethnographers risk the appearance of naivety and ignorance in order continually to satisfy themselves that they have understood what is being said... the conversations... are instruments... for stripping away the ballasts of expectation and assumption...’ (Cohen, 1984, p.226)

These conversations also allowed us to build trust and rapport with the participants on a continual basis, something that is vital when collecting data of a sensitive nature, such as personal finances. When conducting these interviews, whilst a short list of items for discussion were often preprepared, usually consisting of clarifications we wanted to make from the last round of data collection, the majority of the questions asked were not prepared in advance, rather were borne out of the conversation as it progressed.

Observation

Observation as an ethnographic method has had a long history, with Aristotle using the method in his botanical studies in Lesbos (Baker, 2006), and Auguste Comte, in

his early sociological reflections, listing it as a core research method in the late 19th Century (Comte, 1896).

The researcher role used in this study for can be likened to Spradley's 'moderate role' (Spradley, 1980). As Chapman (1992) did with her participants in the study of women living in retirement communities, where she would play cards and eat with the women she was observing, we too would observe our participants over a cup of tea, or walking with them in the farm. We were not directly involved in any of their daily activities, but rather would engage with them in relaxed activities of eating lunch or drinking tea, and occasionally escort them for more menial tasks, such as feeding the livestock, or checking on tethered animals. Due to the longitudinal design of the research, we managed to create a comfortable environment with participants where participants and I were able to talk to one another through Phyllis as translator that did not feel too awkward for the participants.

This form of observation allowed us to limit involvement with the participants, which may affect the ability to interpret the data from a detached perspective (Baker, 2006), whilst still being engaged with the participants. This helped build an understanding of the participants for the research, and also assisted in the building of rapport.

Both observations and ethnographic interviews were recorded as field notes, with the condensed version being written during the event, which were then used as reminders for the expanded version (Spradley, 1980), which were written up once the days field work was complete.

Photography

Photography can be used as a mechanical support to field observation capable of gathering descriptive detail that can be used as illustrations (Collier and Collier, 1967). In this study, pictures were taken of relevant items, such as of livestock, agricultural lands used for livestock feed, and animal pens. As stated by Heng (2016) these methods can be used to 'expose significance, emotions and meanings' (chapter 7) that individuals place on objects, and inform ethnographic narratives, by revealing the 'cartographical ways in which [participants] lead their lives' (chapter 4). These images do however show on a subjective reality, a snap-shot in time of the subjects (Pink, 2001). The addition of photographs can provide a window into the study site that can aid understanding of disseminated documents, acting as supplementary to the text. As

stated by Flick, von Kardoff and Steinke (2004) ‘the photograph is worth a thousand words... a text is never equivalent to the image, but images by themselves do not communicate fully’ (p.231-232).

A smart phone was used to capture the images. Smart phones are a common sight in Busia, so the use of this technology over camera itself was less alienating for the participants. While we took advance permission to take photos, we were able to take the actual photographs subtly, without disrupting any conversation or observation that was occurring at the time.

3.2.4 Add-on Module

A single add-on module was utilised in this study (see appendix E), collecting data relating to risk perception, experience, and mitigation (different to the monthly risk data collected in the financial interviews), and decision making and division of labour. This add-on module took place in November 2019, in a separate visit to each homestead. The purpose of the addition of this module was to collect data relevant to the study that was not gathered by the other data collection methods.

The module took the form of a single survey, which took on average 1 hour 29 minutes to complete, ranging between 33 minutes and 3 hours. This large difference between homesteads is primarily explained by the amount the participant talked around the topic at hand, with some homesteads having much more to say regarding the thoughts and opinions than others.

Experience, Perception, and Mitigation of Risk

Relatively few studies have been conducted concerning the risk perceptions and management of smallholder livestock farmers (Gebreegziabher and Tadesse, 2014). This data is invaluable as it allows us to consider the decision-making and economic behaviours as a response to the perceived risk (Duong *et al.*, 2019).

In judging probability of an event occurring, there are a number heuristics that people are likely to utilise (Kahneman and Tversky, 1982). The first, called the heuristic of availability, is that the ability to judge the probability of a situation occurring is influenced by their previous experiences with the event or the ease with which the event can be imagined. The second, the heuristic of representativeness, sees respondents view the structure of an event as containing information on its

representativeness. For example, people may judge a string of coin tosses of HTHTTH as more likely than HHHTTT. The third is the heuristic of anchoring, where people are sensitive to any value that is indicated to them during the data collection.

For the collection of this data, a list of 7 risks relating to livestock production were listed, chosen based on knowledge on the topic and previous discussions with participants. Participants were first asked for their perception of the risk occurring in the next year, 3 years, and 5 years, using a 7-point Likert scale where 1 represented 'extremely unlikely', 5 represented 'neither likely nor unlikely', and 7 represented 'extremely likely'. Likert scales tend to produce results that favour the positive end of the scale, which can be mitigated again somewhat by using a scale with a larger number of points. (Dawes, 2008). Using a 10-point Likert scale rather than say a 5-point Likert scale then can slightly lower the mean score. This quantitative data was combined with following up the response with the question 'why' to explore the participants reasoning. This also allows us an insight into the impact of the heuristics, particularly the heuristic of availability, in the participants perceptions. The participants were then questioned on whether they have experienced any of the listed risks in the past year, 3 years and 5 years, and questioned them on the impact this had.

This questionnaire style of collecting this data is common within the literature (see for example Gebreegziabher and Tadesse, 2014; Le Dang *et al.*, 2014; Sulewski and Kloczko-Gajewska, 2014; Rizwan *et al.*, 2019). Combining the quantitative data with qualitative data provided us with a deeper insight into the thought process behind the response, the situation that occurred, how this affected the homestead, and the specific way in the participant mitigates this risk.

Decision-Making and Division of Labour

This section of the add-on module particularly considers the gender aspect to livestock production, allowing us to understand how responsibilities in livestock production is divided among the household members, and in particular, the role of gender in livestock systems.

Again, it is common in the literature for this such data to be collected using some form of survey (see for example Okitoi *et al.*, 2007; Mulugeta and Amsalu, 2014; Thi *et al.*, 2019). For this study we used a simple survey, asking the participant which members of the homestead are involved in various decision making and livestock chores, with

multiple responses allowed. Previous studies that collected data on decision making and divisions of labour collect more detailed data on this topic, such as the length of time spent each day on particular tasks (Thi *et al.*, 2019). However, having already spent a significant amount of time with the participants, it was determined that this level of detail was not necessary for this study due to the perceived inaccuracies we would receive in the responses due to misjudgement, and the potential for the participants to attempt to downplay the role of others.

Decision making and divisions of labour were questioned in two individual surveys. For each a list of potential decisions or tasks were listed, based on previous literature and our knowledge of the various decisions and tasks that are undertaken by our participants. The head of the homestead (who was in all cases the owner of the livestock in our study) was then asked which members of the homestead were involved in making these decisions or completing the tasks.

This data was collected again like an interview, with the participant encouraged to expand on their responses with explanations. This coupling of quantitative and qualitative data again provides us with a deep understanding of who makes the decisions and completes the various tasks, and why.

3.3 Research Design

3.3.1 Location

This research project was conducted in Busia County of Western Kenya, due to the county having the highest human and animal population densities in East Africa (Kemp *et al.*, 2021). In addition, the ZooLink project had an existing lab here.

Located within the Lake Victoria Basin, Busia County borders Uganda to the west, and the counties of Siaya, Kakamega, and Bungoma to the east and north, with Lake Victoria in the south. The county contains two border crossings, in Busia and Malaba towns, and serves as the major trade crossing point from the neighbouring countries of Uganda, Rwanda, Burundi, Democratic Republic of Congo, and South Sudan (County Government of Busia, no date). The county covers an area of 1,694.5km², between latitudes 0°-0°45 North and longitudes 34°-25° East (*ibid*).

Busia is divided into 7 administrative sub-counties: Teso North, Teso South, Matayos, Nambale, Butula, Samia, and Bunyala, each headed by a sub-county administrator. The administrative sub-counties are then further divided into wards, headed by a ward administrator, and beyond this, into ‘villages’, groups of between 2-5 villages (by the more traditional definition) headed by a village administrator. Seven political constituencies also exist. These are Teso North, Teso South, Matayos, Nambale, Butula, Funyula, and Budalang’i. These are further broken down into Locations, headed by the Chiefs, and Sub-Locations, headed by the assistant chiefs. In most cases the administrative and political units overlap.

During the 2019 census, Busia’s population was estimated to be 893,681, with 467,401 (52.3%) females and 426,252 (47.7%) males, making up 198,152 households with an average household size of 4.5 persons, and a population density of 527 persons/km² (Kenya National Bureau of Statistics, 2019). Projections suggest that this figure may have increased to a total population of 1,113,266 by 2025, consisting of 580,304 (52%) females, 532,962 (48%) males, and a population density of 657 persons/km² (County Government of Busia, no date). **Error! Reference source not found.** shows a breakdown of the population of Busia County by sub-county.

Within Busia County the average land holding size is 1.71 acres (*ibid*). Land tends to be ancestral, handed down from one generation to the next (91.7%) by the transfer of a title deed (71.9%) (County Government of Busia, no date). However, it is largely the men who enjoy this inheritance, with 82.6% of men in the county owning family land, compared to 8.7% of women (*ibid*).

The primary crops produced in Busia are the food crops maize, beans, sweet potatoes, millet, cassava, and the cash crops tobacco, cotton, and sugarcane. 155,990 acres of land are under food crops, whilst 29,525 are under cash crops (*ibid*). This equates to 37.3% and 7% of the total land area of Busia respectively.

The rearing of livestock is also an important part of livelihoods in the county, with the highest animal to human ratio in Kenya (Kenya National Bureau of Statistics, 2015). In the 2015 county statistical abstract report (*ibid*), it was estimated that the animal with the largest population was local poultry (828,780), followed by Zebu cattle (169,198), local goats (64,260), pigs (63,047), and sheep (56,090) (Kenya National Bureau of Statistics, 2015). Table 1 lists the livestock population in Busia County in

2014. In a study of 416 livestock keeping homesteads in Busia, Fèvre *et al.* (2017) found that the average household size was 7.6 (ranging from 1-30). Cattle were kept in 55.3% of homesteads, with an average herd size of 4.9. Pig keeping was found to be less common, being kept at 16.9% of homesteads, with an average herd size of 2.6.

Table 1: Livestock population in Busia

Livestock species	Population
Local poultry	828,780
Zebu cattle	169,198
Local goats	64,260
Pigs	63,047
Sheep	56,090
Langstroth hives	35,700
Ducks	28,455
Exotic poultry	22,336
Dairy cattle	20,664
Turkey	7,582
Pigeons	4,688
Rabbits	4,394
Geese	2,778
Quails	2,142
Guinea fowl	2,040
Dairy goats	1,684
Donkeys	866

(Kenya National Bureau of Statistics, 2015)

Busia County is considered a semi-intensive/intensive beef and dairy production area, and primarily semi-intensive/backyard improved indigenous chicken production area (with a high proportion of extensive/free range chicken production) (FAO, 2018).

3.3.2 Participant Selection

Sampling

This study utilised purposive sampling, a form of non-random sampling, using expert knowledge to select the participants in a subjective manner (Battaglia, 2008). This approach differs greatly in its logic to random sampling approaches employed by quantitative study designs. Whilst the purpose of random sampling with relatively large sample sizes is to allow generalisation to the wider population, the purpose of non-random purposive sampling is to select information rich cases whose participation in the research will prove the most value to the study (Patton, 1990).

Being a qualitative study with the goal of understanding the range of experiences of the participants, the sample size for this study was selected with the aim of reaching

saturation, the most commonly employed principle for assessing the adequacy of purposive sample size in qualitative research (Hennink and Kaiser, 2022). Saturation is reached when the selected sample represents a full range of experiences, and the use of additional participants would be unlikely to bring new information to the study. The use of the term saturation varies within the literature, making it a poorly defined term with uncertainty as to how it should be conceptualised. Originating in grounded theory, saturation was defined by Glaser and Strauss (1967, p.61) as:

“The criterion for judging when to stop sampling the different groups pertinent to a category is the category’s theoretical saturation. Saturation means that no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated. He goes out of his way to look for groups that stretch diversity of data as far as possible, just to make certain that saturation is based on the widest possible range of data on the category.”

Since the writing of their seminal work, understandings of *theoretical saturation* have evolved, and have come to include ideas of *data saturation*, especially outside of the grounded theory literature (Saunders *et al.*, 2018). Data saturation has been defined as the point at which:

“New data tend to be redundant of data already collected. In interviews, when the researcher begins to hear the same comments again and again, data saturation is being reached... It is then time to stop collecting information and to start analysing what has been collected.” (Grady, 1998, p.26)

Due to being a longitudinal study that would take place over many months, the study design in terms of the methodology, and the time available to complete the Ph.D., did not well suit the continuous addition of new homesteads into the study until data saturation was reached. Instead, the sample size had to be decided upon at the study design phase. In their systemic review of the literature that has empirically assessed saturation, Hennink and Kaiser (2022) found that an average of 12-13 interviews reached saturation. For instance, Guest and Johnson (2006) conducted an experiment

in which they performed 60 interviews, and found that data saturation was reached in 12 interviews, with broader themes apparent after just 6 interviews.

A separate, more pragmatic consideration when selecting the sample size was understanding the sample sizes used in previous Financial Diaries studies. Whilst these previous studies tend to be more focused on the quantitative data, the nature of the research, of implementing the financial diary methods over many months, is the same, and thus understanding how many participants each enumerator was able to visit in a month, and of the attrition rates that the studies experienced, was able to further inform the realities of how many participants would be able to be handled each month. Some examples of sample size and number of enumerators used are as follows. The Zambia Financial Diaries had a sample size of 355 respondents with data being collected by 11 enumerators, resulting in an average of 32.27 respondents per enumerator (FSD Zambia, 2016). The Kenya Financial Diaries recruited 300 households who were interviewed by 10 enumerators, resulting in 30 households allocated to each enumerator (Zollmann, 2014). The Ramanagaram Financial Diaries recruited 90 households and 3 enumerators, averaging 30 participants per enumerator (Dattasharma, Kamath and Ramanathan, 2015). There are also few examples of the attrition rates experienced by other studies are available. Those who have published their attrition rates are the Ramanagaram Financial Diaries (5.3%) (Dattasharma, Kamath and Ramanathan, 2015), the Kenya Financial Diaries (15%) (Zollmann, 2014), the South African Financial Diaries (16%) (Collins *et al.*, 2009), and the American Financial Diaries (28%) (Morduch, 2016).

In this study, there lacked the opportunity to hire multiple enumerators, and the scope of the study did not require a large sample size. Previous studies often utilised mobile data collection tools, or hired separate data entry assistants. In this study however, this again would not be possible. Therefore, the sample size had to consider the fact that the aim of sampling would be to reach saturation, be manageable for me and one field assistant working in tandem, and account for the possible attrition rates found by previous financial diaries.

Ultimately, it was decided that 18 homesteads would be recruited into the study. This was a manageable number for the small team, allowed for the maximum previous attrition rate found by the American Financial Diaries of 28% (which for 18 homesteads would lead to a final sample of 12.96, or 13 homesteads), and would meet

the minimum of 12 participants required to reach saturation, as found by Hennink and Kaiser (2022) and Guest and Johnson (2006).

Inclusion Criteria

The first point in the inclusion criteria was that the participants needed to own livestock. For this study, the farmers could own any form of livestock (cattle, pigs, goats, chicken, or any other). Therefore, any form of livestock would count towards the first inclusion criteria.

The second point within the inclusion criteria, was that participants must be members of the Luo tribe. There are various tribal groups that reside within Busia, with different cultures and histories with livestock production. There are three dominant tribes in Busia, the most populous being the Luhya, which consists of 26 sub-tribal groups, each with a slightly different culture, and even dialects. The Iteso tribe are said to mainly reside in the north of the county, and are one homogenous group. The Luo are more spread out throughout Busia County, and are also a homogenous group. This is largely due to the different tribe's histories, where they migrated from in particular before settling in Busia. The choice to focus on one tribal group firstly stems from this difference in culture and histories of livestock production. By only focusing on one tribe the risk of there being cultural difference underlying results is removed. Secondly, physical location, and thus accessibility to people, and diversity in languages pose a difficulty for a study this size. The Iteso, being based far from the research lab in Busia town, were deemed unsuitable due to this. The Luyha tribe, having many languages and highly variable cultures between them, were deemed unsuitable due to potential communication issues, and the risk of cultural differences being the underlying cause of results. The Luo were the only dominant tribe for who these potential issues did not exist. They are a homogenous tribe, with one culture, and live throughout Busia County.

Thirdly, given the aim of this research, to 'understand the financial risks associated with livestock intensification' (p.9), the participants also needed to be intensifying their production. Given prior knowledge that the purchase of inputs by poor farmers can be sporadic, due to their small and lumpy incomes (Zollmann, 2014), and the scope of the research to include the process of intensification, the final sample was intended to show participants across a range of levels of intensification, 'intensifying farmers' here were considered to be those who wished to intensify their production.

In summary, the inclusion criteria for this study was as follows:

Participants must:

1. Own livestock
2. Be of the Luo tribe
3. Be wanting to intensify their livestock production

Accessing Participants for Screening

Participant selection occurred in three phases. Firstly, a meeting was set with the Busia County Livestock officer, to introduce this project. Secondly, following the meeting with the county livestock officer, meetings were arranged with the livestock officers for each sub-county. These meetings were conducted to discuss the nature of this research and ask for assistance in moving forward. The livestock officers then assisted by contacting local chiefs and livestock extension officers, who were able to provide introductions to local people who they knew to meet the first two inclusion criteria.

During these meetings with the chiefs, the study was introduced and the inclusion criteria were explained. With the inclusion criteria in hand, the chiefs then took several weeks before we returned to them, together travelling across their areas to administer the screening surveys.

The chief escorted the research assistant and author to the participant's homesteads for the screening surveys, and assisted in providing an introduction to the study, though were not present when the surveys were conducted. Further information was provided about the study, and participants were provided with information booklets that were read through and explained to them (available in English, Kiswahili, and Luo). This included describing the study design, explaining the potential risks, and informing the participants that their involvement would be voluntary (not involving payment) and that they could remove themselves from the study at any time, and finally ask whether they were willing to take part in the screening survey and ultimately the larger study. Only two homesteads visited did not agree to take part in the screening surveys. Forty-one homesteads were screened between December 2018 and March 2019.

Thirty-five participants met the inclusion criteria and were willing to take part in the study. The remaining participants were then ranked on a scale of one to five. This scale represented the subjective opinion of the suitability of each homestead to take part in

the study. This opinion was based on impressions of the rapport that had been established with participants. A few homesteads were found to be unsuitable for the study in this respect. A more extreme example of one of these situations, which led to the homestead scoring a 1 out of 5, was when, during the screening survey, the participant had her house girl inform the neighbours of our presence and invited them to come to ask for money and employment. At the end of the survey, several people had come to ask for money and employment, and the refusal to do so led to anger among a few, including the participant.

Homesteads that were ranked lowly with scores of 1 or 2 were removed from consideration for continuation with the study. Twenty-seven participants remained from which a final selection that represented a range of livestock intensification were chosen. This was achieved through stratified purposeful sampling (Patton, 1990). These twenty-seven homesteads were subjectively categorised as being of a low, medium, or high level of intensification based on the information gathered in the screening survey, with nine homesteads being placed in each category. Six homesteads were then selected from each category using a random number generator to comprise the final study sample.

3.3.3 Field work

Field work was conducted by the author and research assistant. The research assistant was a local young woman, trained by the author in the implementation of the screening surveys, initial interviews, and follow-up interviews. The screening surveys, initial interviews, first two follow-up interviews, the fourth follow-up interview, add-on module, and final follow-up interview were conducted by both the author and research assistant. All other follow-up interviews were completed by the research assistant alone, so that data entry could be conducted by the author in tandem to data collection.

Field work took place across four sub-counties Matayos, Nambale, Samia, and Teso South. To only conduct field work in these four counties was a pragmatic decision made once sampling began. Teso North was deemed to be too far from the ZooLink lab in Busia town, making it difficult to schedule participants here due to needing to be flexible to see participants across the county according to their own schedules. Despite extensive efforts difficulty was had in scheduling meetings and/or subsequent assistance with livestock officers in Butula and Budalang'I,

A mobile phone was used for taking photographs, as this was more discrete way of capturing photographs and video and did less to alienate the participants, most of whom have a mobile phone and are familiar with smart phones. At the end of each day all photos were transferred from the phone to the appropriate computer files, and deleted from the phone.

3.4 Data Preparation

3.4.1 SPSS Data Preparation

The coding, and the way in which the data was presented in the various spreadsheets, was inspired by how this was managed in the Kenyan Financial Diaries (FSD Kenya, Bankable Frontier Associates and Digital Divide Data, 2014). On-going preliminary analysis allowed for the spotting of obvious data entry errors (such as dating a transaction as 2009 instead of 2019). When data entry had been completed, each file was briefly reviewed to ensure they had been coded correctly in preparation for the data analysis.

3.4.2 Nvivo Data Preparation

Initial interviews, financial interviews, and the add-on module were audio-recorded, with the audio translated and these translations loaded into Nvivo for analysis. The audio recordings were transcribed to Kiswahili for quality checks, and all recordings were translated into English. These documents were stored electronically, and deleted from the transcribers laptops once completed.

Transcribing can take various forms, such as transcribing only some parts of the interview, whilst making notes of others, or only creating a draft transcript which may produce sufficient data for certain studies (Gibbs, 2007). In this study, the interviews were conducted in Kiswahili, thus full transcripts were required. Both the transcribers involved in the study were instructed to transcribe the audio verbatim, reducing the amount of transcriber interpretation. The coding of the verbatim text allowed for interpretation based on extensive academic experience in the subject at hand, and familiarity with the participants and the way they spoke by the author.

To mitigate this risk of transcriber interpretation each transcriber checked a proportion of the translations produced by the others. This way, any concern about inaccuracies in the translations could be highlighted and edited if need be.

3.5 Data Analysis

A wide range of data analysis methods were utilised in this thesis. A description of these is described below in order of results chapter.

3.5.1 *Chapter 4: Participants Overview*

The participant overviews were developed using the screening survey data, which included household demographics and livestock ownership. Where necessary other data, such as further information about household members and livestock were derived from ethnographic interviews and financial diaries.

Clustering data utilised calculated data from the financial diary interviews. These calculated data were the level of commercialisation (calculated as the percentage of livestock and their products that was sold rather than consumed), the total income earned during the study, livestock income as a percentage of total income, and livestock expenditure as a percentage of total expenditure. A TwoStep cluster analysis is utilised to identify similar groups of participants within datasets (Norusis, 2011). The first involves preclustering, where the cases (in this case participants) are distanced based on the available data, after which the cases are clustered using a hierarchical clustering algorithm (Tkaczynski, 2016). In addition, a Pearson correlation is used to test the correlation between these clustering variables.

3.5.2 *Chapter 5: Piecing Together a Livelihood: Diverse Incomes and Competing Needs*

This chapter relied primarily on the monthly financial diary data. Incomes and expenditures were calculated, and most frequently presented as descriptive statistics, such as means, minimums and maximums, pie charts, area charts, and box plots.

A coefficient of variation (CV) was calculated for variation in monthly incomes of the participants. The CV is used to measure relative variation of a variable to its mean, and to assess the performance of analytical techniques/equipment (Albert and Zhang,

2010). The CV here then was able to show, compared to the participants mean monthly income during the study, how much these incomes could vary.

This was calculated manually and stored in SPSS by having SPSS provide the standard deviation and mean of each participants incomes, and using the formula:

$$\textit{Coefficient of Variation} = (\textit{Standard Deviation}/\textit{Mean}) * 100$$

As well as the financial data collected from the financial diary interview, data was also used from the disruptive goings-on section of the interview to establish during which months participants had children returned from school due to a lack of school fee payments.

3.5.3 Chapter 6: Accessing Finance: Making Ends Meet

The first part of this chapter details which financial providers were utilised by the participants. This data came from the Financial Diary dataset. The next section made particular use of the initial interview data to establish which financial providers are utilised by the participants, and the reasons for these choices.

These data were analysed in Nvivo using thematic analysis, an approach to analysing transcripts that allows researchers to identify, analyse, and report on repeated themes (Braun and Clarke, 2006). Themes here can be defined as a ‘patterned response or meaning’ (Braun and Clarke, 2006, p.82), and are an abstract entity which requires a level of interpretation and integration of data (Nowell *et al.*, 2017). This method of analysing interview data has been described as a powerful method for understanding a set of experiences, thoughts, or behaviours (Braun and Clarke, 2012). Whilst some researchers consider thematic analysis to be something that can assist researchers in analysis rather than a method of itself (Boyatzis, 1998; Ryan and Bernard, 2000; Holloway and Todres, 2003), others disagree, believing that thematic analysis is a method in its own right (Leininger, 1992; Thorne, 2000; King, 2004; Braun and Clarke, 2006; Kiger and Varpio, 2020).

The 6 step process laid out by Nowell *et al.* (2017) was followed; 1. Familiarizing yourself with the data, 2. Generating initial codes, 3. Searching for themes, 4. Reviewing themes, 5. Defining and naming themes, and 6. Producing the report/manuscript.

The transcripts for the 18 homesteads who were involved in the study at the time of the initial interview were read through in full, involving repeated and active reading (Braun and Clarke, 2006). From here initial codes were developed. Having developed a strong familiarity with the data, codes were created. These codes, rather than themes, have been defined by Boyatzis (1998) as ‘the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon’ (p.63). Codes were developed and continuously added to as the transcripts were read. Once all transcripts had been fully coded, themes were developed. Rather than emerging from the data, themes are constructed through analysis of the codes (Kiger and Varpio, 2020). In the case of this study, this was done in an inductive manner, developing themes expressly from the codes, rather than deductive analysis, in which predefined theory informs theme development (*ibid*). In step 4, these themes were then reviewed. All coded data within the themes were checked to ensure fit, and all codes were checked to ensure they were included within a suitable theme.

3.5.4 Chapter 7: Intensifying Livestock Production: How Smallholder Farmers Attempt to Intensify

Chapter 7 utilised data from the Financial Dairy dataset to establish how the participants attempt to intensify, and the benefits they receive from their production, along with ethnographic interviews and observation in particular. Various sections of the financial interview were utilised, including the changes to livestock ownership section, which recorded the purchase, sale, consumption, death, and any other changes that occurred to the numbers of livestock owned by the participants, and the financial data itself, which showed any incomes and expenditures that were made in relation to livestock. Only descriptive statistics were used here to calculate the main ways the participants intensify their production, and the outputs and outcomes of this production.

3.5.5 Chapter 8: Risk in Smallholder Livestock Production

This final results chapter utilised the risk section of the add-on module to establish the primary risks to livestock production faced by participants. With data collected on a 7-point Likert scale, and all participant responses added together to create an overall

score for each risk. Transcriptions from the audio that had been recorded during these add-on modules was then used to provide additional data of the participants perceptions of the risks. These data were not coded, but rather were able to provide quotes of the participants explanations.

3.6 Methods Reflexivity

The quantity of data that was collected from between twelve to fifteen participants who took part in this study was immense, and at times difficult to manage. Such an array of interesting topics emerged from the data that at times, in the earlier stages, the purpose of the research began to blur at the edges. In the end, with a combination of regaining the focus, whilst simultaneously ‘listening’ to the emerging data, I was able to let the thesis develop in a way that maintained its purpose, whilst allowing the key emerging data to shine through.

Coming into this Ph.D., knowing that the overarching, undeveloped question to be answered was simply ‘how do smallholder farmers intensify their livestock production’, I had several expectations of what the final data would show. I expected that livestock production more generally, but especially in terms of intensifying production, would require inputs, and therefore money. I expected to find that those severely lacking in financial capital would not be the ones able to intensify, and that people would access loans to assist in their livestock production. I also expected that the participants of the study would be engaged in the process of the livestock ladder, focusing the little resources they had on a small number of smaller livestock, gradually building themselves up to higher value livestock.

CHAPTER IV: INTRODUCTION TO THE PARTICIPANTS

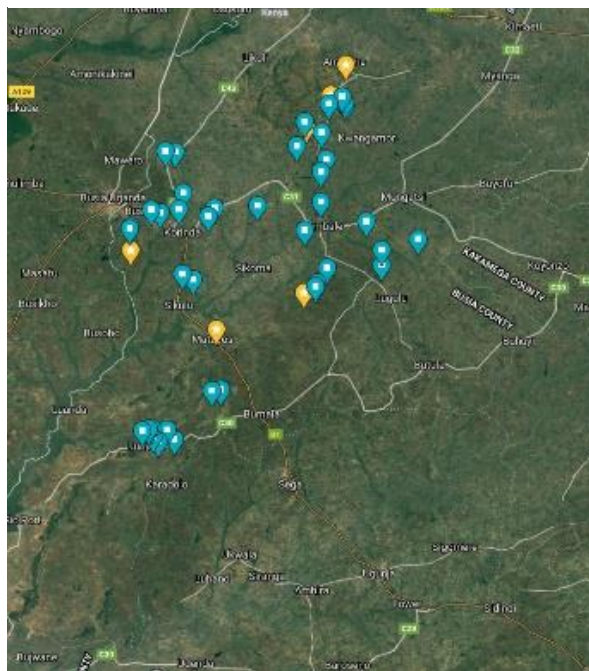
4.1 Introduction

This Ph.D. involved monthly data collection from 15 participants. Whilst they are all livestock farmers who wanted to intensify their production by increasing herd sizes on the same plot of land and improving/increasing the use of inputs, they are 15 different individuals, with different income portfolios over the study period, and different family lives, responsibilities, and events in their lives.

Their experiences with livestock production form the basis of this thesis. Therefore, this chapter sets out to provide a brief introduction and background information to who they are, such as the household structure, access to land, and income sources, which will provide context to their experiences during the study. All the participants reside in Busia County, spread between Funyula, Matayos, Nambale, and Teso South sub-counties.

Error! Reference source not found. shows the rough locations of all screened homesteads, from which the sample were selected. Blue pins represent homesteads, whilst yellow pins represent government livestock offices and chiefs' offices.

Figure 9: Rough Locations of Screened Households (Blue), and Livestock Officer and Chief Offices Visited (Yellow)



4.2 Classification of Homesteads

For the purpose of data analysis in this thesis, the participants were clustered using a two-step clustering analysis on SPSS, as described in section 3.6.1 (p.84) of this thesis.

The variables used to cluster the participants were the percentage of livestock and their products that were sold during the study (commercialisation) as opposed to consumed by the homestead (subsistence), the total income earned during the study (to account for varying levels of wealth), livestock income as a percentage of total income (importance of livestock to the income portfolio), and livestock expenditure as a percentage of total expenditure. These variables were chosen as it was deemed that together, these variables can provide the best understanding of the investment and expenditure of the participants on their livestock, the commercial nature of the production, and the underlying wealth of the participant.

Of these variables, the clustering algorithm found level of commercialisation to be the most important variable (importance of 1.00), followed by livestock income as a proportion of total income (importance of 0.89). There is a clear variation between these variables between the clusters, as can be seen in Table 2.

Table 2: Cluster Averages for Clustering Variables

Cluster	Commercialised %	Livestock Income %	Total Income (Ksh)	Livestock Expenditure %
1	4.25	0.33	245,002	14.1
2	58.70	17.40	180,805	10.1
3	90.62	46.12	225,920	7.7
4	81.90	47.50	1,190,775	46.2

The resulting clusters revealed 4 distinct groups of participants:

1. Subsistence Farmers

This cluster represents the participants for whom livestock was predominantly used for subsistence purposes, usually being held as assets. They are the second highest income earning cluster, ranging from 134,859-340,900ksh during the study, and spend the second highest percentage of total expenditure on their livestock production, ranging from 6.2-27.7%.

2. Medium Commercialisation with Low Livestock Income

This cluster represents participants who sell between 52%-80% of their livestock production, and make a relatively small proportion of their total income from this (ranging from 9.9%-24.3%). They are the lowest income earning cluster, ranging from 26,655-463,345ksh during the study, and spent the second lowest percentage of total expenditure on their livestock production, ranging from 3.5%-22.2%.

3. High Commercialisation with Medium Livestock Income

This cluster includes participants who are highly commercialised, selling between 86%-95% of their production, from which they make a significant proportion of their incomes (ranging from 33.0%-59.9%). Their total incomes were the second lowest during the study, ranging from 79,030-432,150ksh. Yet the most interesting aspect to this cluster, is that a smaller proportion of their expenditure goes towards their livestock than cluster 2. As can be seen in table 4, this equates to an average of only 3,177ksh more being spent on livestock through the study than cluster 2.

4. High Commercialisation with High Livestock Income

This cluster represents an outlier cluster. The cluster is highly commercialised, though nearly 10% less than cluster 3, from which a significant proportion of income, similar to that of cluster 3, are derived. What is particularly interesting with this cluster is the extremely high level of income that was earned during the study compared to other clusters, as well as the high proportion of expenditure that went towards this production.

Further variables that show differences between the clusters in terms of Kenya Shilling values rather than percentages can be seen in table 4. This table shows more clearly the difference between the clusters. It can be seen that livestock income, livestock profit, and value of livestock owned at the beginning of the study increase through the clusters. Where this trend changes is with the value of livestock expenditure. The Subsistence Farmer cluster spend the largest amount in terms of shilling value, and have the highest proportion of expenditure being spent on livestock, excluding the outlier cluster 4, of the other clusters, despite having the lowest value livestock and not making any profit from their production. Clusters 2 and 3 spend very similar amounts of money on their livestock production, and yet their average profits from this production are much higher for cluster 3, and they also own a much higher average value of livestock than cluster 2. A final particular point of interest that can be seen from Table 3, is that although

CHAPTER IV: INTRODUCTION TO THE PARTICIPANTS

cluster 4 earn almost half of total income from livestock production, because livestock expenditure is also very high, the overall profit that was made during the study period was not significantly greater than that of cluster 3.

Table 3: Mean Summary Variables by Cluster

Cluster	Livestock Income (Ksh)	Total Expenditure (Ksh)	Livestock Expenditure (Ksh)	Livestock Profit (Ksh)	Value of Livestock (Ksh)
1	1,075	184,814	28,060	-26,985	208,988
2	30,857	191,521	18,041	12,816	229,950
3	105,841	227,691	19,392	86,449	517,620
4	565,939	882,579	407,662	158,277	1,006,900

A Pearson correlation of the above variables shows some significant results, as seen in Table 4. The level of commercialisation and percentage of income derived from livestock are strongly positively correlated. That is, the more commercialised production is, the larger the proportion of income is derived from livestock production. The other significant result is the strong positive correlation between total income earned during the study and the proportion of expenditure spent on livestock production. This is not surprising, as the higher the total income earned during the study the more money is available to be invested in livestock production. Total income earned during the study period is not correlated to the percentage of income earned from livestock production, nor is it correlated to level of commercialisation. Perhaps surprisingly then this means that commercialising livestock production does not lead to higher overall incomes, nor does increasing the proportion of income derived from livestock production (reducing livelihood diversification). Another perhaps surprising result is that the proportion of expenditure spent on livestock production is not correlated to the percentage of income derived from livestock production, nor to the level of commercialisation.

Table 4: Pearson Correlations of Cluster Variables

Variable	Livestock Income %	Commercialised %	Total Income (Ksh)	Livestock Expenditure %
Livestock Income %		0.884 P=0.01	0.274 P=0.324	0.028 P=0.920
Commercialised %	0.884 P=0.01		0.225 P=0.420	-0.156 P=0.579
Total Income	0.274 P=0.324	0.225 P=0.420		0.713 P=0.01
Livestock Expenditure %	0.028 P=0.920	-0.516 P=0.579	0.713 P=0.01	

4.3 Introduction to the Participants

The individual participants who were involved in this study are detailed below, inclusive of kinship diagrams. Within these kinship diagrams, all individuals listed are those who the participants defined as being a part of their households, with those shaded in grey representing those who do not actually live at the homestead. Delving deeper into understandings of kinship and what constitutes a homestead are outside the scope of this study. Instead, the participants were simply asked during the screening survey to provide us with the demographic information for everyone they consider members of their homestead. The participants tend to consider their spouses, children, grandchildren, and staff to be members of their homesteads, whether they physically reside at the homestead or not.

Data here comes from a combination of all data collection methods, particularly drawing from the screening surveys, financial diaries, ethnographic interviews, and observations. The following participant summaries provide an overview of each of the participants so that they can be understood and known to some degree as they are followed through the study and the results sections of this thesis.

This information allows for an understanding of the participants in greater detail throughout the remainder of this thesis. Names have been changed for anonymity, and all participants represent ‘normal’ families in Busia. None of the below information threatens this anonymity.

4.3.1 Cluster 1: Subsistence Farmers

Thelma

Thelma was a 38-year-old housewife who lived on the steep, rocky terrain of Funyula sub-county. She lived with her husband, a 50-year-old mechanic in the local town, four of her five children (10-25 years old), 5-year-old grand-daughter, and 13-year-old house servant (see Figure 10: Thelma's Homestead Demographics Figure 10). One of her sons was often stationed away from home in his job in the army. Early in the study this was her only child to be often living away from home. As the study progressed two more of her children moved to Nairobi in search of work.

Thelma did not have any income generating activities of her own, and did not own any livestock of her own. She received most of her money from her husband and occasionally her mother, and was often able to make small contributions to a merry go round group. With her husband working in town six days a week, she was in charge of all farming chores, both crop and livestock, though much of this was delegated to the young house boy.

The livestock that was owned was purely for subsistence and savings. Owned by her husband but cared for by Thelma, the homestead kept beef cattle, dairy cattle, chickens, and goats, and during the study added turkeys and ducks (see Table 5), as well as caring for a pig and her litter of piglets for her church. Milk from the dairy cattle was consumed by the family, and in times of need Thelma was able to sell livestock to make ends meet. She wanted to purchase livestock of her own in order to make an income [informal conversation, 2019], but the very low levels of income she received from her husband and mother made even the purchase of chickens difficult.

Thelma and her husband owned several parcels of land around the homestead. Four parcels of 4, 3, 3, and 2 acres were all inherited from her husband's father, with the title deeds still in the late father's name. She grew maize, Napier grass, beans, and cassava in particular.

Figure 10: Thelma's Homestead Demographics

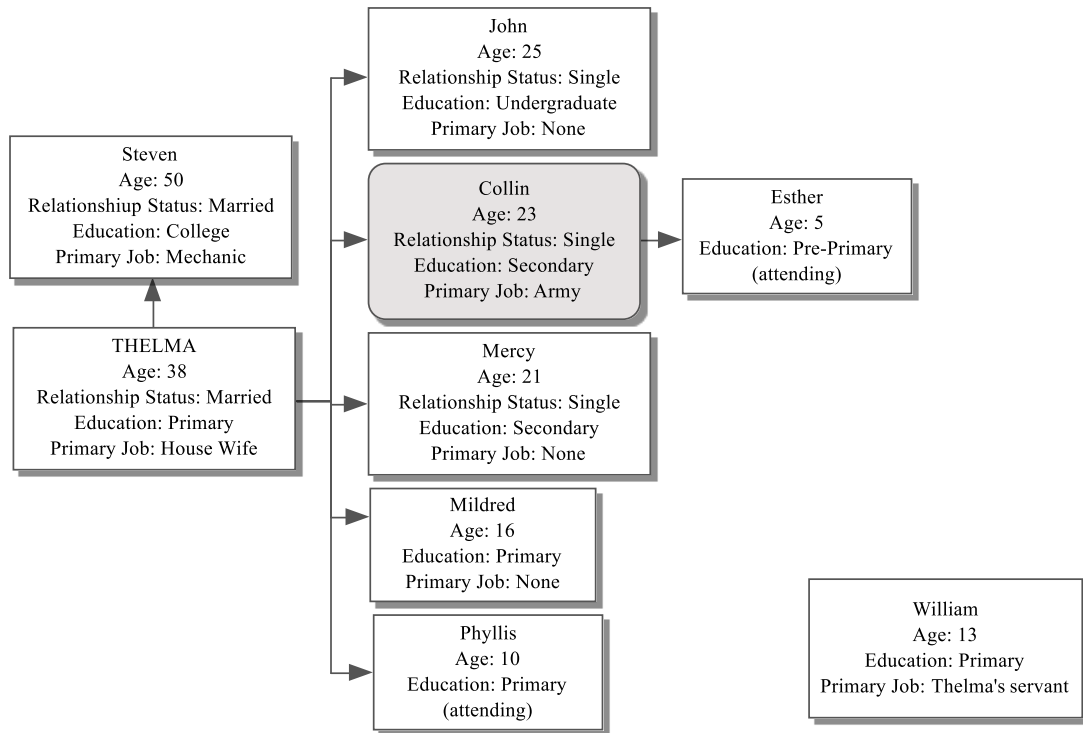


Table 5: Land and Livestock Ownership at Thelma's Homestead

HH Member	Land	Livestock
Steven	12 acres	5x indigenous beef cattle 8x indigenous dairy cattle 18x indigenous chicken 3x indigenous goats

Alice

At 71 years old, Alice was a widow who lived alone with her granddaughter and several house servants (see Figure 11). She had three grown up children who had moved far from home. Her eldest daughter was a doctor in United States of America, her son a private helicopter pilot working in Uganda, and her youngest daughter a teacher in Nairobi. In total Alice had four members of house staff, a housemaid, who lived at the property with her 2-year old daughter (though she was fired during the study after Alice accused her of theft [informal conversation, 2019]), and three house/farm boys (whom she terms servants) who work in combination between house chores and farm work.

Though she left after four months of data collection, Alice utilised 8 income sources during this time. These income sources tended to be more stable than some others, including renting out a motorbike, owning a posho mill where neighbours come to grind their maize, owning a small corner shop, and remittances sent from her children. Her largest source of income came from regular remittances sent by her children, particularly her son. The father of the grandchild who lives with Alice, some of the remittances he sends is to cover her costs including school fees. Alice earned a significant amount from selling maize early in the study, with this sale of crops representing her second largest income during the study. Her incomes earned from her posho mill and renting out of motorbike were particularly stable throughout her time in the study.

Alice owned a single 4-acre parcel of land, the title deed of which remains in her late father's name. She had walled off an area for her home compound, with the remainder utilised for growing maize, groundnuts, bananas, and sweet potatoes. On the home compound she keeps her livestock, comprising grade dairy cattle, indigenous goats, indigenous chicken, and rabbits (see Table 6), which during the study did not earn her any income, though her plan, headed by her son, to increase her herd to create a profitable dairy business was still underway.

Figure 11: Alice's Homestead Demographics

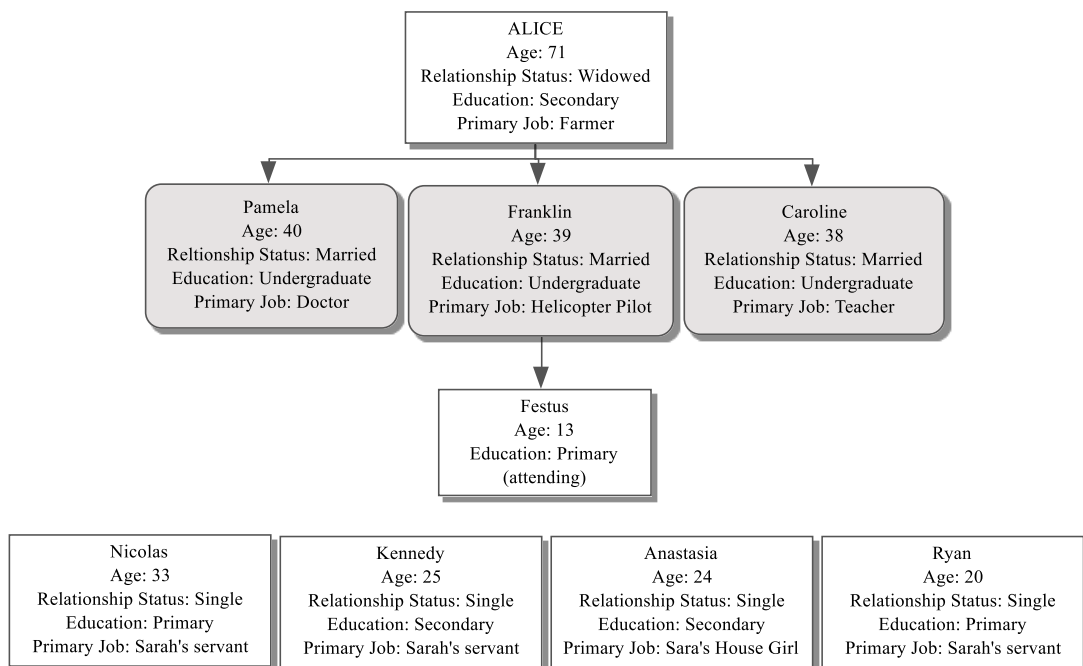


Table 6: Land and Livestock Ownership at Alice's Homestead

HH Member	Land	Livestock
Alice	4 acres	2x grade dairy cattle 2x indigenous goats 20x indigenous chicken 3x rabbit

Kevin

A 35-year-old secondary school teacher with a college level education, Kevin lived with his 32-year-old wife, a tailor, 13-year-old niece, and three children aged 1-6 (see Figure 12). Owning 7 acres of land, the title deeds of which were in Kevin's name, he grew maize, Napier grass, beans, and watermelon, amongst other crops.

The household's livelihood was heavily reliant on Kevin's teaching salary, with which he was a member of a SACCO which deducted savings contributions directly from his pay check. Even with these deductions, this salary contributed a little under one third of his total income over the study period. His largest income, which contributed over one third of his total income, came from selling crops, particularly watermelons, which he harvested by the truck load three times over the study period. The remaining third of his income was generated through a combination of 9 other income sources, including loans, remittances, livestock sale, paid extra duties within the school including extra tuition and exam marking, and Chama pay-outs. His wife's income was infrequent, with most of her tailoring income coming at the beginning of the school year as she made and fitted school uniforms.

Kevin owned few livestock, including dairy cattle (the milk from which was most often all consumed by the homestead), and pigs, and his wife cared for his chickens (see Table 7). These livestock were primarily for subsistence, however Kevin wanted to increase his herds to be able to benefit from increased milk sales in particular.

Figure 12: Kevin's Homestead Demographics

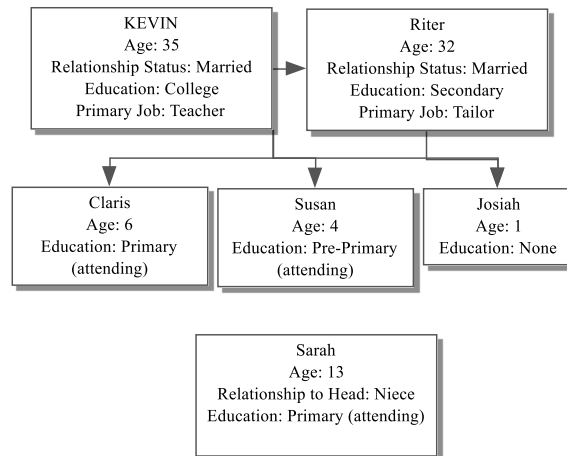


Table 7: Land and Livestock Ownership at Kevin's Homestead

HH Member	Land	Livestock
Kevin	7 acres	2x indigenous dairy cattle 2x pigs 21x indigenous chicken

Moses

Moses was a 58-year-old bicycle repairer, who lived with his 38-year-old wife, five children aged 17-31, two of whom were still in education, and 26-year-old daughter in law. Only Moses and his 31-year-old son had jobs, with the son working as a head teacher at the local school (see Figure 13).

Moses had access to two plots of land. The first is 3 acres, for which he owned the title deed, which housed the homestead, which include three different homes, and farmland for growing crops and rearing livestock. The second was a small 0.05-acre plot, a short walk away, for which he also owned the title deed, on which he completed the construction of rental houses during the study, and a shop from which his wife sold stock such as vegetables and flour.

He owned a market stall in a small local market from which he ran his bicycle repair business. This business represented his largest source of income during the study, providing him with a daily income. Money sent by his son, the head teacher, provided

his second largest source of income, followed by his rental house income. He owned six rental properties, four of which were rented throughout the study.

Moses owned a few different livestock, including dairy cattle, chickens, and goats (see Table 8). None of these earned him an income during the study, rather they were used for consumption of livestock products, of eggs and milk.

Figure 13: Moses's Homestead Demographics

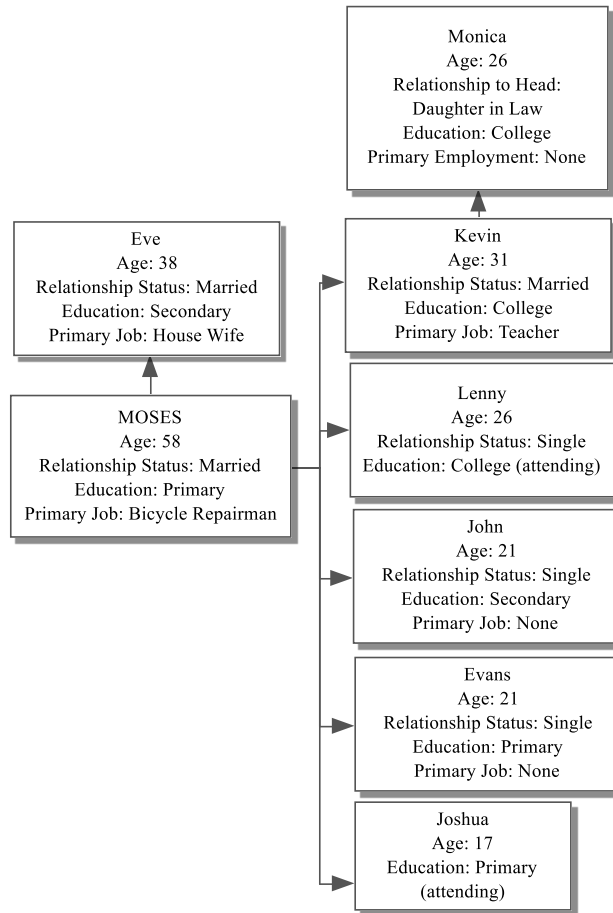


Table 8: Land and Livestock Ownership at Moses's Homestead

HH Member	Land	Livestock
Moses	3.05 acres	1x indigenous dairy cattle 25x indigenous chicken 5x indigenous goats

4.3.2 Cluster 2: Medium Commercialisation with Low Livestock Income

Sarah

Widowed several years ago, 47-year-old Sarah was the head of her homestead, which consisted of herself and her four children; aged 13-24. Sarah had a secondary education, and considered herself to be a farmer. Two of her children were still in education. The two sons not in education both considered themselves to be farmers (see Figure 14).

Sarah had access to a single 30-acre parcel of land located behind the homestead which she inherited from her late husband. The title deed was still in her late husband’s name due to difficulties she had faced in transferring the title deed to herself. Here she predominantly grew sugarcane, maize, vegetables, and grazed her livestock. James owned a 4-acre parcel of land connected to Sarah’s, where he too planted maize and sugar cane. His title deed was in his own name, and was passed down to him by his father upon his death. Sarah, James, and Justus all owned livestock, with the majority owned by Sarah (see Table 9).

Figure 14: Sarah's Homestead Demographics

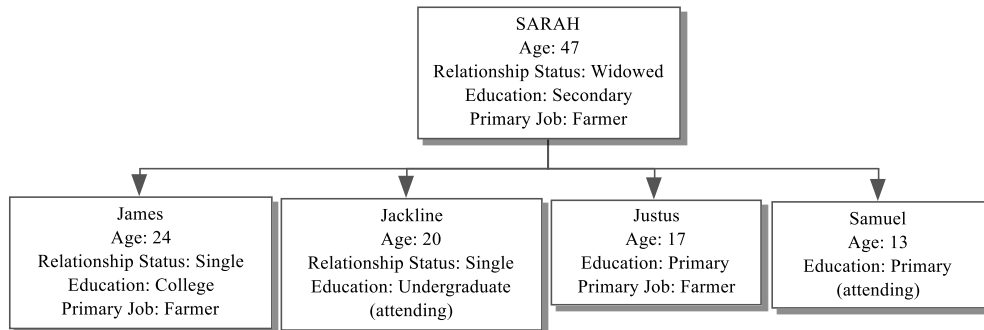


Table 9: Land and Livestock Ownership at Sarah's Homestead

HH Member	Land	Livestock
Sarah	30 acres	1x Cross breed working cattle 1x Indigenous working cattle 3x Cross breed dairy cattle 5x Indigenous chicken 2x Cross breed pigs 2x Indigenous sheep
James	4 acres	1x Indigenous working cattle 5x Indigenous chicken 4x Indigenous sheep
Justus		5x Indigenous chicken

Dan

62-year-old Dan was the head of a large homestead, with 11 family members residing across several homes on the compound. The whole direct family consisted of 18 members, though 2 of his children had moved together to Nairobi. Residing at Dan's homestead were his wife (37 years old), five of his children (12-37 years old), a daughter in law (25 years old), and three grandchildren (1-6 years old) (see Figure 15). There were two independent 'households' at this homestead, with the eldest son and his wife and three children operating financially independently for the most part from Dan's household.

Dan owned two parcels of land, one of 2.25 acres on which the homestead sits, as well as where he had planted banana trees and Brachiaria grass, and a parcel of 1.5 acres nearby where he planted maize, cassava, beans, and potatoes. The larger plot was inherited from his father many years ago, with the succession currently not completed. The 2.25-acre plot, though owned by Dan, was utilised by several local farmers, who work together to manage the Brachiaria grass, sharing in the financial and labour requirements of preparing land, purchasing seed, planting, weeding, and harvesting.

Of the 7 income generating activities Dan engaged in over the study period, 6 were related to farming. He considered himself a farmer, though was also involved in local community work for which he received a small stipend. Beyond this, he raised income through a combination of informal and formal loans, a harambee, and remittances. His largest sources of income came in August and October from a harambee fundraising event, and sale of a grade dairy cow respectively.

Dan owned a single Friesian dairy cow during the study, from which the family consumed milk. He also owned several chickens and sheep. Dan's daughter-in-law Margret, married to his eldest son, owned several chicken. Both Dan's and Margret's chickens roamed freely in the compound together, distinguishable by the purple paint applied to Margret's chickens to prevent attacks by birds of prey (see Table 10).

Figure 15: Dan's Homestead Demographics

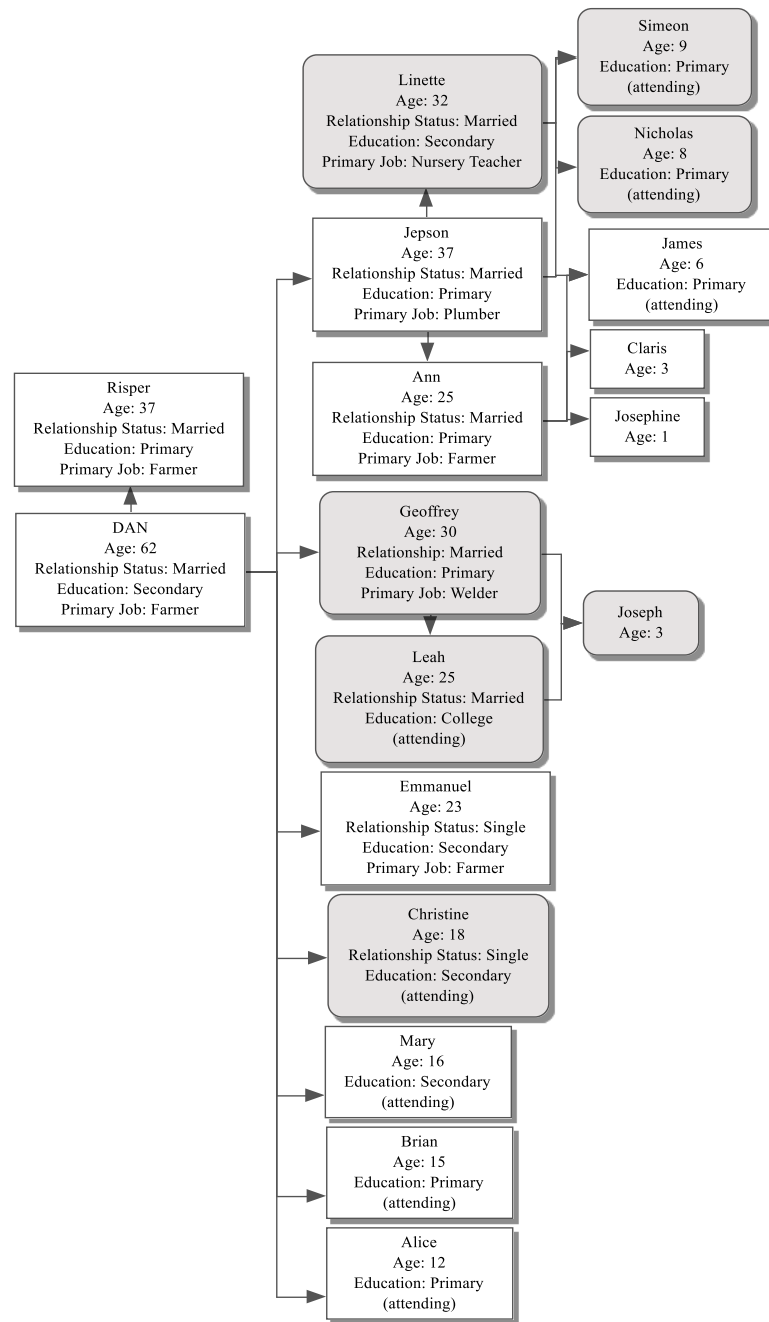


Table 10: Land and Livestock Ownership at Dan's Homestead

HH Member	Land	Livestock
Dan	3.75 acres	1x Grade dairy cattle 4x Indigenous sheep 30x Indigenous chicken
Margret	0 acres	20x Indigenous chicken

Roy

Roy was a 58-year-old teacher with an undergraduate degree who retired following the end of the study in 2020. He lives with his wife (51 -years old) and four children (31-19 years old) all of whom were in education. He had a further son, daughter in law, and daughter who lived together in Nairobi. This son was an engineer whilst his wife was a public health officer. They cared for Roy's youngest daughter who was still in school in Nairobi. Roy's widowed sister in law moved into a separate home on the homestead when her husband died (see Figure 16). Although Roy had provided her with somewhere to live, they do not get along and were not involved in each other's lives, financially or otherwise.

Roy's reason for wanting to intensify his livestock production was to provide himself with a profitable dairy business which could sustain him and his family during his retirement. Despite his big dreams of owning many dairy cattle, at the screening survey he owned just one Friesian cow, along with several chickens, goats, and sheep (see Table 11). Roy owned several parcels of land, a 2.5-acre parcel which housed the homestead, some trees, and a cleared area for brick making, and two parcels some 30 minutes' drive away, a 2 acre and a 1-acre parcel. He had only recently purchased the 1-acre parcel during the study, and had not yet put it to use. On the 2-acre parcel he had planted napier grass, trees, and various vegetables for the family's consumption. None of the title deeds for these parcels of land were in his name. The parcel which housed the homestead had been inherited from his father many years ago and the succession was still not complete. The other two parcels he had purchased also were in the process of having the title deeds changed, but were not yet complete.

Roy's largest source of income was his teaching salary. He was signed up to a SACCO savings account from which savings were deducted automatically from his pay every month. Almost equal to his take home pay after these savings deductions were remittances sent from his son in Nairobi every month. Sometimes this money was used to pay for everyday purchases, however during the study Roy was in the process of building a new, larger house for his family to live in, a significant upgrade from the house they had been living in. The son's remittances often were spent on supplies for this, with the money occasionally sent directly to the hardware store.

Figure 16: Roy's Homestead Demographics

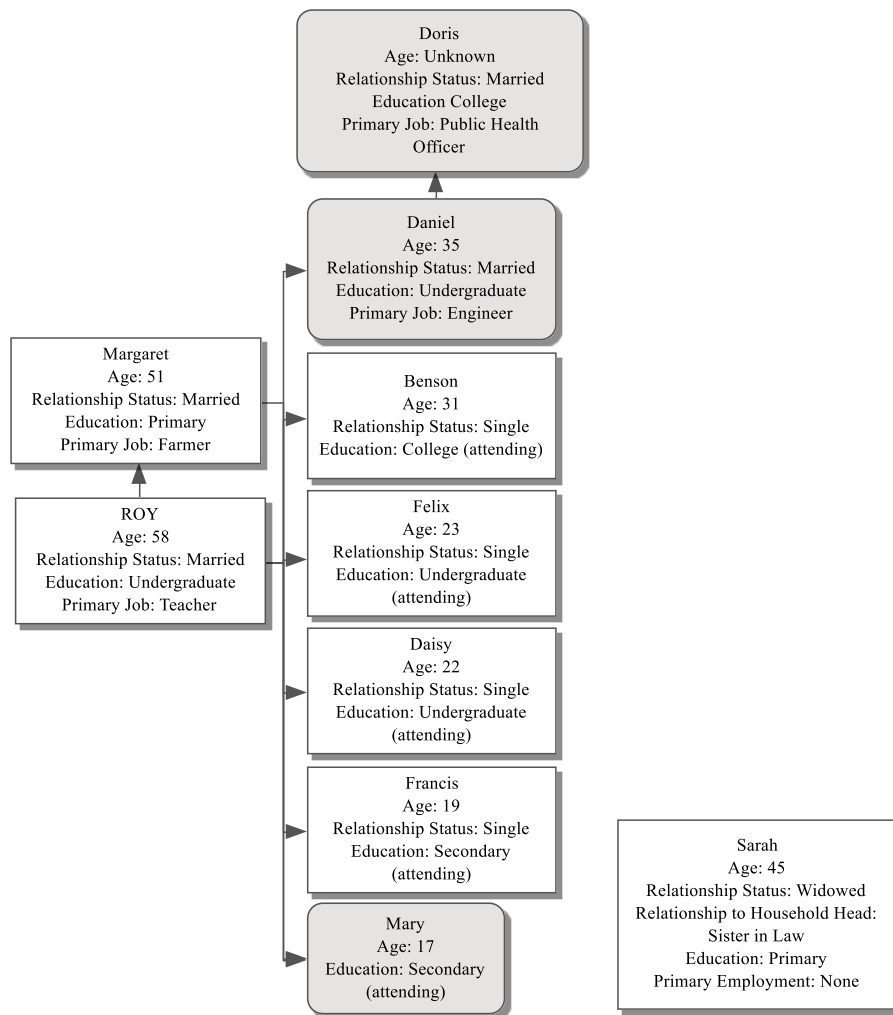


Table 11: Land and Livestock Ownership at Roy's Homestead

HH Member	Land	Livestock
Roy	5.5 acres	1x Grade dairy cattle 3x Indigenous sheep 3x Crossbreed goats 19x Indigenous chicken

Emmanuel

Emmanuel had the most difficult time financially during the study. At 50 years old, he was now a farmer, but had once been employed as a health and safety officer at Mumias Sugar Company. He was made redundant many years ago when the company went into administration. A devastating house fire just a few years before this made losing his job even more difficult for the homestead.

Emmanuel lived with his wife (49 years old), four children aged 13-20, and two grandchildren both 1 year old (see Figure 17). Despite considering herself a farmer, his wife’s ongoing health issues impacted upon her ability to assist on the farm. The only incomes earned during the study therefore were earned by Emmanuel himself. Income generated during the study was little, with the majority of this occurring later in the study from the sale of milk after his dairy cow gave birth. Instead, most of the money gained during this time came in the form of loans, particularly a KCB M-Pesa loan (provided by KCB bank through M-Pesa mobile money), many of which he had defaulted many times.

Emmanuel owned a single 1.5 acres of land, on which was the homestead, as well as where he grew sugar cane, maize, and vegetables, and grazed his livestock. He owned one dairy cattle at the screening survey, which gave birth during the study allowing him to earn an income from milk sales. He also owned chicken, a pig, and ducks (see Table 12).

Figure 17: Emmanuel's Homestead Demographics

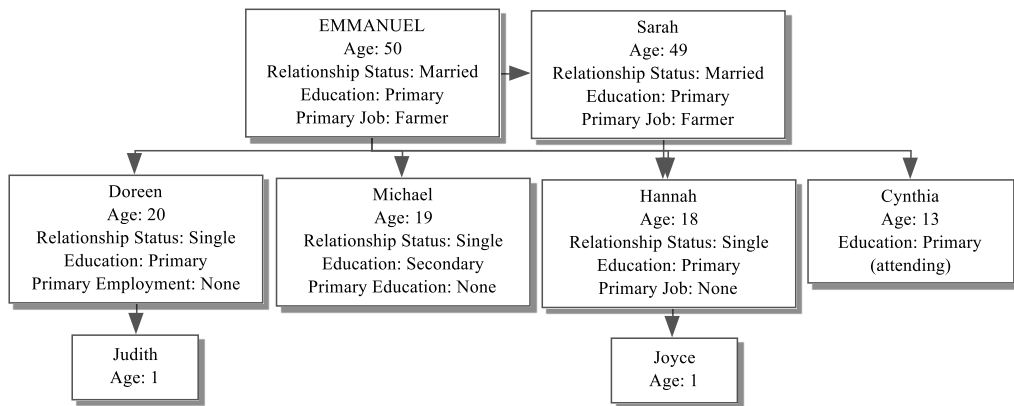


Table 12: Land and Livestock Ownership at Emmanuel's Homestead

HH Member	Land	Livestock
Emmanuel	1.5 acres	1x indigenous dairy cattle 6x indigenous chicken 1x indigenous pig 5x ducks

Anita

Anita was a 62-year-old widow, whose husband, a police officer, died several years ago. She was a farmer, and lived with two children, aged 34-7, a daughter in law aged 27, and 8 grandchildren aged 1-15 (see Figure 18). These family members lived between several houses on the compound. Her son, aged 34, was a teacher, and lived with his wife and children in one of the other houses on the property. Anita was the first of two. Whilst Anita had a relationship with her stepchildren, she had no relationship with the second wife.

Anita had access to two plots of land, one of 1-acre, on which the homestead sat, and she grew Napier grass, and one of 2-acres which she borrowed from her son free of charge on which she grew her crops. Anita used to graze her cattle on local land owned by the government, which, being idle land, was used by local people for cattle grazing. However, this plot of land was said to have a poor reputation, including being an area from which numerous children were kidnapped or raped on their way to and from school [informal conversation, 2019]. For this reason, the government divided the land up into one acre plots to be distributed to local people for growing crops, so the land would no longer be idle. Anita was one of those to receive a borrowed plot of land here.

Anita's largest source of income, accounting for around three quarters of her total income over the study, came from money sent to her by her son. Beyond this she earns money selling crops, selling milk, and taking loans.

She owned a variety of livestock, including beef and dairy cattle, chickens, goats, pigs, and sheep (see Table 13). However, although Anita wished to increase her dairy herd to earn more money, now that the government land is no longer available for grazing her livestock, her son wished to reduce the herd size, and even sold her cattle during the study without informing her.

Figure 18: Anita's Homestead Demographics

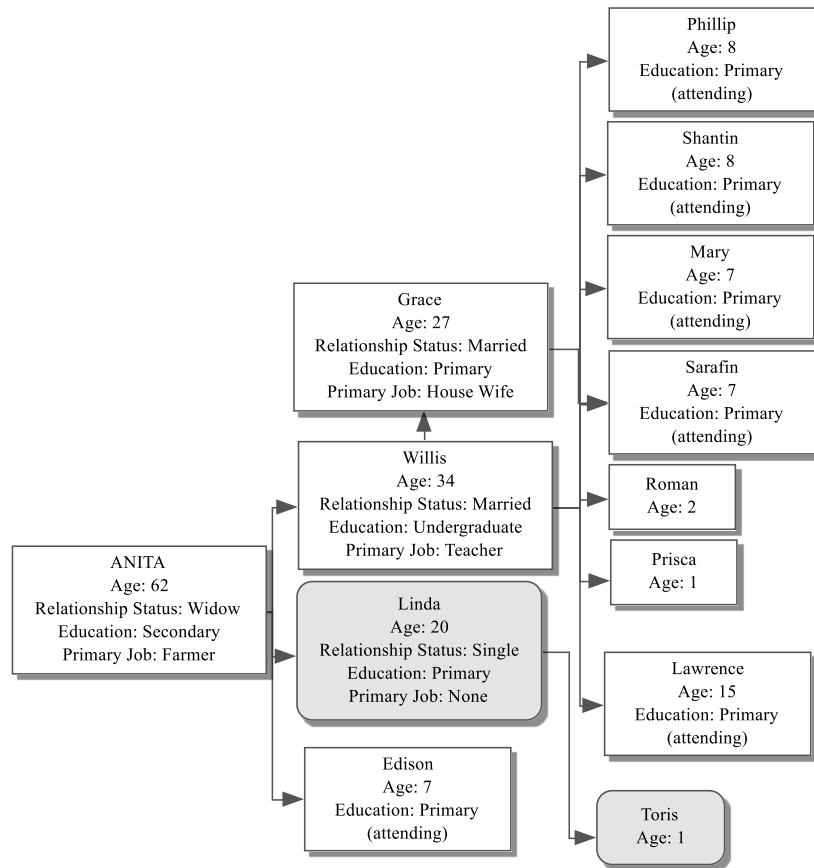


Table 13: Land and Livestock Ownership at Anita's Homestead

HH Member	Land	Livestock
Anita	3 acres	3x indigenous beef cattle 3x indigenous dairy cattle 2x grade dairy cattle 4x indigenous calves 1x grade calf 40x indigenous chicken 1x indigenous goat 2x indigenous pigs 2x indigenous sheep

4.3.3 Cluster 3: High Commercialisation with High Livestock Income

Benjamin

Benjamin was a 60-year-old farmer who split his time between his two homesteads and families, one in Busia, the other in Siaya county, travelling at least once every month. Between the two homesteads Benjamin had 8 children between the ages of 9-32, all but one of whom were still in education, and none were employed. His first

wife at 58 years old considered herself a farmer, and assisted with the agricultural chores at the homestead. His second wife, who was 34 years old and had younger children at home was a housewife (see **Error! Reference source not found.**).

Benjamin’s livelihood was particularly reliant on his milk sales, accounting for close to half of his total income earned during the study. Outside of the money he earned through his livestock and crops, the remaining six income sources consisted of loans and remittances.

Benjamin owned a 2-acre plot of land, on which there are several homes, a cattle shed, and vegetable plots growing predominantly maize and pumpkins. The title deed was in his name. He owned a relatively large herd of cattle, including 2 indigenous and 2 crossbreed beef cattle, 3 Ayrshire bulls, and 2 Ayrshire dairy cattle. He also owned chickens and goats, and had a pigeon coop on the property in which many doves lived (see Table 14).

Fairly early in the study Benjamin withdrew all of his life savings, some 80,000ksh (\$746.97/£543.81), to send to his daughter who believed she had found herself a cleaning job in Europe. This money was paid to his daughter’s boyfriend, who had supposedly found her the job abroad, and was said to cover her passport purchase, flight, and visa fees [informal conversation, 2019]. Despite the money being paid, by the end of the study the daughter had still not travelled for this job. Instead, the plan had changed, and she had supposedly now found a factory job in the Middle East which she was hoping to travel for soon.

Figure 19: Benjamin's Homestead Demographics

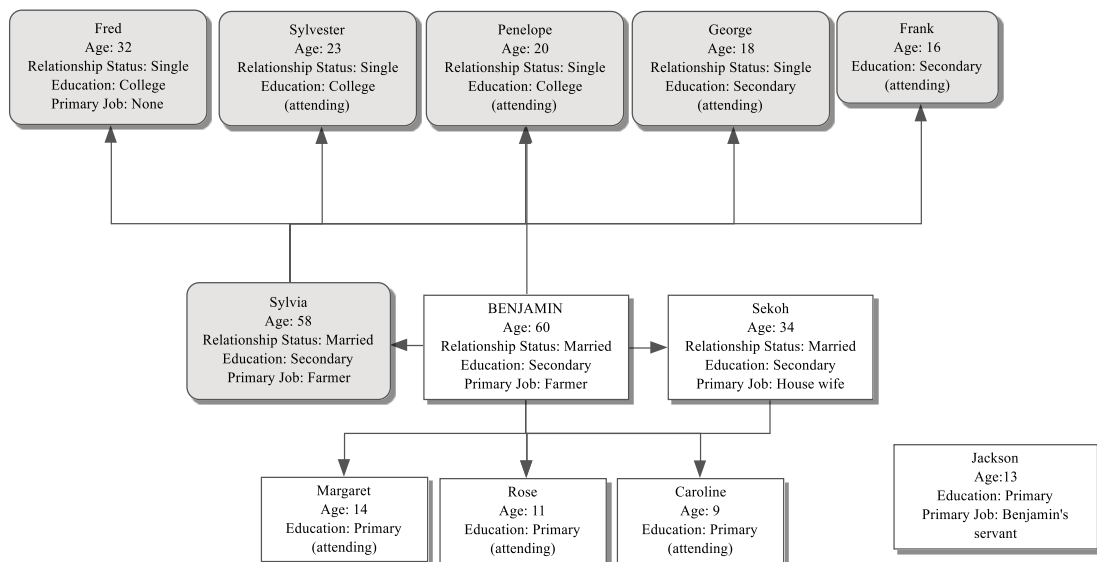


Table 14: Land and Livestock Ownership at Benjamin's Homestead

HH Member	Land	Livestock
Benjamin	2 acres	3x Ayrshire bulls 2x crossbreed beef cattle 2x indigenous beef cattle 2x Ayrshire dairy cattle 10x indigenous chicken 3x Alpine goats

Gabriel

Gabriel was a 63-year-old farmer, who lived with his wife, a 47-year-old vegetable seller, and 3 children aged 13-18 (see Figure 20). His first wife lived on a neighbouring homestead, where she was financially independent from Gabriel. Gabriel owned two plots of land. The first one is where he had built his homestead, along with rental properties, and measured roughly 0.05 acres. The second plot is located behind the homestead, and at 0.5 acres was where he conducted the rest of his farming activities. The title deeds for both these plots were in his name. The area in which Gabriel lived was the most urban of all the participants. On the edge of Busia town, houses were more closely compacted and land holdings smaller.

Despite having 11 income sources over the study period, 7 related to income generating activities, and 4 related to borrowing or remittances. His largest income source by far was the sale of milk, accounting for over half of his total income during the study. He sold this to both regular customers, as well as standing on the roadside outside his compound, selling to neighbours in the evenings when many people were returning home from work. He was also involved in community work, being paid a fee for assisting with the likes of handing out vitamin A supplements for under 5-year olds in his local community. Whilst the payments were often delayed, this provided him with his second largest source of income. Rental income from three single room dwellings provided his third largest income. These homes sat at the edge of the homestead besides a natural spring, where Gabriel allowed neighbours to collect water free of charge, freely entering his compound, they collect water in jerricans.

Gabriel owned a small number of livestock at the start of the study consisting of cattle and pigs (see Table 15), both of which he earned money from during the study period. The pigs lived tethered on the homestead, whilst the cows resided in the land behind.

Figure 20: Gabriel's Homestead Demographics

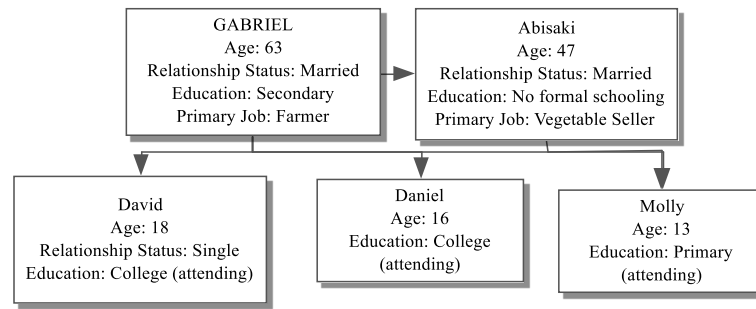


Table 15: Land and Livestock Ownership at Gabriel's Homestead

HH Member	Land	Livestock
Gabriel	0.55 acres	1x grade dairy cattle 1x crossbreed calf 2x indigenous pigs

Geoffrey

Geoffrey, a 60-year-old farmer, and his wife, a 58-year-old teacher, lived together with two of their three children, aged 24 and 17. His eldest child was a 25-year-old teacher living away from Geoffrey with her husband (see Figure 21).

Geoffrey owned two parcels of land. One parcel of land of 3.25 acres housed the homestead and farmland. Here Geoffrey grew Napier and vegetables. This land was inherited from his father, and the title deed had been transferred to Geoffrey. The second plot of land measured 1 acre, and was rented, though rarely was he able to meet the payments for this rent. On this plot he also grew a number of crops. An ongoing dispute with a neighbour regarding the land boundary culminated in the neighbour destroying his fence, and when Geoffrey confronted him, the neighbour attacked Geoffrey with a weapon, resulting in injuries and police involvement [informal conversation, 2019]. Unfortunately for Geoffrey, this caused ongoing financial difficulty as police required payment for attending the scene, and he had to hire a lawyer.

With 10 sources of income in total, half related to income generating activities, and the other half related to loans, Chama pay outs, and remittances, Geoffrey's largest

income came from the sale of milk. For the homestead, the largest and most stable income came from his wife’s work as a teacher, though being a privately hired teacher rather than a government paid teacher as Roy and Kevin were, she earned a smaller income than these other two teachers in the study. Geoffrey’s second largest source of income came from a merry go round pay out.

During the study Geoffrey was also dealing with an on-going health issue caused by a large wound on his leg which would not heal. He had attended the hospital when he could afford to do so, but none of his medical treatments helped. His wife also had a similar issue, with swollen legs that caused her enough pain that she had taken over a month off work during the study.

Geoffrey owned several livestock during the study, all residing on the homestead, including dairy cattle, chickens, sheep, goats, and pigs (see Table 16).

Figure 21: Geoffrey's Homestead Demographics

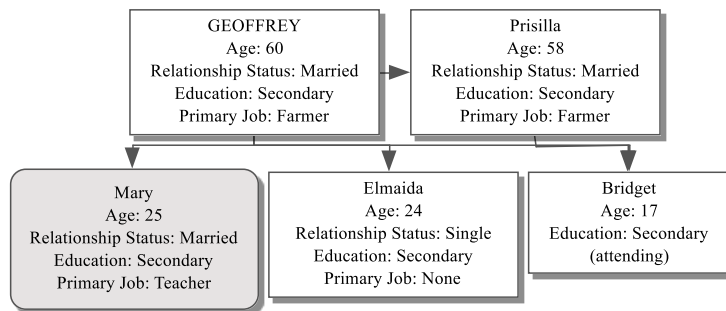


Table 16: Land and Livestock Ownership at Geoffrey's Homestead

HH Member	Land	Livestock
Geoffrey	4.25 acres	2x crossbreed dairy cattle 2x indigenous dairy cattle 30x chickens 3x indigenous goats 1x pigs 2x sheep

Henry

Henry was a 56 year old farmer, who lived with his 55 year old wife, a second-hand clothes seller, 6 of his 7 children aged 30-13, 2 daughters in law, and 3 grandchildren aged 6 months to 2 years. Two of his children who lived at the homestead work, one

was a farmer, the other a boda boda driver. His daughter who lived away from the home had an undergraduate university education and worked at a petrol station (see Figure 22).

Henry owned a single 4.75 acre parcel of land, for which the title deed was in his name. Here he grew maize, napier grass, and vegetables, as well as housing the homestead and the livestock. Henry's livestock production was impressive, particularly his dairy production (see Table 17). The only participant to use YouTube as his information source for improving his livestock production, Henry grew up very poor. He recounted once of how he once saw the story of a dairy farmer on the news who had created a highly successful dairy business despite having grown up in poverty. This news story inspired him to create his own dairy business to raise himself out of poverty [informal conversation, 2019]. With information learned through YouTube, Henry had developed an intensive dairy production, which once included the use of hydroponics to grow shoots to feed cattle. He was also the only participant to raise dairy goats intensively.

Despite the success of his dairy production in particular, Henry's largest source of income during the study came from remittances sent by family members including his daughter who works at the petrol station. This accounted for almost a third of his total income. During the study he demolished his home, and was in the process of building a larger, improved home in its place. The remittances were used for this construction. Of incomes he had earned, the sale of milk and sale of dairy cows accounted for nearly half of his total income. Cattle were sold for two reasons. On the one hand, Henry was disappointed with the grade dairy cattle he had purchased a few years prior, finding them to be less productive than the crossbreed cattle he had previously owned. The lower productivity was the reason he now longer utilised his hydroponics tent [informal conversation, 2019]. On the other hand, he needed to liquidate assets to come up with the lump sum required for the construction of his home.

Aside from his grade dairy cattle and dairy goats, Henry also owned indigenous cattle, chickens, indigenous goats, and pigs.

Figure 22: Henry's Homestead Demographics

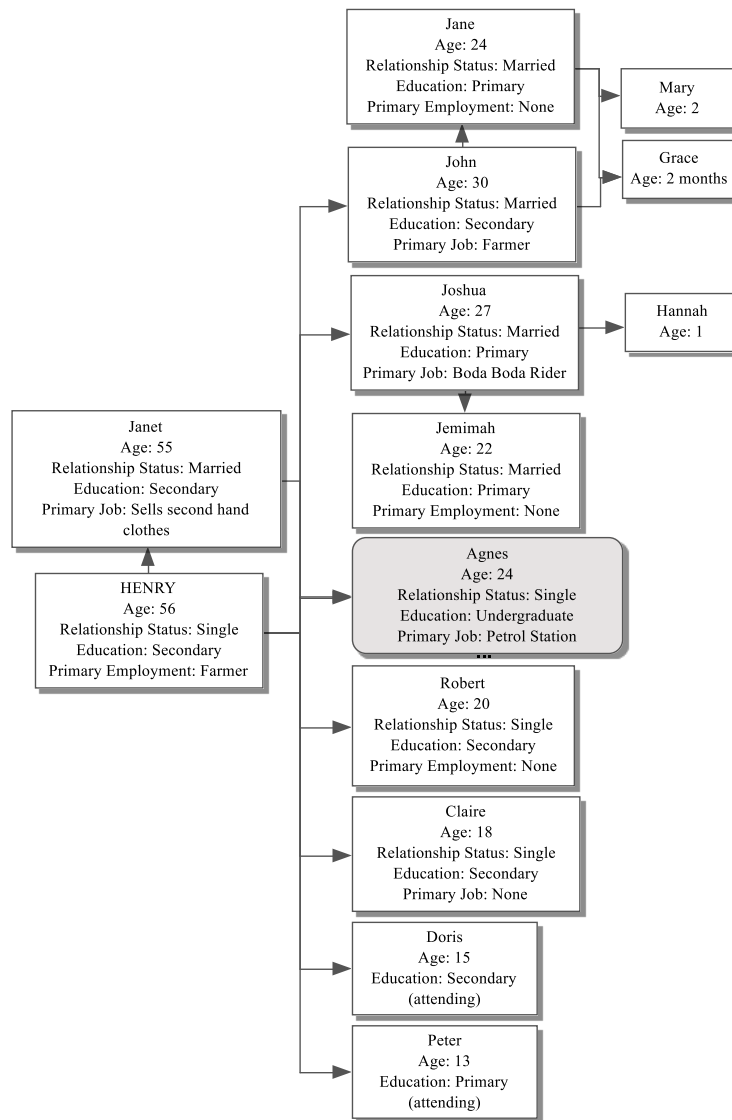


Table 17: Land and Livestock Ownership at Henry's Homestead

HH Member	Land	Livestock
Henry	4.75 acres	10x grade dairy cattle 20x indigenous chicken 12x grade dairy goats 8x indigenous goats 2x grade pigs

Joseph

Joseph was a 66 year old shop owner, who lived with his wife, 60 years old, and four of his seven children aged 20-30 (see Figure 23). Josephs homestead was located on a busy crossroads, where people in cars passed frequently. They had built a small corner shop on the edge of their compound, selling airtime, sodas, bread, and other commodities. His wife also sold mandazi, chapati, and chai alongside a neighbour who sold fried tilapia from his compound.

Joseph owned a 1-acre plot of land, for which he owned the title deed, on which sits the homestead and some farmland on which he grew maize and vegetables, and keeps his cattle, other than which, he only owns chicken, though his son Steven owned 5 grade pigs which he kept here as well. Whilst his largest source of income came from his shop, accounting for around a third of his total income, Joseph also earned around a fifth of his income from the sale of milk, making this his second largest source of income. He mostly sold the milk to passing customers and those who came to his shop, but has on occasion also sold to another nearby shop and a restaurant.

Joseph owned a few livestock, including dairy cattle, chicken, and goats (see Table 18). He wanted to increase his dairy production in particular so that he would have more milk to sell, meaning he could sell to other shop owners and restaurants more frequently [informal conversation, 2019].

Figure 23: Joseph's Homestead Demographics

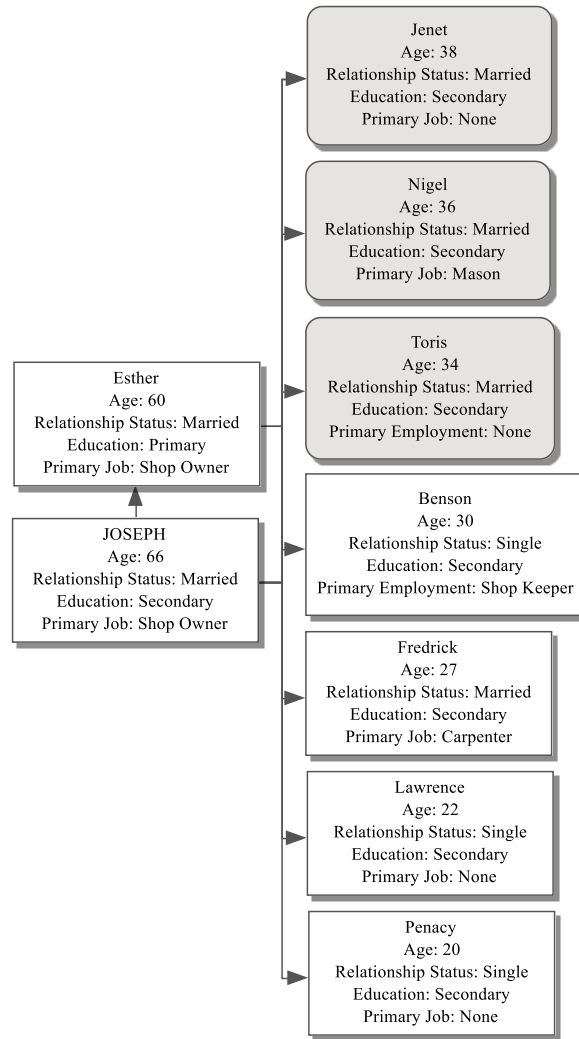


Table 18: Land and Livestock Ownership at Joseph's Homestead

HH Member	Land	Livestock
Joseph	1 acre	1x grade dairy cattle 1x crossbreed cattle 1x crossbreed calf 8x indigenous chicken
Steven	0 acres	5x grade pigs

4.3.4 Cluster 4: High Commercialisation with High Livestock Income

Daisy

Daisy was a 60 year old retired teacher, who lived with her 63 year old husband Boaz who worked for the local government, and two of her young grandchildren aged 11 and 13 (see Figure 24). Her grown up children lived and worked in Nairobi, and were financially independent from Daisy. Daisy represented the richest homestead in terms of monthly income and savings, due to her pension from her previous teaching job and Boaz's income, she had the benefit of significant regular income with which she was able to invest in other activities. Between them, Daisy and Boaz owned a significant amount of land. Boaz owned a little over 8 acres, whilst Daisy owned 3.7 acres, though for all these plots the title deeds were in her husband's name. On this land they planted crops such as napier grass, bananas, and pineapples, and housed their livestock.

Daisy had three income sources which together make up the majority (roughly two-thirds) of her earnings over the study period, her pension, sale of grade chickens, and rental income. Her remaining income comprised 10 other sources, including selling eggs, remittances, loans, chama pay-outs, and selling indigenous chicken. Having had two stable significant incomes for much of her life, Daisy had been able to utilise much of her pension to invest in the building of rental houses and intensive chicken production, which now earned her an additional income greater than that of her pension.

Daisy had once been a member of a now collapsed cooperative which dealt with poultry production, and included trainings from outside companies. Here she met the owner of a poultry company which, following the collapse of the cooperative, she continued to deal with personally. She purchases Sasso chicks from the company, as well as feed, and when the chicks have been reared, she sells the majority of them back to the same company who then market them to large companies such as supermarkets. Whilst this was profitable for Daisy during the study period, frequent delayed payments from the company have resulted in her being owed a significant amount of money (though due to poor record keeping she is not sure exactly how much she is owed) at the end of the study.

The cattle at the homestead were owned by Boaz, whilst Daisy owned the many chickens at the property herself. The remaining livestock, which included goats, geese,

and ducks, were owned by both Daisy and Boaz (see Table 19). Both the cattle and poultry productions here were intensive. For the most part Daisy dealt with all expenditures and kept all incomes from the chicken production, whilst her husband dealt with all expenditures and kept incomes from the dairy production. In some instances, Daisy would collect income from milk sales, and was able to keep these incomes for her own spending.

Figure 24: Daisy's Homestead Demographics

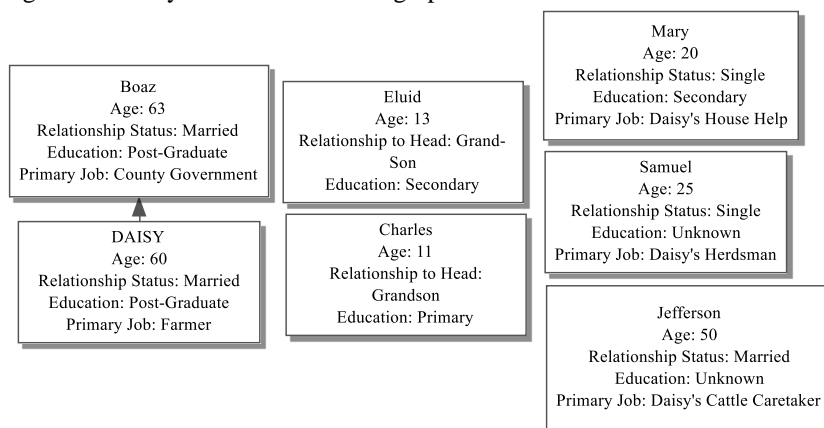


Table 19: Land and Livestock Ownership at Daisy's Homestead

HH Member	Land	Livestock
Daisy	7.55acres	850x Sasso chicken 300x broilers 50x indigenous chicken 4x indigenous goats 8x geese 6x ducks
Boaz	8.2 acres	5x indigenous beef cattle 2x Friesian dairy cattle 1x Friesian/Ayrshire crossbreed dairy cattle

4.4 Participant Overview

Though the results from the 15 participants of this study cannot be used to extrapolate data to the wider community, broad results can be found within the summary and clustering data. Livestock incomes, which are of importance when considering livestock production as a pathway out of poverty, increase through the clusters, in line with increased value of livestock at the homestead, and the increased commercialisation of this production.

The increased value of livestock tends to mean the keeping of larger livestock, which have a higher market value than smaller livestock. Particularly in this group of participants, it suggests the keeping of dairy cattle.

The level of commercialisation (the value of produce sold rather than consumed) may therefore be linked to the increasing livestock profits through the clusters, as livestock incomes rise, but expenditures do not, despite the increasing livestock values. In fact, with higher values of livestock and levels of commercialisation, and relatively similar overall incomes and expenditures, the proportion of expenditure spent on livestock actually decreases through the clusters. This would imply that despite keeping more and/or higher value livestock, there is a relative lack of input purchases to match.

Perhaps acting as an argument against livestock production as a pathway out of poverty, commercialisation and increasing livestock incomes do not lead to higher incomes overall. Instead, as livestock incomes increase, the proportion of total income derived from livestock production also increases, which implies that as homesteads become more commercialised, they also become more specialised, and reduce the proportion of other incomes in their portfolios, ultimately negating the financial gains to their livelihood portfolios they have achieved from livestock production (see Table 20).

Figure 25 shows how much of the participants livestock production was sold compared to what was consumed. The mean proportion of livestock production which was sold rather than consumed is 56%, with a median of 68%. 12 of the 15 participants could be considered as mixed subsistence/commercial farmers, and act as both consumers and producers of their livestock production. Only 3 participants did not sell any livestock or their products during the study. However, it was only Thelma for who this was intentional, Alice and Moses both intended to sell livestock products, particularly milk, but had failed to gain sufficient productive stock during the study.

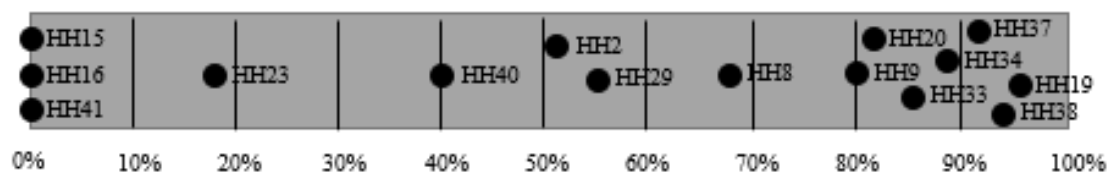
Table 21 provides further statistics for the participants and clusters, relating to their estimated livestock value (using average figures for current market value rates of livestock sold in livestock markets in Busia at the time of analysis which were available from the Busia lab), livestock incomes, livestock expenditure, and financial profit from livestock.

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Table 20: Participant Results for Cluster Variables

Cluster	Participant	Commercialised %	Livestock Income %	Total Income	Livestock Expenditure %
1	Thelma	0	0	134,859	12.2
1	Alice	0	0	293,000	18.8
1	Kevin	17	1.3	340,900	7.3
1	Moses	0	0	211,250	18.5
2	Sarah	52	17.4	118,800	17.6
2	Dan	68	18.7	231,950	16.1
2	Roy	80	16.7	463,345	4.6
2	Emmanuel	55	24.3	26,655	3.6
2	Anita	40	9.9	63,275	8.7
3	Benjamin	95	47.2	352,855	2.5
3	Gabriel	86	59.9	79,030	11.6
3	Geoffrey	88	33.0	133,770	6.7
3	Henry	91	50.6	432,150	10.6
3	Joseph	93	39.9	131,795	2.0
4	Daisy	82	47.5	1,190,775	46.2

Figure 25: Percentage of Livestock Production Sold During the Study Period



In the coming chapters, this thesis will examine the detail and reasoning behind the aforementioned differences between the participant cluster summary results, by looking at how they attempt to intensify their production, how they access finance to invest in livestock production, the risks they face that impact on their production, and the barriers to intensification that they face.

As a broad overview of the findings of this study, many of the participants have limited income, enough to just about get by, affording food, education (although payments are

Table 21: Participant Summary Variables

Cluster	Participant	Value of Livestock at Screening (Ksh)	Total Livestock Income During Study (Ksh)	Total Livestock Expenditure (Ksh)	Livestock Profit During Study (Ksh)
1	Thelma	348,100	0	15,680	-15,680
1	Alice	315,500	0	33,140	-33,140
1	Kevin	104,700	4,300	23,200	-18,900
1	Anita	583,500	6,325	4,075	+2,250
1	Moses	60,000	0	40,220	-40,220
2	Sarah	282,500	20,640	21,830	-1,190
2	Dan	120,000	43,400	37,640	+5,760
2	Roy	108,800	77,445	17,460	+59,985
2	Emmanuel	49,200	6,475	1,030	+5,445
3	Benjamin	817,000	166,565	26,140	+140,425
3	Gabriel	210,000	47,360	6,240	+41,120
3	Geoffrey	208,500	44,170	11,100	+33,070
3	Henry	1,112,000	218,570	51,500	+167,070
3	Joseph	240,600	52,540	1,980	+50,560
4	Daisy	974,000	565,939	407,662	+158,277

often delayed), and some agricultural inputs. However, most lack sufficient accumulation of cash in the form of savings or disposable income to make significant investments. Most participants keep livestock in back yard, extensive, or semi-intensive systems, with high mortality rates (particularly in the case of poultry), low yields (particularly in the case of dairy cattle), and limited financial or nutritional benefits.

The average benefits achieved from different types of livestock differ. Generally speaking, poultry production reaped few benefits, largely due to high mortality rates. Many participants spent more on the upkeep of chicken than they earned from their production, with few chickens from the original flock being consumed. Dairy cattle tended to reap higher benefits from the sale and consumption of milk, and prove for most to be financially profitable, earning participants a daily wage. However, low yields limited the incomes that were earned from these cattle, with limited improved

feeds likely a significant contributor. Other types of livestock played a less significant role in the participants livestock related activities. Small ruminants are often owned as a form of savings, acting as easily liquidated assets. If considering livestock as a form of savings, then the opportunity to breed the likes of pigs, goats, and sheep can be considered as a kind of interest paid on the savings. Whilst the breeding of these livestock was infrequent, it allowed the participants to earn an income whilst maintaining the asset value.

The participants access to finance was generally good, with loans and savings easily available through chamas and mobile money for all participants. However, the often insufficient incomes the participants were earning meant that despite the availability of financial products and services, available finance from savings or loans was often subject to significant competing needs. Informal financial providers, whilst often looked at from outside actors as 'lesser' than formal providers, were often preferred by the participants. The ease with which they can be accessed, and the opportunity to be part of a group of like-minded people with whom to achieve their goals were significant draws for most participants. On the other hand, there was often a fear of taking loans from financial providers due to the risk of having property, including land, taken to repay the debt if they were to default on the loan, something many saw as a very real possibility due to their low incomes. Some participants even stated that should they be offered a formal loan through a bank they would not take it. The knowledge that savings could be needed at any time if income falls too low or a sudden large payment was needed (such as a medical bill), prevented all participants from wanting to take advantage of the high interest rates (up to 8%) offered by locked savings accounts.

Past risks in livestock production experienced by the participants include livestock death due to disease, drought, and the increased cost of inputs, which each affected over half the participants. These were also the three risks they found most likely to occur in the future, though in a different order. These, amongst other risks, can significantly impact the participants ability to intensify, as well as lead to additional financial and time burdens in their mitigation. A key factor in the regular lack of significant mitigation strategies was availability of finance. Often mitigation strategies require money, and when this is already failing to cover household expenses

CHAPTER IV: INTRODUCTION TO THE PARTICIPANTS

sufficiently, implementing mitigation strategies becomes more than simply a conversation of access to knowledge as is often discussed in the literature.

CHAPTER V: PIECING TOGETHER A LIVELIHOOD: DIVERSE INCOMES AND COMPETING NEEDS

5.1 Introduction

With the focus of this thesis being on how the participants of this study intensify their livestock production (within the context of intensifying livestock production in Kenya to improve smallholder livestock farmers livelihoods whilst meeting the growing demand for livestock products), it is vital to consider how livestock production fits within the participants wider livelihood portfolios. Livestock production has the ability to benefit livelihoods in terms of increasing incomes through sales of livestock products and animals, as well as providing social and nutritional benefits. However, the use of inputs to increase herd/flock sizes and/or yields may prove to have a negative impact on livelihoods due to the financial burden of such practices should these benefits not be achieved.

In order to understand how livestock production fits within the participants livelihoods, this chapter will examine these livelihoods. The diversification of income generating activities is a strategy utilised by all the participants, from the poorest to the richest. This chapter will detail how most commonly the participants have one or two primary income sources which contribute significantly to their livelihoods, but engage with no fewer than six income sources, and no more than 14 sources, over the study period. Comparing the livelihood strategies of the different groups of participants detailed in the methodology provides an insight into whether livelihood portfolios have any influence on livestock production, or vice-versa.

5.2 Background

Within the literature, livelihood diversification, both on and off farm, is often considered as a beneficial strategy with which farm households are able to make a living; without this diversification, some doubt whether food and livelihood security could be achieved (Gebu *et al.*, 2018). There has been much debate around whether smallholder farming can have benefits for economic growth, food security, poverty reduction, and creation of employment (Melketo, Geta and Sieber, 2020). Whilst the likes of FAO, the World Bank, and IFAD, as well as many authors, believe investments in agriculture to be the most effective way to reduce poverty, in part due to the extent

to which a large proportion of the world's poor already rely significantly on agriculture for their livelihoods (World Bank, 2008; FAO, 2009b, 2015b; Janvry and Sadoulet, 2009; Birner and Resnick, 2010; Torrez, 2011; IFAD, 2013), there is a growing body of literature which suggests smallholder agriculture cannot support sufficient livelihoods alone in most cases (Block and Webb, 2001; Woldenhanna and Oskam, 2001; Gassner *et al.*, 2019).

In a report by OECD that considered the top 25 countries that made the fastest progress in reducing poverty between 1980-2005, which included Brazil, Chile, China, Costa Rica, Dominican Republic, Egypt, Gambia, Ghana, Guatemala, Honduras, Indonesia, Kenya, Malaysia, Mali, Mauritania, Mexico, Nicaragua, Panama, Philippines, Senegal, Tajikistan, Thailand, Tunisia, and Vietnam, an average of 52% of poverty reduction could be attributed to agricultural improvements, 35% to remittances, and 13% to non-agricultural (Cervantes-Godoy and Dewbre, 2010). The report concludes that a reduction in extreme poverty would be near impossible without an increase in agricultural productivity and increased farmer incomes. However, there was a vast difference between individual countries in how they managed this level of poverty reduction. Table 22 shows which of the three modes of poverty reduction (agricultural improvement, non-agricultural improvement, or remittances) was the leading contributor in each of these countries.

This serves as a reminder that whilst improving agriculture through increased productivity and access to markets at a country level is clearly an important aspect to ensure poverty reduction, it cannot be considered in isolation from other sectors or potential modes of poverty reduction country wide. In Kenya the most significant mode of poverty reduction was from remittances, with this study occurring prior to the invention of M-Pesa, a mobile e-wallet available on all Safaricom network mobile phones. M-Pesa was developed initially to assist with the transfer of remittances, resulting in a surge in remittances being sent to rural areas, in particular in the years following the introduction of M-Pesa.

In the years since, poverty reduced in Kenya from 46.6% in 2005/06, down to 36.1% in 2015/16, with rural poverty reduction providing the vast majority of this decline, with rates falling from 50.5% to 38.8% during the same period, whilst urban poverty

CHAPTER V: PIECING TOGETHER A LIVELIHOOD: DIVERSE INCOMES AND COMPETING NEEDS

reduction only fell from 32.1% to 29.4% during this time (Wankuru *et al.*, 2019). Agricultural households accounted for 31.4% of this reduction in rural poverty (*ibid*).

Table 22: Primary Contributor to Poverty Reduction Between 1980-2005 in the Top 25 Countries with the Largest Reduction in Poverty Rates

Agriculture	Non-agriculture	Remittances
Brazil	China	Gambia, The
Cameroon	Mauritania	Ghana
Chile	Thailand	Guatemala
Costa Rica	Vietnam	Honduras
Dominican Republic		Indonesia
Egypt		Kenya
Malaysia		Philippines
Mali		Senegal
Mexico		Mexico (same contribution as agriculture)
Nicaragua		Tajikistan
Panama		
Tunisia		
12	4	10

(Cervantes-Godoy & Dewbre, 2010)

Hussein & Nelson (1998) have found that whilst the literature agrees that diversification of livelihoods is common, its nature is different depending on the context in which it has occurred. They state that livelihood diversification is:

- *Sometimes a means to enable accumulation for consumption and investment;*
- *Sometimes employed to help spread risk, or to cope with temporary crises;*
- *Sometimes an adaptive response to longer-term declines in income or entitlements, due to serious economic or environmental changes beyond local control;*
- *Inevitably pursued via a range of activities that are by nature specific to the local context (in relation to resources available, culture, natural resources, climate etc);*
- *Often differentiated (types and degrees of diversification differ according to location, gender, age, class, and culture);*
- *Usually structured by a wide range of motivations, restrictions, and opportunities;*
- *Often closely bound to and concurrent with the development and implementation of other livelihood strategies, especially agricultural intensification and migration;*

- *Tempered in form and extent by wealth disparities and differential access to entitlements.*

(Hussein & Nelson, 1998, p.3)

More simply put, livelihood diversification has been defined as ‘the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living’ (Ellis, 2007, p.1). For many people, the ways they build their livelihood is unlike that of the waged and salaried employment we presume as the norm in modern western societies. Instead, informal, precarious, and non-standard employment is prevalent (Ferguson and Li, 2018). Diversification can occur as a result of both ‘push’ and ‘pull’ factors. Push factors refer to constraints that force diversification to occur, whilst pull factors are enabling conditions that incentivize diversification. Overall, income diversification among small farmers has been shown to lead to higher consumption and lower consumption variation (FAO, 2015a).

The participants of this Ph.D. study are highly diversified in how they earn their incomes. All farm both crops and livestock, as well as having non-farm income generating activities and access to financial products. In order to understand the role of livestock in the participants livelihoods, this thesis begins with considering how the participants earn their livings, and how livestock production is situated within this context.

5.3 Incomes

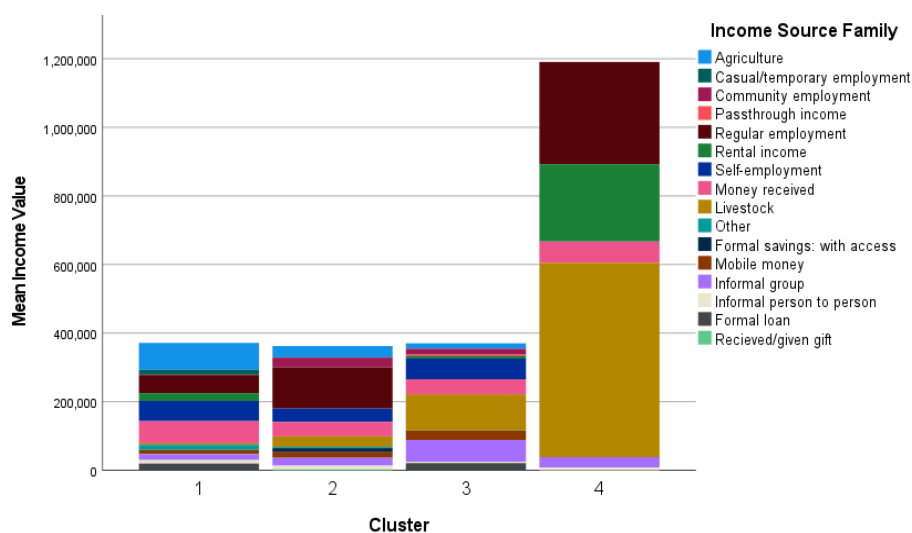
5.3.1 Piecing Together a Livelihood

Livestock production is just one component of farmers livelihoods. At the beginning of the study, the participants were asked what they consider their primary employment to be. The majority responded that they were farmers, referring to both crop and livestock production. For most, this agriculture was an income generating activity. However, the ways in which the participants piece together their livelihoods is complex and diverse. With few formal employment opportunities available in Busia, the participants pieced together a number of income sources which ebb and flow throughout the study period. In 2018, the waged labour sector only grew by 2.8% in Kenya, whilst the informal sector grew accounting for 91% of all new jobs created

(KNBS, 2019). Few participants had formal employment which could be relied on. Instead, most needed to engage in a variety of informal activities to earn money.

Not only do the participant clusters vary in terms of their income levels, proportion of income derived from livestock, livestock commercialisation, and proportion of expenditure that goes towards livestock, the ways in which the participants piece together their other sources of income also vary. Figure 26 shows how cluster 4 derived a much larger value of income from their livestock production, and also had a much larger rental income and income from regular employment than other clusters. On average, cluster 1 (subsistence farmers) earned a larger income from crop agriculture than the other clusters, as well as a slightly larger income from money received (being either remittances or intrahousehold transfers). Cluster 2 (medium commercialisation with low livestock income) tended to predominantly earn their living from regular employment. Cluster 3 (high commercialisation with medium livestock income) earned the majority of their income from livestock production, and also had the largest income from informal groups (table banking, merry go round, or harambe, with merry go round pay outs counted as income here).

Figure 26: Mean Value of Income Sources by Cluster



In terms of the proportion of total income earned from various sources during the study, the clusters also vary, as can be seen in table 24. Cluster 1 were heavily reliant on resources received (25.7%), crop agriculture (23.4%), and self-employment (17.5%) in particular. Cluster 2 were similar in that the top two income sources were resources received (23.2%) and crop agriculture (18.3%), but they differed from cluster 1 in that

they earned significantly more from their livestock production (17.1%), with self-employment playing a less significant role in livelihoods (4.3%). Cluster 3 earned most from their livestock production (46.8%).

Resources received were still an important source of income for this cluster, contributing 19.3% of total income. The use of informal groups for loans and savings were the third most important source of income for this cluster (11.1%) though only slightly more than was the case for cluster 2 (10.1%). Cluster 4 earned the majority of income from livestock production (47.5%), similar to cluster 3. Regular employment (25.0%) and rental income (19.0%) were the other two significant income sources for this cluster. Overall, from Table 23, some general trends can be seen. Crop agriculture reduces in its proportion of total income through the clusters, as livestock income both in terms of Kenya Shilling value and proportion of total income, and livestock profits and value of livestock at the homestead increase (as seen in **Error! Reference source not found.**and **Error! Reference source not found.**). The same is true with reducing proportion of income derived from resources received, though to a lesser extent. The income sources highlighted in red in this table show the largest five income sources for each

Table 23: Mean Proportion of Income Derived from Income Sources by Cluster

Income Source	Cluster			
	1	2	3	4
Agriculture	23.4	18.3	5.6	-
Casual/Temporary Employment	2.8	0.2	-	-
Community Employment	0.1	3.2	1.5	-
Regular Employment	10.6	13.3	0.1	25.0
Rental Income	6.8	-	0.6	19.0
Self-Employment	17.5	4.3	5.3	-
Resources Received	25.7	23.2	19.3	5.2
Livestock	0.4	17.1	46.8	47.5
Withdrawal from Formal Savings	-	1.3	-	-
Mobile Money Loan	1.2	5.5	2.4	-
Informal Group	6.9	10.1	11.3	2.5
Informal Person to Person Borrowing	1.0	2.4	1.1	0.7
Formal Loan	2.0	-	5.6	-
Gift Received	-	0.3	-	-
Other	1.5	0.7	-	

The question arose during this analysis of whether this reduction in crop income as livestock income increases may be due to increased livestock production resulting in increased fodder production. Data collection did not include the precise acreage allocated to different crops. However, it did collect data on the total acreage utilised at the homestead, the cluster averages for which are shown in Table 24.

Table 24: Mean Acreage Available at the Homestead by Cluster

	Cluster			
	1	2	3	4
Acreage	6.5	9.6	2.9	11.9
Range	3.05-12	1.5-34	0.55-4.75	11.9

Whilst not enough data were collected to answer this question with certainty, plotting the data on a scatter graph with a line of best fit shows that whilst there is a slight positive correlation, it is not strong, as can be seen in Figure 27 and Figure 28. For this data, land size is not significantly correlated to agricultural income nor livestock income. These averages between clusters break down further. Figure 29, Figure 30, Figure 31, and Figure 32 show the breakdown of income sources for each participant within each cluster. Whilst the cluster average trends can be seen within the individuals in the clusters, there are differences within these clusters. For example, whilst cluster 1 is the most reliant on crop agriculture of all the clusters, Thelma did not earn any money from selling crops, and this was not a significant source of income for Moses. In cluster 2, who earn less money from crop production than cluster 1, Dan, and Sarah in particular, make a significant proportion of their income from this source.

Figure 27: Scatter Graph of Land Access and Crop Income

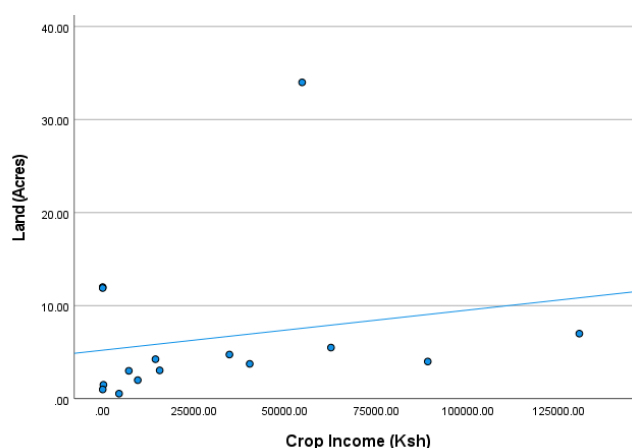


Figure 28: Scatter Graph of Land Access and Livestock Income

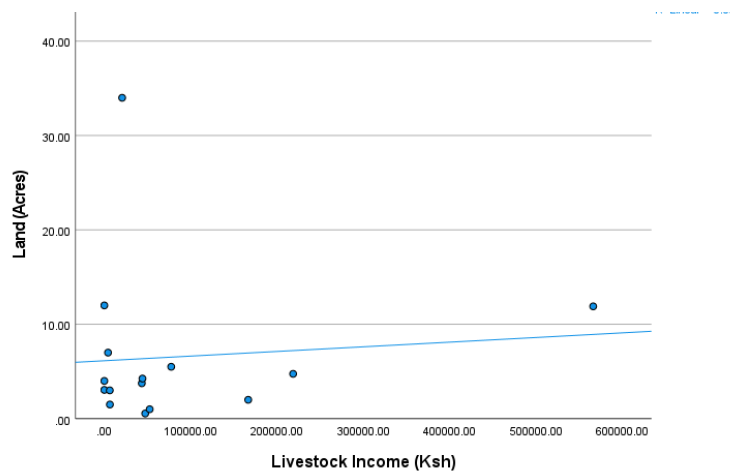


Figure 29: Income Sources for Participants in Cluster

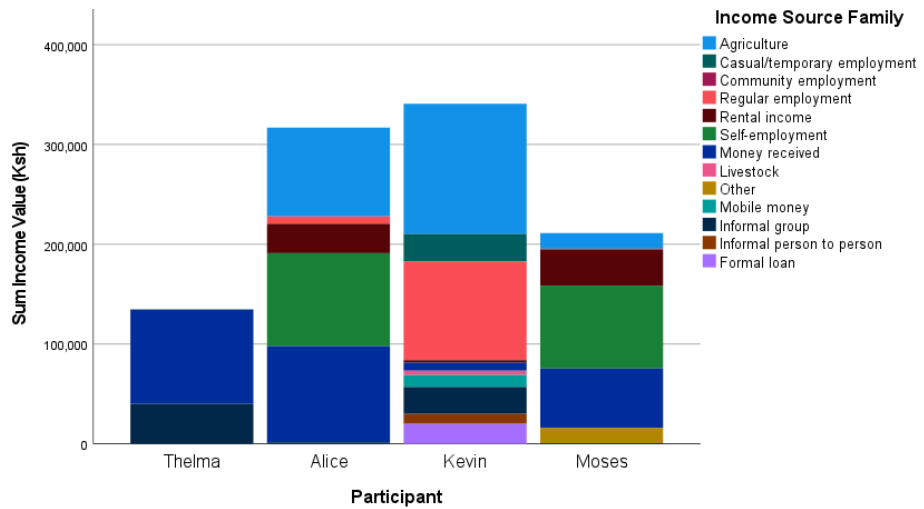


Figure 30: Income Sources for Participants in Cluster 2

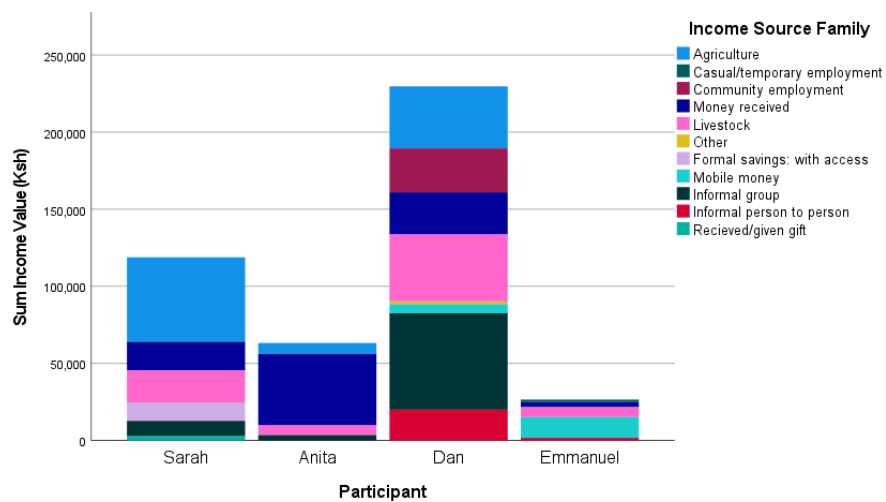


Figure 31: Income Sources for Participants in Cluster 3

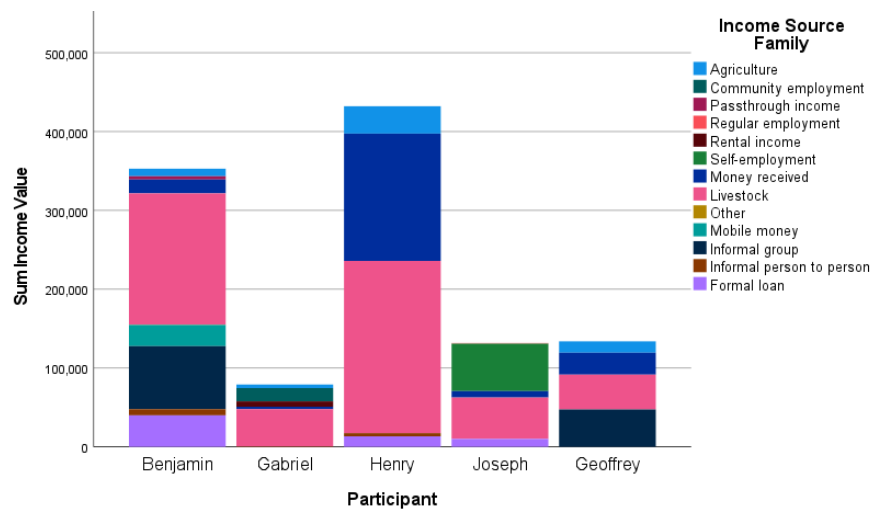
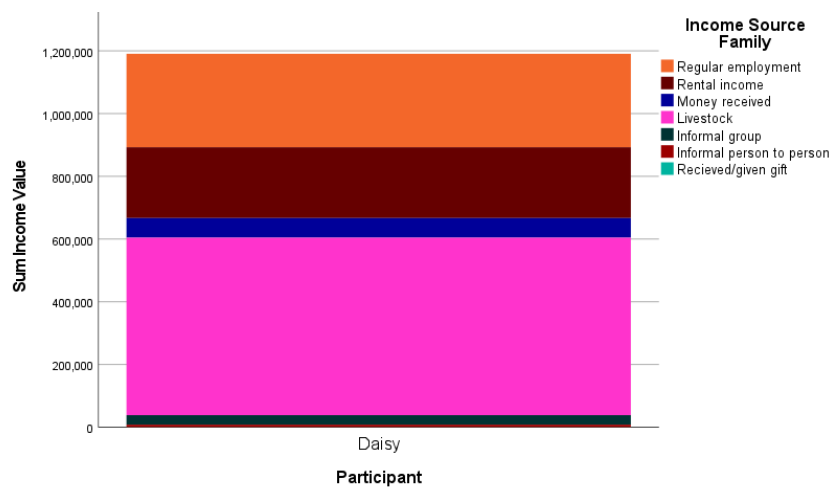


Figure 32: Income Sources for Participants in Cluster 4



Rather than farmers, teachers, remittance recipients, shop owners, the participants were a combination of these and more at various times. Income sources over time look a lot like that of Gabriel, one of two participants to earn the largest proportion of his income from selling milk. Gabriel tapped into 10 income earning activities from 6 income source families over the 10 months. Some of these were regular incomes which were fairly reliable, such as selling milk and rental income. Despite the possibility of late payments or yield fluctuations, these provided a relatively reliable income, and in the case of milk, offer a daily income. However, these two sources were not enough to make ends meet, and so Gabriel, as with other participants, sought out other income generating activities through a combination of labour, enterprise, and redistribution. Whilst the regularity of each income and sources of income differed between the

participants, this piecing together of income generating activities existed across the board, even among the wealthier participants.

The minimum number of income sources came from Thelma, whose sources included casual employment, remittances sent from family members outside the homestead, money sent by her husband, and table banking withdrawals. She was highly reliant on other people for her income during the study. Roy had the most income sources, with 14 over the study period, which included selling food crops, milk, bricks and trees, his job as a teacher, remittances received from outside the homestead, merry go round pay-outs, and loans. The participants had an average of 9 income sources, and a total of over 53 individual income sources between them.

Whilst this shows a huge variation in how the participants created their livelihoods, there are income sources that were very common. All participants, from the richest to the poorest, received remittances from other households; typically, from children and male family members (particularly brothers), for 11 of the participants this constituted one of the 5 largest sources of income. 12 of the 15 participants sold crops during the study, with selling crops (either food crops or animal feeds) being one of the largest income sources for 10 of them, 11 participants made one of their largest sources of income from selling milk. A combination of these three income sources contributed to the livelihoods of all the participants. The participants top 5 income sources can be seen in Table 25. Whilst their income portfolios are diverse, the top 5 sources represent a minimum of 63.2% of the participants total incomes during the study period, and frequently represent over 90%.

Table 25: Participant Largest 5 Income Sources During the Study

Cluster	Participant	Income Source Rank	Source of Income	Income (Ksh)	Percentage of Total Income (%)
1	Thelma	1	Money received- within homestead	49,000	36.3
		2	Money received- outside homestead	45,334	33.6
		3	Informal group- withdrawal	40,000	29.7
		4	Casual employment	450	0.3
		5	Communication- airtime received	75	0.1
					100
	Alice	1	Agriculture	89,000	30.4
		2	Money received- outside homestead	74,000	25.3
		3	Self-employment-posho mill	45,100	15.4
		4	Rental income- motorbike	29,400	10.0
5		Self-employment- shop	24,000	8.2	

CHAPTER V: PIECING TOGETHER A LIVELIHOOD: DIVERSE INCOMES AND COMPETING NEEDS

					89.2
	Kevin	1	Agriculture	130,500	38.3
		2	Regular employment- teaching	99,000	29.0
		3	Informal group- merry go round	27,000	7.9
		4	Formal loan	20,000	5.9
		5	Casual employment	19,000	5.6
	Moses	1	Self-employment- bicycle repair	76,300	36.1
		2	Money received- within homestead	46,660	22.1
		3	Rental income- houses	36,100	17.1
		4	Money received- outside homestead	12,690	6.0
		5	Agriculture	9,000	4.3
2	Sarah	1	Agriculture	54,600	46.0
		2	Livestock	20,640	17.4
		3	Money received- outside homestead	18,660	15.7
		4	Formal savings- withdrawal	12,000	10.1
		5	Informal group- loan	9,000	7.6
	Dan	1	Informal group- Harambe	60,000	25.9
		2	Livestock	43,400	18.7
		3	Agriculture	42,650	18.4
		4	Community employment	28,550	12.3
		5	Money received- outside homestead	27,150	11.7
	Roy	1	Regular employment- teaching	120,000	25.9
		2	Money received- outside homestead	113,900	24.6
		3	Livestock	77,445	16.7
		4	Agriculture	62,500	13.5
		5	Self-employment- selling bricks	39,000	8.4
	Emmanuel	1	Mobile money- KCB Mpesa loan	11,300	42.4
		2	Livestock	6,475	24.3
		3	Money received- outside homestead	3,330	12.5
		4	Mobile money- M-shwari loan	2,150	8.1
		5	Borrowing from friends/family	1,700	6.4
	Anita	1	Money received- outside homestead	42,300	66.9
2		Agriculture	7,150	11.3	
3		Livestock	6,325	10.0	
4		Money received- within homestead	4,000	6.3	
5		Informal group- loan	3,500	5.5	
					100
3	Benjamin	1	Livestock	166,565	47.2
		2	Informal group- withdrawal	80,000	22.7
		3	Formal loan	40,000	11.3
		4	M-shwari loan	27,000	7.7
		5	Money received- outside homestead	17,360	4.9
	Gabriel	1	Livestock	47,360	59.9

CHAPTER V: PIECING TOGETHER A LIVELIHOOD: DIVERSE INCOMES AND COMPETING NEEDS

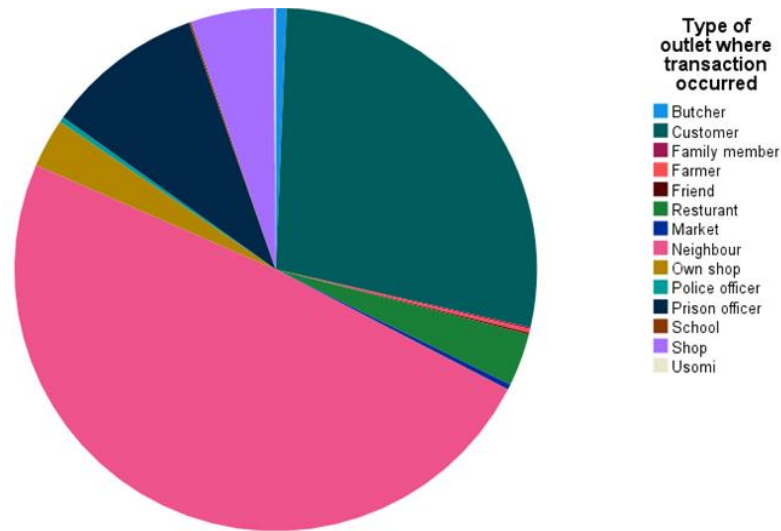
		2	Community employment	16,900	21.4
		3	Rental income- houses	6,800	8.6
		4	Agriculture	4,470	5.7
		5	Money received- arrears owed to participant	1,100	1.4
	Geoffrey	1	Livestock	44,170	33.0
		2	Informal group- merry go round	31,000	23.2
		3	Money received- within homestead	22,750	17.0
		4	Agriculture- selling trees	14,000	10.5
		5	Informal group- withdrawal	6,000	4.5
	Henry	1	Livestock	218,570	50.6
		2	Money received- outside homestead	161,530	37.4
		3	Agriculture	34,700	8.0
		4	Formal loan	13,350	3.1
		5	Borrowing from friends/family	4,000	0.9
	Joseph	1	Livestock	52,540	39.9
		2	Self-employment- shop	48,355	36.7
		3	Self-employment- restaurant	11,700	8.9
4		Formal loan	10,000	7.6	
5		Money received- outside homestead	8,200	6.2	
					99.2
4	Daisy	1	Livestock	565,939	47.5
		2	Regular employment- pension	297,756	25.0
		3	Rental income- houses	226,000	19.0
		4	Money received- arrears owed to participant	51,000	4.3
		5	Formal loan	20,000	1.7

Livestock

Overall, 12 participants earned money from their livestock production during the study period. Income earned through livestock production was the largest income source for six of the participants, and was a top 5 income source for 11. This income was earned from a combination of selling milk and selling live animals. 11 participants sold milk during the study, accounting for between 1.5-100% of livestock incomes, and 0.09-53.35% of total incomes, with a group average of 34.3% and 10.48% respectively. In addition, 11 of the participants sold livestock during the study. The sale of livestock accounted for between 11-100% of the participants livestock incomes, and 1.2-29.6% of total incomes during the study.

Livestock related incomes, from the sale of live animals and from produce rarely occurred within formal markets, with only 0.003% of sales occurring at a market. By far the most common ‘outlet’ from which to sell livestock and its produce was to neighbours, accounting for 49% of all sales, as seen in Figure 33.

Figure 33: Type of Outlet Where Sale of Livestock and Their Products Occurred



The second most frequently sold to were local customers, people who pass by the homestead but are not well known to the participants, which account for 28% of all sales. The third most frequently utilised ‘outlet’ was sales to prison officers, accounting for 10% of all livestock related sales. A few participants sold milk to these customers. Those who did lived near Busia prison, and transported milk to the prison where prison officers would purchase it. These three sources account for 87% of all sales, and all three represent informal sales to individuals.

A deeper look at livestock incomes is provided in Chapter 6: ‘Understanding how livestock farmers go about intensifying livestock production’.

Remittances and Intrahousehold Transfers

Money received in this study refers to both intrahousehold transfers and external remittances. As stated previously, every participant received remittances from people outside the homestead during the study. These accounted for between 0.67-66.85% of the participants total sum incomes during the study, with a mean of 16.73%. These tended to be sent from children and male family members, such as uncles.

As can be seen in Table 26, there is some difference in the level of income derived from remittances between the clusters. Cluster 2 represent those participants who have a medium level of livestock commercialisation, the lowest average incomes, and the lowest profits from livestock production among those for whom livestock is intended to be an income generating activity. It is understandable then that their lower levels of income result in their higher proportion of income being derived from remittances. But the context that surround these remittances, for all participants, is of particular interest; what situations lead to the receiving of remittances and what was their purpose?

Table 26: Proportion of Income Received from Remittances by Cluster

Cluster	Mean	Maximum	Minimum
1	16.3	33.6	2.6
2	26.3	66.9	11.8
3	10.7	37.4	1.3
4	0.7	0.7	0.7

For some, remittances were received in return for the participants caring for a family member. For instance, during the study Sarah took in her nephew, who was attending a nearby school. She therefore received remittances from her sister to help cover his school fees and upkeep. Alice had a similar situation, who received a significant proportion of her remittances from her son for caring for his child, to cover her upkeep and school fees. For others, remittances represented the norm here of financially supporting older family members, with money being sent by the participants children, either as and when required due to otherwise low cashflow, or a fixed amount sent each month. For Henry, much of the remittances he received were from his children who had moved away from the homestead to finance the building of his new home.

As well as the participants receiving money from outside the homestead, there were also instances of intrahousehold cashflows, particularly for those participants who were not the primary income earner. Thelma for example received a significant proportion of her income, 36.3%, from her husband, who was employed as a mechanic in the nearby town. She received money from him to pay for household needs, such as the children's education and food. A further 33.6% of her income came from remittances, which not only assisted in the purchase of household needs, but also

afforded her a boosted income to cover other spending needs of her own. Geoffrey also received a relatively high proportion of his income, 17%, from intrahousehold transfers, from his wife, who had formal employment as a teacher. And again, Moses' grownup children lived with him, including his 31-year-old son who worked as the head teacher at a local school.

In all, 8 participants received intrahousehold transfers during the study, accounting for between 0.06-36.3% of their total incomes, with a mean of 11.31%.

Crop Agriculture

Crop agriculture was the largest source of income for another three participants; Sarah sold sugarcane, a cash crop, to a local sugar company, and although they delayed payment which concerned her deeply at the time, she eventually earned 21,000ksh (almost double her average monthly income) from this, and Kevin, who sold large quantities of watermelons. Alice's single largest income earning activity was from the sale of maize, which she sold from her shop and posho-mill.

In all, 12 participants earned income from agriculture during the study, with this source of income accounting for a top 5 income source for 9 participants, accounting for between 0.7-45.6% of the total income for those who did sell agricultural produce during the study. Most frequently, this agricultural income came from the sale of food crops, rather than selling animal feed crops. The sale of food crops accounted for between 0.3-45.5% of the participants incomes, with 11 participants selling these crops. The sale of animal feed crops on the other hand accounted for between 0.4-7.1% of agricultural incomes for 4 participants.

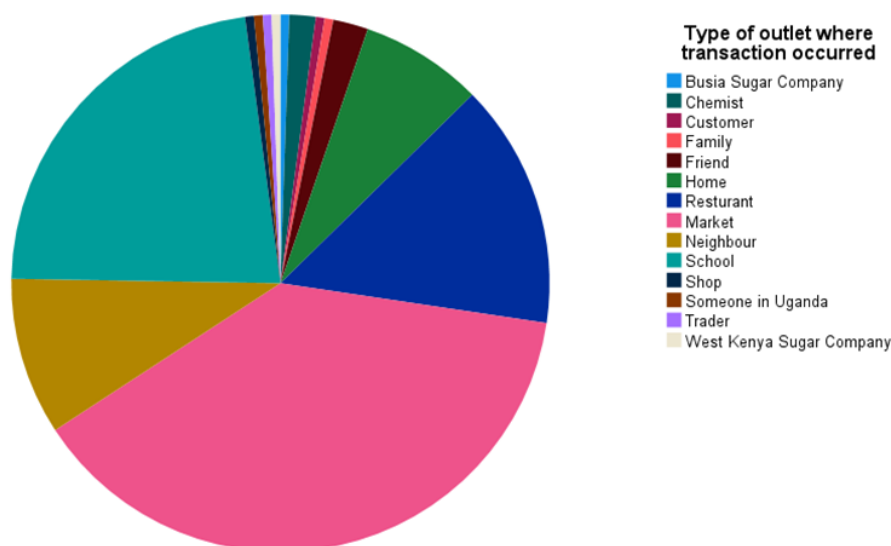
Growing crops at the homestead had the added benefit of ensuring a level of food security even when incomes fell. Maize and *mboga* (local greens) were particularly consumed by the participants, as well as various vegetables such as tomatoes, onions and avocados, fruits such as watermelon, lemon, banana, and jackfruit, and other grains such as sorghum and millet. Between harvested food and that which was purchased, no participant ever had to go to bed hungry due to not having enough to eat.

Much of the income that was derived from the sale of produce occurred outside of local markets. Figure 34 shows the 'outlet' to which agricultural produce (both food crops and animal feed) was sold, when data were collected: 40% of these sales took

place at local markets, 24% were sold to schools for use in the school canteens, 15% to local restaurants, and 14% to neighbours.

Between livestock and crop production, agriculture was the largest source of income for 40% of the participants. Agriculture is a constant for all participants. Crops are growing and in need of planting, weeding, and harvesting. Livestock are being cared for every day. Both ensure a level of food security through either money earned from sales, or the homesteads own consumption of the produce. Many other sources of income come and go, but agriculture remains constant for the participants even when money is not being earned, so whilst for the majority it is not the largest source of income, it is always a part of who they are and what they do.

Figure 34: Type of Outlet Where Sale of Food Crops and Animal Feed Crops Occurred



Informal Group

Informal groups were an important income source for 7 participants. Providing savings and loans options, the participants relied heavily on informal groups. Aside from loans (which is covered in the next income source ‘loans’), informal groups, depending on whether they are merry-go-rounds or table banking groups, can provide either savings options through regular contributions and sharing of the accumulated money from the group members (merry-go-round), or through the purchase of ‘shares’ which accrue interest when used to provide loans (table banking) and can be withdrawn. Another

unrelated form of informal group is a *Harambe*, a local fundraiser where people come together to donate money to a cause.

Dan's largest income came from a Harambe he had organised to assist with the payment of school fees. The fundraiser proved extremely successful, leaving him in profit after the school fees were paid. This Harambe was attended by local people, family members and friends, and is a common way for people in Busia to raise large sums of money.

For the remaining 6 participants for whom income from informal groups was one of the largest 5 income sources, it is merry-go-rounds and table banking groups that were the source. 4 of these participants either withdrew money from an informal group, or received this from merry-go-round pay outs. Both of these constitute a form of savings, as the money had been contributed regularly in the past with the knowledge it would eventually be withdrawn in the future. For many, income from these sources was not one of the largest sources of income, but in total 11 participants earned money from either merry-go-rounds or table banking, not inclusive of loans taken.

Benjamin withdrew the largest sum from his family table banking group. Several family members came together regularly to contribute a set sum of money to purchase 'shares'. These were then lent out to members of the group should the members agree to the sum and purpose of the loan. These loans were then repayable at a set rate of interest. This withdrawal amounted to 22.7% of his total income earned during the study. However, he did not keep this money, it was given to his daughter.

The only other participant to withdraw a large sum of money from their table banking group was Thelma, who withdrew 40,000ksh, equating to 29.7% of her total income during the study. In her case, her group all withdrew their funds around the Christmas period, to begin saving again in the new year. Geoffrey is the final participant to have withdrawn money from a table banking group during the study period, though he withdrew just 6,000ksh, 4.5% of his total income. Withdrawal of funds from table banking groups was therefore relatively uncommon among the participants. The primary use for table banking groups was for loans.

Merry-go-rounds were more commonly used, with 7 participants receiving merry-go-round pay outs during the study period. These were most often smaller sums of money, totalling between 300-31,000ksh, depending on the number of people in the group, the

frequency of the meetings, and the value of the contributions made at the meetings. Geoffrey received the largest pay out, equivalent to 23.2% of his total income. The benefit of these groups is that they allow the group members to essentially save more useful, larger sums of cash, which they can put towards more significant expenditure needs, and knowing in advance the size of the pay out, and when they are scheduled to receive it, they are able to plan ahead what they will use the money for.

Loans

13 participants took loans during the study. These ranged from formal to informal, borrowing from friends and family to personal loans from commercial banks. In some instances, these loans were fairly small, for instance Gabriel borrowed 400ksh (0.5% of his total income) from a friend which fixed a temporary shortfall in his income. However, in most cases loans amounted to 10,000ksh or more. Benjamin took the largest loan of the participants of 40,000ksh (11.3% of his total income). This loan was taken in January on behalf of his wife, to whom he gave the full sum. Whilst he hasn't benefitted from the money, he is liable for the loan.

Several participants used M-Shwari, a savings and loans service available to users of M-Pesa, to access loans. This is a short-term loans service, with a repayment period of one month. Some participants, such as Roy, took loans on M-Shwari regularly. Roy took loans on M-Shwari five times during the study. In some instances, these are new loans. Other times however, participants are able to temporarily repay the loan before immediately taking a new loan, thus essentially maintaining their debt for an additional month.

The most common source of loans was from table banking groups. Six participants received loans from these. Most frequently these were standard table banking loans, where shares had been purchased, and loans taken from the group savings at a set interest rate (usually 10-20%). One loan however, taken by Sarah, was different. Her table banking group had jointly applied for an agricultural loan from a local organisation. This table banking group was developed to assist the group members with their poultry production. The group members would come together to share advice and learn from each other, and organise the likes of veterinary treatment and workshops. During the study this group was awarded a relatively large sum from an agricultural loan provider, with the money split between the group members for the

purpose of improving their poultry production. Sarah herself was awarded 9,000ksh, of which she spent 6,000ksh on the purchase of two local sheep, 2,000ksh on 50kg of chicken mash (a chicken feed) and 300ksh on antibiotics for some recently hatched chicks. From September to March, when the study ended, she had only managed to repay 2,000ksh of this loan.

Table banking loans tended to be smaller than other forms of loan, with participants taking between 700-10,400ksh from this provider. Depending on the group members, the available pots of money are typically not very large. In some cases, such as in Thelma's table banking group, taking a loan was mandatory, so as to encourage the growth of the participants shares through interest. Thelma told us of a time when she did not require a loan, but needed to take one to fulfil this requirement. She took a loan on behalf of a friend who then made repayments to her to repay the loan.

Loans were used for a wide variety of needs, often to make up for temporary shortfalls in income flow. Kevin for example took a loan of 5,000ksh from Equity Eazzy Loan, a mobile money loan provider from Equity Bank. He spent 4,000ksh of this on Harambe contributions, with the remaining 1,000ksh being put towards usual household spending. Geoffrey took a loan of 6,500ksh from his table banking group to put primarily towards hospital fees. He had an infected leg injury that required a treatment of daily injections as well as a scan, plus the need to pay public transport to reach the hospital. He spent 4,205ksh on this treatment, with some injections being given by the hospital on credit. The remaining loan was put towards other monthly spending. Henry took a loan of 10,150ksh from a microfinance provider in July 2019, which was primarily spent on agricultural needs, including polythene bags to make silage, grass cutting supplies, temporary farm workers to cut grass and carry harvested maize from the farm to the homestead, petrol for the chaff cutter, and molasses for the cattle. These cost him 10,300ksh altogether.

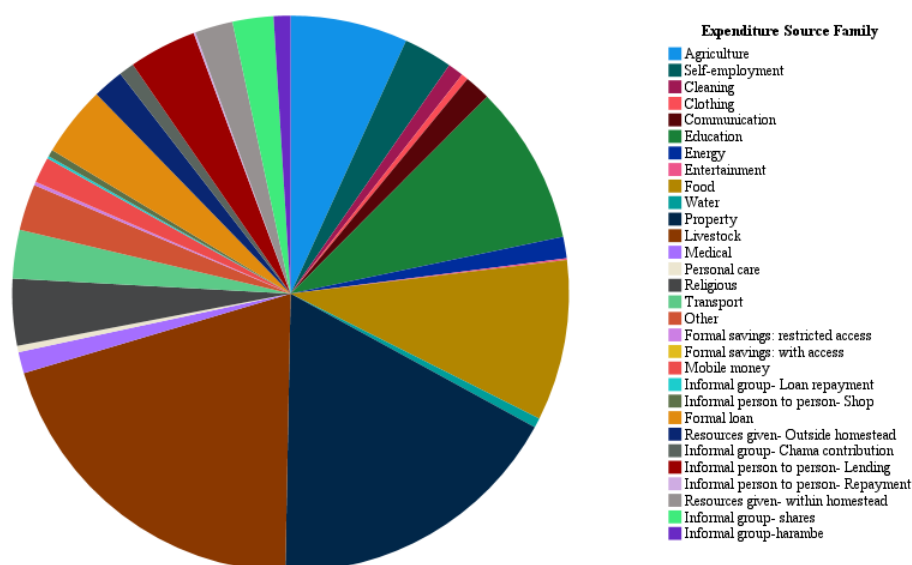
With the lack of savings among the group, aside from those formally employed who had access to SACCO savings accounts, loans and merry-go-round pay outs were often the only way the participants accessed large sums of money.

5.4 Expenditure

5.4.1 Competing Needs

If considering the participants together to understand sources of expenditure by smallholder farmers in Busia County, it is clear from Figure 35 that expenditure on livestock is the primary source among the study participants as a group, closely followed by spending on property (house building and repairs). Spending on food and education are other significant sources of expenditure. Whilst livestock production does provide income for many, it must also be seen as a source of expenditure when considering livestock intensification, be considered within the context of competing needs.

Figure 35: Sum Participant Sources of Expenditure (ksh)



These trends in how the participants spend their money can be further broken down by looking at the participant clusters. Figure 36 shows this expenditure at the cluster level, whilst Table 27 shows this as a percentage of total expenditure.

Cluster 4 spends a larger sum on livestock production (407,662ksh/46.2%) than the total average expenditures of the other clusters, with property expenditure (home building and/or maintenance) (89,190/10.1%), and informal lending to friends and family (86,105ksh/9.8%) constituting the main sources of expenditure.

On average, cluster 1 (subsistence farmers) spend the most money on food (32,701ksh/16.9%), followed by property (18,770ksh/15.5%), livestock production

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(28,060ksh/14.0%), crop agriculture (25,750ksh/6.3%), and education (21,263ksh/9.1%).

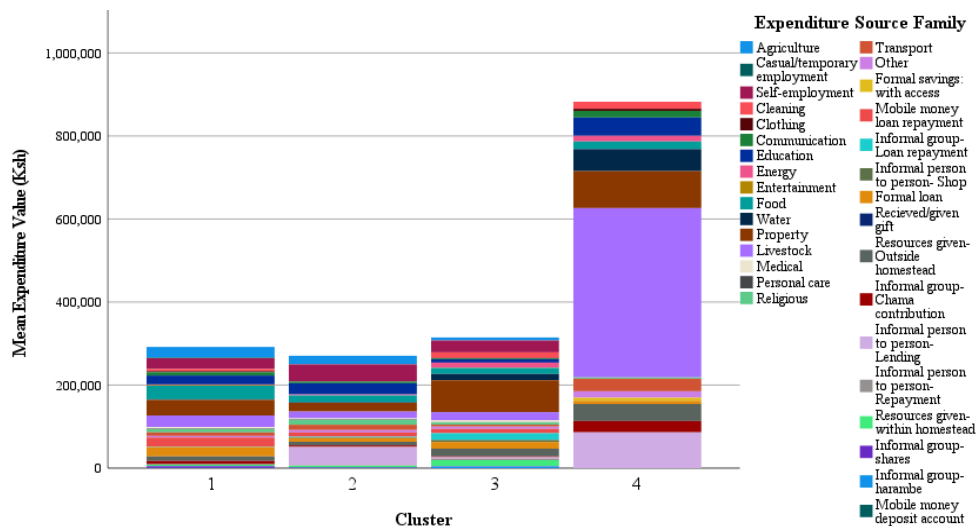
Cluster 2 (medium commercialisation with low livestock income) spend the most on education (27,026ksh/13.6%), crop agriculture (20,704ksh/12.1%), food (16,412ksh/11.9%), and livestock production (16,061ksh/9.8%).

Cluster 3 (high commercialisation with medium livestock income) spend by far the most on property (76,910ksh/19.3%), followed by money given outside the homestead (22,499ksh/7.0%), livestock production (19,392ksh/7.7%), food (18,316/12.8%), and education (15,794ksh/7.9%).

What is clear is that for all the clusters, livestock production, food and education are key sources of expenditure, and for those who earn a larger income from crop production (clusters 1 and 2) so is expenditure on crop production.

These cluster level trends can be broken down even further by considering the expenditure needs of the individual participants, which can vary widely within the clusters, as can be seen in Figure 37 and Table 28.

Figure 36: Mean Expenditure Source Value by Cluster

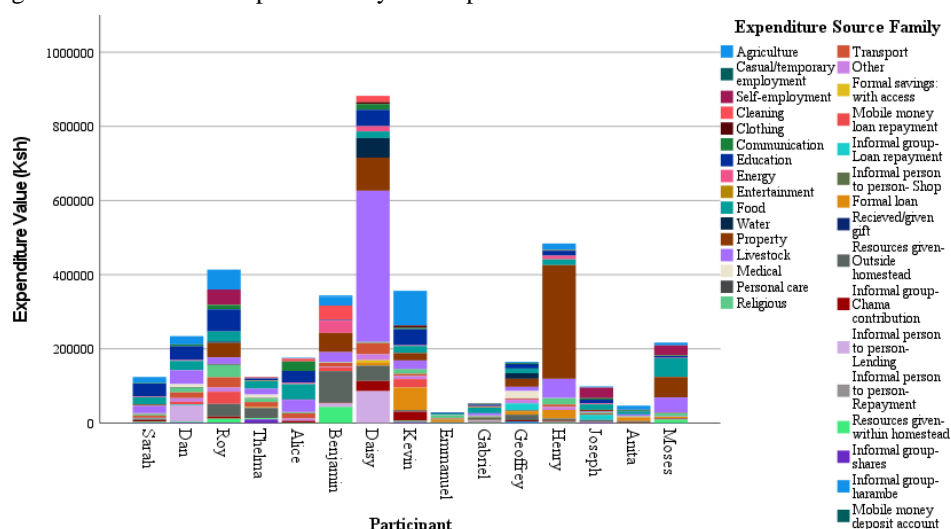


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Table 27: Mean Expenditure by Cluster and Expenditure Source Family

Expenditure Source	Cluster			
	1	2	3	4
Agriculture	6.3	12.1	2.4	-
Casual/temporary employment	0.4	-	-	-
Self-employment	12.0	9.7	29.1	-
Cleaning	3.5	0.4	3.8	1.9
Clothing	0.8	0.8	1.2	0.6
Communication	4.2	2.5	2.3	1.8
Education	9.1	13.6	5.8	5.0
Energy	0.9	1.5	4.5	1.6
Entertainment	1.2	-	-	-
Food	16.9	11.9	13.6	2.0
Water	0.7	0.4	9.1	6.0
Property	15.5	6.0	19.3	10.1
Livestock	14.0	9.8	7.7	46.2
Medical	2.7	2.1	2.9	-
Personal Care	0.7	1.1	0.7	0.0
Religious	3.8	8.9	2.3	0.3
Transport	5.0	5.9	2.3	3.4
Other	1.7	2.5	2.5	1.8
Formal savings deposit	-	0.3	-	0.8
Formal loan repayment	7.0	23.2	5.2	0.9
Mobile money loan repayment	6.2	3.2	3.0	-
Informal group- loan repayment	0.3	0.9	12.8	-
Informal group- shares purchase	4.3	0.6	0.8	-
Informal group- harambe contribution	0.2	1.9	2.4	-
Informal group-merry go round contribution	2.7	2.7	1.1	3.1
Informal person to person- repayment	0.1	0.8	3.2	-
Informal person to person- lending	0.2	18.9	2.2	9.8
Informal person to person (shop)- repayment	-	7.0	7.4	-
Money given outside the homestead	7.7	4.2	7.0	4.7
Money given- within the homestead	2.0	1.5	4.4	-

Figure 37: Sources of Expenditure by Participant



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Table 28: Participant Largest 5 Expenditure Sources During the Study

Cluster	Participant	Expenditure Source Rank	Source of Expenditure	Expenditure (Ksh)	Percentage of Total Expenditure (%)
1	Thelma	1	Resources given- Outside homestead	27,500	21.3
		2	Food	20,495	15.9
		3	Livestock	15,680	12.2
		4	Transport	12,570	9.7
		5	Informal group- shares	10,000	7.8
					66.9
	Alice	1	Food	40,840	23.2
		2	Livestock	33,140	18.8
		3	Education	31,650	18.0
		4	Communication	25,600	14.6
		5	Transport	14,280	8.1
					82.1
	Kevin	1	Agriculture	92,300	25.9
		2	Formal loan	61,100	17.1
		3	Education	43,000	12.1
		4	Informal group- Chama contribution	24,700	6.9
		5	Livestock	23,200	6.5
					68.5
Moses	1	Property	55,080	25.4	
	2	Food	50,460	23.3	
	3	Livestock	40,220	18.5	
	4	Self-employment	25,985	12.0	
	5	Resources given- within homestead	8,300	3.8	
				83.0	
2	Sarah	1	Education	34,500	27.8
		2	Livestock	20,100	16.2
		3	Food	19,856	16.0
		4	Agriculture	16,450	13.2
		5	Transport	6,020	4.8
					78.0
	Dan	1	Informal person to person- Lending	44,202	18.9
		2	Livestock	37,640	16.1
		3	Education	37,461	16.0
		4	Food	24,585	10.5
		5	Agriculture	22,100	9.4
					70.9
	Roy	1	Education	59,670	14.4
		2	Agriculture	53,490	12.9
		3	Self-employment	40,100	9.7
		4	Property	38,970	9.4
		5	Resources given- Outside homestead	33,969	8.2

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					54.6
	Emmanuel	1	Religious	7,715	26.6
		2	Formal loan	6,900	23.8
		3	Food	3,360	11.6
		4	Informal person to person-Shop	2,020	7.0
		5	Education	1,950	6.7
	Anita	1	Agriculture	10,980	23.4
		2	Formal loan	10,578	22.6
		3	Food	6,905	14.7
		4	Livestock	4,075	8.7
		5	Resources given- Outside homestead	3,000	6.4
3	Benjamin	1	Resources given- Outside homestead	85,464	24.7
		2	Livestock	51,500	14.9
		3	Resources given- within homestead	42,936	12.4
		4	Cleaning	38,570	11.1
		5	Energy	33,250	9.6
	Gabriel	1	Food	15,220	28.4
		2	Informal person to person-Shop	6,940	13.0
		3	Livestock	6,240	11.6
		4	Informal person to person-Repayment	4,500	8.4
		5	Education	4,400	8.2
	Geoffrey	1	Property	21,600	13.1
		2	Medical	19,725	11.9
		3	Informal group- Loan repayment	18,600	11.3
		4	Water	15,000	9.1
		5	Resources given- Outside homestead	15,000	9.1
	Henry	1	Property	306,720	63.4
		2	Livestock	51,500	10.6
		3	Formal loan	23,165	4.8
		4	Religious	17,000	3.5
		5	Agriculture	16,670	3.4
Joseph	1	Self-employment	28,670	29.1	
	2	Food	14,610	14.8	
	3	Informal group- Loan repayment	14,000	14.2	
	4	Education	10,000	10.1	

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		5	Resources given- Outside homestead	6,000	6.1
					74.3
4	Daisy	1	Livestock	407,662	46.2
		2	Property	89,190	10.1
		3	Informal person to person-Lending	86,105	9.8
		4	Water	52,995	6.0
		5	Education	44,061	5.0

Livestock

The most commonly featured expenditure source within the individual participants largest sources of expenditure came from livestock, being a top 5 expenditure source for 7 of the participants, the largest expenditure source for one participant, and accounting for between 2.0-46.2% of the participants total expenditures, with a mean of 13.0%. All the participants keep livestock at their homesteads, and purchase inputs of various forms for their upkeep. In Table 29 the participants 5 largest sources of livestock expenditure are shown.

For the majority of the participants, the purchase of livestock represented the largest source of expenditure. A variety of livestock were purchased by the participants during the study, including grade and local dairy cattle, grade and local chickens, pigs, goats, and geese. For many, increasing the numbers of livestock on the homestead was considered a key goal that would lead to increased income. Livestock were purchased most often from friends and neighbours, rather than livestock markets. With a constant supply of livestock for sale in the local community, travel to livestock markets is not always necessary.

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Table 29: Participant Largest 5 Sources of Livestock Expenditure

Cluster	Participant	Expenditure Source Rank	Source of Expenditure	Expenditure (Ksh)	Percentage of Total Expenditure (%)
1	Thelma	1	Building new shelter for chicken and other poultry-labour	9,200	58.7
		2	Building new shelter for chicken and other poultry-materials	2,000	12.8
		3	Animal feed- other livestock	1,400	8.9
		4	Animal feed- local chicken	1,020	6.5
		5	Tick spray- Various	1,020	6.5
					93.4
	Alice	1	Purchase of livestock-local dairy cattle	15,000	45.3
		2	Livestock staff	9,000	27.2
		3	Purchase of livestock- local goat	2,500	7.5
		4	Animal feed-Grade cattle	1,500	4.5
		5	Ropes (tethering)	1,200	3.6
					88.1
	Kevin	1	Animal feed- dairy cattle (general)	4,000	17.2
		2	Vet fees-dairy cattle (general)	3,400	14.7
		3	Other veterinary treatment (general)	3,000	12.9
		4	Purchase of pig	3,000	12.9
		5	Full time staff	2,500	10.8
					68.5
	Moses	1	Purchase of livestock-local dairy cattle	26,000	64.6
		2	Building dairy cattle (general) shelter- materials	7,000	17.4
		3	Purchase of livestock-local goat	2,000	5.0
4		Tick spray- combination	1,650	4.1	
5		Building dairy cattle shelter-labour	1,500	3.7	
				94.8	
2	Sarah	1	Purchase of local sheep	6,000	29.9
		2	Animal feed- local chicken	3,100	15.4
		3	Vet fees- Dairy cattle	3,000	14.9
		4	Ropes	2,160	10.7
		5	Animal feed- pigs	1,100	5.5
					76.4
	Dan	1	Purchase of grade dairy cattle	30,000	79.7
		2	Purchase of livestock- local chicken	4,000	10.6
		3	Vet fees- dairy cattle	700	1.8
4		Salt lick	640	1.7	

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		5	Tick spray- dairy cattle	370	1.0	
					94.3	
	Roy	1	Purchase of livestock- local chicken	6,900	39.5	
		2	Dewormer- dairy cattle	1,900	10.9	
		3	Animal feed- dairy cattle (general)	1,700	9.7	
		4	Salt lick	1,610	9.2	
		5	Transport for feed	1,200	6.9	
					94.8	
	Emmanuel	1	Purchase of livestock- goose	500	48.5	
		2	Veterinary treatment- local dairy cattle	200	19.4	
		3	Ropes	200	19.4	
		4	Salt lick	130	12.6	
		5	-	0	0	
					100.0	
	Anita	1	Purchase of livestock- pig	2,500	61.3	
		2	Purchase of livestock- local chicken	700	17.2	
		3	Ropes	605	14.8	
		4	Tick spray- dairy cattle (general)	150	3.7	
		5	Tick spray- combination	120	2.9	
					99.9	
	3	Benjamin	1	Animal feed- dairy cattle (general)	12,550	48.0
			2	Livestock staff	5,000	19.1
			3	Tick spray- combination	2,050	7.8
			4	Artificial insemination- local dairy cattle	2,000	7.7
			5	Purchase of livestock- local chicken	1,700	6.5
						89.1
Gabriel		1	Animal feed- grade dairy cattle	1,970	31.6	
		2	Artificial insemination- grade dairy cattle	1,500	24.0	
		3	Vet fees- local dairy cattle	1,300	20.8	
		4	Vet fees- crossbreed calf	700	11.2	
		5	Vet fees- grade dairy cattle	600	9.6	
					97.2	
Geoffrey		1	Animal feed- dairy cattle (general)	4,500	40.5	
		2	Animal feed- local chicken	3,650	33.3	
		3	Renting bull for breeding	1,400	12.6	
		4	Repair of dairy cattle shelter- materials	700	6.3	
		5	Deworming- dairy cattle (general)	300	2.7	
					95.4	
Henry		1	Animal feed- dairy cattle (general)	17,250	36.3	

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		2	Artificial insemination-grade dairy cattle	6,500	13.7
		3	Animal feed- grade dairy cattle	5,700	12.0
		4	Animal medicines	4,520	9.5
		5	Salt lick	3,940	8.3
					79.8
	Joseph	1	Tick spray-combination	840	42.4
		2	Salt lick	440	22.4
		3	Ropes	400	20.4
		4	Deworming-dairy cattle (general)	300	15.3
		5	-	0	0
					100.0
4	Daisy	1	Purchase of livestock-grade chicken	160,000	39.2
		2	Animal feed- chicken (general)	137,990	33.8
		3	Building materials- new shelter chicken (grade)	37,500	9.2
		4	Animal feed- grade dairy cattle	15,200	3.7
		5	Feed supplements	11,510	2.8
					88.7

Education

Education was one of the largest sources of expenditure for 9 of the participants, and the largest proportion of expenditure for 2 participants and all 15 participants had educational expenses to pay during the study. This expenditure is spent primarily on a combination of school fees, registration fees, exam fees, and scholastic materials.

The amount spent on education varies depending on the number of children the participants are paying for, their ages, and what other schooling cost choices are made by the participants. Figure 39 shows the sum educational expenditure spent during the study period by each of the participants, whilst Figure 38 shows the proportion of total income that is spent on education.

Sarah's two children who remain in education required her to pay these school related costs, and the addition of her school aged nephew to her household during the study only added to her responsibilities here. Roy has four children still in education, and as a teacher himself, very much values the education of his children. Alice's granddaughter, who is of school age, lives with her. Though paying for her education is her largest source of expenditure, she receives this money in advance from her son, the father of her granddaughter.

Figure 39: Value of Educational Expenditure by Participant

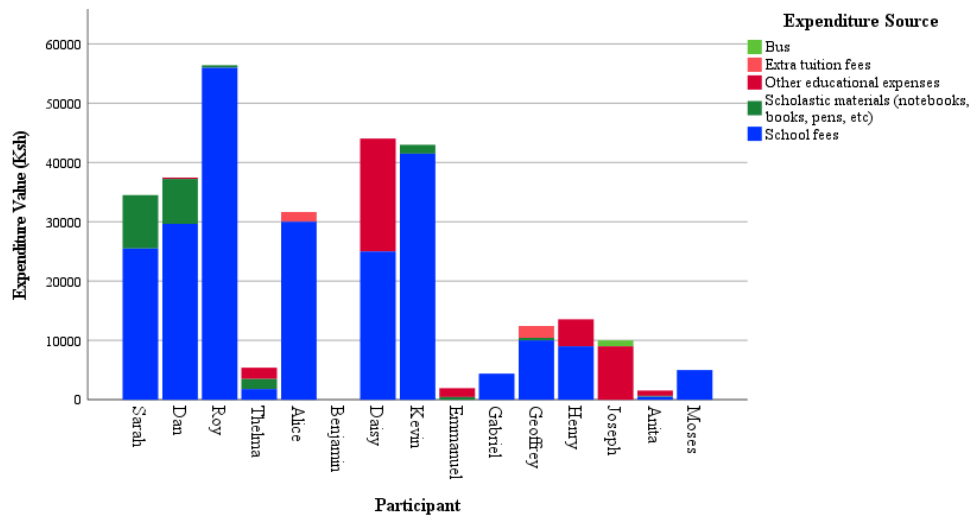
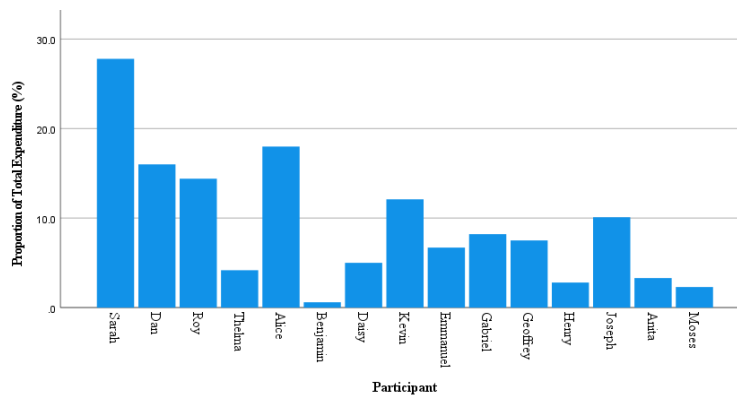
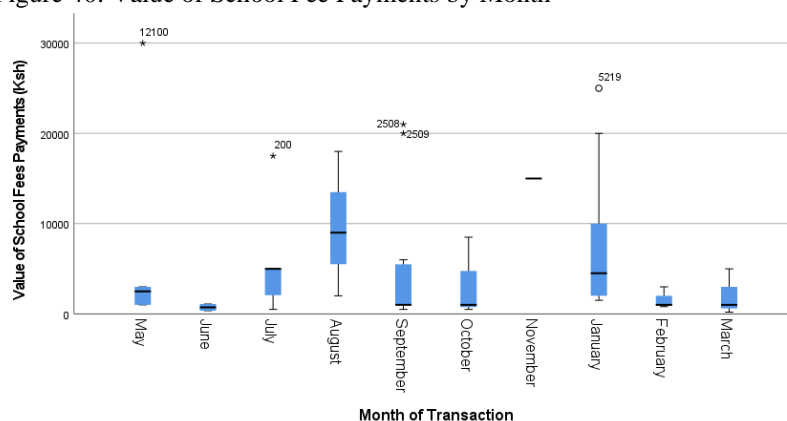


Figure 38: Percentage of Total Income Spent on Education by Participant



The majority of educational expenditure for most of the participants was on school fees, inclusive of all payments relating to school fees themselves, exam fees, and registration fees. Whilst the school year begins in January in Kenya, school fees are rarely paid in full at the beginning of the school year, largely due to the high cost due. Instead, most participants pay small sums only when children are sent home by the headmaster/mistress for non-payment. Figure 40 shows a boxplot of when school fee payments are made. August is the month when the mean payments made by the participants are the highest. As discussed already, August is the month when the participants as a group earn the highest overall income and largest incomes from money received from outside the homestead, though not significantly so.

Figure 40: Value of School Fee Payments by Month



Eleven of the homesteads had children returned from school for non-payment, with most experiencing this relatively frequently, as seen in Table 30. When children were sent home, parents would meet with the school staff to negotiate an amount to be paid from the money owed that would allow the children to return, with the remaining balance paid at a later date. Usually, children would only be home for a few days at the most whilst payment was organised, though in some cases children were home for several weeks or even months at a time. Participants rarely saved money in advance to pay school fees, indebted to the school for the majority of the school year, with likely negative consequences for the child’s education.

Table 30: Frequency of Participant’s Reporting Children Being Sent Home from School Since Last Visit by Month

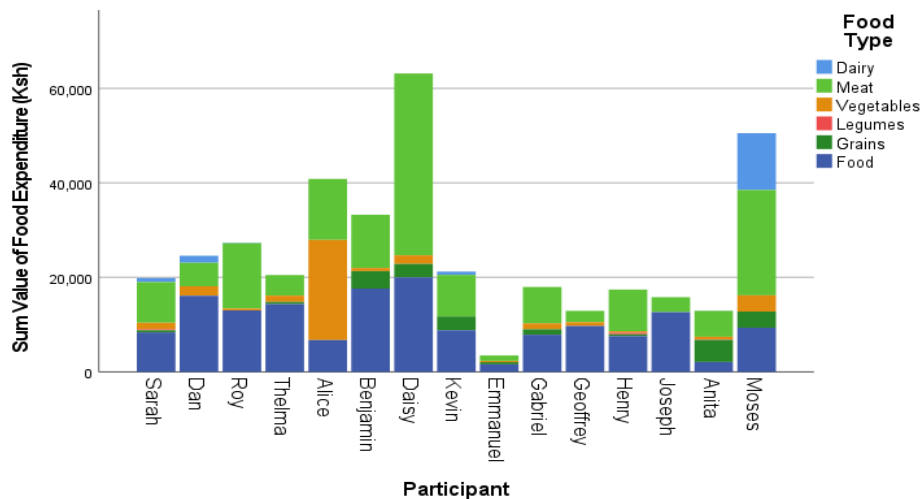
Participant	Diary Number										
	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Sarah											
Dan											
Roy											
Thelma											
Alice						Dropped out of study					
Benjamin											
Daisy											
Kevin											
Emmanuel											
Gabriel											
Geoffrey											
Henry											
Joseph								Dropped out of study			
Anita											
Moses											

*Shaded boxes show months when a child was sent home, or still home from school

Food

Ten participants had food within their top expenditures, accounting for between 2.0-28.4% of the participants total expenditures, with a mean of 13.1%. Though all the participants grow crops of some kind at their homesteads, it is insufficient for their needs, and some produce cannot be derived from the homestead. This is particularly the case with meat and fish. Though the participants all had livestock, most do not have a fridge, and none have constant electricity. Even if they did slaughter a larger livestock such as a pig, goat, or cow, they would not be able to store the meat. Many also expressed that they were attached to their animals, and they would not be able to slaughter them, preferring to sell them on to other farmers to use for reproduction. *Omena* (whitebait), is another popular food purchase that could not be produced on the farms, and must be purchased. Flour, bread, cooking oil, tea and sugar are other regularly purchased food items that need to be purchased. Participants also regularly purchase vegetables, as few grew enough of the regularly eaten vegetables to sustain themselves. These include tomatoes, onions, and *sukuma wiki*. The purchase of animal derived foods represents the highest value food items purchased by the participants. Figure 41 shows each participants food spending by food type.

Figure 41: Sum Expenditure on Food by Food Type During the Study



The above graph shows that ‘Food’ (meaning other food, particularly processed goods) is generally the largest source of food expenditure among the participants. This includes the like of bread, sugar, tea, and oil, amongst others. With a sum expenditure between the group of 170,238ksh on Other Food, the participants ranged between

1,590ksh spent by Emmanuel, and 21,375ksh spent by Moses. The single item of Other Food purchased most by the participants was sugar, with a total spend of 29,385ksh, ranging from 0ksh for Daisy and Joseph (though other members of the homestead purchased the sugar), and 8,185ksh for Benjamin. Often sugar is added in large quantities to *chai* which many drink daily. This is followed closely by the purchase of meat and fish, with a sum value of 154,350ksh, ranging between 1,180ksh spent by Emmanuel, and 38,500ksh spent by Daisy. Most commonly purchased were beef and omena, with omena generally being the most frequently consumed.

Food was often bought frequently. A lack of refrigeration at the home was a key barrier to reducing the amount of time spent food shopping and to taking advantage of possible economies of scale purchasing larger quantities at once. Another reason often given for purchasing food so often was to limit the amount eaten at the home. Participants most often gave this as a reason to not purchasing larger quantities of ‘other food’ such as sugar and bread in particular. There was concern that if these foods were laying around the house household members would be more inclined to consume larger quantities, and thus increase the food bill. Instead, these foods were often purchase daily, and meat and fish purchased on the day of consumption, often between once to three times a week, along with key vegetables such as onions and tomatoes.

Agriculture

For Kevin and Anita, the largest source of expenditure was agriculture, and it accounted for one of the largest 5 sources of expenditure for 6 of the participants. Agriculture accounted for an average of 6.4% of the participants expenditure, ranging from 0%-25.9%. For Kevin, the majority of his spending was on the hiring of an occasional/part time farm hand, accounting for nearly 62% of his agricultural spending. A further 16% of his agricultural spending went towards the purchase of commercial fertilizer, and the remainder spread between the purchase of crop anti-fungal spray, the hiring of a tractor for ploughing, insecticide, and seeds. Anita spent a considerably less on her agriculture, in terms of Ksh value, but she too spent the majority of her agricultural expenditure on the hiring of an occasional/part time farm hand (79%). The remaining agricultural expenditure consisted predominantly of the purchase of seed (19%), and a small amount of commercial fertiliser (1%).

The largest value agricultural expenditure between the participants was the hiring of an occasional farmhand. A total of 146,780ksh was spent on occasional farmhands, people hired on an ad-hoc basis to assist with particular farm needs, particularly ploughing and harvesting, with an average of 13,344ksh spent by each of the 11 participants who hired occasional farmhands, ranging between 100ksh to 26,180ksh. For those who did not hire occasional farm hands during the study period, other members of staff were usually already available at the property to assist with agricultural work. For instance, Joseph had a regular part-time farm hand who worked for him on a regular basis, though this was often paid for by other members of the homestead.

The costs of growing crops both for sale and consumption are a significant proportion of many participants expenditures (see Table 31). Whether this is profitable is beyond the scope of this study, though collected data suggests that for many a profit was made. Difficulty in calculating profitability from collected data (again, being that crop production, itself was outside the scope of this study) is due to the gendered nature of crop production, with male headed households often having men selling cash crops or higher value crops, and women allowed to sell vegetables on a small scale, and also the uncertain quantities of crops that were consumed by the homestead.

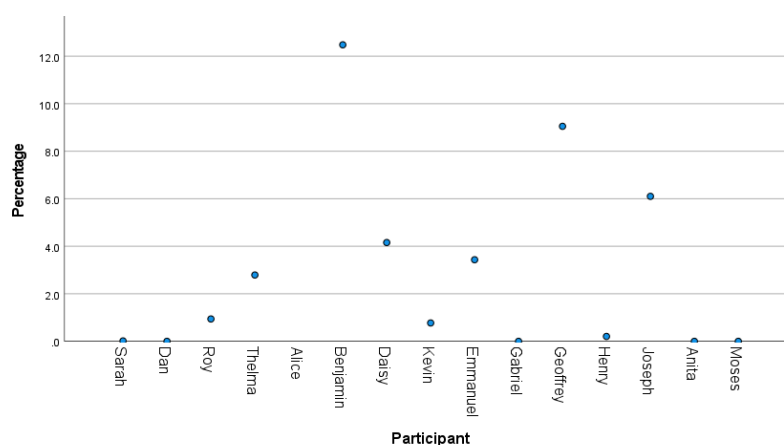
Table 31: Participant Crop Expenditure and Income

Participant	Crop Expenditure (Ksh)	Proportion of Total Expenditure (%)	Crop Income (Ksh)	Proportion of Total Income (%)
Sarah	16,450	13.2	54,650	43.3
Dan	22,150	9.4	43,450	17.9
Roy	53,490	12.9	42,700	8.5
Thelma	1,000	0.8	450	0.3
Alice	2,000	0.6	9,000	3.1
Benjamin	23,525	6.1	9,600	2.7
Daisy	0	0	0	0
Kevin	92,300	25.9	130,050	37.5
Emmanuel	500	1.7	1,000	3.8
Gabriel	830	1.5	4,470	5.7
Geoffrey	2,500	1.5	14,450	9.5
Henry	16,670	3.4	9,000	2.1
Joseph	3,000	3.0	0	0
Anita	10,980	23.4	3,650	6.6
Moses	7,700	3.5	15,600	7.6

Money Given Outside the Homestead

Money given outside the homestead was the largest source of expenditure for two participants, Thelma and Benjamin, and accounted for one of the largest expenditure sources for 6 of the participants, averaging 6.1% of the participant’s expenditures, ranging from 0%-24.7%. Money was sent to family and friends, mostly to assist in payments of needs such as health care and education, or to assist with the care of elderly family members. Whilst many participants received money from outside the household, they also gave it when available. The participants’ percentage expenditure on money given outside the homestead is shown in Figure 42.

Figure 42: Percentage of Expenditure Spent on Money Given Outside the Homestead by Participant



Thelma for instance was a regular receiver of money sent from her aunt, sister, mother, son, sister-in-law, and friends. Lacking her own source of income, being given money from her husband instead, she was often in need of additional money. She also redistributed this money to others when they were in need, with money given outside the homestead accounting for 21.3% of her total expenditure. For instance, when her grandmother, who lived with other family members, fell ill, Thelma sent her money to pay for her transport to the hospital. This occurred in two cash payments, one she gave her daughters to pass on, and the other given to her directly. When her mother needed assistance to build a new house, Thelma withdrew all 27,000ksh from her informal group savings and gifted it to her mother to purchase building materials. Benjamin spent the largest proportion of his income on sending money outside the homestead. In his case, he sent a large sum, 85,000ksh, which he withdrew from an informal

savings group to his daughter in Nairobi. She had planned to pay for a passport and travel to a European country in search of work. Unfortunately, and despite the cost, this plan failed as she only had a secondary education and was unable to find work abroad that she was qualified for. The rest was sent to various people, including his first wife, who lived in the neighbouring county of Siaya, his sister-in-law to assist her with payment of school fees.

Property

Property related expenditures were the largest source of expenditure for 3 participants, and within the top five expenditures for 5 participants. Both Henry and Moses were in the process of building new homes for themselves during the study period. Both were building on their existing homesteads, hiring local *fundis* (handymen) to complete the work, and buying materials from the local hardware store. Both were upgrading their basic accommodations, made from wattle and daub, a combination of sticks and mud, with thatched or tin rooves. The majority of the participants lived in such housing, which are damp and dark. Rectangular in shape, these buildings lacked a ceiling, internal walls often failed to reach the roof, windows were small and often lacked glass, and none had plumbing. The kitchen was either a small open sided hut outside where kitchenware (plates, bowls etc) and a *jiko* were kept, or a dedicated room within the house. The new houses being built by Henry and Moses, which had not been finished at the end of the study period, consisted of a single layer of breeze block for Henry, and locally made brick in the case of Moses, which were cemented together by thick layers of concrete. A significantly higher income earner than Moses, Henry received around half of the funds for his house building from family outside the homestead, whereas Moses received a relatively small sum from this source, instead largely paying for the project himself. Geoffrey's property expenditure came from a different source. He was having a boundary dispute with a neighbour, and thus had to hire a surveyor to survey the land and settle the dispute.

Of the 10 participants who had property expenditure during the study period, the average expenditure was 59,099ksh, ranging from 130ksh-306,720ksh. Most commonly, the participants property expenditures consisted of labour and materials for home construction, with 5 participants purchasing each of these. During the study, Roy was already building a new home for him and his family on his property. Unlike

his previous home, this new home was a large building, made from brick and breeze block, with a corrugated iron roof, and large windows. He spent 10,500ksh on labour and 17,910ksh on materials by the end of the study. Benjamin built a new latrine at his home, an outbuilding, since he had previously sold the plot of land which housed the properties toilet. Now that the new owner was ready to start building works on the plot Benjamin needed to build a new latrine for his family. The labour consisted of a *fundi* to assist in the build, which cost 1,500ksh. Daisy built new rental houses during the study, spending a total of 11,200ksh on labour and 54,100ksh on construction materials, as well as a total of 22,030ksh on other home repairs and maintenance. Finally, Joseph was in the process of building a small new house for himself on his property. This building consisted of two small rooms, one leading through to the other. One would have a seating area and the other a bed. He lived surrounded by his children and their families, and so a larger space was not considered necessary, and he had full access to their two homes no further than 40 meters away. Whilst the homes were divided by hedges to provide privacy, the family members were often seen meandering between the dwellings.

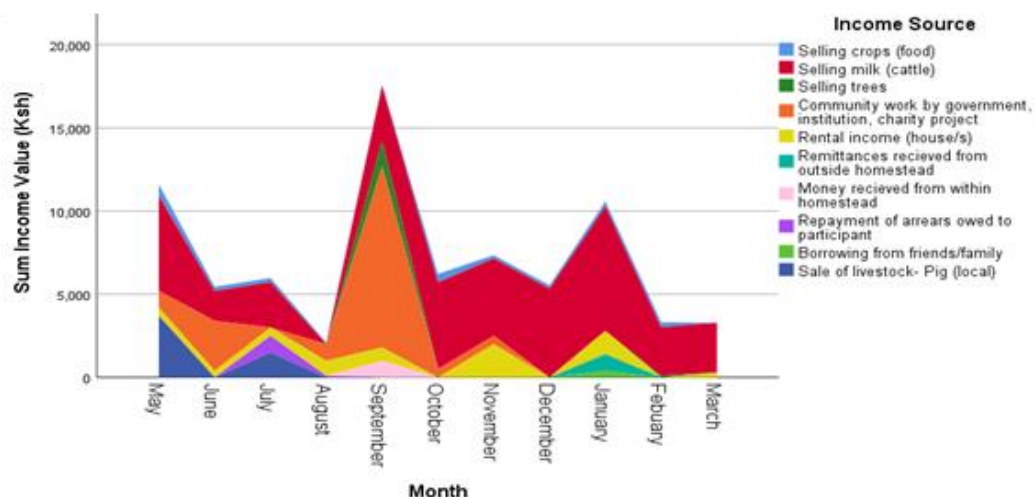
5.5 Varying Livelihoods Through Time

5.5.1 Taking a Wider Look- Month by Month

Not only do income sources vary over time, but income generated each month can rise and fall significantly. All but the formal income sources, teaching, and pensions specifically in this case, prove to be either irregular in frequency or irregular in earnings. As an example of how incomes can vary, shown in Figure 43, Gabriel's highest income came in September, when he earned 17,600ksh, largely thanks to taking on additional community work as well as delayed pay received for prior community work, which involved handing out vitamin supplements to children, screening for diabetes and hypertension, and assisting as an elder with the census, amongst others.

This higher income came just a month after his lowest income which came in August, with earnings of just 2,100ksh. Lower rental income due to late payments, a lack of milk sales due to ill-health of the cow, delayed community work payment, and low food crop sales here contributed to this low income. Whilst his income fell in August,

Figure 43: Gabriel's Income Sources by Month



having his rental income and some community work income allowed him to just about survive through this time.

All participants experienced significant highs and lows in their monthly incomes over the study period. The boxplot in Figure 44 shows the range in the participants monthly incomes. These swings in incomes each month can be represented as the Coefficient of Variation, meaning the relative variation in income each month against the monthly mean income of the participant. As seen in Figure 45, monthly incomes vary anywhere between 28.54% to 147.95% during the study. These fluctuations can have an enormous impact on household decision making, including how much money to spend on risk-reducing inputs, how much money to save for the future, and household welfare decisions such as paying school fees, hospital fees, and for food (Key, Prager and Burns, 2017).

Figure 44: Boxplot of Variation in Participant Monthly Income

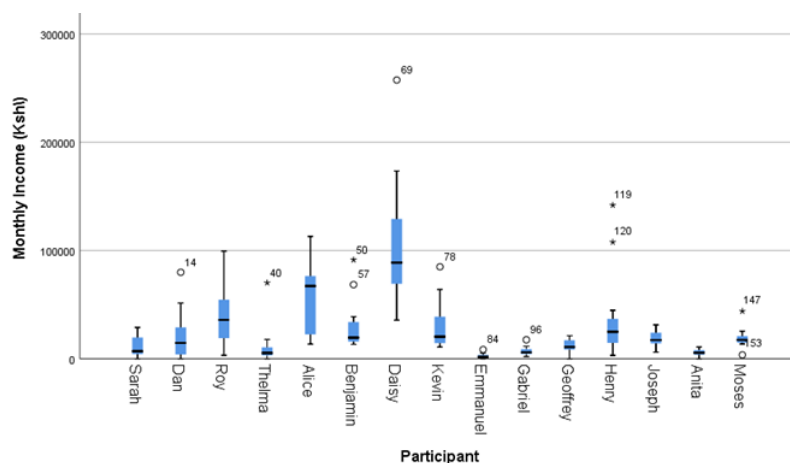
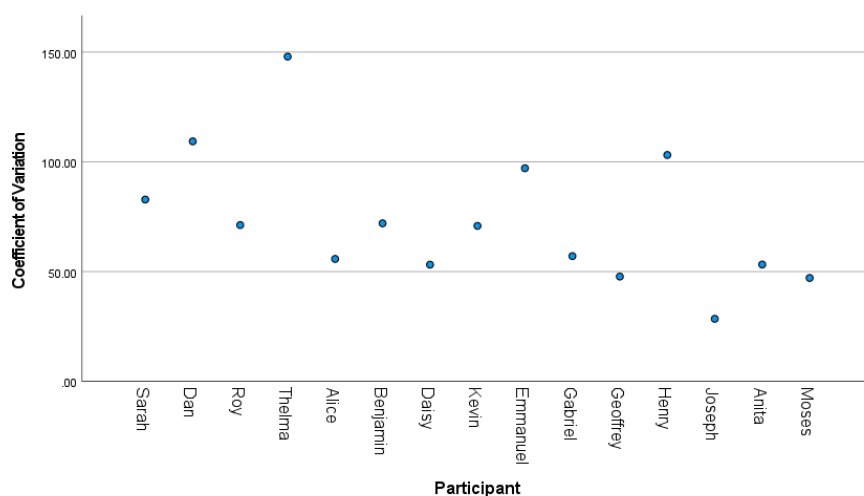


Figure 45: Coefficient of Variation of Participant Monthly Incomes



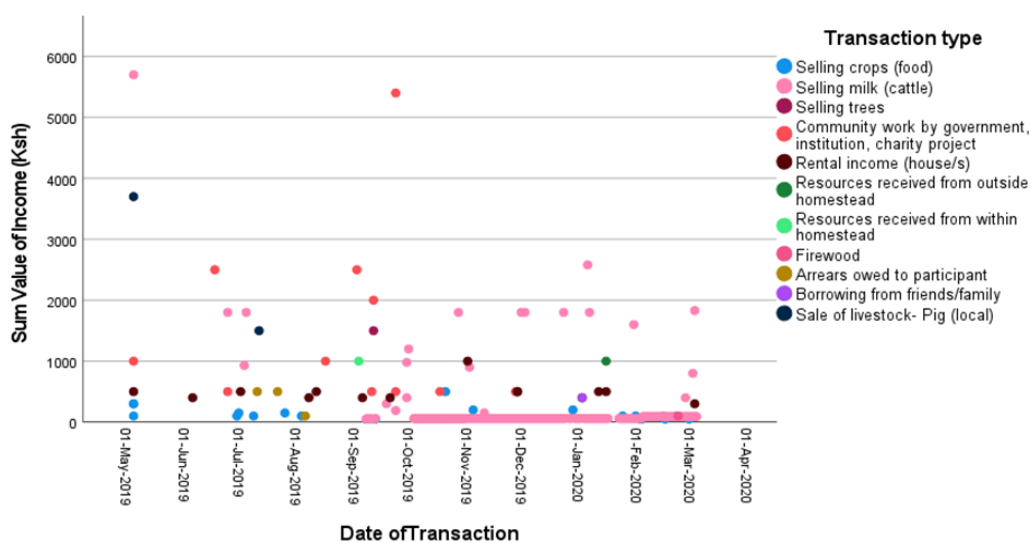
Whilst it may appear that a monthly view of incomes for many of the participants may be a poor way to consider the flow of money, since few have formal employment that pays on such a time frame, results from the Kenyan financial diaries found that in fact for many, a monthly time horizon is still a common way to view income and expenses. This was largely due to those having salaries paying staff, sending remittances, and doing the bulk of their spending at the time they are paid (Zollmann, 2020). As has been established, all of the participants receive remittances, and many of these are from formally employed family members living outside the homestead. In addition to this, three participants receive a formal income (two from teaching and one from a pension), and the majority are involved in selling of commodities. However, as has been shown previously, there is a lack of savings among the participants, and those savings that are made, whether it be formal savings through SACCOs or the purchase of shares or contributions to merry go rounds, they are not used to buffer these months of lower incomes. People tend to spend their money when it is received, and make do with what they have in harder times.

5.1.1 Volatile Livelihoods Day by Day

The participants tended to earn their incomes in high-frequency, low value increments. Looking back at Gabriel as an example, **Error! Reference source not found.** shows each individual income from each income source family that Gabriel received during the study. It shows how as of October he received a small income (usually under 100ksh) every day from his livestock production, by selling milk. Larger incomes were

less frequent, consisting of two instances of selling pigs/piglets. Larger incomes from milk sales were also paid monthly, with most of these being paid at the beginning of the month, though these customers collect the milk daily. Prior to the increased frequency of milk sales, Gabriel’s income was more varied with more income derived from community work in particular. Gabriel earned the highest percentage of his income from his livestock production of all the participants, accounting for almost 60% of his total income during the study. His second largest income came from his community work, and his third from his rental income from the rental houses on his property. In the last three months of the study the community work dried up, with no local projects available for him to assist with. This role he considered voluntary, but he was given an income in gratitude for his assistance. His rental income, whilst smaller, was a more secure source. Whilst there were occasional late payments by his tenants, payment did eventually come.

Figure 46: Gabriel's Income by Day



Aside from the first round of financial data that was collected, for which the dates of the transactions were not collected and thus was entered into the data as having occurred on the day of data collection, it can be seen that in many months larger individual incomes were often focused around the beginning of the month as seen in figure 45. Often when incomes came later in the month, they were due to late payment. Late payments occurred in the cases of monthly milk income, rental income, and community work income. This mirrors previous research discussed previously which

found that a monthly timeline is still relevant when considering the incomes of those without formal employment.

Whilst the participants all used a different patchwork of income generating activities to build their livelihoods, the nature of the lumpy incomes seen with Gabriel is mirrored by the other participants. The need to diversify incomes in order to ‘fill in’ gaps in income is clear from the participants.

5.6 Discussion

With formal employment hard to come by in Busia, the participants of this study have to find multiple ways to piece together a sufficient income to make ends meet. Busia is one of the poorest counties in Kenya, with a poverty rate of 67.6%, due to inequalities in resource allocation, large household sizes, high numbers of female headed households, food poverty, and poor infrastructure, and has focused poverty reduction in part by promoting the boosting of agricultural production (County Government of Busia, 2019).

All the participants in the study are farmers, growing crops and keeping livestock. However, they vary significantly in the ways they piece together their incomes. This portfolio of income not only assists in increased income, but also provides some level of security. None of the income sources utilised by the participants are totally secure, even formal employment.

All the participants of the study base their livelihoods off of some combination of crop agriculture, livestock production, and remittances. However, these incomes alone were not sufficient, and were fraught with uncertainties; crop yield can reduce as a result of weather-related events or disease, livestock production yields can reduce due to illness and death, and remittances can reduce as a result of financial difficulties of those sending the remittances, for example. As a result, the participants have had to create income portfolios of various income generating activities, based on their capabilities, as described by (Sen, 1984, 1993), being their resources and entitlements that can be harnessed to achieve a livelihood.

All the participants represent the informal market in the milk and livestock value chains in Kenya, which are characterised by limited access to infrastructure (such as refrigeration, water, and sanitation), and traditional processing and retail practices

(Blackmore *et al.*, 2020). The milk sold by the participants is raw, something that is outlined within the code of hygienic practice for milk and milk products. Within this code it is stated that ‘No direct sale of raw milk to consumers in municipalities shall be allowed; enforcement shall be monitored by the Kenya Dairy Board and local authority’, and ‘Direct sale of milk by farmers or bulk distribution may be allowed in rural and semi-rural areas subject to conditions of time since milking and distance relative to the point of production; farmers must be registered and licensed’ (Brown *et al.*, 2018). Kenya’s approach to governing the informal milk market has been inconsistent through the past, and has turned a blind eye to the informal sector, either willingly or due to a lack of capacity to enforce regulations (Blackmore *et al.*, 2020).

As with income sources, the participants often had the same core expenditure requirements. All the participants had educational, livestock, food, and phone airtime related expenditure during the study period. Primary education is free in Kenya, however, poor government funding means that schools must charge for many things which make it an expensive expenditure for those less well off (Wawire, Corresponding and Kiruki, 2011).

Crop agriculture, transport, informal group loan repayments, remittance, religious (either church donations or funeral contributions), medical payments (either hospital fees or medicine purchases), electricity, cleaning supplies, and personal care items such as soap were other extremely common sources of expenditure. Whilst some of these cost more than others, they are all necessary payments that must be made by the majority of the participants, on top of other requirements that can include intrahousehold transfers, purchasing water, buying clothes, repaying informal credit at shops, and the like.

Overall, the incomes the participants achieve were rarely sufficient to adequately meet all these needs, and decisions had to be made about what available money would be spent on. There was rarely enough to consider the future, with limited savings among those not in formal employment, and whilst they would often allocate some income to each necessary need, it was rarely sufficient sums for the full benefits to be achieved.

CHAPTER VI: ACCESSING FINANCE: MAKING ENDS MEET

6.1 Introduction

Whilst importance is placed in the literature and within relevant organisations on improving access to finance providers and services, it is also important to consider how people use these providers and services, and what attracts and detracts, or what people like and dislike, about them. This will provide the understanding of decision-making of smallholder farmers when adopting financial services and providers that will enable to development of providers and services that are more suitable for this target group.

There is much literature relating to farmer preferences when it comes to matters such as weather index insurance and soil management (Tadesse, Shiferaw and Erenstein, 2015; Sibiko, Veetil and Qaim, 2018; Ahmed, McIntosh and Sarris, 2020), determining factors of demand for credit (Kiplimo *et al.*, 2015; Gurmessa, Ababa and Ndinda, 2017; Rehman, Pathan and Mohsin, 2021), impacts of credit constraints for farm productivity (Freeman, Ehui and Jabbar, 1998; Mukasa *et al.*, 2017; Seck, 2021), and the challenges of rural financial inclusion (Cnaan, Moodithaya and Handy, 2012; Lopez and Winkler, 2018; Taylor, 2021), among others, however, there is little in the literature relating to what smallholder farmers want from financial providers, and the factors that attract or detract them from using particular providers.

In this Chapter I will explain how the study participants have created ‘financial portfolios’, with a typically large number of financial providers in use, a detailed overview of which was provided in Chapter 4. Beginning with a brief overview of the relevant literature, the chapter will continue by detailing the overarching positive and negative themes that were uncovered during the initial interview stage of the data collection, to understand what attracts or detracts people from using certain providers, and to shed light on the factors that need to be considered when developing financial markets targeting smallholder farmers.

6.2 Creating Financial Portfolios

At the cluster level there are some points of interest relating to how the participants create their financial portfolios. Cluster 2 (medium commercialisation with low livestock income), who have the lowest average incomes of the clusters, actually have

the largest mean number of formal financial accounts, significantly more than any other cluster (see Table 32), with a total of 23 formal accounts, averaging 4.6 accounts between the members in this cluster, similar to cluster 4 (high commercialisation with high livestock income) who was significantly wealthier than the other clusters. From Table 33, it can be seen that this portfolio of formal financial providers is made up of a combination of commercial bank accounts, mobile bank products (M-Shwari, KCB M-Pesa, Equity Eazzy Loan), SACCO's, and registered organisations.

Table 32: Number Financial Providers by Formality and Cluster

<u>Cluster</u>	<u>No. of Informal Providers</u>	<u>Mean Informal Providers</u>	<u>No. of Formal Providers</u>	<u>Mean Formal Providers</u>
1	12	3.00	13	3.25
2	12	2.40	23	4.60
3	17	3.40	13	2.60
4	4	4.00	5	5

The makeup of these formal financial portfolios for cluster 2 are not particularly different from that of other clusters, only that they have access to more of these providers than cluster 1 and 3. With access to a larger number of formal providers, cluster 2 access the fewest informal providers, though not considerably less that of others.

Clusters 1, 2, and 3 are fairly similar in their number of financial assets and liabilities, whilst cluster 4 had considerably more financial assets that the other clusters, and no financial liabilities (see Table 34).

The number of the participants who had access to various financial providers within each of these groups during the initial interviews is shown in Table 35, with 'no. of participants with this as their highest formality' referring to the number of participants who have access to this level of formality as the most highly regulated provider they have access to.

CHAPTER VI: ACCESSING FINANCE: MAKING ENDS MEET

Table 33: Sources of Financial Assets and Liabilities by Cluster

Formality	Assets	Cluster			
		1	2	3	4
Formal (prudential)	Commercial Bank	2	6	6	2
	M-Shwari Deposit Account	0	2	1	0
	KCB M-Pesa Fixed Savings Account	0	1	0	0
	Shares in SACCO	1	2	0	3
Formal (non-prudential)	M-Pesa	4	5	5	1
Informal	Shares in Table Banking	2	3	2	0
	Chama (multiple functions)	6	2	2	1
Excluded	Savings in a Secret Place	1	2	1	1
Liabilities					
Formal (prudential)	Personal Loan from Commercial Bank	0	0	1	0
	SACCO Loan	1	2	0	0
	Microfinance Loan	1	0	0	0
	M-Shwari Loan	1	2	0	0
	Equity Eazzy Loan	1	0	0	0
Formal (registered)	One Acre Fund Loan	2	2	0	0
	Busia County Government Agricultural Loan	0	1	0	0
Informal	Table Banking Loan	1	2	3	0
	Informal Credit at Store	0	2	4	0
	Supplier Credit	0	0	1	0
Excluded	Borrowing from Friends/Family	0	0	1	0
	Borrowing from an Elder	0	0	1	0

Table 34: Number of Financial Assets and Liabilities by Cluster

Cluster	Number of Financial Assets	Mean Financial Assets	Number of Financial Liabilities	Mean Financial Liabilities
1	18	4.5	7	1.75
2	24	4.8	11	2.20
3	20	4	10	2.00
4	9	9	0	0

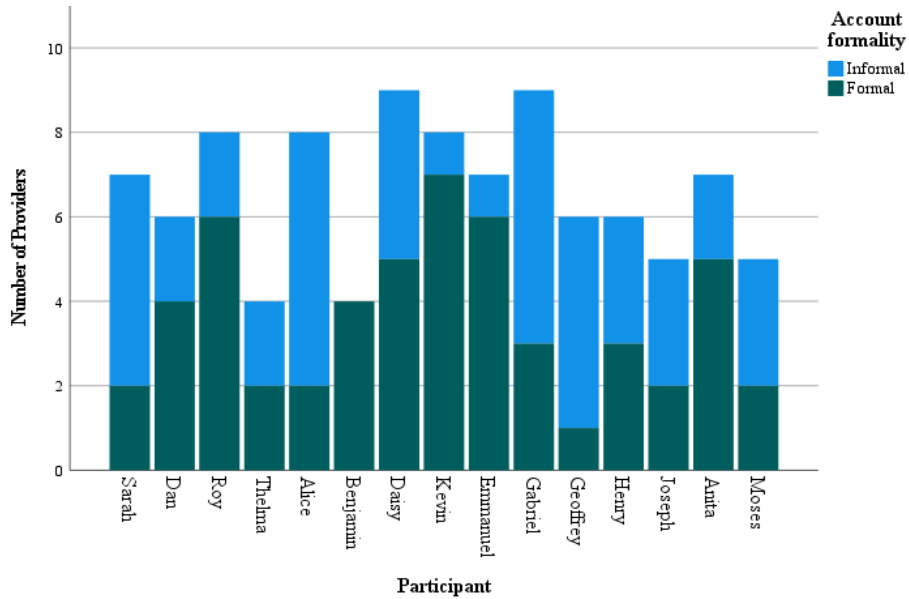
Table 35: Participant Account Ownership

<u>Formality</u>	<u>Provider</u>	<u>No. of participants with current own access</u>
Formal Financial Providers (Prudential)	Commercial Bank	10
	KCB Mpesa	1
	M-Shwari	6
	Eazzy Loan	1
	Microfinance	2
	Deposit taking SACCOs	4
	No. participants with this highest formality	10
Formal Financial Providers (non-prudential)	Mpesa	15
	Postbank	2
	No. participants with this highest formality	5
Formal Financial Providers (Registered)	Credit only microfinance	0
	Non-deposit taking SACCOs	0
	Development financial institutions	0
	Mobile money apps	0
	No. participants with this highest formality	0
Informal	Mixed Chamas	7
	Table Banking	6
	Merry Go Round	4
	Informal lenders (shop keeper, village elder, chief etc)	4
	Money lenders	0
	No. participants with this highest formality	0
	Excluded	Borrowing/saving with friends and family
Secret hiding place		6
No. participants with this highest formality		0

Financial providers are able to offer savings, loans, and/or ways to transact for their customers. The participants of this study utilised a variety of financial providers during the study, with a combination of savings and loans services, and all participants utilised both formal and informal providers.

At the first round of data collection, the participants had between 4-9 financial providers which they utilised. For 7 of the participants, these were primarily formal providers, for 6 they were primarily informal providers, and 2 participants utilised an equal number of each (see Figure 47).

Figure 47: Number of Formal and Informal Accounts by Homestead



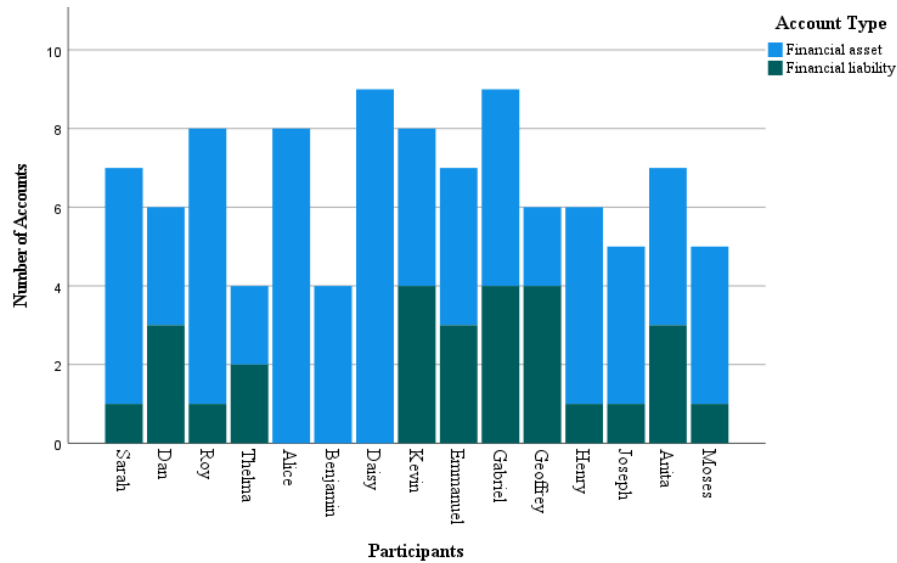
Whilst the majority of accounts held by the participants were financial assets, 10 of the 15 participants had at least one financial liability (see Figure 48).

Figure 52 shows that for the majority of participants, the total values of their financial accounts throughout the study often hovered around 0ksh, with assets and liabilities more or less cancelling each other out. Daisy and Kevin were able to maintain relatively very high overall balances during the study, with assets far in excess of the value of liabilities. Roy and Henry also managed to achieve relatively high positive balances during the study. Again, Daisy, Kevin, and Roy represent 3 of the 4 formally employed (or retired from formal employment) participants, receiving a relatively large stable monthly income. For others though, including Dan, Emmanuel, and Anita, their relatively small negative overall balances are enough to put immense financial pressure on the homestead, with all three struggling to pay for basic needs, such as food, loan repayments, and education expenses over the study period.

By the end of their varying times in the study, the participants had, on average, accounts/membership with 7 financial providers excluding cash on hand. This consists of an average of 4.1 formal providers (ranging from 1-7) and 5.5 informal providers (ranging from 1-12) per participant.

The participants financial situations varied significantly. Emmanuel was the participant who struggled the most financially during the study period. Though not one to complain, Emmanuel was the lowest income earner among the participants, really

Figure 48: Number of Financial Assets and Liabilities by Homestead



struggling to make ends meet, and is the most heavily reliant participant on his financial providers. He had once been employed as a health and safety officer at Mumias Sugar Company, but was made redundant when the factory closed down. He had also experienced a significant house fire several years ago, while he was building a new house on his compound. With all the family's belongings stored in a small hut on the compound, a faulty electricity cable is thought to have started the fire, resulting in the total destruction of all the family's belongings. Out of a job, with nothing of his home left, and the sole breadwinner of a large family, Emmanuel struggled to rebuild himself over the years.

'Economically it is not that bad because now we can at least get some little money to sustain us [now that the dairy cow has given birth] although it is not enough for all our needs. We just thank God because at least we can sell our milk so it sustains us, we can't complain, and we cannot also want a life that we can't afford' (Emmanuel, February 2020)

At the time of the quote above, Emmanuel's income for the previous month had been just 1,105ksh (\$10.22/£7.81), significantly below the average monthly income of 25,023ksh for the group of participants (\$230.90/£174.91). His wife too considers herself to be a farmer, working the same land as Emmanuel, but she has been experiencing ill health throughout the study period. A local doctor has said she needs tests and x-rays to be done, but this is something far outside their financial reach [Informal Conversation, 2019]. Emmanuel is therefore the only income earner of his

homestead, with his wife usually not well enough to help him. He has 4 children aged between 13-20. Whilst the 13-year-old daughter is still in primary school, the other two daughters have children of their own, a 15-month-old and an 18-month-old at the beginning of the study, one of them being a single mother. The lack of local job opportunities means they and their 19-year-old brother are all unemployed as well as out of education. With a total household size of 8 to care for on such a small income, Emmanuel has had to rely heavily on his financial portfolio to keep the family afloat.

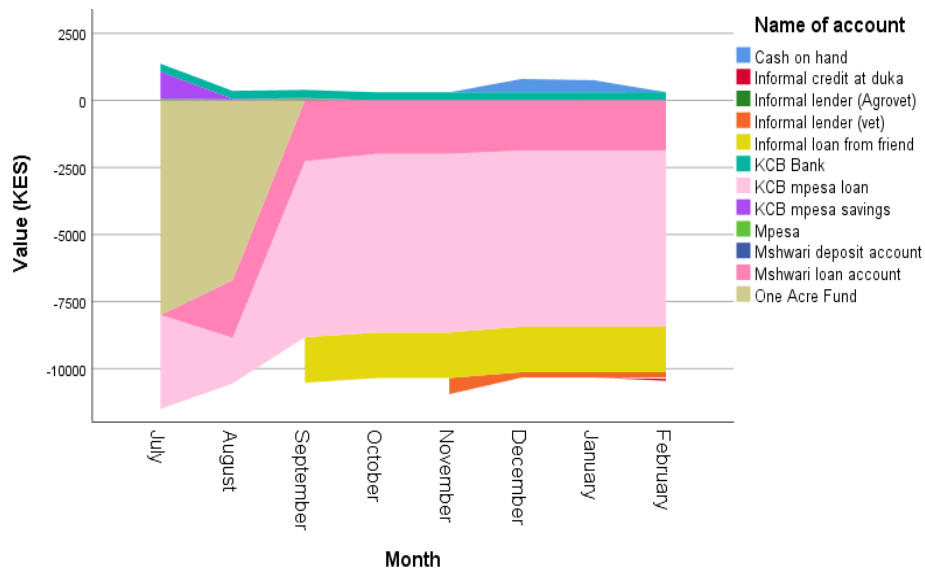
He has the second largest financial portfolio among the participants, having used 9 financial providers during the study period, with 11 accounts in total. As with many of the participants, this large portfolio is characterised by many dormant accounts, such as his KCB bank account and M-Shwari deposit account, for which he does not have sufficient income to deposit to, and a breadth of loan accounts, primarily offering informal loans, which have remained largely unpaid during the study.

Figure 49 shows the balances of Emmanuel's various accounts over the study period. At the beginning of the study, he had 7 accounts with 6 providers (plus cash on hand), but as time progressed, additional loan accounts were added to his portfolio, namely an informal loan from Agrovet (store credit from a leading agricultural supplier), an informal loan from a vet (unpaid balance), an informal loan from a friend, and a mobile loan from KCB M-Pesa. The overall value of his financial portfolio though hardly changed over this time, starting in June 2019 with a total value of -310ksh (-110ksh including cash on hand), before quickly falling to -10,130ksh by the end of July after taking a loan from One Acre Fund. Despite the repayment of the One Acre Fund loan, and the addition of these new loan accounts, the overall value of Emmanuel's financial portfolio failed to rise, ending in February 2020 with a total value of -10,145ksh. Instead, loans were taken to fill the gap. Whilst the balances remain almost constant throughout the study, he is unable to afford to repay the loans. The repayment of the One Acre Fund loan was achieved by taking other loans which have remained unpaid.

With an average monthly income excluding loans of just 1,257ksh, without a boost in income, this balance will be very difficult to clear.

The bulk of Emmanuel's liabilities come from his KCB M-Pesa and M-Shwari loans. These are formal financial providers, which causes concern when considering the length of time these have remained unpaid and understanding from his financial

Figure 49: Balances of Emmanuel's Financial Accounts at the End of Each Month



situation that he is going to struggle to do so. For the first few months of the study Emmanuel managed his KCB M-Pesa loan by paying off just enough to be able to qualify for another loan. Typical loan terms of KCB Mpesa are 4, 12, or 24 weeks (Hwang and Tellez, 2016), so by taking a 24 week loan, he has provided himself some temporary breathing space. M-Shwari loans however offer much shorter loan terms at 4 weeks (*ibid*). Having not paid this loan, Emmanuel is unconcerned. He cannot afford to repay the loan, and as of yet, he has not faced any negative consequences for not doing so, as far as he's aware. However, as will be explained later in this chapter, he is likely facing consequences that he is unaware of.

Whilst Emmanuel is particularly struggling to make ends meet, his story of piecing together a financial portfolio to keep his family afloat is one that resonates with many of the participants, as was shown in the previous chapter relating to the piecing together of incomes, as well as the data provided here. When choosing which financial providers to use, the overarching themes that attract or detract from different providers should be considered. As discussed in the background of this chapter, simply making access easier does not necessarily lead to increased usage, which can be evidenced by the number of participants who have a bank account but do not use it, despite having physical access to the account, and previous research tends to focus on specific aspects of specific providers and services that are liked or disliked.

The next section of this chapter will look at overarching themes that encompass all financial providers, to gain an understanding of important aspects that need to be

considered when creating financial products and services to meet the needs of smallholder farmers.

6.3 Perceptions of Financial Providers

Having examined Emmanuel's case as an example to understand how and why people may create financial portfolios, we can look deeper into the overarching themes that are attracting and detracting the participants from using financial providers and services. The literature relating to access to finance often deals with supply side concerns, such as unwillingness of banks to lend to farmers due to the risk and uncertainties related to this sector (Isaga, 2018; Maloba and Alhassan, 2019), or considerations of the differences between formal and informal providers (Ayyagari and Maksimovic, 2010; Hoai *et al.*, 2020). Far less though has considered demand side factors that influence an individual's decision of whether to utilise a particular provider, information that could be invaluable to the implementation of financial projects.

Here we utilise transcribed interview data from the Initial Interviews, using thematic analysis to uncover what they like and dislike about the various available financial providers, and why they chose to open an account or become a member. A number of themes were present in the data for both positive and negative responses, with a wider variety of themes relating to positive responses.

6.3.1 *Making Money Work, and Working Together*

During the data analysis 16 positive themes were derived from the data, with some being raised much more frequently than others. **Error! Reference source not found.** shows the number of participants who talked about particular themes during the initial interviews. Whilst the interviews were conducted with 18 participants, data on actual usage is only available for 15 homesteads as 3 dropped out very early in the study.

The top 4 themes, ease of access, community spirit, making money productive, and trust, were raised by at least half or more of the participants, and these will be the themes will be considered in more detail.

Table 36: Themes that Attract Participants to Financial Providers

Easy of Access	17
Community Spirit	13
Making money productive	12
Trust	9
Low interest rates	7
Seeing other people doing well	6
Bonus services (e.g. seminars)	5
Just a way of getting money	4
Flexible repayment	3
Good customer service	2
Accessibility across counties	2
Access to inputs	1
Adertised for people like them	1
Accept small funds	1
Cheap services	1

Ease of access

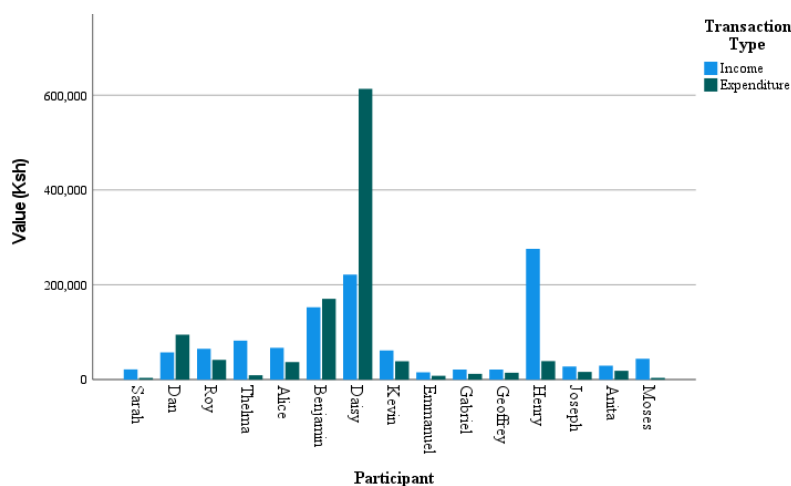
It is not surprising to discover that the factor that most attracts people to using a financial provider is ease of access. With many of the participants not having access to private transport and living away from the more urban areas, distance is a primary concern for most. For many, desired deposits and withdrawals are small sums, and paying for public transport to reach a financial provider represents a disproportionate cost. Praise for ease of access most frequently comes when discussing M-Pesa. With all the participants having their own M-Pesa accounts, the ease with which it can be used appears to be its primary selling point. Emmanuel highlighted the issue of accessing financial providers when dealing with small sums while discussing why he's enjoys using M-Pesa:

'I can withdraw money from nearby here [from an M-Pesa agent], you know the first bank branch is in Busia and Malaba, which is far. Let's say for example you want to withdraw 50 shillings, you will have to spend 200 shillings on transport [to Busia] or 400 [shillings] to Malaba just to go and withdraw 50 shillings, you will have spent 450 shillings... At the [M-Pesa] agent here it's good because one can walk on foot'. (Emmanuel, May 2019)

Whilst these sums of 200ksh and 400ksh may seem small, equating to roughly \$1.84/£1.39 and \$3.69/£2.78 respectively, the low incomes of many of the participants means this is money they may be hard pressed to come by, representing a significant proportion of an average daily wage for many. To withdraw larger sums so not to need to make this trip too frequently defeats the purpose of the provider, and would require larger sums of cash to be stored at the home. This is something that was also uncovered in a study by Morawczynski & Miscione (2008) when looking at how people in the slum Kibera use their mobile money.

M-Pesa is the most popular financial provider among the participants, with all participants having their own registered accounts. For the majority, M-Pesa is used primarily for incomes, with less expenditure occurring through M-Pesa (see Figure 50). Instead, much of the incomes received this way are withdrawn at an agent so spending can occur in cash. Many small market stall owners, individuals, and even some shops, do not accept M-Pesa for purchasing, and to transact frequently with M-Pesa would incur a higher number of fees. A total of 1,053,119ksh worth of incomes passed through the participants M-Pesa accounts during the study period, compared to 835,584ksh worth of expenditures, influenced by two significant outliers in the group.

Figure 50: Value of Incomes and Expenditures Through M-Pesa During the Study Period by Homestead

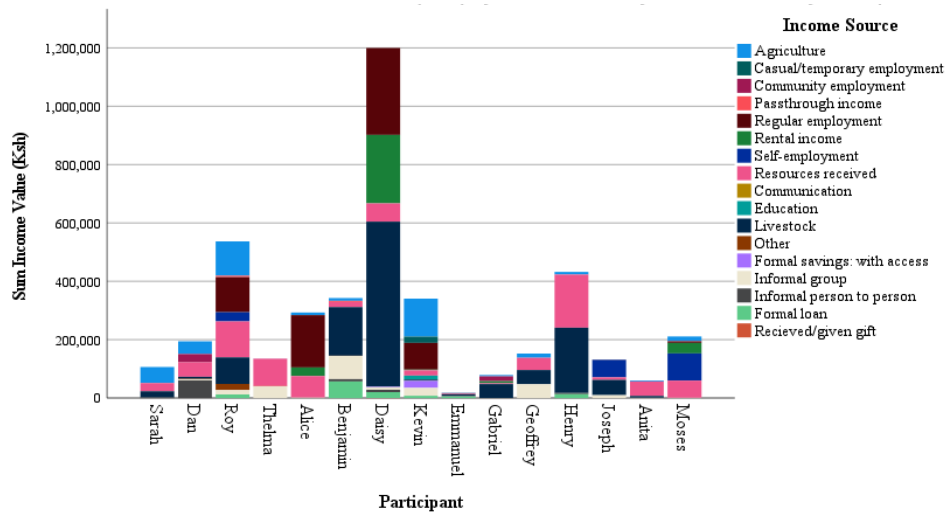


The first outlier is Daisy, who alone accounts for around half of this expenditure and around a fifth of the incomes passing through M-Pesa. Daisy raises chickens for a local company called Usomi. She purchases chicks and feed from them, rears the chicks, and sells the grown chickens locally, with any unsold chickens being purchased back by Usomi. She uses M-Pesa to pay for chicks and feed, whereas she predominantly

sells the chickens for cash. The second outlier is Henry. A large proportion of the income he received through M-Pesa were remittances, received over just 2 months during the study, from his adult children and brother during the construction of his new house.

Receiving remittances and intrahousehold transfers (resources received) is the most common use of M-Pesa among the study participants as seen in Figure 51.

Figure 51: Income Sources Received Through M-Pesa



Whilst it is M-Pesa that is mostly discussed in terms of ease of access, participants do also consider ease of access to be a leading reason they chose to utilise other financial providers as well. For some, the ease of applying for an instant loan from M-Shwari, another product available through M-Pesa, provided an ideal way of getting money for small emergencies, as described by Benjamin:

“There is a time I was travelling, I did not have a lot of money, I had little money, something like 100 shillings, I borrowed 500 shillings from M-Shwari, and I was given” (Benjamin, May 2019)

Emmanuel too has found himself in such a position in the past, having travelled and finding that he has run out of money while away:

“M-Shwari services help in case of emergencies, for example you can be stuck somewhere and request for a loan from M-Shwari, maybe you have travelled somewhere, and your money is finished. M-Shwari can be of help in such emergencies” (Emmanuel, May 2019)

M-Shwari is another of the more popular providers among the participants, with seven of the fifteen participants utilising its services.

Of the participants using M-Shwari, five had taken loans during the study. No participants utilised M-Shwari's savings service. These loans were typically smaller than that taken from banks or SACCO's and with short repayment periods of just 4 weeks, M-Shwari is typically used to make up for smaller shortfalls during months with higher expenditure. For example, Kevin took his loan of 4,300ksh with M-Shwari to help pay for agricultural inputs such as anti-fungicide and fertiliser, in a month were he also had higher than usual school fees to pay. Dan took two loans from M-Shwari within a week of each other between October and November 2019 to help make up for low earnings and the need to purchase agricultural inputs. A larger loan of 5,913ksh was taken using his wife's phone and M-Shwari account on 31st October 2019, due to him not being eligible for such a loan through his own account. This was taken because during this month Dan had only earned 500ksh through community employment. His daughter sent him remittances worth 10,000ksh during this time, which he used to pay an agricultural labourer and towards fertilizer, and transport to Siaya respectively. The loan from his phone was used when he was running low on cash and needed to take a matatu, and the loan from his wife's phone was money that was used for other general household spending.

The ease of access from chamas, some SACCOs, and money boxes were also raised to a lesser extent by some participants. Loans from chamas and SACCOs can be, depending on the group, easily accessed in times of need, which is highly valued by the relevant participants. Only one participant raised enjoying using a money box as a 'secret place' to store small amounts of money. Usually money boxes and 'secret places' are not liked by participants due to the lack of security of the money, but they do allow of small amounts to be saved, rather than needing to take small coins to an M-Pesa agent or banks for depositing. Anita tells us:

“Now that little money like 10 shillings, 20 shillings, do you also take that to the bank? You know, when you want to take it to the bank, you will have to collect it until it reaches maybe 500 or 300 shillings, then you go and deposit. That 10 shillings, you can save in the money box slowly by slowly, and you find yourself to have saved more” (Anita, May 2019)

Financial products and services then need to be hassle free for participants, and

consider the small sums that they deal with, the lack of their ability to travel much distance to the provider, and the sudden nature in which the need for loans can arise.

Community Spirit

The second most common response relating to what attracts the participants to particular providers relates to an interest in bringing together members of the community so that, as a group, people can discuss their problems, build relationships, advise each other, learn from each other, and make investment plans together which can build up not only them as individuals, but the community more broadly. Very much fitting with the idea of *Harambee*, it is mostly the Chamas that offer participants this community spirit.

“When you come together you see how someone develops their home...that is like education, right? You learn development so that you don’t remain behind [whilst other] people progress” (Sarah, in reference to a cooperative with merry go round function, May 2019)

“It brings people together, it brings about unity, peace, it shows you how to practice with money” (Geoffrey, in reference to his merry go round, May 2019)

These chamas offer a combination of informal savings, loans, and insurance within this community environment where people can support each other. This is a level of personal support and sharing of ideas that is not possible from large financial providers like banks, or technological providers like M-Pesa.

They typically consist of around 30 people and below (in the case of the study participants), and come in three forms.

A merry go round is what is more commonly referred to in the literature as a Rotating Savings and Credit Association (ROSCA), and involves the group meeting usually once a month, though this can be more frequent. All group members agree to take a specific amount of cash with them to group meetings, whether it be 200ksh, 500ksh, 1000ksh, depending on the capabilities of the group members. Members often meet at each other’s homes, and each member’s contribution is pooled and given to whose turn it is for receiving the pay-out, which is predetermined at the beginning of each cycle. In describing how his merry go round works, Roy tells us:

“We are thirteen, every member contributes one thousand shillings, and we give it to one member if it is his or her turn, so your turn can come once a year... so, when you are given 13,000, you can add something and even buy a sheep or a goat... so we encourage members to do that”
(Roy, May 2019)

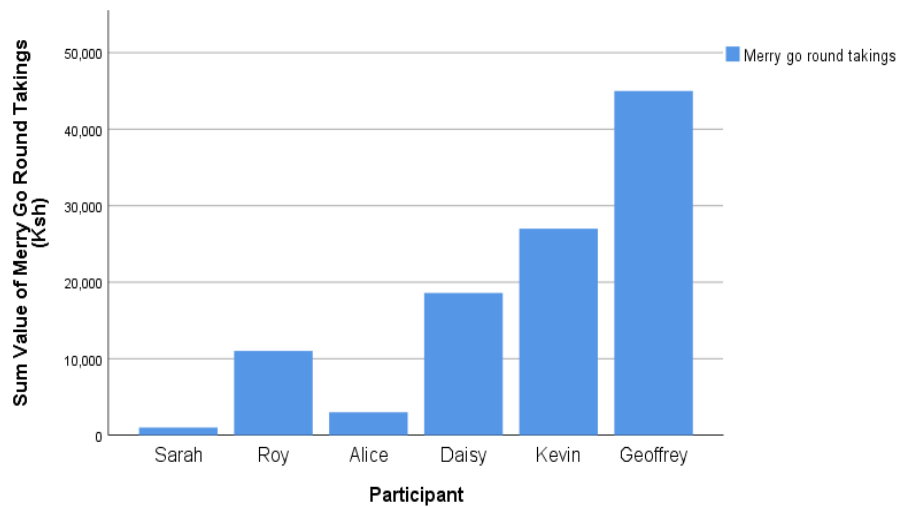
A merry go round therefore acts like a form of savings, allowing members to acquire relatively large lump sums of cash. Participants stated that whilst the month of each member’s turn for receiving the lump sum is set at the beginning of the cycle, for severe emergencies they are able to request to swap their turn with another member. Whether this is accepted depends entirely on whether the other member is willing to lose out on their turn at that time. This did not happen during the study, with the participants only taking their turns at their set time.

We see in this study that simply coming together as a community, to be able to sit together for the purposes of financial development, is also a key attraction to joining merry go rounds.

During the study period 6 participants received pay outs from their merry go rounds, the values of which can be seen in Figure 52. For some the value was small, just 1,000ksh, but for others their pay outs were much larger, particularly for Geoffrey who received a pay-out of 31,000ksh, which represented almost 26% of his entire income during the study. He received merry go round pay-outs twice during the study, in July and January for the sums of 14,000ksh and 17,000ksh respectively. In July Geoffrey was able to pay off a table banking loan, and pay a property surveyor to manage a land dispute with a neighbour, whilst in January he was able to use his pay-out predominantly to pay school fees.

Table banking, or as is usually called in the literature Accumulating Savings and Credit Association (ASCA) on the other hand involves group meetings at which each member provides a contribution with which they purchase shares. These shares are then used to provide loans, with interest rates tending to range between 10-20%. In some cases, these shares are also pooled and used to purchase investments, such as plastic chairs

Figure 52: Value of Merry Go Round Pay Outs Over Study Period



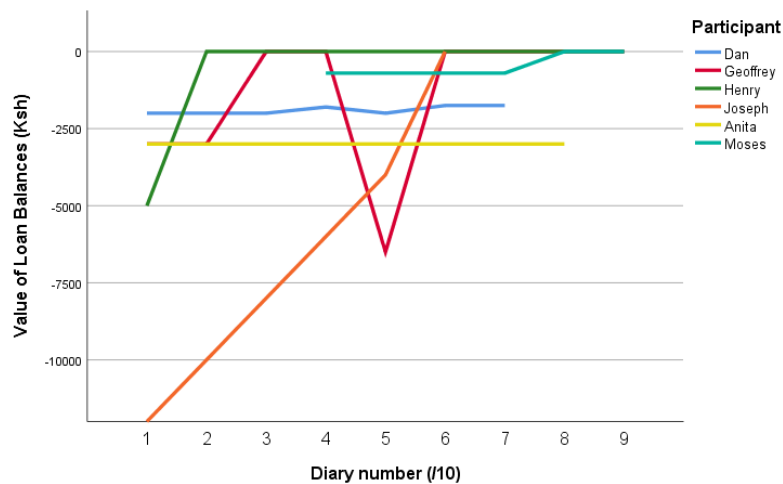
and gazebos which can be hired out, allowing participants to take part in investing whilst sharing the risk involved with other members of the group. Profits from loan interest and/or investments are then divided among the participants based on the value of their shares. Thelma tells us of her table banking:

“we save every Friday, you can even save 300ksh, 200ksh, it depends how much you have. So, you save, and then it also has business, now this business, we give out 100ksh... and then after nine months, they know the money has gained profit, we can also take a loan and then we come back to share all the money.” (Thelma, May 2019)

6 participants had outstanding loans from their table banking groups during the study, with an average loan size of 4,300ksh, ranging from 2,000ksh to 12,000ksh as can be seen in Figure 53. The loans tend to be for smaller amounts, but can be quite large, such as Joseph’s loan which began the study at 12,000ksh and was taken predominantly to restock his shop, though this represents only 6% of his income during the study period.

As with merry go rounds, table banking requires the group to come together, providing them with the opportunity to work together as a group to meet their financial requirements. At one of Sarah’s chamas, the group chose to invest in their own chicken production. They arranged for a local vet to provide them training on rearing chickens, and provide veterinary treatment.

Figure 53: Table Banking Loan Balances During Study Period



Finally, there are welfare elements to some chamas. These particularly focus on aiding with funerals costs. In some cases, there is a specific amount that is paid at every group meeting as a funeral contribution, which is saved and given to members as needed. In others there is an agreement between the members, who provide additional contributions in case of need. Whilst none of the participants utilised this during the study, some have done in the past. Alice is a member of such a chama, which began its life as purely a welfare group providing contributions to funerals, but later added a merry go round. She explains how it works:

“This merry go round, we formed because of funerals when people die...we can give our colleague two kilos of sugar, salt, tea, kerosene, cooking oil, maize six tins [each tin is two kilos], eight tins of beans so that we can cook githeri (a local dish of mixed maize kernels and beans which are boiled together) during the burial when we stay overnight, so we joined that so we could contribute two hundred per head so that we can buy those things. So later we said, no, let us add that two hundred and then we...we do a merry go round still when no one is dead yet, right?” (Alice, May 2019)

At Alice’s chama the group members now each provide 500ksh at each meeting, with 300ksh being put towards a merry go round, and 200ksh being saved for funerals. Being an emotional and stressful time, this chama allowed her to come together with a group of likeminded people to share that sadness and relieve a small element of the stress of affording the funerals.

“I joined when my mother wasn’t dead yet, now...it pleased me, it helped me with my mother’s burial and then when my husband died, it helped me by helping in the proceedings of my husband’s funeral” (Alice, May 2019)

Chamas are flexible in how they work, unlike how they often described in the literature, meeting the needs of their group members. The chamas utilised by the participants consist of various combinations of these three types, in how often they meet and the size of the contributions, and even the types of welfare given. The majority of the participants in chamas are in mixed chamas (7 participants), in which two or more of the merry go round, table banking, and welfare functions are combined. Pure table banking is the second most popular form of chama, with 6 participants being members, followed by merry go rounds, with just 4 participants being members. For some, these meetings are very social, involving ‘hosting’ other members at the home, providing food and drinks, such as mandazi and chai, or members bring snack to share. For others, this is not the case. People come together more for ‘business’ and to discuss matters such as farming. Each group is different, and the participants join and leave chamas based on whether they like the way a group works.

Making money productive

The participants are drawn to financial providers that offer their money an opportunity to grow or provide benefits, rather than just sitting idle, though this is also subject to participant misunderstanding, as will be discussed later in this chapter. 12 of the 18 participants interviewed about this discussed making money productive as something they like about financial providers, as it allows their often small savings to grow into more useful larger sums and offer benefits that they would otherwise be unable to afford.

Group investments are looked upon fondly by the participants, with this coming from chamas and SACCOs. From each of these providers participants are able to come together to discuss ideas for how to invest together. These investments most often come in the form of buying matatus or buses which can be run as a business with profits being shared as dividends, or gazebos and chairs which can be rented out for local functions, and in some cases include purchase of land for building rental houses, or purchase of company shares. For instance, Anita says of her chama:

“[I] Am happy because even now they have a bus, they have opened a hotel, and so if you have a problem and you are a member it will be easier for them to help” (Anita, May2019)

Moses wishes to be a member of a SACCO, but does not have the income to allow for savings that would enable him to benefit from membership. He explains to us his reason for wishing to join one:

“You know, a SACCO is somewhere where you can deposit money and it multiplies, you buy stuff, you get shares, yes. Someday, you can find that your shares could help you do a certain thing” (Moses, May 2019)

He would like to invest his money so that it can grow to a large enough sum that it allows him to purchase something more valuable than what he can do by simply saving little himself.

Deposit taking SACCOs were typically used by the teachers of the participants. Daisy, Kevin, and Roy all regularly use their SACCO's, with the majority of activity from Kevin and Roy, who unlike Daisy, are still employed rather than receiving a pension. Both Kevin and Roy were able to sign up to their SACCOs through their schools, and agreed an amount to be deducted directly from their salaries to be put into their SACCO savings accounts, and to repay SACCO loans. A fourth participant, Anita, signed up to a SACCO after members of the SACCO came to her chama group to raise awareness of the SACCO and the benefits of joining. The chama members registered for the SACCO, and she uses it simply as a way of getting a loan, hoping to accumulate enough savings in the future to be able to take a larger loan.

With eligible loan values calculated based on the value of the shares, Roy and Kevin, with their long term, no hassle savings being taken directly from their salaries, have been able to accumulate significant sums, and take significant loans (see Figure 54 and Figure 55). Roy took his loan to pay school fees, and Kevin to plant sugar cane. Both chose to take loans rather than use their savings because dividends are calculated based on share value, meaning to spend their shares would result in lower dividends. Roy's SACCO offers very low interest loans when compared to other providers, at 2%.

Kevin's on the other hand offers rates more similar to that of other providers found in the study, at 12%. The majority of the participants were aware of SACCOs and the

benefits of becoming a member, with particular interest in the savings and loans services. Again, the main reason for the low number of participants utilising SACCOs was a lack of income.

Figure 54: Roy's SACCO Balances

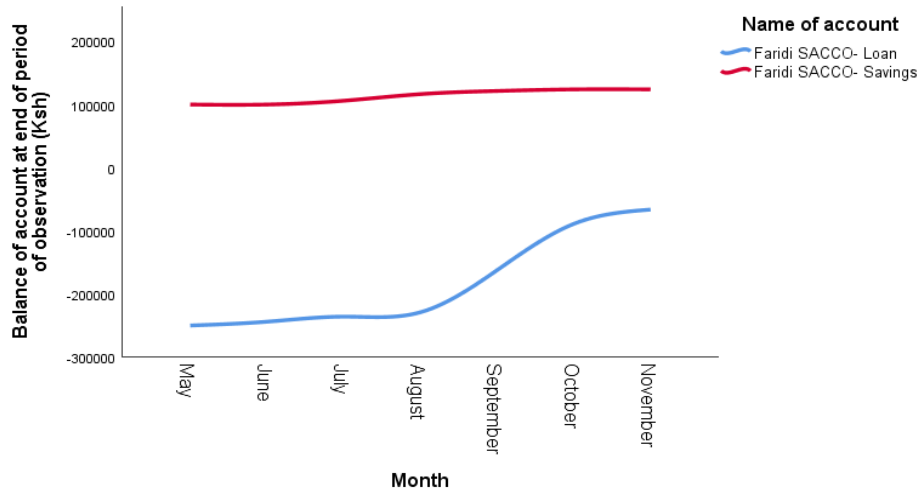
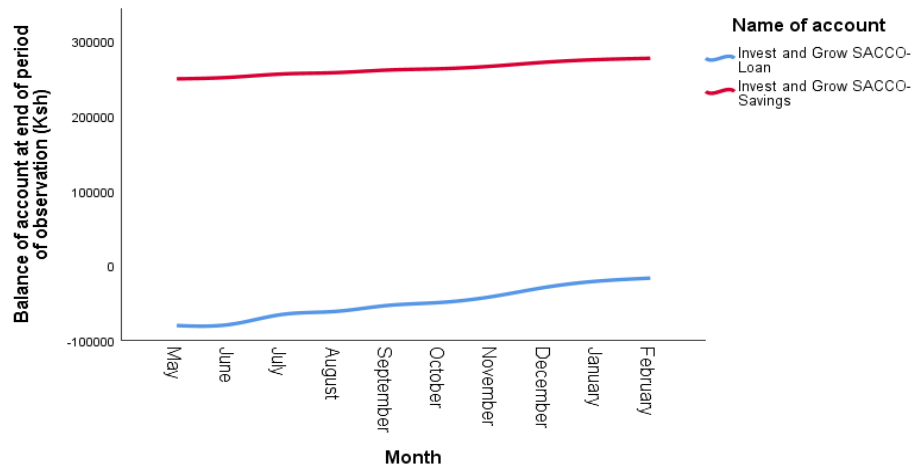


Figure 55: Kevin's SACCO Balances



The participants are able to gain this investment and insurance benefits from their chamas. Alice gains this benefit from her table banking. In this case, every member is encouraged to save 5,000ksh at the beginning of the year. Loans taken from the group incur an interest rate of 10%, with loan interest returning to the pot. At the end of the year this money is then divided up among the group members.

“If I loan one thousand, I return with a hundred, so we have said, when it reaches December, everyone should have paid their five thousand personally which they shall divide, now it shall start gaining interest, so if someone loans, it gains interest, it is loaned and gains so you might get an interest of like ten thousand” (Alice, May 2019)

By being a member of 6 chamas, she is able to access loans, savings, and insurance from a variety of sources.

For some, when interest has to be paid on a loan, it is not always thought of as a cost, since this interest returns to the pooled pot, and goes back towards interest earned on the shares. Anita enjoyed her table banking group for this reason.

“When I borrow 600 and repay with interest, at the end of the year, we are usually given back the money, only those who save” (Anita, May 2019)

When the money collected through the year is divided up among the group members at the end of the year based on the value of their savings, Anita expects the growth of her savings will at least meet, if not exceed, the value of the interest she has paid on the loans she’s taken, thus making table banking almost like a way of accessing interest free loans.

Trust

The final most commonly discussed theme that attracts the participants to financial providers is trust in the provider to keep their money safe. Accountability in the case of an issue and the security of the money are what most cause participants to trust providers, with banks and M-Pesa featuring considerably in discussions of trust among the participants. Particular banks are discussed in this context in particular were Barclays, KCB, and Cooperative banks. Here the participants raise the concern of banks crashing, running out of money and savings being lost, or of corruption and the potential for the bank to steal money. The participants believe their accounts at the aforementioned banks are safe because of the belief that these banks cannot run out of money. Daisy tells us of her account with Barclays:

“I don’t know whether it is still parastatal, but I liked it. What I had in mind, that Kenyan banks sometimes they run out of money, there’s a lot of cheating there whereby you’ll find that the money has been stolen, so my

best reason was that I knew my money was safe there since it was a parastatal bank. I know I could not miss the money totally” (Daisy, May 2019)

Another provider often deemed trustworthy is M-Pesa. The physical security of the money being stored on a phone, and the good reputation of their customer service department for dealing with any potential problems should they arise means that often the participants feel very secure in the day to day use of the provider.

“If there is some theft going on, you can follow it up, ... when you send money to a wrong number, you call Customer care...It will be reversed immediately.” (Benjamin, May 2019)

Previous research too has found that public trust in Safaricom is strong. In a study conducted by Morawczynski and Miscione (2008) it was concluded that trust in Safaricom is high due to the long term exposure people have had to the company as a mobile network, accounting for 70% of Kenya’s mobile network market in 2008 (Reuters, 2008).

People are drawn unsurprisingly to providers they know will keep their money safe, and who have systems in place to manage any issues that may occur. The type of trust that attracts people to providers among the study participants is institutional trust, between people and institutions, as opposed to interpersonal trust between individuals.

6.3.2 The Problem of Trust, Income, Knowledge, and Community

As with the positive themes, a variety of negative themes were also drawn out of the data. Thematic analysis uncovered 15 themes that detract the participants from financial providers, again with some being much more commonly discussed than others. Table 37 shows the number of participants who raised the various themes during the initial interviews.

Table 37: Themes that Detract Participants from Financial Providers

Lack of Trust	13
Lack of Income	12
Causing Disagreements and Shame	11
Lack of Knowledge	10
Distance	6
High Interest Rates	6
Slow Service	4
Insufficient Loan Limits	2
Fear of Defaulting on Loans	1
High Fees	1
Fines	1
Money not Productive Enough	1
Not Suitable for Needs	1
Too Hidden	1
Unable to Meet Loan Terms	1

Lack of trust

The primary concern the participants have regarding financial providers is a lack of trust in the provider. This is most commonly a concern with groups, whether they be agricultural cooperatives or chamas, and M-Pesa, and thus constitutes a mix of institutional and interpersonal trust.

Several participants have been members of agricultural cooperatives at some time, though no participant is currently a member. Several participants have had issues in the past with mismanagement of funds at agricultural cooperatives. Daisy was a member of a chicken cooperative. Members pooled together their savings to purchase machinery such as incubators and freezers, which would help members rear and sell chicken. However, despite some of these inputs being purchased, the leaders of the cooperative are thought to have stolen the remaining money, leaving these machines unused and the chicken business unable to progress. She explains:

“We had officials managing it... but we don’t know what happened... People are crying, “Our shares are lost,”. They have incubators, they have big machines there and freezers, but they are just lying there, they are not working because there is no money” (Daisy, May 2019)

Dan too was a member of a cooperative, a milk cooperative where members held shares as a form of savings. The cooperative provided a market for milk, where milk could be taken daily, and an income is paid. However, the cooperative collapsed. The collapse of a cooperative can negatively impact a farmer in two ways, in the loss of the shares the farmer had invested as a form of savings which earned dividends, and due to the non-payment of the product that the farmer had supplied. Dan says:

“They have made my farming even worse.... They demoralized me. We expected to collect milk together and money goes to the banks, so that we get money from Cooperative direct. You go there and their work is to collect milk, collecting milk... then they send your payments to the bank... but they never did, so didn't do us good.” (Dan, May 2019)

Some concerns around trust also exist for some chama members. The potential for some members to default on loans or not contribute to merry go rounds is a concern because these missed contributions or repayments can impact the progress of the chama and the rest of the members. Dan has experienced this within his chama before. He tells us:

“With merry go rounds you have to plan also...like having a loan, you must ensure that it is paid...the way I have seen people do in those things, you contribute to other people and during their turn to contribute to you they say they didn't get something and maybe you had planned for that money” (Dan, May 2019)

There were many instances during the study where we found the participants not being able to meet their chama contributions, whether for loans or merry go rounds. From discussions with the participants during the study, it appears that some chama members missing contributions is not uncommon.

There is also a concern about trust with regards to M-Pesa. Some participants feel that the agents are able to steal money during withdrawals, especially when dealing with the elderly. Benjamin tells us:

“M-Pesa itself is just good, only those who are working there, some of them are thieves. If you are an old woman, they will tell you, “Hey, this person sent you this amount of money, have it.” They will give you less and keep some.” (Benjamin, May 2019)

M-Pesa is also thought to be prone to cons and mistakes when sending money which concerns some participants, though this does not deter from use. Rather the participants take care when sending money to avoid issues. Emmanuel says of comment:

“The only thing about M-Pesa, there are these cons, that’s the only thing I see but M-Pesa itself is good. There are some cons who can con you, but we were told how to ignore these people” (Emmanuel, May 2019)

Joseph explains the importance of taking care when sending money:

“if you are not very careful you can send money to a wrong person and if you don’t follow up in time, your money will be lost” (Joseph, May 2019)

Trust is both a major factor that attracts the participants to providers, and the main factor to detract from using them. It is vital when considering how to improve access to finance that considerations about trust are considered in terms of offering security and accountability at all levels of the provider.

Lack of Income

Despite the participants generally having an interest in utilising most formal financial providers, a common issue that is raised is the lack of income they receive. There is a general understanding that to fully benefit from utilising or joining banks, SACCOs, and microfinance, for savings, loans and other benefits, they would require a larger income. Even for simple deposits, there is limited demand due to lack of income. Money that is earned is generally used, with little if anything remaining to deposit.

“We do not have income... when we get money, we use it, we pay school fees and other things, we then remain with nothing, you are left with nothing to deposit” (Moses, May 2019)

To benefit from savings with formal providers would require larger sums to be saved for longer periods of time, and to benefit from loans would require the security of larger incomes to ensure that the repayments can be met, or risk property being auctioned if they default on the loan. Loan limits are often calculated based on the value of shares saved, or income passing through the account. If there is little or no depositing or savings, it may not be possible to take loans. Emmanuel once tried to take a loan from KCB where he had an account in which he had some money deposited as savings. However, he was denied a loan due to his lack of stable income:

“I wanted a loan from them, but I was told that unless am employed somewhere and channelling my salary through that account, I cannot be loaned, or unless am running a big business, if so then I can take a loan. Since I didn’t have both, they referred me to KCB M-Pesa” (Emmanuel, May 2019)

A lack of income also puts some participants off taking loans even when they are able to access them, for fear of the financial burden and risk of defaulting on the loan, which from some providers could lead to property being auctioned, or a sense of shame and creating arguments or tension from others. Talking of her fear of taking a loan from a bank, Alice tells us:

“If I take a loan and I fail to pay they can come and take all my things and shamba, they go sell somewhere because I have failed...if you go to take a loan, they ask you “How many cows do you have?”, “How many goats do you have?”, “How many chickens do you have?”. They come and write everything in the house, if I just fail, won’t they take all those things? And I don’t want someone to take my things” (Alice, May 2019)

This lack of income also causes many participants to fear joining providers where they know they will need to commit to payments, whether this be formal or informal providers. With a lack of sufficient stable income, many do not want to put themselves in this financial position:

“When you join a SACCO, there is some money you are supposed to deposit monthly, that’s a must. When it’s hard for you, it’s better to withdraw yourself from the SACCO” (Anita, May 2019)

“With merry go rounds, you have to have income, if you can’t get money to pay someone when it’s their turn, it will be hard for you” (Emmanuel, May 2019)

Generally speaking, the lack of income results in participants being attracted to the informal providers rather than formal ones. Chamas are able to provide savings, loans, and insurance services for much lower values of money than formal providers, depending on the group.

Disagreements and shame

The borrowing of money from informal lenders and friends and family, as well as involvement in chamas can cause problems for some participants. For some, borrowing money from informal lenders or friends and family comes with a fear of negative gossip being spread.

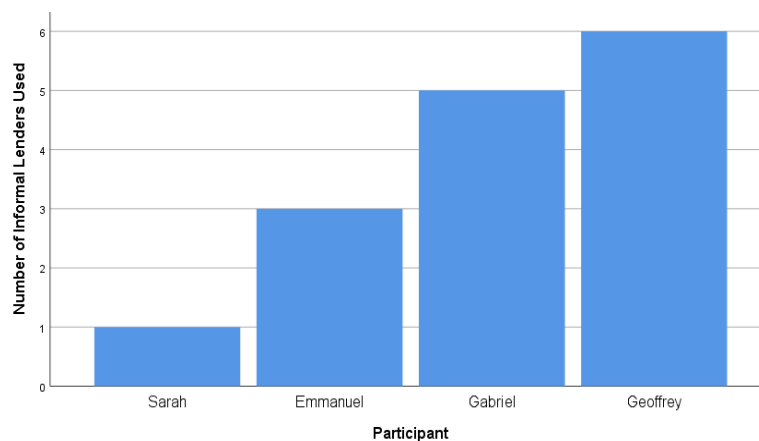
“I can borrow from family, but I don’t like borrowing from friends because they will start bad mouthing, I just don’t like it” (Thelma, May 2019)

“Family look down on you...if you often ask... even they can turn off their phones for you” (Sarah, May 2019)

During the study 4 participants borrowed from informal lenders. All 4 took informal credit, meaning that they were given permission to take items or services and pay at a later date when they had the cash available. In the data collection, this refers not only to physical shops, but also suppliers and service providers. Of informal credit taken, 6 of these were local convenience stores, 2 were vets, and the rest include agrovet, an electronics store, a fishmonger, a chemist, a village elder, and a cow breeder. These participants utilised between 1-6 of these providers (see Figure 56).

Taking informal credit at a shop known to you is very easy, so long as you are trusted and known by the shop owner. This is a great benefit for people waiting for their next income, as it allows people to access food stuffs such as bread, rice, oil, and sugar despite not being able to afford it, preventing the family from going hungry.

Figure 56: Number of Informal Store Credit Lenders Used During the Study



Whilst no participant saves money with a shop keeper or other person in the form of informal savings, these 4 participants have used store credit of sorts as a way of making ends meet, accounting for the inconsistent incomes they receive. They have been able to purchase food, livestock inputs, medicines, and veterinary care despite not having the money available, meaning that they have not needed to disrupt their farming as a result.

The values of the amounts owed to these lenders is relatively low (see Figure 57), the largest being Geoffrey’s credit owed to a local cattle breeder (who keeps bulls and charges local farmers to breed the bulls with their dairy cows), at 1,400ksh, and they tend to be repaid relatively quickly.

Four participants borrowed money from friends and family during the study, with 1-3 sources of this provider over the study period (see Figure 58). These loans tend to be for slightly larger sums than is borrowed from informal lenders, but generally smaller than loans taken from SACCOs or M-Shwari (see Figure 59).

Figure 57: Value of Balances from Informal Store Lenders During Study

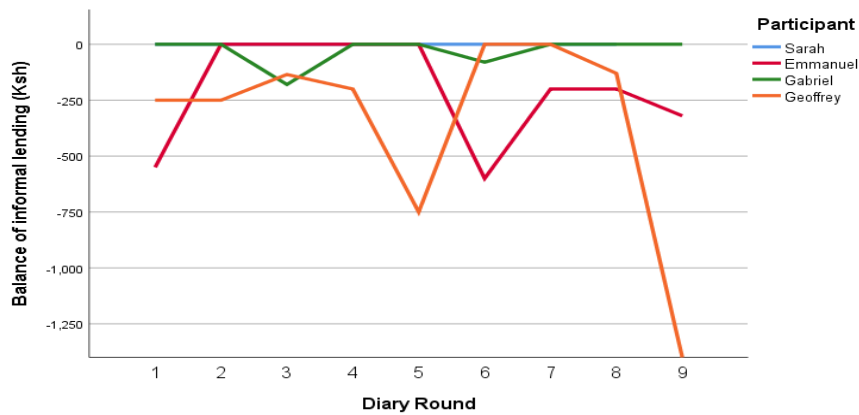


Figure 58: Number of Sources of Borrowing from Friends and Family

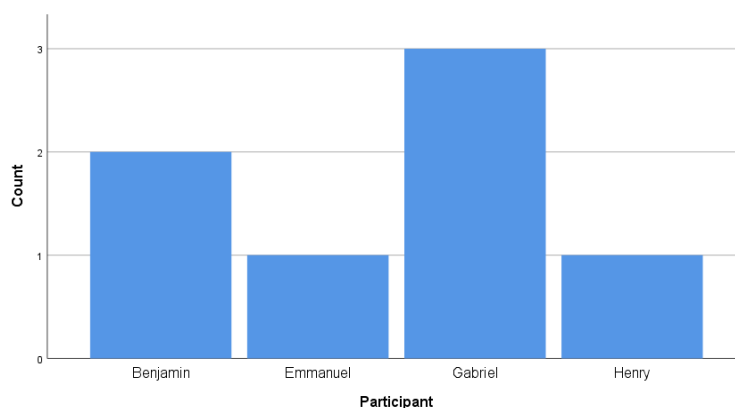
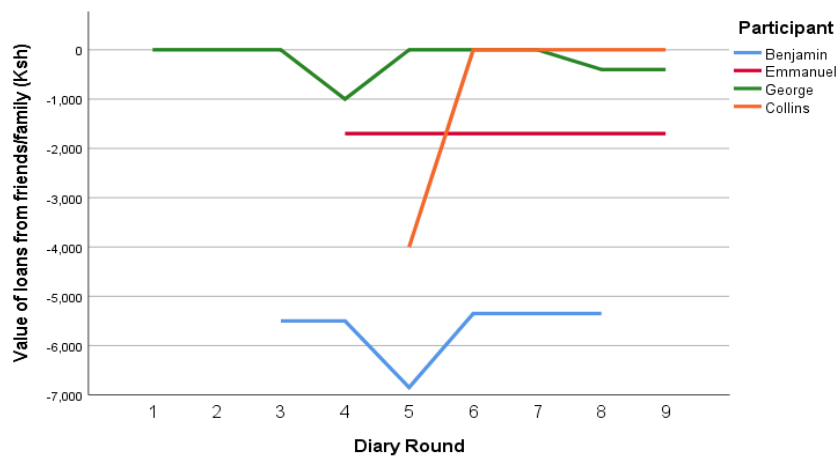


Figure 59: Value of Loans from Friends and Family during the Study



Lack of knowledge

A lack of knowledge about providers was also raised by the majority of participants, but is also something that was noticed during the interviews. For some participants there is the expectation of agents going door to door to educate people about a provider in order for them to gain a deeper understanding of how it works and why they should utilise it. This links to literature relating to how people come to know of financial providers, and who gives them financial advice. In talking about why he has not yet joined a SACCO despite having an interest in doing so, Gabriel stated:

“I have not been approached, but if I understand well and am comfortable, I just accept...if they can come to me and introduce me, they tell me the rules, I will accept” (Gabriel, May 2019)

This is the case for many participants who have an interest in joining a particular provider, but haven't done so. They are waiting for an agent or other person to come to them to explain how the provider works and what the benefits of joining would be.

Beyond this, a general lack of understanding of financial providers creates a lack of interest in joining the provider. None of the participants who have a bank account and keep money as savings actually have a savings account. When questioned about this, some participants were aware that dedicated savings accounts could earn them interest, but believed all the available savings accounts are restricted access accounts only, where money cannot be withdrawn, whilst others were unaware that savings accounts could earn them interest. Take Sarah for example, who said to us:

“Why should I pay high interest if I can just save and remove when I want?” (Sarah, May 2019)

Having a bank pay her interest, rather than the other way around, was not something she was aware of. Even the participants that are relatively wealthy and maintain relatively high bank balances each month are failing to take advantage of high bank interest rates due to a lack of knowledge on the subject.

6.1 **Discussion**

When considering access to finance and how to connect smallholder farmers to financial services, the aspects that attract and detract from financial providers should be considered. This chapter utilised initial interview data from the study’s financial diary methodology, and thematic analysis, to establish to major over-arching themes that impact the participants use, or non-use, of financial service providers. It was found that the top four themes that attract the participants to financial service providers are ease of access, community spirit, making money productive, and trust. Banks, M-Pesa, and chamas feature most heavily within these themes. The top four themes that were found to detract from the use of financial providers were lack of trust, lack of knowledge, lack of income, and the causing of disagreements and shame. compared to the themes that attract people to financial providers, those that detract tend to be spread more broadly across the available providers.

Whilst some of these themes are already known and discussed in the literature such as ease of access, trust, knowledge, and income, some are underrepresented in the literature, such as community spirit (social capital), making money productive, and causing disagreements and shame. In order to improve financial access, financial providers need to incorporate the positive themes into their service provision, by ensuring ease of access in terms of reducing distances to providers and making the services easy to use, fostering a sense of community, allowing money to be productive by offering accessible accounts that can earn interest and provide additional benefits, and prove themselves to be trustworthy. At the same time, they should be making information about the provider and services more accessible to the local population whilst limiting the potential for disagreements and shame.

These considerations may be beneficial to informal financial providers as well as formal providers, given their popularity, and assist in the improvement of how informal providers functions and the services they offer to their members.

Ease of access was a major attraction for participants, as shown in the results. M-Pesa and M-Shwari were among the providers most highly rated by the participants for ease of access. Designed with the remittance market in mind (Morawczynski, 2009), Safaricom advertised M-Pesa with the slogan ‘Send Money Home’, showing a city dwelling worker in suit and tie sending money to his rural grandparents (Kusimba, Yang and Chawla, 2015). Prior to the introduction of M-Pesa in 2007, the sending of remittances could be costly and risky. Previous options for sending remittances included the post office’s Post Pay system at a cost of around 75ksh for sending 1,000ksh, or by bus at a cost of around 175ksh (CGAP, 2009; Morawczynski, 2009). Not only was this expensive, but there were regular complaints of money not arriving at the final destination (*ibid*). M-Pesa on the other hand offers no fee on sums below a value of 1,000ksh, with progressively rising fees up to 105ksh on sums of 20,001ksh and above. The withdrawal fee for the recipient of 1,000ksh would be 28ksh, progressively rising to 300ksh on sums of 50,001ksh and above (Safaricom, no date). M-Pesa then is not only cheaper than previous methods of sending remittances, but it is also quicker, with money being received to the recipients’ phone almost instantly. The ability of M-Pesa to meet remittance needs has been shown to improve household welfare, especially in times of shocks, as it allows households to smooth their consumption, acting almost as a form of insurance through resource sharing (Suri, Jack and Stoker, 2012). M-Shwari entered Kenya’s financial market in 2012 as a combined savings and loans product, and was considered the next frontier in digital financial services, bringing the benefits of banking products, such as interest earning savings, deposit insurance, and access to credit, to millions of unbanked poor (Cook and Mckay, 2015). The ease and speed with which loans can be accessed through M-Shwari has previously been found have contributed to the popularity of the loans service in Kenya (*ibid*).

Another important finding in this study was that ‘community spirit’ was another leading attraction to financial providers. This community spirit represented the seeking of increasing and utilising social capital. In research using the Kenyan Financial Diary data (Zollmann, 2014), Johnson *et al.* (2017) found that people engage in financial practices which allow them to ‘cultivate social relationships through reciprocity,

mutual support and generosity’, ‘use funds to develop and uplift individuals, family and community’, ‘use funds in ways that create a sense of identity, belonging and status in the community’, and ‘learn how to carefully manage their funds which encourages them to work hard’ (p.4). Despite 30% of Kenyans who took part in the 2019 FinAccess survey being members of informal groups (chamas) (CBK, KNBS and FSD Kenya, 2019), there has been a surprising lack of research conducted looking at chamas in Kenya (Njeru, 2018).

Previous studies have found that making money productive, or money ‘working’ as it is sometimes described as in the literature (for example Cook and McKay (2015)), is something that people look for in financial providers. Essentially this is the ability for money to grow through investments. The participants of this study highly valued providers with which their money could earn interest, such as table banking. However, this is an area that was subject to much misunderstanding in terms of interest, which is discussed further below.

Trust is an important aspect of how people chose which financial providers to use. With regards to table banking loans there tends to be a mechanism in place whereby defaulting on a loan will result in group members auctioning property from the defaulters home to make up for the groups lost money, and the number of the defaulter is reported to the area chief (Mwobobia, 2016). Missed merry go round contributions tend just to lead to the non-contributing member being removed from the group. This is a particular problem should this member have already received their pay out. Whilst those due their pay out towards the end of the cycle are motivated to maintain their contributions to ensure they receive their pay out, those whose turn is closer to the beginning of the cycle do not have such a strong motivation to maintain their contributions (ibid). In this sense, this study shows that trust and the detracting factor of causing disagreements and shame, are highly linked. A study conducted by Morawczynski & Miscione (2008) found that trust between customers and mobile banking agents is poor, with customers blaming agents for stealing money, and agents finding themselves blamed for network problems, and customer misunderstandings.

A lack of income was a leading reason for people not accessing financial providers and services in this study, and was found in the 2019 FinAccess survey to be the primary reason for non-use of banks, with income related factors accounting for the

top 3 reasons for non-use and 70% of the responses (CBK, KNBS and FSD Kenya, 2019).

Lack of knowledge was found as a leading detracting factor in this study, and has been discussed in the literature not only in terms of preventing use of certain products, but also in terms of misunderstanding products which leads to people accessing products which cost them much more than they realise. This is the case for M-Shwari for example. This service states that they charge 7.5% facilitation fee per 30 day loan, which seems reasonable when considering it against the common 10-20% interest rates people pay for table banking loans for example. However, this converts to an annual APR of approximately 90% (Cook and Mckay, 2015). A lack of knowledge is impacting usage of financial providers is vitally important for financial service providers to consider. The low level of knowledge regarding how financial providers work, what services are provided, how the providers operate and what the terms and conditions might be, has a significant impact on provider use. The 2019 FinAccess survey (CBK, KNBS and FSD Kenya, 2019) found that the majority of their substantial sample population, 38% of people, did not have a source of financial advice, closely followed by 31% who got advice from friends and family. Locally appropriate modes of information sharing, and advertisement sound be utilised to encourage people to join financial providers.

CHAPTER VII: INTENSIFYING LIVESTOCK PRODUCTION: HOW SMALLHOLDER FARMERS ATTEMPT TO INTENSIFY

7.1 Introduction

The need and desire to intensify livestock production is two-fold: to use livestock intensification as a way to improve the livelihoods of smallholder farmers, whilst at the same time meeting the growing demand for livestock products.

This chapter explores the ways in which the participants go about this process: the types and breeds of livestock that are owned, how they keep their livestock, the inputs purchased, and the outputs and outcomes achieved. This allows for consideration of how the participants invested in inputs for their livestock production, including looking at the financial value of these investments, and allows for an understanding of what attempting to intensify livestock production looks like in Busia. The chapter outlines what these efforts were able to achieve in terms of outputs for the participants, considering the economic, social, and nutritional gains, if any, that were achieved. Finally, this chapter explores whether livestock production was financially beneficial for the participants, and some of the factors that impacted this.

In order to increase the productivity of livestock production and increase incomes, the primary benefit the participants were aiming to achieve, inputs are required. The primary inputs the participants invested in were the acquisition of additional livestock, feed, shelter, labour, and veterinary services. In this study family labour was not quantified in terms of the number of hours spent by each member of the homestead on various tasks.

The purpose of this chapter, therefore, is to enhance the existing literature by taking a deeper look at not only what inputs were purchased, and the outputs that were gained, but also consider this in monetary terms. The cost of inputs and financial gains resulting from outputs are rarely considered in such detail within the literature.

7.2 Background

A range of determinants, outcomes, and barriers have been found to influence the intensification of smallholder livestock production around the world, and the

intensification of different livestock have been found to have varying impacts on household incomes. The increased use of inputs and services, such as improved feed and breeds, as well as veterinary services, are required to achieve livestock intensification (La Rovere, Hiernaux and van Keulen, 2001; Birthal and Rao, 2004; Udo *et al.*, 2011; Didanna and Wossen, 2018), as well as an enabling institutional and policy environment (Aune and Bationo, 2008; FAO, 2009a; Mcdermott *et al.*, 2010; Schut *et al.*, 2016). Factors such as age, gender, experience, education, access to trainings and extension services, access to suitable financial products, and membership to social network groups have all been found to influence the adoption of these inputs (Bebbington, 1997; Baltenweck *et al.*, 2003; Aune and Bationo, 2008; Birhanu, Girma and Puskur, 2017; Salmon *et al.*, 2018; Duguma and Debsu, 2019).

Enabling smallholder farmers to maximise production and intensify is a complex task, requiring efforts from various sectors to provide the environment in which these farms can thrive. Intensification of livestock production then has the potential to result in a range of outcomes from improved nutrition, through the increased availability of livestock as a food source at the home, increased income allowing for the purchase of a greater number of foods from outside the home (Chagunda, Mwangwela and Mumba, 2016; Micere *et al.*, 2016), improved soil through sustainable manure management (IAEA, 2008; Malomo, Madugu and Bolu, 2018), increased yields to be used for either the farmers own food or for sale (Rincker *et al.*, 2011; Udo *et al.*, 2011; Kindu *et al.*, 2014; Gonzalez-mejia *et al.*, 2018), improved human and animal health through increased knowledge, veterinary service use, human and animal nutrition, and increased incomes (Keyserlingk *et al.*, 2009; Gustafson *et al.*, 2015; Thumbi *et al.*, 2015).

7.3 Inputs in Livestock Production

How participants spend money on their livestock production sheds lights on the process of livestock intensification in Busia County. Table 38 shows the sum spending by all participants over the study period. It can be seen that the largest category of spending comes from the purchase of livestock, with a total of 270,300ksh spent during the study. This comes primarily from the purchase of grade chickens, followed by local dairy cattle. The second largest source of expenditure comes from feed, with a total of 148,302ksh spent during the study. The largest individual source of expenditure within

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this category is in feed purchased for dairy cattle-general (defined as feed purchased that is fed to all dairy cattle where a combination of local/crossbreed and/or grade are owned and fed together or fed the same feed). The second largest source of expenditure in this category is in the purchase of feed for grade chickens, at 31,900ksh.

Together, livestock purchase and feed expenditure account for 71.5% of all livestock expenditure among the participants. Other sources of expenditure include that within the categories of staff costs, the building and repairing of shelters, veterinary costs, and miscellaneous costs.

How livestock farmers invest in their livestock production can be further broken down by the participant clusters, as can be seen in Table 39. The largest source of expenditure for cluster 1 (subsistence farmers) and cluster 2 (medium commercialisation with low livestock income) is the purchase of livestock, accounting for 45.2% and 57.9% of total livestock expenditure respectively. For cluster 3 (high commercialisation with medium livestock income) and outlier cluster 4 (high commercialisation with high livestock income), the largest source of livestock expenditure is livestock feed, accounting for 58.2% and 45.1% of total livestock expenditure respectively.

Where clusters 1 and 2 differ, despite spending similar sums on the purchase of livestock, is where they focus the remaining expenditure. The second largest source of expenditure for cluster 1 is the building of animal shelters at 17.6%, whilst the third largest source is the payment of livestock staffing. Cluster 2 on the other hand focus larger sums on feed at 21.3% of total livestock expenditure, and veterinary costs at 14.7%. Where clusters 3 and 4 both spend the most on livestock feed, they too differ in their remaining spending. For cluster 3 the second largest source of expenditure comes from veterinary costs, whilst this is a very small source of expenditure for cluster 4, who's second largest source of expenditure is the purchase of livestock.

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Table 38: Sum Participant Livestock Expenditure Sources

<u>Expenditure Source</u>	Sum Value (Ksh)
<u>Staff</u>	
Full time	7,500
Part time/occasional	10,000
Total	17,500
<u>Feed</u>	
Salt lick	12,180
Dairy Cattle- general	48,650
Dairy cattle- grade	24,370
Pigs	2,100
Chickens- local/crossbreed	4,370
Chickens- grade	31,900
Other livestock	1,400
Feed supplements	12,190
Animal feeders	11,142
Total	148,302
<u>Shelter</u>	
Building materials- new shelter- dairy cattle (all)	7,000
Building materials- repair/expand/improve- dairy cattle (all)	1,100
Building materials- new shelter- goats (local)	2,400
Building materials- new shelter- chicken (grade)	37,500
Building materials- new shelter- chicken (local)	2,000
Building new shelter- Labour	20,200
Repair/expand/improve shelter- Labour	200
Total	70,400
<u>Veterinary Costs</u>	
Vet fees- Dairy cattle (general)	8,300
Vet fees- Dairy cattle (grade)	2,300
Vet fees- Dairy cattle (crossbreed)	700
Vet fees- Dairy cattle (local)	1,500
Vet fees- Pigs	400
Vet fees- Sheep	600
Vet fees- combination	800
Artificial Insemination- Dairy cattle (local)	2,000
Artificial Insemination- Dairy cattle (grade)	8,000
Rental of Bull for breeding	1,400
Deworming- Dairy cattle (general)	4,580
Deworming- Dairy cattle (grade)	600
Deworming- Dairy cattle (crossbreed)	50

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Deworming- Pigs	250
Deworming- Sheep	200
Deworming- combination	990
Vaccinations- Chicken (local)	1,100
Tick spray- Dairy cattle (general)	5,260
Tick spray- Dairy cattle (grade)	740
Tick spray- goats (local)	80
Tick spray- combination	5,550
Other animal medicines	9,860
Other veterinary treatment	4,300
Total	59,560
Livestock Purchase	
Dairy cattle (grade)	30,000
Dairy cattle (local)	41,000
Pig	5,500
Goat (local)	4,500
Sheep	6,000
Chicken (grade)	160,000
Chicken (local)	17,800
Other livestock	500
Transport	5,000
Total	270,300
Other	
Milking salve	720
Ropes	9,355
Transport- boda boda	1,200
Fundi	800
Other	7,050
Total	19,125
<u>TOTAL SUM LIVESTOCK EXPENDITURE</u>	585,187

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Table 39: Mean Livestock Expenditure Sources by Cluster

	Cluster			
	1	2	3	4
<u>Staff</u>				
Full time	625	-	1,000	-
Part time/occasional	2,500	-	-	-
Total	3,125	0	1,000	0
Percentage of total livestock expenditure	11.1%	0.0%	5.2%	0.0%
<u>Feed</u>				
Salt lick	162.5	522	1,784	-
Dairy Cattle- general	1,000	430	6,860	8,200
Dairy cattle- grade	375	-	1,534	15,200
Pigs	250	2,200	-	-
Chickens- local/crossbreed	565	620	980	106,090
Chickens- grade	-	-	-	31,900
Other livestock	350	-	-	-
Feed supplements	-	16	120	11,510
Animal feeders	-	60	-	10,842
Total	2,703	3,848	11,278	183,742
Percentage of total livestock expenditure	9.6%	21.3%	58.2%	45.1%
<u>Shelter</u>				
Building materials- new shelter- dairy cattle (all)	1,750	-	-	-
Building materials- repair/expand/improve- dairy cattle (all)	-	80	140	-
Building materials- new shelter- goats (local)	-	-	-	2,400
Building materials- new shelter- chicken (grade)	-	-	-	37,500
Building materials- new shelter- chicken (local)	500	-	-	-
Building new shelter- Labour	2,675	-	-	9,500
Repair/expand/improve shelter- Labour	-	-	40	-
Total	4,925	80	180	49,400
Percentage of total livestock expenditure	17.6%	0.4%	0.9%	12.1%
<u>Veterinary Costs</u>				
Vet fees- Dairy cattle (general)	975	380	500	-
Vet fees- Dairy cattle (grade)	-	60	400	-
Vet fees- Dairy cattle (crossbreed)	-	-	140	-
Vet fees- Dairy cattle (local)	-	300	-	-
Vet fees- Pigs	100	-	-	-
Vet fees- Sheep	-	120	-	-
Vet fees- combination	-	160	-	-
Artificial Insemination- Dairy cattle (local)	-	-	400	-
Artificial Insemination- Dairy cattle (grade)	-	-	1,600	-
Rental of Bull for breeding	-	-	280	-
Deworming- Dairy cattle (general)	50	496	380	-

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Deworming- Dairy cattle (grade)	137.5	-	10	-
Deworming- Dairy cattle (crossbreed)	-	-	10	-
Deworming- Pigs	50	10	-	-
Deworming- Sheep	50	-	-	-
Deworming- combination	62.5	148	-	-
Vaccinations- Chicken (local)	162.5	90	-	-
Tick spray- Dairy cattle (general)	335	118	666	-
Tick spray- Dairy cattle (grade)	87.5	30	48	-
Tick spray- goats (local)	20	-	-	-
Tick spray- combination	565	354	304	-
Other animal medicines	355	290	1,114	1,420
Other veterinary treatment	750	100	160	-
Total	3,700	2,656	6,012	1,420
Percentage of total livestock expenditure	13.2%	14.7%	31.0%	0.3%
Livestock Purchase				
Dairy cattle (grade)	-	6,000	-	-
Dairy cattle (local)	10,250	-	-	-
Pig	750	500	-	-
Goat (local)	1,125	-	-	-
Sheep	-	1,200	-	-
Chicken (grade)	-	-	-	160,000
Chicken (local)	550	2,640	480	-
Other livestock	-	100	-	-
Transport	-	-	-	5,000
Total	12,675	10,440	480	165,000
Percentage of total livestock expenditure	45.2%	57.9%	2.5%	40.5%
Other				
Milking salve	-	-	144	-
Ropes	932.5	617	288	1,100
Transport- boda boda	-	240	-	-
Fundi	-	160	-	-
Other	-	-	10	7000
Total	932.5	1017	442	8,100
Percentage of total livestock expenditure	3.3%	5.6%	2.3%	2.0%
<u>TOTAL MEAN LIVESTOCK EXPENDITURE</u>	28,060	18,041	19,392	407,662

When considering the different approaches to livestock production taken by the clusters, participants in cluster 1 primarily differ in that these are currently subsistence livestock producers, and cluster 4 differ as it contains only one participant, Daisy, who is a significant outlier among the participants, who has a higher income level and involvement with a commercial chicken production company. The most interesting

difference between the clusters is that between clusters 2 and 3. These two clusters have a fairly similar income level (180,805ksh and 225,920ksh respectively), but very different levels of commercialisation (58.7% and 90.6% respectively). Cluster 2 spend on average significantly more on the purchase of livestock than cluster 3, who instead spend significantly more on livestock feed. Cluster 3 spent very little on the purchase of new livestock (mean 480ksh), and whilst cluster 2 did spend a mean 21.3% of their livestock expenditure on food, the majority of this was spent on feeding pigs, whereas cluster 3 spent the majority of their feed spending on feed for dairy cattle.

The way the participants invest, and why, can be understood further by look at the categories of expenditure and how the participants engage with them.

7.3.1 Livestock Acquisition

Daisy was the only participant to own grade chickens during the study, all of which she purchased from Usomi. In total Daisy purchased over 3,000 grade chickens. All participants, including Daisy, owned local chickens. A total of 74 local chickens were purchased during the study period, with most of these purchases being made from the local markets. 10 homesteads purchased between 1-18 chickens during their times in the study. These chickens were purchased for between 400ksh-800ksh each. More frequently local chickens were hatched at the homestead, with 517 chickens acquired in this way. 14 participants had between 5-110 chicks hatch at the homestead during their varying times in the study. However, something that was noticed very early on was that none of the participants, irrelevant of whether they were men or women, or their spouses where they were asked, were consistently accurate in reporting the number of chicks hatching at their homesteads. It was not something the participants were monitoring and recording.

In terms of cattle, only Geoffrey acquired mature grade cattle during the study period. He purchased the cow from a nearby farmer at his homestead for 30,000ksh (\$270.60/£201.35) to increase his herd and earnings potential from milk sales. Alice purchased a local dairy cow for 15,000ksh (\$135.30/£100.67), and Moses purchased two local dairy cattle, one for 11,000ksh (\$99.22/£73.83), and one for 15,000ksh. Relative to their incomes, purchasing cattle costs the participants a much larger proportion of their average monthly incomes. Geoffrey's average monthly income was 13,347ksh (\$120/£90) during the study period, making his purchase of a grade dairy

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cow a significant investment. For many participants, spending this amount is not possible. Alice was in the process of trying to increase her herd size significantly during the study, something her son was encouraging her to do, as well as providing her with financial assistance to achieve this, as a kind of retirement business. In some cases, participants were given cattle from outside the homestead. This was either when a bull was borrowed from a friend to mate with a dairy cow, in which case the participant kept and fed the cow whilst it stayed at the homestead, or on occasion when a friend or family member could no longer care for the cow themselves and asked the participant to take over its care for a while. Dan is an example of someone being given a local cow when his elderly mother had a period of ill health and struggled to maintain her dairy cow. Dan bought it onto his homestead to care for it for her. Most frequently again cattle were born at the homesteads. In total 22 calves were born during the study period: 9 grade calves, 5 crossbreed calves, and 8 local calves, between 11 participants. For most this was achieved with through renting or borrowing bulls, or using artificial insemination services. These births occurred evenly through the study period between January and November 2019.

In the case of goats, most frequently they were purchased. 5 local goats for meat were purchased during the study period, as was 1 crossbreed goat for meat. Goats are more expensive than chickens to purchase, but less expensive than cows, with these goats purchased for between 2000-2500ksh (\$18-\$22.48/£13.44-£16.80) each, all from local markets. Dairy goats on the other hand were solely born. Only one participant kept dairy goats during the study, with Henry beginning the study owning 12 Toggenburg goats. He owned males and females, and bred these goats at the homestead, with 4 Toggenburg kids born during the study.

Sheep were also more likely to be born at the homesteads, with 4 sheep born during the study, to Dan, Alice, and Geoffrey, whereas 2 were purchased, again from local markets. Both of these sheep were purchased by Sarah, who wanted sheep as they are low effort livestock which when bred can provide her with additional income. She purchased each of the sheep for 3000ksh (\$26.94/£20.25).

Two participants, Sarah and Emmanuel purchased 2 and 4 pigs each respectively during the study. Another low effort livestock, a perceived benefit of owning pigs was that though their investment requirements in term of inputs is low, they give birth to

relatively large litters of piglets, thus offering higher financial returns. This is evidenced by the 2 participants whose pigs did give birth during the study, Geoffrey and Henry, with each gaining 8 and 9 piglets respectively. Being purchased for just 1500-2000ksh (\$13.47-\$17.96/£10.08-£13.44), and a sale price for piglets of around 1000ksh (\$8.98/£6.72), the potential gains from each litter are relatively high, as was explained to us by Geoffrey when his pig gave birth.

Other less frequently owned livestock were turkeys, ducks, geese, and rabbits. Only Thelma owned turkeys. She purchased 3 during the study, and had a total of 10 hatch at the homestead. She had purchased them due to their size, and considered them a good investment because they would command a higher selling price than chickens. She did however mistake her turkeys for ducks when she first purchased them. Later into the study she did eventually purchase ducks, as did Anita, whilst Emmanuel had ducks at the start of the study. The participants ducks were unproductive during the study period, in that they were neither eaten nor sold. They were not primary concerns for those who owned them, rather they were just another livestock which could be sold in times of need. There were no births or purchases of geese during the study. Daisy explained that the primary role of her geese for was for security. Geese can be aggressive and loud, and thus were deemed suitable as a guard animal. One participant, Alice, also owned rabbits, and had 3 born during the study. She owned these for consumption, but did not eat any during the study period.

7.3.2 *Shelters*

Zero-grazing shelters for the various forms of livestock owned by the participants was relatively uncommon, and was a feeding strategy primarily reserved for grade dairy cattle. Keeping livestock in shelters at night though was most common for all forms of livestock, to reduce the chances of livestock being attacked by animals in the night, and to reduce the likelihood of theft [informal conversations, 2019]. The vast majority of all livestock were allowed to graze either on or outside of the homestead during the day, with feed and water provided throughout the day in some cases, but this is generally preferred to allow the animals to graze and supplement their own feeding during the day.

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There was a vast scale in the quality of these shelters. Some participants had fairly well built shelters for zero-grazing cattle. Examples of this are Dan and Henry's shelters as can be seen in Figure 60, Figure 61, Figure 62, and Figure 63. These shelters were generally very clean and tidy, with significant attention paid to maintaining a hygienic and comfortable home for the livestock. Another example of this is Daisy's shelter for her intensive chicken production, which again involved zero-grazing, as can be seen in Figure 65.

Others appear to have built their shelters with lower budgets, and this was generally the case for those with local or lesser value livestock. Again, an example of this is Henry. The well-built and planned shelters at his homestead house only grade animals (one shelter for grade cattle and another for grade goats). Instead, local cattle and goats shared a more basic, less clean, and less spacious shelter together, and these animals were only housed at night, whilst being loose on the compound during the day (see Figure 64). This suggests that even when the resources and knowledge is available, farmers may not wish to invest as much money and time into their local livestock.

Figure 60: Grade Dairy Cattle Shelter- Henry



Figure 61: Grade Dairy Cattle Shelter- Henry



Figure 62: Grade Dairy Cattle Shelter- Dan

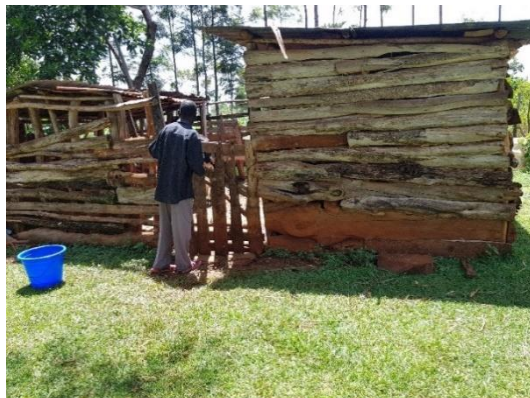


Figure 63: Grade Dairy Cattle Shelter- Dan



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Figure 65: Grade Chicken Shelter- Daisy



Figure 64: Local Cattle Shelter- Henry



For some participants though, the quality of the shelters was determined predominantly by the lesser amount of money they had available at the time to invest in a shelter. Not having enough money was an often used reason amongst those participants who had lower quality shelters, or no shelters at all, for their livestock [informal conversations, 2019-2020]. An example of this comes from Thelma, who decided to build a single pen for her various chickens, turkeys, and ducks during the study period. This decision came only after a neighbour had drunkenly attacked one of her turkeys, breaking its leg. So not to waste the animal she chose to slaughter the turkey and feed it to her family. She built a rudimentary run for the remaining birds, as seen in Figure 66 (being used during the day to dry grain so that wandering livestock cannot eat it), which cost her a total of 11,200ksh (\$100.49/£74.86). This consisted of 2000ksh (\$17.95/£13.38) for materials, and 9,200ksh (\$82.55/£61.52) in labour costs to a local fundi. Daisy also had a new chicken shelter built during the study for her chickens. Using materials she already had at the homestead, her labour cost for the shelter was 9,000ksh (\$80.78/£60.24).

Figure 66: Local Chicken Run- Thelma



7.3.3 Feed

Most livestock feed used by the participants is derived from their own shambas. Cattle is predominantly fed napier grass which is usually harvested daily. Most had several acres of land on which they planted napier to meet the needs of their cattle. This is very labour intensive for the participants, with additional labour rarely hired for assisting with napier grass, unlike food crops (see Table 40 for combined costs associated with planting, weeding, and harvesting). Most participants harvest the napier themselves in the morning. A few participants even sold napier in half acres, with neighbours purchasing the napier and harvesting it themselves when needed.

It is generally recommended that around 70kg of napier grass should be fed to a dairy cow per day (KARLO, no date; Kabirizi *et al.*, 2015), however the majority of participants consistently fail to reach this level. Table 41 shows the participants own estimates of their napier production per month. Usually measured in wheelbarrows, as this is what they use to transport the freshly cut napier to the cattle. Occasionally the participants used the measurements of sacks, or kilogram estimates. Instead, most allow their cattle to graze either tethered on the compound or herded in the nearby area during the day.

Three participants, Dan, Roy, and Henry, also feed *Brachiaria* grass to their cattle. Dan grew very little Napier during the study. He harvested Napier in November, having planted the crop 6 weeks earlier to supplement the *Brachiaria* he usually fed to his cattle (see Table 42 for *Brachiaria* harvested during the study). His choice to plant a relatively small area of Napier was purely a test [informal conversation, 2019].

Table 40: Cost of Hired Labour for Napier (Ksh)

Participant	Month									
	May	June	July	August	September	October	November	December	January	February
Sarah	0	0	0	0	1,100	0	0	0	0	0
Dan	0	0	0	0	0	0	0	0	0	0
Roy	0	0	2,000	200	400	0	80	100	0	0
Alice	0	0	0	0	0	-	-	-	-	-
Benjamin	0	0	0	0	0	0	0	0	0	0
Daisy	0	0	0	0	0	0	0	0	0	0
Emmanuel	0	0	0	0	0	0	0	0	0	0
Gabriel	0	0	0	0	200	0	100	100	100	0
Geoffrey	0	0	0	0	0	0	0	0	0	0
Henry	0	0	0	0	0	0	0	0	0	600
Anita	0	0	0	0	0	0	0	0	0	0
Moses	0	0	0	500	0	0	0	0	1,000	0

He had sold a grade dairy cow at the end of October as it was not producing any milk though he expected it to be, and purchased a new dairy cow the next day. He had

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planted the Napier to see if it would have any effect on milk production, but did not continue with this venture. He was once involved with a research group that worked in Busia spreading knowledge of Brachiaria and giving out seed, where he learnt about other crops which can be fed to cattle to increase yields. As a result, and whilst feeding predominantly Brachiaria to his cattle, he also grows Desmodium and Calliandra to supplement feed (see Table 43 and Table 44), both of which can increase milk yields (Kaitho and Kariuki, 1998; Mwangi and Wambugu, 2003). Dan and a group of his neighbours have a joint venture when it comes to Brachiaria. Whilst the land is owned by Dan, the group of farmers split the labour required for planting, weeding, and harvesting, and as a result are able to plant swathes of land with Brachiaria (see Figure 67), sharing the responsibilities.

Figure 67: Dan's Brachiaria Fields



Henry on the other hand was the only participant to use YouTube to learn more about dairy farming and how to improve his practices, which is where he learned about the benefits of feeding his cattle Brachiaria. YouTube is available on smartphones using purchased data, or is available as a bundle subscription for as little as 10ksh per day for a package which includes farming videos, news clips, and educational videos. From YouTube he also learnt about and built his own hydroponics shed (see Figure 69 and Figure 68).

Figure 69: Henry's Hydroponics Shed



Figure 68: Henry's Hydroponics When in Use



Table 41: Quantities of Napier Grass Harvested

Participant	Month																									
	July			August			September			October			November			December			January			February				
	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack		
Sarah	0	0	0	19	0	0	0	31	0	0	0	31	0	0	0	0	30	0	0	0	0	0	0	0	0	
Dan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	99	0	0	0	0	0	0	0	0	
Roy	714	0	0	336	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	260	0	0	400	
Alice	0	0	16	0	0	31	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Benjamin	0	0	0	0	0	0	630	0	0	100	0	27	0	0	0	0	0	0	0	0	0	45	330	0	15	60
Emmanuel	0	22	0	0	0	0	0	34	0	0	0	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gabriel	0	0	0	0	0	0	0	21	0	0	0	31	0	0	0	0	34	0	0	0	0	0	0	31	0	3
Geoffrey	1620	0	0	0	0	0	81	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Henry	0	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anita	0	54	0	62	0	0	0	130	0	0	0	66	0	0	0	0	110	0	0	0	0	0	0	62	0	6
Moses	0	0	0	540	0	0	1120	0	0	300	0	0	0	0	0	540	0	0	0	0	0	600	0	295	0	23

Table 42: Brachiaria Production During the Study

Participant	Month																								
	July			August			September			October			November			December			January			February			
	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	
Dan	73	0	0	88	0	0	90	0	0	146	0	0	131	0	0	2038	0	0	3000	0	0	1100	0	0	0
Roy	51	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Henry	0	56	0	0	60	0	0	112	0	0	38	0	48	0	0	62	0	0	0	60	0	0	20	0	0

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Table 44: Desmodium Production During the Study

Participant	Month																										
	July		August		September		October		November		December		January		February												
	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow										
Dan	20	-	-	5	-	-	9	-	-	44	-	-	33	-	-	170	-	-	200	-	-	80	-	-	-	-	-

Table 43: Calliandra Production During the Study

Participant	Month																											
	July		August		September		October		November		December		January		February													
	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow	Sack	Kg	Wheel-barrow											
Dan	9	-	-	0	-	-	8	-	-	20	-	-	20	-	-	10	-	-	0	-	-	0	-	-	-	-	-	-

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However, he stated that now he has grade dairy cattle, they do not respond as well to the shoots he was growing as they are lower yielding by nature than his previous mixed-breed cattle [informal conversation, 2019]. Most often the participants get their knowledge on farming from friends and family, since there is not much of a presence of extension officers or other channels of information [informal conversations, 2019-2020].

Participants purchased Dairy Meal for their dairy cattle during the study, the most commonly purchased additional feed (see Table 45). Only those with grade cattle purchased this, although it was often fed to all cattle owned, including crossbreeds and local cattle. Those only owning crossbreeds and local cattle did not supplement the feed. Dairy cattle tended to command the most investment from the participants in terms of purchase of feed, except for Daisy, who spent a significant amount of money on feed for her intensive chicken production. She purchased the feed directly from Usomi. Seven participants did purchase Chicken Mash for their chickens, to help with growth. This tended to be purchased sporadically from a local Agrovet. It was fed to all chickens of all ages, spread around the ground. No participant ever purchased feed for goats or sheep, which were grazed on the compound or tethered nearby, and fed offcuts from harvested crops. Two participants purchased feed for pigs, though this was infrequent as all participants pigs were predominantly fed on scraps. The prices spent on other animal feed during the study by the participants is seen in Table 46.

Table 45: Cost of Purchased Feed for Dairy Cattle (Ksh)

Participant	Napier	Dairy Meal	Hay	Maize Jam	Mollases	Maize Brand	Ultra Mix
Dan	0	450	0	0	0	0	0
Roy	1,000	700	0	0	0	0	0
Alice	1,500	0	0	0	0	0	0
Benjamin	0	11,800	0	0	0	0	0
Daisy	12,800	21,640	6,000	0	2,000	0	0
Kevin	2,000	2,000	0	0	0	0	0
Gabriel	0	450	0	0	0	1,270	350
Geoffrey	2,500	500	0	0	0	0	0
Henry	0	17,300	0	2,000	1,650	0	0

Table 46: Cost of Feed for Other Livestock (Ksh)

Participant	Chicken	Sheep	Goats	Pigs	Ducks
Sarah	2,240	0	0	400	0
Thelma	700	0	0	0	1,400
Alice	740	0	0	0	0
Benjamin	1,200	0	0	0	0
Daisy	132,490	0	0	0	0
Kevin	500	0	0	1,000	0
Geoffrey	3,650	0	0	0	0
Anita	0	0	0	0	0

7.3.4 *Veterinary Services and Store Bought Treatments*

Veterinary treatment was generally unpopular among the participants, because of the relatively high perceived costs associated with their services. Most frequently participants would manage any routine medication, such as deworming and tick spray, themselves (something that does not require a vet), and even purchase medications for their livestock to treat illness themselves.

Very infrequently were livestock vaccinated, with only two participants having their local chickens vaccinated. These were administered by a local vet, though neither participant was aware what the vaccinations were for. We deduced it was likely for Newcastle disease, but both participants informed us that the vet did not tell them what the vaccines were for, and they did not ask. Often the participants would not use a qualified vet. These were said to be difficult to access due to there not being many available, being more expensive, and not always being necessary. Instead ‘vets’ were often local people, other farmers, who had a good knowledge of livestock health. The cost of this was low, with one participant paying 450ksh (\$4.04/£3.04), and the other 650ksh (\$5.83/£4.38), which roughly equates to the market value of one local chicken. No other livestock were vaccinated during the study period, despite high cases of disease that lead to death. Dairy cattle were the livestock most likely to receive veterinary treatment, with six participants getting dairy cattle veterinary checks/treatment during the study. This included checks and/or treatments for mastitis (500ksh/\$4.87/£3.78), a new-born calf who was not suckling (1,400ksh/\$12.56/£9.44), and treatment of a skin infection (300ksh/\$2.92/£2.37). Despite the concerns

participants often had regarding the cost of their vets, when veterinary assistance was needed, the cost was generally fairly low, and affordable to the participants. Vets often allow payments to be made in instalments in a payment plan made at the time of treatment.

Most frequently for their livestock's veterinary needs, participants would go to their local Agrovets to purchase medications themselves. Deworming and tick spraying of livestock was often well managed, occurring frequently by most participants. The largest source of veterinary costs the participants had overall were from the purchase of medications, often antibiotics for self-diagnosed ailments. However, this can be problematic for farmers with literacy difficulties. One participant once told of how his chickens had the flu (likely a catch all term used for when chickens became sick as we heard this often), so he went to Agrovets to buy antibiotics, later being informed by a friend that what he had purchased was in fact vitamins [informal conversation, 2019].

Two participants, Benjamin and Henry, paid for artificial insemination (AI) of their dairy cows during the study. Both of these were for grade dairy cattle, but cost significantly different prices. Benjamin paid just 2,000ksh for the AI services, whereas Henry paid 6,500ksh. Concerns were raised by several participants during the study regarding those providing AI services. There was a consensus among those who have previously used AI that not all those providing the service are legitimate, with many conmen around. Dan told of how, many years ago, he had used AI for one of his grade dairy cows, but that the following day the cow had died. He had a veterinary officer come to inspect the dead cow, where it was found that the AI provider had pierced through the cow's internal organs, causing damage which caused the death of the cow. Others told of frustrations with AI services as after paying for multiple rounds their cows had previously failed to become pregnant.

7.4 Outputs and Outcomes

Livestock are owned by the participants primarily with the intention of using them as a money making activity. They also act as an asset which can be easily liquidated, which can be sold at times of need, acting as a form of savings. However, during the study we found clear issues with this, in that few participants made significant income from their livestock. For many participants, livestock was an expensive endeavour

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from which they failed to reap significant benefits. The outputs and outcomes of livestock production appear to be highly correlated to education and off-farm income levels among the participants, with those with external sources of knowledge beyond friends and family, and those with more significant external incomes, more able to invest in their production in ways which are more likely to improve their production.

What the participants do with the livestock and their products is shown in Table 47. Livestock and livestock product sales constitute the majority of what the participants do with their livestock production. Sales, giving away to friends and family, and consumption all provide the participants with some kind of benefit, whether it be income, strengthening of social connections, or nutrition. However, theft of livestock, and death through illness and accidents, do not provide any benefits, instead representing lost assets and wasted investments. Local chickens are particularly prone to theft and death. They are also the most commonly consumed livestock, and the most given away. The sale and consumption of milk is another clearly important livelihood strategy for the participants as a whole.

To understand more how the participants benefit from their livestock production, these figures can be looked at a cluster level. Table 48 shows the mean Kenya shilling value earned from livestock sales by the clusters. Unsurprisingly, cluster 1 (subsistence farmers) made very little from their production. Selling livestock is not within the aims of this kind of production, with sales only occurring when necessary. Cluster 4, with the relatively large scale commercial chicken production, involving the purchase of day old chicks which are raised to adulthood and sold back to the company, obviously makes a significant income from this. Clusters 2 and 3 did make a valuable income from the sale of live animals. The largest mean income source here for both clusters comes from the sale of grade dairy cattle. The sale of crossbreed and local dairy cattle, and of bulls also contribute to income, together making the cattle herd the most valuable in terms of live animal sales. The point perhaps of the most interest, is the lack of chicken sales among the clusters.

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Table 47: Sum Livestock Outputs and Outcomes for All Participants

Livestock	Number (head of cattle/litres/individual pieces)
Sold	
Dairy Cattle (grade)	4
Dairy Cattle (local)	2
Bull (grade)	1
Bull (local)	3
Calf (grade)	4
Calf (crossbreed)	1
Calf (local)	2
Goat (grade)	2
Goat (local)	7
Sheep (local)	3
Pig	19
Chicken- Mixed use (grade)	1,586
Chicken- Mixed use (local)	21
Milk	5,181 litres
Eggs	7,152
Given Away	
Dairy Cattle (grade)	1
Dairy Cattle (local)	2
Bull (crossbreed)	1
Bull (local)	3
Goat (local)	1
Sheep (local)	1
Chicken- Mixed use (grade)	5
Chicken- Mixed use (local)	14
Duck	5
Stolen	
Chicken- Mixed use (grade)	70
Chicken- Mixed use (local)	10
Eaten by the Homestead	
Bull (local)	1
Sheep (local)	2
Chicken- Layers (grade)	3
Chicken- Mixed use (grade)	18
Chicken- Mixed use (local)	99
Duck	1
Geese	2
Milk	2,363 litres
Eggs	57
Died- Illness	
Dairy Cattle (grade)	1
Dairy Cattle (local)	1
Calf (local)	3
Goat (local)	2
Pig	2
Chicken- Layers (grade)	5
Chicken- Mixed use (grade)	126
Chicken- Mixed use (local)	273
Turkey	10
Died- Accident	
Calf (grade)	2
Calf (local)	1

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Goat (local)	2
Sheep (local)	2
Chicken- Mixed use (grade)	37
Chicken- Mixed use (local)	139
Turkey	1
Duck	2
Rabbit	3
Combination sold and eaten	
Milk	23 litres

Table 48: Mean Income Earned Through Livestock Sales by Cluster (Ksh)

Livestock	Cluster			
	1	2	3	4
Dairy Cattle (grade)	-	13,600	20,000	-
Dairy Cattle (crossbreed)	-	5,800	-	-
Dairy Cattle (local)	-	-	2,600	-
Bull (grade)	-	-	5,400	-
Bull (local)	-	-	2,000	-
Pig	1,000	900	4,640	-
Goat (grade)	-	-	3,000	-
Goat (local)	-	1,200	1,500	-
Sheep (local)	-	1,480	-	-
Chicken (grade)	-	-	-	255,700
Chicken (crossbreed)	-	-	-	8,700
Chicken (local)	-	460	-	-
Total	1,000	23,440	39,140	264,400

Another benefit the participants of this study derive from their livestock production is consumption at the homestead, as seen in Table 49. On average, very few livestock are eaten by the homesteads. Cluster 4 consume the most livestock, particularly chickens, but also high value livestock, a grade bull. Cluster 2 consume the most of their own livestock of the remaining clusters, consuming on average almost one chicken per month of the study.

Where there is significant activity in the terms of outputs and outcomes of livestock production, is in the death of livestock. This is particularly true of chickens. The numbers of chicken which died during the study far outweighed the number sold, consumed, or given away. In total the group of participants had 412 chicken deaths during the study, 273 due to illness, and 139 due to accidental death (see Figure 70). It was rare to see young chickens older than a couple of weeks old during the data collection, but very common to see adult chickens with young chicks. This could be

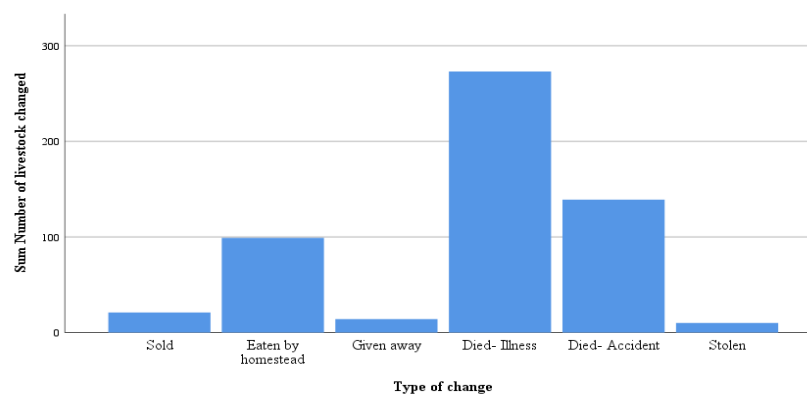
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considered a significant missed opportunity for the participants in a commercial sense. With relatively few chickens being sold, and a common lower end sale value of around 400ksh per chicken, it can be estimated that the participants lost an asset value of 230,400ksh between them during the study, ranging from 0ksh to 65,200ksh, representing a significant proportion of many participants average monthly income.

Table 49: Mean Livestock Consumed at the Homestead by Cluster

Livestock	Cluster			
	1	2	3	4
Bull- Local	-	-	-	1
Sheep- Local	-	0.4	-	-
Chicken- Layers (grade)	-	-	-	3
Chicken- Mixed use (grade)	-	-	-	18
Chicken- Mixed use (local)	3.5	9.6	4	16
Duck	-	0.2	-	-
Geese	-	-	-	2

Figure 70: Cause of Decrease in Local Chicken Population



As seen in Table 50 and Table 51, all clusters suffered livestock deaths as a result of both illness and accidents. Clusters 1 and 3 experienced the death of livestock due to illness across a wide range of livestock, including high value livestock, cattle, and livestock that offer high profit potential, calves born at the homestead. Cluster 1 also experiences significant livestock death due to accidents, together representing high mortality rates among this cluster. Whereas cluster 3 have high mortality rates due to illness, they have low mortality rates due to accidents. The opposite is true of cluster 2, who suffer less from livestock dying from accidents, and more from deaths due to illness.

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Table 50: Mean Livestock that Died from Illness by Cluster

Livestock	Cluster			
	1	2	3	4
Dairy Cattle (grade)	-	-	0.2	-
Dairy Cattle (local)	0.25	-	-	-
Calf (local)	0.5	-	0.2	-
Goat (local)	0.25	-	0.2	-
Pig	-	0.2	0.2	-
Chicken- Layers (grade)	-	-	-	5
Chicken- Mixed use (local)	4.25	38.6	12.6	-
Turkey	2.5	-	-	-

Table 51: Mean Livestock that Died from Accidents by Cluster

Livestock	Cluster			
	1	2	3	4
Calf- Grade	-	0.2	-	1
Calf (local)	-	0.2	-	-
Goat- Local	0.5	-	-	-
Sheep- Local	-	0.2	0.2	-
Chicken- Mixed use (grade)	-	-	-	37
Chicken- Mixed use (local)	16.5	12.6	2	-
Turkey	0.25	-	-	-
Duck	-	0.4	-	-
Rabbit	0.75	-	-	-

At the individual participant level, there are various scenarios and decisions that lead to these outcomes, which shed further light on the outcomes of livestock production.

A major factor affecting the previous three potential benefits of sales, nutrition, and social benefits of the owning of livestock the rate of livestock mortality among the participants.

7.4.1 Sales

Sales, referring to the sale of livestock themselves as well as livestock products such as milk and eggs, was an important source of income for many participants. The income earned from these various sources can be seen in Figure 71.

The sale of head of livestock was relatively rare during the study period. The number of livestock sold during the study can be seen in Table 52. Most frequently grade chickens were sold, although these are entirely made up of 1,586 chicken sales Daisy made of her Sasso chickens. Whilst some of these chickens were sold to local customers, in all Usomi purchased back thousands of fully grown chickens that Daisy had reared. However, she did not keep regular records of these sales, and Usomi

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frequently owed her money for the chickens they bought back from her. It is likely the number of chickens she sold was much higher given her sporadic record keeping. By the end of the study period, they owed her more money than they had paid her, but due to poor record keeping she was not aware of what she was currently owed.

Figure 71: Livestock Income Sources

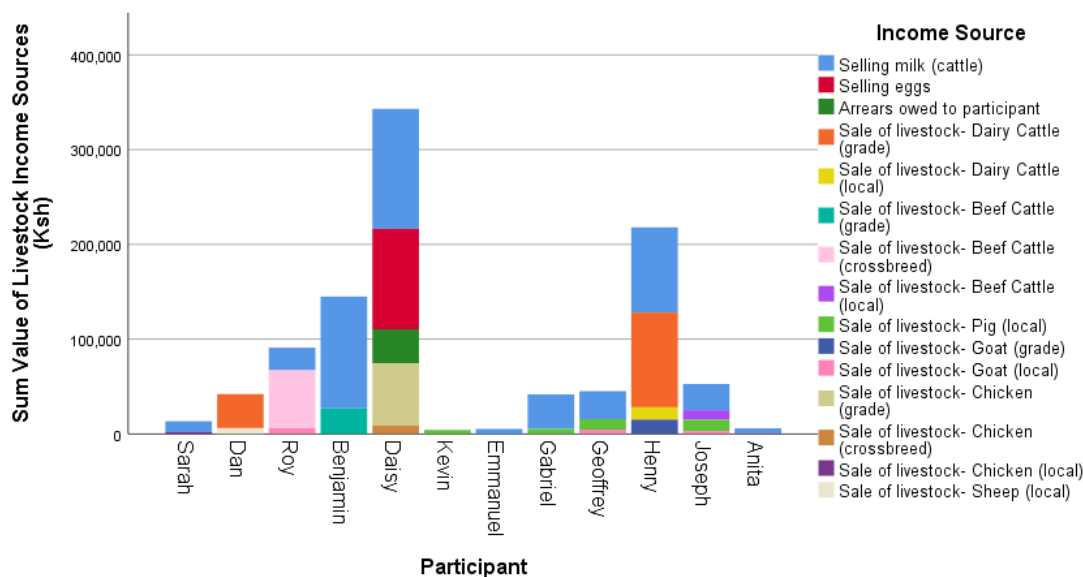


Table 52: Head of Livestock Sold

Livestock Type	Head of Livestock Sold
Chicken- Grade	1,586
Chicken- Local	21
Goat (Meat)- Local	5
Pig- Local	5
Dairy Cattle- Grade	4
Calf- Local	4
Beef Cattle- Mixed	4
Sheep- Local	3
Calf- Grade	3
Dairy Cattle- Local	2
Goat (Dairy)- Grade	2
Pig- Grade	2
Calf- Local	2
Beef Cattle- Grade	1
Pig- Mixed	1
Working Cattle- Local	1
Calf- Mixed	1

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Outside of Daisy's production, which in terms of her grade chickens bears no resemblance to the production of any other participant, the most common sales were from local chickens. Daisy sold 14 local chickens during the study. She once benefitted from a temporary outbreak of an unknown disease that killed many of her neighbours chickens. This meant she was able to take advantage of the sudden reduction in supply, and was able to sell a larger number of chickens to her neighbours for a short period of time.

Only three other participants sold chicken over this time. Sarah sold 4 chickens, Benjamin sold 2, and Anita sold 1. Two of those sold by Sarah were when she wanted to attend a church conference but did not have enough money on the day for her transport, whilst the other two were opportunistic sales, as were Benjamin and Anita's sale of chicken. Opportunistic sales from the homestead differs from how chickens were usually purchased, from the market. A neighbour or friend who happened to be wanting to buy a chicken would come to request to purchase from the participant. This money tended not to be allocated for a specific purpose, but rather to top up the income of that time. With only 7 chickens sold among all participants excluding Daisy, chicken sales were not a frequent occurrence.

Henry earned the most from his livestock sales. He reduced his cattle herd in order to pay for a new home to be built on his compound for him and his wife. He had told us prior to this how he regretted selling his crossbreed dairy cattle several years ago to establish a herd of grade dairy cattle. He told us that he was disappointed that grade dairy cattle are lower yielding than the crossbred cattle, which is why he no longer uses his hydroponics tunnel to grow shoots to increase yields. A similar situation occurred with Roy, who was also in the process of building a new home for his family on his compound, as well as preparing for his retirement, in which he planned to create a thriving dairy business, selling off the male cattle that he had been holding onto as a form of savings.

For both Henry and Roy, these sales were planned in advance, rather than being a response to a sudden financial shock or lack of income from other sources. Both had a long term plan of what they wanted to do, and both had healthy herds of cattle as assets which could be liquidated for this purpose, Henry's being valuable grade cattle, and Roy's producing a number of male calves.

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Not all participants sold livestock during the study. Alice, Elizabeth, and Emmanuel did not sell any livestock during the study. As can be seen in Table 53, there is great variation among the participants in the value of livestock sales over the study period, ranging from just 500ksh to 128,000ksh in overall value. Certain livestock feature regularly in the list of sales, namely both young calves and slightly older males who have been born at the homestead, local goats, and local pigs.

The most regular source of income for many, and for most the largest source of livestock income, was from the sale of milk, with eleven participants selling milk during the study, earning between 300ksh-126,654ksh during this time, and monthly income from milk sales vary. The majority of customers the participants sell to are neighbours, though there are cases where the participants sell their milk further afield, such as Henry who sells milk to a number of policemen at the local prison, delivering it to them on his motorbike. These customers are usually regulars, those who buy milk frequently, even daily, from the participants, with 0.5 litres to 1 litre sold per customer being the most common quantity. The participants are most often paid daily for their milk, though being paid monthly is not uncommon, nor is customers owing money or delaying payments to the participants, which accounts for some, but not all, of the variation seen in Table 54. Ill-health of cattle, birth of calves, purchasing or selling cattle, loss or addition of customers, failure of customers to pay, and increase or decrease of milk allocated to family consumption all impact milk sales continuously. Take Emmanuel for instance, who only began selling milk in October 2019. He had been waiting for his single dairy cow to give birth since before the beginning of the study, during which time he was not reaping any financial benefit from the cow. He had high hopes that once the cow gave birth, his financial situation would improve drastically. However, milk production proved to be poor, with an average of only 1 litre per day being sold for the remainder of the study. At a cost of 50ksh per litre, whilst this was a much needed source of income, it was not enough to significantly improve the families livelihood.

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Table 53: Income from Livestock Sales

Participant	Livestock	Quantity	Sale Value (Ksh)
SARAH	Chicken- Local	4	1,800
	Working Cattle- Local	1	13,000
	TOTAL		14,800
DAN	Dairy Cattle- Grade	1	36,000
	Sheep- Local	1	6,000
	TOTAL		42,000
ROY	Calf- Grade	4	61,000
	Goat- Local	1	6,000
	TOTAL		67,000
THELMA	Beef Cattle- Local	1	18,000
	TOTAL		18,000
BENJAMIN	Beef Cattle- Local	2	27,000
	TOTAL		27,000
DAISY	Chicken- Grade	?	65,500
	Chicken- Mixed	11	8,700
	TOTAL		74,200
KEVIN	Pig- Local	1	4,000
	TOTAL		4,000
GABRIEL	Pig- Local	2	5,200
	TOTAL		5,200
GEOFFREY	Pig- Local	8	11,000
	Goat- Local	1	4,500
	TOTAL		15,500
HENRY	Dairy Cattle- Grade	3	100,000
	Dairy Cattle- Local	1	13,000
	Goat- Grade	3	15,000
	TOTAL		128,000
JOSEPH	Beef Cattle- Local	1	10,000
	Pig- Local	3	12,000
	Goat- Local	1	3,000
	TOTAL		25,000

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Table 54: Participant Monthly Incomes from Milk Sales (Ksh)

Participant	May	June	July	August	September	October	November	December	January
Sarah	1,500	1,500	1,500	1,500	1,550	1,610	5,080	4,500	240
Roy	2,800	3,300	4,345	5,345	6,975	1,250	0	0	0
Benjamin	7,800	8,310	12,690	12,400	18,605	17,380	27,385	11,895	1,510
Daisy	11,100	13,160	6,510	12,060	21,240	9,750	16,456	29,850	6,528
Kevin	0	0	0	0	0	0	0	0	300
Emmanuel	0	0	0	0	0	1,700	1,150	1,300	875
Gabriel	5,700	1,800	2,730	0	3,330	5,220	4,650	5,340	7,480
Geoffrey	4,140	3,000	6,100	6,700	300	0	900	2,610	4,320
Henry	8,740	13,500	15,880	12,270	15,800	1,860	5,820	5,200	9,900
Joseph	2,400	0	1,740	5,940	4,500	10,980	1,980	-	-
Anita	2,000	2,600	725	0	0	0	0	0	0

Henry derived a significant income from his milk production even after the sale of 3 of his dairy cows in October. Joseph had widely varying milk sales throughout his reduced time in the study, ranging from 0ksh to 10,980ksh a month. Being a shop owner, with the shop located on the entrance to his compound, Joseph was used to providing goods to the local people on an IOU bases, and also occasionally sold milk to another nearby shopkeeper to sell on. The jump in income in October came as the result of having the opportunity to sell 5,400ksh worth of milk to a local restaurant, though this proved to only be a one-time event. Benjamin also had significant variation in his milk sales, ranging from 1,510ksh to 27,385ksh per month. In this case the extreme increase in earnings from milk sales in November came as a result of Joseph collecting income that has been owed to him.

7.4.2 Food

In addition to generating income, all participants consumed livestock products at the homestead. As can be seen in Table 55, clusters 1, 2, and 3 consumed a similar value of livestock and their products during the study period.

Where livestock production benefitted the participants nutritionally the most was in the consumption of milk. Thirteen participants consumed milk produced by their own cattle during the study. Consumption of milk from own production was not uniform for the participants over the study period, which follows suit with the variation in milk production during the study. This variation in milk production is the result of periods of ill health among cattle, long waits for cattle to become pregnant or give birth and

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thus produce milk, changes in availability of feed, and changes to available customers to sell milk to.

When milk was produced, the participants usually allocated between 0.5-2 litres per day for household consumption, depending on the quantity produced. Thelma allocated the largest proportion of milk to household consumption. Her livestock production is predominantly for subsistence purposes. Her production peaked in September-October 2019 when her cattle were producing 150 litres and 108 litres of milk respectively. However, this production fell as low as 20 litres in August and February, 60 litres in September, 71 litres in January, and 93 litres in December, with all of this milk allocated to household consumption. For most participants milk available for own consumption varied in this way throughout the study. Many participants stated in conversation that they would prioritise milk sales over their own consumption, reducing the milk they allocated to themselves (though rarely falling below 0.5 litres per day) if a customer wished to purchase more from them, or a new customer became available.

Table 55: Value of Consumption of Livestock and their Products by Cluster and Participant

Cluster	Participant	Milk (sum ksh)	Eggs (sum ksh)	Chicken (sum ksh)	Beef Cattle- Local (sum ksh)	Sheep (sum ksh)	Geese (sum ksh)	Total (sum ksh)
1	Thelma	26,100	50	800	-	-	-	26,950
	Alice	-	-	400	-	-	-	400
	Kevin	11,450	-	4,000	-	-	-	15,450
	Moses	-	-	400	-	-	-	400
	Mean	9,387.5	12.5	1,400	-	-	-	10,800
2	Sarah	9,700	20	5,200	-	-	-	14,920
	Dan	6,050	-	7,200	-	-	-	13,250
	Roy	8,450	-	4,000	-	3,750	-	16,200
	Emmanuel	5,400	30	-	-	-	-	5,430
	Anita	1,350	-	2,800	-	3,750	-	7,900
	Mean	6,190	10	3,840	-	1,500	-	11,540
3	Benjamin	7,700	-	400	-	-	-	8,100
	Gabriel	6,600	-	-	-	-	-	6,600
	Geoffrey	3,850	-	800	-	-	-	4,650
	Henry	11,450	-	4,400	-	-	-	15,850
	Joseph	7,700	-	2,000	-	-	-	9,700
	Mean	7,460	-	1,520	-	-	-	8,980
4	Daisy	12,400	360	20,800	37,500	-	6,500	77,560
	Mean	12,400	360	20,800	37,500	-	6,500	77,560

The livestock most frequently eaten by the homesteads were chicken, predominantly local chicken, though Daisy did consume 3 of her layers during the study. Exceptions to this include the instance where Thelma butchered her injured turkey, and 2 cases of participants eating a sheep. Only 2 participants did not eat any of their chicken, with the remaining participants consuming between 1-18 chickens over this period. This most frequently occurred when valued guests were visiting, which will be discussed further in the section 7.4.3, rather than simply to provide a nutritious meal for the family. Very few eggs were consumed by the participants. Sarah, Thelma, Daisy, and Emmanuel ate eggs laid by their chickens during the study, consuming 2, 5, 36, and 3 eggs respectively. The other participants most often left the eggs to hatch in the hope of growing the chicken flock. However, this logic did not benefit any of the participants significantly, as although eggs often did hatch, the scale of mortality among the chickens, which will be discussed in a subsection 7.4.4, often decimated any potential growth in the participants chicken populations. The consumption of the sheep was also in relation to social situations, being consumed at wedding celebrations of family members, and so will be discussed in the next subsection.

7.4.3 Social Benefits

Cattle tended not to hold significant social benefits for the participants during the study period, though it was often mentioned by the participants that a person with many cattle was successful in life. However, this was not stated as a conscious benefit of owning cattle. The livestock that provided the most in terms of social benefits was chickens. Their consumption during visits from valued guests marked the value of the guests arrival. It showed the participant was grateful for the visit, and evidenced respect. However, these chickens which were consumed were often not part of the original flock and had been purchased specifically for the occasion. It was raised in conversation with many of the participants that they did not want their own flocks to be affected by the consumption of a chicken, that chicken may have gone on to hatch many chicks which would provide the opportunity to grow the flock.

Roy and Anita were the only two participants to consume one of their sheep during the study. Both had a large number of visitors over the easter period for which they slaughtered a sheep to feed their guests and mark the celebration. Eight participants gifted chickens during the study. This was usually simply the gifting of chickens to

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friends as a kindness, or when they deemed their friend to be in need. On occasion chickens were gifted to the church as an offering. Moses gifted a local goat to a family member as a wedding present. However, evidence of the role of livestock in marriage in the form of dowries was evidenced by Anita, who received a local goat and a local bull as a dowry when her daughter married.

Overall, the participants reaped few tangible social benefit from owning livestock. The most common benefit came from the ability to feed chicken to guests.

7.4.4 Livestock Death

Table 56 shows the causes of increase and decreases to the participants chicken flock sizes. However, consideration must be taken of the fact that most participants proved to be somewhat inaccurate in their reporting of these figures, particularly in forgetting how many chicks hatched and how many chickens died, with the number of deaths in particular thought to often be under reported. Taking these figures as estimates, and considering the fact that the participants had existing flocks prior to the study, that for many the number of deaths were close to, equalled, or outweighed the number of chickens hatched during the study.

Table 56: Chicken Acquisition Against Causes for Flock Size Reductions

Participant	Hatched	Purchased	Given	Eaten	Sold	Given away	Died	Value of lost assets (Ksh)*
Sarah	49	18	0	13	4	0	44	17,600
Dan	17	4	0	18	0	2	22	8,800
Roy	110	17	1	10	0	0	104	41,600
Thelma	12	2	0	2	0	0	14	5,600
Alice	5	13	1	1	0	0	2	800
Benjamin	12	3	0	1	2	0	32	12,800
Daisy-Grade chickens	0	2720	0	18	1586	5	163	65,200
Daisy- Local chickens	0	0	3	16	14	1	0	0
Kevin	85	5	0	10	0	2	59	23,600
Emmanuel	29	0	0	0	0	4	25	10,000
Geoffrey	46	0	0	2	0	2	16**	6,400
Henry	47	1	0	11	0	2	15**	6,000
Joseph	50	0	0	5	0	1	10**	4,000
Anita	33	10	3	7	1	0	62	24,800
Moses	12	1	0	1	0	0	8	3,200

**Number of deaths thought to be higher than was reported as flock size was not seen to have grown by this size.

The causes of these deaths varied. Sick chickens were often described as ‘having the flu’ or a fever. Diarrhoea was another common cause of death given, whilst

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occasionally Newcastle's Disease and Fowl Pox was said to be to blame. Often when the participants chickens died it would be over a period of a few days/weeks, with several chickens dying each day. However, since the chickens were left to graze during the day, the participants did not make any efforts to quarantine the visibly sick chickens. Accidental deaths in the case of chicks were usually put down to the chicks being 'washed away by the rain'. Whilst rainfall could be fairly heavy and small areas of land could temporarily flood in Busia, it was rarely severe. It could not be established why this was such a common occurrence among the participants, why the chickens had not taken shelter themselves or why the participants did not put the chickens in their night shelters during this time. From talking with the participants, having chicks washed away by rain did not appear to concern them, rather they took it simply as something that was likely to happen. For adult chickens, animal attacks (including dogs, mongeese, birds of prey, foxes, and cats) were the cause of all deaths given.

Death of other livestock was less common, but did still occur, as seen in Table 57. Benjamin lost a grade dairy cow to East Coast Fever, losing him not only the daily income he would have earned from milk, but also in the region of 36,000-50,000ksh in the sale value of the cow, based on grade dairy cattle sales by other participants. Moses lost one of his two local dairy cows to illness. He was unsure of the cause, and had not sought veterinary assistance. He told us the cow died of a sore throat, though some viral or bacterial infection is more likely. Two participants had grade calves die during the study. Sarah's calf died after it fell in a hole in the ground which had filled with rainwater, leading to it drowning, whilst we were unable to establish what had happened to Daisy's grade calf. Three participants had local calves die during the study. Thelma lost two calves. One died just 3 days after being born. Thelma told us that the mothers teats were swollen, and the calf was unable to feed and ultimately died, though she did not contact a vet. The second calf died at around 2 months old after it stopped feeding, but again Thelma did not take any action to ensure the calf was fed. Geoffrey had a local calf die of apparent pneumonia, whilst Anita's calf was trampled by an older cow. Had these cows reached maturity, they could have been worth in the region of 13,000ksh (based on other participant sales of local dairy cattle), and the females would have provided a daily income through milking.

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Table 57: All Livestock Deaths by Head of Livestock

Participant	Chicken-Layer-Grade	Chicken-Mixed Use-Grade	Chicken-Mixed Use-Local	Dairy Cattle-Grade	Dairy Cattle-Local	Calf-Grade	Calf-Local	Goat-Local	Sheep-Local	Pig	Turkey
Sarah	-	-	44	-	-	1	-	-	3	-	-
Dan	-	-	22	-	-	-	-	-	-	-	-
Roy	-	-	104	-	-	-	-	-	-	-	-
Thelma	-	-	14	-	-	-	2	3	-	-	1
Alice	-	-	2	-	-	-	-	-	-	-	-
Benjamin	-	-	32	1	-	-	-	-	-	-	-
Daisy	5	163	-	-	-	1	-	-	-	-	-
Kevin	-	-	59	-	-	-	-	-	-	-	-
Emmanuel	-	-	25	-	-	-	-	-	-	-	-
Gabriel	-	-	0	-	-	-	-	-	-	-	-
Geoffrey	-	-	16*	-	-	-	1	1	1	-	-
Henry	-	-	15*	-	-	-	-	-	-	-	-
Joseph	-	-	10*	-	-	-	-	-	-	1	-
Anita	-	-	62	-	-	-	1	-	-	1	-
Moses	-	-	8	-	1	-	-	-	-	-	-

*Number of chicken deaths assumed to be higher or lower based on available data

Two participants, Thelma and Geoffrey, lost local goats. Thelma lost three in total, one to illness and two through accidental death. The goat she believes to have died from an illness was simply found dead one day, though the cause was unknown. Of the accidental deaths, one fell in the latrine on the compound, which was not secured (e.g., by a locked door) and the goat was not tethered. The other goat she stated ate maize whilst grazing and died as a result. One of Geoffrey's three goats also died of a mystery illness, having had diarrhoea for three days before dying, and not receiving veterinary care. Sarah and Geoffrey both lost local sheep through accidental deaths too. Both these sheep died due to bite wounds, suspected to be from dogs.

Anita's pig died despite veterinary assistance. The pig's health had deteriorated rapidly one morning, and a vet was called. However, the pig died later that day, though the cause remained unknown. The cause of the illness that caused the death of Joseph's pig was also unknown, and he did not seek veterinary assistance.

7.5 What Makes Successful Livestock Intensification?

Overall, the participants in the study benefitted financially from their livestock production. Not inclusive of the value of the consumption of livestock products, purely from incomes and expenditures related to livestock production, the participants as a

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group earned 1,277,339ksh, whilst they spent 755,327ksh, resulting in an overall profit during the study period of 522,012ksh, and a profit margin of 69.1%.

The mean profit margins achieved by cluster 3 were significantly higher than that of any other cluster, as seen in Table 58. Despite having a similar level of livestock expenditure to cluster 2, they managed to create almost 6 times the profit. Profit margins for cluster 1 are to be expected to be small at the most, due to the subsistence nature of their production. Daisy's livestock production in cluster 4 had been developed as a strong business venture, rather than just another way of getting money. It is possibly surprising then that her profit margins are significantly below many of the other participants, with the 7th lowest profit margin of the 15 participants, but the 2nd highest profit value.

Henry and Benjamin (cluster 3) in particular had high profit values from their livestock production. Henry earned a total of 218,570ksh from his livestock, and spent 51,500ksh on production, giving him an overall profit of 167,070ksh, at a gross profit margin of 76.4%. Benjamin earned 166,565ksh from his livestock, and spent 26,140ksh on production, resulting in a profit of 140,425ksh with a gross profit margin of 84.3%. Daisy on the other hand earned 565,939ksh from her production, whilst spending 407,662ksh, giving her an overall profit of 158,277ksh, with a gross profit margin of just 28.0%. The participant with the most surprising profit margin was Joseph, at a massive 96.2%. Whilst his profit value was not particularly high, he managed to achieve this profit whilst spending very little money during the study period, only 1,980ksh, the 2nd lowest amount among the participants.

Table 58: Livestock Profitability by Cluster and Participant

Cluster	Participant	Income (Ksh)	Expenditure (Ksh)	Profit (Ksh)	Gross Profit Margin (%)
1	Thelma	0	15,680	-15,680	0
	Alice	0	33,140	-33,140	0
	Kevin	4,300	23,200	-18,900	0
	Moses	0	40,220	-40,220	0
	Mean	1,075	28,060	-26,985	0
2	Sarah	20,640	20,100	540	2.7
	Dan	43,400	37,640	5,760	13.3
	Roy	77,445	17,460	59,985	77.5
	Emmanuel	6,475	1,030	5,445	84.1
	Anita	6,325	4,075	2,250	35.6
	Mean	30,857	16,061	14,796	42.6
3	Benjamin	166,565	26,140	140,425	84.3

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	Gabriel	47,360	6,240	41,120	86.8
	Geoffrey	44,170	11,100	33,070	74.9
	Henry	218,570	51,500	167,070	76.4
	Joseph	52,540	1,980	50,560	96.2
	Mean	105,841	19,392	86,449	83.7
4	Daisy	565,939	407,662	158,227	28.0
	Mean	565,939	407,662	158,227	28.0

7.5.1 *The Type of Livestock Kept is Important*

A Pearson correlation shows that there is a strong positive correlation between the value of the livestock owned and the value of the livestock profits that were achieved during the study ($p=0.791$, significance 0.01).

Table 59 shows the clusters differ in the types of livestock they keep. In terms of cattle, cluster 4 had the largest herd size of 8 grade cattle. Cluster 1 had the largest average herd size of the remaining clusters of 5.25 head of cattle, consisting of 4.75 local cattle and 0.5 grade cattle. Cluster 2 had on average 5 cattle, consisting of 1.4 grade cattle, 1 crossbreed, and 2.6 local cattle. Cluster 3 also had on average 5 cattle during the study, with an average of 3.4 grade cattle, 0.6 crossbreeds, and 1 local cattle.

What is clear from this that where there are higher herd values and profits, there is a higher proportion of grade cattle. The same is true of whether the participants in each cluster own bulls or dairy cattle, with the exception of cluster 4. Cluster 1 owned on average 4 dairy cattle and 1.25 bulls. Cluster 2 owned on average 2 dairy cattle, 1.6 bulls, and 1.4 calves. Cluster 3 owned on average 3.4 dairy cattle, 1.4 bulls, and 0.2 calves. Cluster 4 owned on average 3 dairy cattle and 5 bulls.

There is some variation in the size of the goat herds in each cluster. The majority of the participants owned goats for meat, with only Henry owning dairy goats. Again, the largest meat goat herd was owned by cluster 4, with cluster 1 having the second largest herd, and clusters 2 and 3 having equal herd sizes. The overall size of the goat herd however is impacted by these dairy goats, resulting in cluster 3 having the largest herd size.

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Table 59: Mean number head of Livestock Owned at the Start of the Study by Cluster

Livestock	Cluster			
	1	2	3	4
Bull- Grade	-	-	0.6	5
Bull- Crossbreed	-	0.4	0.4	-
Bull- Local	1.25	1.2	0.4	-
Mean Bulls	1.25	1.6	1.4	5
Dairy Cattle- Grade	0.5	0.8	2.8	3
Dairy Cattle- Crossbreed	-	0.6	0.2	-
Dairy Cattle- Local	3.5	0.6	0.4	-
Mean Dairy Cattle	4	2	3.4	3
Calf- Grade	-	0.6	-	-
Calf- Local	-	0.8	0.2	-
Mean Calves	0	1.4	0.2	0
Mean Cattle Herd	5.25	5	5	8
Goat- Meat-Grade	-	-	0.4	-
Goat- Meat- Crossbreed	-	0.6	-	-
Goat-Meat-Local	2	0.6	0.8	4
Mean Goats- Meat	2	1.2	1.2	4
Dairy Goat- Grade	-	-	2.4	-
Dairy Goat- Local	-	-	1.6	-
Mean Goats- Dairy	0	0	4	0
Mean Goat Herd	2	1.2	5.2	4
Sheep- Local	1.25	1.6	0.4	-
Pig	1.25	0.8	2	-
Chicken- Mixed Use- Grade	-	-	-	1,150
Chicken- Mixed Use- Local	19.75	18.8	13.6	50
Ducks	0.5	-	-	6
Geese	-	-	-	8
Rabbit	0.75	-	-	-

Chicken production was not profitable for any participant. As seen in Table 60, financial losses ranged from 0ksh to 92,160ksh. The high value of financial loss for Daisy must be considered in the context of her being owed money by Usomi, as well as that at the completion of data collection she was just a few weeks away from selling her latest batch of chicks back to the company, which will reduce this loss.

Dairy production on the other hand proved to be a profitable venture for 12 of the 15 participants (see Table 61), contributing significantly to the income of many. Those for whom dairy production was particularly profitable were Daisy and Henry.

Daisy benefits from a higher level of education (both her and her husband obtained university degrees), as well as a high off-farm income (Daisy's husband worked for the Busia government, whilst Daisy is a retired teacher), whilst Henry benefitted from a real drive to create a dairy business and external knowledge gained from the use of YouTube livestock related videos. They both also proved to have the largest expenditure in their dairy cattle inputs during the study period, as well as some of the

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Table 60: Participant Expenditure, Income, and Asset Value Loss- Chicken (Ksh)

Participant	Total Expenditure ¹	Total Income ²	Financial Profit	Lost Asset Value Due to Death ³
Sarah	3,090	1,800	-1,290	17,600
Dan	4,000	0	-4,000	8,800
Roy	6,300	0	-6,300	41,600
Thelma	11,900	0	-11,900	5,600
Alice	7,380	0	-7,380	800
Benjamin	2,900	1,000	-1,900	12,800
Daisy	272,490	180,330	-92,160	65,200
Kevin	2,600	0	-2,600	23,600
Emmanuel	0	0	0	10,000
Geoffrey	3,650	0	-3,650	6,400
Henry	700	0	-700	6,000
Joseph	0	0	0	4,000
Anita	700	500	-200	24,800
Moses	2,700	0	-2,700	3,200

¹ Expenditure includes purchased inputs including feed, supplements, veterinary care and medications, and purchase of new chickens. Not inclusive of participants own labour, or land.

² Income includes sale of eggs and live animal sales.

³ All chickens and chicks valued at 400ksh per head, a lower end estimate, and assumes chicks would have been raised and sold as mature chickens had they not died. It should be noted that participants frequently misjudged the number of chickens that had died, usually underestimating, during the study, and so these figures are likely higher in reality.

Table 61: Participant Expenditure, Income, and Asset Value Loss- Dairy Cattle (Ksh)

Cluster	Participant	Total Expenditure ¹	Total Income ²	Financial Profit ²	Value of Milk Consumed ⁴	Total Financial Benefit ⁵	Value of the Herd ⁶	Lost Asset Value Due to Death ⁷
1	Thelma	17,040	0	-17,040	26,100	9,060	130,000	26,000
	Alice	18,600	0	-18,600	0	-18,600	125,000	
	Kevin	9,050	300	-8,750	11,500	2,750	65,000	
	Moses	35,720	0	-35,720	0	-35,720	26,000	13,000
	Mean	20,102.5	75	-20,027.5	9,400	-10,635	86,500	9,750
2	Sarah	5,460	12,980	7,520	9,700	17,220	215,000	43,000
	Dan	32,110	36,000	3,890	6,100	9,990	43,000	
	Roy	8,170	24,015	15,845	8,450	24,295	43,000	
	Emmanuel	330	5,125	4,795	5,400	10,195	41,000	
	Anita	850	5,325	4,475	1,350	5,825	0	13,000
Mean	9,384	16,689	7,305	6,200	13,505	68,400	11,200	
3	Benjamin	14,240	117,975	103,735	7,850	111,585	86,000	43,000
	Gabriel	5,110	36,430	31,320	6,650	37,970	99,000	
	Geoffrey	7,200	29,570	22,370	3,950	26,320	54,000	13,000
	Henry	41,880	202,870	160,990	11,450	172,440	344,000	
	Joseph	1,860	27,540	25,680	7,750	33,430	84,000	
Mean	17,572.5	82,877	68,819	7,530	76,349	133,400	11,200	
4	Daisy	44,440	126,654	82,214	12,450	94,664	129,000	43,000
	Mean	44,440	126,654	82,214	12,450	94,664	129,000	43,000

¹Expenditure inclusive of purchased inputs including feed, supplements, veterinary care and medications, purchase of new cattle, and hired labour for napier. Not inclusive of participants own labour, or land purchase for napier prior to the study.

²Income inclusive of milk sales and live animal sales.

³Financial profit total income again total expenditure.

⁴Value of milk calculated at 50ksh per litre, the most common sales price.

⁵Total financial benefit calculated by financial profit plus value of milk consumed.

⁶Value of herd based on value (according to average sale prices by participants) of cattle owned at the end of the study.

⁷Values of livestock based on average sale price other participants during the study. Assumes calves were raised, valued as mature dairy cattle. Does not include loss of potential income through milk sales.

most highly valuable herds, with both owning a number of grade dairy cattle. Other participants with similar value herds, whether this be due to a smaller number of grade cattle or higher number of mixed or local cattle, all spent significantly less on inputs. Sarah ended the study with 3 mature grade dairy cattle and 2 grade calves, however she invested very little in inputs, as well as achieving a relatively low financial benefit over the course of the study. Thelma ended the study with 7 mature local dairy cattle and 3 local calves. She spent over three times that of Sarah on inputs, however her total financial benefit was significantly lower. Alice, like Moses, was affected by owning dry cattle throughout her time in the study, investing a significant amount of money (though less than Daisy and Henry) in their maintenance, but not reaping any regular financial benefit through either sales or consumption of milk from them.

7.6 Discussion

No participant is solely reliant on livestock production for their livelihoods. Rather, livestock are just one income generating activity out of many for all the participants. Whilst they have the potential to become a lucrative venture, they also have the ability to drain resources and prove to have a negative impact on livelihoods should they require financial investment, but not reap rewards.

Different livestock are able to provide different benefits to the participants, whether these benefits were actually achieved or not during the study period. For example, dairy cattle are not only a valuable asset, but also provide daily income through milk sales, or daily nutritional benefits through consumption of milk; chickens are able to multiply quickly and are consumed at social gatherings; pigs require few inputs and give births to litters of multiple piglets which are easily sold; goats and sheep also require few inputs though they reproduce more slowly, but are more valuable an asset than chicken, though less valuable than cattle, and may be used in social situations such as wedding gifts or dowry. Local chicken and dairy cattle are the most commonly owned livestock, involving the most investment and potential earnings as things stand. Other livestock are typically owned in smaller numbers and involve less investment than chicken and cattle.

Rural smallholder poultry production has been encouraged for its potential to improve incomes of the poor through the sale of meat and eggs (Magothe *et al.*, 2012), improve

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nutrition through access to a cheap source of protein (Wong *et al.*, 2017; Dumas *et al.*, 2018), and female empowerment due to the fact that women are often the primary carers of the homesteads local chickens (Hadji and Gueye, 2000; Ahlers *et al.*, 2009). However, in this study there is little evidence of this being achieved in this study.

In terms of the cost of starting up livestock production, chicken require the least cash. A chicken can be purchased at just 400ksh (lower end cost), and given that they are free to roam (often nicknamed ‘roadrunners’) there is the potential for fertilised eggs without having to purchase a male. This means that with little effort the flock can, in theory, grow rapidly. Chickens are valued not just for this reason, but also their ability to be eaten, especially when guests are visiting (social value).

However, the mortality rate in chicken production proved to be extremely high. The issue of mortality as the primary constraint to nutritional and financial gains from poultry in western Kenya has been introduced as a concern by Otiang *et al.* (2020), who found that 70% of losses in chicken production were involuntary losses, with mortality accounting for 60% of total off-take from chicken production in Rarieda, Siaya County, western Kenya. Whilst the participants value their chickens, and express an interest in increasing their flock sizes so that they are able to sell more and increase their incomes, the high levels of mortality are clearly a key factor limiting their progress. The mortality rate in chicks in particular is also of interest when considering that most participants chose not to regularly consume or sell eggs laid by their chickens in the hope they would hatch.

A lack of knowledge is having an impact on chicken mortality. Usually, participants got their knowledge of poultry production simply by seeing what everyone else is doing. Livestock extension services did not reach any of the participants, and so opportunities for increasing knowledge about the importance of, for example, keeping chickens in pens or getting them vaccinated, was not accessible.

In most cases, chicken production had real potential to benefit the participants nutritionally and financially. However, the present situation is that poultry production proved to be a drain on financial resources for all participants over the study period.

Dairy production tended to provide much larger benefits for the participants. This was considered much more seriously by all participants, who took more time and care over

their dairy cattle. Dairy cattle require larger values of investment typically, with the cost of purchasing cattle high, as well as the need for supplements and veterinary treatment, and a high labour cost from the harvesting of napier or other feed crops. This means that should the cow not be producing milk she can pose a significant financial burden. For all participants however, the value of the herd, coupled with the total financial benefits achieved, made dairy production a profitable venture for the participants. The profitability of dairy production in Kenya, including the value of consumed milk, has been found in previous studies. However, when factoring in the cost of production these profits are small. Mburu, Gitu and Wakhungu (2007) found average profits of milk production to range from 1.85-5.05ksh/kg, and 0.45-1.25ksh/kg from the sale of cattle. Further, they found that level of intensification did not affect the cost of production. Kibiego, Lagat and Bebe (2015) found that the cost of production did differ between levels of intensification, and that milk profits in free grazing systems significantly outweighed those from intensive systems, at 20.19ksh/kg and 8.25ksh respectively.

It was found in this study that participants routinely underfeed their livestock, and this too has been found in previous studies. For instance, Mugambi *et al.* (2015) found in their study that cattle are routinely underfed, and that a doubling of current roughage and concentrates being fed could double milk yields, and that economies of scale could benefit production. Another input that the study participants struggled with was A.I., when multiple rounds had failed to result in the cow becoming pregnant. Similar findings come from a study by Lawrence *et al.* (2015) found that 36% of respondents stated they had issues when using A.I. services, and 87% of them cited need for repeated use as a major concern. With A.I. significantly more expensive than breeding from a bull, the cumulative cost of A.I. is a major barrier to its use. The expense of building shelters is another input that was prohibitively expensive for many participants, likely to represent a significant proportion of their average monthly income, and sheds light on why some participants may choose to have more basic shelters, or none at all, despite the benefits in security, amongst others, of housing livestock in purpose built shelters. However, in a study by Asgedom (2007), shelter building can cause the cost of production to rise to a point where profits become non-existent.

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For those who did not earn any income from their dairy production during the study period, there were still significant gains from nutritional benefits. Thelma's dairy production was purely for subsistence purposes, and thus a lack of profit is to be expected. However, the value of the milk consumed by the homestead had a value of 26,100ksh. Whilst this could have been profit from milk sales, by consuming the milk herself this is the value of the savings made compared to if she had purchased the milk from someone else, whilst also benefiting from a herd valued at 130,000ksh, which could be liquidated in a time of need. For all the participants except for Anita, the financial benefits of owning cattle were two-fold. Not only did they either earn a regular income from milk sales, or save money by consuming milk from their own cattle, but they also benefitted from having significant asset value from their dairy cattle, which can be considered as a form of savings.

The lack of income being earned from the sale of chicken, and the small mean incomes earned from the sale of pigs, goats, and sheep, seems to show that the participants are generally not using livestock in the ways suggested by the livestock ladder, selling lower value livestock until higher value livestock can be purchased, as a pathway out of poverty (ILRI, 2002).

If smallholder livestock farmers are to be utilised to meet the growing demand for livestock food products, whilst raising them out of poverty and improve standards of living, it is vital that livestock extension is improved so that these farmers have access to this support. Increasing knowledge of other sources of information, such as YouTube videos would also significantly aid these farmers.

CHAPTER VIII: RISK IN SMALLHOLDER LIVESTOCK PRODUCTION

8.1 Introduction

In the previous chapter of this thesis, the presence of risk, particularly in the form of livestock death, has been evidenced. Livestock death had a significant impact on the profitability of livestock production for all participants in one way or another during the study period. However, this is not the only risk faced by the participants over this time.

Agriculture (both crop and livestock) is a sector fraught with risk and uncertainty. Typically, there are five types of risk in agriculture: production risk, price/market risk, financial risk, institutional risk, and human/personal risk as stated by (Komarek, Pinto and Smith, 2020). Production risks occur as a result of the impact of weather related events, such as increased/decreased rainfall or temperature, or other climatic changes, or as a result of disease (Kahan, 2008; Ullah, Shivakoti and Ali, 2015). Price/market risks are those associated with the changes to the prices of inputs or outputs during production (Hurduzeu, Huidumac and Hurduzeu, 2014; Reddy, 2015). Financial risk relates to the borrowing of money and the resulting repayment obligations, which can be affected by changes to interest rates, loans being recalled, or restricted credit availability (Boggess, Anaman and Hanson, 1985; Kahan, 2008; Hurduzeu, Huidumac and Hurduzeu, 2014; Reddy, 2015). Institutional risks are those resulting from changes to policy and regulation that affect production, inputs, or outputs (Kahan, 2008; Anton, 2009; Reddy, 2015). And finally, human/personal risk refers to problems of human health or personal relationships which can affect production, such as illness, death, or person crises (Kahan, 2008; Anton, 2009; Reddy, 2015).

Smallholder livestock production is very hands on, and the farmers are open to a variety of risks at any one time. The risks discussed in this chapter, those of production and market risk, were chosen for discussion based on their frequency and previous discussion with participants earlier in the study. The specific risks considered here are the production risks of illness, accidents, theft, and drought, and the market risks of difficulty selling livestock due to illness, reduced livestock market value, and increased cost of inputs. This chapter will build on the prior chapters of this thesis, and

of the available literature, by considering how the participants of this study perceive these risks, the impact they have on the participants, and the mitigation strategies the participants utilise to minimise these risks.

Policies and organisations must consider the specific risks of an area, the impacts they have, and the typical ways that people mitigate these risks, to reduce their negative outcomes and promote successful intensification of livestock production. Without this consideration, these risks and their negative impacts will continue to impact on the success, and the fairly low rate of intensification found by the study, of intensified livestock production in western Kenya.

8.2 Background

When thinking about risk as a factor influencing farmer decision making and the successes, or lack of, they may face in their production, understanding smallholder farmers perception of risk, and how they mitigate this, is a factor that is of vital importance. Within the literature there is a lack of consensus regarding the definition of 'risk perception'. According to Sjoberg (1998) an individual's risk perception is the subjective judgement of the probability of a particular risk occurring, and their awareness of the risks consequences. An individual's perception of a particular risk involves an evaluation of both the probability of occurrence, and of the potential consequences of a negative outcome (Sjoberg, Moen and Rundmo, 2004), with risk itself being the product of magnitude and likelihood of harm (Patt and Schroter, 2008). Thus, by this definition, risk perception is a function of the probability of loss occurring, and the potential consequences of a negative outcome. On the other hand, Cox & Rich (1964) see risk perception as a function of uncertainty and consequences, where uncertainty refers to the subjective uncertainty of whether something can lead to a loss or a gain. In this thesis, risk perception is defined by the participants perception of the likelihood of a particular risk occurring, with further consideration of the impact of previous experience of the risk, and mitigation strategies that are utilised to reduce the risk.

Risk perceptions can affect farm production, investment, and management decisions (Ullah, Shivakoti and Ali, 2015). In this regard, Patt (2001) states 'farmers make decisions based on what they think is likely to occur, and sometimes based on what

they fear, or hope, is possible'. As has already been established in this thesis, participants are often highly constrained by available income and finance, which poses a problem when considering mitigation strategies, many of which require additional financial investment.

Risk perceptions have been said to be complex, incorporating consideration of controllability, uncertainty, dread, equity, catastrophic potential, and others (Renn, 1992; Slovic, 1992, 2001). Previous studies have found that cultural, social, and institutional processes are highly important factors that influence the perception of risk, as well as socioeconomic, cultural, gender, environmental, and historical contexts proving to have an impact on people's perception of risk, which are not well modelled in traditional risk assessments (Legesse and Drake, 2007). This means that the perception of risk of people both within and between different locations can vary significantly, and must be considered independently when considering risk in a particular location, in order to create context specific risk management strategies.

Expert intervention in risk management is often based on the experts own perceptions of farmer livelihood risks (Eitzinger, Binder and Meyer, 2018), which could lead to failure of the intervention if there exists a difference between the perception of the experts and the farmers themselves. Risk perception is highly individualistic in nature, with each individual having a unique and subjective views of the risks involved in livestock production (Ramsey *et al.*, 2016).

Though livestock farmers risk perceptions have been the subject of research in developed countries, little attention has been paid to developing economies (Ahsan, 2011), less still considering the subject from a qualitative stand-point. Previous studies of risk perception in dairy production in the Dar Es Salaam region of Tanzania have found inadequate feed and water, lack of skills, marketing difficulties, and poor animal health services to be major the major risks associated with production (Kivaria, Noordhuizen and Kapaga, 2006). In Tigray, Ethiopia, smallholder dairy farmers considered low milk yield due to feed shortages as the primary risk to their production, followed by low farm income, lack of government support, milk price variability, milk marketing problems, and ineffective AI, amongst others (Gebreegziabher and Tadesse, 2014). A study of farmers in Khyber Pakhtunkhwa, Pakistan, found that farmers consider flood, heavy rains, and pests and disease as the primary sources of risk to

production (Ullah, Shivakoti and Ali, 2015). In Kenya, studies of risk perception are fairly few, and focus of a range of topics, most frequently relating to climate change (Rao *et al.*, 2011; Ndambiri, Ritho and Mbogoh, 2013; Kichamu *et al.*, 2018; Kogo *et al.*, 2021), as well as topics such as pesticide use (Constantine *et al.*, 2020), and crop pests (Abteu *et al.*, 2016).

8.3 Risk Perception, Experience, and Mitigation

In order to understand the risks faced by smallholder livestock farmers in Busia, Kenya, which affect their ability to intensify their production, this study questioned participants on their previous experiences of certain risks, their perception of the likelihood of these risks occurring in the future, and how they mitigate against these risks. The risks themselves were selected based on previous discussions with the participants. By combining how the participants rated the likelihood of the risks on a Likert scale, we can see which sources of risk are of most concern to them. The minimum score possible between the 13 participants who took part in this section of the study is 13, which would mean all participants considered the risk to be extremely unlikely (score of 1) to occur, whilst the highest combined score would be 91, which would mean every participant considered the risk to be extremely likely (score of 7) to occur.

The combined scores, in descending order of likelihood, can be seen in Table 62. It can be seen that overall, the participants consider the increased cost of inputs to be the risk most likely to occur, both in their near future, in the next 2 years, and in the next 5 years, followed by drought, and death due to disease. The top 3 risks considered most likely to occur by the participants are a group as the same as the top 3 they stated they have experienced in the past, as seen in Table 63. To understand these risks further, understanding the participants' explanations of these scores is vital.

At a cluster level, as can be seen in Table 64, a risk of increasing cost of inputs is perceived as the most likely risk to occur for clusters 1, 2, and 4, and the second most likely risk for cluster 3. For cluster 3, the risk of drought was considered slightly more likely than the risk of increasing input prices. For all clusters, selling livestock at a poor market value was considered to be the least likely risk to occur.

CHAPTER VIII: RISK IN SMALLHOLDER LIVESTOCK PRODUCTION

Table 62: Sum of Participant Scores for Risk Likelihood

Risk	Score
Increased cost of inputs in the near future	79
Increased cost of inputs in the next 2 years	76
Increased cost of inputs in the next 5 years	70
Drought in the near future	74
Drought in the next 2 years	66
Drought in the next 5 years	57
Livestock death due to disease in the near future	67
Livestock death due to disease in the next 2 years	60
Livestock death due to disease in the next 5 years	52
Unable to sell livestock due to disease in the near future	59
Unable to sell livestock due to disease in the next 2 years	58
Unable to sell livestock due to disease in the next 5 years	53
Livestock theft in the near future	54
Livestock theft in the next 2 years	48
Livestock death in the next 5 years	44
Livestock death due to accident in the near future	55
Livestock death due to accident in the next 2 years	44
Livestock death due to disease in the next 5 years	44
Sell livestock for poor market value in the near future	37
Sell livestock for poor market value in the next 2 years	47
Sell livestock for poor market value in the next 5 years	41

Table 63: Participant Risk Experience

Risk	Yes (/13)	No (/13)
Livestock death due to disease in the recent past	12	1
Livestock death due to disease in the past 2 years	8	5
Livestock death due to disease in the past 2-5 years	8	5
Drought in the recent past	10	3
Drought in the past 2 years	6	7
Drought in the past 2-5 years	9	4
Increased cost of inputs in the recent past	9	4
Increased cost of inputs in the past 2 years	6	7
Increased cost of inputs in the past 2-5 years	4	9
Sell livestock for poor market value in the recent past	5	8
Sell livestock for poor market value in the past 2 years	5	8
Sell livestock for poor market value in the past 2-5 years	6	7
Livestock theft in the recent past	4	9
Livestock theft in the past 2 years	5	8
Livestock death in the past 2-5 years	4	9
Livestock death due to accident in the recent past	5	8
Livestock death due to accident in the past 2 years	2	11
Livestock death due to disease in the past 2-5 years	4	9
Unable to sell livestock due to disease in the recent past	1	12
Unable to sell livestock due to disease in the past 2 years	2	11
Unable to sell livestock due to disease in the past 2-5 years	5	8

Table 64: Mean Participant Scores for Risk Likelihood by Cluster

Risk	Cluster			
	1	2	3	4
Increased cost of inputs in the near future	6	6.2	6	6
Increased cost of inputs in the next 2 years	5.3	5.6	6.5	6
Increased cost of inputs in the next 5 years	5.3	4.4	6.5	6
Drought in the near future	4.7	5.6	6.5	6
Drought in the next 2 years	4.7	4.4	6.5	4
Drought in the next 5 years	3	4	6	4
Livestock death due to disease in the near future	4.3	5.4	5.8	4
Livestock death due to disease in the next 2 years	3.3	4.8	5.3	5
Livestock death due to disease in the next 5 years	4	4	4.25	3
Unable to sell livestock due to disease in the near future	3.3	5.6	4	5
Unable to sell livestock due to disease in the next 2 years	3.3	5.6	3.8	5
Unable to sell livestock due to disease in the next 5 years	3.31	4.6	3.5	5
Livestock theft in the near future	3.3	4	4.5	6
Livestock theft in the next 2 years	3.3	3.6	3.5	6
Livestock death in the next 5 years	3.3	2.8	3.5	6
Livestock death due to accident in the near future	3.7	5.4	2.8	6
Livestock death due to accident in the next 2 years	3	4.6	2.8	1
Livestock death due to disease in the next 5 years	3.3	4.8	2.3	1
Sell livestock for poor market value in the near future	3	3.6	2	2
Sell livestock for poor market value in the next 2 years	3	4	4	2
Sell livestock for poor market value in the next 5 years	3	3	3	5

8.3.1 Increased cost of inputs

The risk that the participants found to be the most likely to occur was increased cost of inputs, with many having recently experienced price increases in the past.

“Prices keep changing every year, livestock feed that we have been buying at 700 shillings, the price can rise to 750 shillings, but you will be forced to buy because if you don’t, your livestock will die, you just have to buy” (Thelma, Interview, January 2020)

“Livestock input prices have gone up, the salt that I used to buy at 30 shillings, I recently went to the agroveter, it’s now selling at 50 shillings, there is also this medicine called Triatix for spraying cattle, it used to sell at 90 shillings, right now it’s selling at 150 shillings” (Emmanuel, Interview, January 2020)

This is to say, that past experience of increased price of inputs is having an impact on how likely people think this will continue to occur in the future. Participants think that prices increase over time due to an increase in petrol prices which was seen during the study period, growth in the economy, increases in taxes on inputs, growing demand for inputs, and future changes in government. Some examples from those who believe prices will hike continuously through the future are:

“That’s a big possibility because the way things are continuing, the prices keep increasing daily and yearly, economy keeps rising and that affects the farmers a lot...corruption has worsened our country, everyone sell at his own price.” (Sarah, January 2020)

“I believe prices rise, there is no day that it goes down. With the way our economy is doing, there is no way it will come down, just the same way I will never go back to being 18 years old, that’s the same way our economy will never go down, it will continue going higher...That’s the reality, it’s always hiking day and night, not only livestock but life’s economy in general. If you hear that the price of petrol has hiked, everything else hikes including animal feeds and medicine.” (Gabriel, January 2020)

For others, some input prices are seen to increase and decrease throughout the year, particularly due to drought or during the Christmas period.

“Now that we are expecting drought, it is likely that we will buy feed at a higher price because it’s not easy to get feed during drought season.” (Henry, Interview, January 2020)

“...for example, Napier grass, we are now buying 5kgs at 50 shillings, the price can hike up to 200 shillings, so it varies with time...prices of feeds go up especially during the dry season.” (Moses, Interview, January 2020)

There are few mitigation strategies that the participants have for reducing the risk of increases in the cost of inputs. In terms of feed, many participants try to ensure that they grow enough feed at their shamba to be able to store enough to last through the dry season, when the price of Napier increases. If it is known that additional feed will need to be purchased, doing so prior to the price increasing too high is the only

mitigating activity that can be conducted. In terms of livestock medicines, there are no mitigating activities conducted by the participants beyond ensuring the livestock are in good health so to reduce the need for medicines, which in turn however leads to a circling back to a risk in other inputs increasing in cost. Beyond this, price increases, particularly those which may not be fully expected are hard to mitigate against.

“For chicken feeds am trying to plant so that I can mix with soya, [to] make my own food instead of going to buy everything in the agrovet. You can produce even yours so if you buy small you mix so that you can have a large quantity. That’s another way of avoiding buying feeds at a higher price. And if it is cattle instead of buying their feeds you plant yours in the farm, and you buy a small quantity and you mix or you buy dairy meal and mix with Napier grass. Now those are just small supplements. The drug that you can’t avoid buying is for ticks, for deworming even if their prices are higher, you will just buy them.” (Sarah, Interview, February 2020)

The unexpected price increases, or even those which are expected such as seasonal increases in the price of feed, can drastically impact the livestock production on a shamba, and have knock on impact on the rest of the household budget. Either it can mean that the input can no longer be afforded, either at all or in the quantity required, or it may mean that the input is purchased regardless, but that other household expenditure needs can no longer be met.

“If you are not bold enough [increasing cost of inputs] can discourage you, you can stay for a month without spraying your livestock. You know, the law states that it should be weekly or fortnightly but due to high cost of the drug, it can make you spray your livestock after a month or two and by doing so, it makes the ticks have a high chance to affect the livestock and you will just see the livestock getting sick. Do you see how we are affected by high cost of life? Instead of deworming my animals after three months, because of the high cost of the drug I will take even one year or six months because I cannot afford to buy this drug after every three months or quarterly, you know. I am supposed to be giving my livestock salt called ultra-mix, it carries all these supplements, I won’t buy it because of the high cost, and by doing so, my livestock will be affected,

and milk production will become low, so that is due to high cost of items.”
(Gabriel, Interview, February 2020)

As established in previous chapters of the thesis, tight budgets that struggle to make ends meet is a significant concern for the participants. Rarely is there sufficient money remaining at the end of each month to allow for significant savings to be made. Profitability of livestock production is a vital component of peoples income portfolios, and increasing cost of inputs, if not matched with increasing sale prices of products, can have a significant negative impact on the homestead as this additional money has to be spent on livestock inputs in the place of other household spending such as food, education, and health care, or what could have been put towards savings.

8.1.1 Drought

Drought was the second greatest perceived risk. There were concerns of drought during the study period, and hence, the majority reported that they had experienced drought in the recent past. The participants perception of the likelihood of drought was also based on their recent experiences. Unusual rains during the study period led the majority to consider that drought was a likely event in the near future, and with the way the rains have been unpredictable in the past, with many experiencing drought in the past 5 years, the likelihood of it occurring into the future as well is thought to be high.

“...you can see this year the rains are going towards almost the end of the year, this is a time where there should be no rain, we expected it to come earlier so we don't know what will happen in the near future or when it is going to come, sometimes there is that likelihood that when the rains go sometimes longer, coming back it also takes time.” (Dan, Interview, January 2020)

Droughts cause many problems for the participants, many of whom rely heavily on crop agriculture and livestock production. Drought can lead to poor harvest, leading to an increased demand for napier grass, and this causes the cost of feed to increase as the demand for Napier grass in particular increases, and the supply falls due to poor harvests, as well as causing water sources to dry up, requiring extra time spent on collecting water from further afield. These concerns are not only limited to impacting

upon livestock production, but also the household itself, requiring increased spending on food for the family's consumption, as well as needing to collect their own water or even purchase it.

Irregularity of droughts has an impact on available feed stocks and on the ability to begin the process of planting the next crop.

“Nowadays even we farmers cannot predict which month we will plant, in the past while we were still kids, our parents used to prepare the farm and even plant on dry farm when it still hasn't rained, just by looking at the weather, they know that it will rain soon, in like 2 weeks' time, they then plant the crops and after 2 weeks, it begins to rain. Nowadays, you will plant your seeds and they rot on the soil... Whenever there is drought, we usually have water problem, we lack grass for cattle, vegetables, we delay planting and you know, whenever you delay planting, you run out of food that you had stocked last, so getting food to eat becomes a problem.”
(Henry, Interview, February 2020)

Speaking of a drought experience the previous year, Kevin explained the impact this had on his livestock production.

“It was so expensive getting cattle feed, we were forced to sacrifice a lot of time, we had to take them to graze far because we couldn't get feed from people's homestead, they had fed on all the straw...” (Kevin, Interview, February 2020)

The lack of available feed and water for livestock can have an impact on milk production in particular during drought season, and can result in a knock on effect of reduced yields. Not only can farmers face increased costs during drought, but income can also simultaneously reduce due to the impact.

“It usually affects us, as farmers, we do feel the effects of drought, there is no getting grass becomes a problem, if you are milking, milk production becomes low because of feeding style, water becomes less, it usually becomes hectic, it does affect me.” (Gabriel, Interview, February 2020)

Strategies implemented to mitigate the impact of drought, as like increasing cost of inputs the risk itself, is out of the control of the participants and cannot be mitigated

against directly, only indirectly through preparing for the potential impacts. Preparing feed stores that can be accessed during the dry season so to prevent the need for purchasing feed during this seasonal price increase is the primary mitigation method.

“The only thing we always do is purchasing water from outside then also, during harvest, there is a hole that we dug whereby maize stalk is being kept then can be used later on, it is preserved as hay. Whenever we harvest maize, we keep the maize stalk, we also borrow neighbours then put in a hole, when there is drought, we feed it to the cattle.” (Daisy, Interview, February 2020)

“One needs to plant livestock feed in plenty, at the day of harvest, dig a hole and put the grass that’s been harvested, then cover with a canvas, you will then be feeding it to cattle little by little.” (Benjamin, Interview, February 2020)

For some, such as Kevin, digging or deepening boreholes is an option to assist with water supply, though it cannot solve the problem entirely. Water may need to be purchased, though this again is not necessarily a reliable mitigation strategy as government water supplies can be subject to rationing throughout the year, especially in these times of drought.

“We lacked water too, we used to wake up at 2 am to go fetch water... we had to go early to fetch water at the water point, if you went late, you would miss water” (Kevin, Interview, February 2020)

Economically, in reference to reduced incomes that can be experienced due to reduced yields, no participant has a mitigation strategy such as saving money specifically to aid in meeting expenditure needs during this time. Planning crop production around a knowledge of impending drought can also lessen the impact. Beans, cassava, and sweet potato are hardy crops that are better able to withstand the dry period, and thus many participants ensure they grow and store these to help reduce the amount of food that will need to be purchased during the drought.

“When we know that there will be drought, we usually plant sweet potatoes and cassava, we plant foods that don’t dry fast when there is drought. In the month of April, we will have a hard time, there will be no food, so we

will depend on the sweet potatoes and cassava.” (Anita, Interview, February 2020)

An added difficulty here is that the drought period, often from December to February, though as has already been raised this can begin and end early or late, coincides with the beginning of the school year, when school fees must be paid. It is common for the participants to be behind on school fees, paying in increments and having children sent home from school until the balance can be paid. This adds an additional stress to the drought period.

8.1.1 Death of Livestock Due to Disease

Livestock death as a result of disease had a significant impact during the study period on the benefits that were able to be obtained from livestock production. Yet livestock death was not the risk which the participants perceived as the most likely risk to their production in the coming years. Death from disease ranked the 3rd most likely risk to occur, though the vast majority have experienced livestock death due to disease in the past, with 12 of the 13 participants experiencing it in the recent past.

The average perception of the likelihood of livestock dying from disease in the future reduced with the distance of time, from the near future, in 2 years' time, and in 5 years' time. Some participants believed that the season had a big impact on the likelihood of livestock dying from disease, whilst others believed that the threat of disease was a constant. The majority of participants understood factors that could influence the likelihood of disease in their livestock, whilst others believed there was no way to establish likelihood.

For some, the rainy season is the time associated with increased risk of disease, and of resulting livestock death.

“It is extremely likely [that livestock will die from disease], especially during this rainy season, if I don't take precaution. You know, right now it's raining, and crops are growing, tsetse flies are breeding, ticks and worms are also breeding during this rainy season, the foods that they eat is on the grass too, so it's extremely likely considering the current situation”. (Gabriel, Interview, 2019)

Moses on the other hand believes that the dry season is when there is the highest risk of livestock disease, particularly for chickens:

“It’s not extremely likely but somewhat likely, especially chickens, during the dry season, chickens usually die, disease spreads from nowhere.” (Moses, Interview, 2019)

The relatively poor level of care provided to chickens, as was established in chapter 6, was also considered a reason for the high level of mortality among chickens:

“For cattle, only one died, for chickens, many of them have died, this is because cattle and goats are taken good care of and they sleep in a nice shelter, I care for them”. (Moses, Interview, 2019)

Livestock death due to disease not only has an immediate impact due to reduced incomes or food sources, but also has a longer term impact as a result of the loss of the value of the livestock, and potentially it is exponential increase in value had it been able to produce offspring, and the risk that the death of one head of livestock due to disease can lead to many deaths through the spread of the disease.

With the death of chickens so common, as was established in chapter 6, a question of why this is not mitigated against was raised. Speaking of this situation Henry explained to us that it was largely due to managing manging disease within the constraints of free-roaming and continuous breeding:

“We usually give them antibiotics, because these chickens are free range, it is hard to administer medicines to them because most of these antibiotics are put in their drinking water, so when these chickens graze outside the compound, they can drink water outside, so it’s not easy for them to come and drink this water that has medicine in it. Secondly, ignorance or failing to be educated is what makes livestock like chickens to die because so many people do not know that chickens need to be vaccinated and they also do not know different types of vaccinations. When people are taught only about Newcastle vaccine, they [believe] that it will prevent the rest of the diseases. If my neighbour’s chickens die and my neighbour hasn’t been educated that chickens need to be vaccinated, in case I did not vaccinate mine, they will die too. You know, chickens hatch at different times, so, vaccinating the

chicks becomes so challenging. Let's say maybe you bought vaccine last week and vaccinated the chicks, then after a week another chicken hatches, it will be a burden to a farmer going again to bring another vaccine. For the ones that will not have been vaccinated, in case there will be an outbreak of disease, they will die. For the chickens that are always confined, you can administer the antibiotics easily, you can vaccinate them easily, for the chickens that are on free range, they give one a hard time.” (Henry, Interview, February 2020)

As Henry stated, our data showed that for those who did know which vaccinations were being given to the chicken were vaccinating their chickens with only Newcastle Disease vaccine. Newcastle disease was said to be the most prolific in Busia, and a lack of finance meant that for some participants choosing to vaccinate chickens only with Newcastle vaccine, when vaccination could be afforded at all, meant that the highest risk disease at least was mitigated against.

There are various ways in which death of livestock from disease can cause financial difficulty of the participants. Anita for instance suffered when her pregnant pig died unexpectedly after a short illness. Though a vet was called, they were unable to diagnose or treat the pig, and it died later that night, along with the unborn piglets. She said of the occurrence:

“It affected me so much because the pig had been bought at 12,000 shillings and it was also pregnant, it became ill shortly, we called a vet, but the pig died... [we were expecting that we] would get lots of income from it because piglets are normally sold at 1,000 shillings each. If the pig was still alive and gave birth, we would get lots of money from selling the piglets.” (Anita, Interview, February 2020)

Thelma, who's livestock production is primarily for subsistence, but also for the purpose of being sold when additional cash is needed for the household, primarily suffered with reduced milk consumption at the homestead, affecting the nutrition of her children. She had several livestock die during the study period, including 3 calves. The impact reduced the amount of milk she was able to get from her dairy cows, as without calves they were unable to provide milk for long.

“We were affected because we used to get milk. You cannot milk a cow when it’s calf has died because the cow is usually fierce at that time... We were affected because we couldn’t get milk for our children like we used to.” (Thelma, Interview, February 2020)

The loss of income from the sale of milk can have a significant impact on households, and reduce money that can be spent on important household needs. The year before the study Benjamin suffered from the death of a grade dairy cow after it caught Foot and Mouth disease. He said of the incident:

“We were not happy, mostly me because they helped me with payment of school fees for children, I would also [use] some of the money, do you get me? I didn’t feel good because they were good cattle, one cow used to produce 15 litres of milk per day, so I used to get 30, 31, or 32 litres of milk per day. That was good production.” (Benjamin, Interview, February 2020)

The year prior to this he had lost two grade dairy cattle to East Coast Fever, which again negatively affected his income. For many of the participants, livestock death due to disease is a constant occurrence year on year.

The mitigation strategies the participant utilise to reduce the risk of livestock death due to disease includes vaccinating animals, calling the vet to come to diagnose and treat the animals when the first signs of illness are noticed, and regular maintenance of tick spray to reduce the risk of tick-borne disease. Yet, as has already been established, these are all financial investments that not all the participants can afford to keep up to date with.

“Ensuring that their health is maintained, always ensuring that they are treated early enough, ensuring that they feed well. In case there is an outbreak of a disease, it’s normally dealt with as fast as possible so that livestock cannot be affected.” (Kevin, Interview, February 2020)

Accessing qualified vets can be limited by a lack of funds, lack of availability of the vet, and lack of knowledge of whether local ‘vets’ are indeed qualified. Scam artists are said to be a common problem, passing themselves off as vets when they in fact have no veterinary qualifications.

“I haven’t seen any vet in our area, the ones that are here aren’t qualified, these are people who can claim they know how to treat livestock and maybe they will treat your cow and the cow ends up dying. We are forced to get vets from Bumala, Matayos and Sega.” (Thelma, Interview, February 2020)

The need to look for qualified vets from further afield results in a higher cost of veterinary treatment as additional money must be spent on more expensive transport to get the vet to the property.

“We are forced to cater for everything, they charge a lot, motor bike transport to and from and treatment money, so they charge double. You are forced to spend more, let’s say you were to spend 500 shillings, you will be forced to spend 1,000 shillings.” (Thelma, Interview, February 2020)

The high rates of death of livestock due to disease during the study is undoubtedly contributed to by the high cost associated with veterinary care, and the regularity and cost of preventative measures such as tick spray.

8.1.1 Death of Livestock Due to Accidents

In chapter 6 of the thesis, it was established that death of livestock due to accidents played a significant role in lowering the profits attained by the participants and was a frequent occurrence. However, only 5 participants stated that they had experienced livestock death due to accidents in the recent past, and it was ranked as the second least likely risk to occur in the future. From the data collected during the study on livestock populations each month, it is known that in fact 12 of the 15 participants experienced livestock death due to accidents, 11 of whom were involved in the risk add-on module. This would make this the second most experienced risk in the recent past. This can potentially serve as a reminder as to why cross-sectional data collection may not always provide accurate results, and further prove the value of utilising longitudinal data collection methods. Most of the animals that died due to accidents during the study were chickens, many being chicks. The fact that relatively few participants recalled these in the cross-sectional questionnaire may suggest the relative lack of importance given to chickens.

Ten of the fifteen participants actually experienced more individual incidents of livestock dying from accidents than from disease during the study, though this was uncommon to occur in higher value livestock, such as cattle, goats, and sheep. For some participants the thought of considering the likelihood of livestock dying due to accidents was difficult, thought not to be the work of forward planning to decrease the likelihood of this to occur, but the work of a higher power that cannot be known. For others however there were known risks.

The participants who do see livestock accidents as a potential risk generally considered livestock to be most at risk of accidents due to busy roads. Of the risk Benjamin states:

“It’s likely, the first reason being, I live near the road, livestock might cross the road and get knocked by a passing motor bike or car, so while crossing the road with the cattle, one has to be careful, look right and left before crossing with them. That’s likely to happen.” (Benjamin, Interview, November 2019).

Others consider fighting between livestock or jealousy from neighbours to pose a threat. Sarah has dealt with bulls fighting in the past, and as a result mitigates this risk through castration.

“I had a bull which I sold, they used to fight from that side and they could easily injure anyone...For me, I am learned, I know these rules like if it is a cow I know I cannot keep two bulls that are of the same age together they will fight, so I rather castrate one and leave one uncastrated.” (Sarah, Interview, November 2019)

“It is possible [that livestock may die from accidents] because people are not the same, some are jealous. If they see someone’s livestock on their shamba, instead of calling the owner, he/she takes a stick and beats the livestock until it’s unable to walk. I have a cow here, it went to someone’s shamba, the owner beat it until the legs broke, the cow was a cross breed.” (Thelma, Interview, November 2019)

The most commonly referenced strategies used to reduce the chance of accidents involve ensuring shelters are secure, and ensuring feed is of good quality to reduce the chance of poor feed or rubbish in feed that can make the animals sick. Whilst all

participants referred to keeping a watchful eye over livestock and ensuring they get a good level of care as primary ways to prevent accidents, the high number of accidents that occurred, particularly among chicken, show that this knowledge may not be translating effectively into mitigation strategies.

8.1.1 Difficulty Selling Livestock Due to Disease

Considered to be of higher likelihood is difficulty selling livestock due to disease, although this was the least experienced risk in the past. Some participants expressed, or even experienced during the study, that they may need to sell diseased livestock if they are unsure of its survival. Keeping livestock that may not survive may be a financial burden that cannot be deemed worthwhile. The participants fell into two groups here. Those who believe that sick livestock must be sold quickly when they fall ill so as to reduce the chance of losing the livestock and the financial investment, and those who believed that sick livestock cannot be sold on, that instead they must be treated at the homestead and any financial loss is the responsibility of the farmer, not to be passed on to some unwitting stranger.

“It could be likely because you never know the extent to which a cow can be ill or you never know the extent to which the disease can be incurable, so when you don’t know the degree or the period of illness, you cannot have a surety if you will sell it or not. You know, it reaches a point where a cow can fall ill, then the vet recommends that it’s better for you to dispose it, just like the way we disposed the other one. So, you never know if it is going to happen, but if it does, the vet is the only one who will be able to know if it’s going to survive or not, so I can say that I do not have the surety of saying that I will never sell a cow if it falls ill, if the cow will fall ill, we will follow the recommendation from the vet.” (Emmanuel, Interview, February 2020)

Other participants do not believe that sick livestock can be sold, despite it meaning they may suffer a financial loss as a result.

“I can just say when there is an outbreak I can’t sell, am ready to accept the loss. Selling a sick cow? No, I just try to treat if it can’t get well, I let it die and bury.” (Sarah, Interview, February 2020)

“No, we cannot sell because that is our investment, we pray and hope that we succeed in this project, not that we sell due to disease, no. If a disease worsens, we just let the livestock die, we will just go ahead and bury it on the soil and it will act as manure, even these chickens, when they become more and more ill, we bury them... You have to treat first until they recover, if they fail to recover then that’s it, you have to try treating and hope that they will recover” (Roy, Interview, February 2020)

Livestock falling ill can have a significant impact on the ability to sell, as sick livestock are not attractive to butchers or farmers. Henry explained:

“It’s extremely likely because, firstly, you won’t sell that cow at the price that it would have been sold at if it was healthy because the buyer knows that the cow is sick, so he will give you a price that he wants. Secondly, most people do not like buying livestock that is ill, if the person who buys it has a butcher, the vets might test the meat, and if they find that it’s bad, they will not allow him to sell, so the person will encounter a loss.”
(Henry, Interview, February 2020)

Whilst many of the participants talked about how you cannot sell a sick animal, that you cannot pass that misfortune onto an unwitting customer, we saw several instances of this occurring during the study. For instance, Benjamin sold one of his dairy cows during the study as it had fallen ill and begun to lose its sight. Rather than risk having to deal with the cow deteriorating and possibly dying, he sold it to ensure he earned money from it. Animals which are clearly visibly unwell are much harder to sell even if the participants wanted to. There are no strategies to mitigate against being unable to sell livestock due to disease, beyond those previously mentioned to prevent illness in the first place by providing a high level of care with adequate feeds and providing veterinary care, including vaccinations against the most prevalent diseases.

8.1.1 Selling Livestock for a Poor Value

Considered to be less likely than difficulty selling livestock due to disease, but more experienced in the past, is having to sell livestock at poor market value, for reasons other than illness. Most often this had to do with the need to pay school fees, either needing to sell livestock to pay school fees and/or needing to sell in January/February

when many people are selling livestock to pay school fees, resulting in the market flooding and animals being sold for poor market values, or due to emergencies such as hospital fees or needing to pay for funerals. This most often is said to affect cattle, with lower value livestock actually experiencing an increase in market value around the Christmas period as people prepare for festivities.

“I can only [sell livestock for a low market value] in case of an emergency, you know there are some emergencies that occur and will force you to sell, maybe death of a member of a family, that can force you to sell at a low price because of the situation, but if there is no emergency, there is no need of selling livestock at a throw away price” (Emmanuel, Interview, February 2020)

“Even now as we are approaching December, a hen goes for 700 shillings and above, that’s the price I can sell it at because things have started changing. Today is 18th November, prices of livestock have started rising, even the price of chicken will hike but cattle price usually goes down because of school fees, immediately exam results are out, livestock prices start going down, but right now the prices are still good.” (Geoffrey, Interview, November 2019)

Beyond these situations, some had concern that future changes in the economy could lead to higher prices of most household needs, thus pushing people to sell livestock at low market values due to struggling to make ends meet. Selling livestock at low market values were otherwise considered to be unlikely, as there must be serious circumstances that lead to the sudden need to sell livestock, rather than waiting for the market to improve.

To mitigate selling livestock at poor market value then is to ensure good health of the animal, and holding onto livestock until the market price peaks. Selling for a low price, or what the participants tend to refer to as a throw away price, cannot always be avoided, however. When money is needed urgently, livestock are an easily liquidated asset, that can be sold to provide instant cash. In times of need, accepting a low price for livestock may be necessary if a higher price cannot be found.

8.1.1 Livestock Theft

The final risk, theft of livestock, was both considered to be the fourth most likely risk, and was the fourth most experienced risk among the study participants. Often it is the lack of jobs and finance among the youths that is said to be the cause of theft, and the run up to the Christmas period is often said to be the most likely time for livestock theft to occur, corresponding to a peak in the value of some livestock.

“My chickens have been stolen here more than thrice, so it’s extremely likely because the youth are unemployed and they want to survive, so they must steal for them to get money, that’s the reason theft cases will increase.” (Henry, Interview, February 2020)

“Livestock theft mostly happens during the month of December, that’s the time people used to steal cattle so that they can celebrate Christmas, some steal because they are greedy or because they have no source of income.” (Emmanuel, Interview, February 2020)

The loss of livestock, whether from death or from theft, has a significant impact on participants, due to the loss of the value of the livestock as an asset, but also in terms of the loss of the opportunity to earn income from the sale of livestock products. Nutritionally, theft of cattle can result in a reduction of the amount of milk consumed by a homestead, or particularly in the case of chickens, may increase the number needing to be purchased to eat when guests visit.

Chickens are the most commonly stolen livestock, and may on occasional be bought on credit from a neighbour. Emmanuel told of a time he had a chicken stolen:

“We were affected because we took the chicken as a loan and we had agreed with the seller to be paying him little by little, we came with the chicken, it laid only one egg then went missing. We had not yet finished paying the owner of the chicken, we had to clear the debt, we couldn’t stop paying because the chicken got stolen, so we got affected.” (Emmanuel, Interview, February 2020)

Henry is another participant to have had chickens stolen. For him, the concern was more about the loss of value of this easily liquidated asset, and the potential impact this can have when emergencies arise.

“Chicken is like a bank for us poor people, I told you that a child can fall ill, when you don’t have money to treat the child, you will walk up to the road, and someone will buy the chicken then you will be able to take your child to the hospital. When you have a visitor but you don’t have money and it’s a visitor that you respect, you will slaughter the chicken for him/her, he will leave your home so happy because he has eaten well, so when your chickens get stolen and a visitor comes to your home, how will you welcome him/her, in case of a little problem that doesn’t need a lot of money, how will you solve it? It affects greatly.” (Henry, Interview, February 2020)

The ways in which participants mitigate against livestock theft predominantly involve ensuring livestock are kept in secure shelters overnight, and the compound is surrounded by secure fencing.

“I try to keep livestock at a place where I can be able to check on them easily, ensuring that I build them a shelter that’s lockable, ensuring that I tether cattle at a place where when I wake up at night, I can be able to see them easily.” (Kevin, Interview, February 2020)

Beyond this many participants keep dogs and/or geese, which can alert to intruders. Others however have no mitigation strategies to reduce the risk of theft.

“There is no strategy for that, even when you decide to build a shelter for the cattle, when a thief decides to break into it, he will still do it. We just leave everything to God.” (Emmanuel, Interview, February 2020)

As has been established earlier in the thesis, many participants do not have secure shelter for their livestock. They can be excessively expensive to build, and so most either simply leave their livestock free on the compound, or have rudimentary shelter that keep the livestock inside during the night, but are not secure enough to deter thieves.

8.2 Discussion

In their systemic literature review of farmer risk perception and management strategies, Duong *et al.* (2019) found that of 197, the significant risks to agriculture are weather-related risks (55%), biosecurity threats (48%), and human risk (35%). Erratic rainfall and drought are the primary causes of risk to agriculture in Kenya (D'Alessandro *et al.*, 2015). Representing a production risk, severe drought has occurred in Kenya with increasing frequency over the past decade, as has year on year rain variability (*ibid*). These risks are particularly discussed within the literature (Thornton *et al.*, 2007; Rust and Rust, 2013; Dineshsingh and Nilotpal, 2014; Gashaw, Asresie and Haylom, 2014; Assan, 2015; Rojas-Downing *et al.*, 2017; Bahadur and Ali, 2018; Cruz *et al.*, 2018). Livestock disease is another particular risk to production in Kenya (D'Alessandro *et al.*, 2015), and has also attracted much research (de Vos *et al.*, 2011; Lean, Westwood and Playford, 2011; Garforth, Bailey and Tranter, 2013; Inamura, Rushton and Antón, 2015; Ahmed *et al.*, 2019).

The risks the participants considered most likely to occur in the future, and those that they had experienced most in the past, were increasing cost of inputs, drought, and livestock death due to disease. Representing market and production risks, these align with previous research of smallholder farmer risk perception which related to both crop and livestock production. These were also the top three risks that were experienced by the participants in the past. Theft of livestock, livestock death due to accidents, and having to sell livestock for a low market value were considered the least likely risks to occur.

In some cases, there appears to be a correlation between how likely the participants consider the risk to occur and whether or not the risk had been experienced in the past. The top three risks the participants considered the most likely to occur were also the top three most experienced, though in a different order. However, this is not the case for the risks the participants consider the least likely to occur. Despite having to sell livestock for a poor market value being considered the least likely risk to occur, with many stating that they would never sell for a 'throw away price' unless desperately necessary, and that this was unlikely to occur, it was actually the fourth most experienced in the past.

An interesting lesson learned from this study was that some participants had difficulty in comprehending how likely a risk may be to occur. For some, these risks are largely acts of God, something that is rarely discussed in the literature, if ever, but for some individuals can prove to be an important cultural factor affecting their perceptions. Irrelevant of past experience, some participants struggled to give their own perception of likelihood, as they saw risk likelihood as something only known to God, and that prayer was the best mitigation strategy. This is important to consider for two reasons. Within the literature, questioning study participants on risk likelihood is not unheard of, and it is unlikely that the participants of this study are the only ones who would have the above stated struggle with answering the questions. Secondly, understanding risk to be so deeply a result of God's actions can itself explain for some individuals why further mitigation strategies are not utilised. Some participants mitigate against some risks anyway, whilst others see less need to do so, irrelevant of past experience.

Previous research has found a variety of responses to various risk sources. In their systemic literature review, Duong *et al.* (2019) found that crop and livestock diversification, pest and disease monitoring and prevention, off-farm work, farm insurance, off-farm investment, debt reduction, produce at the lowest costs, and cooperation with other farmers, were the leading risk mitigation strategies.

To cope with production risks, diversifying production and selecting risk reducing inputs have often been given much importance (Hardaker, Anderson and Lien, 2004). Responses such as maintaining feed reserves to reduce the impact of drought is an often used mitigation strategy (Sonka and Patrick, 1984). An outdated recommendation of the past was for antibiotics to be regularly used in animal feed (Eidman, 1990). Ensuring access to information is an important factor in mitigating production risks, as knowledge of, for example, improved livestock breeds, production techniques, and weather forecasts are needed to enable better decision making (Hardaker, Anderson and Lien, 2004). In managing marketing risks, smallholder farmers may not be able to access certain strategies, such as options trading and minimum price contracts (Ullah *et al.*, 2016). However, government action in input markets can have a significant impact on market risk (Eidman, 1990). For financial risk, marketing strategies are often used to mitigate. Other studies have found financial record keeping, debt management, and maintenance of credit reserves (Woodburn, Ortmaa and Levin, 1995), and holding assets for sale to meet cash demands, and

maintaining liquid credit reserves (Eidman, 1990), are importance financial risk management strategies.

An overarching issue that the participants faced when it comes to implementing mitigation strategies, beyond the frequent concerns within the literature of access to knowledge or other barriers, was a lack of available finance with which to pay for these strategies. For instance, with regards to increasing cost of inputs, the participants saw little they could do themselves beyond pay the increased prices, whether this meant spending a higher proportion of income on inputs, reducing the amount of inputs used, or working to increase household income so that there was more available money with which to pay for inputs. In the case of drought, purchasing additional feed and/or storing feed grown at the household were often the strategies given. Improving water storage was infrequently given as a strategy, but this is highly expensive, especially relative to average incomes of the participants. To purchase additional feed during a drought also becomes very expensive as demand grows and prices rise, and storing additional feed requires additional crop input purchases, possibly even of land, and is itself an uncertain venture as harvests can be prone to being poor as a result of a variety of issues such as pests and hailstorms (a frequent occurrence during the study which was said to impact crop production). In the case of livestock death due to disease, veterinary care is thought of by many as being expensive. Whilst all the participants had a good understanding of when a vet should be called and what regular treatments should be given (for example tick spray), veterinary services and medicines were considered to be expensive, leading in some instances to participants self-diagnosing and treating their animals with antibiotics, without a full understanding of what was inflicting the animal.

Even the risks considered less likely were impacted by available finance. If income sources were higher, participants may not need to sell livestock at poor market values to cover the costs of healthcare and education in particular. If incomes were higher theft may be able to be reduced by the building of more secure housing or hiring of farm assistants for example. Death due to accidents may be able to be reduced by investing again in higher quality livestock housing, hiring of farm assistants, and creating a safer and more secure environment for the animals at the shamba.

CHAPTER IX: DISCUSSION

9.1 Methodology Overview

The research design employed by this study, the Financial Diary methodology, was chosen for use in this Ph.D. due to it being a mixed-method approach to collecting data in a way that has been deemed more appropriate to the collection of financial data from the world's poorest people (Collins *et al.*, 2009). Combining interview techniques with financial data collection over a longer period of time allows this methodology to track not only a person's finances, their incomes and expenditures, and changes in their financial provider usages and preferences, and find trends in this respect, but it also gives a great insight into the person's life as a whole. Longitudinal studies in the social sciences are vital to understanding social change and stability over time (Gayle and Lambert, 2018); they allow the research to uncover patterns and trends between participant results, which may falsely show heterogeneity in a cross-sectional study, and experience in time situations which may be uncommon and thus difficult to collect accurate data on in a cross-sectional study. By using qualitative and quantitative methods alongside each other, simultaneously during the data collection process, the methodology was able to dig deeper into the data in the moment, allowing a near total understanding of a situation, or opinion, at the time the data were collected. As stated by Sandelowski (2000) 'the complexity of human phenomena mandates more complex research designs to capture them', and this has been the benefit of using this mixed-method methodology.

The thesis has been able to provide a detailed account of the lives of smallholder livestock farmers, and analysis of the data has been able to show how smallholder livestock farmers in Busia County invest in their livestock production, how they have benefited from their production, intensified, and suggest whether intensifying livestock production is truly capable of raising people out of poverty.

9.1.1 Strengths of the Study

Utilising the Financial Diaries methodology, in the way it was adapted, in this study allowed for a deep understanding of the lives of each participants, beyond the confines of the research questions. It allowed for an understanding of who they are as people, how they interact with others, some of their likes and dislikes, goings-on in their life,

as well as a deep understanding of their livelihoods and livestock production. This is achieved through the use of the highly detailed cash flow statements and survey questions, but also by the simultaneous use of the more ethnographic methods of conversation with purpose and observation, and the rapport that was built with the participants. Repeat visits with the participants allowed for a continuous building of this understanding, and proved vital in answering the research questions. This understanding of the farmers as individuals played a significant role in the interpretation of the data and results, allowing more accurate connections to be made between data from different questions, such as matters relating to production decisions and risk.

9.1.2 *Limitations of the Study*

Recall Bias

The methodology utilised in this study involves recall periods of 1-month. Previous studies have found that recall of household consumption data over longer recall periods result in lower aggregate totals of food expenditure. When recalling large amounts of data for a longer period of time, participants can shift from summing total individual events to estimating overall totals (Beegle, Carletto and Himelein, 2012). Salience therefore can be an important factor in the collection of recalled data, and is affected by the unusualness of the event, the economic and social cost or benefit of the event, and the continuing consequences of the event (Bradburn, Sudman and Wansink, 2004). Longer recall periods have been linked to higher discrepancies between actual expenditure values and recalled values, however, when this data has been tested for accuracy, data suggests that the most accurate data were that with longer recall periods (when considering 1 week vs 1 month recall periods), and thus, researchers may often favour longer recall periods (Scott and Amenuvegbe, 1991)

In this study this has been mitigated by the fact that expenditures tend to be regular (such as daily purchase of sugar, or daily milk sales, the prices of which remain stagnant), and thus easily remembered, and by the collection of data on a per item basis. For instance, rather than asking how much was spent on food during the month, the question was posed in such a way that the purchase of each of the few items purchased during that time were collected by their dates individually. Other data, such

as the sale of a cow or a health care expenditure, tended to be less frequent and posed a significant burden on the household, and thus was more easily remembered.

However, despite mitigating this, it is likely that some incomes and expenditures were still forgotten. These are most likely to be the small, regular payments, such as forgotten purchases or amount spent on say tomatoes. They are unlikely to have amounted to a significant amount each month. The methodology did account for minor errors, but comparing the incomes and expenditures of the participants each month. Over the course of the study this amounted to an error of 10%. In the Kenyan Financial Diaries Zollmann (2014) calculated their error at 8%, and so the error in this study was deemed acceptable.

Paper-based data collection

During the planning stage of this study a question arose as to whether paper based data collection would be sufficient, or whether a phone/tablet based digital data collection tool should be created. The digitalisation of the financial diaries has been discussed by several organisations who have previously utilised this methodology.

In a blog post by Taro Works, a data solutions company that provided Catholic Relief Services (CRS) with a mobile data collection and analysis app, and cloud-hosted database for their 2015 study of their local savings and lending group in Kasama, Northern Zambia. CRS praised the belated creation of their digital data collection tools and cloud-based database for the breadth and depth of data their researchers were able to capture as a result (Chang, 2017). They had been paper-based until launching their digital tools in the 40th week of their more than two-year data collection period.

Chang (2017) lists the advantages of using mobile data collection and analysis tools that come from using financial technology (FinTech) in financial diaries data collection. These are: increased productivity as a result of the tracking of progress provided by such a data collection app; Improved data quality due to the data checks programmed into the diary survey on the app which reduce input errors or other anomalies, and the immediate data storage provided by the database; and reduced cost as a result of eliminating the need for data entry clerks.

Although the number of participants is lower in this PhD study than has occurred with other financial diaries (the CRS study involved 272 households for example), all data

entry, preparation, and analysis was done single headedly by me and the financial interviews were filled in by hand by the research assistant. Both these elements of data entry, particularly the entry of the financial data into SPSS, was very time-consuming.

On the other hand, the creation of a phone/tablet based tool would itself have been time consuming. The nature of the study meant that whilst there were regular sources of income and expenditures that could have been inputted into a tool prior to the beginning of data collection, much of the data collected would have been difficult to have preconceived. The datasets themselves had to be severely edited during the first few months of data collection to account for the types of variables that were being collected. By using paper based surveys, new variables could be added, notes could be made directly within the survey where there was confusion as to how best to add the variable to the dataset, and the checking of previously collected data was simple to do in the field. On the other hand, using paper based collection meant much time had to be spent copying the data into SPSS spreadsheets, something that took far more time than expected, and resulted in significant delays in the data being transferred and analysed. This resulted in significant delays to the project timeline.

Large Amount of Data Collected

The methodology implemented in this study involved the collection of a wide range of data, relating to a wide range of situations, which was often over-whelming, and made data entry and analysis an incredibly lengthy process. A large number of interesting situations arose during the study, which made it difficult to keep focus on the original research questions at times, and difficult to establish what was really important to the overall study. Analysing the data was as much an art form as a technique, which was learned along the way. Knowing so much information about the participants resulted in a large amount of summary statistics used, especially due to the small sample size and goal of the thesis to be to explain livestock intensification at a personal level. This was difficult to prevent.

Withholding of Information by Participants

It was expected in the planning of this study, that given the sensitive nature of the data collected, there was a likelihood for the participants to withhold information at times. This is unavoidable in any study. For instance, participants may have spent money on something they did not want to share, or a situation may have occurred that they did

not want to tell researchers. The way this was mitigated against, to reduce as much as possible, was to ensure that a rapport was built between participants and the researcher and field assistant to ensure a sense of trust. Other than this, the calculating of the difference between incomes and expenditures each month allowed the author to ensure that even if information was being withheld, this difference was not exceeding an acceptable level.

Small Sample Size

This study utilised data from 15 participants. Whilst this did reach saturation as described in the methodology, it did mean that for the quantitative data results are based on a small number of participants. This has meant that the data cannot be extrapolated to the wider community. Whilst this is common for smaller qualitative studies, it means that data was highly affected by outliers. This is evident when data were described at cluster level, where Daisy represented the only participant in cluster 4, which was described as the outlier cluster in chapter IV. The participants represented farmers with a range of levels of intensification. In clustering them, the study was able to determine classifications for the participants, but these classifications apply only to these participants as calculated against each other, and not the wider community,

9.2 How Does Livestock Benefit the Participants?

From the data collected in this study, there is no one simple answer to how livestock intensification contributes to farmers' livelihoods. To begin, there are a variety of ways in which livestock production *can* contribute to livelihoods, including generating income, providing food, strengthening social ties, acting as investments and savings, and for use in cultural ceremonies (FAO, 2020). Some of these, namely generation of income, providing food, and acting as investments and savings are more easily quantifiable than the others. They have a measurable monetary value. This study did not attempt to quantify the intangible benefits that could be derived from owning livestock, and instead focused on the tangible benefits in a monetary sense, as this fits sufficiently with understanding livestock production within the context of the Kenyan government's desire to intensify livestock production to meet the growing demand for livestock products, whilst simultaneously raising the farmers out of poverty.

In addition to generating income, all participants consumed livestock products at the homestead. Most of the participants only consumed their livestock when a valued guest was visiting the homestead. This represents a social benefit to livestock production. The social benefit here then was negated by the fact that the farmers kept chickens to feed guests, they were purchased to feed guests. Whilst social benefits of livestock in the case of weddings is valuable to the participants, it did not occur often. Compared to the frequency of weddings that were attended by the participants, it suggests that livestock were only gifted to those closest to the participants, and that the gifting of livestock is not always done, with some people gifting other items instead. Not only did this provide nutrition for them and their families, but it also constituted as a saving from the purchase of milk. For meat usually consumed by the homestead, the participants usually purchased it from local markets and butchers, with beef, omena, and fish, the latter two in particular, being purchased regularly as they were cheaper sources of animal protein than livestock.

The majority of livestock that were sold during the study period were sold either with a specific purpose, such as to fund property building or paying school fees, or for sudden and unexpected expenditure requirements such as medical fees. Two participants sold livestock due to illness. This is obviously a serious concern regarding the spread of animal diseases. Smaller livestock like chicken were beneficial for small, unexpected expenditures, as they could be sold easily, and the value is low.

The participants livestock did act as a form of savings, which could be bought in times of higher incomes and sold when need arose, but for most, this was a last resort, rather than a planned strategy.

9.3 Barriers to Intensification

The primary barrier to intensifying livestock production rapidly is that many of these farmers are simply too poor, and have too many expenditure needs to be able to consistently allocate income received to livestock production. The rising cost of inputs, which was considered to be the most likely risk to occur in the future, further hampers attempts to intensify, and results in people purchase these in smaller quantities and at more distant intervals (e.g., increasing the length of time between spraying cattle for ticks, and reducing the amount of feed supplements and commercial feed provided).

For those who had higher yielding livestock at the beginning of the study, the cost of production is not increased, but results in much higher profits than for those who did not.

Considering the high rate of chicken mortality, it is possible that the cost of building a contained shelter to reduce accidents and the spread of disease from other roaming chickens, which in turn could lead many of the participants to make a profit from their livestock production, can be prohibited expensive. Thelma spent 11,000ksh on her chicken pen, which if calculated using the lower end value for a chicken in Busia of 400ksh, equates to the cost of 27.5 chickens. Whilst in the long term this money could be made back in resulting in increased flock sizes that could be sold, it exceeds the value of chicken mortality (through both disease and accidents) for 8 of the participants. Restocking of livestock, either after death or after it was sold, was a factor that resulted in the participants in cluster 2 spending so much of their livestock expenditure on purchasing livestock. Again, these can both be linked back to insufficient income.

A key issue with considering improving access to finance to assist with livestock intensification is that money earned and saved is subject to a host of competitive needs for farmers. Ten out of fifteen participants had at least 1 financial liability, and for the majority the sum balances of all assets and liabilities hovered around 0ksh throughout the study period. The initial interview showed how many of the participants feared taking loans, due to an acknowledgement that they would struggle to repay them, and did not want to face the repercussions of defaulting on the loan. To increase people's access to more loans may be a struggle due to a lack of demand, but would also further stretch their already insufficient incomes. Improving education through investment in livestock extension and education materials (perhaps radio, TV, and YouTube for instance) would provide better outcomes.

9.4 Recommendations

It is clear from this study that smallholder livestock farmers need assistance if they are to intensify in a way that can produce enough to meet growing demand, and earn a sufficient income to raise them out of poverty and increase their standard of living. Whilst financially there are often significant profit margins involved in the participants

livestock production, these often relate to low value incomes, which whilst contributing to the participants livelihoods, do not equate to sufficient income to ensure a secure a large enough income that can make ends meet.

The overarching theme that summarises this research, is that smallholder farmers struggle to intensify for a number of reasons, largely coming down to their lack of incomes and inability to regularly access required inputs (including higher yielding cattle). Access to education for livestock farming is also poor, with insufficient extension provided, and thus for the majority of the participants this education comes only from friends and family.

Simply providing these participants with more loans is unlikely to solve the issue. Many of them are already heavily in debt, and expressed a fear of taking loans due to the knowledge that they would struggle to repay them, and that they will create yet another financial burden that needs to be met.

It is not money in itself that is required, but inputs and higher yielding livestock, and it is not only an issue that these people lack in financial capital, but that they are burdened by this in such a way that providing loans may only exacerbate the issue.

Something that came to light in this study is the extent to which the participants, from all clusters and of all levels of wealth, appreciate informal groups for financial services due to liking what was referred to in this thesis as ‘community spirit’. They enjoy coming together with others to discuss their finances, and having a sense of building themselves up together. This same model may benefit the participants in terms of their livestock. The co-operative model could work here. There had been co-operatives in Busia before, but no participant was aware of any at the time of the study.

An example of one co-operative that had existed was the Nambale Dairy Co-operative. Two participants had used this dairy in the past, being able to take their milk there daily to receive a daily income, providing a secure market for their milk. However, the co-operative is said to have collapsed suddenly, with many farmers left owed money. A similar situation occurred for Daisy. She was in a group, though she believed it to be a SACCO, which invested in commercial chicken production. Incubators were purchased to hatch the groups own chicks, and the market organisation identified.

Providing a market is a necessity if smallholders are to intensify. Whilst there was no issue with accessing customers at the time of the study, there appeared to be a limited informal market of neighbours and local restaurants. If farmers in Busia more widely were to intensify their production, they'd come a point when the market would become flooded.

A co-operative model has been suggested as the best way to organise smallholder farmers who suffer from few low yielding livestock, and who lack market access, knowledge, and power (Mirdamadi *et al.*, 2011), given the right government framework and policies were put in place (Poulton, Dorward and Kydd, 2010). From cooperatives farmers would be able to sell their produce, but it could also provide services such as workshops (something that many enjoyed during the study, often with the church), and providing access to higher yielding livestock in a similar format to One Acre Fund, with livestock provided on loan, with the money repaid from profits.

Within the literature studies have found co-operative membership to improve the commercialisation behaviour of smallholder farmers (Bernard and Spielman, 2009; Markelova and Mwangi, 2010), thus improving farm productivity and increasing farm income (Timmer, 1997). Co-operatives have also been shown to strengthen farmers negotiation ability, resulting in reduced transaction costs and information asymmetry (Hellin, Lundy and Meijer, 2009; Trebbin, 2014), and improve gender relations (Baden and Pionetti, 2011).

Without access to higher yielding livestock, financial capital with which to purchase inputs, and potentially stronger markets, it is my opinion that smallholder livestock farmers in Busia will be unable to intensify their production sufficiently to improve livelihoods to any strong degree.

This study has contributed significantly to the literature by considering intensification of livestock production from a small, longitudinal, qualitative standpoint, allowing an understanding of these farmers as people, and not simply a line of data for whom all context of who they are, and their lives is lost. It has contributed not only to the literature related to the intensification of livestock production, but also to the literature of smallholder livelihoods more widely.

9.5 Future Research Opportunities

Whilst the amount of data collected caused some problems in the analysis and write up of this thesis, it has resulted in a number of opportunities for further thematic research. For instance, participants with common data trends could be further analysed to compare the strategies that differentiated those who had more profitable milk production with those who had lower profits. Participants who focused more heavily only lower value livestock such as chickens, pigs, and goats could be compared against those who focused more on dairy cattle to understand the role of livestock in their livelihoods. And finally, further analysis could be conducted to compare interview and conversation data with cash flow statement data, such as comparing financial data relating to risk mitigation strategies to interviews that provide an understanding of how the participants consider risk. The results from this thesis alone will be used in the production of multiple peer-reviewed journal articles.

Future studies may wish to take inspiration from this Ph.D., to collect data regarding livestock intensification utilising the Financial Diaries methodology. Whilst this study reached saturation, exceeding the average of 12 interviews required as evidenced by Guest and Johnson (2006) and Hennink and Kaiser (2022), enhancing the quantitative financial data to discover further trends would help to solidify understandings and create a dataset large enough for data to be extrapolated across the whole of Busia County.

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APPENDICES

Appendix A: Consent Forms



Institute for Risk
and Uncertainty



PARTICIPANT CONSENT FORM- Initial Interview

This project is part of a PhD study researching the financial and social aspects of intensification and commercialisation of livestock production in western Kenya. The PhD is completed from the University of Liverpool, and is being hosted in Kenya by the International Livestock Research Institute (ILRI), which works around the world to develop and improve the role livestock play in food security and poverty alleviation.

The purpose of this initial questionnaire is to gather more information about what type of financial services each member of the homestead uses.

I give my written consent that ILRI and the University of Liverpool can use the data I provide, and understand/ confirm the following:

- I understand what is required of participants of the study. I have had a chance to consider the information Ellie has given me about the study, ask questions, and have had these questions answered.
- I understand that the participation of each member of the homestead is voluntary, and that we have the right to withdraw from the research at any time without giving reason. I understand that there will be no consequences to choosing to leave the study or removing any consent.
- I understand that I can ask for access to my data at any time, and that I can request for the destruction of my data at any time.
- I understand that in the findings of the results, every effort will be made to retain our confidentiality and anonymity, and that personal information will not be published.
- I understand that data collected from my homestead will be kept safely by Ellie on the M drive (remote storage on the university system).
- I understand that at the end of Ellie's study period, she will make summaries of the data collected (though not including any identifiable information) available to ILRI and FSD Kenya, which may then be used by other researchers in studies that they publish on the internet.
- I understand that personal information given during this study will not be shared with anyone else.
- I have been provided with Ellie's personal contact number, which can be used at any time to ask questions relating to the study and to remove consent that I have previously granted.

Participant:

Date:

Signature:

Researcher:

Date:

Signature:



Institute for Risk and Uncertainty



Ellie- 0703596573

PARTICIPANT CONSENT FORM- Screening Survey

This project is part of a PhD study researching the financial and social aspects of intensification and commercialisation of livestock production in western Kenya. The PhD is completed from the University of Liverpool, and is being hosted in Kenya by the International Livestock Research Institute (ILRI), which works around the world to develop and improve the role livestock play in food security and poverty alleviation.

The purpose of a screening survey is to gather some background information about your homestead to see whether your production is suitable for this study. The survey will ask questions relating to the homesteads demographics, access to finance, livestock ownership, and income sources.

I give my written consent that ILRI/University of Liverpool can use the data I provide, and understand/ confirm the following:

- I understand what is required of participants of the study. I have had a chance to consider the information Ellie has given me about the study, ask questions, and have had these questions answered.
- I understand that the participation of each member of the homestead is voluntary, and that we have the right to withdraw from the research at any time without giving reason. I understand that there will be no consequences to choosing to leave the study or removing any consent.
- I understand that I can ask for access to my data at any time, and that I can request for the destruction of my data at any time.
- I understand that in the findings of the results, every effort will be made to retain our confidentiality and anonymity, and that personal information will not be published.
- I understand that data collected from my homestead will be kept safely by Ellie on the M drive (remote storage on the university system).
- I understand that at the end of Ellie's study period, data collected (though not including any identifiable information) will be made available to ILRI and University of Liverpool, and results will be sent to FSD Kenya, which may then be used by other researchers in studies that they publish on the internet.
- I understand that personal information given during this study will not be shared with anyone else.
- I have been provided with Ellie's personal contact number, which can be used at any time to ask questions relating to the study and to remove consent that I have previously granted.

I consent to taking part in the screening survey, but do not want to participate in the larger study

I consent to taking part in the screening survey, and give permission to be contacted to take part in the larger study

Participant:

Date:

Signature:

Researcher:

Date:

Signature:

Ellie Balchin- 0703596573

PARTICIPANT CONSENT FORM- Monthly

This project is part of a PhD study researching the financial and social aspects of intensification and commercialisation of livestock production in western Kenya. The PhD is completed from the University of Liverpool, and is being hosted in Kenya by the International Livestock Research Institute (ILRI), which works around the world to develop and improve the role livestock play in food security and poverty alleviation.

As part of this project, we will be asking you to participate in financial interviews, supplementary 'add-on module' interviews and questionnaires, ethnographic interviews, and observation. Please indicate which of these research methods you are willing to consent to.

<input type="checkbox"/> Financial interviews	<input type="checkbox"/> Add-on modules	<input type="checkbox"/> Ethnographic interviews
<input type="checkbox"/> Observation		

I give my written consent that ILRI and the University of Liverpool can use the data I provide, and understand/confirm the following:

- I understand what is required of participants of the study. I have had a chance to consider the information Ellie has given me about the study, ask questions, and have had these questions answered.
- I understand that the participation of each member of the homestead is voluntary, and that we have the right to withdraw from the research at any time without giving reason. I understand that there will be no consequences to choosing to leave the study or removing any consent.
- I understand that I can ask for access to my data at any time, and that I can request for the destruction of my data at any time.
- I agree for the Ellie and Phyllis to visit my homestead at least once a month for 12 months.
- I understand that in the findings of the results, every effort will be made to retain my confidentiality and anonymity, and that personal information will not be published.
- I understand that data collected from my homestead will be kept safely by Ellie on the M drive (remote storage on the university system).
- I understand that at the end of Ellie's study period, she will make summaries of the data collected (though not including any identifiable information) available to ILRI and FSD Kenya, which may then be used by other researchers in studies that they publish on the internet.
- I understand that at the end of Ellie's study period, all non-personal data will be made open access to ILRI and University of Liverpool.
- I understand that personal information given during this study will not be shared with anyone else.
- I have been provided with Ellie's personal contact number, which can be used at any time to ask questions relating to the study and to remove consent that I have previously granted.

Participant:

Date:

Signature:

Researcher:

Date:

Signature:

Ellie Balchin- 0703596573

PARTICIPANT CONSENT FORM- Photography and videography

This project is part of a PhD study researching the financial and social aspects of intensification and commercialisation of livestock production in western Kenya. The PhD is completed from the University of Liverpool, and is being hosted in Kenya by the International Livestock Research Institute (ILRI), which works around the world to develop and improve the role livestock play in food security and poverty alleviation.

The purpose of using photos and videos in this study is to provide a visual representation to some of the data. Photos will not include any identifying yourself (e.g. will not include your face).

I give my written consent that ILRI and the University of Liverpool can use the data I provide, and understand/confirm the following:

- I understand that the participation of each member of the homestead is voluntary, and that I have the right to withdraw my consent for the use of photographs and videos at any time without giving reason. I understand that there will be no consequences to choosing to do so.
- I understand that I can ask for access to my data at any time, and that I can request for the destruction of my data at any time.
- I understand that data collected from my homestead will be kept safely by Ellie on the M drive (remote storage on the university system).
- I understand that Ellie will use any of the photos and videos taken during the study in the publication of reports, articles, and her thesis.
- I understand that images used by Ellie in her publications may in turn be used by other organisations (namely ILRI and FSD Kenya) in their own publications.

I give my consent for the use of the following methods:

Photography | Videography

Participant:

Date:

Signature:

Researcher:

Date:

Signature:



Institute for Risk and Uncertainty



Ellie Balchin- 0703596573

PARTICIPANT CONSENT FORM- Audio- recording

This project is part of a PhD study researching the financial and social aspects of intensification and commercialisation of livestock production in western Kenya. The PhD is completed from the University of Liverpool, and is being hosted in Kenya by the International Livestock Research Institute (ILRI), which works around the world to develop and improve the role livestock play in food security and poverty alleviation.

The purpose of using photos and videos in this study is to provide a visual representation to some of the data. Photos will not include any identifying yourself (e.g. will not include your face).

I give my written consent that ILRI and the University of Liverpool can use the data I provide, and understand/ confirm the following:

- I understand that the participation of each member of the homestead is voluntary, and that I have the right to withdraw my consent for the use of photographs and videos at any time without giving reason. I understand that there will be no consequences to choosing to do so.
- I understand that I can ask for access to my data at any time, and that I can request for the destruction of my data at any time.
- I understand that data collected from my homestead will be kept safely by Ellie on the M drive (remote storage on the university system).
- I understand that Ellie will use the audio-recording for the production of transcripts, which will be translated, so that she is able to read the full account of the interview.
- I understand that quotations from the transcripts may be used in the thesis and any journal articles written for this study.

I DO give my consent for my interview to be audio-recorded

I DO NOT give my consent for my interview to be audio-recorded

Participant:

Date:

Signature:

Researcher:

Date:

Signature:

Appendix B: Sampling Survey

SAMPLING SURVEY

<u>Date</u>	
<u>Time</u>	
<u>Homestead ID</u>	
<u>Homestead coordinates</u>	

SECTION 1: TO BE ANSWERED BY THE HEAD OF THE HOMESTEAD OR OTHER KNOWLEDGABLE ADULT

Domestic Unit Demographics

D1 Member ID	D2 Name	D3 Chosen alias (for write up purposes)	D4 Relationship to homestead head	D5 Gender	D6 Age	D7 Marital status	D8 Highest grade attended	D9 Currently in school	D10 Contribute to the homestead income	D11 Primary Employment	D12 Participate in homestead livestock activities	D13 Own livestock
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

I3: 1=Head, 2= spouse, 3= son/daughter, 4= step-son/daughter, 5= grandchild, 6= father/mother, 7=parent in law, 8= brother/sister, 9= other relative, 10= not related, 98= don't know

I6: 1= Single/ never married, 2= married, 3= divorced/ separated, 4= widowed, 5= living together/ cohabiting, 98= don't know

I7: 1= No formal schooling, 2= informal schooling only, 3= Primary 4= intermediate, 5= secondary, 6= polytechnic/ college, 7= university undergraduate, 8= university post-graduate, 98= don't know

D14: How do you define a domestic unit?

D15	
Largest source of income over previous 12 months	
Earning money from regular job	1
Earning money from occasional job	2
Running a business (not livestock)	3
Getting money from family or friends	4
Growing crops and selling them	5
Rearing livestock and selling produce	6
Other	7

D16	
Smallest source of income over previous 12 months	
Earning money from regular job	1
Earning money from occasional job	2
Running a business (not livestock)	3
Getting money from family or friends	4
Growing crops and selling them	5
Rearing livestock and selling produce	6
Other	7

D17 Minimum amount needed to survive each month (KES): _____

D18 Homestead total monthly average income (KES): _____

D19 Languages spoken: _____

D20: Are you hoping to increase your livestock production, either by increasing numbers or by improving inputs (improved breeds, improved feeds etc)?

No	1
Yes	2

**SECTION 2: TO BE ANSWERED BY EACH ADULT MEMBER OF THE
HOMESTEAD INDIVIDUALLY**

HH MEMBER ID:

DATE:

TIME:

Access to land

A1. How many parcels do you currently own/rent/borrow/have access to? _____

A2. How many hectares is each parcel of land?

Parcel 1: _____

Parcel 2: _____

Parcel 3: _____

Parcel 4: _____

Parcel 5: _____

Parcel 6: _____

Parcel 7: _____

A3. What is the land tenure system that each parcel is under?

Parcel 1: _____

Parcel 2: _____

Parcel 3: _____

Parcel 4: _____

Parcel 5: _____

Parcel 6: _____

Parcel 7: _____

A4. What is the current use of each parcel?

Parcel 1: _____

Parcel 2: _____

Parcel 3: _____

Parcel 4: _____

Parcel 5: _____

Parcel 6: _____

Parcel 7: _____

A5. Do you now own/rent/borrow/have access to more or less land than you had 5 years ago?

More	1
Same	2
Less	3

Access to finance

F1. Do/.have you had an account/ membership with the following provides

Financial Provider	At present	In the past 3 years	In the past 5 years
Bank			
Microfinance Institution			
SACCO			
Cooperative			
Mobile Money			
M-Shwari			
VLSA			
ROSCA			
ASCA			
Informal money lender (e.g. shop keeper, village elder who lends money)			
Shylock			
Borrowing money from family or friends			
Savings money in a secret place			
Other:			

Livestock Rearing- present

Beef Cattle

1. Do you own beef cattle at present? Yes No
2. Are they grade/indigenous/mix? Grade Indigenous Mix
3. If grade, do you know what breed?

4. How many? _____
5. Where do they stay during the day time?

In their shelter Grazing on the compound Grazing outside the compound Other

- Other: _____
- Explain: _____

6. Where do they stay during the night time?

In their shelter In another building In the house
Free in the compound Other

- Other: _____
- Explain: _____

7. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

8. Do you hire labour to help you care for these animals? Yes No

Dairy Cattle

9. Do you own Dairy cattle at present? Yes No

10. Are they grade/indigenous/mix? Grade Indigenous Mix

11. If grade, do you know what breed?

12. How many? _____

13. Where do they stay during the day time?

In their shelter Grazing on the compound Grazing outside the compound Other

- Other: _____
- Explain: _____

14. Where do they stay during the night time?

In their shelter In another building In the house

Free in the compound Other

- Other: _____
- Explain: _____

15. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

16. Do you hire labour to help you care for these animals? Yes No

Chickens

17. Do you own chickens at present? Yes No

18. What are they for? Meat Eggs Mix

19. Are they grade/indigenous/mix? Grade Indigenous Mix

20. If grade, do you know what breed?

21. How many? _____

22. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

23. Where do they stay during the night time?

In their shelter In another building In the house
Free in the compound Other

- Other: _____
- Explain: _____

24. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

25. Do you hire labour to help you care for these animals? Yes No

Goats

26. Do you own goats at present? Yes No

27. What are they for? Meat Dairy

28. Are they grade/indigenous/mix? Grade Indigenous Mix

29. If grade, do you know what breed?

30. How many? _____

31. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

32. Where do they stay during the night time?

In their shelter In another building In the house
 Free in the compound Other

- Other: _____
- Explain: _____

33. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

34. Do you hire labour to help you care for these animals? Yes No

Pigs

35. Do you own pigs at present? Yes No

36. Are they grade/indigenous/mix? Grade Indigenous Mix

37. If grade, do you know what breed?

38. How many? _____

39. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

40. Where do they stay during the night time?

In their shelter In another building In the house
 Free in the compound Other

- Other: _____
- Explain: _____

41. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

42. Do you hire labour to help you care for these animals? Yes No

OTHER 1:

43. Do you own at present? Yes No

44. Are they grade/indigenous/mix? Grade Indigenous Mix

45. If grade, do you know what breed?

46. How many? _____

47. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

48. Where do they stay during the night time?

In their shelter In another building In the house
Free in the compound Other

- Other: _____
- Explain: _____

49. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

50. Do you hire labour to help you care for these animals? Yes No

OTHER 2:

51. Do you own at present? Yes No

52. Are they grade/indigenous/mix? Grade Indigenous Mix

53. If grade, do you know what breed?

54. How many? _____

55. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

56. Where do they stay during the night time?

In their shelter In another building In the house
 Free in the compound Other

- Other: _____
- Explain: _____

57. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

58. Do you hire labour to help you care for these animals? Yes No

OTHER 3:

59. Do you own at present? Yes No

60. Are they grade/indigenous/mix? Grade Indigenous Mix

61. If grade, do you know what breed?

62. How many? _____

63. Where do they stay during the day time?

In their shelter Inside the compound Outside the compound Other

- Other: _____
- Explain: _____

64. Where do they stay during the night time?

In their shelter In another building In the house
 Free in the compound Other

- Other: _____
- Explain: _____

65. What do you feed them? (multiple answers OK ranked: 1= most)

Commercial feed	
Vegetation from own compound	
Vegetation purchased from outside	
Scraps	
Do not provide feed	
Other	

- Other: _____
- Explain: _____

66. Do you hire labour to help you care for these animals? Yes No

Income Sources

I1: What income sources are you currently receiving?

		<u>I1: Member ID</u>		
	<u>Source</u>	<u>Is this a regular job, full time job, part time job, or irregular job?</u> (1. Full time, 2. part-time, 3. irregular)	<u>Does this provide regular income?</u> (1. Monthly, 2. Fortnightly, 3 Weekly, 4. Daily, 5. Irregular)	<u>Av. Monthly income from this source</u>
<u>1</u>				
<u>2</u>				
<u>3</u>				
<u>4</u>				
<u>5</u>				
<u>6</u>				

Appendix C: Initial Interview

Initial Questionnaire

Financial devices

<u>Date</u>	
<u>Time</u>	
<u>Homestead ID</u>	

- All available adult members of the homestead to answer separately
- Below is the entire questionnaire. Since different homesteads will use different providers, for data collection this will be adapted to only include providers and number of accounts used by the homestead (as data collected by the sampling survey)
- During the follow up questionnaires if a new account is opened with any of the providers, relevant questions will be asked accordingly at the time.
- Estimated completion time: Up to 1hr (dependant on number of financial devices utilised by each member)

Have

Bank Account

1. Please remind us from the previous time we questioned you, do you currently have a bank account?
2. What is the name of the bank you have an account with?
3. When did you open this account?
4. Which services do you have from your bank account currently?

Savings
Money Transfers
Insurance
Loans
Deposits/ withdrawals
Other
Don't know

Savings

(If yes)

5. What is the name of the savings account?
6. When did you open the savings account?
7. How much and how often do you add savings to the account?
8. What are you saving for?
9. For what reason did you want to open a savings account at the bank rather than another provider?
10. Are you happy with your savings account and why?
11. Is there anything you don't like about your savings account?

(If no)

12. Would you like a savings account at the bank and why?
13. Why do you not have a savings account at the bank?

Money Transfers

(If yes)

14. Who do you send/ receive money transfers to/from?
15. Do you use this service often?
16. When was the last time you made a money transfer?
17. Are you happy with the money transfer service and why?
18. Why do you choose to do money transfers through the bank and not another provider?
19. Are you happy with this service?
20. Is there anything you don't like about doing money transfers through the bank?

(If no)

21. Would you like to use your bank account for money transfers?
22. Why would you like to use your account for money transfers?
23. Why do you not use your account for money transfers?

Insurance

(If yes)

24. What type of insurance does your bank offer you? (*e.g. agricultural/ home contents/ car/ phone etc*)

Health
Agriculture
Livestock
Life
Vehicle
Other

25. When did you take out this insurance?
26. How much and how often do you have to pay for this insurance?
27. Have you claimed from this insurance yet?
28. What happened for you to make this claim?
29. What did you receive from the insurance?

30. Did your premiums since increase?
31. How much did it increase by?
32. Why did you choose to take insurance from this provider rather than another?
33. Are you happy with your insurance through the bank and why?
34. Is there anything you don't like about your insurance policy?

(If no)

35. Would you like insurance through your bank?
36. What type of insurance would you like?

Health
Agriculture
Livestock
Life
Vehicle
Other

37. Why would you like this insurance?
38. Why do you not have insurance from this provider?

Loans

(If yes)

39. When did you take out this loan?
40. How much did you take as a loan?
41. How long is the repayment period total?
42. How many months of repayments do you have remaining?
43. What is the interest rate?
44. What is the reason you took this loan?
45. Have you spent all the money?
46. How much do you have remaining?
47. What did you end up spending the money on?
48. Why did you choose to take a loan through the bank rather than another provider?
49. Are you happy with this loan, and why?

50. Is there anything you don't like about this loan service?

(If no)

51. Would you like a loan through your bank?

52. Why would you like a loan through your bank account?

53. Why do you not have a loan through your bank?

Deposits/ withdrawals

(If yes)

54. What do you tend to use this service for?

55. How often do you deposit and withdraw money?

56. When was the last time you made a deposit/ withdrawal?

57. Why do you choose to do deposits/withdrawals through the bank rather than another provider?

58. Are you happy with this service and why?

59. Is there anything you don't like about this service?

Microfinance

60. What is the name of the microfinance institution you are with?

61. Do you currently have a microfinance loan?

62. When did you take out this loan?

63. How much did you take as a loan?

64. How long was the repayment period total?

65. How many months of payments do you have remaining?

66. What is the interest rate?

67. Have you spent all the money?

68. What is the reason you took this loan?

69. What did you spend the money on in the end?

70. Why did you choose to take a loan through microfinance rather than another provider?

71. Are you happy with this provider and why?

72. Is there anything that you don't like about using this provider?

SACCO

73. What is the name of the SACCO you are a member of?
74. Do you know how your SACCO invests your money?
75. Please describe how your SACCO works (do you take meetings, how do you deposit money, how often etc etc)
76. Do you have a loan or savings or both from your SACCO?
77. Please describe this (these) to us (amount saved, repayment period of loan etc)
78. What are you saving this money for?
79. Why did you choose to save money through a SACCO rather than another provider?
80. Are you happy with your SACCO and why?
81. Is there anything you don't like about your SACCO and why?

Cooperative

82. What is the name of the cooperative you are a member of?
83. What is the primary purpose of the cooperative/ (e.g. housing, agriculture, producer, consumer etc)?
84. Describe how your cooperative works (e.g. you and 10 others have put money together as in monthly instalments to buy a plot of land for building houses)?
85. What is the reason you wanted to join a cooperative?
86. Are you happy with your cooperative and why?
87. Is there anything you don't like about using this provider?

Mobile Money

88. Which mobile money provider are you using (e.g. Mpesa)?
89. When did you last use this account?
90. What is the main purpose of your mobile money account?
91. For what reason did you choose to get a mobile money account?
92. Are you happy with the mobile money and why?
93. Is there anything you don't like about using this provider?

Mshwari

94. Do you use any of the following Mshwari products do you use?

Deposit account	
Lock savings account	
Loan account	
KBC Mpesa account	

(If deposit account)

95. What is the current balance of your deposit account?

96. How often and how much do you deposit money into this account?

97. When was the last time you deposited money into this account?

98. What are you saving this money for?

99. Why did you choose to save money with Mshwari rather than another provider?

100. Are you happy with this service and why?

101. Is there anything you don't like about this product?

(If not deposit account)

102. Why do you not have this service?

103. Would you like to use this service and why?

(If lock savings account)

104. What is the current balance of your lock savings account?

105. Do you know what the interest rate on this is?

106. How much and how often do you deposit into this savings account?

107. Why did you choose to save money in a lock savings account, rather than the usually Mshwari savings account or another provider?

108. Are you happy with this service and why?

109. Is there anything you don't like about this service and why?

(If not lock savings account)

110. Why do you not have this service?

111. Would you like to use this service and why?

(If loan account)

112. What was the balance of the loan when you took it?

113. What did you take this loan for?

114. What did you actually purchase with this money?

115. Have you spent all the money?

116. How much money is remaining?

117. When do you have to repay?

118. Do you have the funds for the repayment?

119. Why did you choose a loan from this service as opposed to another provider?

120. Are you happy with this service and why?

121. What do you not like about this service and why?

(If not loan account)

122. Why do you not have this service?

123. Would you like to have this service and why?

(If KCB Mpesa account)

124. Which KCB Mpesa service do you use? Loans, savings, or both?

(If KCB loans)

125. How much was the loan for?

126. When did you take the loan?

127. What repayment period was set?

128. What interest was charged? (may be fees + interest)

129. What did you borrow this money for?
130. Did you spend all the money?
131. How much do you have remaining?
132. What did you end up spending the money on?
133. Why did you choose a loan from this service and not another provider?
134. Are you happy with this loan and why?
135. Is there anything you don't like about this loan provider and why?

(If not KCB loan)

136. Would you like a KCB Mpesa loan and why?
137. Why do you not have a KCB Mpesa loan?

(If KCB savings)

138. How much money do you have saved in this account?
139. How much and how often do you deposit into this account?
140. What are you saving for?
141. What is the reason you are saving through this provider instead of another provider?
142. Are you happy with this service and why?
143. What do you not like about this savings account?

(If not KCB savings)

144. Would you like a KCB Mpesa savings account and why?
145. Why do you not have a KCB savings account?

Chama

146. What is the name of the Chama you are with?
147. When did you join this Chama?
148. Describe how your chama works (e.g. there's 10 of you who meet up once a week and pay 100ksh, what happens to this money, who looks after the money, etc)
149. Do you currently have a loan from your chama?

150. How much was the loan?
151. How long did you have to repay the loan?
152. How often and how much do you repay?
153. How much time do you have left to repay the loan?
154. Do you have to pay interest on the loan? How much?
155. What did you take the loan for?
156. How much money do you currently have saved with the chama? (*Adapt question to the way the chama works, e.g. how many months have you been depositing money with the chama, and when is the pay-out/ how much will it be?*)
157. What is the reason you wanted to join a chama?
158. Are you happy with this provider and why?
159. Is there anything you don't like about using this provider?

Merry Go Round

160. What is the name of the merry go round you are with?
161. When did you join?
162. Describe how your merry go round works
163. When did the merry go round cycle start?
164. When are you expecting the pay-out/ when did you receive it?
165. How much is the pay out?
166. Do you have to pay interest? How much?
167. What did you use the money for/ What do you intend to use the money for?
168. What is the reason you joined a merry go round?
169. Are you happy with your merry go round?
170. Is there anything you don't like about being in a merry go round?
171. Please confirm the amount you currently have saved with your chama (total contributions)?

Table Banking

172. What is the name of the table banking group you are with?
173. When did you join?

174. Describe how your table banking group works?
175. Do you currently have a loan from your table banking group?
176. How much of a loan did you take?
177. How long do you have to repay the loan?
178. How much and how often do you repay?
179. What did you take the loan for?
180. What is the reason you joined a table banking group?
181. What do you consider to be the benefits of a table banking group?
182. Is there anything you don't like about being in a table banking group?
183. Please confirm the amount you currently have saved with the table banking group (total contributions minus pay out)?

Informal

184. Who is the informal money lender you currently have a loan from?
185. When did you borrow this money?
186. How long did you have to repay it?
187. How much was the loan for?
188. Do you have to pay interest? How much?
189. How much and how often do you repay?
190. How much do you have remaining to repay?
191. What did you take this loan for?
192. Why did you choose to borrow money from an informal lender, rather than another lender?
193. What do you consider to be the benefits of using an informal money lender?
194. Is there anything you don't like about using an informal lender?

Shylock

195. What was the amount of the loan you took?
196. When did you take this loan?
197. How many more months do you have of repayments?

198. What is the interest rate charged?
199. What did you take this loan for?
200. Did you spend all the money?
201. What did you actually spend the money on?
202. Why did you choose to take a loan from a shylock rather than another provider?
203. Are you happy with this service and why?
204. What do you not like about using this provider?

Borrow from friends and family

205. Do you borrow or save money with friends and family? Borrow/save
206. What is your relationship with the person you are currently borrowing/save money from?

(If borrow...)

207. When did you borrow this money?
208. When you took the loan, how long did you agree you would have to repay it?
209. How much was the loan for?
210. How much of the loan do you still have to repay?
211. How much longer do you have to repay it?
212. Do you have to pay interest? How much?
213. How much and how often do you repay?
214. What did you take this loan for?
215. Why did you choose to borrow from this person, rather than another lender?
216. What do you consider the benefits of borrowing money from friends and family?
217. Is there anything you don't like about borrowing money from friends and family?

(If save...)

218. When did you start saving money with this person?
219. How long did you agree you would save money with this person for?
220. How often and how much do you deposit savings with this person?
221. What are you saving this money for?

- 222. Why did you choose to save money with this person and not another savings provider?
- 223. Are you happy with this provider and why?
- 224. Is there anything you don't like about saving with friends and family?

Secret place

- 225. How much money do you currently have in this secret place?
- 226. What do you keep this money for?
- 227. How often do you add money here and how much?
- 228. Why do you choose to keep money in a secret place rather than depositing it with another savings provider?
- 229. Are you happy with this provider and why?
- 230. Is there anything you don't like about keeping money in a secret place?

Have Not

Bank Account

231. Would you like a bank account and why?

232. Do you have a particular bank that you would like to have an account with?

a. Which bank(s)

233. What is the reason you would particularly like an account with this/these banks? What services would you like an account for?

Savings
Money Transfers
Insurance
Loans
Deposits/ withdrawals

234. What is the reason you do not have a bank account?

Microfinance

235. Would like an account with an MFI and why?

236. Do you have a particular MFI that you would like to have an account with?

a. Which MFI(s)?

b. What is the reason you would particularly like an account with this/these banks?

237. What services would you like a membership with an MFI for?

Savings
Money Transfers
Insurance
Loans
Deposits/ withdrawals

238. What is the reason you do not have a membership with an MFI?

SACCO

239. Would you like to be a member of a SACCO and why?

240. Is there a particular SACCO you want to be a member of?

a. Which SACCO?

b. What is the reason you would particularly like to be a member of this SACCO?

241. What services would you like from a SACCO?

Savings
Insurance
Loans
Other
Don't know

242. What is the reason you don't have a membership with a SACCO?

Cooperative

243. Would you like to be a member of a cooperative and why?

244. Is there a particular cooperative you want to be a member of?

c. Which cooperative?

d. What is the reason you want to be a member of this particular cooperative?

245. What is the reason you are not a member of a cooperative?

Mobile Money

246. Would you like to use mobile money and why?

247. Which mobile money provider would you like to use?

248. Why do you not use mobile money?

Mshwari

249. Would you like to use Mshwari?
250. Would you like to use Mshwari for?

Deposit account
Lock savings account
Loan account
KBC Mpesa account

251. Why would you like to use Mshwari for this?
252. Why do you not use Mshwari?

Chama

253. Would you like to be a member of a chama and why?
254. Is there a particular chama you want to be a member of?
e. Which chama?
f. Why do you want to be a member of this chama and what does it do?
255. Why are you not a member of a chama?

Merry Go Round

256. Would you like to be a member of a merry go round and why?
257. Is there a particular merry go round you would like to be a member of?
g. Which merry go round?
h. Why do you want to be a member of this merry go round and why?
258. Why are you not a member of a merry go round?

Table Banking

259. Would you like to be a member of a table banking group and why?

260. Is there a particular table banking group you would like to be a member of?

i. Which table banking group?

j. Why do you want to be a member of this group?

261. Why are you not a member of a table banking group?

Informal

262. Would you like to save/borrow money from an informal saver/lender and why?

263. Is there a particular informal saver/lender you would like to use?

k. Who is this person?

l. Why would you like to use this person?

264. Why are you not using an informal saver/lender?

Shylock

265. Would you like to use a shylock and why?

266. Is there a particular shylock you would like to use?

m. How do you know of this particular shylock?

267. Why would you like to borrow money from this particular shylock? Why do you not use a shylock?

Borrow from friends and family

268. Would you like to borrow money from friends and family and why?

269. Is there a particular member of you friends and family you would like to borrow money from?

n. How are you related to them?

o. Why would you like to borrow money from them?

270. Why do you not borrow money from friends and family?

Secret place

271. Do you want to keep money in a secret place and why?

272. Why do you not keep money in a secret place?

Appendix D: Financial Dairy Interviews

Financial Dairy Interviews

Date:	
Number of days observed:	
Diary:	
Homestead ID.	
Member ID.	

- Asked to each adult member of the homestead individually. (note a couple of questions will be directed to certain members only)

- Estimated time to complete: 1 hour

Well-being

		Member ID	Member ID	Member ID
F1.	How happy have you been with your livestock production since I last saw you? (1-10)			
F2.	How have you been doing economically since I last saw you? (1-10)			
F3.	How confident do you feel about the future of your livestock production? (1-10)			

Disruptive goings-on

		Y/N	Explain (who, why)
F4.	Needed a doctor or medicine but went without		
F5.	Any member of the homestead been too ill to work		
F6.	Had assets taken to repay debt		
F7.	Child sent home from school		
F8.	Expected an important source of income that did not come		
F9.	Went to sleep hungry or without eating		
F10.	Any other disruptive goings on?		

New financial devices

F11. Have you opened or closed any financial devices				Y/N
Device	Owner ID	Closing balance	Balance moved to...	Why?

Changes to homestead demographics

Member of homestead	Change	Explain

- | | |
|---|---|
| 1= Got married, moved away | 7= Became permanently disabled |
| 2= Got married, spouse moved into homestead | 8= Was born |
| 3= Moved to new home nearby | 9= Was orphaned and moved into homestead |
| 4= Moved to new home away for work | 10= Moved into homestead as parents moved away for work |
| 5= Spent at least 1 week in hospital | 11= Died |
| 6= Became temporarily disabled | 12= Other |

Changes to livestock ownership

Date	Livestock	Number	Change	Explain

- Change
- 1- Bought
 - 2- Sold
 - 3- Eaten by homestead
 - 4- Given away
 - 5- Other

Nutrition

Do you currently have enough to eat?

No	1
Yes	2

F12. Since I last saw you, how many meals on average have you eaten per day: _____

F13. Since I last saw you, have you had milk or dairy?

No	1
Yes	2

F14. Where did this milk/ dairy come from?

Only from own livestock	1
Mostly from own livestock, with a small amount purchased	2
About half from own livestock and half is purchased	3
Mostly purchased, with some from own livestock	4
Only purchased	5

F15. Since I last saw you, what meats have you eaten?

Beef	1
Pork	2
Goat	3
Chicken	4
Other:	5

F16. Where did this meat come from?

Only from own livestock	1
Mostly from own livestock, with a small amount purchased	2
About half from own livestock and half is purchased	3
Mostly purchased, with some from own livestock	4
Only purchased	5

	<u>Financial Provider Balance</u>		
		KES	Total Balance(KES)
Provider 1:	In		
	Out		
Provider 2:	In		
	Out		
Provider 3:	In		
	Out		
Provider 4:	In		
	Out		
Provider 5:	In		
	Out		

Appendix E: Add-On Module

Add-on Module



<u>Risk</u>		
1. <u>Livestock death due to illness</u>		
1a	How likely do you think it is that you will experience the death of a livestock due to disease in the near future? (why)	
1b	How likely do you think it is that you will experience the death of a livestock due to disease in the next 2 years? (why)	
1c	How likely do you think it is that you will experience the death of a livestock due to disease in the next 5 years? (why)	
1d	Have you experienced livestock death due to illness in the recent past? (explain)	
1d(a)	What impact did this have on the homestead?	
1e	Have you experienced livestock death due to illness in the past 2 years? (explain)	
1e(a)	What impact did this have on the homestead?	
1f	Have you experienced livestock death due to illness in the past 5 years? (explain)	
1f(e)	What impact did this have on the homestead?	
1g	What strategies do you use to reduce the chance of this happening?	
2. <u>Livestock death due to accident</u>		
2a	How likely do you think it is that you will experience the death of a livestock due to an accident in the near future? (why)	
2b	How likely do you think it is that you will experience the death of a livestock due to an accident in the next 2 years? (why)	
2c	How likely do you think it is that you will experience the death of a livestock due to an accident in the next 5 years? (why)	
2d	Have you experienced livestock death due to an accident in the recent past? (explain)	
2d(a)	What impact did this have on the homestead?	
2e	Have you experienced livestock death due to an accident in the past 2 years? (explain)	
2e(a)	What impact did this have on the homestead?	

2f	Have you experienced livestock death due to an accident in the past 5 years? (explain)	
2f(e)	What impact did this have on the homestead?	
2g	What strategies do you use to reduce the chance of this happening?	
3. <u>Unable to sell livestock due to disease</u>		
3a	How likely do you think it is that you will experience the inability to sell livestock due to disease in the near future? (why)	
3b	How likely do you think it is that you will experience the inability to sell livestock due to disease in the next 2 years? (why)	
3c	How likely do you think it is that you will experience the inability to sell livestock due to disease in the next 5 years? (why)	
3d	Have you experienced the inability to sell livestock due to disease in the recent past? (explain)	
3d(a)	What impact did this have on the homestead?	
3e	Have you experienced the inability to sell livestock due to disease in the past 2 years? (explain)	
3e(a)	What impact did this have on the homestead?	
3f	Have you experienced the inability to sell livestock due to disease in the past 5 years? (explain)	
3f(e)	What impact did this have on the homestead?	
3g	What strategies do you use to reduce the chance of this happening?	
4. <u>Selling livestock at a poor market value</u>		
4a	How likely do you think it is that you will experience selling livestock at a poor market value in the near future? (why)	
4b	How likely do you think it is that you will experience the selling livestock at a poor market value in the next 2 years? (why)	
4c	How likely do you think it is that you will experience selling livestock at a poor market value in the next 5 years? (why)	
4d	Have you experienced selling livestock at a poor market value in the recent past? (explain)	
4d(a)	What impact did this have on the homestead?	

4e	Have you experienced selling livestock at a poor market value in the past 2 years? (explain)	
4e(a)	What impact did this have on the homestead?	
4f	Have you experienced selling livestock at a poor market value in the past 5 years? (explain)	
4f(e)	What impact did this have on the homestead?	
4g	What strategies do you use to reduce the chance of this happening?	
5. <u>Drought</u>		
5a	How likely do you think it is that you will experience drought in the near future? (why)	
5b	How likely do you think it is that you will experience drought in the next 2 years? (why)	
5c	How likely do you think it is that you will experience drought in the next 5 years? (why)	
5d	Have you experienced drought in the recent past? (explain)	
5d(a)	What impact did this have on the homestead?	
5e	Have you experienced drought in the past 2 years? (explain)	
5e(a)	What impact did this have on the homestead?	
5f	Have you experienced drought in the past 5 years? (explain)	
5f(e)	What impact did this have on the homestead?	
5g	What strategies do you use to reduce the chance of this happening?	
6. <u>Livestock theft</u>		
6a	How likely do you think it is that you will experience livestock theft in the near future? (why)	
6b	How likely do you think it is that you will experience livestock theft in the next 2 years? (why)	
6c	How likely do you think it is that you will experience livestock theft in the next 5 years? (why)	
6d	Have you experienced livestock theft in the recent past? (explain)	
6d(a)	What impact did this have on the homestead?	

6e	Have you experienced livestock theft in the past 2 years? (explain)	
6e(a)	What impact did this have on the homestead?	
6f	Have you experienced livestock theft in the past 5 years? (explain)	
6f(e)	What impact did this have on the homestead?	
6g	What strategies do you use to reduce the chance of this happening?	
7. <u>Unexpected rise in cost of inputs</u>		
7a	How likely do you think it is that you will experience selling livestock at a poor market value in the near future? (why)	
7b	How likely do you think it is that you will experience the selling livestock at a poor market value in the next 2 years? (why)	
7c	How likely do you think it is that you will experience selling livestock at a poor market value in the next 5 years? (why)	
7d	Have you experienced selling livestock at a poor market value in the recent past? (explain)	
7d(a)	What impact did this have on the homestead?	
7e	Have you experienced selling livestock at a poor market value in the past 2 years? (explain)	
7e(a)	What impact did this have on the homestead?	
7f	Have you experienced selling livestock at a poor market value in the past 5 years? (explain)	
7f(e)	What impact did this have on the homestead?	
7g	What strategies do you use to reduce the chance of this happening?	

Decision making

To be delivered to all relevant members of the homestead

		MEMBER ID who owns the livestock			
	<i>CATTLE- BEEF</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L19	WHICH INPUTS TO BUY				
L21	WHEN TO SELL				
L22	WHERE TO SELL				
L23	MAKES SALE				
L24	VETERINARY TREATMENT				
L25	PAYS FOR TREATMENT				
	<i>CATTLE- DAIRY</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L26	PURCHASE OF INPUTS				
L27	PURCHASES INPUTS				
L28	WHEN TO SELL				
L29	WHERE TO SELL				
L30	MAKES SALE				
L31	VETERINARY TREATMENT				
L32	PAYS FOR TREATMENTS				
	<i>INDIGENOUS CATTLE</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L33	WHICH INPUTS				
L34	PURCHASES INPUTS				
L35	WHEN TO SELL				
L36	WHERE TO SELL				
L37	MAKES SALE				
L38	VETERINARY TREATMENT				

L39	PAYS FOR TREATMENT				
	<i>PIGS</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L40	WHICH INPUTS				
L41	PURCHASES INPUTS				
L42	WHEN TO SELL				
L43	WHERE TO SELL				
L44	VETERINARY TREATMENT				
L45	PAYS FOR TREATMENT				
	<i>GOATS- MEAT</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L46	WHICH INPUTS				
L47	PURCHASES INPUTS				
L48	WHEN TO SELL				
L49	WHERE TO SELL				
L50	MAKES SALE				
L51	VETERINARY TREATMENT				
52	PAYS FOR TREATMENT				
	<i>GOATS- DAIRY</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L53	WHICH INPUTS				
L54	PURCHASES INPUTS				
L55	WHEN TO SELL				
L56	WHERE TO SELL				
L57	MAKES SALE				
L58	VETERINARY TREATMENT				
L59	PAYS FOR TREATMENT				
	<i>CHICKEN- BROILERS</i>				

	WHEN TO BUY				
	WHERE TO BUY				
L60	WHICH INPUTS				
L61	PURCHASES INPUTS				
L62	WHEN TO SELL				
L63	WHERE TO SELL				
L64	MAKES SALE				
L65	VETERINARY TREATMENT				
L66	PAYS FOR TREATMENT				
	<i>CHICKEN- LAYERS</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L67	WHICH INPUTS				
L68	PURCHASES INPUTS				
L69	WHEN TO SELL				
L70	WHERE TO SELL				
L71	MAKES SALE				
L72	VETERINARY TREATMENT				
L73	PAYS FOR TREATMENT				
	<i>OTHER: _____</i>				
	WHEN TO BUY				
	WHERE TO BUY				
L74	WHICH INPUTS				
L75	PURCHASES INPUTS				
L76	WHEN TO SELL				
L77	WHERE TO SELL				
L78	MAKES SALE				
L79	VETERINARY TREATMENT				
L80	PAYS FOR TREATMENT				

Division of Labour – To be delivered to the head female, or where we are interviewing the husband, ask both head female and husband?

		Men	Women	Girls	Boys
General					
	Building animal shelters				
	Cleaning animal shelters				
	Slaughtering animals (nonpoultry)				
	Slaughtering animals (poultry)				
	Collecting manure				
	Fetching water				
Cattle	Grazing/herding				
	Taking to water				
	Collecting grass				
	Tethering				
	Milking				
	Administering medicine				
Sheep/goats	Moving/monitoring tethered animals				
	Caring for kids				
	Administering medicine				
Poultry	Feeding/watering				
	Vaccinating				
	Caring for chicks				
	Catching to put in night shelter				