Coping or crumbling:

a comparative study of drought vulnerability between commercial- and smallholder farmers in Golomoti, Malawi

MSc thesis by Merijn Jaraj Schoutsen

Wageningen University & Research
12 December 2025

Student number: 1426494
Supervisor WRM: G. van Halsema

WAGENINGEN
UNIVERSITY & RESEARCH

Research title
Coping or crumbling: a comparative study of drought vulnerability between commercial- and smallholder farmers in Golomoti, Malawi

MSc thesis report
Final version

Student
Merijn Schoutsen

Student number
1426494

E-mail
merijn.schoutsen@wur.nl

Study program
MSc International Land and Water Management

Supervisors
Dr.ir. GE (Gerardo) van Halsema
Water Resource Management (WRM)
Wageningen University
The Netherlands

Location
Golomoti EPA, Dedza District, Malawi
Wageningen University, the Netherlands

Date
12 December 2025

Cover page photo credits
Merijn Schoutsen, 2025

ABSTRACT

Drought is a recurrent feature of Malawi's climate and a major threat to rural livelihoods that depend on rainfed agriculture. Smallholder and commercial farmers in Malawi often share the same agro-ecological conditions, but they do not face drought the same way. This thesis investigates how differences in the socio-economic contexts of rainfed smallholder and commercial farmers in the Golomoti Extension Planning Area (EPA), Dedza district, shape their vulnerability to drought.

The study applies a qualitative approach, and uses a vulnerability framework that distinguishes between sensitivity, adaptive capacity, and coping strategies. These dimensions are linked to farmers' access to land, capital, markets, institutions and social networks. Data were collected through semi-structured interviews with nine smallholder and six commercial farmers, a focus group discussion with smallholders, participatory mapping and timeline exercises, field observations, and analysis of existing household survey data.

The results show that drought sensitivity in Golomoti can largely be attributed to farming systems and resource constraints. Smallholders farm in a maize-based subsistence on very small plots. They have limited access to inputs and credit, meaning that even short dry spells can be highly damaging. Commercial farmers in the region also farm rainfed land, but they have larger landholdings, some crop diversification, machinery and better market access. This allows them to spread risk and recover more quickly. Adaptive capacity and coping strategies are also different between farmer types and produce contrasting feedback loops. Smallholders rely on wage labour, distress sales and informal savings groups that ensure short-term survival. However, it gradually erodes assets and soil fertility. On the other hand, commercial farmers draw on savings, credit and hired labour to reinvest after shocks.

The thesis concludes that drought vulnerability in Golomoti is historically rooted. The current situation reflects long-standing biases in land policy and agricultural support that favour commercial, export-oriented farming. Reducing vulnerability of farmers will require different policies. Namely, policies that go beyond technical irrigation or seed solutions and which address the imbalances in land access, credit, markets and institutional support for rainfed smallholders.

ACKNOWLEDGEMENTS

This thesis would not have been possible without the support of many people and organisations in both the Netherlands and Malawi.

I would first like to thank Pieter van Oel, who supervised the early stages of this thesis and encouraged me to take on this topic in the first place. Even though he had to step back due to health reasons, his initial guidance helped me get started on my thesis. I am especially grateful to Gerardo van Halsema, who took over supervision halfway through. His clear feedback, critical questions, and calm insistence on focus and feasibility were crucial in bringing the thesis back on track and seeing it through to completion.

This research was initially hosted by the International Institute of Tropical Agriculture (IITA) Malawi. I thank Francis Muthoni for giving me the opportunity to come to Malawi and for his early encouragement, and Julius Manda for his support during fieldwork, for facilitating access to existing survey data, and for many insightful discussions about farming systems in Golomoti. Although the collaboration with IITA changed over time, I remain grateful for the doors they opened and the trust they placed in this research.

Fieldwork in Lumwira and on the surrounding commercial farms would not have been possible without the hospitality of the farmers who participated. I am thankful to all smallholder and commercial farmers who welcomed us to their homes and fields, shared their experiences of drought, and allowed me to ask many questions in the middle of their busy schedules. Thanks also to my translator, whose patience, careful interpreting between Chichewa and English, and company on long days in the sun made this work both possible and enjoyable. I further thank the Golomoti extension officers for their practical help, information they gave me and all the logistical support during visits.

I am also grateful to the friends I made in Malawi and to my accommodation host, who offered not only a place to stay but also many conversations and moments of everyday life that made Malawi feel like home. Their kindness and humour were an important part of the journey.

Finally, I wish to thank my family and friends for their continuous encouragement throughout my time in Malawi and during the time writing this report. Their interest and occasional reality checks helped me to keep going when the process felt slow or uncertain. A special word of thanks goes to my girlfriend for her patience and her belief in this project, especially during my stay in Malawi.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 GENERAL CONTEXT; DROUGHT, MAIZE, AND RURAL LIVELIHOODS

Drought is a recurring feature of the climate in southern Africa and is expected to intensify under climate change, with longer dry spells and greater rainfall variability projected across the region (Intergovernmental Panel on Climate Change, 2022). Malawi is no exception. In Malawi, where more than 80% of the population depends on rainfed agriculture for their livelihoods, these changes translate directly into risks for food security and rural incomes (Chirwa et al., 2006). Maize dominates the farming system and national food policies to such an extent that food security is often equated with maize production; for many Malawians, "maize is life" (Smale, 1995). This strong dependence on a single rainfed staple, combined with limited water storage or irrigation, makes farming households highly exposed to rainfall shocks (Mungai et al., 2020).

In the central region of Malawi, and specifically in Dedza District where the Golomoti Extension Planning Area (EPA) is located, recent studies highlight declining soil fertility and high dependence on rainfed maize. On top of that, there is limited access to irrigation, credit and extension for many smallholders, alongside a growing presence of larger commercial farms (Mungai et al., 2020; Nyasa Times, 2020). While smallholders cultivate less than 1 ha on average, these larger scale commercial farmers often farm more than 10 ha (up to 200ha), use hired labour and are better connected to markets and finance (Jayne et al., 2010). Both types operate under the same increasingly erratic climatic conditions. This includes the late onset of rains, prolonged dry spells and more frequent drought years. However, their resources, constraints and options (such as diversification) differ noticeably (Snapp et al., 2010; Mungai et al., 2020; Government of Malawi, 2021).

Studies of climate and livelihood vulnerability in Malawi and neighbouring countries emphasise that such differences cannot be understood from biophysical exposure alone. They are shaped by land tenure, input and output markets, extension services, and social networks that determine who can adapt, when, and at what cost (Eriksen et al., 2005; Sietz et al., 2011). This thesis builds on that by examining drought vulnerability in one specific setting: Golomoti EPA in central Malawi. Rather than treating "farmers" as a homogeneous group, it compares rainfed smallholder and commercial farmers living in the same agro-ecological context. The aim is to understand how differences in their socio-economic context (including access to land, capital, markets, institutions, and labour) shape their sensitivity to drought, their adaptive capacity, and the coping strategies they use when shocks occur.

1.2 FOCUS AREA; GOLOMOTI EPA

This study is situated in the Golomoti Extension Planning Area (EPA) in Dedza district, in central Malawi (figure 1-1). Golomoti lies within the South-West Lakeshore river basin, to the east of the Dedza highlands. Elevation drops from these highlands from roughly 1500 meter towards the lake floodplain at about 470 meters above sea level. The landscape changes between these two points from upland slopes to gentle mid-slopes, to low-lying river valleys. These topographic transitions shape the runoff, the erosion, local water availability, and they therefore influence how drought is experienced on farms at different positions in the landscape (Rockström et al., 2010). Golomoti is located in the middle, so with gentle slopes. The climate in the region is characterised by a rainy season between November and April, and a dry season from May to October. This region also shows increasing rainfall variability, more frequent dry spells within the growing season, and rising temperatures (Mungai et al., 2020; Chirwa et al., 2016).

Administratively, Golomoti is one of several EPA's in Dedza district. It is served by the Golomoti agricultural extension office. Within Golomoti EPA, my fieldwork was concentrated in and around

the remote village of Lumwira and neighbouring commercial farms located on the mid- to upper slopes outside formal irrigation schemes. In this setting, both smallholder and commercial farmers depend primarily on rainfall, with only very limited access to informal water sources such as shallow wells or seasonal streams.

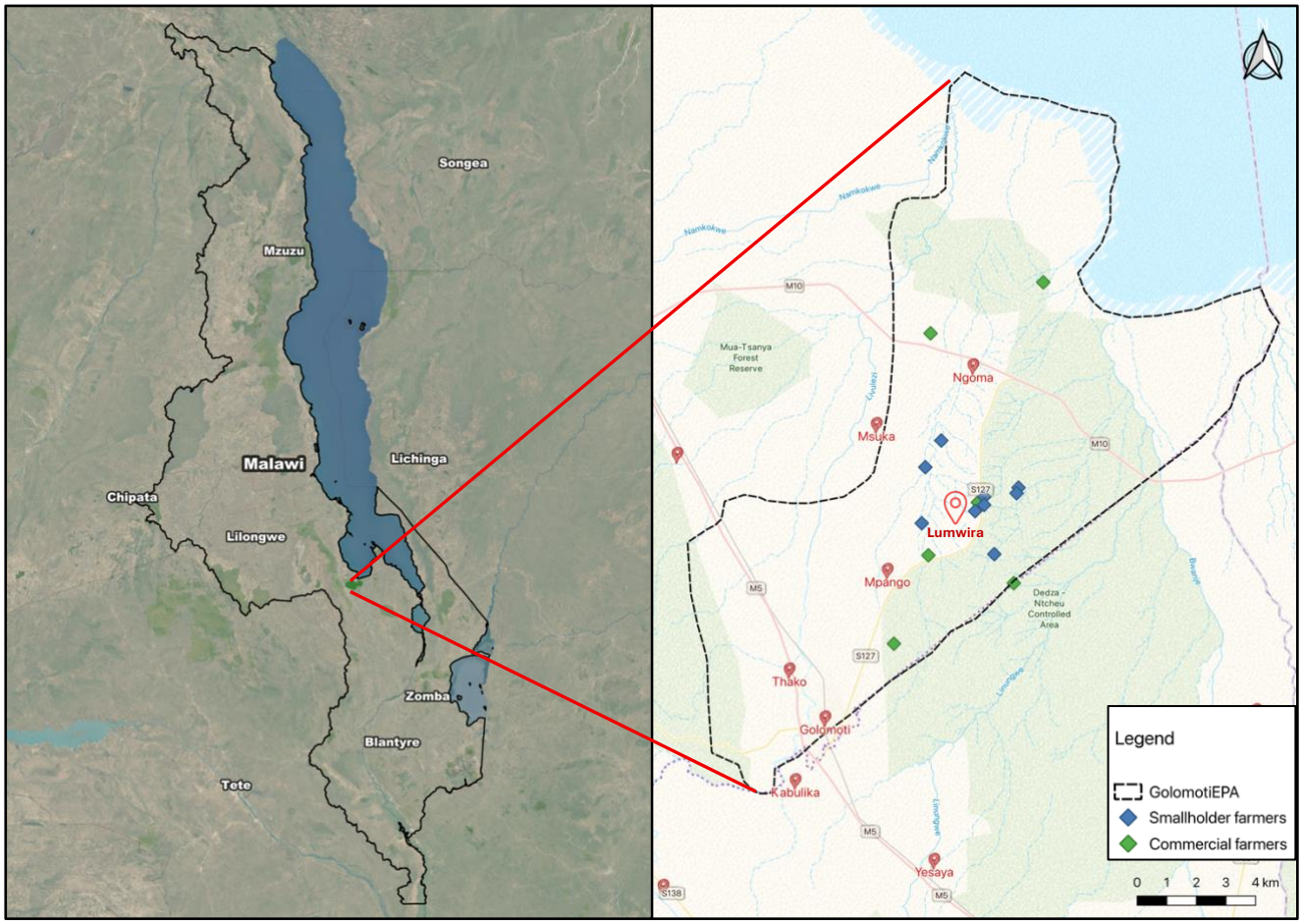


***Figure 1-1**: Map of Malawi on the left. Map of Golomoti EPA on the right, with location of interviewed farmers (see legend). The red arrows indicate how Golomoti EPA is situated in Malawi.*

1.3 PROBLEM STATEMENT

Malawi's agricultural sector is the backbone of the economy and is the primary livelihood source for the majority of its rural population. Within this sector, smallholder farmers are the largest group. They cultivate plots often smaller than 0.5 ha, primarily for subsistence (Kumwenda et al., 2015). Alongside these smallholders, there are commercial farms which are often larger but, in most cases, not irrigated (Kumwenda et al., 2015). These commercial farms operate within the same agro-ecological zones, especially in areas like Golomoti EPA.

In recent years, water scarcity and drought have become major challenges in Malawi (Mungai et al., 2020), exacerbating food insecurity and threatening local economies. The Malawi drought post-disaster needs assessment (2015-2016) found that the Dedza district, which includes the Golomoti EPA, is in the top 5 of districts for drought recovery needs. However, while climate change and drought exposure are widely acknowledged as threats to agricultural sustainability (Conolly-Boutin & Smit, 2016; IPCC, 2014), there is still limited empirical understanding of how different types of farmers experience and manage drought in varying ways. By different types of farmers, I am referring to rainfed smallholder and rainfed commercial farmers. Many studies tend to focus either on technical water solutions or assume irrigation as a clear dividing line

between resilience and vulnerability, without fully including the socio-economic context that shapes farmers' capacities to adapt or cope (Montaña, Pastor, & Torres, 2009; Shiferaw et al., 2014). This gap is particularly pressing in Malawi, because irrigation coverage is extremely limited, even among commercial farms (Chirwa et al., 2006; Kumwenda et a., 2015).

National studies about Malawi indicate that a significant proportion of smallholders operate under insecure or informal tenure arrangements (Deininger & Xia, 2017). This discourages long-term investment and limits adaptive capacity (Ajefu & Abiona, 2020). On top of that, limited access to inputs, weak market leverage, and low access to credit makes them even more vulnerable (The Rockefeller Foundation, 2021). In some cases, smallholders get income from non-farm activities such as firewood collection, remittances, or small trading (Nzima et al., 2024). Hearing about these reactive livelihood strategies indicated that there could be even more to the vulnerability than that meets the eye, where drought does not just threaten crops but entire household economies. Commercial farmers, despite also farming rainfed land, often have access to larger plots. They often also have access to mechanisation, and better links to formal markets. It is hypothesised that commercial farmers, despite facing high input costs and financial risks during poor seasons, are better able to adopt adaptive strategies due to their larger landholdings, access to mechanisation, and stronger links to formal markets.

In short, despite their co-existence in the same landscape, the differences in farm size, capital, knowledge, input access, labour structure, and market connections remain poorly understood in terms of how they mediate drought vulnerability. The assumption that rainfed farmers are homogeneously vulnerable does not really hold. But still, current agricultural policies in Malawi continue to prioritize the expansion of commercial agriculture, mostly because of belief that larger farms are more efficient (de Bont et al., 2016; Malawi Government, 2023). This causes a neglect towards facing the structural disadvantages of smallholder farmers (Chinsinga & Chasukwa, 2012; Peters, 2013). In many rural areas of Malawi, local governance around water use, agricultural support and risk management remains weak, and extension services are often under sourced (Tiyeni, 2020; Mungai et al., 2020).

Therefore, there is a need for context-specific analysis that moves beyond technical fixes or simplistic rainfed versus irrigated conversations. Instead, this report focuses on the underlying socio-economic systems that shape farmer responses to drought. By comparing rainfed smallholder and commercial farmers within the Golomoti EPA, this research aims to provide insights into how socio-economic dissimilarities translate into a difference in drought vulnerability, with the broader goal of informing more inclusive and sustainable agricultural resilience planning in Malawi.

1.4 Research objectives

The objective of this research is to explore and compare how socio-economic factors shape drought vulnerability among rainfed smallholder and commercial farmers in the Golomoti EPA, Malawi. It aims to identify how differences in sensitivity, adaptive capacity, and coping strategies translate into a varying vulnerability to drought. By focusing on farmers within the same agro-ecological and climatic zone, this study seeks to isolate the socio-economic context in explaining why some farmers are more vulnerable to drought than others.

1.5 Thesis setup

This thesis is structured as follows. Chapter 2 presents the theoretical framework, introducing the key dimensions of drought vulnerability and the concept of the socio-economic context. Chapter 2 also formulates the main research question, together with the sub-questions that guide the analysis. In chapter 3 I describe the methodology used, including the qualitative design,

data collection methods, and the procedure used for data organisation. Chapter 4 then presents the empirical results. It begins with the farmer demographics of interviewed farmers, then it describes the socio-economic factors and how they differ between farmer types. In chapter 5 I look at a broader perspective by analysing the historical, economic, institutional, and cultural context that lies underneath it all for farmers in Malawi. Chapter 6 discusses the main results in relation to the framework, and existing literature, and reflects on the methodology and other choices made in this study. Finally, chapter 7 concludes the thesis by summarising the insights I gained. The references and annexes provide supporting material, including survey summaries and figures.

2. THEORETICAL FRAMEWORK

This chapter provides the theoretical lenses through which the socio-economic dimensions of drought vulnerability in Golomoti are interpreted. The framework is structured around the main concept of drought vulnerability, which is split into the three dimensions of sensitivity, adaptive capacity, and coping strategies. These dimensions form the backbone for exploring how both smallholder and commercial farmers live in a shared climatic and geographical context with similar exposures to drought.

2.1 CONCEPT OF DROUGHT VULNERABILITY

Throughout this report the concept of '***vulnerability'*** is often used. The term has become central in the analysis of social and environmental risks within the context of climate change in agriculture. In this research, I refer to drought vulnerability as the degree to which farming households in Golomoti are susceptible to the adverse effects of drought. This definition follows the widely adopted framework proposed by the IPCC (2014) and Adger (2006). They propose that vulnerability can be seen as a function of three dimensions: ***sensitivity, adaptive capacity, and coping strategies***. These three dimensions are in turn shaped by socio-economic factors and are activated in response to a shared ***exposure*** to drought. The exposure refers to the climatic and environmental conditions that present a risk to agricultural systems. Among these, declining rainfall patterns, changing seasonal onset, and increasingly frequent dry spells have been noted (Mungai et al., 2020). I regard exposure as broadly shared across farmers in Golomoti because both smallholder and commercial farmers farm under the same regional rainfall regime. However, this is a simplification. In reality, localised differences in soil type, slope, and natural vegetation can strongly influence infiltration and soil moisture availability and thereby modify how drought is experienced on specific plots (Rockström et al., 2010; Chirwa et al., 2016). While accounting for those micro-variations lies outside the scope of this socio-economic study, it is important to acknowledge that exposure is not entirely homogeneous, and that biophysical variation interacts with socio-economic factors in shaping vulnerability. While exposure is critical to understanding drought impacts, in this research, it is treated as an external condition rather than an internal dimension of vulnerability.

As mentioned, sensitivity, adaptive capacity, and coping strategies interact to determine a farmer's level of vulnerability once exposed to drought. And these dimensions are shaped by a range of socio-economic factors which will be discussed later, but include factors such as access to land, income diversity, crop choice, farming practices, extension services, and institutional support. All of these factors together are described through the concept of the ***socio-economic context***. Within this context, eight different "mechanism boxes" are identified: crop portfolios, soil management and fertility, water access, in-farm spatial flexibility, finance and input access, market structure and prices, information and learning, and labour and social safety nets. Each of these mechanisms can act as either positive or negative influences, reinforcing or reducing vulnerability (indirectly via one of the dimensions) depending on the situation. In this way, observed variation in the field can be understood and compared by placing it in one of the boxes together with its effect.

The framework's three dimensions; sensitivity, adaptive capacity, and coping strategies, should be seen as dynamically interacting. The cross-linkages will be further explained in the following sections of this chapter. In addition, two extra temporal dimensions are acknowledged: anticipation (under adaptive capacity) and recovery (under coping strategies). These help distinguish between proactive and reactive responses to drought. Figure 2-1 presents the conceptual framework guiding this study. It highlights how exposure interacts with the three dimensions of vulnerability, and how these are shaped by the socio-economic context. It forms

the foundation for comparing the drought vulnerability of rainfed smallholder and commercial farmers in Golomoti. For illustrative purposes, one example of a potential positive and one of a negative influence is shown for each mechanism box.

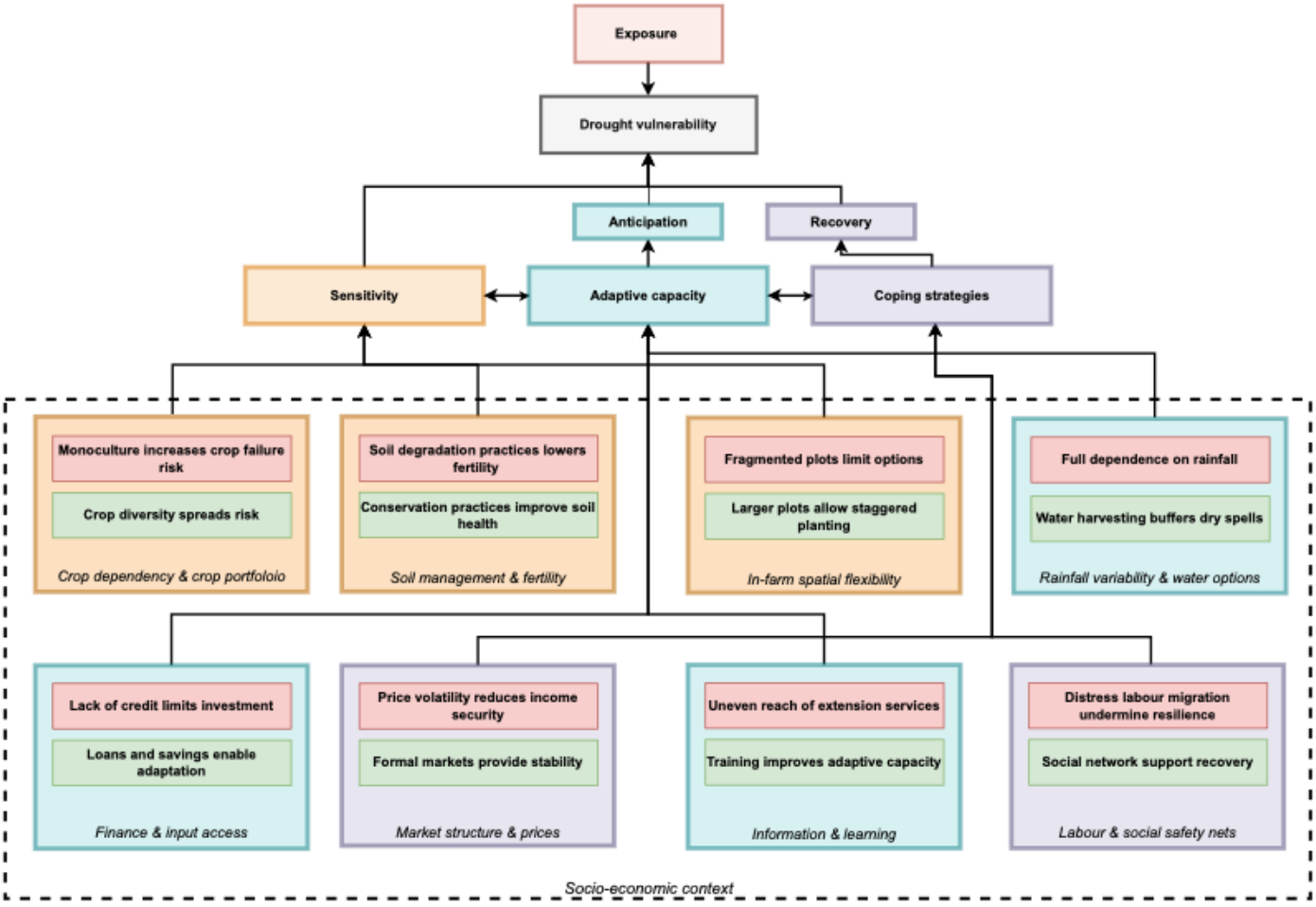


***Figure 2-1**: Conceptual framework of drought vulnerability in Golomoti.*
This framework visualises how drought vulnerability is affected by exposure and by the three dimensions: sensitivity, adaptive capacity, and coping strategies. It also shows how these dimensions are shaped by the broader socio-economic context. The socio-economic context is divided into eight mechanisms: crop portfolio, soil management and fertility, rainfall and water access, in-farm spatial flexibility, finance and input access, market structure and prices, information and learning, and labour and social safety nets. Each mechanism can either have a positive effect (–, shown in red) or negative effect (+, shown in green) on one of the three dimensions (indicated by box colours orange = sensitivity, teal = adaptive capacity, and purple = coping strategies).

2.2 Sensitivity

Farmers growing only one crop type, often due to land constraints and food security needs, are more likely to suffer from total yield losses during drought years (Deininger & Xia, 2017; Distefano & Kelly, 2017). This is just one of the factors that potentially influence a farm when exposed to drought. Sensitivity can therefore be described as the thermometer that shows the extent to which a farming system is affected as the result of drought. Other factors that can affect sensitivity are crop choice, crop diversity, and land use to name a few. These factors fall within the mechanism boxes crop dependency and crop portfolio, soil management and fertility, and in-farm spatial flexibility. Diversified farm systems have been related with lower sensitivity, in that crop rotations and staggered growing periods can be used to minimize potential for total loss of yields under drought conditions. There are multiple studies in Southern Africa that have shown that diversification can buffer farmers against climatic shocks, both by spreading the biophysical

risks across different crops and by increasing the likelihood of retaining at least some harvest under adverse conditions (Chibwana et al., 2012; Makate et al., 2016; Sietz et al., 2011; Ellis, 2000). Other socio-economic factors that influence sensitivity are small and fragmented land holdings, and farming practices that degrade soil structure and health.

As mentioned in the previous section, there are dynamic interactions between dimensions. Adaptive interventions such as conservation agriculture and rainwater harvesting can reduce sensitivity (Rockström et al., 2010; Sietz et al., 2011). A prime example is if farmers implement mulching or pit planting, this could increase soil moisture retention. Keeping soil moisture in de ground directly mitigates the negative effects of dry spells, thus lowering their sensitivity (Oduor et al., 2023; Uwizeyimana et al., 2018; Thornton et al., 2014). These types of strategies blur the line between adaptive capacity, coping strategies and sensitivity. Improvements in one dimension can reinforce another. However, it can also be the other way around. For instance, some studies have shown that selling livestock to cope with drought can reduce access to manure in the following seasons, thereby possibly undermining soil fertility and increasing sensitivity (Coates et al., 2006; Cooper et al., 2008). This last example is a negative feedback loop that shows that coping actions, while immediate, can have consequences that increase vulnerability in the long term.

2.3 ADAPTIVE CAPACITY

The second dimension of drought vulnerability is the adaptive capacity of farmers. The capacity to adapt reflects the ability of farmers to plan for and adjust to changing conditions. The factors within the socio-economic context that affect the adaptive capacity are included in the mechanism boxes rainfall variability and water options, finance and input access, and information and learning. And examples of separate factors within these boxes are access to finance and land, support from institutions, and knowledge sharing (Adger 2006; Eriksen et al., 2005; Smit & Wandel, 2006; IPCC, 2014). As mentioned in paragraph 2.1, a temporal subcomponent of adaptive capacity is ‘anticipation’. Anticipation can be understood as the ability to foresee and prepare for drought. Farmers who use early maturing crop varieties, diversify their crops, or adjust planting dates demonstrate anticipatory behaviour. Authors as Adger (2003) and Eriksen et al. (2005) emphasise that adaptive capacity is not only technical but also deeply influenced by social structures, and by governance quality, and power dynamics within a region.

Adaptive choices can not only help reduce vulnerability directly but also influence both sensitivity and coping strategies. For example, participation in farmer cooperatives or savings groups (an adaptive behaviour) can enable access to loans or knowledge-sharing that improve future coping strategies (Pretty, 2003). At the same time, low financial capacity may force reliance on negative coping strategies, creating a downward spiral. An example for this is that if a farmer lacks the means to invest in early maturing or drought-resistant crop varieties, they may face repeated losses. That farmer will eventually need to sell productive assets, like livestock or farming equipment (increasing sensitivity in its turn) (Cooper et al., 2008).

2.4 COPING STRATEGIES

Coping strategies are actions that are taken in response to drought impacts at the moment a dry spell occurs. In many cases strategies are short-term “survival” mechanisms rather than long-term solutions. Common examples of coping strategies described in the literature include replanting after crop failure, engaging in off-farm wage labour, selling livestock or household assets, and accessing temporary land or water resources (Ellis, 2000; Scoones, 1998). While these strategies can provide temporary relief, they can also undermine long-term resilience. A good example of that is reliance on wage labour can that divert effort from one’s own farm, or

repeated asset sales that diminish productive capacity and reduces resilience over time (Carter & Barrett, 2006; Cooper et al., 2008). These factors fit in the mechanism boxes market structure and prices, and labour and social safety nets. 'Recovery' is an essential aspect of coping, as mentioned in paragraph 2.1. Recovery refers to the capacity to rebound after a drought event. Farmers with greater financial reserves, or access to savings groups (within communities), are more likely to recover quickly. In contrast, farmers operating on the margin may become trapped in cycles of poverty (Carter & Barett, 2006).

Similarly to what was described with previous dimensions, coping decisions often create trade-offs that feed back into sensitivity and limit adaptive options. Farmers who are better prepared (e.g. via training or input subsidies) may avoid the most damaging coping strategies. Replanting late into a shortened season may lower yields, increasing sensitivity to the next dry spell. Or engaging in wage labour may secure income but reduces the labour for their own farm, perhaps laying off soil improvements or water harvesting techniques. In the long term, these examples may weaken both coping and adaptive capacity (and therefore increase vulnerability). It could be said that the choice of coping strategies is an expression of the current vulnerability of a farmer, but at the same time also determining the future vulnerability.

2.5 SOCIO-ECONOMIC CONTEXT

The socio-economic context is the term used to describe the situation farmers are facing with regard of the financial, institutional, social, and knowledge-based conditions. It is not an independent dimension of vulnerability, it is an environment within which sensitivity, adaptive capacity, and coping strategies operate. The mechanism boxes presented in earlier sections illustrate key elements of this context. Each can act positively or negatively depending on the situation, ultimately representing observed differences in vulnerability among smallholder and commercial farmers (Deininger & Xia, 2017; Chirwa et al., 2016; Rockström et al., 2010).

Table 2-1: *Overview of key vulnerability concepts and definitions used in this study*

Concept	*Description*
Drought vulnerability	The degree to which a farming system is affected by drought, reflecting how exposure interacts with the farmer's sensitivity, adaptive capacity, and coping strategies.
Exposure	The climatic and environmental conditions that pose a risk to agricultural production, such as rainfall variability, seasonal shifts, and local topography or soil characteristics.
Sensitivity	The "thermometer" of how strongly a farming system is affected by drought, influenced by crop choice, crop diversity, land use, and farming practices that affect soil and water retention.
Adaptive capacity	The ability of a farmer to adjust practices, anticipate drought events, and take advantage of opportunities to reduce potential impacts.
Coping strategies	Short-term actions taken in response to drought impacts, such as replanting, off-farm wage labour, or selling assets.
Socio-economic context	The broader set of financial, institutional, social, and knowledge-based factors that shape how farmers experience and respond to drought, influencing all three dimensions of vulnerability.

2.6. MAIN RESEARCH QUESTION

The conceptual framework and the context described in chapter 1 lead to the main overarching research question of this thesis. Additionally, five sub-questions are drawn up that that complement the main question by unpacking five essential parts of the research. These sub-questions follow the structure of the framework. The main questions read as follows, the sub-questions are listed thereafter:

"How do differences in the socio-economic contexts of smallholder and commercial rainfed farmers in Malawi explain variations in their vulnerability to drought?"

2.6.1 Sub-questions

1. Which socio-economic factors influence sensitivity, adaptive capacity, and coping strategies in Golomoti?
2. How do socio-economic factors positively or negatively influence each dimension of vulnerability for each farmer type?
3. What differences exist between smallholder and commercial farmers in their socio-economic context and access to resources?
4. How do feedback loops or trade-offs in coping and adaptive strategies influence farmers' sensitivity, adaptive capacity, and coping options over time?
5. How do these differences explain the observed variation in drought vulnerability between smallholders and commercial farmers?

3. RESEARCH METHODOLOGY

This chapter describes the approach used to investigate the socio-economic context among rainfed smallholder and commercial farmers in the Golomoti EPA, Malawi. It also explains the research approach, data collection methods, and data analysis methods.

3.1 RESEARCH APPROACH

This study adopts a qualitative approach. Instead of using quantitative scoring methods, which may oversimplify the complexity of vulnerability, I opted for a more interpretive and descriptive approach. The goal is not to measure vulnerability numerically but to understand how it manifests differently across farmer types. Qualitative methods do just that, it allows a nuanced understanding of farmers' lived experiences and how socio-economic context shapes sensitivity, adaptive capacity, and coping strategies. Understandings were derived from a combination of semi-structured interviews, focus group discussions, literature review, existing survey data, and field observations. These methods are shortly described below.

3.2 DATA COLLECTION METHODS

3.2.1 Literature review

The literature review of my research included examining studies on smallholder and commercial farming in Malawi. The focus hereby was land tenure, financial access, market access, drought vulnerability, and farmer adaptation- and coping strategies. It also covered relevant conceptual and policy documents on climate resilience and socio-economic dimensions of vulnerability. On top of that, the literature informed the research design, comparative categories, as well as the interview and survey design style. Literature reviewing was done mainly during the first phases of the research and during the writing of the research proposal. Insights from the literature directly informed the selection of the eight mechanism boxes described in the theoretical framework.

The literature review was conducted using a combination of keyword searches in academic databases (mainly Google Scholar) and a snowballing approach from reference lists of relevant publications. This snowballing technique was aided by using Connected Papers (connectedpapers.com) to identify which other advancements were made on a research topic and for finding prior research papers. Overall, in the literature review, keywords included "Malawi", "smallholder farmers", "commercial farming", "drought vulnerability", "adaptive capacity", and "climate resilience".

3.2.2 Existing survey information

In the past three years, the International Institute of Tropical Agriculture (IITA, 2022) has been executing different kinds of surveys surrounding many different socio-economic factors in Malawi, including household demographics, labour, crop and plot details, and recent shocks to household welfare, to name a few. For my thesis, I was allowed to access this data and use it for my analysis. This information was used as a basis on which my own interview data can build upon, specifically information that was not gathered by IITA (2022) previously. This dataset covered only smallholder farmers, but it did serve as a valuable benchmark to validate the interviews done in this research. Anonymised survey data are available on request.

3.2.3 Semi-structured interviews

Between February and March 2025, I conducted 15 semi-structured interviews with both smallholder and commercial farmers. The farmers were selected based on their location within the Golomoti EPA, the type of farming system (rainfed smallholder or commercial), and their willingness to participate. Prior coordination with the local extension officer ensured access and facilitated introductions to potential interviewees. Most farmers would be working on their farms during this time of the year.

The selected farmers were from a very local community, from the remote village of Lumwira. Given that most smallholder farmers in the region do not speak English, a local translator was arranged, and the extension officer also accompanied us to assist with navigation and introduction. The interviews were conducted in a flexible format, allowing farmers to elaborate on themes important to them while still following a consistent set of topics. A tablet was used to record responses in a structured way, but often extra notes were taken due to the nuance of the conversations. These were typed out and annotated each evening.

Interviews with commercial farmers were more difficult to arrange. For a long time, it was unknown which area and where the commercial farmers were actually located. However, many people ensured me that they were in the area. There is almost no information available online about big commercial farmers in Malawi, and it is also almost impossible to see on satellite imagery. However, after driving through the region many times, and talking with smallholder farmers and asking them to point out where commercial farmers are located on the map, the extension agent was able to pinpoint these commercial farms and arrange interviews.

Interview topics included: water access and use, experiences with drought, coping mechanisms, financial and institutional support, labour dynamics, and perspectives on future risks. For both farmer types, care was taken to ensure terminology was explained clearly to maintain consistency in responses. The exact used questionnaires can be found in Annexes B–D.

3.2.4 Focus group discussions

To complement and validate individual interviews, a focus group discussion was held with 18 farmers from the Lumwira community. The session aimed to capture shared experiences, test the consistency of themes emerging from earlier interviews, and explore community-level perceptions. A printed map of the area and a timeline (1980–2025) were used as participatory tools to discuss changes in land use, water access, and commercial farm encroachment (Annex E). This interactive way helped surface collective memories and contextual narratives that were difficult to obtain in individual interviews alone. The grouped format also helped to give more attention to understanding tensions and collaborations between smallholder and commercial farmers.

3.2.5 Observations

Observation was an important part of my data collection. It allowed me to engage with the study area in a visual way. I used both non-participatory and participatory observation techniques, in order to see the complexity between land, water, and farming practices in the project area. During the field visits, undertaken with my own car, I relied on non-participatory observation to familiarise myself with the physical layout of the landscape, the river locations, rainfall runoff patterns, and farm boundaries. These field trips helped me develop a mental map of the study area.

In more structured, participatory settings I integrated myself into local activities, listening carefully to farmers' stories of drought impacts and watching their responses as they showed me their coping strategies on their farms. By attending community meetings and informal gatherings, I could observe the body language and social dynamics that underlie spoken answers. My affiliation with IITA influenced how I was perceived by farmers. The farmers already had a positive opinion about IITA, which meant that they were eager to open discussions. At the same time, my outsider status was immediately apparent, which may have affected how individuals behaved and spoke in participatory contexts. With these non-participatory and participatory approaches, I was able to compare everything with each other; observations, interview data, and survey responses.

3.3 DATA ANALYSIS METHODS

As mentioned, the dataset comprised 15 semi-structured interviews (9 smallholder, 6 commercial), one focus group discussion with 18 smallholder participants, observation notes from multiple field visits, and selected secondary sources. Interviews with non-English speakers were conducted with a local translator. Brief translations were entered during interviews and expanded immediately after each visit based on audio notes and field memos. I structured the analysis around the key dimensions from the theoretical framework: sensitivity, adaptive capacity, coping strategies, and socio-economic context. These dimensions guided both the organisation and interpretation of the data. Immediately after fieldwork days, I consolidated extra notes from the tablet forms and my field notebook into a categorised excel workbook. Quotes from farmers were copied into a separate "quotes" sheet and linked back to the source ID (SH1 -SH9; CF1-CF6). Photos were made with geolocation, which makes it easy to link back to the specific visited farms and areas later.

Within the mentioned excel notebook, I categorised all the questions that were discussed in the field into the four dimensions. A fifth dimension was added; the farmer demographics, which includes questions about farmer age, level of education, farming practices, and farm size. Categorising the different questions was done manually and based on my own interpretation. However, I used terms derived from the framework (e.g., crop dependency, conservation practice, seed access, replanting, wage labour, asset sales, market access, credit access, tenure, anticipation, recovery) as indicators.

The analytic procedure was as follows:

1. Checking the question content and key terms within the question.
2. Identifying the dominant patterns within each dimension.
3. Comparing patterns across dimensions, including feedback loops and dependencies.
4. Selection of quotes to evidence claims (quotes were anonymised and labelled by participant code, e.g. Smallholder Farmer 6 = SH6, Commercial Farmer 3 = CF3)

The trustworthiness and validity of the data was controlled by:

- Triangulation: I compared interview answers with FGD outputs, observation notes (e.g., presence/absence of box ridges, residue management), and secondary sources where relevant.
- Outlying cases: I explicitly noted outliers (e.g., a commercial farmer experimenting with residue retention; a smallholder prioritising cowpea cash-cropping).
- Reflexivity: I kept a reflexive memo after each field day noting how my affiliation with IITA and outsider status might shape responses and how the translator's phrasing could influence meaning. These memos helped me remember to be cautious in interpreting.
- Thick description: I use some boxes in chapter 4 that draw on integrated notes, quotes, and observations to preserve context and avoid decontextualised claims.

All participants were briefed on the study purpose and consented verbally. Identifiers were replaced with codes (SH1–SH9; CF1–CF6). Locations are described at village level to avoid inadvertently revealing identities. The framework dimensions directly underline the structure of chapter 4 (Results) and the comparative synthesis (section 4.7). Cross-dimensional linking and outlying-case analysis inform the feedback loop interpretations and relational vulnerability discussion in chapter 6.

4. RESULTS

This chapter presents the empirical findings of the research. The results go into depth on how the socio-economic context of rainfed smallholder and commercial farmers in Golomoti shapes the three dimensions of drought vulnerability. Drawing on the interviews, focus group discussion, field observations, existing survey data, and literature, I describe both shared patterns and contrasts between the two farmer types.

The chapter is organised as follows. I first shortly describe the basic characteristics of the interviewed farmers and their shared exposure to climatic conditions in Golomoti. I then present the socio-economic factors that influence sensitivity, adaptive capacity, and coping strategies. The framework is used to organise these factors through the mechanism boxes introduced in chapter 2. Finally, I try to bring everything together by examining how positive and negative influences differ between smallholder and commercial farmers.

4.1 FARMER DEMOGRAPHICS

This research involved a total of 15 farmers that were individually interviewed: 9 smallholder and 6 commercial farmers. Their demographic characteristics are summarised in Table 4-1 and reveal important contrasts between the two groups. The majority of smallholder respondents were women (7 out of 9) aged between 31 and 50, with most having completed only primary education or no formal schooling. In contrast, commercial farmers were predominantly male (5 of 6), often also between age 31 and 50. The commercial farmers that were interviewed had higher levels of formal education, including diploma and bachelor degrees. Farming practices also differed. All smallholders reported only having crop production, typically on plots of less than 0.5 hectares. Commercial farmers, by comparison, often practiced mixed farming. Half of the commercial farmers practice both crop and livestock production, and their farm sizes range from just under 10 to over 100 hectares.

There are significant differences in demographics between farmer groups. Factors such as education, landholding size, gender, and type of agricultural activity influence farmers' access to resources. And this access to resources in term influences the availability of institutional support and management strategies. As such, these demographics serve as an important basis for interpreting the results in the subsequent chapters on sensitivity, adaptive capacity, coping strategies, and socio-economic context.

Table 4-1: *Summary of demographic and farming characteristics*

Variables	***Smallholder***	***Commercial***
Respondent age		
18-30	11.1%	0%
31-40	22.2%	33.3%
41-50	44.4%	50%
>50	22.2%	16.7%
Respondent sex		
Male	22.2%	83.3%
Female	77.8%	16.7%
Highest level of education		
No formal education	33.3%	0%
Primary	55.6%	33.3%
Secondary	11.1%	0%
Diploma	0%	33.3%
Bachelor	0%	33.3%
Agricultural practices		
Crop farming	100%	33.3%
Livestock	0%	16.7%
Crop and livestock	0%	50%
Farm size		
Less than 0.5 ha	55.6%	0%
0.5-1 ha	22.2%	0%
1-10 ha	22.2%	33.3%
10-50 ha	0%	33.3%
More than 50ha	0%	33.3%

4.2 EXPOSURE

Golomoti is located within the South-West Lakeshore river basin, this river basin descends from the Dedza highlands (1,200–1,600 m above sea level) to the Lake Malawi floodplains (around 470 m). Steep upland slopes cause a faster runoff and thereby increases soil erosion, while flatter lowlands retain water more effectively, supporting rice cultivation and other water-sensitive crops. My fieldwork focused on the mid- to upper-slope areas outside irrigation schemes, where farmers rely entirely on rainfall. Micro-variations in soil type, slope, and vegetation cover can slightly modulate exposure on individual plots (Rockström et al., 2010), but these differences are not the focus of this socio-economic study. While temperature data and rainfall anomalies were available through GIS layers, they were not directly included in this report due to the study's focus on socio-economic dimensions.

Because of its geographic location, the smallholder and commercial farmers in the Golomoti EPA operate under roughly similar agro-ecological and climatic conditions. During the interviews, Both farmer types described the current situation as getting worse and worse, with rainfall patterns becoming less predictable and soil requiring more and more inputs to get preferable yields. These are trends that are consistent with national patterns for Malawi (Mungai et al., 2020; Chirwa et al., 2016). While these environmental changes do affect all farmers, the way they experience and respond to drought is still determined primarily by the socio-economic context of each farmer. This is explored in later chapters. Focus group participants highlighted

particularly dry years such as 2001, 2015, and 2024, with dry spells lasting three to five weeks during the growing season. These years align broadly with documented El Niño events, such as the 2014–2015 drought, which disrupted national cropping patterns and intensified food insecurity (FAO, 2016). Occasional informal water access exists, for example through shallow wells in dry riverbeds, but this is rare and primarily accessible to farmers who can afford to rent plots along rivers. Smallholders sometimes described bucket watering as "irrigation," though it does not constitute a formal system. None of the farmers interviewed had access to functioning irrigation networks.

4.3 FACTORS INFLUENCING SENSITIVITY

Sensitivity measures how strongly a farming system is affected by drought. it is shaped by multiple socio-economic factors. In Golomoti, these include crop choices, soil management, and the spatial characteristics of farms. The following sections present all the factors at play, organised under the three mechanism boxes as mentioned in the theoretical framework. For sensitivity, these boxes are crop dependency & crop portfolio, soil management & fertility, and in-farm spatial flexibility. For each box, the distinct factors for smallholder (SH) and commercial farmers (CF) are described. This is done in the following sections.

4.3.1 Crop dependency & crop portfolio

Most smallholders in Golomoti grow maize, as they say it is the "easiest" crop to grow, and it works almost every time. It is a safe option; they need to feed their families and growing other crops is risky. Farmers acknowledged that this discourages experimentation with alternative crops, as the risk of not having harvest for food is too great: "*If I try another crop and it fails, we have no food. We must grow maize to survive"* (SH6). This is not unique to Golomoti, maize is the main staple food and national food security has traditionally been defined in terms of adequacy of maize production. Or as Smale (1995, p. 820) quotes, *"Maize is life"*. The centrality of Nsima, which is a maize-based staple, reinforces maize dependency. Additionally, the dry season is commonly described as the "hungry season," reflecting the dependence of household food security on maize yields. This reliance on maize is not just a farming choice, but a deeply ingrained cultural and policy norm that shapes the entire agricultural system of Malawi (Chirwa & Zakeyo, 2003). This norm is probably the reason why most commercial farmers (again not necessarily limited to Golomoti) also cultivate this crop, albeit for market purposes.

Maize monoculture increases the risk of total crop failure during dry spells and is often less effective than some intercropping systems on food production (Bockstaller et al., 2024; Crews et al., 2018; Renwick et al., 2020). Farmers in Golomoti repeatedly described harvest losses as high as 75-100% during prolonged dry spells. These failures are often linked to the spread of pests such as the fall armyworm, which they noted "*kills entire harvests when the rains are late*" (SH3) in drought years.

Box 1
"We didn't have these worms before," said SH2, holding up a maize leaf eaten by fall armyworm. He described how drought brought more pests, and how he now sprays several times a season. "It is expensive," he said, "but if we don't spray, we lose everything." He buys the pesticide with money earned from working on commercial farms.

Few smallholders mentioned growing other crops such as groundnut or soybean, and those who did, indicated that these secondary crops provided only partial compensation when maize failed. Besides maize, cow-peas are cultivated on small-scale by most of the interviewed smallholder

farmers. However, they noted that dry spells often lead to losing the entire harvest. Commercial farmers showed greater crop diversity than smallholder farmers, with some cultivating groundnut, soybean, pigeon pea, or even sweet potato. However, maize is still the main crop grown. While commercial farmers also reported substantial crop losses in dry seasons, the overarching consensus was that commercial farmers can afford more pesticide and fertilisers than smallholder farmers, meaning they have lower sensitivity in that regard.

Box 2
SH6, a 44-year-old farmer in Lumwira, showed me a plot where fall armyworm had destroyed her entire maize crop last season. She had dug pit planting basins by hand but said there wasn't enough water without rain. Even though most of the harvest failed, she still offered me some maize to take home.

4.3.2 Soil management & fertility

Farmers in Golomoti often face challenges related to soil fertility and moisture retention. In the interviews, multiple factors that affected the soil quality became apparent. Multiple people in Malawi, including the extension officer of Golomoti, and an IITA professor (J. Manda, personal communication, March 2025) told me that there is a culturally ingrained norm of "clean fields" among farmers, where all undergrowth and all crop residues are removed. This practice leads to drying top-soils, which become bare soils with reduced infiltration capacity, which in turn increases surface runoff and erosion. Farmers acknowledged that under high heat these soils became hard and water-repellent. This can be linked to interviewees mentioning degrading soil conditions (some described their land as "exhausted") with poor soil moisture retention during dry spells. Other studies have declared that continuous cultivation is a big contributor to soil degradation (declining organic matter contents and increased erosion), which leaves soils depleted of nutrients (Snapp et al., 1998; Mungai et al., 2020). Commercial farmers also followed similar practices.

Box 3
SH1 explained why farmers remove all undergrowth and residue: "Because of snakes, I don't want my children to work in the field if there is grass"

Some farmers reported experimenting with minimum tillage, contour ploughing, and retaining crop residues, either due to extension advice or prior experience. Where such practices were in use, farmers noted improved soil moisture retention, which directly reduced sensitivity to short dry spells. Maintaining livestock manure can partially improve soil fertility, providing nutrients and aiding moisture retention when available (Zingore et al., 2008). Some farmers mentioned owning livestock, and they did use manure on their crop fields. One commercial farmer built an elevated goat shed so that droppings fall and are collected beneath it. Smallholders, due to the manageable size of their plots, often employ labour-intensive soil moisture conservation methods such as pit planting, box ridges, and planting vetiver grass to retain water and reduce erosion. As one farmer noted, *"Box ridges keep water in the soil; without them the crops would all die"* (SH4). In contrast, commercial farmers described these techniques as *"too labour-intensive for big farms"* (CF1), resulting in greater exposure of their soils to moisture loss during droughts. However, they have access to fertilisers and machinery that may partially offset soil fertility constraints.

4.3.3 In-farm spatial flexibility

Farm size and the spatial arrangement of plots also seem to influence drought sensitivity. In Golomoti, smallholders' plots are typically fragmented and under 0.5 ha. This limits the ability to experiment with staggered planting or different crop locations. Moreover, this might contribute to the difficulty of crop diversification, and soil conservation practices such as fallowing or crop rotation. The ability to spread risk across space and time, can be extremely useful against

localised drought impacts or pest outbreaks (Emerton, 2016; Dercon, 2002; Di Falco & Chavas, 2009). This is something commercial farmers seem to be able to do more for the sole reason of having larger plots to work with. Commercial farmers in Golomoti operate on large plots (some being over 100 ha). While they also experience yield losses during droughts, their sensitivity is mediated by their ability to plan where to plant on their farm (better or wetter soil in other parts of the plot for example) and sometimes stagger planting dates. One commercial farmer explained that losses are "*big, but we can spread risk across more land and change planting date if needed"* (CF2). Nevertheless, several commercial farmers highlighted that rainfed conditions and pest outbreaks can wipe out entire fields regardless of scale.

Finally, insecure land tenure discourages farmers from making long-term investments in rearranging or improving their plots (Ajefu & Abiona, 2020; Deininger, Savastano, & Xia, 2017). Interviews in Golomoti did not confirm that land tenure was insecure in the area. However, employees at IITA did mention that there are many farmers who do not have full security of keeping their land.

4.4 FACTORS INFLUENCING ADAPTIVE CAPACITY

Adaptive capacity can be seen as the ability of a farmer to adjust farming practices and anticipate drought events. Moreover, adaptive capacity also includes the ability to take advantage of opportunities to reduce possible impacts. In Golomoti, this dimension is shaped by access to financial, institutional, and knowledge resources. Three mechanism boxes have been categorised where all the socio-economic factors that influence adaptive capacity fall in. These boxes are rainfall variability & water options, finance & input access, and information and learning. The following sections are used to describe these factors.

4.4.1 Rainfall variability & water options

Both smallholder and commercial farmers in Golomoti reported that they face challenges linked to unpredictable rains. Replanting due to false rainfall onset was reported in both groups. Most farmers mentioned having to replant at least 2 times out of the last five cropping seasons due to early rain followed by drought, with some indicating that this depleted their seed reserves. One woman explained: "*The rains come, we plant, and then the sun kills everything. We plant again, but we have no seed left"* (SH8). Many commercial farms also had to replant. However, a few indicated that they have not needed to replant at all. On top of that, commercial farmers were generally better able to absorb the cost of additional seed and labour. However, repeated replanting increased input costs and delayed the season for both groups, further exposing them to rainfall variability.

Water management remains limited in Golomoti. Only a handful of smallholder farmers reported using simple techniques such as planting basins or ridging to retain moisture. These measures increase soil moisture locally but do not offset the impact of prolonged dry spells. Similarly, although commercial farmers occasionally mentioned small on-farm water storage systems or shallow wells, none actually used it for watering crops. The farmer that indicated collecting rainwater, used it to provide water to livestock. The farmers that had a shallow well, said that using one single bucket does not work on a large commercial farm, they used it solely for drinking water. Both farmer types confirmed that formal rainwater harvesting systems are practically absent, despite their potential to stabilise yields under increasing rainfall variability and to "survive" a dry spell.

Box 4
When asked why no one is storing rainwater, SH5 explained: "we make box ridges and plant vetiver grass to keep moisture at the seeds, but water tanks are too expensive for us".

4.4.2 Finance & input access

Smallholder farmers face financial barriers that constrain their ability to invest in certain adaptation techniques. Many farmers described struggling to buy improved seeds, fertilisers, or pesticides. They rely instead on informal saving groups that exist within the communities, and on income earned through casual labour (often on commercial farms). Many expressed interests in using early-maturing maize seed or drought-resistant varieties but cited cost as the main barrier. *"If we had money for early seeds, we would buy them,"* explained SH7. As mentioned in previous chapter, farmers were not very keen on trying new farming techniques, but when they see that something works well, they are willing to try. Some farmers showed testing fields (very small due to fear of failure) with new crops or techniques (Box 5). Smallholders described relying entirely on hand tools. During the focus group discussion, a few farmers mentioned that for those who can afford it, there is the possibility of renting a plot near the river (roughly 30km away). These plots are located in areas with better soil moisture, and there was even talk of an informal irrigation scheme. Such arrangements offer a rare opportunity to secure harvests even in poor rainfall years.

Commercial farmers, by contrast, benefit from larger financial buffers and easier access to credit. Several reported having savings or access to formal loan systems that allowed them to purchase improved inputs or replace lost seed after failed rains. As CF3 explained, *"We can buy improved seed if needed and adjust planting times, but it's still a gamble with the rains."* This financial stability allows commercial farmers to manage uncertainty more proactively, while smallholders remain reactive and dependent on external or seasonal income sources.

Box 5

SH8 made a different choice. She grows cowpeas as a cash crop and uses the profit to buy maize, instead of growing it herself. "I cannot feed my children on cowpeas," she told me, "but at least I can buy enough food when the harvest is good." She is one of the few farmers experimenting with crop selection, a sign of cautious adaptation.

4.4.3 information & learning

Both smallholders and commercial farmers consistently reflected that there is engagement with extension services. Farmers received occasional visits from the Golomoti EPA extension agent, most reported getting agro-advisory & training, as well as access to agricultural inputs (e.g., seeds, fertilisers, tools). One farmer highlighted the value of these interventions: *"The extension workers taught us pit planting and vetiver grass; without that, we would lose more"* (SH2). Most commercial farmers mentioned occasional government or NGO initiatives but expressed that support was sporadic and often targeted towards smallholders rather than larger farms. In contrast, one of the interviewed commercial farmers mentioned the presence of a local NGO, Total Land Care, which reportedly brings together both smallholder and commercial farmers to teach improved agricultural practices (Total LandCare [TLC], n.d.). According to this respondent, the NGO facilitates joint learning activities that promote climate-smart techniques across different farm types. However, it is noteworthy that none of the smallholder farmers interviewed referenced Total Land Care during their interviews or focus group discussions. This may suggest that only a limited number of smallholders are actually involved in the NGOs programming, and that those included in this research were not among its current participants. As such, while the initiative may enable group knowledge exchange between farmers, its reach appears to be uneven and may not significantly influence adaptive capacity among the broader smallholder population.

Some commercial farmers also indicated that there is interaction with smallholder farmers in terms of gatherings where technical knowledge was exchanged, or that farmers gather together

to benefit from mega farm government loans (more on that later). Commercial farmers mentioned that these linkages expanded their adaptive capacity through knowledge and network access. In contrast, only one of the smallholders interviewed mentioned actively working together with commercial farmers. Smallholders indicated that besides extension help, they largely rely on informal knowledge sharing within the community. While this provided some resilience, it also reinforced traditional practices such as the land "cleaning" that was mentioned in the sensitivity section.

As mentioned in the previous section, several farmers (from both farmer groups) reported using early-maturing seed varieties to counter unpredictable rainfall. However, the sustained use of these modified seeds depended on access to sufficient financial assets each season. That aside, the adoption of these seeds was linked by farmers to awareness from extension services and from talk within communities.

Education levels also shape how information is received and applied (Nhemachena & Hassan, 2007). Many smallholder farmers in Golomoti received only primary education or none at all. This affects their access to, and perhaps their interpretation of, technical advice. Again, this often leads to reliance on oral knowledge networks within the village. These informal exchanges help spread useful practices. Similarly, indigenous knowledge on rainfall patterns for example, can guide decisions that may lead to successful yields. Commercial farmers generally had a higher education level, up to secondary or tertiary level. This could further support forwards planning, with more deliberate anticipation and investment decisions compared to smallholders. They have access to mobile phones for agricultural information, access to written extension materials, and perhaps weather forecasts. This last point was not verified during my research. But it seems that there is generally a lack of climate information services that are region specific.

4.5 Factors influencing coping strategies

Coping strategies are actions that are taken as a response to a dry spell. Coping strategies are mainly short-term strategies that aim to alleviate the hit of drought. There are many socio-economic factors that influence which strategies can be implemented by a farmer and therefore how effective they are. In Golomoti, smallholder and commercial farmers both showed a range of measures, but their options and long-term effects differed greatly. The factors that affect this dimension, can be fit into the following two mechanism boxes: market structure & prices and labour & social safety nets. The next sections of this report describe these boxes together with the factors.

4.5.1 Market structure & prices

Smallholder farmers commonly reported selling crops immediately after harvest at low prices ("distress selling") to meet urgent food or school fee needs for the children. This often leaves the farmers without reserves to sell later when the prices rise again (in dry season). They explained that they lack the storage capacity, so selling their crops is almost a necessity. As one woman noted: *"We sell when everyone sells; the buyers know we need money"* (SH5). Ultimately, this, and the factor that smallholders have little amounts to offer, leads to a low bargaining power. All of the interviewed farmers stated that low prices for their produce is one of the bigger problems that they face in the current market structure. Moreover, there is a dependence on middlemen, who determine prices and purchase at the farm. Around half of the farmers sell their produce, either via these middlemen, or at local markets, the other half uses their yields solely for home consumption.

In contrast, commercial farmers typically sell directly to formal markets or aggregators in Lilongwe, allowing them to time sales and secure higher and more stable prices. Some

commercial farmers described having contracts or bulk sale agreements that shielded them partially from price fluctuations. Still, price fluctuations were still a common answer when asked what their main challenges regarding the current market structure are. They have to sell their produce in batches, as demand is not always sufficient.

4.5.2 Labour & social safety nets

Smallholder farmers consistently reported engaging in labour-based coping strategies during drought periods. A large proportion described seeking wage labour on commercial farms or in nearby villages as their primary means of generating income when crops fail. Several explained that during drought years they were forced to work on commercial farms to afford basic inputs: *"When there is no harvest, we go and work for the big farms to buy pesticides or food"* (SH5). This strategy, while providing short-term cash or food, often diverted labour away from their own fields, which several smallholders acknowledged could compromise planting or soil preparation. Some commercial farmers reported shifting labour internally (e.g., reallocating workers to prioritised fields) as a way to safeguard high production areas during drought events. Commercial farmers act as employers during drought crises. Some commercial farmers say they hire labour for specific tasks only, such as planting and harvesting, other farmers offer year-round employment (or at least during the growing season).

There are many case studies of rural Africa that show how smallholder farmers benefit from social networks (Nyantakyi-Frimpong, Matouš, & Isaac, 2019; Cassidy & Barnes, 2012). Community-level safety nets can provide crucial relief during crises, even when entire villages face simultaneous losses. In Golomoti, there was mention of village saving groups, informal lending, and food-sharing arrangements. Commercial farmers, by comparison, rely more on formal mechanisms such as savings, access to bank loans, or reinvestment of profits from other businesses. This was described in chapter 4.4.2.

Both farmer groups mentioned asset sales, livestock in particular, as a last-resort coping strategy. In some extreme drought years, smallholders had to sell their goats or chickens for short-term cash to buy inputs for their farm or even just household necessities. A commercial farmer reported having to sell his cattle before. However, these decisions carry future costs. Selling livestock reduces access to manure, and as livestock is mostly for subsistence, also impacts food security.

4.6 SOCIO-ECONOMIC CONTEXT OF SMALLHOLDER AND COMMERCIAL FARMERS

Now that all factors are described, this section briefly steps back and characterises the overall socio-economic context in which smallholder (SH) and commercial farmers (CF) operate. A full overview of all identified factors for both groups is provided in Annex F for SH and Annex G for CF, following the framework's structure.

Smallholder farmers in Golomoti cultivate small, often fragmented plots, below 0.5 ha on average, with maize as the main crop and only limited areas under other crops. Farming is largely subsistence-oriented, relying on family labour and hand tools. Access to cash and credit is tight, most households depend on informal saving groups or borrowing from relatives. Income from casual wage work, often on commercial farms, is necessary in many cases. When there is some yield left over to sell, it usually leaves the farm through local markets or through middlemen, at low and fluctuating prices. Contact with institutions exists but is irregular. Many smallholders rely instead on informal knowledge networks within their village. Education levels are generally low, which means that oral information and local "lead farmers" are important.

Commercial farmers operate on larger and more numerous plots, in several cases above 10-100 ha, sometimes combining crops with livestock. Production is market-oriented, with sales to buyers directly in Lilongwe (capital city), and other regional markets. They can often sell in bulk, making them less susceptible to price fluctuation. Commercial farms use some machinery and use hired labour. Most have more reliable access to inputs, savings and formal credit, which enables them to purchase fertiliser, pesticides, and improved seeds when needed. They interact more frequently with government programmes and NGOs and are better connected to formal information channels. Education levels are higher among commercial farmers, as farms are often voluntary side "jobs", and many have additional off-farm income sources or business.

These contrasting socio-economic contexts shape how the three dimensions of vulnerability play out. For smallholders, the combination of small landholdings, subsistence maize dependence, the lack of financial buffers, and the weak market power makes them very sensitive to crop failure. This also intrinsically leaves little room for adaptation and coping. Commercial farmers are also fully exposed to rainfall shocks, but their larger land base, access to better inputs, stronger institutional links, and more diverse income sources give them greater adaptive and coping options. The detailed mechanisms through which this occurs have been described in sections 4.3 – 4.5. Drought vulnerability in Golomoti is hereby not only ingrained in climate exposure, but in two very different socio-economic contexts in which smallholder and commercial farmers are embedded.

4.7 POSITIVE AND NEGATIVE INFLUENCES; DIFFERENCES BETWEEN SH AND CF

This section is a follow-up of the previous. It summarises the identified factors that shape the socio-economic context and describes the factors that positively or negatively affect the three dimensions of vulnerability. The figures presented visualise the relationships between the factors, smallholder and commercial farmers, and their effect on the dimension. Within the figures, factors with a positive influence are shown in green, negative influences in red, and how they differ between the two farmer groups is shown by listing the factors per group.

4.7.1 Sensitivity

Figure 4-1 shows an overview of how crop dependency, soil management, and in-farm spatial flexibility shape sensitivity to drought. For smallholder farmers in Golomoti, maize monoculture, degrading soil practices, and the fact they have small and fragmented plots increase drought sensitivity. These factors are reinforced by cultural norms and practices, such as wanting "clean" fields, and reliance on maize for food security. Taken together these discourage potentially beneficial practices. Positive influences also exist but are labour-intensive. The practices like pit-planting, ridge tilling, and planting vetiver grass do improve soil moisture. This is however only possible on small scale farms, so although commercial farmers benefit from larger landholdings that permit staggered planting and partial crop diversification, they leave soils exposed on a greater scale. Overall, sensitivity among smallholders is driven by resource scarcity and cultural practice, whereas among commercial farmers it comes from the large scale and limited conservation effort.

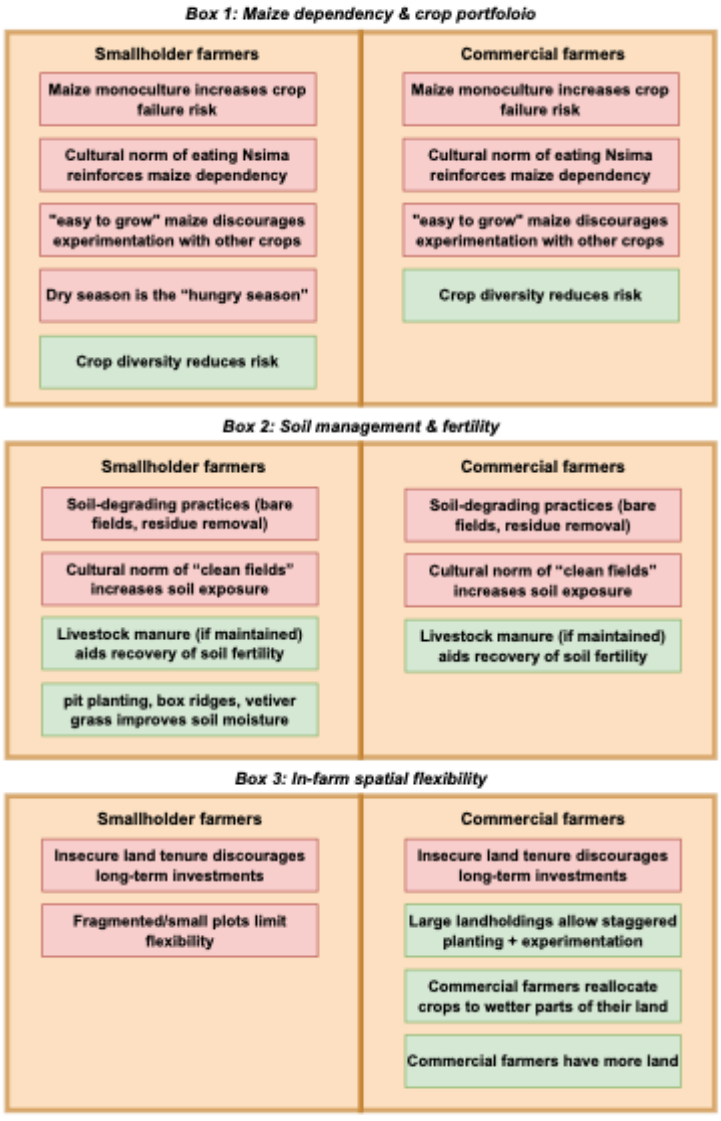


Figure 4-1: *Sensitivity factors influencing drought vulnerability among smallholder and commercial farmers*

4.7.2 Adaptive capacity

As shown in Figure 4-2, the main factors that influence adaptive capacity are rainfall variability and water access, finance and input access, and information and learning. For smallholders, limited access to financial means and weak institutional links limit adaptation options. Positive factors are the strong informal knowledge exchange within communities and their indigenous knowledge. On top of that, participation in village saving groups helps to buffer some drought hits. High input costs, for seed purchase, fertilisers, and pesticides are a strong negative.
Commercial farmers, who possess more financial and also material buffers, are able to purchase improved inputs more easily. They can also plan ahead and adjust planting schedules due to knowledge gained from government, NGO, and online initiatives and available data. Nevertheless, the high input costs and absence of irrigation infrastructure remain significant constraints.

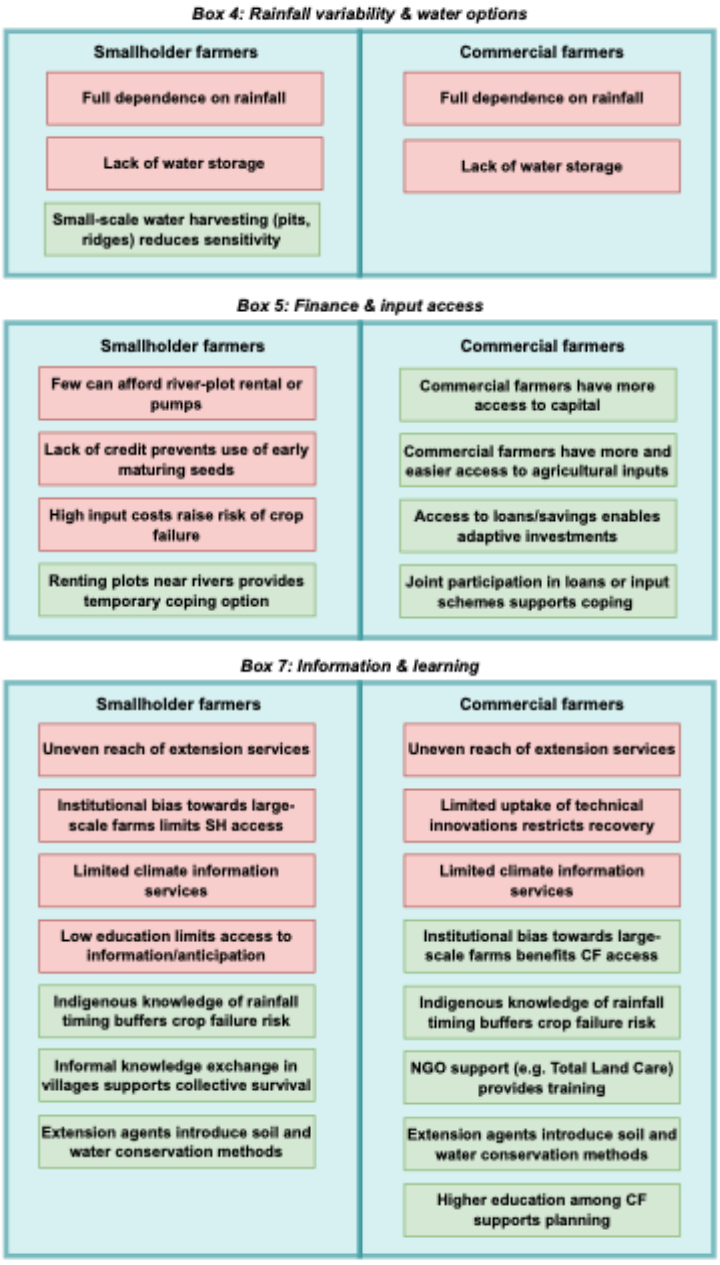


Figure 4-2: *Adaptive-capacity factors influencing drought vulnerability among smallholder and commercial farmers.*

In short, adaptive capacity is uneven. Smallholders rely on low-costing adjustments that can be implemented incrementally, whereas commercial farmers have broader adaptation possibilities because of their financial capital and their stronger institutional access.

4.7.3 Coping strategies

Coping strategies describe short-term responses to drought impacts. Figure 4-3 gives an overview of the factors that influences these responses. Smallholders depend on wage labour, livestock sales, and social capital (village saving groups or food sharing). These strategies offer immediate relief and spread risk during difficult years. However, they may reduce resilience in the long term by depleting productive assets and diverting labour from their own farms. Smallholder farmers in Golomoti are also dependent on middlemen, who offer low prices for produce, and the lack of storage possibilities does not help. Commercial farmers can sell in formal markets, directly to buyers in Lilongwe. This helps stabilise income even during droughts, though price volatility still affects their profitability. They can also store inputs and buy them when cheap.

Overall, coping strategies show the clearest socio-economic divide. Smallholders' survival-oriented actions versus commercial farmers' more stabilising actions.

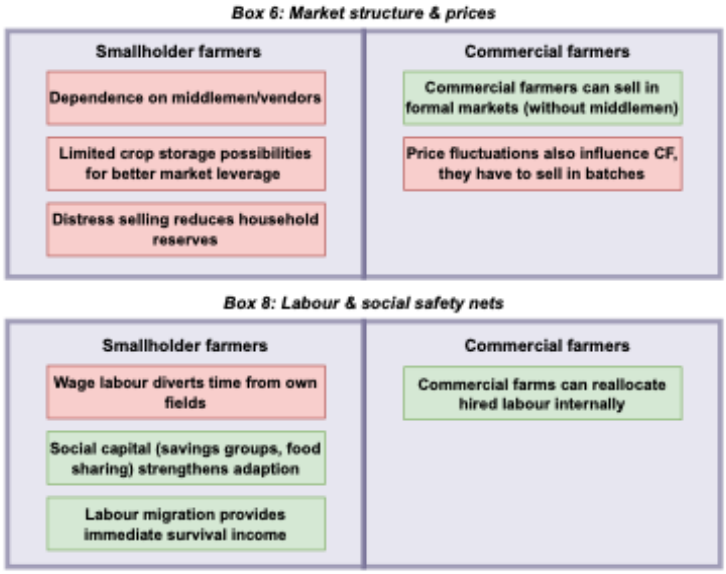


Figure 4-3: *Coping-strategy factors influencing drought vulnerability among smallholder and commercial farmers.*

4.8 FEEDBACK LOOPS

The previous sections showed how socio-economic factors influence the three dimensions of drought vulnerability for smallholder and commercial farmers. During analysis it also became clear that many of these factors have influence on other factors as well. They form feedback loops in which farmer decisions determine future sensitivity, and adaptive and coping options. This section presents four feedback loops that were identified from the field data.

The four loops are as follows:

1. *Investment loop*
2. *Replanting loop*
3. *Wage-labour loop*
4. *Asset-sale loop*

The first loop was found on commercial farms. The larger plots, access to credit, and better market integration enable them to absorb drought losses. This is because they can reinvest in inputs and keep experimenting within their production systems. When seasons are favourable, profits can be used to strengthen infrastructure, purchase modernisation equipment, and perhaps even for expanding land area. This creates the *investment loop* (see figure 4-4). However, interviews also revealed that many commercial farmers continue to rely on large-scale bare-soil practices and limited water storage. Under more frequent drought situations, these practices could well generate negative feedbacks by further reducing soil organic matter and increasing moisture stress. In this case soil health would erode the very productivity that currently pays for their adaptive capacity.

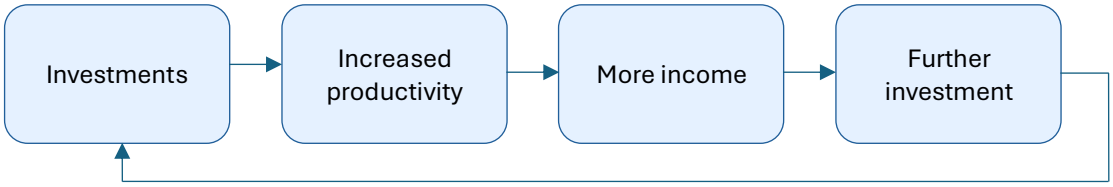


Figure 4-4: *Investment loop*

Both farmer groups reported frequent replanting after false rainfall onset. Each replanting round uses up seed and costs labour. Requiring purchasing new seed, fertiliser, or pesticide can be a large chunk of the available credit. Farmers described that repeated replanting is very expensive, and it also shortens the growing season. Therefore, yields can end up lower despite the higher expenditure. In following season, depleted savings and seed stores make it harder to buy better seed varieties or experiment with alternative crops. This is the *replanting loop* (figure 4-5), the second loop identified.

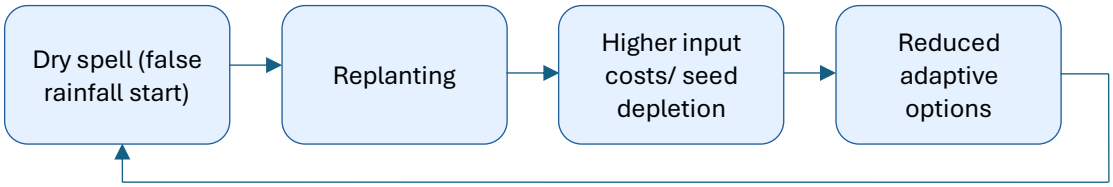


Figure 4-5: *Replanting loop*

Smallholders depend heavily on wage labour (often on the commercial farms). The third of the four loops I found therefore is about wage labour. When crops fail, many smallholder farmers are obliged to work on nearby commercial farms to secure food or cash to buy inputs for their own field. During interviews farmers acknowledged that this strategy takes away energy and time from their own fields during critical periods for land preparation or planting. Over time, this can lead to less accurate planting timing, fewer soil conservation structures, and therefore, failing yields on their own land. Lower yield then increases the need to return to wage labour again. From a vulnerability perspective, this creates the *wage-labour loop* (figure 4-6).

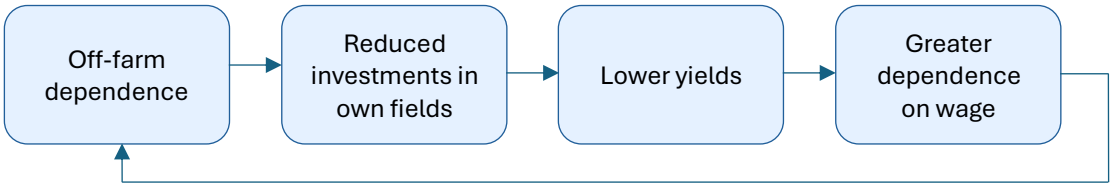


Figure 4-6: *Wage-labour loop*

For many farmers in both farmer groups, livestock and basic equipment are the first assets to be sold in bad years to buy food or inputs. Several respondents linked selling livestock to poorer soil quality and lower yields. Studies by Carter & Barrett (2006), and Cooper et al. (2008) reflect this. They show examples of cases in Southern Africa where distress sales of animals during drought undermines future production and that it contributes to poverty traps. Finally, the last feedback loop I identified in the field is the *asset-sale loop* (figure 4-7). This dynamic is consistent with Carter and Barrett's (2006) argument that repeated shocks and distress sales can trap households below an asset threshold from which recovery is unlikely, and with evidence from Southern Africa showing how liquidation of livestock during drought undermines future production capacity (Cooper et al., 2008).

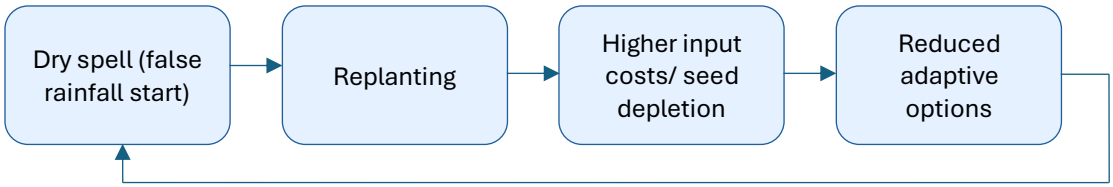


Figure 4-7: *Asset-sale loop*

4.9 SECONDARY SURVEY DATA

In addition to my own interviews, I also drew on an earlier household survey carried out by IITA in late 2021 and early 2022 among smallholder farmers in Lumwira (IITA, 2022). The survey covered 15 rainfed smallholder farmers, and recorded detailed information on soil and water management, land tenure, extension contact, and income sources, among others not relevant for this study. A summary of the main variables is presented below, in table 4-2. This dataset was used mainly to be able to validate the answers collected in my research. It allowed me to cross-check whether emerging patterns of this study were consistent with earlier observations. Some of the surveyed farmers in 2021, participated again in my interviews.

The survey confirms several features of the local farming system. Around 80% (12 of 15) of respondents grew maize as their main crop, some use intercropping systems and use improved seed varieties. At the same time, almost all farmers used no inorganic fertiliser, and nearly half reported no organic amendment. This indicates that there were strong input constraints under the surveyed farmers too. Soil and water conservation practices were present but there were quite big differences among the farmers. Land was mainly accessed through family allocation or from local leaders, with only one farmer holding a titled plot. Finally, over half of the farmers reported wage labour in agriculture as an important additional income source, similar to what was found during this research. Overall, the survey results align quite closely with results of this study and therefore support the interpretation of smallholder drought vulnerability in Lumwira.

Table 4-2: *Summary of key agronomic and socio-economic variables from the IITA smallholder survey in Lumwira (n = 15, 2021-2022)*

Variables	***# of farmers***	***% of farmers***
Crop grown		
Maize	12	80.0%
Cowpeas	1	6.7%
Groundnut	1	6.7%
Soybean	1	6.7%
Crop variety		
Improved	10	66.7%
Local	5	33.3%
Cropping system		
Intercropping	8	53.3%
Monocropping	7	46.7%
Soil conservation practice		
Grass/bench terraces	6	40.0%
Agro-forestry	2	13.3%
Contour ploughing	2	13.3%
Minimum tillage	2	13.3%
Mulching	1	6.7%
Tied ridges	1	6.7%
Trash line/stone/soil bunds	1	6.7%
Fertiliser used		
No fertiliser	14	93.3%
CAN	1	6.7%
Major organic amendment		
No organic amendment	7	46.7%
Animal manure	6	40.0%
Compost	2	13.3%
How acquired land		
Allocated by family member	4	26.7%
Granted by local leaders	4	26.7%
Inherited by death family member	3	20%
Short-term rent	3	20%
Purchased with a title deed	1	6.7%
How were crop residues managed		
Crop residues incorporation	5	33.3%
Left on the plot (burned)	4	26.7%
Left on the plot (not burned)	4	26.7%
Livestock feed	2	13.3%

Table 4-2: *(continued)*

Variables	***# of farmers***	***% of farmers***
Main measure against soil erosion		
None	6	40.0%
Box ridges	3	20%
Grass strips/barriers	3	20%
Contour bands	2	13.3%
Marker ridges	1	6.7%
Main reason for lower yield in bad years		
Inorganic fertiliser use	3	20%
None	3	20%
Bad rainfall	2	13.3%
Crop management	2	13.3%
Pests or disease	2	13.3%
Low-yielding seeds	1	6.7%
Other	1	6.7%
Soil degradation	1	6.7%
Topics of extension advice received		
No advice	4	26.7%
Minimum tillage	3	20%
New varieties of maize	3	20%
Soil and water management	3	20%
Input markets and prices	1	6.7%
Pest and disease control	1	6.7%
Other income sources		
Wage labour (in agriculture)	8	53.3%
Firewood & other forest products	3	20%
Household non-farm enterprise	3	20%
Remittances	1	6.7%

5. BROADER SOCIO-ECONOMIC CONTEXT

The patterns described in chapter 4 do not exist at random. The patterns came to be because of differences that extends beyond Golomoti itself. This chapter steps back from the farm level and examines the broader historical, economic, institutional, and cultural conditions that shape farmers' options. By placing the discoveries of the results chapter of this research within this broader context, it becomes possible to understand why certain practices exist and persist. It can also explain how structural factors constrain or enable both farmer types.

5.1 HISTORICAL CONTEXT AND COLONIAL LEGACY

Although the farmers did not explicitly mention historical causes, the literature research does indicate that Malawi's colonial history has set the stage for some current challenges. During the British colonial rule (1891-1964) much of the fertile lands were taken over by European settlers and companies (Pachai, 2009). This land appropriation at the time changed the traditional agrarian systems for good, the self-sufficient smallholder farming made place for estate agriculture and thereby the implementation of cash crops for export. These crops are still grown today, and include tobacco, sugarcane, cotton, and coffee (Chirwa, Kydd, & Dorward, 2006). This introduction is still a problem to this day, as cash crops are still preferred over local food production. Around this time Maize was also introduced to Malawi. As McCracken (2012, p. 13) mentioned, *"They were also growing maize, the most important of the so-called American crops, high yielding but vulnerable to drought, which had been introduced from the east coast, perhaps in the eighteenth century, and by the 1880s had become 'the chief article of cultivation'."*. The promised protections for local smallholders (such as secure tenancy on estate lands) were seldom honoured. Because many people became landless, this indirectly forced many families into wage labour on these estates (Pachai, 2009; McCracken, 2012).

The colonial legacy has had lasting effects on rural livelihoods in Malawi. Even decades after independence there are still structural inequalities and much of the population remains impoverished (Horn, 2024). In the central region of Malawi (including Dedza district, where Golomoti is located), the historical pattern seems somewhat different from the estate-dominated south, but the influence is still significant. Another thing is that colonial authorities often implemented top-down agricultural schemes, for example, the coercive soil conservation practices in the 1930's (Morris, 2016; Chandana & Wapulumuka, 2018). The soil conservation measures were implemented to restore the soil as it was badly damaged because of the introduction of cash crops. These measures were extremely labour intensive, however, and British forced labour onto the farmers. This caused a resentment against compulsory labour which led to different protests, ultimately leading to the decolonization movement. Chandana & Wapulumuka (2018) even suggest that the forced soil conservation at the time still stoke resentments to this day. All in all, this caused distrust among the smallholders for external interventions (Green, 2009).

In the Dedza region (and much of central Malawi), most people are Chewa. Traditional Chewa society follows a matrilineal land inheritance system. This is where land rights pass through the mother's side of the family. During the colonial period, British administrators viewed this system as a barrier to "modern" agriculture. They argued that it created insecurity for men, who typically married into their wives' villages and therefore did not own land directly. Some colonial reports described men as a "floating population" because they did not have any incentive to invest in long-term improvements, while women's clan-based land control was seen as too fragmented and informal for efficient production (Pachai, 2009). In reality, according to anthropologists, these matrilineal systems were actually quite stable and provided flexibility within extended families. However, these misunderstandings still justified policies at the time toward individual

land titles, promotion of male-led estate farms, and discouragement of traditional tenure practices.

5.2 Economic constraints and resource access

Day-to-day decisions of farmers are heavily influenced by their economic situation. Smallholder farmers in Malawi operate under severe resource constraints that limit their capacity to innovate or take risks. More than 80% of Malawians live in rural areas and rely on subsistence agriculture (Chandana & Wapulumuka, 2018). This means that most families prioritize food security over commercial production, and they have little surplus income to invest in new crops or other inputs. A single bad season can be devastating. Reliance on rainfall keeps farmers one drought away from hunger. Ultimately, this risk of crop failure makes farmers understandably cautious about experimenting with unfamiliar practices that might not pay off immediately.

Another major constraint, as also described in chapter 4.4, is the lack of access to credit and financial means. Formal financial institutions in Malawi have strict conditions for loans, that most small farmers simply cannot meet. For example, requirements include multi-year credit histories, substantial upfront cash deposits (often 40% of the loan), collateral assets, and the ability to pay high interest rates (Africa Business Communities, 2023). On top of that, as agriculture is seen as a high-risk sector in Malawi (because of erratic weather and unstable crop prices), banks have been hesitant to lend to smallholders. As a result, farmers are often caught in a so-called liquidity trap. They cannot afford investments that would increase their productivity (irrigation pumps, quality seed, fertilisers, etc.), yet without those investments they remain too unprofitable to gather savings. There have been cases, and the interviews also confirms, that there are informal community savings groups. And in some cases NGOs fill the gap, however, both these sources are limited. The outcome is that many farmers remain stuck in low-input, low-output farming.

When opportunities do arrive, such as a new irrigation scheme close to the river, or a new seed variety is introduced, poorer households may be unable to participate due to lack of money. Economic differentiation thus leads to a divide; better-off farmers (who had some savings or assets) are more likely to take advantage of new initiatives, while the poorest may hold back because they simply cannot afford the risk. This goes a long way in explaining why interventions must be low-cost and low-risk from the farmers' perspective to gain traction at all.

5.3 Institutions, policies, and knowledge gaps

Another layer of socio-economic differences are institutions and policies. The support (or lack thereof) from government extension services, development projects, and local organisations can determine whether farmers adopt new farming practices. In Malawi, agricultural extension is an important service, it provides farmers with information, training, technical advice, and sometimes even inputs. However, there have been reports that there are way too few extension agents, and that the service is under-resourced across Malawi. In recent years, one agricultural extension officer might be responsible for 2500-3000 farmers on average (Tiyeni news article, 2020). This means that in practice, many rural communities see an extension worker only rarely, if at all. In Golomoti EPA, farmer reported that there was contact with official extension agents, but that it was limited prior to recent projects (Mungai et al., 2024). As a result, smallholders often rely on informal knowledge networks such as via other farmers that are a bit more progressive, relatives, and local lead farmers. This can be effective, but may exclude those not connected to the right networks. Within this landscape, NGOs play a visible role. One organisation that was mentioned during the interviews, was Total Land Care (TLC, n.d.). They have been active in the Golomoti area through training on soil and water conservation, and climate-smart practices. During fieldwork, several commercial farmers mentioned TLC programmes, but contrastingly

smallholders appeared only indirectly aware of them. The reach of NGOs is still limited, and not all farmers benefit.

Government and NGO policies also affect opportunities for farmers. A good example is the Agriculture Transformation Initiative (ATI) program that was introduced in Malawi (including Golomoti) after the devastation of cyclone Idai in 2019. ATI and the farmers union of Malawi organised an irrigation scheme somewhere in Golomoti EPA and also different schemes in neighboring EPA's (Nyasa Times, 2020). These interventions were aimed at rebuilding livelihoods, and importantly, promoting crop diversification (targeting declining tobacco demand). These projects provided some physical infrastructure, but also trainings and workshops for farmers in irrigation and new crop techniques, and linking farmers to markets. Although these interventions were not located in the area of this particular research, it shows how policy-driven support can alter farmers' outlook. Because those included in the scheme reported now being able to produce more than just one crop per year, improving their food security and incomes. Another example is the government of Malawi's "Mega Farms Initiative". It represents a national policy push to commercialise agriculture through the creation of large-scale modern farms. The programme aims to increase the production and attract investments by improving infrastructure, mechanisation, and irrigation (Government of Malawi, 2021). While this might potentially benefit economic growth, such initiatives may widen the gap between smallholder and commercial farmers. That being said, the interviewees almost all mentioned there being some government help for smallholders as well. However, they emphasised that this support was only occasional and uneven, and that it was too limited to transform their production constraints.

5.4 Social and cultural influences on farming decisions

Farming is not just an economic activity, there are much more aspects at play such as the community norms, gender rules, and belief systems. In Malawi, gender dynamics are particularly important. About a quarter of households are female-headed, and these households tend to be among the poorest (Takane, 2007). This disparity is a result of multiple factors, female-headed families often have less adult labour, smaller land sizes, and less access to credit or extension (since many programs historically targeted male-headed farmers). In a matrilineal society like the Chewa communities in Golomoti, women may technically own the land, but men often still control the marketing of cash crops and major decisions. This can lead to conflicts within households or suboptimal use of resources. For example, if a husband feels less secure because the land is in his wife's lineage, he might hold off investments in long-term improvements on that plot (Pachai, 2009). Empowering women farmers through cooperatives can have a strong positive impact, as women are more likely to use resources for the family (food and stability) (Msofi Mgalamadzi, Matita, & Chimombo, 2024).

Another social factor is community knowledge sharing. Rural Malawian communities traditionally have systems of labour exchange and knowledge sharing. This happens in both formal and informal situations, such as at church or shops. Knowledge spreads fast, if a farmer tries a new intercropping system with soy-beans, the whole village will wait in anticipation to see if the innovation is successful or not. Farmers need to see to believe. This is already embedded in an approach used in Malawi's extension strategy, they appoint a "lead farmer" to demonstrate new technologies (Holden et al., 2018).

Lastly, cultural attitudes toward change and external actors influence farmer decisions as well. Many older farmers have witnessed many development projects come and go. This history can breed cynicism ("we have seen promises before that did not last") or it can cause farmers to implement pragmatic approaches to extract short-term benefits while the project is there.

Younger farmers might be more open to new ideas, especially as rural areas slowly modernise. As mentioned earlier in this report, education levels also factor in, a farmer with some secondary education might be quicker to calculate the profitability of a new crop or to adopt improved farming methods than a farmer without formal education. Development is not just about providing assets or information, but also about changing mindsets and community narratives.

6. DISCUSSION

Between January and March 2025, I experienced firsthand what it means to farm under uncertainty. I spent days in Golomoti, walking and driving along dusty paths between fields, sitting under trees in the midday sun, listening to the stories of harvest losses, weeks of waiting for rain, and dependency on good yields. The farmers I met, both smallholder and commercial, were open, generous, and remarkably patient. Despite any problems they faced, they took time to share their knowledge with me, to gather in focus groups, and to welcome me into their communities. Many smallholder farmers spoke with quiet resignation about repeated crop failures and the toll that drought has taken on their families. Yet just as often, they expressed cautious optimism. Hope that the next season would be better, that a loan might come through, that new seed varieties or other inputs would be subsidised by the government or other institutional parties. Among commercial farmers, I encountered similar tensions; they have their own battles to fight regarding market competition and such. In the midst of this landscape of insecurity, one thing stood out: the strength of relationships. People help one another, hire one another, rent land to one another. It is this interdependence, that reveals the complexity of vulnerability in Golomoti. This complexity is often invisible in statistics about the country. As a researcher, I could never fully disentangle the ecological from the social, or the personal from the structural. What I could do was listen carefully and reflect on the patterns that emerged.

In this chapter, I look at the key themes and results presented earlier, linking them to the theoretical framework. This chapter reflects on the main discoveries of the study and places them within the wider literature of drought vulnerability and rural livelihoods in Malawi (and other comparable regions). My aim was to understand how the socio-economic contexts of smallholder and commercial farmers in the Golomoti EPA shape their drought vulnerability. Instead of treating vulnerability as a fixed attribute, I examined how sensitivity, adaptive capacity, and coping strategies are determined by farmers' access to land, capital, markets, institutions, and social networks. The discussion is organised in two parts. The first section answers the research question and looks at feedback loops and trade-offs over time. In the next section I critically reflect on the methodological and conceptual choices I made in this study. Here I include the strengths and limitations of the qualitative structure and the vulnerability framework used. Additionally, I shortly outline the implications for future research.

6.1 HOW SOCIO-ECONOMIC CONTEXT SHAPES DROUGHT VULNERABILITY

The results of my research confirm that drought sensitivity in Golomoti is strongly structured by farming systems and resource constraints, rather than by climate alone. For smallholders, the strong cultural emphasis on maize and Nsima grown on small plots, lock households into doing what they have been doing. This is consistent with national studies that show how Malawian food security has been met with maize production for a long time (since colonial time, see chapter 5.1). Soils are degraded because of continuous cultivation and residue removal (a cultural informed practice). This means that even short dry spells quickly turn into crop failure in many cases. Several researchers expressed concerns on this, as soil fertility continues to decline (Mungai et al., 2020; Snapp et al., 1998). I found that commercial farmers have larger landholdings, which gives them freedom in experimentation and flexibility. Their sensitivity therefore comes less so from immediate subsistence, but more from financial exposure directly *because* of their large lands. Large plots are more input- and labour-intensive, and the current structure of agriculture in Malawi means that they too are sensitive to drought in their own way.

Adaptive capacity is more unequally distributed. Smallholders' ability to anticipate and adjust to drought is constrained by their limited access to credit, high input costs, and in some cases insecure tenure. They rely on low-cost measures, saving groups within their community, and

indigenous knowledge. The difference with commercial farmers is that they have little scope for larger investments, such as perhaps new technologies, storage systems or diversification (such as crop rotations or permaculture for example). This aligns with broader research on "low-input, low-output" traps in African smallholder agriculture, and the inefficiency of maize monoculture as a whole. Though, as the results show, commercial farmers are still mostly stuck on maize too as interviews suggest (and observations from the field). They just have more options to "adapt" the system in the nearby future. This pattern resonates with research done in Malawi and neighbouring countries where maize-centred policies and high risk of failure discourage adoption of alternative cropping systems (e.g. Smale, 1995; Jayne et al., 2010).

I discussed sensitivity and adaptive capacity, where differences between farmer groups are already clear. However, the third dimension of drought vulnerability, coping strategies, shows the clearest divide. Smallholder farmers depend on distress sales of crops and small livestock, wage labour, and social networks. As I learnt in this research, this provides just enough for short-term survival but cuts off all future options to break free and it slows down recovery after next dry spells too. Commercial farmers cope mainly via financial and managerial adjustments. Meaning they use savings, reallocate hired labour, sell larger livestock, and they can coordinate sales to formal markets (right timing and quantities). They generally recover more quickly, but interviews suggested that repeated shocks and the price volatility can still give serious financial stress. The feedback loops identified in the results chapter bring these patterns together. They show how replanting, wage labour, asset sales and investment decisions either cause destructive or more stabilising trajectories over time.

All in all, these results help me answer the research question of this study: *"how do differences in the socio-economic contexts of smallholder and commercial rainfed farmers in Malawi explain variations in their vulnerability to drought?"*. The results show that the same climatic shocks play out very differently for each farmer type because the crop portfolios, soil practices, land size, finance, markets, and institutions are unevenly distributed (partly reflecting policy narratives that prioritise large-scale "modern" farms). The socio-economic context shapes which options are available to a farmer, which risks are acceptable, and how quickly farmers can recover from drought. The feedback loops taken together show that coping and adaptation strategies in Golomoti are not neutral. Short-term decisions what to sell, where to work, or how often to replant shapes the future drought vulnerability. For smallholders many of the options tend to cost a lot short-term, including assets, but also soil fertility. This gradually locks households into high sensitivity and low adaptive capacity. Commercial farmers, in contrast, are currently positioned in more favourable feedback loops. Found advantages allow them to buffer shocks. In this sense, differences in socio-economic context are not just things we can measure alongside vulnerability, they are the processes that *shape* vulnerability and keep it going over time.

At the same time, the contrast between smallholder and commercial farmers in this study is quite strong. By focusing on one remote village and on a set of large commercial farms, I have effectively compared two ends of a spectrum rather than the full gradient of farming situations that might exist in Golomoti and elsewhere. This black and white contrast was analytically useful. It makes the underlying structures very clear and shows how the framework can distinguish between farmer types. But it also raises questions about what happens in the middle. In many regions there will be a medium scale or better-off smallholders who share characteristics with both farmer types. Or even commercial farms that operate under tighter constraints than the ones I met. A logical next step would therefore be to apply this framework in settings with more gradual variation in farm size, resource access, and market integration. That would allow a closer look at where and how feedback loops start to shift, and whether small changes in socio-

economic context can already move farmers into more favourable loops. The following section will continue this discussion on the methodology and framework.

6.2 Reflections on methodology and conceptual framework

In this study, I used a qualitative and comparative approach to analyse and interpret the data I gathered through the semi-structured interviews, a focus group discussion, observations, and secondary survey data. In many ways, I believe this approach worked well for the research aim. It allowed me to trace how drought vulnerability is embedded in everyday decisions of farmers and to build up understanding of the context. It would have been difficult to capture that with standardised questionnaires alone. The small sample size (9 smallholder and 6 commercial farmers) enabled very long and elaborate conversations, and it meant I could repeatedly cross-check information and try to focus on the emerging themes. The focus group discussion and field observations were particularly valuable for validating what was said during "solo" interviews and meant I could get opinions of farmers of almost the entire village at once.

At the same time, the methodological choices also introduced important limitations. First, the sample was restricted to a small section of the Golomoti EPA and to farmers that lived extremely remote (Lumwira village). Golomoti EPA is quite large, and other research done in the EPA suggests that Golomoti actually has quite substantial extension help, and NGO activity (Mungai et al., 2024). There are many recent projects even introducing irrigation and similar modernisation practices for smallholders (Nyasa Times, 2020). This means that the experiences described here are not entirely representative of entire Golomoti, let alone of Malawi as a whole. Farmers within areas where development projects are more common, and extension agents visit more often, may face very different constraints. Second, in chapter 4.3.1 I mention "even though the harvest failed, she still offered me maize to take home". Although I interpreted such gestures fully as expressions of hospitality, it is also possible that my presence as a foreign researcher was associated with future assistance. This may have shaped how some farmers explained their experiences and interacted with me. Third, the reliance on a translator in most interviews may have shaped how questions were understood and how answers were framed. I tried to mitigate this by debriefing with the translator after interviews and by writing memos, but nuances may still have been lost in translation. All farmer quotations in this thesis were originally expressed in Chichewa and translated into English through the translator (whom I asked to translate as literally as possible). While I checked meanings with him afterwards, some nuance may nevertheless have been lost or altered in translation. Finally, the fieldwork captured only one moment in time, I was in Malawi for three months. I would have gained a more dynamic view of how coping and adaptive strategies evolve after every shock, if I had followed the same farmers across several seasons. Although, I did have the secondary survey data, that was gathered years before in the same village.

The way I organised and analysed the data also has strengths and weaknesses. Working with an Excel based coding system made the analysis transparent and traceable. Each quote I wrote down, and every observation I made, could be followed back to a specific farmer and interview question. However, because this was all done manually, there are limited possibilities to do cross-case comparisons, or even further research. Perhaps more formal qualitative analysis software (i.e. typologies analysis) could have revealed additional sub-themes around household decision making or separate dynamics within the group of smallholders or commercial farmers.

A related question is whether this qualitative framework could be used in more quantitative research. In principle, the three dimensions I worked with, (sensitivity, adaptive capacity, coping strategies) and many of the mechanism boxes can be translated into measurable indicators. For example, land size, degree of crop diversification, access to credit, inclusion in saving groups,

frequency of replanting, could all be coded from survey data. A follow-up study could use larger existing databases (such as national household surveys or NGO baselines) to quantify each factor and then apply a quantitative analysis method to identify a gradient of farmer types rather than only two types. The feedback loops identified here could then be tested statistically by examining how combinations of factors are connected with reported drought impacts over time. Qualitative work would remain important, but it could be combined within a mixed-methods design to strengthen the results and to make pattern recognition easier and possible on a larger region.

Another point is that I developed the conceptual framework iteratively. I started the research with the three dimensions of sensitivity, adaptive capacity, and coping strategies in mind, but the more detailed "mechanism boxes" only fully came to place after initial rounds of analysis. In that sense, the framework partly followed the data instead of preceding it like usual. This has two implications. On the one hand, it ensured that framework remained focussed on farmers' realities, rather than forcing their experiences into predefined categories. It also helped me see, for example, that the socio-economic context was not just something on the background, but an active component of drought vulnerability. On the other hand, refining the concept during analysis, also means that some boundaries between the dimensions are fuzzy. Some factors such as implementing early-maturing seeds or village saving groups could influence multiple dimensions. In this case they influence adaptive capacity, and coping strategies. I tried to handle this by being clear about overlaps, but the framework should not be read as a set of watertight compartments.

Looking back, there are several ways in which the framework could be strengthened in future research. In this thesis, exposure was deliberately treated as a shared background because all farmers were rainfed. Still, Integrating exposure was considered, and doing that could allow a fuller vulnerability assessment. A next step would be to combine the socio-economic framework with a spatial climate and water data analysis, therefore examining rainfall, soil type, and topography. Next, the current framework deals mainly with farmer-level dynamics. I touch on historical and policy driver in chapter 5, but these are not actually included in the vulnerability diagram. A more ambitious version of this research might explicitly connect farm-level with macro-level processes. Laying more emphasis on land policies, market regulations, and government interventions for example.

Above reflections bring me to several recommendations for future research.

a. This study focused on 15 farmers in one remote village in Golomoti EPA. A logical next step would be to include a larger and more diverse group of farmers, both within Golomoti and in Neighbouring EPA's. Comparing villages with different levels of NGO presence, market access, infrastructure, perhaps irrigation access would help to test whether the feedback loops identified here also apply in other socio-economic settings.
b. The feedback loops found in this thesis were reconstructed from single interviews. A study that follows the same farmers for several years, including at least on severe drought, would allow the research to observe if and how coping strategies, asset levels, and soil conditions actually change or evolve over time. This would give a stronger empirical ground to stand on for supporting the claims about poverty traps and path dependency mentioned in this report.
c. In this thesis, exposure was kept in the background because all farmers were rainfed. It would be of interest for further research to integrate rainfall records, soil maps, and topographic data with a qualitative analysis used here. Most interestingly, it would make it possible to see whether farmers caught in the most adverse socio-economic situation, are also located in the environments with higher biophysical exposure.

d. During my time in Malawi, I heard stories about the government buying crops at the lowest price and selling it back to the farmers for a higher price. These are interesting aspects of the current situation in Malawi. Although it could not be verified in this study, further research could lay more emphasis on the policy part of the story. Additional interviews with extension officers, NGO staff, and policy-makers would allow a better understanding of how these institutional actors actually shape the options available to the farmers. This research is mainly exploratory of nature, including the above could let the research speak more directly to policy design.
e. It would be valuable to explore if the vulnerability framework developed in this thesis can be used for larger sample sizes by including quantitative methods (mixed-method research). One option would be to translate each mechanism box into a concise set of survey indicators and link them to larger datasets. I do believe that qualitative case studies should still stand at the base, because it will be better at retaining the depth needed to interpret the trade-offs farmers face. But statistical analysis could still be useful for increasing the sample size.

7. CONCLUSIONS

This thesis set out to understand how differences in the socio-economic context of smallholder and commercial rainfed farmers in Golomoti EPA shape their vulnerability to drought. Three main conclusions emerged from the research. Drought sensitivity of farmers in Golomoti is shaped by their farming systems, not by rainfall (the lack and inconsistency thereof) alone. Both types operate within a maize-centred farming system, this concentrates climatic and market risk rather than dispersing it. Smallholders are locked into subsistence farming on small, fragmented and often degraded plots. There is a constant threat of near-total crop failure, even from short dry spells. The main cause for this threat is cultural norms around eating maize and wanting "clean fields", together with limited access to credit and inputs. Commercial farmers are also fully rainfed and exposed, but they have (much) larger landholdings. Meaning that some crop diversification and machinery allow them to spread risk and recover more quicky.

Next, differences in the socio-economic context between farmer types explain the dissimilarities of their adaptive capacity and coping strategies. Choices of farmers create varying feedback loops for both farmer types as well. Smallholders rely on wage labour for income (often on commercial farms). In some cases, they also rely on distress sales of crops and livestock, and informal saving groups. Most of these strategies provide short-term relief but gradually deplete their assets and soil fertility, which could create bigger problems in the future. In contrast, commercial farmers can draw on savings, credit, hired labour, and in many cases also better market access. This puts them in more favourable loops, in which shocks can actually be absorbed, and profits can be reinvested, even though long-term soil and water risks remain for them too.

Lastly, this research found that drought vulnerability in Golomoti is relational and that it is historically rooted. Smallholder and commercial farmers have an uneven structure, because it is shaped by colonial land policies, estate agriculture, but also by new initiatives that often have (and still do) privileged larger farms. Their livelihoods are intertwined. Many commercial farms depend on smallholder labour, and smallholders depend on these farms for income, technologies, and, indirectly, access to knowledge.

This thesis shows that drought in Golomoti is experienced not as a one-off shock but as a snowballing process shaped by everyday decisions of farmers farming under constraint. Taken together, the results suggest that policies aiming to reduce drought vulnerability must go beyond technical fixes alone in the future. It would be better to address the imbalances in land, credit, markets and institutional support that currently allow some farmers to adapt while leaving other trapped in cycles of high sensitivity and constrained recovery.

8. REFERENCES

Adger, W. (2003). Social Capital, Collective Action, and Adaptation to Climate Change . Retrieved from Economic Geography, vol. 79, p. 387-404: https://doi.org/10.1111/j.1944-8287.2003.tb00220.x

Adger, W. (2006). Vulnerability. Retrieved from Global Environmental Change, vol. 16, p. 268-281.: https://doi.org/10.1016/j.gloenvcha.2006.02.006

Africa Business Communities. (2023). Unlocking Malawi farmers' access to finance. Retrieved from (Column by G. Chipande): https://africabusinesscommunities.com

Ajefu, J., & Abiona, O. (2020). The Mitigating Impact of Land Tenure Security on Drought-Induced Food Insecurity: Evidence from Rural Malawi. Retrieved from The Journal of Development Studies, vol. 56(12), p. 2169–2193.: https://doi.org/10.1080/00220388.2020.1762862

Biazin, B., Sterk, G., Temesgen, M., Abdulkedir, A., & Stroosnijder, L. (2012). Rainwater harvesting and management in rainfed agricultural systems in sub-Saharan Africa – A review. Retrieved from Physics and Chemistry of the Earth, Parts A/B/C, Volume 47–48, p. 139-151.: https://doi.org/10.1016/j.pce.2011.08.015.

Bockstaller, C., Blatz, A., Rapp, O., Slezack, S., & Schaub, A. (2024). Sustainable alternative to irrigated maize monoculture in a maize-dominated cropped area: Lessons learned from a system experiment. Retrieved from Heliyon, Vol. 10, Issue 10: 10.1016/j.heliyon.2024.e30400

Carter, M., & Barett, C. (2006). The economics of poverty traps and persistent poverty: An asset-based approach. Retrieved from The Journal of Development Studies, vol. 42(2), p. 178–199.: https://doi.org/10.1080/00220380500405261

Cassidy, L., & Barnes, G. (2012). Understanding Household Connectivity and Resilience in Marginal Rural Communities through Social Network Analysis in the Village of Habu, Botswana. Retrieved from Ecology and Society, 17(4).: http://dx.doi.org/10.5751/ES-04963-170411

Chandana, M., & Wapulumuka, M. (2018). Colonialism and its legacies, as reflected in water, incorporating a view from Malawi. Retrieved from Wiley Interdisciplinary Reviews: Water. 5. e1287.: doi.10.1002/wat2.1287.

Chibwana, C., Fisher, M., & Shively, G. (2012). Cropland allocation effects of agricultural input subsidies in Malawi. Retrieved from World Development, 40(1), 124–133.: https://doi.org/10.1016/j.worlddev.2011.04.022

Chirwa, E., Kydd, J., & Dorward, A. (2006). Future Scenarios for Agriculture in Malawi: Challenges and Dilemmas. Retrieved from Future Agricultures Consortium. 20. .

Coates, J., Swindale, A., & Bilinsky, P. (2006). Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v.3). Retrieved from Food and Nutrition Technical Assistance Project (FANTA), Academy for Educational Development.: https://www.fantaproject.org/sites/default/files/resources/HFIAS_ENG_v3_Aug07.pdf

Conolly-Boutin, L., & Smit, B. (2016). Climate change, food security, and livelihoods in sub-Saharan Africa. . Retrieved from Reg Environ Change, vol. 16, p. 385–399.: https://doi.org/10.1007/s10113-015-0761-x

Cooper, P., Dimes, J., Rao, K., Shapiro, B., Shiferaw, B., & Twomlow, S. (2008). Coping better with current climatic variability in the rain-fed farming systems of sub-Saharan Africa: An essential first step in adapting to future climate change? Retrieved from Agriculture, Ecosystems & Environment, vol. 126(1–2), p. 24–35.: https://doi.org/10.1016/j.agee.2008.01.007

Crews, T., Carton, W., & Olsson, L. (2018). Is the future of agriculture perennial? Imperatives and opportunities to reinvent agriculture by shifting from annual monocultures to perennial polycultures. Retrieved from Global Sustainability. Vol. 1, e.11: doi:10.1017/sus.2018.11

de Bont, C., Veldwisch, G., & Komakech, H. (2016). The fluid nature of water grabbing: the on-going contestation of water distribution between peasants and agribusinesses in Nduruma, Tanzania. Retrieved from Agric Hum Values 33, 641–654: https://doi.org/10.1007/s10460-015-9644-5

Deininger, K., Savastano, S., & Xia, F. (2017). mallholders' land access in Sub-Saharan Africa: A new landscape?, Food Policy,. Retrieved from Vol. 67, p. 78-92.: https://doi.org/10.1016/j.foodpol.2016.09.012

Dercon, S. (2002). Income Risk, Coping Strategies, and Safety Nets. Retrieved from World Bank Research Observer. Vol. 17, p. 141-166: doi.10.1093/wbro/17.2.141.

Di Falco, S., & Chavas, J. (2009). On Crop Biodiversity, Risk Exposure, and Food Security in the Highlands of Ethiopia. Retrieved from American Journal of Agricultural Economics. Vol 91, Issue 3, p. 599-611: https://doi.org/10.1111/j.1467-8276.2009.01265.x

Ellis, F. (2000). Rural livelihoods and diversity in developing countries. Retrieved from Oxford University Press.

Emerton, L. (2016). Assessing the economic costs, benefits and drivers of sustainable land management for farmers in Ntcheu District, Malawi & Lushoto District, Tanzania. Retrieved from Publicación CIAT No. 423, International Center for Tropical Agriculture (CIAT), Cali. p. 77: doi.10.13140/RG.2.2.10774.55368.

Eriksen, S., Brown, K., & Kelly, P. (2005). The dynamics of vulnerability: locating coping strategies in Kenya and Tanzania. Retrieved from Geographical Journal, vol. 171, p. 287–305.: https://doi.org/10.1111/j.1475-4959.2005.00174.x

FAO. (n.d.). Drought vulnerability and impact assessment. Retrieved from FAO: https://www.fao.org/common-pages/search/en/?q=drought+vulnerability

FAO. (2016). 2015–2016 El Niño. Early action and response for agriculture, food security and nutrition. Food and Agriculture Organization of the United Nations. Retrieved from: https://openknowledge.fao.org/server/api/core/bitstreams/a80370e6-1845-4c16-aa6f-0b817b99032f/content?utm_source=chatgpt.com

Government of Malawi. (2021). Mega Farm support programme. retrieved from: https://faolex.fao.org/docs/pdf/mlw216690.pdf.

Green, E. (2009). A Lasting Story: Conservation and Agricultural Extension Services in Colonial Malawi. Retrieved from The Journal of African History, 50(2), 247–267.: http://www.jstor.org/stable/25622023

Holden, S., Fisher, M., Katengeza, S., & Thierfelder, C. (2018). Can lead farmers reveal the adoption potential of conservation agriculture? The case of Malawi,. Retrieved from Land Use Policy, Vol. 76, P. 113-123: https://doi.org/10.1016/j.landusepol.2018.04.048.

Horn, M. (2024). Colonial Rule in Malawi. Retrieved from Malawi Culture, Orant Charities Africa: orantcharitiesafrica.org

International Institute of Tropical Agriculture (IITA). (2022). Golomoti baseline household survey dataset [Unpublished dataset]. Lilongwe, Malawi.

Intergovernmental Panel on Climate Change. (2014). Climate change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (C. B. Field, V. R. Barros, D. J. Dokken, et. Retrieved from Cambridge University Press.

Intergovernmental Panel on Climate Change. (2022). Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Retrieved from Cambridge University Press.: https://www.ipcc.ch/report/ar6/wg2/

Jayne, T., Mather, D., & Mghenyi, E. (2010). Principal Challenges Confronting Smallholder Agriculture in Sub-Saharan Africa,. Retrieved from World Development, Vol. 38, Issue 10, p. 1384-1398: https://doi.org/10.1016/j.worlddev.2010.06.002.

Kumwenda, I., van Koppen, B., Matete, M., & Nhamo, L. (2015). Trends and Outlook: Agricultural Water Management in Southern Africa. Retrieved from Country Report Malawi.

Makate, C., Wang, R., Makate, M., & Mango, N. (2016). Crop diversification and livelihoods of smallholder farmers in Zimbabwe: Adaptive management for environmental change. Retrieved from SpringerPlus, 5, 1135.: https://doi.org/10.1186/s40064-016-2802-4

McCracken, J. (2012). A History of Malawi: 1859-1966. Retrieved from Boydell & Brewer. p. 26-27, p. 31-32: PDF retrieved from: https://www.jstor.org/stable/10.7722/j.ctt1x71q0

Montaña, E., Pastor, G., & Torres, L. (2009). Socioeconomic Issues in Irrigation Literature: Approaches, Concepts, and Meanings. Retrieved from: Chilean journal of agricultural research. vol. 69. p. 55-67.: https://doi.org/10.4067/S0718-58392009000500006.

Morris, B. (2016). Conservation Mania in Colonial Malawi. In: An Environmental History of Southern Malawi. . Retrieved from Palgrave Studies in World Environmental History. Palgrave Macmillan, Cham. p. 221-259: https://doi.org/10.1007/978-3-319-45258-6_8

Msofi Mgalamadzi, L., Matita, M., & Chimombo, M. (2024). The gendered nature of household decision making and expenditure choices in the context of smallholder agricultural commercialization in Malawi. Retrieved from CABI Agric Biosci 5, article 65: https://doi.org/10.1186/s43170-024-00270-x

Mungai, L., Messina, J., & Snapp, S. (2020). Spatial Pattern of Agricultural Productivity Trends in Malawi. Retrieved from Sustainability: https://doi.org/10.3390/su12041313

Mungai, L., Messina, J., Zulu, L., Chikowo, R., & Snapp, S. (2024). The role of agricultural extension services in promoting agricultural sustainability: a Central Malawi case study. . Retrieved from Cogent Food & Agriculture, 10(1).: https://doi.org/10.1080/23311932.2024.2423249

Nhemachena, C., & Hassan, R. (2007). Micro-Level Analysis of Farmers' Adaptation to Climate Change in Southern Africa. Retrieved from IFPRI Discussion Paper 00714. International Food Policy Research Institute: https://hdl.handle.net/10568/21659

Nyantakyi-Frimpong, H., Matouš, P., & Isaac, M. (2019). Smallholder farmers' social networks and resource-conserving agriculture in Ghana: a multicase comparison using exponential random graph models. Retrieved from Ecology and Society, 24(1).: https://doi.org/10.5751/ES-10623-240105

Nyasa Times. (2020). Golomoti and Ntakataka farmers applaud Agriculture Transformation Initiative for life-changing interventions. Retrieved from Nyasa Times: https://www.nyasatimes.com/

Nzima, W., Ip Ryan, H., Bhatti, M., Godfrey, S., Eik, L., Gondwe, S., & Divon, S. (2024). Diversity and heterogeneity of smallholder vegetable farming systems and their impact on food security and income in Malawi. Retrieved from Frontiers in Sustainable Food Systems, vol. 8: DOI=10.3389/fsufs.2024.1387912

Oduor, O., Muchheru-Muna, M., Mugwe, N., Sijali, I., Nyabuga, G., & Mugendi, N. (2023). Soil water use efficiency under integrated soil management practices in the drylands of Kenya. Retrieved from Heliyon.: https://doi.org/10.1016/j.heliyon.2023.e16145

Pachai, B. (2009). Land policies in Malawi: an examination of the colonial legacy. Retrieved from The Journal of African History. 1973;14(4):681-698.: doi:10.1017/S0021853700013116

Peters, P. (2013). Conflicts over Land and Threats to Customary Tenure in Africa. African Affairs. Retrieved from Vol. 112, p. 543-562.: https://doi.0.1093/afraf/adt047

Pretty, J. (2003). Social capital and the collective management of resources. Retrieved from Science, vol. 302(5652), p. 1912–1914.: https://doi.org/10.1126/science.1090847

Renwick, L., Kimaro, A., Hafner, J., Rosenstock, T., & Gaudin, A. (2020). Maize-Pigeonpea Intercropping Outperforms Monocultures Under Drought. Retrieved from Frontiers in Sustainable Food Systems. Vol. 4: https://doi.org/10.3389/fsufs.2020.562663

Rockström, J., Karlberg, L., Wani, S., Barron, J., Hatibu, N., Oweis, T., . . . Qiang, Z. (2010). Managing water in rainfed agriculture—The need for a paradigm shift. Retrieved from

Agricultural Water Management, vol. 7(4), p. 543–550: https://doi.org/10.1016/j.agwat.2009.09.009

Scoones, I. (1998). Sustainable Rural Livelihoods: A Framework for Analysis. Retrieved from IDS Working Paper No. 72. .

Scoones, I. (2009). Livelihood Perspectives and Rural Development. Retrieved from Journal of Peasant Studies - J PEASANT STUD. 36. : https://10.1080/03066150902820503.

Shiferaw, B., Tesfave, K., Berresaw, M., Abate, T., Prasanna, B., & Menkir, A. (2014). Managing vulnerability to drought and enhancing livelihood resilience in Sub-Saharan Africa: Technological, institutional and policy options. Retrieved from Weather and Climate Extremes. vol. 3.: https://doi.org/10.1016/j.wace.2014.04.004.

Sietz, D., Förch, W., Janssen, P., & Thornton, P. (2011). Smallholder agriculture in sub-Saharan Africa: A typology of vulnerability contexts. Retrieved from Global Environmental Change, 21(1), 258–272.: https://doi.org/10.1016/j.gloenvcha.2010.10.007

Sietz, D., Lüdeke, M., & Walther, C. (2011). Categorisation of typical vulnerability patterns in global drylands. Retrieved from Global Environmental Change, vol. 21(2), p. 431-440: https://doi.org/10.1016/j.gloenvcha.2010.11.005

Smale, M. (1995). “Maize is life”: Malawi's delayed Green Revolution,. Retrieved from World Development, Vol. 23, Issue 5, P. 819-831: https://doi.org/10.1016/0305-750X(95)00013-3.

Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability,. Retrieved from Global Environmental Change, vol. 16.: https://doi.org/10.1016/j.gloenvcha.2006.03.008.

Snapp, S., Mafongova, P., & Waddington, S. (1998). Organic matter technologies for integrated nutrient management in smallholder cropping systems of southern Africa,. Retrieved from Agriculture, Ecosystems & Environment, Vol. 71, Issue 1–3, p. 185-200: https://doi.org/10.1016/S0167-8809(98)00140-6.

Takane, T. (2007). Diversities and Disparities among Female-Headed Households in Rural Malawi. Retrieved from IDE Discussion Papers 124, Institute of Developing Economies, Japan External Trade Organization(JETRO).: Acquired from: https://ir.ide.go.jp/record/38043/files/IDP000124_001.pdf

The Rockefeller Foundation. (2021). Diagnostic and Landscaping Analysis by the Food System Transformative Integrated Policy (FS-TIP) Initiative. Retrieved from Accelerating Malawi's Food System Transformation.

Thornton, P., Ericksen, P., Herrero, M., & Challinor, A. (2014). Climate variability and vulnerability to climate change: A review. Retrieved from Global Change Biology, vol. 20(11), p. 3313–3328.: https://doi.org/10.1111/gcb.12581

Tiyeni. (2020). Malawian farmers in serious Agriculture Extension service deficiency. Retrieved from Tiyeni News: https://www.tiyeni.org/

Total LandCare. (n.d.). About us. Retrieved 2 December 2025, from: https://www.totallandcare.org/.

Uwizeyimana, D., Mureithi, S., Karuku, G., & Kironchi, G. (2018). Effect of water conservation measures on soil moisture and maize yield under drought prone agro-ecological zones in Rwanda. Retrieved from International Soil and Water Conservation Research, vol. 6(3), p. 214-221.: https://doi.org/10.1016/j.iswcr.2018.03.002.

Zant, W. (2019). If smallholder farmers have access to the world market: the case of tobacco marketing in Malawi. Retrieved from European Review of Agricultural Economics Vol 47 (4) (2020) pp. 1402–1437: doi:10.1093/erae/jbz039

Zingore, S., Delve, R., Nyamangara, J., & Giller, K. (2008). Multiple benefits of manure: The key to maintenance of soil fertility and restoration of depleted sandy soils on African smallholder farms. Retrieved from Nutrient Cycling in Agroecosystems, Vol. 80, p. 267–282: https://doi.org/10.1007/s10705-007-9142-2

Figure credits:
Cover page (p.1): taken by Merijn Schoutsen, 2025
Figure (p.8): created in Qgis (ESRI Basemap, 2024; Google Maps, 2025)
Picture (p.16): taken by Merijn Schoutsen, 2025
Picture (p.20): taken by Merijn Schoutsen, 2025

9. APPENDICES

ANNEX A – USE OF ARTIFICIAL INTELLIGENCE

During this MSc thesis "Coping or crumbling: a comparative study of drought vulnerability between commercial- and smallholder farmers in Golomoti, Malawi", I made limited and supportive use of generative and other AI-based tools. The research design, fieldwork, interpretation of data, argumentation, and final responsibility for the text were carried out by me. At no point did I submit AI-generated text without careful review, rewriting, and integration into my own reasoning. The tools I used are as follows:

ChatGPT (OpenAI):
I used ChatGPT as a writing coach and feedback partner in one long conversation. The main forms of use were:

1. Clarifying report structure and headings
2. Checking readability of my own drafts
3. Language and style support
4. Thinking through concepts and feedback loops
5. Support with tables and figures (text and structure suggestions only)

ChatGPT did not have access to my raw field data files. Whenever I asked for summaries, I first wrote or pasted my own notes, and the model responded based on that text. Interpretation of farmer quotes, selection of literature, framing of arguments, and all final wording choices are my own responsibility.

I carried out the qualitative coding and organisation of interview and focus-group data myself in Excel. However, I occasionally used ChatGPT to summarise my own coded notes (for example, asking it to condense a long list of codes into a short narrative paragraph), and then compared those summaries with my own understanding. The identification of key themes, trade-offs, and feedback loops was done by me. AI suggestions were treated as tentative and were only used if they matched my empirical material and conceptual framework.

Below is a list of prompts I used (non-exhaustive but the rest are in similar style). Each prompt was followed by my own critical assessment:

1. *"I am writing a MSc thesis on drought vulnerability among smallholder and commercial farmers in Golomoti, Malawi. Can you suggest a clear structure for the introduction and theoretical framework, based on the concepts of sensitivity, adaptive capacity and coping strategies?"*
2. *"Here is a draft of my problem statement (text pasted). Can you give critical feedback and give me suggestions to make it more concise and avoid repetition?*
3. *"These are the main patterns I see in my interview data on coping strategies (bullet list pasted). Can you suggest a logical way to group them and a possible diagram or narrative structure?"*
4. *"Given this explanation of my field methods (text pasted), do you see any gaps or unclear parts that I should clarify in the methodology chapter?"*
5. *"I developed three feedback loops from my results (description pasted). Can you check whether they are logically consistent and suggest clearer wording?"*
6. *"Please check the following paragraph for academic grammar and British spelling only; do not change the meaning."*
7. *"I have two possible titles for my thesis (options pasted). Can you comment on their clarity and suggest small improvements?"*

8. *“I would like to improve the transition between the end of Chapter 5 and the start of Chapter 6 (text pasted). How could I rewrite the opening sentence of Chapter 6 to make the link clearer?”*

Link to conversation:
On request

Connected Papers:
I used Connected Papers to find additional scientific articles that were related to key research papers I had already selected from conventional database searches (mainly Google Scholar). The tool suggested related articles in the citation network. I manually screened titles and abstracts, checked their relevance to Malawi, drought vulnerability, or smallholder/commercial farming, and then retrieved and read the full texts when useful. Connected Papers did not summarise articles or write the literature review. Its influence was limited to broadening the pool of potentially relevant references (snowballing technique).

ANNEX B – SEMI-STRUCTURED INTERVIEW GUIDE: SMALLHOLDER FARMERS

Introduction:
My name is Merijn Schoutsen, and I am a student from Wageningen University in the Netherlands and a Graduate Research Fellow at the International Institute of Tropical Agriculture (IITA). IITA implements a program called **Sustainable Farming** (formerly **Mixed Farming/Africa RISING Project).** I am conducting research on **drought vulnerability among smallholder and commercial farmers** in this region to better understand how farmers access and use water, how droughts impact farming, and how commercial farms may influence smallholder farmers.

What to Expect:

- First, I will ask you to fill out a short survey about your **farming practices, water use, and experiences with drought.**
- Afterward, we will have an **open discussion** where we reflect on some of the survey questions together.
- I have also brought a **map of the area**, where you can mark important locations such as **water sources and farming areas**, and a **timeline** where you can illustrate changes over time.

Confidentiality & Voluntary Participation:

- Your responses will be **coded and kept strictly confidential**.
- No identifying information (e.g., your name) will appear in the research report.
- Participation in this research is **completely voluntary**. You may:
    - Refuse to participate.
    - Discontinue the interview at any time.
    - Skip any question you do not want to answer.
- There will be **no penalty or loss of benefits** if you choose not to participate.

Your Rights & Questions:

You may ask questions about this research **before, during, and after** the interview. If you have further questions about the study or your rights as a research participant, you may contact:

Dr. Julius Manda (IITA Malawi) – **(phone number on request)**

By participating in this interview, you acknowledge that you have understood the purpose of this research and agree to take part. Thank you for your time and valuable insights.

Informed consent: Are you willing to participate in this interview?
[Please cross the correct answer]

- Yes
- No

If no, reason(s) for decline: _____

Date and time of interview: _____

Definition of a drought period:
"A drought period typically refers to below-normal rainfall during the wet season, which can result in prolonged dry spells within the season or a complete failure of expected rains. This differs from the natural dry season, which is expected and part of the climate cycle."

Definition of a commercial farm:
"A commercial farmer in Malawi is someone who cultivates land larger than 5 acres, with 10–25 acres or more indicating larger-scale commercial operations. In addition to size, commercial farmers primarily grow crops for sale rather than subsistence, often have access to irrigation, hired labour, mechanized equipment, and external inputs like fertilizers and pesticides."

Starting questions:

a. Respondent name

_____

b. Respondent sex
    - Male
    - Female

c. Respondent age

_____

d. Respondent's level of education
    - No formal education
    - Primary
    - Secondary
    - Certificate
    - Diploma
    - Bachelor
    - Masters and above
    - Other (please specify): _____

GPS coordinates of HH

Administrative units

1. Water Use and Access

1.1. Is rainwater your main water source for farming and domestic needs?
- Yes
- No

1.2. What other water sources, rather than rainwater, do you use for farming and household needs? (select all appropriate)
- Rivers
- Wells
- Boreholes
- Lake
- Earth dam
- Piped
- Harvested rainwater
- Other (please specify): _____

1.3. What challenges do you face with rainwater availability? (select all appropriate)
- Unreliable/unpredictable
- Inadequate
- Too much/floods
- Runoff erosion
- None
- Other (please specify): _____

1.4. What is the trend of the amount of growing-season rainfall compared to the last five cropping seasons and 30 years ago (1990s)?
- Increasing (wetter)
- No change
- Reducing (drier)

1.5. How do you assess the trend of the onset of rain during the main cropping seasons in the last 5 years as compared to the situation 30 years ago (1990s)?
- Rain starts early
- Rain starts late
- Rain starts at the same time

1.6. During the last 5 cropping seasons, how many instances did you have to replant seeds of the main crop due to poor germination of seeds caused by prolonged drought (or false start of rain season)?
- 5
- 4
- 3
- 2
- 1
- Never replanted

1.7. Are there any systems or rules in the community for sharing water during droughts?
- No
- Yes (please describe): _____

2. Impact of Commercial Farmers

2.1. Are there any commercial farms near your area?

- Yes
- No

2.2. If yes, what crops do they grow? (select all appropriate)

- Maize
- Cow-pea
- Groundnut
- Rice
- Sugarcane
- Tobacco
- Wheat
- Soyabean
- Cabbage
- Tomato
- Onion
- Other (please specify): _____

2.3. Do you think the presence of commercial farms has changed how you farm or access water?

- No change
- Reduced my access to water
- Improved my access to water
- Increased competition for water
- Increased opportunities for irrigation
- Other (please specify): _____

2.4. Do commercial farmers ever use the same water sources as your community?

- Yes
- No
- Don't know

2.5. If yes, how does this affect your water availability? (select all that apply)

- No effect
- Reduces my water access during drought
- Reduces my water access throughout the year
- Improves access through shared infrastructure
- Causes water conflicts
- Other (please specify): _____

2.6. How has water availability changed in the last 5 years?

- No change
- Less water available
- More water available

2.7. Do you feel commercial farms have contributed to these changes?

- No
- Yes (explain): _____

2.8. Have you experienced any indirect benefits from commercial farming activities in your area?

- Job opportunities
- Improved market access
- Knowledge transfer
- Access to shared irrigation or infrastructure
- No benefits
- Other (please specify): _____

2.9. Have there been instances where you or your community have worked together with commercial farms?

- Yes
- No

2.10. If yes, in what ways have you worked together with commercial farms? *(Select all that apply)*

- Sharing water resources
- Receiving technical advice or training
- Selling produce to commercial farms
- Accessing inputs (e.g., seeds, fertilizers) from commercial farms
- Employment on commercial farms
- Other (please specify): _____

3. Drought Impact and Coping Mechanisms

3.1. How have droughts affected your ability to farm and sustain your household? (Select all that apply)

- Lower crop yields
- Crop failure
- Reduced household income
- Decreased food security
- Delayed harvests
- Increased pest & diseases
- No major impact
- Other (please specify): _____

3.2. What has been your highest harvest loss due to drought for different crops?

- Maize:
  - No loss
  - 0–25% loss
  - 25–50% loss
  - 50–75% loss
  - More than 75% loss
- Groundnut
  - No loss
  - 0–25% loss
  - 25–50% loss
  - 50–75% loss
  - More than 75% loss
- Soyabean
  - No loss
  - 0–25% loss

    - 25–50% loss
    - 50–75% loss
    - More than 75% loss
- Cow-pea
    - No loss
    - 0–25% loss
    - 25–50% loss
    - 50–75% loss
    - More than 75% loss
- Other (please specify crop & loss %): _____

3.3. What strategies or methods have you used to cope with drought? (Select all that apply)
- Irrigation
- Changing planting dates (circle appropriate answer: earlier / later)
- Growing drought-resistant crop varieties
- Growing early maturing crop varieties
- Change main crop grown (name crops: _____)
- Soil conservation techniques (name techniques: _____)
- Intercropping/ diversification (name intercropped crop: _____)
- Replanting
- Increase seed rate
- Cover crops
- Soil water harvesting
- Buying food from markets
- Receiving aid from the government/NGOs
- Deep wells/boreholes
- Water storage systems
- Mechanized farming
- Do nothing
- Other (please specify): _____

3.4. What strategies do commercial farmers use to handle drought? (Select all that apply)
- Irrigation
- Changing planting dates (circle appropriate answer: earlier / later)
- Growing drought-resistant crop varieties
- Growing early maturing crop varieties
- Change main crop grown (name crops: _____)
- Soil conservation techniques (name techniques: _____)
- Intercropping/ diversification (name intercropped crop: _____)
- Replanting
- Increase seed rate
- Cover crops
- Soil water harvesting
- Buying food from markets
- Receiving aid from the government/NGOs
- Deep wells/boreholes
- Water storage systems
- Mechanized farming
- Do nothing
- Other (please specify): _____

3.5. If you compare yourself (as a smallholder farmer) with commercial farmers, are there differences in how you experience drought?

- Smallholder farmers experience more difficulties
- Commercial farmers experience more difficulties
- Both face similar challenges

3.5a. What do you think are the biggest differences?

_____

3.6. Do you think commercial farms have more resources to cope with drought?

- Yes
- No
- Not sure

3.7. What activities have been most affected by drought in your household or community? (Select all that apply)

- Crop production
- Livestock keeping
- Water collection for domestic use
- Fishing
- Business/ trade activities
- Other (please specify): _____

4. Market Access

4.1. Where do you mainly sell your produce?

- Local market
- Middlemen
- Contract with a buyer
- Direct to consumers
- Other (please specify): _____

4.2. Do you sell your produce at markets?

- Yes (→ proceed to next question)
- No (→ skip to section 5)

4.3. What type of produce do you sell?

- Maize
- Rice
- Groundnuts
- Vegetables
- Fruits
- Livestock
- Other (please specify): _____

4.4. How do you transport your goods to the market?

- On foot
- Bicycle

- Motorbike
- Car
- Hired vehicle
- Public transport
- Ox/Donkey cart
- Other (please specify): _____

4.5. What challenges do you face in accessing markets? (Select all that apply)
- High transport costs
- Low prices for produce
- Competition from commercial farmers
- Limited buyers
- Poor road network
- Other (please specify): _____

4.6. Are you aware of commercial farmers selling in the same markets?
- Yes
- No

4.7. If yes, how does their presence affect your sales or prices?
- Decreases sales
- Increases sales
- Decreases prices
- Increases prices
- No impact
- Other (please specify): _____

5. Socio-Economic Conditions

5.1. Which financial resources do you have access to that improve your farming enterprise?
- Bank credit/ savings
- Off-farm income
- Cooperative support
- Government subsidy
- Input credit
- Loans
- Supply contracts
- None
- Other (please specify): _____

5.2. What equipment that you have access to improve your farming enterprise?
- Tractor
- Donkey cart
- Combine harvester
- Plough
- Hand tools only
- Other (please specify): _____

5.3. Are there any community programs, cooperatives, or government initiatives that support smallholder farmers in your community?

- Yes
- No

5.4. If yes, what kind of help have they offered?

- Agro-advisory & training

-
- Input subsidies/ discounts
- Access to agricultural inputs (e.g., seeds, fertilisers, tools)
- Marketing
- Demand/ supply aggregation
- Advocacy
- Other (please specify): _____

6. Suggestions and Perspectives

6.1. What are the biggest barriers to improving your farm's resilience to drought? (Select all that apply)

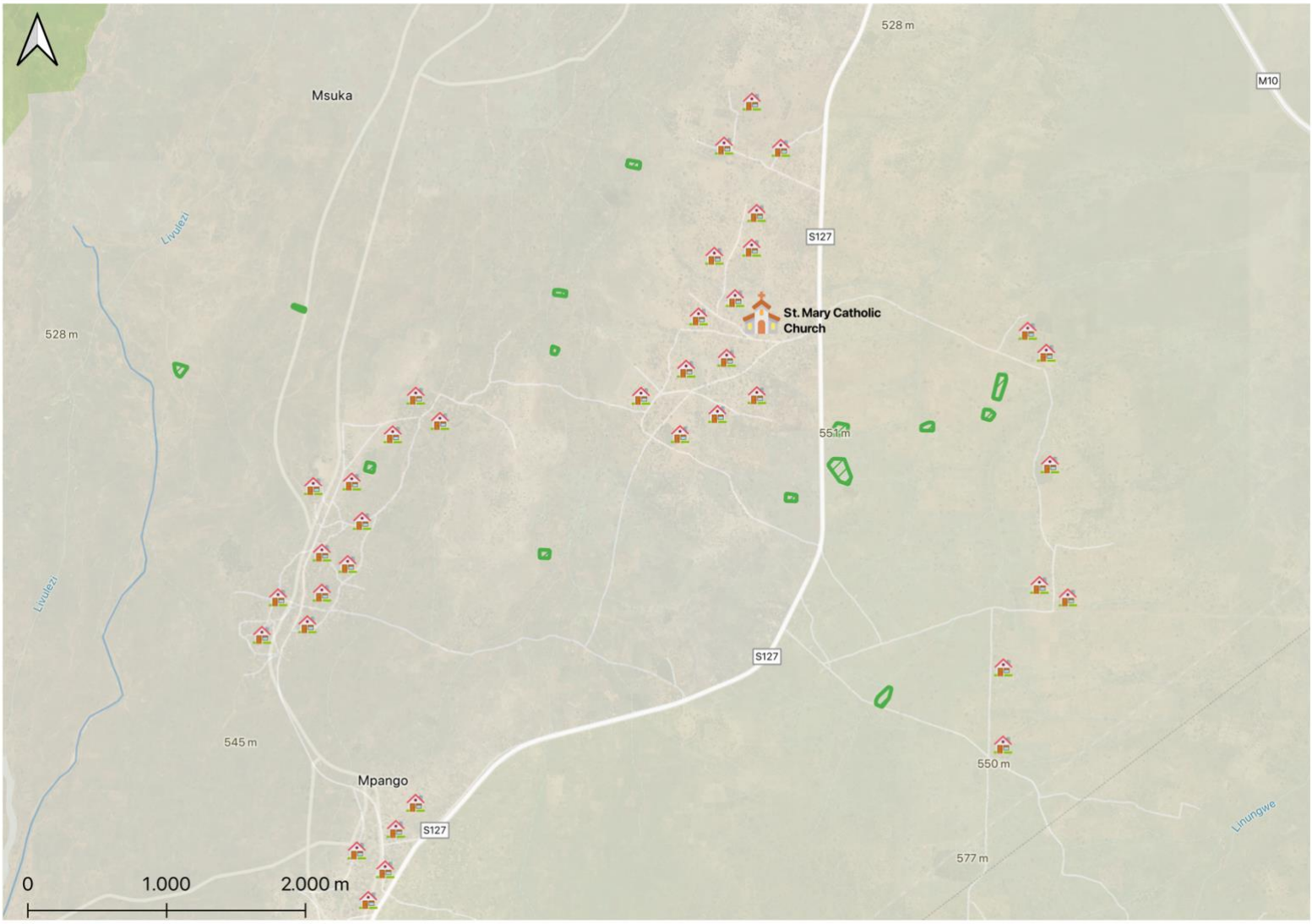
- Lack of water access
- Poor soil quality
- Limited access to inputs (seeds, fertilizer, etc.)
- Market instability
- Lack of financial resources
- Other (please specify): _____

6.2. What would make it easier for you to farm or improve your productivity during drought periods?

6.3. What role do you think commercial farmers could play in supporting or collaborating with smallholder farmers in your area?

6.4. What is your vision/dream for your farm's future and the community?

Spatial map discussion:
I will print out the map below on A3 paper multiple times. Then I will give the people in the focus group markers and ask them to draw whatever they want and to show specific issues and the locations of the commercial farmers on the map. This way farmers can highlight areas where drought, resource competition, or environmental degradation is most severe. (I will also do this with commercial farmers later to compare).



*(green areas are plots of farmers already questioned in baseline survey)

Timeline exercise:
I will also take some blank A3 papers and draw a timeline with years on it. Then I want to ask farmers to visually represent key events and patterns over time. For example, which years were drier than others, when commercial farmers arrived, changes in water use/ farming practices, and any other changes they want to add.

ANNEX C – SEMI-STRUCTURED INTERVIEW GUIDE: COMMERCIAL FARMERS

Introduction:
My name is Merijn Schoutsen, and I am a student from Wageningen University in the Netherlands and a Graduate Research Fellow at the International Institute of Tropical Agriculture (IITA). IITA implements a program called Sustainable Farming (formerly Mixed Farming/Africa RISING Project**).** I am conducting research on drought vulnerability among smallholder and commercial farmers in this region to better understand how farmers access and use water, how droughts impact farming, and how commercial farms may influence smallholder farmers.

What to Expect:

- First, I will ask you to fill out a short survey about your farming practices, water use, and experiences with drought**.**
- Afterward, we will have an open discussion where we reflect on some of the survey questions together.
- I have also brought a map of the area, where you can mark important locations such as water sources and farming areas, and a timeline where you can illustrate changes over time.

Confidentiality & Voluntary Participation:

- Your responses will be coded and kept strictly confidential.
- No identifying information (e.g., your name) will appear in the research report.
- Participation in this research is completely voluntary. You may:
    - Refuse to participate.
    - Discontinue the interview at any time.
    - Skip any question you do not want to answer.
- There will be no penalty or loss of benefits if you choose not to participate.

Your Rights & Questions:
You may ask questions about this research before, during, and after the interview. If you have further questions about the study or your rights as a research participant, you may contact:

Dr. Julius Manda (IITA Malawi) – +265997667571

By participating in this interview, you acknowledge that you have understood the purpose of this research and agree to take part. Thank you for your time and valuable insights.

Informed consent: Are you willing to participate in this interview?
[Please cross the correct answer]

- Yes
- No

If no, reason(s) for decline: _____

Date and time of interview: _____

Definition of a drought period:
"A drought period typically refers to below-normal rainfall during the wet season, which can result in prolonged dry spells within the season or a complete failure of expected rains. This differs from the natural dry season, which is expected and part of the climate cycle."

Definition of a commercial farm:
"A commercial farmer in Malawi is someone who cultivates land larger than 5 acres, with 10–25 acres or more indicating larger-scale commercial operations. In addition to size, commercial farmers primarily grow crops for sale rather than subsistence, often have access to irrigation, hired labour, mechanized equipment, and external inputs like fertilizers and pesticides."

Starting questions:

e. Respondent name
_____

f. Respondent sex
   - Male
   - Female

g. Respondent age
_____

h. Respondent's level of education
   - No formal education
   - Primary
   - Secondary
   - Certificate
   - Diploma
   - Bachelor
   - Masters and above
   - Other (please specify): _____

GPS coordinates of HH

Administrative units

1. Water Use and access

1.1. What type of commercial farm do you operate?

- Crop production
- Livestock
- Mixed farming
- Other (please specify) _____

1.2. What is the size of your farm?

- Less than 10 hectares
- 10-50 hectares
- 50-100 hectares
- More than 100 hectares

1.3.What crops do you grow? (select all appropriate)

- Maize
- Cow-pea
- Groundnut
- Rice
- Sugarcane
- Tobacco
- Wheat
- Cotton
- Soyabean
- Cabbage
- Horticultural crops
- Tomato
- Onion
- Other (please specify): _____

1.4. How long have you been operating this farm?

- Less than 5 years
- 5-10 years
- 10-20 years
- More than 20 years

1.5.What are your primary water sourcres for farming? (select all appropriate)

- Rainwater
- Rivers
- Wells
- Boreholes
- Lake
- Earthdam/ reservoirs
- Piped water
- Harvested rainwater
- Irrigation schemes
- Other (please specify): _____

1.6. If you pump water from boreholes or wells, is it:

- From a legal water source with permits

- From an unregulated source

1.7. Do you have to pay for access to water?
- Yes, for all water sources
- Yes, but only for certain sources
- No, water is freely available

1.8. Do you have water storage or irrigation systems in place?
- Yes, large-scale irrigation
- Yes, small-scale irrigation
- Yes, water storage (e.g., tanks, reservoirs)
- No, we depend entirely on natural water sources
- Other (please specify): _____

1.9. How do you distribute water on your farm?
- Irrigation canals
- Sprinkler systems
- Drip irrigation
- Manual application (e.g., buckets, watering cans)
- Other (please specify) _____

1.10. Comparing the last 5 cropping seasons and 30 years ago (1990's) what is the trend of the amount of growing season rainfall?
- Increasing (wetter)
- No change,
- Reducing (drier)

1.11. How do you assess the trend of onset of rain during the main cropping seasons in the last 5 years as compared to the situation 30 years ago (1990s)?
- Rain starts early
- Rain starts late
- Rain starts at the same time

1.12. Can you continue growing crops in dry season?
- Yes
- No

1.13. What challenges do you face regarding water availability
- Unreliable rainfall
- Water shortages during dry periods
- Conflicts over water use
- Water infrastructure issues (e.g., broken boreholes, pipes)
- High cost of irrigation systems
- Other (please specify): _____

1.14. During the last 5 cropping seasons, how many instances did you have to replant seeds of the main crop due to poor germination of seeds caused by pro-longed drought (or false start of rain season)?
- 1
- 2

- 3
- 4
- 5
- Never replanted

1.15. Do you practice any water conservation techniques? (Select all that apply)
- Mulching
- Rainwater harvesting
- Contour plowing
- Drip irrigation
- Swales
- None
- Other (please specify): _____

2. Coexistence with smallholder farmers

2.1. Have you had interactions with smallholder farmers regarding water use or farming practices?
- Yes
- No

2.2. If yes, in what ways have you interacted (Select all that apply)
- Sharing water resources
- Competition for water resources
- Providing or receiving technical knowledge
- Hiring smallholders as labourers
- Purchasing crops from smallholders
- Market competition for selling produce
- Other (please specify) _____

2.3. If sharing water resources above: do you think smallholder farmers' water use affects your farm's operations?
- Yes, it reduces our water availability
- Yes, it increases competition for water
- No, their use does not affect us
- Other (please specify): _____

2.4. Have you experienced conflicts over water access with other farmers or the community?
- Yes
- No
- Unsure

2.5. If yes, what were the main issues?
- Water shortages
- Market competition
- Government regulations
- Land encroachment issues
- Water access disputes
- Differences in farming techniques
- Other (please specify) _____

2.6. How has water availability changed in the last 5 years? (all water sources)

- No change
- Less water available
- More water available

2.7. Are there instances where you have actively worked together with smallholder farmers or a community (such as sharing resources or knowledge)?

- Yes
- No

2.8. Are there instances where you have offered labour to people from the villages/ communities?

- Yes, regularly (e.g., for the entire growing season, year-round employment)
- Yes, Occasionally (only for specific tasks such as planting, harvesting, etc)
- Yes, but only as part of community support or agreements
- No, we do not hire labour from the villages/communities
- Other (please specify)

3. Drought Impact and Coping Mechanisms

3.8. How frequently do you experience drought conditions?

- Every year
- Every 2-3 years
- Every 4-5 years
- Rarely

3.9. What has been the impact of drought on your farm? (Select all that apply)

- Lower crop yields
- Crop failure
- Increased cost of irrigation
- Delayed harvests
- Soil degradation
- Financial losses
- No major impact
- Other (please specify): _____

3.10. What has been your highest harvest loss due to drought for different crops?

- Maize:
  - No loss
  - 0–25% loss
  - 25–50% loss
  - 50–75% loss
  - More than 75% loss
- Groundnut
  - No loss
  - 0–25% loss
  - 25–50% loss
  - 50–75% loss
  - More than 75% loss
- Soyabean
  - No loss
  - 0–25% loss

    - 25–50% loss
    - 50–75% loss
    - More than 75% loss
- Cow-pea
    - No loss
    - 0–25% loss
    - 25–50% loss
    - 50–75% loss
    - More than 75% loss
- Other (please specify crop & loss %): _____

3.11. What strategies or methods have you used to cope with drought? (Select all that apply)
    - Irrigation
    - Changing planting dates (circle appropriate answer: earlier / later)
    - Growing drought-resistant crop varieties
    - Growing early maturing crop varieties
    - Change main crop grown (name crops: _____)
    - Soil conservation techniques (name techniques: _____)
    - Intercropping/ diversification (name intercropped crop: _____)
    - Replanting
    - Increase seed rate
    - Covercrops
    - Soil water harvesting
    - Buying food from markets
    - Receiving aid from the government/NGOs
    - Deep wells/boreholes
    - Water storage systems
    - Mechanised farming
    - Do nothing
    - Other (please specify): _____

3.12. If you compare yourself (as a commercial farmer) with smallholder farmers, are there differences in how you experience drought?
    - Smallholder farmers experience more difficulties
    - Commercial farmers experience more difficulties
    - Both face similar challenges

3.5.a What do you think the biggest differences are?

_____

3.13. Do you think commercial farms have more resources to cope with drought?
    - Yes, significantly more
    - Yes, but only in certain aspects

- No, smallholders have similar or better coping mechanisms
- Not sure

3.14. What activities have been most affected by drought on your farm? (Select all that apply)
- Crop production
- Livestock keeping
- Water supply for irrigation
- Water supply for farm operations (e.g., processing, cleaning, livestock watering)
- Business operations (e.g., trade, processing, transport)
- Other (please specify): _____

3.15. Have you faced any government restrictions or policies related to water use during drought periods?
- Yes, restrictions on water use
- Yes, higher costs for water
- No, no restrictions experienced
- Unsure

4. Market Access

4.8. Where do you mainly sell your produce?
- Local market
- Middlemen
- Contract farming agreements
- Export markets
- Direct to consumers
- Other (please specify): _____

4.9. What type of produce do you sell?
- Rice
- Nuts
- Vegetables
- Fruits
- Livestock (e.g., meat, milk, eggs)
- Tobacco
- Coffee/tea
- Sugercane
- Other (please specify): _____

4.10. How do you transport your goods to the market?
- On foot
- Bicycle
- Car
- Hired vehicle
- Public transport
- Other (please specify): _____

4.11. What are the main challenges you face in accessing markets? (Select all that apply)
- High transport costs

- Market price fluctuations
- Buyer preferences
- Competition from smallholder farmers
- Competition from other commercial farmers
- Limited buyers
- Other (please specify): _____

4.12. Do smallholder farmers sell in the same markets as you?
- Yes
- No

4.13. If yes, how does their presence affect your sales or prices?
- Decreases sales
- Increases sales
- Decreases prices
- Increases prices
- No impact
- Other (please specify): _____

5. Socio-Economic Conditions

5.5. Which financial resources do you have access to that improve your farming enterprise?
- Bank credit/ savings
- Off-farm income
- Private investors
- Cooperative support
- Government subsidy
- Input credit
- Loans
- Personal savings
- Supply contracts
- Other (please specify): _____

5.6. What equipment that you have access to improves your farming enterprise?
- Tractors and mechanised tools
- Combine harvester
- Plough
- Irrigation systems
- Rainwater harvesting systems
- Fertilizer application equipment
- Hand tools only
- Other (please specify): _____

5.7. Are there any government or NGO initiatives that support commercial farmers in this region?
- Yes
- No

5.8. If yes, what type of support do you receive? (Select all that apply)
- Agro-advisory & training
- Input subsidies/ discounts

- Marketing
- Demand/ supply aggregation
- Water access support
- Advocacy
- Other (please specify): _____

5.9. What additional support would help you cope better with drought? (Select all that apply)

- Better irrigation infrastructure
- More government subsidies
- Improved water management policies
- Increased access to climate-resilient crops
- Other (please specify) _____

6. Suggestions and Perspectives

6.5. What are the biggest barriers to improving your farm's resilience to drought? (Select all that apply)

- Lack of water access
- Poor soil quality
- Limited access to inputs (seeds, fertilizer, etc.)
- Market instability
- Lack of financial resources
- Other (please specify): _____

6.6. What would make it easier for you to farm or improve your productivity during drought periods?

- More reliable irrigation systems
- Improved access to credit and loans
- Government policies on water management
- Collaboration with smallholder farmers
- Other (please specify): _____

6.7. What role do you think commercial farmers could play in supporting or collaborating with smallholder farmers in your area?

- Providing training and knowledge-sharing
- Allowing shared water use (e.g., from wells)
- Buying produce from smallholders
- No role, each farm should be independent
- Other (please specify): _____

6.1. What is your vision/dream for the future of your farm and for the community?

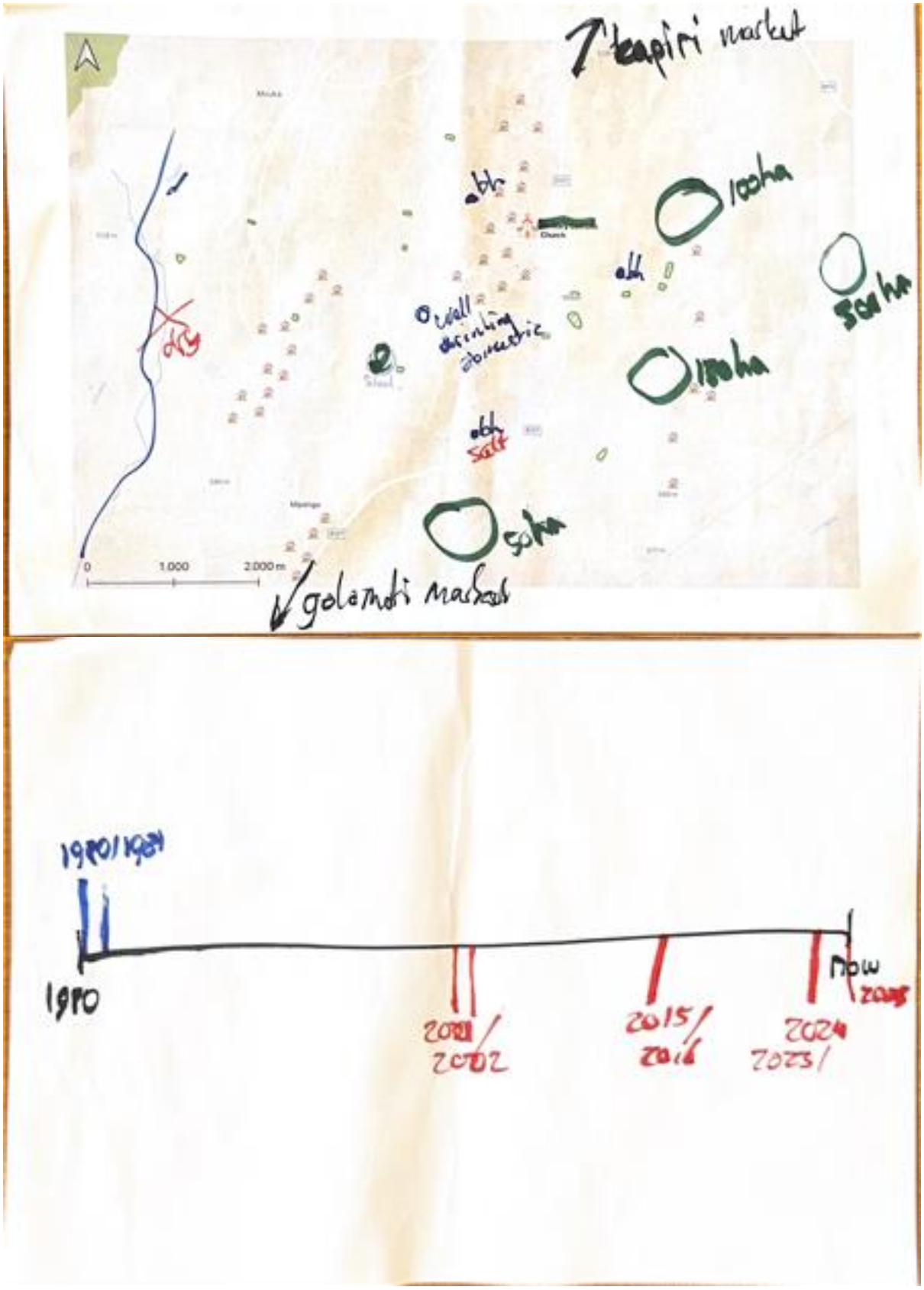
ANNEX D – FOCUS GROUP DISCUSSION GUIDE (SMALLHOLDERS)

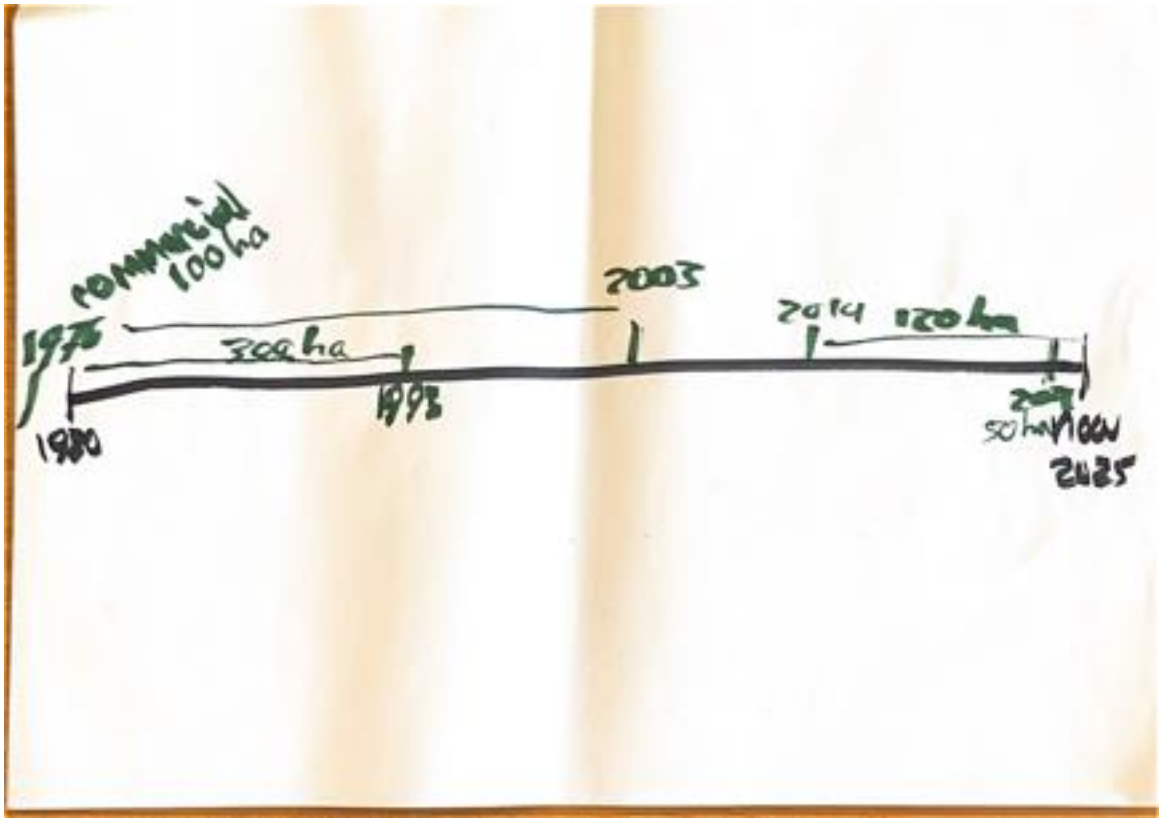
Open questions:

Ask the most important questions from survey to start discussions.

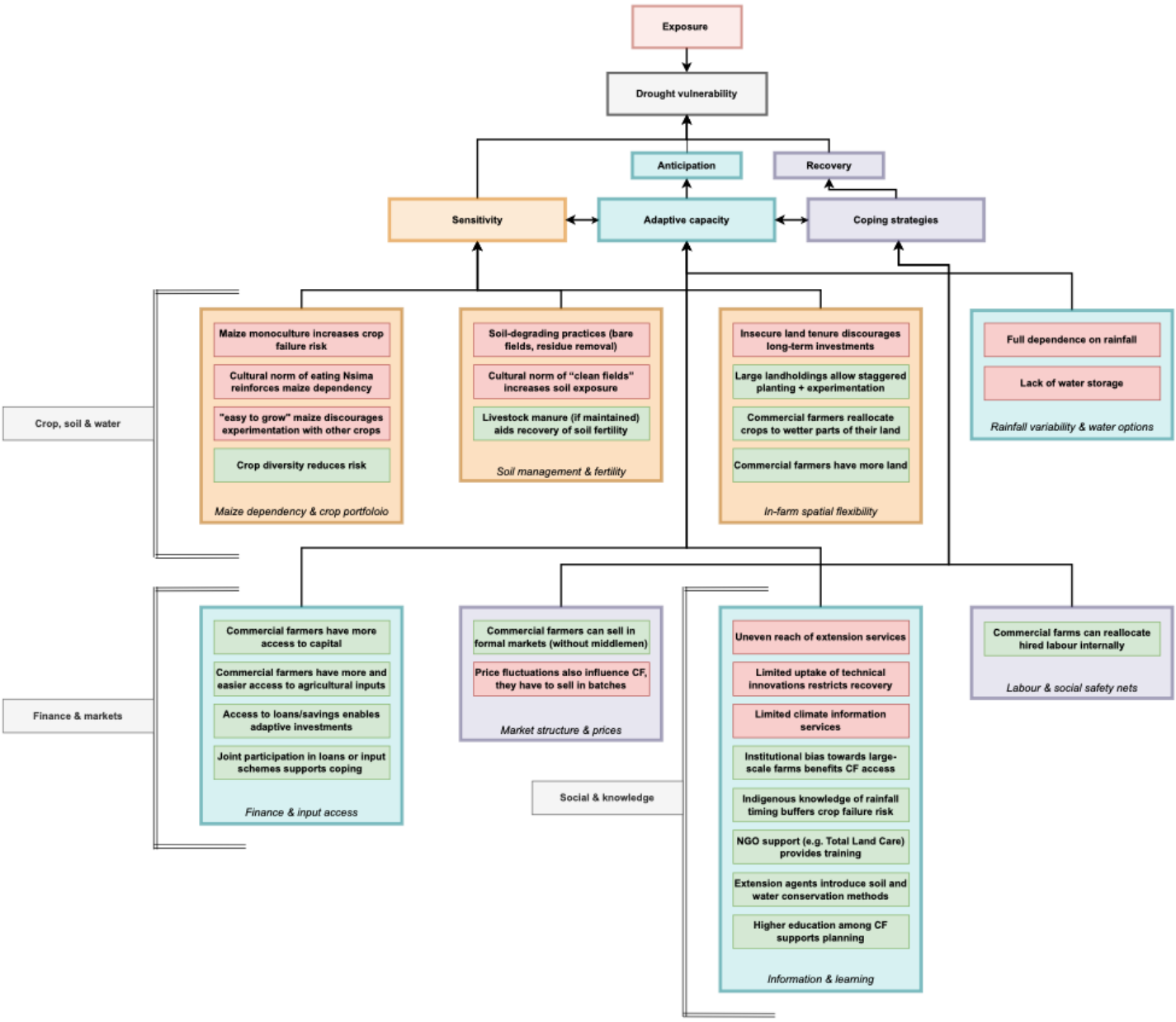
1. How has water availability changed over time? *(show timeline with data on which were dry years/ wet years)*
2. Where are commercial farmers located, and how do they influence your farms? *(map where they can point locations)*
3. How have droughts affected your ability to farm?
4. What strategies have you used to handle the drought?
5. If you compare yourself (as a smallholder farmer) with commercial farmers, are there differences in how you experience drought?
6. What do you think of the difference in market acceptability for products for commercial farmers and smallholder farmers?
7. Why are people not growing other crops than maize/cowpea/soya/groundnut? *(Is it because maize is easy and a "safe" option and its needed for food? Too high risk to change it)*
8. Statement: Big markets and companies/restaurants only buy off of commercial farmers because they need bulk.
9. Statement: Big markets and companies/restaurants only buy off of commercial farmers because growing stuff those companies want is risky and you need more land to take risks in case of crop failure.
10. What are the biggest risks in trying new farming techniques or crops? (e.g., costs, lack of market, fear of failure, water limitations)
11. What support do smallholder farmers need to cope better with droughts? (Government programs, irrigation, financial support, training, etc.)
12. Statement: If there were better irrigation schemes for smallholder farmers, they could compete more with commercial farms.
13. Why do some farmers shift to wage labour on commercial farms instead of continuing their own farming? (reasons such as better income, lower risk, lack of land/water access)

ANNEX E – MAP AND TIMELINE EXERCISES




commercial
100 ha
1975
300 ha
2003
2014
120 ha
1980
1993
2025

ANNEX F – OVERVIEW OF SOCIO-ECONOMIC FACTORS INFLUENCING SENSITIVITY, ADAPTIVE CAPACITY, AND COPING STRATEGIES FOR SMALLHOLDER FARMERS



ANNEX G – OVERVIEW OF SOCIO-ECONOMIC FACTORS INFLUENCING SENSITIVITY, ADAPTIVE CAPACITY, AND COPING STRATEGIES FOR COMMERCIAL FARMERS