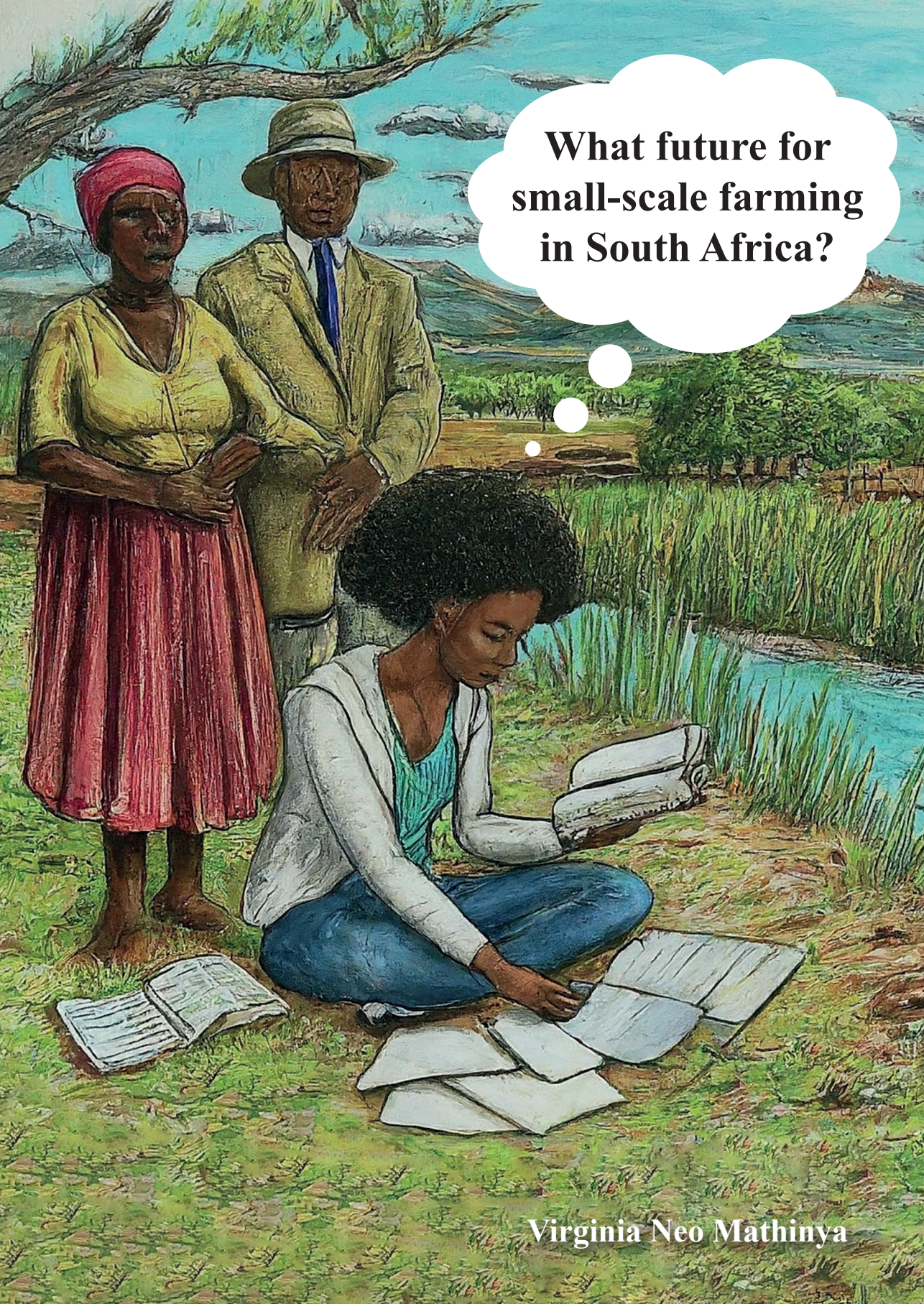

Virginia Neo Mathinya

Propositions

1. Promoting small-scale farming without enabling market participation further entrenches poverty and inequality in the former homelands of South Africa.
   (this thesis)

2. Known for crop production, does not mean suitable for crop production.
   (this thesis)

3. Inherent biases are a near-impossible maze to navigate in research.

4. Common sense gets lost in the pursuit of "scientific correctness"

5. Institutions of higher learning are calculatingly complicit to the high rates of poverty and unemployment in South Africa.

6. An uninformed and ignorant electorate is a politician's dream: it allows a perpetuation of immorality, arrogance, and corruption in governance.

7. A completed PhD thesis from a married candidate with children is equivalent to an advanced degree in project management.

Propositions belonging to the thesis, entitled

What future for small-scale farming in South Africa?

Virginia Neo Mathinya
Wageningen, 10 June 2024

What future for small-scale farming in South Africa?

Virginia Neo Mathinya

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This research was conducted under the auspices of the C.T. de Wit Graduate School of Production Ecology & Resource Conservation

What future for small-scale farming in South Africa?

Virginia Neo Mathinya

Thesis

submitted in fulfilment of the requirements for the degree of doctor
at Wageningen University
by the authority of the Rector Magnificus,
Prof. Dr C. Kroeze,
in the presence of the
Thesis Committee appointed by the Academic Board
to be defended in public
on Monday 10 June 2024
at 1.30 p.m. in the Omnia Auditorium.

Virginia Neo Mathinya

What future for small-scale farming in South Africa?
154 pages.

PhD thesis, Wageningen University, Wageningen, The Netherlands (2024)
With references, with summary in English

DOI: 10.18174/652759

DEDICATIONS

I dedicate this thesis to all the children who look up to me. May you learn from all my mistakes and be brave enough to do better and be better! May this achievement inspire true confidence and excellence in you all.

Toka, Bohlokoa le Selekane, lea ratoa lona batho!

Rearabetswe, Mohale le Leruo, mamane oa le rata!

Kago, Mathapelo, Ikgopoleng, Goitse, le Kenaleone, rakgadi o a lo rata!

Kaone, mama o rata wena!

Bo ngwanake ba Thaba Nchu, ke a lo rata.

Ingane zami zase Emmaus, ngyanithanda.

All the tiny humans God has yet to bless us with, I cannot wait to welcome you into our (@12) family.

Sorcerer's Secret

Abstract

This thesis explores the current (Chapters 2 and 3) and prospective (Chapters 4 and 5) role and contribution of small-scale farming to rural livelihoods in South Africa. The study was conducted in two former homelands of South Africa, Emmaus region in KwaZulu Natal (KZN) province and Thaba Nchu in the Free State (FS). The regions differed in biophysical conditions and socio-economic context. The Drakensberg Mountain Range, forming a natural border between KZN and FS, presents distinct biophysical differences between the two regions. The proximity of the regions to urban centres creates a substantial difference in their socio-economic landscape. Emmaus is more remote, while Thaba Nchu is closer to major urban centres, with daily commutes to these centres forming a big part of the livelihood portfolios of households in this region.

Aimed at contributing a holistic empirical evidence base for the ongoing debates on how state resources should be invested in supporting small-scale farming, I adopted the Describe-Explain-Explore-Design (DEED) research approach. With this approach, the outcomes of one research chapter often informed the focus and research questions of the next chapter for a logical and complementary flow of research activities. We started addressing the main reasons for differences in productivity between small-scale farming and large-scale farming through a systematic literature review to explore the prospects of small-scale farming to increase production (Chapter 2). This chapter's findings demonstrated that the low productivity of small-scale farming cannot be solely ascribed to biophysical constraints. A key conclusion from the review was that we do not know the actual contribution of small-scale farming to rural livelihoods and if that contribution would be substantial enough to drive rural economies. We investigated this in Chapter 3 by responding to the question, can small-scale farming serve as an engine for economic growth in rural areas? Through the rural household multi-indicator survey (RHoMIS), we determined the contribution of off-farm versus on-farm sources towards household welfare and found stark differences at household and regional levels. In both regions, on-farm production and consumption did not guarantee nutrition and food security and only formed a small part of the income of most households. Although the prospects for small-scale farming to substantially contribute to rural livelihoods appeared limited due to low productivity and small contribution to household welfare, the potential for intensifying production existed for the few households for whom farming formed a substantial portion of their livelihoods. But does it feature in the aspirations of rural households? We explored this question in Chapter 4 through several qualitative methods (observations, life histories, in-depth

interviews, and mapping exercises) and found that only a few people in the former homelands aspired to farm. Even so, it was clear that sustainable intensification of farm production remains a plausible pathway for the small number of households for whom farming forms an important part of their income (Chapter 3) and for those with farming aspirations (Chapter 4).

It remained unclear how, under what context, and which forms of agricultural interventions may be suitable for these households. In Chapter 5, we explored prospective small-scale farming systems for rural households through a participatory scenario analysis. We found that a broiler system (raising day-old chicks to slaughter size) had the highest potential contribution to rural households in both regions. However, two interesting alternatives in Emmaus were a perennial system (producing lucerne bales) and an agroforestry system with macadamia nuts. While the monetary gain existed at regional level for all proposed systems, the likelihood of realising that contribution was limited by internal community conflicts over the use of common property resources in Thaba Nchu. In Emmaus, the preferential allocation of land to staple crops over cash crops reduced the likelihood of monetary gain from small-scale farming. The results suggested that functional cooperatives remain a critical precondition for those with farming aspirations to invest in small-scale farming, but farmers often held an aversion against cooperatives due to bad experiences in the past. Lastly, we conclude that developing skills needed to succeed in the modern economy needs to be prioritised over agrarian reform, as small-scale farming is unlikely to become an engine of economic development in former homelands, and only a few people there aspire to farm.

Keywords: aspirations, common property resource, cooperatives, Describe-Explain-Explore-Design (DEED), Grassland biome, living income, RHoMIS, small-scale farming, South Africa

Contents

1. General Introduction

1.1. Background

In the former homelands of South Africa, there is little obvious evidence of thriving rural agriculture, and farming activities are typically limited to small-scale crop and livestock production. At the same time, farming features prominently in policy formulations for improved rural livelihoods. So how important is farming in the livelihoods of rural people? With this thesis, I explore the current and prospective contribution of small-scale farming systems to the livelihoods of rural households in South Africa.

In the global south, pressure is mounting on small-scale farming systems to support rural livelihoods or at the very least, alleviate poverty and food insecurity in rural areas where alternative livelihoods outside farming remain limited (Collier and Dercon, 2014; Hilson, 2016; Woodhill *et al*., 2022). Marked by the incredible diversity of both socioeconomic and biophysical nature (Vanlauwe, *et al*., 2014), these systems have variable contributions to human welfare. Small-scale farming significantly contributes to the production of grains, tubers, and most legumes consumed in Africa (Altieri *et al*., 2011). In some instances, such as is the case with cotton production in Mali (Falconnier *et al*., 2016), potatoes in Uganda (Van Campenhout and Bizimungu, 2018), or rice in Gambia (Bojang, *et al*., 2020), farmers also produce cash crops for the market.

Unlike in other African countries where small-scale farming predominates (Giller, 2020), small-scale farming in South Africa has played a rather marginal role in the national economy. While they remain an integral and crucial component of rural livelihoods, particularly in former homelands (Aliber and Cousins, 2013), small-scale farming systems are overshadowed by the country's well-developed large-scale farming sector. Co-existing in similar bioregions, the large-scale farming sector is responsible for about 95% of the country's marketed produce - both on local and export markets (BFAP, 2022) – while the contribution of small-scale farming remains limited largely to household food security, informal markets, and marginal participation in formal markets (Materechera and Scholes, 2021).

Although the dual nature of farming in South Africa is unique, the challenges of small-scale farming systems such as low yields (Tittonell and Giller, 2013) and vulnerability to climate shocks (Abegunde *et al*., 2019) are also experienced elsewhere in sub-Saharan Africa. Some scholars have, therefore, argued for small-scale farming to be deprioritised for funding from the government on the basis of these challenges and the observed diversification away from farming by rural households (Blair *et al*., 2018). Collier and Dercon (2014) argued that it might be time for small-scale farming households to actively think about leaving agriculture behind,

as have other scholars (Tegenu, 2010). However, some scholars (Hazell, 2011; Thamaga-Chitja and Morojele 2017; Kamara *et al*., 2019) continue to make the case for supporting small-scale farming on the basis of its potential to alleviate localised poverty and food insecurity that are more often than not - masked at national levels (Francis and Webster, 2019) - as well as the limited opportunities outside farming (Giller *et al*., 2021).

Alongside these ongoing scholarly debates, South Africa's current National Development Plan (NDP) positions small-scale farming as one of its priorities for agricultural development which is often associated with the much-needed rural development (Aliber and Hall 2012; Hall and Kepe, 2017; Sebola, 2018). Hence, small-scale farming systems continuously feature in both scholarly and policy debates on whether or not a viable pathway to improved rural livelihoods could be paved by improving their productivity. There is a general consensus that efforts in better management of small-scale farming systems is beneficial to reduce their degradation of water and soil resources (du Preez and van Huyssteen, 2020).

Small-scale farming is one of several land use systems found in the Grassland Biome, ranging from forestry, mining, and rangelands to tourism. The Grassland Biome is the second largest and the least protected of South Africa's nine biomes (Driver *et al*., 2012). The impact of land use systems on the natural resource base and development efforts for their sustainable management have been well documented (Neke and Du Plessis, 2004; O'Connor and Kuyler, 2009; Kamgan *et al*., 2018). Furthermore, attention has also been paid to how land use systems may be sustainably managed for the protection of both natural resources and the livelihoods of those who depend on them, such as is the case with small-scale farming (Hosu and Mushunje, 2013; Moswetsi *et al*., 2017). Together with the deterioration of the natural resource base, increasing population pressure (Willy *et al*., 2019) further place small-scale farming systems at a critical cross-road. Therefore, questions about the future of small-scale farming remain critical as continued production with limited inputs degrades the natural resource base.

1.2. The rationale for the study

Without attention to improved productivity, small-scale farming systems can become increasingly unviable. This warrants the continuous appraisal of small-scale farming in rural livelihoods, more so in the South African context where, rural livelihoods continuously are subject to political rhetoric. South Africa is one of the most unequal countries in the world (Francis and Webster, 2019). This inequality is, to a great extent, attributed to the country's political history of apartheid or segregation which resulted in the creation of the "homelands". Homelands were areas wherein the black population was forcefully confined during the

apartheid era with limited livelihood opportunities outside agriculture (Rogerson and Letsoalo, 1985). This resulted in what came to be popularly known as the 'dualistic agrarian' landscape of South Africa. Constraints of land and capital as well as deficiencies in essential infrastructure and technical services in accordance with the apartheid rule rendered homeland agriculture of little significance to the country's national economy – a reality that persisted past the apartheid era. As such, rural livelihoods in the country continue to be at the forefront of both scholarly and policy agendas for both 'political redress' and rural development endeavours. To this end, the long-term development policy document of the South African government – the National Development Plan (NDP) - positions small-scale farming as a key component of rural development programmes (NDP, 2013). Unfortunately, these intervention programs have been reportedly incompatible with changing priorities and realities of small-scale farmers (Okunlola *et al*., 2016), marked by limited positive outcomes for developmental goals and targets (Aliber and Hall, 2012).

Hoffman and Todd (2000) noted that the government and its policies for intervention are key determinants of the socio-economic environment in which small-scale farmers operate. Subsequent studies additionally noted that the relative importance of the various biophysical and socio-economic constraints of small-scale farming systems are variable and, therefore, need to be understood for and in different contexts (Huluka *et al*., 2019; Dube and Chatterjee, 2022; Mukwedeya and Mudhara, 2023). However, to date, empirical data to support policy decisions regarding small-scale farming in South Africa is lacking and sorely needed. Chapman *et al*. (2021) noted that debates on governmental policies and interventions for small-scale farming in South Africa lack the necessary evidence base. With this thesis, I contribute to the much-needed empirical evidence base for these important debates by critically and systematically unpacking the complex, variable, and interlinked relationships between the biophysical and socioeconomic environments that influence the productivity of small-scale farming systems and the contribution of these systems to rural livelihoods in South Africa.

1.3. Study setting

The research activities of this thesis were carried out in two study regions: Emmaus in KwaZulu Natal (KZN) province and Thaba Nchu in the Free State (FS) (Figure 1.1), both located in the Grassland biome. However, the Drakensberg Mountain Range, forming a natural border between KZN and FS, causes distinct biophysical differences between the two regions resulting in Emmaus being wetter and hotter than Thaba Nchu.

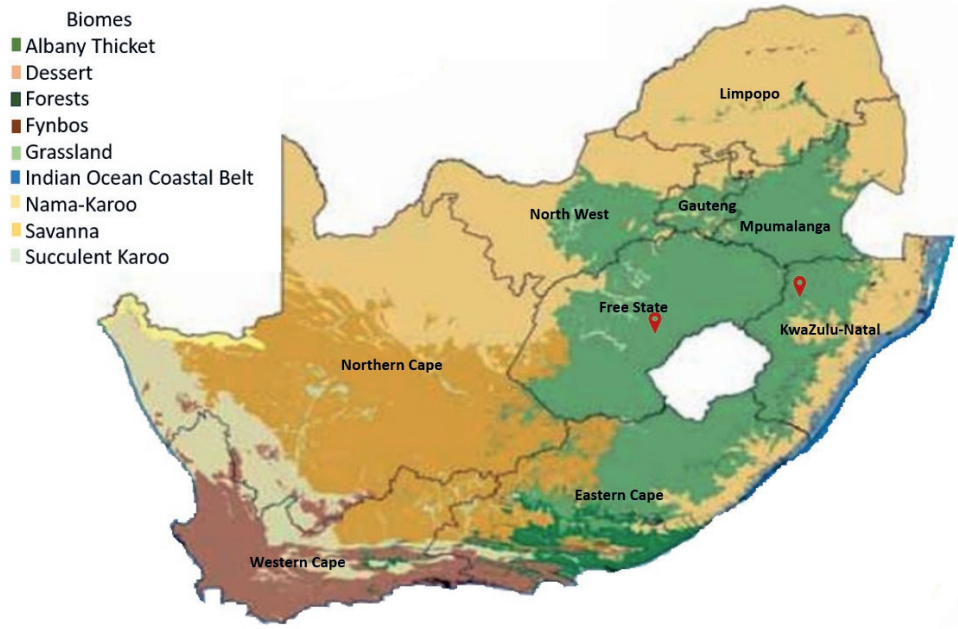


Figure 1.1 Map of South Africa showing the location of the study regions in the Free State and KwaZulu-Natal provinces as well as the distribution of the biomes in the country (adapted from (Driver *et al*., 2012).

Emmaus and Thaba Nchu share a history of being part of the then KwaZulu and Bophuthatswana homelands, respectively (Rogerson and Letsoalo, 1985). As homelands, both these regions were subject to poor provision of services as well as employment and education opportunities from the government. Furthermore, the land tenure system in both regions was and still is communal and managed by tribal authorities. Although both former homelands, developments in Emmaus followed a more traditional homeland route, as it is located in a remote area with sparse and scattered homesteads in-between which communal farming takes place. In contrast, developments in Thaba Nchu were largely influenced by the South African Native Trust (SANT) which acquired the area - known as "Trust lands[1]" - for expanding and consolidating this homeland (Naumann, 2014). Unlike Emmaus, Thaba Nchu is located closer to urban centres, providing alternative job opportunities. The formal existence of the homelands ceased on 27 April 1994.

The study regions were therefore purposely selected as they are both located in the Grassland Biome and both former homelands yet developed in a different independent political

[1] The common name for the planned betterment villages that were established on land that was acquired by the South African Native Trust (SANT) (Geldenhuys, 1981).

governance context (Rogerson and Letsoalo, 1985) which shaped their contrasting socioeconomic landscapes.

1.4. Research objectives

The overarching aim of this research is to investigate the role of small-scale farming systems of South Africa at the field, farm, and village level through the following specific objectives:

1. To compile and analyse empirical data from available secondary sources with which to analyse the productivity and constraints of small-scale farming in South Africa. (Chapter 2)
2. To determine the contribution of small-scale farming to the living income of rural households in former homelands of South Africa and analyse for whom farming is or may be important in these areas. (Chapter 3)
3. To understand how people in former homelands view their future livelihoods and to what extent farming features in these envisaged futures. (Chapter 4)
4. To explore what feasible small-scale agricultural interventions fit for what context and how such interventions may complement rural development. (Chapter 5)

1.5. Research approach and thesis structure

The diversity of small-scale farming systems requires that development strategies, interventions, and policies be tailored to the context within which they exist. To understand these complex systems from different dimensions and hierarchical levels of analysis, the study is framed around the Describe-Explain-Explore-Design (DEED) research methodology (Giller *et al*., 2011; Descheemaeker *et al*., 2019) that I first encountered in Uganda while attending a Farming Systems and Rural Livelihoods course organized by Wageningen University and Research in 2018. I learned that this approach allows the research process to be open and iterative, with data collection, analysis, and writing not following a linear process – an approach I deemed suitable for this study.

The DEED cycle begins with describing and characterizing the system and its components, followed by explaining associated biophysical and socio-economic factors and processes for understanding trade-offs and synergies. The next step is to explore through models and scenario analysis, potential outcomes of a system to enable the (re)design of the farming system based on the information gained from the previous phases in close collaboration with stakeholders.

The DEED approach allowed me to integrate insights from various disciplines with various methods to generate a more detailed view and understanding of small-scale farming systems from different dimensions (biophysical, socio-economic and policy) and scales (field, farm and village) as presented in this thesis.

The thesis consists of six chapters: this general introduction (Chapter 1), four research chapters (Chapters 2 to 5), and the general discussion (Chapter 6). Figure 1.2 provides an overview of how the research chapters are situated regarding the main research dimension (biophysical, socio-economic, policy) they address, the scale of analysis (field, farm, village), and how the chapters feed into each other.

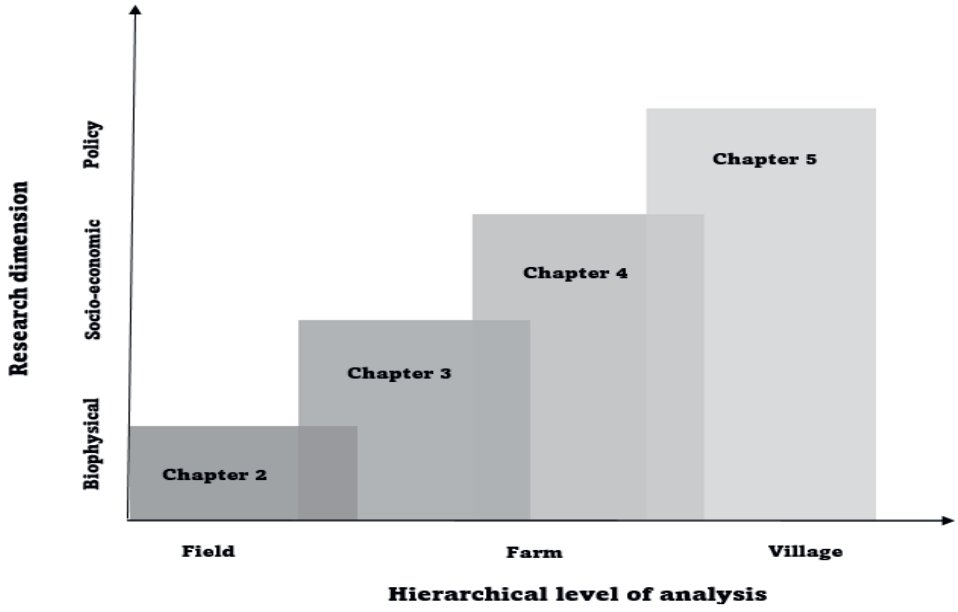


Figure 1.2 Position of the four research chapters in terms of research dimension and hierarchical levels of analysis.

- **Chapter 2** of the thesis reviews the available literature and compiles empirical data that can be used to describe and analyse the productivity and constraints of small-scale farming. This chapter compares small-scale and large-scale farming to elicit the main reasons for differences in productivity between these systems.
- **Chapter 3 D**escribes the biophysical and socioeconomic dimensions of small-scale farming systems in detail with specific reference to agricultural activities, scale of production, and decision-making dynamics in two contrasting regions. The chapter further assesses the relative

contribution of on-farm versus off-farm activities to selected welfare indicators for households in these regions.

- **Chapter 4** zooms in on a subset of the farming households (from Chapter 3) in the two regions to **E**xplain the positionality of small-scale farming in future rural livelihoods.

- **Chapter 5** integrates the outcomes of the preceding chapters (Chapters 2 to 4) to **E**xplore scenarios in which small-scale farming systems in rural South Africa may be sustainable, profitable, and attractive. This chapter employs scenario analysis to **D**esign farming systems - accounting for farmers' aspirations - that could increase the contribution of farming to rural livelihoods at village level. The chapter also addresses the question of the necessary institutional arrangements that must be in place for such systems to thrive.

- **Chapter 6** provides an overview of small-scale farming systems in South Africa and positions the findings of this thesis in a broader African context. In this chapter, I interrogate the representativeness of my study for rural South Africa by critically reflecting on the insights generated in this thesis and the methodologies with which it was gathered. I conclude with appropriate theories and frameworks for rural interventions**.**

2. Productivity and constraints of small-scale crop farming in the summer rainfall region of South Africa[2]

[2] This Chapter was published as:
Mathinya, V.N., A.C. Franke, G.W.J. van de Ven and K.E. Giller (2022). Productivity and constraints of small-scale crop farming in the summer rainfall region of South Africa. *Outlook on Agriculture* 51(2): 139-154.

Abstract

The South African policy sphere hails the commercialisation of small-scale farming as the answer to a myriad of socioeconomic, ecological and political challenges of rural livelihoods. Yet the low agricultural productivity of this sector challenges the realisation of this pathway. Through comparison with large-scale farmers, this review sought to elicit the main reasons for differences in productivity and explore the prospects of small-scale farming. It highlights that low productivity of small-scale farming cannot be solely ascribed to biophysical constraints and that differences rather arise at farm and regional level. Therefore, intervention strategies should not be solely sought at field scale, which seems to be the norm. While the prospects of small-scale farming may seem gloomy at first glance, opportunities such as investing in horticulture exist. Prospects for small-scale farming are limited by the country's very competitive and thriving largescale farming that saturate most agricultural markets. A key conclusion from this review is that we still do not know enough about small-scale farming systems in South Africa. For example, what is the contribution of small-scale farming to the living income of households? Are farming households food and nutrition secure? In particular, the role of agriculture in improving rural livelihoods is poorly understood. Farming is likely to remain an important supplementary livelihood opportunity for the majority of rural households. As such, small-scale farming needs to be rethought as part of a broader livelihood strategy by all stakeholders while continuously seeking alternative entry points towards thriving rural livelihoods. This means provision of support for transition to more commercial farming activities for those with interest and sufficient resources, while alternative employment or social protection is provided for others. A key question for research is what types of farming (crops and livestock) and what scale of operation is needed to achieve commercial success in different regions.

2.1. Introduction

The agricultural landscape of South Africa has been coined dualistic in nature, consisting of on the one hand, a diverse and well-developed large-scale sector with established supply chains and on the other hand, large numbers of underdeveloped, small-scale farms. It is therefore not surprising that farm sizes and diversity of agricultural production vary substantially across the country (Okunlola *et al*., 2016). According to the 2017 Agricultural Census by Stats SA (2020), the large-scale agricultural sector consisted of 40,122 farms, while small-scale farming consisted of more than 300,000 units. Furthermore, the General Household Survey of 2019 reported that in addition to the 300,000 units, a further 2.3 million households were engaged in subsistence-orientated agricultural production activities (Stats SA, 2020). Even so, the large-scale sector produces about 95% of the marketed agricultural output on farms with an average size of 2113 ha (Liebenberg, 2013). Small-scale farmers are said to be primarily seeking to augment food security in agriculture on farms ranging between 1 and 5 ha (Elleboudt, 2012) and selling excess through informal trade (BFAP, 2020; Stats SA, 2020; Rusere *et al*., 2019; Zantsi *et al*., 2019; Thamaga-Chitja and Morojele, 2014). Although small-scale farmers outnumber the large-scale farmers, they are regarded insignificant contributors to national food production. This oddity is not unique to South Africa. It remains a common read in both scholarly and policy reports that the productivity (production per unit of land) of small-scale farmers lags behind that of their large-scale counterparts (Cervantes-Godoy, 2015) although they remain key players in local food systems. In South Africa, this "poor productivity" is often ascribed to the "inferior agricultural potential" (Obi *et al*., 2013) of the bioregions within which the majority of small-scale farmers are located. Most small-scale farming communities in South Africa are concentrated in the eastern parts of the country in what were previously termed homelands located in the summer rainfall bioregion. The summer rainfall area lies in the subtropics and most of the area has a temperate, semi-arid climate with erratic rainfall. Unlike in many African countries where smallholder agriculture predominates (Giller, 2020), the uniqueness of the South African agricultural landscape sees farmers at the two ends of the spectrum both co-existing within the same bioregion – in many instances "only separated by a ditch or a fence" (Henriksson-Malinga *et al*., 2018).

Besides biophysical conditions, agricultural potential is influenced by management practices, which in turn are influenced by the socioeconomic contexts of the people who manage these agricultural landscapes. For example, large-scale farmers, although more productive, are not without their fair share of challenges. With labour costs rising faster than inflation, their farms have become larger and more mechanised resulting in employment declines. Employment has

shifted from permanent to irregular, temporary employment, leaving farm workers and their households vulnerable and insecure (BFAP, 2020). Existing within the same region and reliant on the same biophysical resources of that region, why is the agricultural productivity of small-scale farming so much less than that of the large-scale sector within the same region? Furthermore, are there prospects for small-scale farming to develop into more commercial farming activities?

This review aims to explore and understand the differences between large-scale and small-scale farming. Our main objectives are to:

- Compare and contrast large-scale and small-scale farming and elicit the main reasons for differences in productivity.
- Review intervention strategies aimed at improving the productivity of small-scale farmers.
- Explore the prospects of small-scale farming in South Africa.

This review uses the term small-scale farmer to refer to all farmers who do not have much commercial activity. Commercial and large-scale farmer are popular but noninformative terms often used interchangeably in literature. We object to the implication that small-scale farmers do not pursue commercial strategies and therefore, opt to use the term large-scale farmers. While the focus is on crop production, we acknowledge the integral role of livestock in small-scale farming. As the summer rainfall region is large, we focus on the cropping area of the eastern part of the country where the majority of small-scale farming is located. In our review of intervention strategies, we do not judge the merits of a strategy but rather focus on collating what we know in order to identify knowledge gaps.

To identify eligible literature, a systematic search was conducted in the following electronic databases: Cab Abstracts, Scopus, and Web of Science, as well as local journals: South African Journal of Plant and Soil, South African Journal of Science, African Journal of Agricultural Research, and Agricultural Economics Research, Policy and Practice in Southern Africa. The systematic search consisted of three search terms: smallholder, South Africa and production. Different combinations of these search terms were used as search terms based on the requirements and limitations of each database. Studies that did not make any clear connection between the development or intervention strategy proposed, evaluated or analysed and how it was intended to increase production, efficiency or sustainability of smallholder farms were excluded (See Appendix 2.1).

2.2. An overview of the summer rainfall region

South Africa has almost 12 million hectares of soils with a moderate to high potential for cropping, which comprise 10.3% of the country. However, when suitable climatic conditions are added, this figure falls to just over 2 million hectares, or around 1.8% (Waldner *et al*., 2017). Rainfall in South Africa is seasonal and erratic, and divides the country into three broad climatic zones. A narrow strip of the regions bordering the eastern edge of the country receives rainfall throughout the year, while the winter rainfall zone is confined to a relatively small area in the southwest of the country. The summer rainfall zone is the largest and houses the majority of SA's small-scale farmers.

2.2.1. Biophysical characteristics

The cropping area in the summer rainfall region is mainly flat and rolling, becoming mountainous towards the Drakensburg escarpment. The region has large variations in elevation, ranging from 300 m above sea level over the lowlands to over 2800 m above sea level in the Drakensberg Mountains (Mucina and Rutherford, 2006). The mean annual rainfall in the cropping areas ranges from 400 mm to more than 2000 mm per year and follows a gradient across the landscape increasing from the west to the east Rainfall occurs mostly in the summer months (October to March/April) with an aridity index between 20 and 40% (Mucina and Rutherford, 2006). The region is categorized by warm to hot summers and cold winters. The occurrence of frost increases with elevation. Soil cover is dominated by the red-yellow-grey latosol plinthic catena, which constitutes almost half of this region. Other soil types include black and red clays and well-drained sandy soils. For a comprehensive description of the biophysical characteristics of the summer rainfall region, see (http://daffarcgis.nda.agric.za/comp_atlas_v2/;Strauss *et al*., 2021).

2.2.2. Socio-economic setting

Administrative boundaries divide the summer rainfall region among seven provinces i.e. Limpopo (LP), Kwa-Zulu Natal (KZN), the Eastern Cape (EC), Mpumalanga (MP), Gauteng (GP), North West (NW) and the Free State (FS) Provinces. The political history of South Africa is related to the uniqueness of the country's agricultural landscape that – in addition to farming scale – has entangled race connotations to farming where large-scale farming is associated with the white farmers while small-scale farming has become synonymous with the black farmers. The South African government has sought to create a class of black farmers, commonly known as "emerging farmers", and found in the middle range of the country's agricultural spectrum.

They include beneficiaries of land reform programmes and new entrants who took advantage of opportunities to enter into agriculture. Although not within the scope of this review, this class is worth mentioning as they have been the targeted recipients of substantial government investments through the land reform programmes. While many have not been very effective due to the type of models used (Sebola, 2018), there are reports of successful black commercial farmers who have independently entered the commercial market (Zantsi *et al*., 2019).

Land use is predominantly dry-land cropping and livestock grazing by both large-scale and small-scale farmers as well as pockets of irrigated agriculture by large-scale farmers. Large-scale farmers produce field crops for national and international trade, while small-scale farmers grow them primarily for own consumption with the occasional sale of excess in "good years" to supplement their low income, primarily from social grants (Sinyolo *et al*., 2016). For example, as reported by the Census of commercial agriculture of 2017, commercial farmers in the FS, KZN and EC contributed 14.1%, 10.2% and 8.1% respectively to the country's total agricultural income while the contribution of small-scale farmers is negligible. Poor job opportunities increase reliance on agriculture-centred livelihoods or trigger migration to urban areas (Mlambo, 2018), which perpetuates the socio-economic differentiation among farmers.

2.3. Differences and similarities of large-scale and small-scale farming

2.3.1. Productivity

Productivity records of large-scale farmers (deduced from deliveries to silos and estimates based on cropped areas) are regularly updated and easily accessible. For small-scale farmers, one has to rely on memory recall of farming households which complicates data collection and analysis. Hence, researchers often assume their experimental control treatments to mimic small-scale farmer's practises and yields, which is questionable (Table 2.1). Even so, it remains uncontested that the productivity of small-scale farmers is far outmatched by that of large-scale farmers (Table 2.2). Jovanovic et al. (2018) found that tomato yields commonly achieved on small-scale farms were well below the attainable yields of > 70 t ha^{-1} recorded on some large-scale farms in South Africa. For example, tomato yields of 19 in KZN, 10.4 in LP and 5 t ha^{-1} in MP (Table 2.1) pale in comparison against the 64 t ha^{-1} national tomato average yield recorded in the Census for commercial agriculture by Stats SA in 2017. Drawing further comparisons between productivities of large-scale vs small-scale farmers with different commodities leads to the same outcome (Table 2.2).

2.3.2. Agricultural production constraints

Both large-scale and small-scale farmers face a multitude of production constraints (Table 2.3). Small-scale and large-scale farmers are exposed to the same biophysical constraints at field scale. Unlike large-scale farmers, small-scale farmers are faced with a list of management related constraints at farm scale (Table 2.3) which are exacerbated by climate change with more frequent extreme climatic events such as fires, flooding and recurrent droughts. However, management is the most important yield-reducing factor for small-scale farmers. Moswetsi *et al*. (2017) who concluded in their review that the large gap between farmer yields and the biophysical potential could be reduced through better management practises support this observation.

At regional scale, theft is a common constraint for both small-scale and large-scale farmers. Furthermore, the slowness of government bureaucracy constrains the productivity of farmers differently. Typically, households have exclusive use rights to arable land and communal rights to grazing land. Small-scale farmers do not enjoy private property rights, rather the land is owned by the State and under control of traditional authorities, making long-term farm investment unattractive. For large-scale farmers, constraints manifest through delays in the processing of water licences as well as uncertainties of the land reform programmes (Wilk *et al*., 2013).

Table 2.1: Reported yields of small-scale farmers in the summer rainfall region of South Africa.

Reference	Province	Commodity	Irrigated?	Yield (t/ ha)	Yield source	Special notes on yield data used
(Rusere, *et al*., 2019)	LP	Maize	No	1	Extension officers	Typology based study: Cereal and livestock farms
				0.25-0.5		Horticultural farms
				>0.5		Off-farm income-based farms
(Jovanovic *et al*., 2018)	LP	Tomatoes	Yes	10.4	Field trials data	On-farm field experiments (yield from conventional furrow irrigation)
(Elleboudt, 2012)	KZN	Maize	No	2.6	Field trials data	Farmer managed trials (yield is the control treatment)
(Nyambo and Wakindiki, 2015)	KZN	Cabbage	Yes	30	Extension officers	Data is provided as the mean of the three irrigation systems
		Tomatoes		19		
		Spinach		7		
		Potatoes		9		
		Green beans		1.5		
(Sinyolo and Mudhara, 2018)	KZN	Maize	Yes	1.9	Household survey	Survey data
(Mthembu and Zwane, 2017)	KZN	Maize	No	1.3	Field trials data	On-farm field experiments of intercropping (yield is from the maize monocrop)
(Henriksson-Malinga *et al*., 2018)	KZN	Maize	No	1.79	Household survey	Socio-economic based survey
(Franke and Sekoboane, 2021)	KZN	Potatoes	Supplemental	2.9	Household surveys	Modelling study with baseline data collected through surveys
(Kruger *et al*., 2021)	KZN	Maize	No	2.5	Field trials data	Records of the control treatments in a CA experiment on farmers' fields
		Beans		0.26		
(Franke and Sekoboane, 2021)	MP	Potatoes	Supplemental	6.8	Household surveys	Modelling study with baseline data collected through surveys

(Gwebu and Matthews, 2018)	MP	Tomatoes	Yes	5	Household surveys	Production data collected through questionnaires
(Tesfuhuney *et al*., 2020)	FS	Maize	No	0.83	Field trials data	Intercropping and rainfall water harvesting experiments on communal fields, control data used
		Beans		0.68		
		Beans		0.35		
(Fanadzo *et al*., 2009)	EC	Maize	Yes	2.4	Field trials data	Farmer implemented field experiments
(Agbugba *et al*.. 2020)	EC	Maize	Yes	2.19	Household survey	Values provided as a mean over the irrigation schemes
		Maize	No	1.47		A mean value for homestead gardeners that were part of the study
(Masiza *et al*., 2021)	EC	Maize	No	3.26	Household surveys	Survey data with only one mean value provided for the entire region
(Piesse *et al*., 1996)	EC	Maize	Unspecified	0.9	Household surveys	Survey data
(Mujuru and Obi, 2020)	EC	Maize	Yes	1.04	Household surveys	Survey data with only one mean value provided for the entire region
		Cabbage		5.98		
(Baloyi *et al*., 2009)	NW	Maize	No	1.3	Field trials data	on-farm rotation trial
(Bahta *et al*., 2018)	GP	Maize	Yes	3.45	Household surveys	Survey data on participants of a homestead food garden programme
		Maize	Yes	1.96		Non participants of the study project
(Andersson *et al*. 2013)	SA	Maize	Unspecified	0.98	Unspecified	A modelling study (yield is assumed baseline)

Table 2.2: Small-scale yields vs a 10 year (2011 - 2021) average of large-scale maize yields (t/ha).

Province	**Maize**	
	Small-scale	Large-scale
LP	2.6	6.3
KZN	2.6	6.9
MP	-	5.9
FS	0.83	4.7
EC	3.26	6.2
NW	1.3	4.0
GP	1.96	5.5
SA	0.98	5.6
Values used for small-scale farmers are obtained from Table 2.1 and the highest recorded yield per province is used. For large-scale farmers, a 10-year average was calculated from Grain SA data.		

2.3.3. Adaptation and coping capacities

Large-scale farmers have access to relevant information pertaining to agriculture that provides them a better footing in terms of adjusting management strategies of their commercial agricultural activities (Wilk *et al*., 2013). For example, in a bad year, large-scale farmers might adjust their herds to clear some debt, cut back on labour, even restructure bank loans, or borrow from business partners in other ventures. In good years, commercial farmers boost their future adaptive capacity by investing in their farms. Concerning socio-economic factors such as theft, large-scale farmers can enhance security measures by hiring guards, improving security features such as fencing and by proper marking of livestock and livestock protection against predators (Brink *et al*., 2021). Ultimately, large-scale farmers are thought to be able to cope better with production constraints and shocks because of the diversified nature of their production activities (Clarke *et al*., 2012).

Coping strategies of small-scale farmers are primarily based on traditional methods such as studying weather conditions over time, harvesting water from rain, and practising indigenous water and soil conservation methods (Popoola *et al*., 2018). In more severe cases, coping may be misconstrued as "giving up" such as discontinuing the planting of specific crops or varieties (Popoola *et al*., 2018) or completely abandoning fields (de la Hey, 2017; Blair *et al*., 2018; Shackleton *et al*., 2019). While some strategies may be desirable by small-scale farmers such as the use of fertilisers and biocides, their lack of access to capital restricts their adoption as most rural households depend on social welfare. During bad years, small-scale farmers often have to compromise on most necessities. Selling livestock would be the ultimate resort as livestock serves as both savings and an indicator of wealth or social class. In good years, coping

may entail selling of excess grain to buy fertiliser for the next year's crop. However, money obtained from selling excess produce in a good year is typically used to buy food and other household items (Popoola *et al*., 2018).

The striking difference is that the respective long term versus short term planning of large-scale and small-scale farmers alludes to the differences in access to credit. The prospects of small-scale farmers to take out a loan or crop insurance is shaky as they lack records to demonstrate land ownership and the ability to farm. Their inconsistent income from farming prevents them from investing their own capital into farming. This has a ripple effect on their priorities in saving and spending as well as their risk attitudes. For example, while stock theft is a common occurrence, large-scale farmers bear a further brunt of associated asset theft (e.g. fencing). Yet, they continue to take the risk of acquiring such assets as they cannot farm at scale without them. While one might argue that their risk is eased by obtaining insurance, associated insurance premium changes. Furthermore, livestock is not insured against theft.

Coping strategies for large-scale farmers revolve around diversified forms of off-farm investments. For small-scale farmers, coping strategies are more traditional in nature. Taking a risk that does not pay off may mean debt for large-scale farmers while this may mean food insecurity for small-scale farmers. Nonetheless, farmers need to perceive adequate welfare gains from any technological intervention before choosing to adopt it (Senyolo *et al*., 2018); Abegunde *et al*., 2020). As such, adoption of proposed coping strategies remains modest at best (Guo *et al*., 2020). For small-scale farmers, technology adoption is limited by poor access to necessary resources (Guo *et al*., 2020). Furthermore, differences in agricultural resource endowments (Henriksson-Malinga *et al*., 2018) drives decisions on managing production constraints as well as technological adoption.

2.4. Intervention strategies to increase productivity of small-scale farmers

The feasibility and sustainability of small-scale farming in South Africa has been questioned (Hart *et al*., 2005). Over the years, this issue has been met with variable efforts both from the research and policy perspective.

2.4.1. Research perspective

Studies on interventions aimed at improving the productivity of small-scale farming are provided as Appendix 2.1. There is ample research addressing field scale constraints and these constraints (Table 2.3) have been mitigated through for example, breeding for improved crop varieties. Recorded benefits of this technology include increased yields, less demand for labour

and lower pesticide use (Beyers *et al*., 2002). Small-scale farmers already use improved crop varieties of cotton (Yousouf *et al*., 2002), soybean (Schutte, 2020) and maize (Fischer *et al*., 2015). While there are plenty to choose from, some field scale interventions techniques such as manuring for soil fertility management are favoured for their cost effectiveness (Mkhabela, 2002) while some approaches like conservation agriculture (CA) are disliked for taking time before their benefits become obvious (Chiduza and Dube, 2013; Swanepoel *et al*., 2018).

Several terminologically different, but conceptually similar production approaches have also been pursued to enhance crop yields improvement advantages, as well as for added benefits of environmental protection. These approaches include CA, climate-smart agriculture (CSA), sustainable intensification (SI) and ecological intensification (EI). Practices found in these production approaches are focused on reorientation of crops at field level (e.g. intercropping; diversification). These practices have been investigated at great length and reported to be economically viable as they minimise input costs (Berry *et al*., 2009; Mthembu *et al*., 2018a). Farmers are said to be motivated by risk avoidance to adopt these strategies (Hitayezu *et al*., 2016).

Although limited, there has been research addressing farm-scale interventions that may directly or indirectly contribute to increased productivity. Such interventions include alternative storage techniques to reduce post-harvest losses; techniques improving water use efficiencies; succession planning and creation of field nutrient-management zones. An example is the compact arrangement of crop-livestock integration (Hosu and Mushunje, 2013) also known as mixed farming.

Table 2.3: Production constraints in the summer rainfall region at the field, farm and regional scale based on a detailed review of the literature. See Appendix 1 for sources on small-scale agriculture and the criteria used to assign scales (i.e. field, farm or region). For constraints of large-scale farmers, primary sources consulted were (Clarke *et al*., 2012; Wilk *et al*., 2013; Gwebu and Matthews 2018; Henriksson-Malinga *et al*., 2018; Popoola *et al*., 2018).

Scale	**Type of constraint**	**Nature of constraint**	**Farmers**	
			Small-scale	**Large-scale**
Field	Biophysical	Climatic	Drought	Drought
			Floods	Floods
			Fires	Fires
		Soil	Degradation	Degradation
			Fertility	Fertility
			Moisture	Moisture
		Agronomic	Pests and diseases	Pests and diseases
			Weeds	Weeds
Farm	Management	Knowledge/ skill	Animal nutrition	
			Post-harvest storage	
			Input calibration	
			Production efficiency	
			Technical skill	
	Social	Social	Culture/ tradition	
		Labour	Affordability	Skills
		Capital	Access	Insurance
	Entrepreneurial		Trading acumen	
Region	Economical	Market	Access	Subsidies/ tariffs
				World markets
	Social		Theft	Theft
	Political	Government policies	Tribal laws	Land reform
			Water infrastructure	Water policies
				Labour laws

While there is ample research at field scale, there is a lack of research at regional scale. Furthermore, there is little research that takes on a multi-disciplinary farming systems approach that can encompass the wider socio-economic environment of small-scale farmers. This multi-disciplinary research approach to small-scale farming has been implemented in other African countries such as Malawi (Franke *et al*., 2014), Ethiopia (Josephson *et al*., 2014), Uganda (Van Campenhout and Bizimungu, 2018), Mali (Falconnier *et al*., 2016), Rwanda (Rosa *et al*., 2017), Mozambique (Roxburgh and Rodriguez, 2016) and Kenya (Willy *et al*., 2019). In South Africa, this type of research has been very scanty with only one study to mention (Rusere *et al*., 2019), where the DEED cycle (Describe; Explain; Explore and Design - meant to limit researcher's assumptions while encouraging co-learning among stakeholders (Giller *et al*., 2006)) formed the basis of its methodological approach. As such, there is an overall limited understanding of small-scale agriculture in South Africa.

2.4.2. Policy perspective

The government has, through the National Development Plan (NDP), proposed integration of small-scale farmers into existing commercial value chains as a key objective in rural areas. According to the NDP, agriculture is poised to prosper and continue to contribute meaningfully to the country's rural poor by ensuring food and nutrition security. However, a closer look at recent policy initiatives by Chapman *et al*. (2021) paints a picture of ineffective policy interventions that result in fruitless expenditures. This reality is unpalatable given the governmental investments to increase productivity, enhance sustainable agricultural resource use and facilitate economic growth and development of small-scale farmers. Chapman *et al*. (2021) further highlight that opposing voices to the current status quo of policy processes and implementations lack the "empirical evidence base needed to lend weight to their convictions". Furthermore, Okunlola *et al*. (2016) stated that although government policies have recently shown cognisance of emerging knowledge about small-scale farming such as the diverse nature of this sector, this awareness does not translate into practical programmes of support that take these differences into account in meaningful ways.

One could argue that these "fruitless expenditures" are a result of the wrong starting point. That is, the idea that all small-scale farmers should and will participate in the commercial value chain while basic conditions of scale, access to credit and land ownership are not met (NDP). This then results in white elephant projects like the agri-parks (https://www.gov.za/about-government/governmentprogrammes/agri-parks-programme). Another argument for the "fruitless expenditure" could be poor implementation (lack of capacity and pervasive

corruption) as also recognised by The President's Advisory Panel on Land Reform's report of 2019. Either way, South Africa can no longer afford to run the risk of development programmes and policies that are ineffective (Hall and Kepe, 2017).Hence, the need for a holistic analysis of the dynamics of small-scale farming in guiding strategies and policies to improve the likelihood of success.

On the other hand, a national scan in South Africa by Okunlola *et al*. (2016) indicated a wide variety of forms of support offered to small-scale farmers by private sector and other actors outside of government. Examples of these actors include university research and support groups such as the Agricultural and Rural Development Research Institute (ARDRI) at the University of Fort Hare and the Farmer Support Group (FSG) of the University of KwaZulu-Natal. While perhaps limited in scope and reach, successful outcomes of such programmes have been documented. For example, the Farmer field school by ARDRI is reported to have increased farmers' self-assessed knowledge and skills of production, consumption and selling of vegetables in the Eastern Cape Province (Apleni *et al*., 2019). Similarly, the Integrated Sustainable Agriculture Project (ISA) by FSG assisted farmers to start a communal garden where they grow vegetables for their own consumption and the local market (http://base.d-ph.info/en/fiches/dph/fiche-dph-7074.html).

Likewise, successful collaboration between nongovernmental organisations and small-scale farmers have been developed. Companies such Grain SA (https://www.grainsa.co.za/pages/farmer-development/projects) and Meat Naturally (https://www.meatnaturallyafrica.com/services/) have instituted mentoring programmes where they directly link up with small-scale farmers who demonstrate potential to make it into competitive farming. In some of these programmes, small-scale farmers are assisted with financial management; production training, grazing planning and mapping, farmer and header training, mobile auctions and abattoirs, vaccinations, livestock tagging, to name a few. Such collaborations could help eliminate the government shortfalls of poor implementation of policies.

From all this, an observation is that policy interventions are often based more on ideology and party-political wishes than on empirical research. They are often not very realistic with a slow and messy implementation that yields little impact in the end. For example, while the Presidential Advisory Panel (2019) recognised the capacity constraints and corruption within the government, it still made its recommendations based on the assumption that the government can successfully fund, initiate and oversee interventions. Just the same, the key objective of the

NDP is to commercialise small-scale farming while the reality is, the majority of small-scale farmers will not manage to be active participants of formal agricultural markets.

2.5. Prospects for small-scale farming in South Africa

A fundamental question when assessing the prospects of small-scale farming is given that large-scale farming is capital and knowledge intensive as well as very competitive, is it realistic to expect small-scale farmers to fight their way into formal markets and develop into small- to medium-scale commercial farmers? Unlike large-scale farmers, small-scale farmers do not benefit from the economies of scale. This means either farms should be consolidated (a very sensitive option given the political history of the country) or production intensified (an option deemed foreclosed by land fragmentation and a lack of alternatives outside agriculture; Giller *et al*., 2021a). Scale remains important but with certain high-value irrigated crops like vegetables or nuts, one could at least make a living from a small area of land. A bottle neck for commercialising small-scale farming in South Africa is that, unlike in other African countries (Giller *et al*., 2021b), the thriving large-scale farming sector already saturates most agricultural markets. This leaves very little room for growth and possibilities of breaking into formal markets, a challenge that may be overcome through for example, input subsidies (Rangoato and Oluwatayo, 2018), provision of post-harvest storage facilities (Achiano *et al*., 1999), and negotiating for pre-concluded contracts (Adewumi *et al*., 2010).

Small-scale farming in South Africa seems unlikely to act as an engine for growth and economic development in rural areas as assumed by the NDP. Given the reality that people are not purely focussed on farming and have diversified livelihoods, perhaps small-scale agriculture should be pursued to provide affordable and nutritious food for the rural populations while other opportunities for employment in rural and urban areas are explored. There are opportunities to diversify production to provide more nutritious diets with the inclusion of crops such as pulses and vegetables. It however remains unclear what scale of operations is needed to achieve commercial success in different regions of small-scale farming. A potential alternative for job creation could be investing in the high-value horticultural sector. For example, the ZZ2 Company directly employs about 10,000 people through horticultural production activities (www.zz2.co.za).

While the NDP strongly advocates for investing in small-scale agriculture as a route towards reducing both rural poverty and food insecurities of many rural South Africans, Gassner *et al*. (2019) argue against this dual role thrust upon small-scale farming. The argument is based on the premise that, although poverty and hunger are inextricably linked, they remain two distinct

concepts requiring distinct intervention measures. Therefore, two main questions remain. Is small-scale farming still the appropriate entry point for improved rural livelihoods in South Africa? If so, then towards what objectives (job creation, main source of income, food security and self-sufficiency, supplementary income etc.) should small-scale farming be supported?

2.6. Concluding remarks

Despite scouring the literature, only few papers were found that were explicit on the poor productivity of small-scale agriculture. Through comparison with large-scale farmers in the same bioregion, this review highlights that low productivity of small-scale farming cannot be solely ascribed to biophysical constraints and that differences rather arise at the farm and regional level. Furthermore, this comparison has indicated that productive and profitable farming is knowledge intense, competitive and not without challenges and should be managed as a business enterprise – something not always at the forefront of interventions in small-scale farming.

Notwithstanding the scarcity of available data, the observed large yield gaps between large-scale and small-scale farmers suggest that there is potential to intensify production on small-scale farms. However, prevalent interventions have been sought at field scale. Farm and regional scale studies are scarce with integrated studies even scantier. This creates a misalignment between constraints, interventions and livelihood dynamics of small-scale farming households. Furthermore, it seems that policy interventions are largely driven by ideologies/paradigms/political considerations and are not evidence based.

While prospects of small-scale farming may seem gloomy at first glance, the opportunity to invest in high value crops exists. However, this prospect is limited by the fact that the country's very competitive and thriving large-scale farming already saturates most agricultural markets. In essence though, it seems that for those with secure land holdings and some access to other factors of production, investment in high value vegetable production could be the way forward. For those without sufficient land, small-scale farming remains a small but important contribution to household food security.

A key reflection that emerges from this review is that we know remarkably little about small-scale farming systems in South Africa. The evidence base is incomplete. Better structured and context-based farming systems / livelihood based research is needed to understand the constraints and opportunities of small-scale farmers. Furthermore, it should be acknowledged that different farmers have different objectives, different possible development pathways and

require different interventions. This will provide insights into potential development pathways and the policies needed to support them.

Farming is likely to remain an important supplementary livelihood opportunity for the majority of rural households, more likened to cottage gardening than a thriving commercial venture. What are seen as constraints to agriculture, are more a manifestation of the lack of remunerative jobs in rural areas of South Africa. A diversified approach to rural development is required. Such an approach could support a transition to more commercial farming activities for those with the interest and sufficient land, while providing alternative employment or social protection for others. An important step towards such an approach is to avoid the use of small-scale farmers as a blanket term for rural households. A key question for research is what types of farming in terms of crops and livestock, and what scale of operations is needed to achieve commercial success in different regions. This will clearly differ in relation to the local agroecological conditions and market opportunities, requiring a tailored and nuanced approach.

3. Can small-scale farming systems serve as an economic engine in the former homelands of South Africa?[3]

[3] Published as:
Mathinya, V.N. , A.C. Franke, G.W.J. van de Ven, and K.E. Giller. 2023. Can small-scale farming systems serve as an economic engine in the former homelands of South Africa? *Frontiers in Sustainable Food Systems* 7 (1222120). doi: 10.3389/fsufs.2023.1222120.

Abstract

Small-scale farming plays a critical role in the food security of Africa. An analysis of households in two former homelands provided critical insights into the future of small-scale farming in South Africa. From a survey of 132 households, 57 from Emmaus in the uKhahlamba local municipality in KwaZulu Natal Province and 75 from Thaba Nchu in the Mangaung Metropolitan municipality of the Free State province, indicators of food and nutrition security, income, and the relative contributions of on-farm versus off-farm sources to household welfare were calculated to determine if small-scale farming could drive the economy of these areas. Results revealed stark differences at household and regional levels and were attributed to the importance of crops vs. livestock toward household welfare and the proximity of the regions to urban centers. This was demonstrated by more reliance on arable farming in Emmaus, unlike Thaba Nchu, where a nearby city allowed diversification of income portfolios. In both regions, labor constraints outweighed land limitations. It is, therefore, unlikely that increasing arable land of small-scale farmers alone will stimulate arable farming. On-farm production and consumption did not guarantee nutrition and food security. Currently, small-scale farming did not serve as an engine for economic growth in the communities and formed a small part of the income of most households. However, sustainable intensification of farm production is a plausible pathway for the small number of households for whom farming forms an important part of their income. These households have the potential to engage in more commercial activities if farming and policies can be aligned. A critical knowledge gap is how, under what context, and which forms of agricultural interventions may complement rural development efforts and contribute to the rural economy.

3.1. Introduction

Sub-Saharan Africa (SSA) is, second to Asia, home to the largest population of hungry and poor people in the world. In SSA, 40% of the population survives on less than $1.90 a day (Boudet *et al*., 2021). The predominantly rural nature of poverty in SSA is apparent as approximately 80% of the extremely poor and 76% of the moderately poor live in rural areas, compared to only 44% of the non-poor (Castañeda *et al*., 2018). In these rural areas, land-based production activities are relied upon by communities to boost economic growth, eradicate poverty, and improve the livelihood quality of the less privileged, with agriculture in a dominant role (Ntsebeza and Hall, 2007). It is therefore not surprising that in most countries in SSA, including South Africa, rural development policies are based on the premise that both Sustainable Development Goals (SGD) 1 (End poverty in all its forms everywhere) and 2 (End hunger, achieve food security and improved nutrition and promote sustainable agriculture) can be achieved by revitalizing small-scale farming (NDP, 2013).

Small-scale farming in rural South Africa is a polarizing subject because of the country's political history which burdened the agricultural landscape with connotations of race and race issues related to the apartheid segregation laws. As such these areas have continued to attract both political and academic interest. However, scholarly outputs improving our understanding of the dynamics and the role of small-scale farming systems in rural areas seem to have little impact on sound policy formulation and implementation. For example, despite a number of studies that suggest small-scale farming comprises a small part of rural livelihoods (Obi, 2011; d'Haese *et al*., 2013; Neves and du Toit, 2013), the national development plan (NDP) of South Africa still centralized it to the alleviation of hunger and poverty (NDP, 2013). Therefore, the note by the Voluntary National Review report of 2019 that hunger and poverty alleviation, as well as the creation of thriving rural livelihoods, remain elusive tasks for the country's development (Matona, 2019), comes as no surprise.

Given the centrality of small-scale farmers to thriving rural livelihoods identified in the country's NDP, empirical research to better understand the current diversity and context of this sector is important for several reasons. Firstly, it will enable improved program design leading to targeted intervention strategies. Secondly, it will assist with integrating small-scale farmers into the country's economic activities. Thirdly, it will aid in leveraging resources that are already in place in rural communities for improved rural livelihoods (Larson *et al*., 2016). To this end, Ragie *et al*. (2020) documented trends of varied reliance on land-based income streams that demonstrated a relatively small contribution from crop production. Although this

was single study in one province of the country, it counters the common perception that rural livelihoods are primarily derived from agriculture and other land-based activities.

While there is a growing literature that documents the constraints of small-scale farming in South Africa, as reviewed in Chapter 2, the potential of these farming systems to drive rural development needs to be clarified. Empirical research is needed to understand the diversity of the livelihood strategies of small-scale farmers, how they define their work, how they operate, and what their aspirations are. Chapter 2 demonstrates that government investments to facilitate rural economic growth through the development of small-scale farming have failed to deliver the anticipated results due to a "wrong starting point." They argue that the idea that small-scale farmers should participate in commercial value chains regardless of their context is flawed. Additionally, the assumption that small-scale farmers are a homogeneous group (Okunlola *et al*., 2016; Chapman *et al*., 2021) has contributed to the failure of governmental support programs on to deliver improvements in farming and livelihoods.

Against this background, our paper's central question emerges: can small-scale farming serve as an engine for economic growth in rural areas? We attempt to answer this question by first describing the context and diversity of small-scale farming in terms of agricultural activities, the scale of production, and the dynamics of decision-making; and second, assessing the relative contribution of on-farm vs. off-farm activities to selected household welfare indicators that represent rural economic activity. This chapter uses the term small-scale farmer to refer to all farmers with little formal commercial activity (Chapter 2).

3.2. Materials and methods

3.2.1. Study sites

The study was conducted in two regions in eastern South Africa (Figure 3.1). These regions, Emmaus in Kwa-Zulu Natal (KZN) province and Thaba Nchu in the Free State (FS) province, are both former homelands and were part of the KwaZulu and Bophuthatswana homelands, respectively (Rogerson and Letsoalo, 1985). The study regions were purposely selected as they developed in a different independent governance context (Rogerson and Letsoalo, 1985), affecting these regions' socio-economic development. In both regions, households could access land through tribal authorities and acquire an informal "permission to occupy" (PTO) with no individual ownership through title deeds (Bolliger, 2007). However, stands were randomly and unevenly distributed in Emmaus, while the approach was more formal in Thaba Nchu, resulting

in equal and evenly distributed stands. The stands in Thaba Nchu were allocated in the Trust lands, which are rural areas in homelands that were formerly white-owned and bought up by the South African Native Trust for expanding and consolidating the "native reserves" (Naumann, 2014). Furthermore, land for communal farming was allocated away from these stands, while in Emmaus, communal farming lands were and still are integrated within allocated stands.

Figure 3.1 Location of the two study regions in the eastern parts of South Africa (Map was drawn in R Studio using household GPS Coordinates recorded during the survey, base maps with Leaflet JavaScript).

The specific study sites were four villages in the Emmaus region (Table 3.1), which were selected together with key informants based on easy access to the villages and prior knowledge of farmers' willingness to participate in research activities. In the Thaba Nchu region, the study sites were two trust lands selected to encompass the range of governmental agricultural interventions introduced in the regions. In all study sites, contact with the first household was arranged by key informants and snowballing was used to identify further households for interview.

3.2.2. Data collection and processing

The Rural Household Multiple Indicator Survey (RHoMIS) was chosen for the study as it collects information on a broad range of farm household characteristics, ranging from crop and livestock production and land owned to food security and socio-economic features (Hammond *et al*., 2017). This RHoMIS tool was used to describe the diversity of small-scale farming in

our study regions. Additionally, the data were used to calculate a set of food security, nutrition security, and income indicators related to the welfare of households. These household welfare indicators, often used for analyzing poverty in rural areas (Baulch and Hoddinott, 2000), were then used as the second step toward answering our research question. Data to calculate household welfare indicators were collected through a survey conducted on a digital platform using Android-based mobile phones with a suite of Open Data Kit (ODK; Hartung *et al*., 2010) software installed.

The survey collected general household characteristics, such as demographics and socio-economic activities, agricultural management and production practices, food access, and income and income dynamics.

In Emmaus, data were collected only from households that had planted crops in both the 2018/2019 and the 2019/2020 seasons. All participants worked with Mahlathini - a non-governmental organization (NGO), through which we established access to the communities. In Thaba Nchu, many households had not planted crops or had a minimal harvest in both seasons due to droughts. Therefore, this could not be a criterion for household selection, and answers were based on the most recent production season they could remember.

Eventually, 132 households were interviewed, 57 in Emmaus (out of a total of about 200 households for the four villages surveyed) and 75 in Thaba Nchu (out of a total of about 157 for the two trust lands surveyed).

Surveys were conducted from January to March 2020 by trained enumerators with fair fluency in the local languages. The questionnaires were professionally translated into isiZulu in Emmaus and Sesotho and Setswana in Thaba Nchu. Households from all four villages (i.e., nine households in eQeleni; 17 in Stulwane; 16 in Ezibomveni; and 15 in Emazimbeni) of the Emmaus region were clustered due to their similarity in production activities. Furthermore, although they are named separately, the villages are rather contiguous with unclear boundaries of where one ends and where the next starts (as can be seen from the short distance among them in Figure 3.1).

Table 3.1: Characteristics of the study sites in KZN and FS provinces.

Characteristics	**Kwa-Zulu Natal**	**The Free State**
Municipality	Okhahlamba local municipality	Mangaung Metro Municipality
Region	Emmaus	Thaba Nchu
Regional population density (per km^2) in 2011	1450	1900
Tribal authorities	AmaNgwane and AmaZizi	Barolong
Villages surveyed	eQeleni, Stulwane, Ezibomvini and EmaZimbeni	Sediba and Woodbridge
Distance to nearest town	29 km to Bergville and 25 km to Winterton	28 km to Thaba Nchu town
Distance to nearest city	129 km to Pietermaritzburg	63 km to Bloemfontein
Climate type	A Cwa (Monsoon-influenced humid subtropical)	A Cfb (Temperate oceanic climate)
Rainfall months	October to May	October to May
Mean annual rainfall*	917 mm	609 mm
Annual mean daily minimum temperature (Tn)*	8.7 °C	6.2 °C
Annual mean daily maximum temperature (Tx)*	25.9 °C	23.5 °C
Soil types (Soil Atlas of Africa)	Chromic Acrisols and Leptic Regosol, highly dispersive and erodible	Vertic soils with haplic luvisols prominent

*Based on climate data from the South African Weather Services (SAWS) for 1981 to 2021 from weather stations located in Winterton and Tweespruit for Emmaus and Thaba Nchu, respectively.

In Thaba Nchu, results were analyzed separately for Sediba (48 households) and Woodbridge (27 households) as they are 40 km apart and due to their apparent differences in production activities and access to agricultural resources provided by the Department of Agriculture, Land Reform and Rural Development (DALRRD). For example, irrigation facilities were functional in Sediba and dysfunctional in Woodbridge. Henceforth, the study consists of two regions - Emmaus and Thaba Nchu - and three study sites - Emmaus, Sediba, and Woodbridge.

Data were uploaded to a web server, and an associated set of analysis tools programed in R were used to calculate indicators. In the early phase of our data analysis, we explored the data through principal component analysis (PCA), stepwise regressions, q-plots, and frequency distributions to highlight indicators with notable differences between the sites and explore relationships among them. An ANOVA was conducted to test whether significant differences existed among study sites. The one-way ANOVA test was followed by the Tukey test for

pairwise comparison of the means. R was also used for the graphical representation of the data. The importance of outliers was ascertained in consultation with key informants. Comparisons to assess significant differences between regions were also performed with a one-way ANOVA.

3.2.3. Household welfare indicators

In RHoMIS, several household welfare indicators are calculated by default. We used the following Food and Nutrition Security (FNS) indicators: Household Dietary Diversity Score (HDDS), Potential Food Availability (PFA), Food Self Sufficiency, and Food Insecurity Experience Scale (FIES) to assess the current situation. These consumption-based measures of household welfare are arguably the most comprehensive indicators of the ability to meet needs and wants (Baulch and Hoddinott, 2000). Using the total income welfare indicator (made up of off-farm and on-farm components), we then assessed the contribution of farming to households' participation in economic activities.

3.2.3.1. Household dietary diversity score

Household dietary diversity score (HDDS) indicates the dietary diversity of a household based on the intake of 12 different food groups in the last month prior to the survey. The score ranges from 1 to 12, reflecting the number of food groups consumed. The 12 food groups are cereals, tubers, and roots, vegetables, fruits, meat, eggs, fish and seafood, legumes, nuts, and seeds, milk and milk products, oils and fats and spices, condiments, and beverages. The score is also calculated for a good season (best months for food supply) and a bad season (worst months for food supply) as identified by the households themselves (Ritzema *et al*., 2019). The HDDS is then used to categorize dietary diversity into low (<3), medium (4-5), and high (6-12; FAO, 2006).

3.2.3.2. Potential food availability

Potential food availability (PFA) is a supply-based estimate of the potential amount of food that can be generated through on- and off-farm activities by a household and is measured in energy (kcal) per male adult equivalent (MAE) per day (Hammond *et al*., 2017). The two main components of this indicator are all farm produce and off-farm household income (using local food prices) converted into food. The requirement threshold for food security is 2,500 kcal MAE^{-1} day^{-1} (Holden *et al*., 2001). Households were divided into three PFA categories: i.e., Low: households without enough food available low (PFA < 1,500 kcal MAE^{-1} day^{-1}); Medium: those with roughly enough food available (PFA between 1,500 and 4,000 kcal

MAE^{-1} day^{-1}); and High: households with more than enough food available (PFA >4,000 kcal MAE^{-1} day^{-1}; Frelat *et al*., 2016).

3.2.3.3. Food self-sufficiency

This represents the energy coming from the actual consumption of on-farm products. The energy consumed is calculated by multiplying the amount of food by the energy content of that product. Energy contents were based on a standard product list developed by the US Department of Agriculture USDA.12.3.4. Food Insecurity Experience Scale (FIES) estimates the prevalence of food insecurity as denoted by difficulties in accessing food due to resource constraints. The score on the FIES scale ranges between 0 and 8, with high values indicating households that experience more food insecurity (Wambogo *et al*., 2018). The scale uses a set of eight questions that cover a range of the severity of food insecurity. Questions were answered based on the last 12 months before the survey.

3.2.3.4. Total income

Total income for the household is calculated by adding the income from farm activities (crops and livestock production) and off-farm activities (any income-generating activity outside the farm) as reported by households in the RHoMIS data. The total income indicator generated by the RHoMIS tool was compared to thresholds such as:

The international poverty line: This is the international or extreme poverty line for low-income countries that was set at 2.15 US$ Purchasing Power Parity (PPP) per capita per day in the year 2022 and is based on the national poverty lines of the 15 poorest economies in the world (Jolliffe *et al*., 2022).

The South African food poverty line: the amount of money an individual needs to afford the minimum required daily energy intake (Stats SA, 2020) - given as ZAR 585 per person per month (an equivalent of 2.79 US$ PPP $person^{-1}$ day^{-1}).

The living income is explained by van de Ven *et al*. (2021) as the income a household would require to afford a decent standard of living for all its members. The living income per adult equivalent (AE) facilitates calculation of the income for individual households in rural areas, explicitly considering household size. Elements of a decent standard of living include food, water, housing, education, healthcare, transport, clothing, and other essential needs including provision for unexpected events. The living income benchmark is based on local surveys (van de Ven *et al*., 2021). In addition to collected RHoMIS data, the following local data sources were used:

Food costs: General household survey (Stats SA, 2019); consumer price index.

Housing costs: Quantum for government-subsidized houses, commonly known as RDP houses (45 m2) for KZN and FS from the respective provincial department of Human settlements.

Non-food non-housing costs: General household survey (Stats SA, 2019)

In addition to the total income of households, our calculation of the living income took into account other social security grants such as subsidized housing, water, and electricity. The living income for these former homelands was calculated as 11.79 US$ PPP person^{-1} day^{-1}. To allow comparisons of local thresholds against the international poverty line, we converted ZAR to US$PPP using a conversion factor of 7.0 for 2019/2020.

3.3. Results

3.3.1. The small-scale farming households and farming systems

The average household size was significantly different across the three study sites with the largest households found in Emmaus (Table 3.2). More than 50% of the household heads in Woodbridge were females, while female-led households were fewer in Emmaus. The age of the household head was comparable across all three locations. The education status of household heads was highest in Woodbridge as all had some form of formal education. In Emmaus, 35% of the household heads had no formal education at all.

Households in Emmaus owned on average, 1.2 ha of land of which 0.9 ha were exclusively cultivated to field crops. These lands were mostly owned (in terms of the PTO) by female adults and were mostly flat in topography. While most households did not till their lands (54%), 58% of those who did, used borrowed tractors (from neighbouring villages) and the remaining 42% did so manually. On average, households produced seven crops and 63% (Table 3.2) produced both maize (*Zea mays* L.) and field beans (*Phaseolus vulgaris* L.) that were intercropped, following the recommendations of the Mahlathini NGO (Kruger and Gilles, 2014). Crop yield was reported as "number of bags" by the households and converted to kilograms (50 kg per bag) and only the production of maize and beans as the main field crops were reported. Households produced on average, 453 kg of maize and 56 kg of beans (fresh weight) on-farm production. Crop residues were usually left on the fields and eventually grazed on by free-roaming livestock. Home gardens were present in 53% of the households and were irrigated with water carried primarily from nearby streams to produce cabbage (*Brassica oleracea* L.), spinach (*Spinacia oleracea* L.), onions (*Allium cepa* L.), and pumpkin (*Cucurbita pepo* L.). As

reported by 88% of households, drought presented the biggest challenge for crop production. Important to note is that the data were collected during a particularly dry cycle. Thus, drought might not have been such a prominent challenge had the survey been conducted after the three La Niña seasons that followed the 2018/2019 dry spell. In addition, soil fertility decline and soil erosion were challenges noted by 61 and 40% of the households, respectively. Fertilizers were purchased by 75% of the farmers, 68% purchased pesticides, and 63% manure. Maize and beans were fertilized with mono-ammonium phosphate (MAP) and limestone ammonium nitrate (LAN) depending on their affordability. Livestock manure was used as both a fuel source and soil amendment. Only 5% of the households did not use any agricultural inputs. On average, households owned about five TLUs comprised of cattle, goats, pigs, sheep, and chickens. Some households (14%) owned no livestock.

Only a few (9%) households sold livestock, as livestock, especially goats, was primarily reared for cultural purposes such as cleansing rituals and cattle for lobola ("bride price") proceedings, funerals, and paying fines to the tribal authority when traditional laws were broken. Furthermore, livestock served as a savings account and for social standing in the community. Livestock in Emmaus was usually stabled at night and allowed to graze freely from sunrise to sunset in communal grazing lands. The availability and quality of grazing was only considered in the winter season during which the livestock would be herded higher up into the mountains. The households themselves provided most labor for agricultural activities. Some households (32%) relied on reciprocal labor [non-monetized exchange of group work done by farming households for the benefit of each household in the group, adapted from Gibson (2020)], primarily for time-sensitive activities such as land preparation before planting. Reciprocal labor was done in groups of about 5–7 people. For all households, labor was reported as a constraint delaying other activities such as weeding and harvesting which did not form part of reciprocal labor arrangements. The starting point and subsequent rotation of this reciprocal labor was dictated by which household first secured access to necessary production resources. Mahlathini NGO influenced the long-term production planning and management decisions of households. This implies that the planning of households could have been aligned with the research interest of the NGO such as the conservation agriculture strategies employed.

Also, in Sediba, households cultivated less land than what they owned (Table 3.2). The average farm size was 0.5 ha of which only 0.3 ha was cultivated. On this 0.3 ha, farmers grew fruit trees, field crops and vegetables. Male adults had ownership (PTO) of the lands in 42% of the households while for 35% of the households, female adults did.

Table 3.2: Characteristics of the farming households and systems (Where applicable, the mean is accompanied by the median in parentheses).

Variable	Description	Unit	Emmaus (*n* = 57)	Sediba (*n* = 48)	Woodbridge (*n* = 27)
HH characteristics					
HH Size ***		male adult equivalent	5.3 (5.3)	2.6 (2.3)	2.8 (2.6)
HH Type	Couple	% of households	63	30	40
	Woman single	% of households	33.3	44.7	55.6
	Man Single	% of households	3.5	25.5	3.7
Age of HH head [ns]		Years	57 (56)	57 (59)	60 (61)
Education of HH head	No education	% of households	35.1	14.9	0
	Only Primary	% of households	35.1	31.9	40.1
	Secondary education	% of households	28.1	53.2	59.3
Aid (social grants)		% of households	41	52	30
Land					
Owned *		ha	1.2 (1)	0.5 (0.5)	0.5 (0.5)
Cultivated to crops***		ha	0.9 (1)	0.3 (0.1)	0.2 (0.1)
Land ownership	Female adult	% of households	51	35	52
	Male adult	% of households	42	42	29
	Couple	% of households	7	23	19
Land slope	Flat	% of households	44	87	93
	Sloping	% of households	35	0	0
	Both	% of households	21	13	7
Land tillage	Yes	% of households	46	52	96
	No	% of households	54	48	4
Tillage type	By hand	% of households	42	84	58
	By machine	% of households	58	16	42
Crops					
Crop diversity**		Total number	6.9 (6)	4.8 (4)	6.4 (7)
Field crops produced	Maize	% of households	98	40	44
	Field beans	% of households	65	27	37
Mean on-farm production	Maize	kg	453	105	64
	Field beans	kg	56	35	32
Crop residue use	Animal feed	% of households	9	40	59
	Left on soil	% of households	39	11	15
	Burn	% of households	4	4	4
	N/A	% of households	48	55	22

Home garden	Yes	% of households	53	52	52
	No	% of households	47	48	48
Soil					
Problems	Drought	% of households	88	56	70
	Fertility	% of households	61	31	33
	Erosion	% of households	40	17	19
Agric. inputs					
	Fertilizers	% of households	75	8	19
	Pesticides	% of households	68	2	4
	Manure	% of households	63	34	48
	None	% of households	5	63	41
Livestock					
Ownership [ns]		Tropical livestock unit	5.4 (2.8)	3.7 (2.2)	7.1 (1.4)
Type	Cattle	Average number	6.68	4.2	7.7
	Goats	Average number	4.95	0	2.8
	Sheep	Average number	0.6	7	14
	Chickens	Average number	8.4	6.1	2.6
	Pigs	Average number	0.3	0.1	0
Labour					
	Household	% of households	54	56	67
	Reciprocal	% of households	14	13	7
	Both	% of households	32	31	26
Management (decision power)					
	Outside organization	% of households	19	1	7
	Male adult	% of households	18	38	4
	Female adult	% of households	49	15	41
	Couple	% of households	14	4	26
	NA	% of households	0	42	22

Unless stated in parentheses, the unit of measure is (percentage of households). *p< 0.05; **p< 0.01, ***p< 0.001. N/A= not applicable, ns=not significant

Generally, the land in Sediba is flat and only 13% reported to have both flat and sloping land. Lands were tilled by 52% of the households of which 84% did so by hand.

On average, households produced 105 and 35 kg of maize and beans on farm and the residues of these crops were mainly used as animal feed. Vegetables such as spinach and carrots [*Daucus carota* subsp. sativus (Hoffm.) Schübl. & G. Martens] were cultivated by 52% of the households and irrigated with water from the homestead and fertilized with livestock manure. Drought challenges were reported by 56% of the households while issues of erosion were noted by only 17% of the households. Cultivated crops, mainly maize, were fertilized with MAP and/or LAN by only 8% of the households, while the majority (63%) reported not using any agricultural inputs. Households owned 3.7 TLUs of livestock, mainly cattle and sheep which were primarily sold to neighbouring towns for cultural rituals such as appeasing of the ancestors or at auctions when transport arrangements could be made. Crop production was done by 58% of the households while 71% owned at least one type of livestock.

Sole reliance on reciprocal labor for land preparation was uncommon and practiced by only 13% of the households. As many (56%) relied solely on household labor, limiting the manpower for agricultural production activities. Male adults were operational decision-makers for 38% of the households, the highest across the study regions. In communal croplands that were managed through intervention programs such as the “one - hectare - one household” project, mainly sunflower - intended for sale with a grain trader - was grown under dry-land cultivation through the intervention of the Department of Agriculture, Rural Development and Land Reform (DARDLR). All production activities (weeding, fertilizing etc.) were then performed by all households involved in the project. It is not entirely clear what the inclusion or exclusion criteria for the project were. A portion of the communal land (about 50 ha) was dedicated to future orchards to be irrigated through the revitalization of irrigation schemes project. At the time, the community was erecting irrigation lines on this fallow land and were expected to start planting in 2023. It was unclear to the households what type of orchard was to be planted there. Households had no long-term investment or leverage into the planning as they could only participate for as long as the project remained operational, which depended on the DARDLR.

In Woodbridge, households cultivated even a smaller share of their land than in both other regions, only 0.2 of the 0.5 ha. The 0.2 ha was used to grow fruit trees, field crops, and vegetables. Adult female ownership (PTO) was most prominent across all three study sites with 52% of the households and only 29% of the households having male adult ownership, the

lowest across all three sites. The lands were described as flat by 93% of the households. Tillage was commonly practiced by 96% of the households. Of those who tilled their lands, 58% did so by hand and the remaining 42% hired a tractor. It was bought for a community project on the communal land that was utilized in the past to produce vegetables under greenhouse tunnels, an initiative of the DARDLR that had since collapsed. Households that produced maize and beans had an average production of 64 and 32 kg per household, respectively and the residues of these crops were used as animal feed by 59% of the households-the highest for all the regions. Although on a smaller scale (fewer households) than in Sediba, vegetables [spinach, beetroot (*Beta vulgaris* L.), pumpkin, and carrots] were produced and irrigated with water carried from communal taps. Drought conditions were reported by many households (70%) and 33 and 19% of the households also reported experiencing declines in soil fertility as well as challenges of soil erosion, respectively. Manure was the most widely utilized field crop input. On average, households owned seven TLUs comprised mainly of goats and sheep that were kept in stables and allowed to graze in communal fallow grazing lands during the day. Livestock had started to roam the fallow communal croplands since the community project had ended due to poor market access as reported by community members. At the time, there was an initiative of the provincial Department of Agriculture to resuscitate some communal projects in Woodbridge such as the cattle feedlots and irrigation schemes. For most households (67%), labor was provided by the household members and only 7% of the households relied solely on reciprocal labor. As elsewhere, labor availability was reported as limiting farm production. Day-to-day planning and management of production activities was the responsibility of female adults and outside organizations (extension services, for instance) had influence or were acknowledged by only 7% of the households.

3.3.2. The contributions of farm and off-farm sources to food and nutrition security indicators

From our data explorations in the early phases of the analysis, we found that Food availability and Household Dietary Diversity were the only two indicators that showed notable differences among the sites, hence our focus on them. The general trend across all three study sites was that off-farm sources of income contributed more to nutrition security than on-farm production (Figure 3.2). HDDS in the bad season significantly differed across the regions with Emmaus scoring the lowest (Table 3.3). Households in Emmaus had lower dietary diversity scores than the other regions if only the purchased food sources were considered. However, this region performed better than the other two regardless of the food source in both the bad season (limited

food supply) and the good season (when food availability is above average) when looking at only farm-based food sources. In Sediba, the median of farm-based contribution to HDDS was zero in both the good and bad seasons; in Woodbridge, it was only one (Figure 3.2). In all the regions, on farm production contributed little to the dietary diversity for households. The good season in both Sediba and Woodbridge referred to the months of November and December, generally known as the festive season. In Emmaus, the good season was the months of harvest (May to July).

Figure 3.3 illustrates the contribution of off-farm vs. on-farm sources to the potential food availability of households in the different regions. Although households relied on a variety of livelihood activities, a large proportion of them remained below the given thresholds for energy intake even when all major livelihood activities are considered, especially in Emmaus. More than half of the households in all three regions fell in the "low" PFA category. The highest proportion of households with low (<1,500 kcal MAE^{-1} day^{-1}) PFA were found in Woodbridge. Of the three regions, Sediba had the highest percentage (32%) of households in the high (>4,000 kcal MAE^{-1} day^{-1}) PFA category.

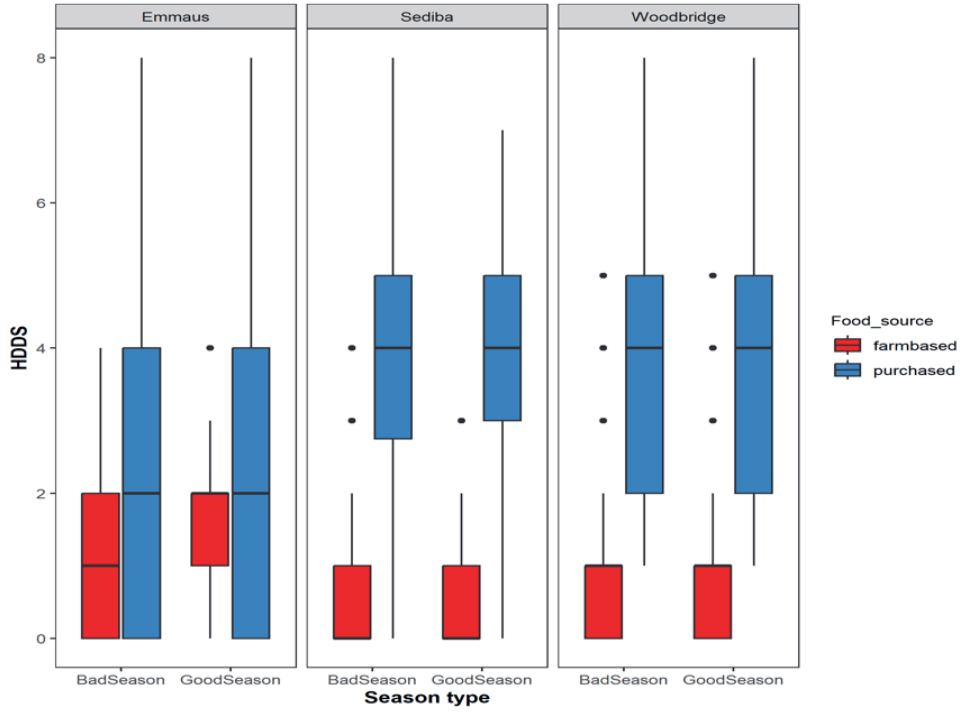


Figure 3.2 Scores for dietary diversity in both the good and the bad seasons and the contribution of farm-based and purchased (off-farm) food sources.

Table 3.3: Results of the welfare indicators. Significant differences between sites were measured using the one-way analysis of variance and indicated by the following symbols: *p< 0.05; **p< 0.01, ***p< 0.001. Standard deviation in brackets. HDDS: Household Dietary Diversity Score; PFA: Potential Food Availability; FIES: Food Insecurity Experience Scale.

Indicator	**Emmaus (*n* = 57)**		**Sediba (*n* = 48)**		**Woodbridge (*n* = 27)**	
(Unit)	Median	Mean	Median	Mean	Median	Mean
HDDS (good season)	5	4.6 ^{ns} (2.5)	6	5.3 ^{ns} (1.5)	5	5.3 ^{ns} (1.5)
HDDS (bad season)	4	4.5 (2.5)	5.5	5.2* (1.6)	6	5.4* (1.5)
PFA (kcal MAE^{-1} day^{-1})	799	7900 ^{ns} (17977)	281	34508 ^{ns} (116592)	80	19163 ^{ns} (46452)
Food self-sufficiency (kcal MAE^{-1} day^{-1})	609	1037** (1185)	106	646* (1299)	52	382* (950)
FIES	5	4.5 ^{ns} (2.8)	5	4.2 ^{ns} (2.9)	5	4 ^{ns} (2.7)
Total income (USD PPP HH^{-1} year^{-1})	0	2971 ^{ns} (7639)	0	3622 ^{ns} (9980)	0	3092 ^{ns} (8622)

Means in each column followed by different letters are significantly different according to Fisher's LSD ($p < 0.05$). Significant differences between sites were measured using the one-way ANOVA and indicated by the symbol, *$p < 0.05$. ns, not significant. Standard deviation in brackets. HDDS, Household dietary diversity score; PFA, Potential food availability; and FIES, Food insecurity experience scale.

Potential food availability was low and more than 50% of the households had a PFA below 800 kcal MAE^{-1} day^{-1} in Emmaus, while the threshold for food security is 2,500. The other two sites performed worse with a median value below 300 kcal MAE^{-1} day^{-1}. Although PFA was low, higher food self-sufficiency was found in Emmaus. Even so, none of the households in all three sites were food self-sufficient. Generally, food insecurity, as indicated by the FIES score, was a reality in all regions.

Generally, off-farm sources contributed more to potential household food availability and on-farm production and consumption did not guarantee nutrition and food security. In Emmaus, crop consumption was the main source of food. Crop sales provided minimal contributions in all three regions but for the 11% of the households in Woodbridge, it contributed to crossing the threshold value of 2,500 kcal MAE^{-1} day^{-1}.

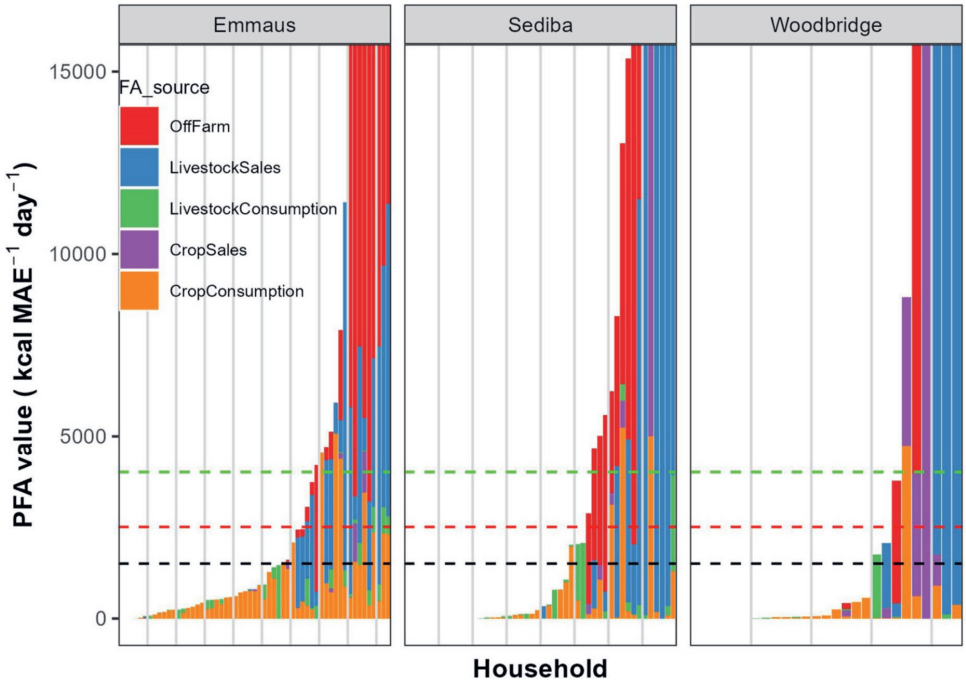


Figure 3.3 Potential food availability (PFA) per MAE for all households in the three regions. The red dotted line represents the threshold value for food security: 2,500 kcal MAE^{-1} day^{-1} while the black and the green represent the low and the high PFA classes, respectively.

For all but three households in Emmaus and one in Woodbridge, off-farm income contributed to PFA values surpassing the threshold requirement. In Sediba and Woodbridge, livestock sales had a more prominent contribution to PFA than in Emmaus. However, livestock consumption provided minimal contributions toward PFA in all three regions.

3.3.3. The relative contributions of farm and off-farm sources to total income

Income results cannot be considered to be entirely reliable, as many households were reluctant to disclose and discuss their incomes, especially income from social grants. Indeed, some households reported no income at all. Nevertheless, the results of those who did report on income revealed the contribution of on-farm versus off-farm sources to people's livelihoods (Figure 3.4). When we compare total income against the following thresholds: the South African poverty line, the international poverty line, and the living income indicator or benchmark (calculated for the regions), most households are below these poverty benchmarks. At best, only a third can meet the international poverty line. The only households that could surpass the living income thresholds were those relying strongly on off-farm sources. Only three households in Emmaus, five in Sediba and three in Woodbridge surpassed the calculated

living income benchmark. Of those relying mainly on on-farm income, six households in Sediba earned more than the SA food poverty line, none in Emmaus and only four in Woodbridge.

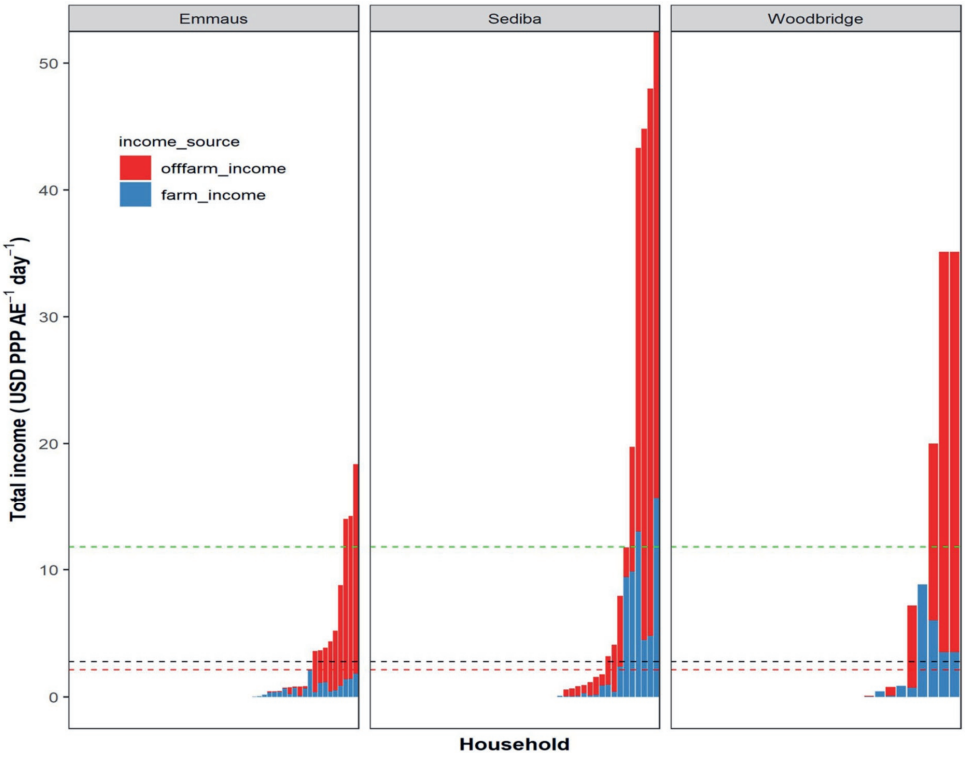


Figure 3.4 Total income (Purchasing power parity per household per year) presented against the international poverty line (red line), the South African Food poverty line (black line), and the rural South African living income benchmark (green line).

Although some households did not report any form of income, field notes, and photographs together with researcher observations (triangulated with key informants), noted some informal and irregular sources of income. In Emmaus, selling of marijuana (*Cannabis sativa* L.), is a prevalent and important but illegal economic activity. This crop is planted in the middle of fields and after harvesting, sold by members of the households (usually men) working elsewhere. Another prominent, more public way of generating income was through weaving of traditional carpets and sewing of cultural garments. This represented a prominent source of income during the "wedding season," usually in early summer (October to late December). Some households that are closer to more foot traffic such as those living closer to the main road or the Emmaus hospital, or schools, rented rooms to people who worked there such as hospital

staff and teachers. Furthermore, some families received remittances from those working away, although this would be only once or twice a year – mainly on major public holidays such as Easter and Christmas. In Thaba Nchu, sewing of school uniforms sold to people in and around the Trust lands generated income mostly in the first part of the academic year (January to March). Some households also preserved some of their harvest such as peaches [*Prunus persica* (L.) Batsch] and beans through canning or drying to sell later in the season when other households have run out.

A crucial part of the total household income which cannot be fully explored with the current empirical evidence is the extent and reach of the South African social security grant or services. In our study, 23 and 44% of households in Emmaus and Thaba Nchu, respectively, received monthly social security grants, i.e., either: Old Age (60–74 years old): 284 USD PPP; Older Age (75+ years): 287 USD PPP; Care Dependency: 284 USD PPP; Child support grant (per child under 18): 69 USD PPP; or Orphaned child support: a top up of 34 USD PPP on the child support grant, etc. per month (Ruiters, 2016). While these grants were acknowledged by some households as off-farm source of income and others did not mention it, depending on the age of the household heads and household sizes, they could add up to a monthly income equal to 5.3 and 3.6 USD PPP MAE^{-1} day^{-1}, in Emmaus (one old age grant and four child support grants) and Thaba Nchu (one old age grant and two child support grants) respectively. This alone potentially puts the households above the US$2.15 poverty line. Furthermore, the indigent status of these regions means that the social security services extend far beyond the monthly income. It makes provision for housing through the Reconstruction and Development Program (RDP; already observed in both Emmaus and Thaba Nchu at the time of the study), electricity fully subsidized to a maximum of 50 kWh per month and fully subsidized water to a maximum of 6 kL per month. Additionally, children attend the "no-fees" schools where they are also provided with a meal in accordance with the National Schools Nutrition Program.[3]

3.4. Discussion

The livelihoods of households in former homelands such as Emmaus and Thaba Nchu, are often stereotyped as persistently poorly resourced, female-led households (Hurlbut, 2018; Khumalo and Sibanda, 2019), resistant to change (Ighodaro *et al*., 2016) in severely underdeveloped regions (d'Haese *et al*., 2013). While the current study in two regions cannot represent all former homelands in South Africa, our study clearly shows that these common assumptions do not hold. Our findings highlight the diversity of households, the limited

contribution of small-scale farming to food and nutrition security, as well as its variable contribution to the households' total income.

The current survey was conducted at one point in time and did not fully capture the dynamic nature of farming systems. Neither did we investigate in detail the influence of different biophysical factors at play in these regions- an important aspect when considering options for intensifying production. Our study nevertheless offered important insights into the context of small-scale farming systems in South Africa. Additionally, our results provide a comprehensive picture of food security and poverty contributing to answering our research question: Can small-scale farming serve as an economic engine in the former homelands of South Africa?

3.4.1. Diversity of small-scale farming systems

In both regions, households farmed on communal land and none of them owned the land, which is common in other South African homelands as well (Kepe and Tessaro, 2014). Farming in the communities was primarily pursued by older women, as is generally the case in small-scale farming across the country (Mkuhlani *et al*., 2019; Materechera and Scholes, 2022). However, the farming systems in the two regions differed, particularly in the dependency of households on farming for food provisioning.

In the region of Emmaus, situated about 129 km away from the city of Pietermaritzburg, crop production formed the base of the livelihood portfolio to the extent that households related the "good season" to the months of harvest (May to July). During this time, maize and beans were harvested for household consumption with their residues remaining in the fields. The residues were grazed by livestock that was extensively kept not as a food source but as means of saving and insurance. Away from the crop fields, vegetables were produced to supplement the household food source, irrigated with water from nearby natural streams. In addition to age, the vulnerability of households to poverty could be related to the low education level of the household heads (Hurlbut, 2018). Female adults made the day-to-day management decisions of the farm with great reliance on the local NGO for long-term planning. The active involvement of the NGO was appreciated and reported by the households to have far greater positive impacts than government departments and their programs, something also previously observed (Hebinck *et al*., 2011; Naumann, 2014; de la Hey and Beinart, 2017; Harris *et al*., 2021).

By contrast, the Thaba Nchu region is closer to major urban centers (63 km to Bloemfontein city and 28 km to Thaba Nchu town) and people could commute daily to these centers for work. This led to off-farm sources contributing more to their livelihoods. Hence, the "good season"

here was unrelated to the agricultural production calendar. It referred to the months of November and December, generally known as the "festive season," a time of the year when off-farm income is received from family members (mostly men) working away. Being more livestock-oriented, households used crop residues to feed the livestock which - unlike in Emmaus - provided the most energy for the households in terms of potential food availability. On the 0.3 ha of cultivated land, maize, beans, and vegetables under fruit trees were grown and irrigated with water from community or homestead taps that were fairly easy to access. Less than 10% of households acknowledged receiving management advice from extension agents of an external organization, which in this case was the local Department of Agriculture. Unlike in Emmaus, household heads had received a higher level of education and were responsible for all management decisions.

An interesting contrast between these regions was the role of livestock. While there was little livestock consumption in both regions, livestock sales were prominent in Thaba Nchu. The differences between these regions demonstrate the important knowledge gap regarding - how, under what context, and which forms of agricultural interventions - may complement rural development efforts and contribute to the rural economy. This is of great consequence, especially to the country's ongoing land reform debates (Materechera and Scholes, 2022).

3.4.2. Food security, poverty dynamics, and the role of small-scale farming

Food insecurity is prevalent in rural areas in South Africa (Maziya *et al*., 2017). Cheteni *et al*. (2020) reported that about 60% of households in South Africa scored in the low HDDS category, making undernourishment a prevalent and common issue (Khumalo and Sibanda, 2019). However, in our study areas, the HDDS scores were in the medium (4-5) range, indicating a fair degree of nutrition security (FAO, 2006). Our findings are comparable to those of Hammond *et al*. (2017), who reported that crop diversification in the Lushoto district of Tanzania improved nutrition (HDDS) but not food (PFA) security. Abegunde *et al*. (2022) also found that the adoption of climate-smart agriculture in small-scale farming contributes to food security. In this survey, PFA differed both at regional and household levels. While the exclusion of households who had not planted crops in Thaba Nchu may mean an underestimation of food insecurities, the distribution, with most households forming a long tail to the left with only a few "better-off households" at the right-hand side (Figure 3.3), is strikingly similar among the sites. Such a pattern is commonly observed in small-scale farming across Africa (Hammond *et al*., 2017; Giller *et al*., 2021).

Understanding the farming system in its broader context allows us to situate small-scale farming and its contribution to rural economies. For example, water for irrigation of vegetables is readily accessible in Thaba Nchu, making agricultural intensification through vegetable production more viable than in Emmaus, where the primary water source is natural streams with unreliable flows. Furthermore, as a satellite town of Bloemfontein, Thaba Nchu offers more market access, facilitating intensified production, especially of perishable products such as vegetables. In addition, an avenue exists to explore options for enhancing livestock production in Thaba Nchu by improving livestock and grazing management. This would require regulated and monitored rotational grazing. This is rather a unique opportunity for Thaba Nchu as, in addition to other uses (manure, social class, insurance, traction etc. Udo *et al*., 2011), livestock contributed to household income.

In Emmaus, the long distance from urban centers means limited market access, constraining opportunities to diversify income with off-farm sources. Under such circumstances, enhancing the production of food crops that could be stored throughout the year to address household food security would be warranted. A focus on good agricultural practices could achieve this. Furthermore, households in Emmaus used limited inputs in relation to the potential output, so the focus here could be on increasing input use and improving input use efficiencies. In Emmaus, interventions could target nutrition security through diversification as crops already provided sufficient energy for the households in terms of potential food availability. This could include local and adaptable vegetables such as amaranthus (*Amaranthus retroflexus* L.) and okra (*Abelmoschus esculentus* L.; Bvenura and Afolayan, 2015). Beyond improving crop production for household consumption in Emmaus, farmers could focus on producing cash crops for household income by targeting crops for which a niche market might exist. A case in point is marijuana, if a legal market for medicinal use could be developed. Another example would be teff for the blooming market for healthy foods (Cheng *et al*., 2017).

Our results showed that land availability did not limit an expansion of crop production in both regions, while labor availability was a limiting factor. So, increasing the available arable land alone is unlikely to increase crop production. In theory, mechanization and the use of herbicides could reduce labor demand for cropping. However, mechanization that is appropriate and economically justified for the scale at which farmers crop in these regions (<0.5 ha) is difficult to achieve.

The potential contribution and drive that the well-developed social security services of the country have in the community cannot be fully encapsulated in our results but is critical in understanding the households that reported no income and seem to meet their welfare needs

with on-farm production. Some argue that the provision of these social security services increases reliance on the government and retard the development of economic life in rural areas (Obi, 2011). The availability of social grants may reduce the pressure on farmers to produce for markets and reinforces the status quo whereby farmers primarily produce for household food security. However, these services may also free up income for investment into agricultural inputs or the required start-up to venture into other forms of income diversification (Sinyolo *et al*., 2016). The lack of evidence on these important aspects limits the scope and robustness of current national discussions on the future of small-scale farming.

Our analysis suggests that farming activities currently contribute little to household income as also noted by Ragie *et al*. (2020). Yet for some households (at the right of the distributions in Figures 3.3 and 3.4), farm income alone was sufficient to surpass the poverty line, while the addition of off-farm income elevated them above the living income threshold. Notably, households who derived substantial income from farming activities, often had substantial income from off-farm activities as well. While we cannot disentangle if and how the two are exactly related, it is likely that these households have stronger economic positions, are able to invest more in agricultural production and carry more risk due to their relatively large off-farm income. These households might invest in making their farming activities more efficient to improve their food self-sufficiency and, in turn, free up any additional income for household needs other than food. This small group of farmers is likely in the best position to develop into small- to medium-scale commercial farmers, as the national government envisages.

These dynamics of on-farm vs. off-farm income are important to understand how households patch together a livelihood from all the different sources and what this means for the role of agriculture in each region. Complementary to the findings of Mbatha and Masuku (2018), small-scale farming could be seen as "enhancing" rural economies by contributing food, although it is not the primary source of income for many households as was reported for households in Ghana and Côte d'Ivoire (Alemayehu *et al*., 2022). Even so, our results indicate that there is potential for small-scale farming to be explored as a primary source of income for a few households (those on the right-hand side of Figures 3.3 and 3.4). Therefore, we take a step back and question if rural development in South Africa can depend on small-scale farms as proposed for other African countries (Larson *et al*., 2016). This would be more challenging in South Africa as small-scale farmers who want to commercialize need to fight their way into agricultural sectors that are served by well-established and highly competitive large-scale farming enterprises (Chapter 2). This suggests that while small-scale farming systems in South

Africa actively supports local diets and household nutrition the contribution to national, continental and global food security is small.

3.5. Conclusion

We identified a wide diversity in rural livelihoods at regional and household scales. Among others, differences between the regions were likely related to the proximity to urban centers which provided alternative employment and income to people and market access for agricultural produce. Our study highlighted the importance of social security grants for income, as well as irregular sources of income that influenced the degree of reliance of households on farm production. Furthermore, our results demonstrated that farming is one of several important activities that support rural livelihoods. Other activities include small businesses such as sewing. Given the centrality of small-scale farming to hunger and poverty alleviation policies of the country, we suggest it is important to take a step back and question whether the answers for thriving rural livelihoods in former homelands rest within small-scale farming. The farmers interviewed generally seem to have little potential or interest to develop into small- to medium-scale commercially oriented producers. Our findings reveal the weakness of current blanket approaches of rural development interventions to improve people's lives in former homelands of South Africa that focus on farming. Therefore, the potential for small-scale farmers to serve as an engine for economic growth appears to be limited. However, a few farmers do obtain substantial incomes from farming activities and appear able to invest in intensifying production. Where market access is limited, such agricultural intensification could take the form of enhancing the production of crops with a long shelf-life such as pecan nuts that could be profitably produced at a small scale or investment in livestock production, primarily because scale matters less for profitable production of grazing animals. In the vicinity of urban centers, investments in high-value vegetable crops such as peppers, tomatoes, and mushrooms are an option. Commercialization options for small-scale farmers, however, remain constrained by the country's highly competitive large-scale farming sector.

4 Where to from here? Aspirations of small-scale farming households in rural South Africa[4]

[4] Will be submitted as: VN Mathinya, AC Franke, GWJ van de Ven, KE Giller and JA Andersson. Where to from here? Aspirations of small-scale farming households in rural South Africa.

Abstract

In the former homelands of South Africa, farming activities are typically limited to small-scale crop and livestock production. At the same time, farming features prominently in policy formulations for improved rural livelihoods. So how important is farming in the livelihoods of rural people and to what extent does it feature in their aspirations? We explored these questions through qualitative methods (observations, life histories, in-depth interviews, and mapping exercises) in two contrasting rural areas. While the concept of aspirations proved challenging for our interviewees to engage with, we received diverse responses. Only a few people aspired to farm, highlighting a mismatch between people's low regard for farming as a livelihood strategy whilst rural development policies hinge on farming as the anchor of thriving rural livelihoods. Therefore, the development of skills needed to be successful in the modern economy may need more emphasis than agrarian reform.

4.1. Introduction

A third of South Africa's population lives in rural areas (WDI, 2022). A large proportion of rural people live in the former homelands – areas characterised by high poverty levels and limited employment opportunities – where black South Africans were forcefully concentrated during South Africa's apartheid era. A large proportion of the population in the former homelands is referred to as small-scale farmers. However, when traveling through these rural areas, there is often little visible evidence of productive, commercial agriculture. So how important is farming in the livelihoods of rural people? In its long-term (2011 to 2030) policy and strategy document, referred to as the National Development Plan (NDP), the South African government positions agriculture as critical for an "integrated and inclusive rural economy" (Chapter 6), for a "transformation of human settlements" (Chapter 8), as well as for "social protection" (Chapter 11) (NDP 2013):

> *"Underdevelopment in the former homelands must be confronted through agricultural development, …"* p. 218.
>
> *"… it is important to provide security and services in rural areas and to support agriculture."* p. 263.
>
> *"This means access to land (…) for subsistence farming can play an important role in ensuring a minimum standard of living."* p. 361.

That the NDP portrays a future of farming-based livelihoods in the former homelands is not surprising. During the apartheid era (1948 to 1994), inhabitants of homelands relied on remittances earned by migrants working in South Africa's wage labour economy, and on land-based activities in the absence of alternative livelihood options (Rogerson and Letsoalo 1985). Since the end of apartheid, the South African government has emphasised agricultural interventions as the preferred pathway towards improved rural livelihoods in the former homelands. This can also be seen in official government documents such as the Food and Nutrition Security Policy (SA Policy on Food and Nutrition 2014) and the Integrated Development Plans (Dlamini and Reddy, 2018) of municipalities, which give the impression that opportunities for thriving livelihoods of rural South Africans can be realised through small-scale farming.

In alignment with the policy goal of enhancing rural livelihoods through agricultural development, former homeland areas not only receive massive government investments, but also continued interest from researchers and investments focused on small-scale farming from

non-governmental organisations (NGOs). For example, Oluwatayo (2019) highlights the importance of agriculture for food security of rural households. In a similar vein, the review by Mbatha *et al*. (2021) notes small-scale farming as a driver of local food security. Hence, small-scale farming has, in many ways, become synonymous with rural development in South Africa. However, failures of rural development programmes in other African countries are explained as a result of a misalignment between "what people want" and policy goals as formulated in rural and agricultural development plans (Mausch *et al*. 2018; Dilley *et al*. 2021; Verkaart *et al*., 2018).

Hence, our research aim was to understand how people in former homeland areas themselves view their future livelihoods, to what extent farming features in these futures, and, if this perspective matches that emerging from policy documents. We addressed our aim through the following research questions: 1) How do rural households regard farming? 2) How do people in rural areas aspire to earn a living? And for those with farming aspirations, 3) How do they imagine their future farming systems? In our research, we define aspirations simply as "envisioned future livelihood strategies and their associated income components" (Mausch *et al*. 2018).

This paper takes an exploratory approach to understand people's aspirations. We draw primarily on observations, life histories, in-depth interviews, and farm mapping exercises to understand how people see their future in their own terms. We first provide background on past and present livelihoods in the two studied former homeland areas of South Africa. This is followed by our methodological approach. We then discuss the results of our questions contextualised with historical references. This leads to the conclusion on our main aim of understanding if aspirations of rural households are aligned to those of the national government.

4.1.1. Context

Our study was conducted in two regions, Emmaus and Thaba Nchu, which before 1994 were part of the KwaZulu and Bophuthatswana homelands respectively. The political history of the homelands is a long and complex one, accounts of which have been provided from different perspectives (Rogerson and Letsoalo, 1985; Halbach, 1988). This section, therefore, only provides a summary of significant historical accounts necessary to understand the key similarities and differences between our study regions in relation to livelihood portfolios then and now.

With segregation laws of pre-democratic South Africa, the South African Native Trust (SANT) was established to manage the organization of homeland areas in accordance with the Natives Land Act of 1913 and the Native Trust and Land Act of 1936. The Trust's declaration was of interpreting and implementing these land acts. This implementation eventually led to the establishment of "betterment schemes" in response to the Trust's concerns of overgrazing, erosion, 'bad farming practices' and population pressures in the homelands (de Wet, 2007).

Technical work of the SANT included fencing-off of grazing areas and the construction of dams, dipping tanks etc. and the creation of "betterment villages" for relocating a growing population of Blacks in White areas. These works were mostly concentrated in the newly acquired areas of SANT known as "Trust lands[5]".

Betterment or trust villages established on trust lands were different from homelands that existed before World War II (1939 - 1945). While traditional homelands were generally located in remote areas with sparse and scattered homesteads in-between which communal farming took place, trust lands were acquired closer to urban centres. Furthermore, land allocation in trust villages was on a grid-pattern base for arable, residential, and grazing areas (Murray, 1996). Emmaus represents a typical traditional homeland with unevenly distributed homesteads and in contrast, Thaba Nchu is exemplary of the more organised trust villages of SANT (Figure 4.1).

Emmaus **Thaba Nchu**

Figure 4.1 A close-up aerial view (100 m scale) illustrating the organisation of homesteads in the two study sites on Google Earth, imagery date: August/September 2022.

Betterment activities of SANT such as the development of irrigation infrastructure (dams, bore holes) encouraged commercialisation of crop production (Rogerson and Letsoalo, 1985; Naumann, 2014). However, the continued forced relocation of people into these areas quickly led to densely-populated areas with limited land availability for farming. To replace declining

5 The common name for the planned betterment villages that were established on land that was acquired by the South African Native Trust (SANT) (Geldenhuys, 1981).

opportunities in agriculture, members of rural households had to commute to nearby urban centres to sell their labor[6]. Extensively reared livestock also formed part of livelihood portfolios in trust lands. In contrast, households in traditional homelands mostly relied on remittances from migrant workers in industrial South Africa and to some degree, on small-scale crop farming.

As homelands, both our study regions were subject to poor provision of services as well as employment and education opportunities from the government. Furthermore, the land tenure system in both these regions was and still is communal and managed by tribal authorities. In addition to constraints of land and capital, homelands had deficiencies in essential infrastructure and technical services which rendered their land-based livelihoods of little significance for the national economy (Neves and du Toit, 2013). The formal existence of these homelands ceased on 27 April 1994 when these areas were re-incorporated into the new democratic South Africa. Yet inhabitants of former homelands are still trapped in poverty with limited livelihood alternatives. As such, livelihood portfolios of the vast majority of people in these areas remain the same, comprising off-farm income through variable migrant (Emmaus) or commuter (Thaba Nchu) jobs in the urban centres and variable reliance on land-based activities.

A recent government review of policies and developments in the former homeland areas found that poverty and inequality has persisted (NPC, 2023). Even though the review acknowledges the prevailing low prospects for economic development in these areas, it appears the government still views farming as central to rural livelihoods. For instance, the NPC (2023) states: *"…rural development and land reform being the core of agrarian reform and economic development."* p. 25.

4.2. Methodology

4.2.1. Study regions

Our first study region is Emmaus, in KwaZulu Natal (KZN). Located on the eastern side of the South Africa-Lesotho border is the small rural town of Winterton situated on the Tugela River's banks at the foothills of the Drakensberg mountains. The road from Winterton leading to the communal villages in Emmaus hosts a string of tourist and leisure attractions. Along the road

[6] Here we refer to selling labour as not having permanent or contract employment. People stood alongside the road in the hope of a "piece job". For instance, this could be mowing the lawn today for one person and cleaning a kraal the next day for the next person.

are several cropped fields (2000 plus ha in total, (Henriksson-Malinga *et al*., 2018)) with centre pivot-irrigated maize (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) of large-scale farmers. On the boundaries of the villages there are plantations of eucalyptus (*Eucalyptus globulus* Labill.) and pine (*Pinus* spp.) trees of the South African Pulp and Paper Industries (SAPPI). In Emmaus, small-scale fields are found around the homesteads and are cultivated primarily with maize and common beans (*Phaseolus vulgaris* L.) for household consumption and crop residues which are grazed on by free-roaming livestock. The villages are remote with the closest urban centres located in Winterton (25 km away) and Bergville (29 km) and the nearest city, Pietermaritzburg, 129 km away. In this region, livelihoods are primarily supported by remittances from migrant labour, social security grants and some informal and irregular sources of income such as selling of marijuana (*Cannabis sativa* L.) to people in urban areas, sewing and weaving of traditional carpets and cultural garments, as well as leasing of rooms to outsiders working in the area (Chapter 3).

Our second study region is located on the western side of South Africa's border with Lesotho. The rural town of Thaba Nchu is located 63 km east of Bloemfontein city in the province of the Free State (FS). To the north and south of the town (separated by the N8 national road) are 'Trust' villages located 28 km away from Thaba Nchu town and 48 km away from Botshabelo, both areas with urban centres. The road from Thaba Nchu town to the villages is marked by large fields (ranging between 50 and 1000 ha (Zantsi *et al*., 2021)) owned by the government, used by "emerging farmers[7]" and cultivated to rainfed sunflower (*Helianthus annuus* L.) and maize. Unlike in Emmaus, households here also generate income intermittently from livestock sales. In addition to social security grants, informal sources of income include the sale of sewn school uniforms and some preserved harvest such as peaches (*Prunus persica* (L.) Batsch*)* and common beans in urban centres.

4.2.2. Data collection

Data was collected from a sub-set of households that were part of the rural household multi-indicator survey (RHoMIS) of 2020 by Mathinya *et al*. (2023). The selection of households was based on the Potential Food Availability[8] (PFA) indicator (Frelat *et al*., 2016) calculated from the survey data. This indicator is a supply-based estimate of the potential amount of food that can be generated through on- and off-farm activities by a household and is measured in

[7] Beneficiaries of the land reform policies and projects such as the Comprehensive Agricultural Support Programme (CASP) (Zantsi *et al*., 2021).
[8] PFA (in kcal MAE^{-1} day^{-1}) was classified as low (<1500); Medium (between 1500 - 4000) and High (>4000)

energy (kcal) per male adult equivalent (MAE) per day. It was deemed a more reliable indicator than household income to capture the contribution from both off-farm and on-farm sources to household welfare and food security. A purposive selection was used to have a representative sample of households in all PFA classes in each region.

Data collection was conducted in October and November 2022 using open questions related to peoples' aspirations as well as their binding constraints to achieve those aspirations. The interviews were conducted in local languages, with translation assistance when necessary. All interviews were recorded and there were no time restrictions to allow the interviewees the freedom to elaborate on their answers.

We first conducted life history interviews with household heads (17 in Emmaus and 11 in Thaba Nchu) to contextualise people's aspirations and their views on small-scale farming. Household heads were prompted to include aspects of relocation and migration, as well as educational and employment shifts to understand how personal circumstances and the bio-physical environment may have influenced their aspirations (Dilley *et al*., 2021). The history of the villages (or surrounding towns), historical narratives of the tribal authorities, and as narrated in local museums were used for historical referencing of life histories.

Following the life history interviews, we conducted qualitative interviews with the same household heads and with their dependents (14 in Emmaus and 5 in Thaba Nchu) on (1) how they see farming, and (2) on how they aspire to earn a living. Participants were asked:

Imagine your life in the future, what income-generating activities would you like to do?

Following these interviews, we further focused on people who aspired to farm to understand how they imagine their future farming systems to look like. We asked these participants to draw their current farm map (household heads) as well as a map of their future (aspired) farm. The farm maps (current and aspired) were drawn using flip chart paper and used as the base for discussions on the differences between the two in terms of constraints and opportunities.

4.2.3. Data analysis

All interviews were fully transcribed and translated into English. Using an inductive approach, we first organised the data per region and per position in the household (household head vs dependent). Outputs of the farm mapping exercises were analysed by comparing the current versus aspired future farm maps.

4.3. Results

This section is structured according to the three research questions used to investigate how people in rural areas of South Africa see their future livelihoods and to what extent farming features in their futures. However, we first share observations from the interview processes as well as the farm mapping exercise.

There was a marked contrast between the life history interviews and interviews on people's aspirations. Whereas the life history interviews required little guidance from the interviewer as people elaborated on their past and offered a lot of information with little prompting, raising the topic of aspirations was met with a lot of hesitation and silences. Interviewees were far less talkative and required a lot more encouragement to speak and elaborate. This difficulty to express and discuss aspirations was also apparent during the farm mapping exercises. Most household heads drew the current farm map quickly and provided a lot of detail that made it easy to recognise the actual homestead. On the other hand, interviewees took much longer to draw farms they envisaged in the future, and the maps were rather basic. Drawing a map of their aspired farm seemed a daunting task.

These observations, illustrate how the interviewees far more easily engaged with their past and current situations than with their aspirations. We acknowledge that talking about lived experiences may be easier than talking about a future you do not know (Conradie and Robeyns, 2013). However, even with considerable encouragement, people appeared unable to formulate what they aspired for the future. The adopted research methodology does not seem to be the cause of this disparity as this open interview approach and drawing-based methodology yielded spontaneous responses in conversations about the past and the present and yet only a few responses about the future, and even these sparse responses had to be "encouraged". It seems that people in both regions were unfamiliar with the concept of aspirations, a finding we did not anticipate.

4.3.1. Perspectives on farming: How do rural households regard farming?

Here we present people's current and foremost views on farming (with mutually exclusive categories).

In Emmaus, small-scale farming is not seen as the main economic activity to make one's living, but as one of many ways people pursue for their livelihoods. Production of field crops such as maize and beans is regarded as the main source of food by household heads.

"Interviewee: When I am farming, I only buy meat. I mill the maize and make maize meal and plant shebo".

In addition to food security, crop production is thus also appreciated for freeing up any household income towards achieving a "better life" or "better social standing" through selling of surplus. The role of livestock is different from crop production:

"Interviewer: But you have goats and sheep, what meat are you buying?

Interviewee: I won't slaughter my goats and my sheep!

Interviewer: So why do you keep them?

Interviewee: I slaughter when I am out of options, or [when] I need money. I sell and do things that I need to do."

Livestock production thus seems to be foremost an 'insurance' activity, consumed only when there is no other option. Livestock is therefore accumulated as a large herd is seen as a sign of wealth. Hence, sales and consumption of livestock are uncommon in Emmaus, making its contribution to food security and income of households limited.

Unlike household heads, who regard farming mostly as a food source, dependents in Emmaus see small-scale farming as a fall-back plan or a stepping stone (Figure 4.2) towards their aspired livelihoods outside of farming. Hence, farming is not an obvious goal for dependents in Emmaus but rather a means to an end.

"... for me I wish that I can farm, plant and sell and take that money to go do a course in sewing and sell clothes."

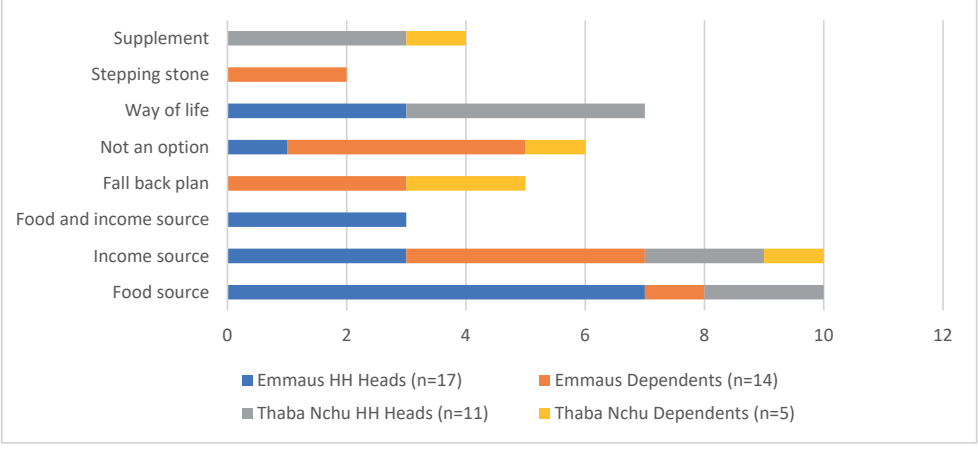


Figure 4.2 How household heads and their dependents in Emmaus and Thaba Nchu see farming. Results reported in number of respondents.

In Thaba Nchu, some household heads see small-scale farming as an income source. This could be related to farming in this region having a history of being more commercially oriented. In the past, communal fields in this area were irrigated from the dams of the "betterment schemes" (Naumann, 2014). On these fields, each household was responsible for the cultivation of one hectare on which they planted wheat (*Triticum aestivum* L.) in winter and maize and beans in summer. This produce was bought by local cooperatives. It is, therefore, not surprising that household heads in Thaba Nchu with irrigated plots see farming foremost as an income source (Figure 4.2). Some interviewees also see farming as a stepping stone and not really as a viable option in itself. This could stem from people's experiences with the "collapse" of the betterment schemes as well as the perceived poor outcomes of recent agricultural interventions (Blair *et al*., 2018). Different members of the communities were unhappy with the dilapidated state of assets (irrigation canals, greenhouses, feed, and dipping lots etc.), and poor institutional support on initiated intervention programs such as skills training (see Okunlola *et al*. (2016) for a comprehensive discussion on forms of support offered to small-scale farmers), and the resultant poor productivity of their farming activities. Interviewees provided different reasons for the current poor state of farming:

> *"The problem was that departments, the two of them, do not have the same word. Agriculture gets to the community and says this. Rural development gets to the community and says that."* Household head

> *"…the department must make time to come here and talk to the community to see how many people want to farm, how many people just want to rear livestock, how many people like …these jobs are not the same. The thing that really ruined things here in the village it's that they said eh, we are all beneficiaries..."* Dependent

Household heads thus have little faith in government-guided agricultural development, pointing to contradictions in policies, a lack of consultation and targeted agricultural interventions.

Dependents in Thaba Nchu generally see small-scale farming as a fall-back plan. Other dependents regard farming as an income source and there are those who do not see any prospects outside of farming.

> *"I mean since jobs are so scarce, I think farming is the one thing for our livelihoods plus we are unemployed, there is nothing happening so all we can do is plough the land because at least that is still possible without money, right."* Dependent

4.3.2. Future livelihoods: Aspirations of small-scale farming households

The aspirations data was subjected to several rounds of manual coding from which four themes emerged: Survival-oriented farming; Farming as a business; Other livelihood pursuits; Success of my dependents.

Survival-orientated farming encompasses aspirations of people who only want to farm for food provisioning in order to reduce their dependence on social security grants. Farming as a business is a category for people aspiring to participate in formal markets. The category of other livelihood pursuits includes non-farm businesses and salaried employment. 'Success of my dependents' is a category of aspirations that is not linked to farming in any way. It is about what household heads consider as the social success of their dependents such as getting married. It is worth noting that aspirations categories presented here are mutually exclusive.

The picture of what future livelihoods in Emmaus could be is a mixed one. Some people see themselves to practice small-scale farming in the future (Table 4.1) while equally, others aspire that their dependents are successful (outside agriculture). In contrast, farming features predominantly for household heads in Thaba Nchu - showing traces of the history of the 'betterment villages'. In both regions however, dependents aspire mainly to other livelihood pursuits than farming.

Table 4.1: Aspirations of household heads and dependents in Emmaus and Thaba Nchu. Scoring in numbers of persons.

Aspiration	**Emmaus (*n = 31*)**		**Thaba Nchu (*n = 16*)**	
	Household head	Dependent	Household head	Dependent
Survival-oriented farming	7	0	6	0
Farming as a business	2	4	4	1
Other livelihood pursuits	0	9	1	4
Success of my dependents	7	-	0	-
Not given	1	1	0	0
Totals	17	14	11	5

4.3.3. Constraints to achieving one's aspirations

The associated constraints of the aspired futures identified by interviewees are presented in Table 4.2. In both regions, other livelihood pursuits are constrained by "prerequisites" which could be in the form of required start-up capital, completion of matric, university fees or required skills and competencies (Table 4.2). Constraints to farming-related aspirations seem to be region specific, reflecting proximity to urban centres and the nature of farming in these

regions. For example, the constraint of poor infrastructure (which in this context referred primarily to roads and transport leading into the urban centres) was only mentioned by household heads in Thaba Nchu where farming is more market oriented. In Emmaus, access to inputs was the main constraint which reflects the challenges of the region being located far from urban centres.

Table 4.2: Most mentioned constraints to different aspirations of household heads and dependents in Emmaus and Thaba Nchu.

Region	Category	Survival oriented farming	Farming as a business	Other livelihood pursuits	Success of my dependents
Emmaus	Household head	Access to inputs	Climatic factors & aging	-	Aging
	Dependent	-	Access to inputs & theft	Prerequisites	-
Thaba Nchu	Household head	Theft	Market access	Poor infrastructure	-
	Dependent	-	Bureaucracy	Prerequisites	-

4.3.4. Farming futures: Aspired commercial farming systems

In our study regions, only 11 out of a total of 47 interviewees aspired to farming as a business, a subset that we focus on henceforth. To understand what their farming futures look like, each member of this group of participants was asked to draw a map of their current farm and a map of their aspired farm. In both regions, participants drew detailed current farm maps, but basic future farm maps.

The differences between the current farm maps and the maps of the aspired farms in Emmaus (Figure 4.3) were mainly related to bigger houses and acquiring own transport. Furthermore, the current many rondavels were replaced by single big houses and double storey houses. The importance of field crops (maize and beans) was seen as diminishing and aspiring farmers put more emphasis on diversified vegetable production. Aspiring farmers generally did not seem to envisage their farm size to increase. Only two interviewees explicitly indicated their desire for land expansion.

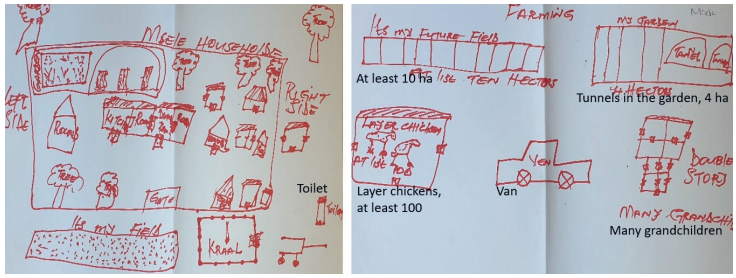


Figure 4.3 Current farm map versus the map of the aspired farm for a household in Emmaus.

In Thaba Nchu, the aspired farms also differed from the current farms (Figure 4.4) in that the vegetable gardens were larger and more diverse. Here, fruit trees also featured on the aspired farms. In addition to diverse vegetable production, some people in Thaba Nchu were interested in expanding livestock production although the maps did not portray this in detail.

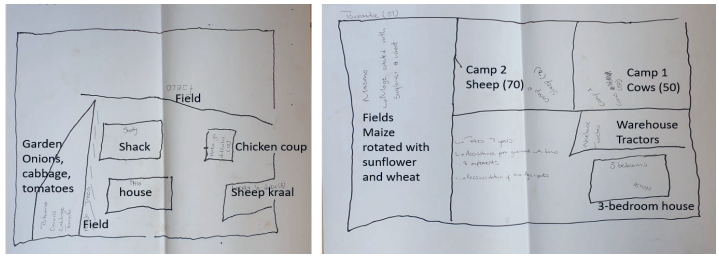


Figure 4.4 Current farm map versus the map of the aspired farm for a household in Thaba Nchu.

Future farm maps from both Emmaus and Thaba Nchu show a desired future of intensified and diversified vegetable production, rather than field crops. The future of farming appears more capital-intensive, portraying a wealthier rural existence. To understand this sub-group of interviewees that see a future in farming further, we present some of their welfare scores in Table 3 as recorded in the RHoMIS survey (Chapter 3).

From Table 4.3, it seems that these are households mainly, but not exclusively, with medium to high PFA values. The household heads had at least up to secondary education. Additionally, most own some livestock, albeit in variable numbers. With the PFA and FIES scores, they are largely food-secure households. Yet none of the indicators seem to offer any obvious structural feature that can be used to easily identify those with farming aspirations in these regions. The same can be said for the dependents. For example, having completed matric or not does not seem to matter. Therefore, the current household situation does not seem to be a major influence of the aspirations of either household heads or dependents.

Table 4.3: Welfare profiles of those who aspire to farm in Emmaus and Thaba Nchu.

Region	Category	Gender	PFA Class (kcal MAE^{-1} day^{-1})	HH Size (MAE)	Livestock holdings (TLU)	FIES Score[9]	On-farm income (USD PPP AE^{-1} day^{-1})	Education
Emmaus	Dependent	Male	High	1.6	0.1	1	0.4	No matric
	Household head	Female	Low	5.6	0	3	0	No school
	Household head	Female	High	5.8	13.5	0	0.7	Secondary
	Dependent	Female	High	5.8	13.5	0	0.7	No matric
	Dependent	Male	High	3.3	0.1	2	0	Matric
	Dependent	Female	Medium	5.8	11.2	4	0.5	Matric
Thaba Nchu	Household head	Male	High	1	23.3	0	15.7	Primary
	Dependent	Female	High	2.3	12.0	2	9.4	Matric
	Household head	Male	Medium	3.1	6.8	3	0.9	Secondary
	Household head	Male	High	0.7	15.0	1	0.7	Secondary
	Household head	Female	Low	2.4	5.9	6	3.5	Secondary

[9] Food insecurity experience scale (FIES) estimates the prevalence of food insecurity as denoted by difficulties in accessing food with scores ranging between 0 and 8. High values indicate food insecurity is more often experienced (Chapter 3).

4.4. Discussion

Our aim was to understand how people in rural areas of South Africa view their future livelihoods and to what extent farming features in these envisaged futures to be able to determine if their perspective is similar to the perspective that emerges from policy documents. In what follows we explore and discuss the five key findings of our study: 1) The unfamiliarity of the 'aspirations' concept among rural households, 2) That only few people aspire to farming, 3) Constraints to farming are region-specific, 4) Farming futures are portrayed as capital intensive, 5) There are no clear structural features that distinguish those with farming aspirations.

Aspirations are generally not easy to understand as they may be based on "rationality, emotion, idealism" and many other social constructs that change with context (Ray, 2006). It is, therefore, not surprising that only few studies have engaged with aspirations within the complex setting of rural households in Africa. While methodological approaches of these studies vary widely from household surveys (Abay *et al*., 2020), structured questionnaires (Henning *et al*. 2022), in-depth interviews (Vercillo and Frayne, 2023), drawing exercises (Daum, 2019), focus group discussions (Elias *et al*., 2018), as well as the Q Methodology (Sumberg *et al*., 2017), there are very few studies employing narratives. With the exception of (LaRue *et al*., 2021; Metelerkamp *et al*., 2019) these studies have relied on verbal exchanges which have been noted to be limited in capturing "emergent" futures (Zipin *et al*., 2015). Our study incorporated a range of approaches including non-verbal methods as advocated by *Elias et al*. (2018). Yet we encountered challenges in getting interviewees to express and engage on the subject of aspirations, while this was not the case with discussions on other topics. Despite these challenges, our broad methodological approach indicated that the concept of aspirations was unfamiliar to the people interviewed who seemed to feel trapped in their current situation.

Only few people aspired to farm. It appears that in the grand scheme of things, farming features little in the livelihood aspirations of rural people. This finding is in line with the findings of Blair *et al*. (2018) and Henning *et al*. (2022) who reported the general disinterest in agrarian lifestyles in rural farming areas in of South Africa. For the youth in Kenya and Uganda, Dilley *et al*. (2021) and Rietveld *et al*. (2020) respectively, also found that farming was not the primary aspired livelihood strategy.

In both our study regions, aspirations differed between household heads and their dependents, as observed by Verkaart *et al*. (2018) in Kenya. Contrary to the findings of (Arora and Slavchevska, 2021), dependents in our study mainly aspired a livelihood outside farming and

only to a lesser extent, to farming as a business. Similarly, Metelerkamp *et al*. (2019) found that only a third of their youth study population aspired to farm. It is therefore understandable that dependents saw a lack of skills required to be successful in the modern economy as the biggest constraint. This points to the far-reaching need for development of business acumen skills rather than emphasis on production in agricultural interventions (Clune and Downey, 2022).

In our findings, household heads aspired to some form of farming with common constraints related to agricultural productivity (e.g., access to inputs and markets). However, there were nuances that were region-specific such as bureaucracy only featuring in the discussions in Thaba Nchu, highlighting the extent of the past and present governmental presence in this area as a Trust land (Naumann, 2014) while NGOs are prominent actors in the Emmaus region (Chapter 3). These nuances further reflected the degree of reliance of households on farming as a livelihood pursuit and may be harnessed for local rural developments. For example, sustainable intensification of livestock production would be an option for Thaba Nchu but not Emmaus as there is a prominent reluctance to livestock sales in Emmaus that is not there in Thaba Nchu. Emmaus on the other hand could benefit from an intervention that is centred on nutrition security as farming is the main source of food in the area. This reiterates the call by Gassner *et al*. (2019) to have poverty and food security as separate targets and not confounded under the banner of rural development as shown by our results.

Aspired farming systems in Emmaus indicated a feature of intensified and or diversified production of vegetables with arable crops receiving less priority. This is observation was also noted by Shackleton and Hebinck (2018) in the Eastern Cape province. In Thaba Nchu, an additional inclination towards livestock production was noted. Even so, the aspired farming systems in both regions appeared to be capital-intensive, contrary to current realities. While Ogunjimi *et al*. (2023) found an association between people's current farm characteristics and their aspirations, other studies (Elias *et al*. 2018; Bloem 2021) also found a disparity between rural realities and aspirations - a concept described as an "aspiration gap" (Ray *et al*., 2006). Nonetheless, the aspired capital-intensive farming could be achieved at the village level by consolidation of farmland (Ntihinyurwa and de Vries, 2021) or through farmer cooperatives (Gwiriri and Bennett, 2020).

Perhaps unsurprisingly, people in rural areas aspire to a diversity of livelihoods and ideally, development policies should cater for this diversity. Such endeavours are currently constrained by the general mismatch between the NDP which promotes rural development policies that are

hinged on farming anchoring thriving rural livelihoods whereas the rural communities do not regard farming as a choice livelihood strategy. Therefore, skills development for the modern economy may need more emphasis in policy formulations as many people aspire to a life outside of farming.

4.5. Conclusion

Our findings speak to the limited opportunities within and outside of farming for rural livelihoods in South Africa's former homelands. This calls for a reprioritization of agrarian development to not foreshadow rural developments in education, infrastructure, and skills development especially for rural dependents. Together with policy shifts to actively include the diverse rural aspirations, it is necessary to reframe the research agenda from improving agricultural productivity and fostering participation in agriculture to developing people's entrepreneurial and technical skills that make them employable in other sectors.

5. Prospective small-scale farming systems for rural South Africa: A participatory scenario analysis[10]

[10] Will be submitted as:

VN Mathinya, AC Franke, GWJ van de Ven and KE Giller. Prospective small-scale farming systems for rural South Africa: A participatory scenario analysis.

Abstract

South Africa faces multiple developmental challenges, including poverty and food insecurities prevalent most among rural households. Small-scale farming is thought to be an important pathway to address these challenges. However, the potential of small-scale farming systems to contribute to the livelihoods of rural households remains unknown. Therefore, this study aimed to explore prospective small-scale farming systems for rural South Africa through participatory scenario analysis. The study considers two contrasting rural areas (Thaba Nchu in the Free State province and Emmaus in the KwaZulu Natal province) within the Grassland biome. A two-step approach was used: a desktop approach through which possible alternative small-scale farming systems were evaluated in terms of biophysical and economic feasibility, and a participatory approach allowing an evaluation of the proposed systems by farmers. Five systems were proposed for each region. For Thaba Nchu, proposed livestock systems were a weaner system, a small-stock unit (sheep), a piggery as well as poultry (broilers) while a perennial system with lucerne was the only crop-based system proposed. For Emmaus, proposed livestock systems were piggery and poultry, while crop systems proposed were a lucerne and a vegetable system. A fifth system for Emmaus was agroforestry using macadamia nuts. We found that the perennial system had the highest potential contribution to rural livelihoods in Thaba Nchu. For Emmaus, the broiler system had the highest potential contribution to livelihoods. However, two interesting alternatives in Emmaus were a perennial system (producing lucerne bales) and an agroforestry system (maize and beans next to macadamia nuts). While there is some monetary gain for all proposed systems at the regional level, except the piggery, the likelihood of realising the contribution of a weaner system and a small-stock unit was limited by internal community conflicts over the use of common property resources in Thaba Nchu. In Emmaus, the reluctance of households to use the land on which they grow staple crops for home consumption, for cash crops reduced the likelihood that alternative farming activities would be taken up. We conclude that while the alternative small-scale farming systems may make a sizeable contribution to rural livelihoods, issues related to management of common property resources need to be addressed before these systems can take off. Our study underscores the need for functional cooperative management of common resources as a precondition for participation in formal markets for small-scale farming to generate livelihoods for rural households.

5.1. Introduction

What are the possibilities for small-scale farmers in South Africa to develop new agricultural enterprises that are technically and economically feasible given their land and labour resources? We address this question by identifying promising alternative systems – and then exploring scenarios for their implementation in which small-scale farming systems may contribute to rural livelihoods and the potential contribution of those systems to rural households' living income.

Finding ways to increase agricultural production of small-scale farming systems sustainably is considered critical to achieving a number of the United Nations Sustainable Development Goals (SDGs), and in particular, the goal of ending extreme poverty (SDG 1) and hunger (SDG 2). This is because small-scale farming systems remain important to rural livelihoods (Leonardo *et al*., 2018; Bellon *et al*., 2020; Ado *et al*., 2022). In South Africa, small-scale farming is also afforded a key role in alleviating hunger and poverty in rural communities as part of the National Development Plan (NDP) (NDP, 2013). However, government investments to increase the productivity of small-scale farmers to facilitate their economic growth and development have not yielded the desired outcomes (Pittock *et al*., 2020; Chapman *et al*., 2021). This has undermined public confidence in rural investments in farming, especially on communal lands (Aliber and Hart, 2009; Aliber and Hall, 2012; Sebola, 2018). Furthermore, the disappointing outcomes of these interventions have intensified calls for more stringent monitoring and evaluation of the efficiency of such investments (Hall and Kepe, 2017; Ntsiapane *et al*., 2023), and questioned the expectation of the NDP that small-scale farming will substantially contribute to rural livelihoods.

Because of the ongoing debates and the limited evidence base on the potential contribution of small-scale farming systems to rural livelihoods (Chapter 2), we use exploratory scenarios to think through a plausible future in which small-scale farming systems in South Africa may be sustainable, profitable, and an attractive component of rural livelihoods. Scenarios have been used to explore the future of small-scale farming systems in terms of land use (Pelletier *et al*., 2020), their impact on ecosystem services (Pfeiffer *et al*., 2022) as well as determining their carbon footprints (Mwambo *et al*., 2021). Scenarios have been further used to determine the contribution of small-scale farming systems to rural livelihoods. For example, Marinus *et al.* (2022) used scenarios to determine viable farm sizes required to attain a living income from farming for rural households in Kenya, Uganda and Tanzania. The authors concluded that the

higher required farm area in contrast to current farm sizes would mean increasing farm area and/or intensifying production is necessary for farming to contribute substantially to rural livelihoods. Similarly, scenarios have been used for outlooks on small-scale farming systems in the South African context. For example, Materechera and Scholes (2022) used conceptual scenarios to understand the interactions between large-scale and small-scale farming which co-exist in the country. Their findings demonstrated that the multiple points of interactions - from sourcing of planting material to processing – between large-scale and small-scale farming can be explored as a pathway towards improved market participation by small-scale farmers.

This study adopts the definition of Schwartz (1991) for a scenario as "A tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out". While normative scenarios provide plans for what the future should look like, exploratory scenarios investigate what the future could look like (Börjeson *et al*., 2006). Such scenarios were, therefore, appropriate for the aim of our study to explore prospective small-scale farming systems for rural South Africa through participatory analysis. The main objectives of our study were to: 1) propose alternative small-scale farming systems suited to the biophysical and socio-economic contexts of the two former homelands in South Africa, 2) analyse and evaluate the economic feasibility of the systems, and 3) use participatory scenario analysis with small-scale farmers to explore the social acceptability and practical constraints of the proposed systems.

5.2. Methodology

5.2.1. Study area

South Africa is a heterogeneous country characterised by nine vegetation biomes, the second largest of which is the Grassland Biome (Carbutt and Kirkman, 2022). This biome stretches continuously across much of the eastern parts of the country and is susceptible to degradation due to poor farming practices (O'Connor and Kuyler, 2009). Our study took place in two contrasting farming communities within this biome. One region, Thaba Nchu in the Free State province (Figure 5.1), is located in the semi-arid part of the Grassland biome with relatively dry climate, variable and unpredictable rainfall with an annual mean of 609 mm (Chapter 3), and a high potential evaporation of 1832 mm $year^{-1}$ (Basson, 1997). This region is dominated by clayey soils overlying a sandstone saprolite. Average soil profile depth is 800 mm, with an effective rooting depth estimated at 1200 mm (Hensley *et al*., 2000). The study took place in Woodbridge village of Thaba Nchu.

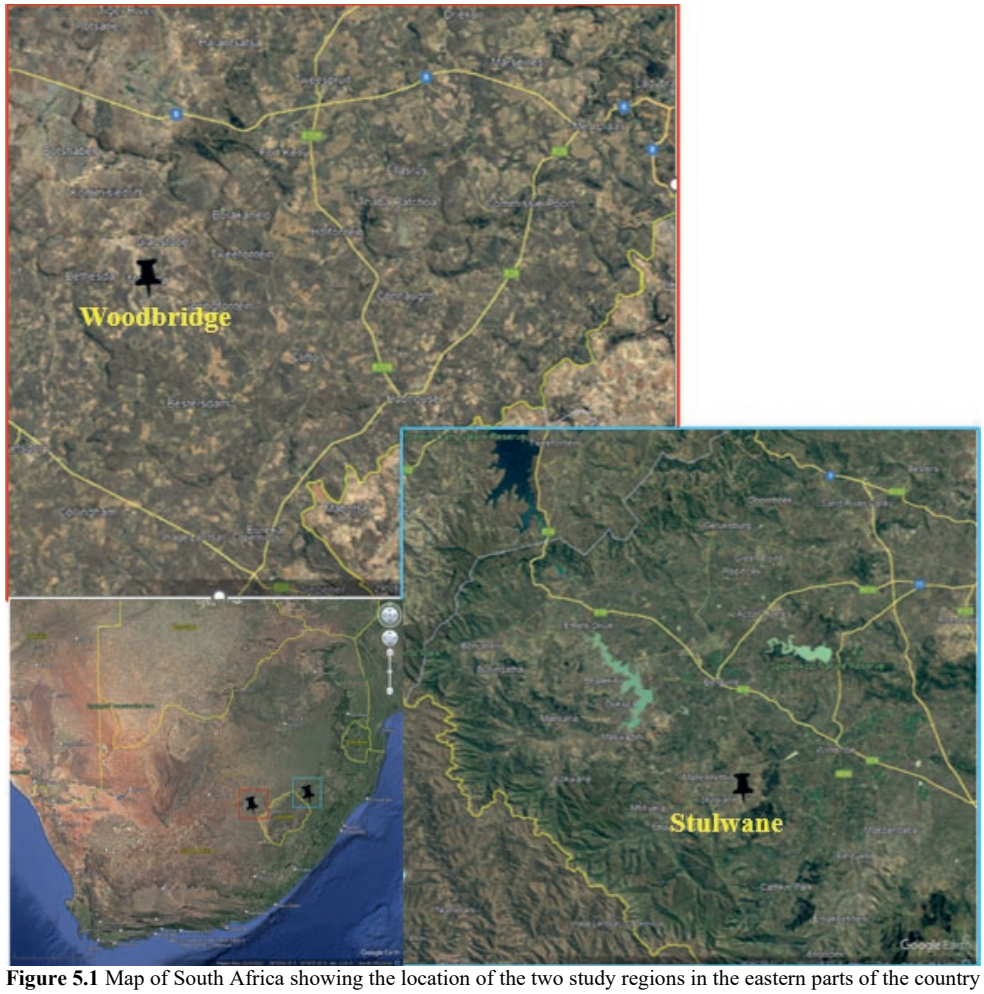


Figure 5.1 Map of South Africa showing the location of the two study regions in the eastern parts of the country at opposite ends of the boarder with Lesotho. (Map from Google Earth Pro.)

The second region, Emmaus, in the KwaZulu Natal province, falls within the sub-humid climate of the Grassland Biome, receiving a mean annual rainfall of 917 mm (Chapter 3). This part of the Grassland biome which is characterised by undulating rolling landscapes (Clulow *et al*., 2012). Mist can be heavy and frequent, adding to the high precipitation and humidity in the area. The region also contains extensive patches of Alpine wetlands and grasslands that are used seasonally for livestock grazing (Mathinya *et al*., 2022). The soil formations are apedal and plinthic in nature, underlain by well weathered sandstone saprolite. In this region, we worked in Stulwane village (Figure 5.1).

5.2.2. Approach

To explore plausible futures, we first used empirical data on both the biophysical and socioeconomic factors to propose alternative farming systems in each study region. The alternative farming systems were developed using recent empirical data (Chapter 3) together with grey and published literature, field notes, and personal observations from the study regions. Where necessary, comparison with and extrapolation from the performances of large-scale farming systems within the same biome were made.

We then engaged local household heads in focus group discussions (FGDs) to explore the proposed farming systems for their acceptability in terms of alignment with the priorities and aspirations of farming households. The discussions included the management strategies that would be required for each system. The FGD were held in January 2024 during which the participants were asked to comment on the proposed systems. Focus groups consisted of 8-12 people who had been part of the previous phases of this research and the discussions were guided around the following open-ended questions:

Would any of the proposed systems be an option for you?

What changes would you make to the proposed systems?

Would you be willing to work together for the systems that require cooperation?

Is there a combination of the systems that is preferable to you?

5.2.3. Proposing prospective farming systems

Alternative farming systems were proposed for each region. The process of selecting farming systems to propose, started with the elimination of unviable options given boundaries posed by the soil and the climate. Literature on soil and climate requirements of crops was consulted for this step. Websites of various entities such as Grain SA and the Agricultural Research Council (ARC) together with expert opinions on crop and livestock suitability were used to ascertain the elimination of unviable options. A list of remaining possibilities was then compiled from which further eliminations were made on the basis of socio-economic relevance and agroecological restrictions (water streams, forestry patches, steep slopes etc.) of the landscape as observed on Google Earth. The proposed systems are described below.

5.2.3.1. Livestock production systems

The large stock unit represented by a weaner system is aimed at producing 6–7-month old weaner calves for sale to livestock fattening operations. It was assumed that a cow producing

a weaner calve requires 5.5 ha of grazing land annually, a bull 5 ha and a replacement heifer 3 ha. We assumed that one bull is kept on 40 cows, a 15% replacement rate for cows, and replacement heifers are three years old when giving birth for the first time. Cows achieve a calf weaning rate of 80%, and 15% of the mature cows are annually replaced by heifers. While some weaner calves would be kept on the farm as replacement heifers, the others would be sold along with unproductive cows.

The small-stock unit, sheep in this case, was set up to produce feeder lambs that would be sold at 30 kg body weight to sheep fattening operations. The system was proposed with the assumption one hectare is required to keep an ewe with a lamb, a hectare for a ram and an additional hectare for a replacement lamb. A ratio of one ram to 40 ewes was used and for this system, one replacement lamb for every four ewes was necessary. An ewe achieves a 100% weaning rate (i.e. on average one lamb weaned per ewe) and 25% of the mature sheep would be replaced with lambs annually. Both the weaner system and the small-stock unit system relied on common property resource (communal grazing land) and as such, were proposed only for Thaba Nchu where dedicated communal grazing land is available. Lick, vaccination and veterinary costs were accounted for in both systems.

In a piggery system, one boar would be kept for every ten sows. One sow was assumed to give birth to 12 piglets, twice a year, of which 10 could be sold at the age of 5 months (Kemm, 2002). An annual replacement rate of 15% of the sows and land allocation ratio of $15m^2$ per pig were considered. Costs included feed and veterinary services.

The poultry system entailed raising one day broiler chicks to slaughter size. A 5% mortality rate of chicks was assumed. With an estimated 40 days from day old chicks to slaughter weight and land allocations of 10 birds per m^2, six production cycles a year would be possible. Maintenance cost included price for a day old chick at 12 ZAR and costs for vaccinations and feed. The piggery and the poultry systems were proposed to be managed by households in back yards. Both the feeder systems (piggery and poultry) are proposed for both Emmaus and Thaba Nchu.

5.2.3.2. Crop production systems

A perennial system with lucerne (*Medicago sativa* L.) is the only crop production system proposed for Thaba Nchu. This system takes place under the three existing centre pivots (covering 50 ha each) which are communally managed. Lucerne is cultivated for four years in one centre pivot and the other two centre pivots would be cropped with the winter crops wheat

and canola in rotation. Each four years the lucerne changes pivot and the winter crops follow the lucerne. The lucerne is to be sold to neighbouring livestock farmers in the Bloemfontein area.

In Emmaus, two crop production systems are proposed, i.e. a perennial (lucerne) and a vegetable production system. Additionally, an agroforestry system with macadamia (*Macadamia integrifolia* Maiden & Betche) nuts is proposed. All these three systems are proposed parallel to the maize (*Zea mays* L.) and field beans (*Phaseolus vulgaris* L.) that the households produce for household consumption. This means, of the 1.6 ha of arable land, 0.8 is dedicated to household consumption while the remaining 0.8 could be dedicated to any of the three systems. The allocation of 0.8 ha to maize and beans was based on the current land allocation practices in the region (Chapter 3).

Lucerne is produced under rainfed conditions with crop establishment assisted using irrigation with water from nearby streams. The target market for the lucerne would be dairy farmers in the Winterton and Bergville areas. Every four years the lucerne is rotated with maize and beans. A vegetable production system where butternut (*Cucurbita moschata* Duchesne), cabbage (*Brassica oleracea* L.), potatoes (*Solanum tuberosum* L.) and onions (*Allium cepa* L.) are rotated is proposed. The vegetables are to be sold to the school feeding programs in the area. In the dry season, vegetables like onions are grown under irrigation. The 0.8 ha allocated to maize and beans for household consumption is rotated with the 0.8 ha allocated to vegetables with two crops in each production season which are rotated with the other two in the next cycle. Vegetables are irrigated with water from the streams. The agroforestry system entails production of macadamia nuts on 0.8 ha with trees starting to generate income only from year five. Costs for the cropping systems included seeds, fertilizers, weed control, pest control, fuel, repairs and maintenance.

5.2.4. Cost-benefit analyses

A cost-benefit analysis was carried out for each of the proposed systemsto determine the financial contribution per unit area of livestock and crops. This was then used to estimate the potential contribution of a system to rural livelihoods at a village level (see below).

The main crop production costs were planting material, fertilizers, pest control, weed control and energy use. Costs per component were calculated using recommended crop requirements. For example, the fertilizer costs were obtained by calculating the total fertilizer required following recommended application rates and multiplying with mean market prices in the

second half of 2023 (https://www.namc.co.za/wp-content/uploads/2023/12/Trends-in-selected-Agricultural-input-prices-December-2023.pdf). For macadamia nuts the costs of new trees and the maintenance during the first four unproductive years were included. The most affordable recommended options were used. All crop production costs were calculated on a per hectare basis.

Expected yields from the hypothetical systems were used for the cost-benefit analysis using Microsoft Excel. The input costs were determined in consultations with experts. The revenue per system was calculated using market prices based on 2023 mean auction prices for livestock in the Free State (https://www.vleisprys.co.za) (Accessed 08/01/2024) and mean trading prices of crops provided by Grain South Africa (Grain SA) (https://www.grainsa.co.za/pages/industry-reports/market-reports), (January 2024 prices).

5.2.5. Contribution of systems to rural livelihoods

Total land area 'belonging to the community' together with the number of households in respective communities were determined from Google Earth Pro. The outcomes of the cost-benefit analysis were used to determine the contribution of each system to rural livelihoods using the living income (LI) indicator – an estimate of the income required for decent living of those who depend on it. The results from the cost-benefit analysis per unit area for livestock and crops in each system was used to determine what the required land area would be for a household to be able to generate a LI from that system. A LI of 11.79 US$ PPP AE^{-1} day^{-1} (Chapter 3), which is an equivalent of R107 885/household/year for the households in Thaba Nchu and Emmaus for the 2019/2020 period was used in these calculations. A similar calculation was done to determine what the required output (livestock units or yield) from that system would be to achieve a LI. Finally, we calculated what proportion of households each system could potentially support at village level given the current available land (Figure 3 and 5) and the existing number of households.

For systems reliant on co-management of common property resources (i.e. the weaner system, small-stock system, and the perennial crop rotation systems in Thaba Nchu), system contribution at village level was calculated simply, as a percentage of the households a system can support. For systems not relying on common property resource use and managed independently by households - i.e., the piggery and the broiler systems in Thaba Nchu as well as all the systems in Emmaus – system contribution to a living income at village level was

calculated assuming all households with farming aspirations adopt that particular system, but none of the other households do (Chapter 4). In Thaba Nchu, aspirations research was conducted with 16 participants of whom 11 aspired to continue some form of farming, equivalent to 69% of the households or 90 out of the current 130 households in the village. In Emmaus, this research was conducted with 31 participants and 13 of them aspired to farm. This is an equivalent of 42% of the households which is 34 out of the current 80 households in the village. When considering the contribution of the systems to the LI in Emmaus, adjustments were also made to include the contribution of food crops to the LI (65%, (Mathinya *et al*., 2023)).

5.2.6. Scenario analysis

We used exploratory scenarios to imagine alternative future decision environments in which the proposed systems may function. We first identified the two most significant drivers from our previous research in the regions which may shape the future of small-scale farming in these regions, following a similar approach by Benton (2019). These drivers - market participation (Chapter 2) and level of cooperation (Chapter 3) – were used to develop and define scenarios along two axes: (1) changes from informal to formal market participation and (2) degree of cooperation from household to village level. The intersection of these axes resulted in four paradigms (Figure 5.2) within which the explored farming systems could be plausible. These two key axes set out four plausible, alternative futures for small-scale farming systems.

Market participation

The thriving large-scale farming sector of South Africa saturates most agricultural markets. This leaves little opportunity for small-scale farmers to break into these markets. In addition to conducive policy environments, drivers of a shift from informal to formal market participation may include input subsidies, provision of post-harvest storage facilities and negotiating for pre-concluded contracts (Chapter 2).

Cooperation

Small-scale farmers do not benefit from economies of scale and given the country's on-going land distribution issues (Hall and Kepe, 2017), it is unlikely that farm consolidation will become a reality in the foreseeable future. Therefore, some degree of cooperation among farming households remains necessary to ease the reported labour constraints (Chapter 3) as well as increase the possibility of market participation. The two drivers were discussed in the

FGD as related to the management strategies that would be required for the success of the proposed systems.

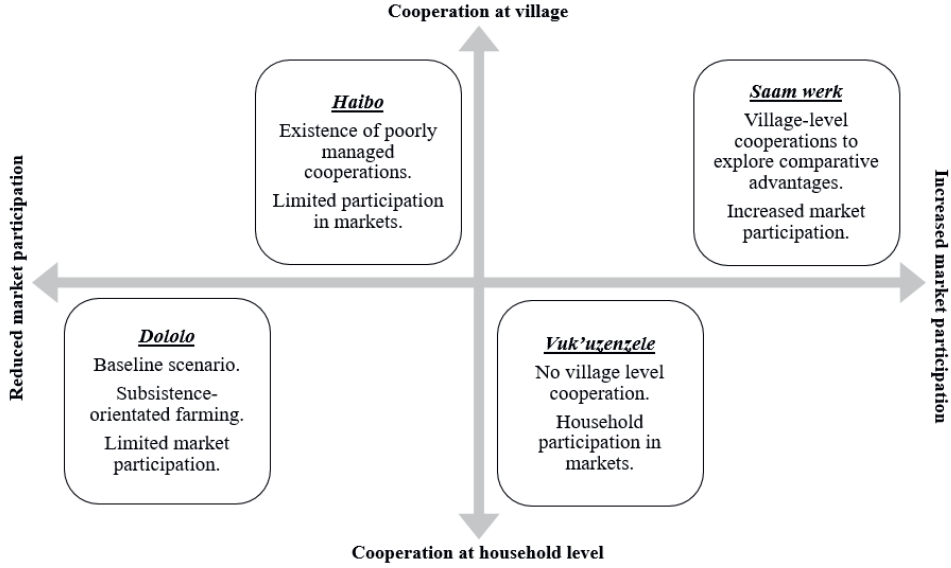


Figure 5.2 Scenario matrix developed along two axes: changes to the transforming structures and processes and, level of cooperation from household to village level.

The scenarios were named using popular South African terms and slang (https://www.ufs.ac.za/supportservices/departments/international-affairs/unlisted-pages/welcoming-2021/fun-facts-sa):

Dololo: A slang for nothing. In this baseline scenario, the current farm configurations and poor productivities of the system remain as they are, and nothing changes in the respective regions. Households remain in small-scale farming due to poverty and lack of livelihood alternatives. Intervention initiatives remain unproductive. The baseline situation is similar in both regions in that the households themselves provide most labour and they cultivate less land than they own (Chapter 3). However, differences also exist in terms of production orientation. Households in Thaba Nchu own an average of seven tropical livestock units (TLUs) comprised mainly of goats and sheep that graze on communal grazing land and are sold in neighbouring villages. In Emmaus, households own about five TLUs, mainly comprised of cattle and goats that graze on patches of grasslands and wetlands in and around the villages as well as on stubble of field crops. The livestock is only herded higher up into the mountains during winter. In Emmaus, livestock is primarily reared to serve as a savings account and for social standing in

the community and not for market purposes. While households in both regions grow vegetables such as cabbage, spinach (*Spinacia oleracea* L.), onions, and pumpkin (*Cucurbita pepo* L.) on backyards, households in Emmaus further cultivate maize and field beans for household consumption.

Vuk'uzenzele: From the Zulu language meaning "Wake up and do it yourself". In this scenario, farming households continue to be self-reliant for both labour and inputs. However, household farm productivity is improved by investing of off-farm income into the system, enabling sufficient surplus for some market participation. The extent of household reliance on social security grants is reduced.

Haibo: This is local slang used to express shock and disbelief. This scenario represents cooperation at village level that happens outside the favour of conducive policy environments and external influence. This would require community by-in (for co-management of common property resources), bypassing of all known and unknown social constraints. Realising this scenario would be, to say the least, surprising. In the absence of external interventions, there would be slow and marginal changes to the *Dololo* scenario as all other biophysical constraints are likely to remain with little if any change to rural infrastructure. This would then limit the chances of market participation.

Saam werk: From the Afrikaans language translating into "working together". Cooperations at village level in this scenario are seen to be working together to exploit comparative advantages of scale and increase burgeoning power. These cooperations are well managed and together with governmental interventions through subsidised mechanisation and improved infrastructure, work together in synergies that enable participation in formal markets.

5.3. Results

5.3.1. Thaba Nchu Region

5.3.1.1. Proposed farming systems

The site in Thaba Nchu, harboured poorly draining clay soils, limiting options for crop production. As such, viable options were limited to livestock and crops that can do well on such soils as well as winter crops that are grown in a period with little rainfall and associated risk of waterlogging, but that requires the provision of irrigation during the critical stages of the crop. The choice of crops was further limited by the tolerance to frost conditions which is common in winter in this region. The soil and climate conditions, therefore, excluded fruit

trees, most vegetable crops, and summer field crops from consideration. The systems were also proposed with cognizance of the current landscape as presented in Figure 5.3.

The total available grazing area for the community was 900 ha. On the communal arable fields (157 ha), there were three centre pivots fed by water from the Woodbridge dam located south of the village. The centre pivots were part of the agricultural intervention programs from the provincial Department of Agriculture. Other physical assets in the village included a storeroom, old livestock handling facilities and remains of a greenhouse tunnel (Figure 5.4).

With these in mind, five systems were proposed. Their cost per productive unit is provided in Table 5.1 with the outcome of the cost-benefit analysis provided in Appendix 5.1. The livestock systems (weaner calves and small-stock units) entail rotational grazing for which compliance to a grazing plan by all households in the village is crucial for it to work. Livestock is herded into the camps in the mornings and back to the household kraals in the evenings. Households remain individually responsible for their herds. All required management practices such as tagging, and vaccinations should be adhered to. Livestock is sold collectively for easier logistical arrangements and bargaining power. It should be kept in mind that these two livestock systems are mutually exclusive. Both the weaner system and the small-stock unit can provide a living income to 5% or less of the households (Table 5.1).

The piggery and the poultry systems entail recommended feeding and management of the herd or flock by each household in their own backyard.

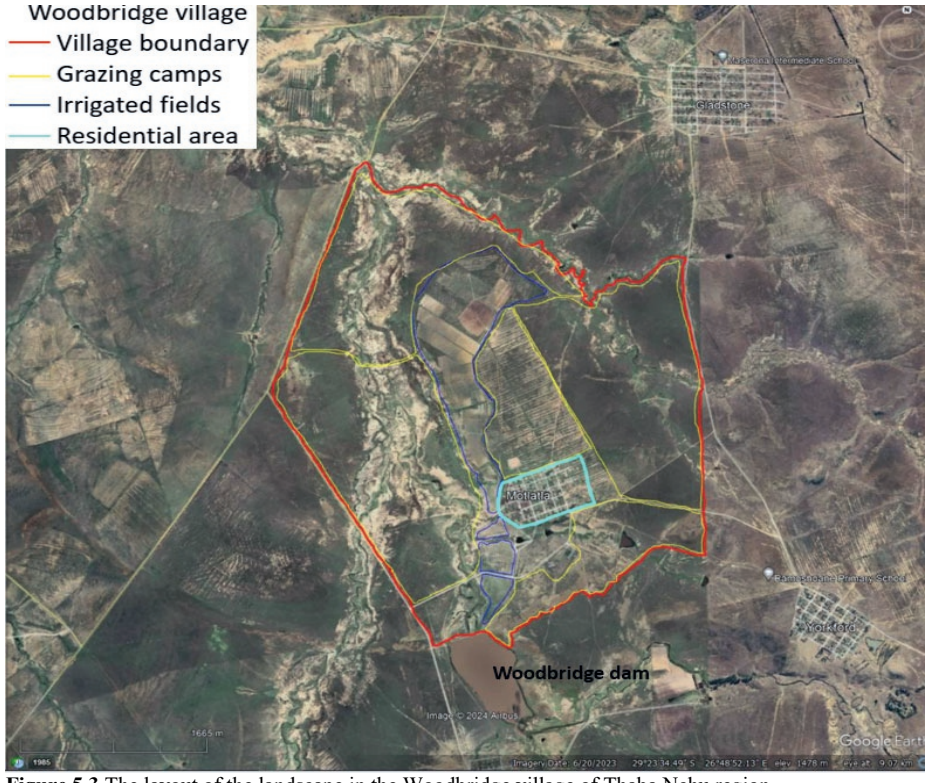


Figure 5.3 The layout of the landscape in the Woodbridge village of Thaba Nchu region.

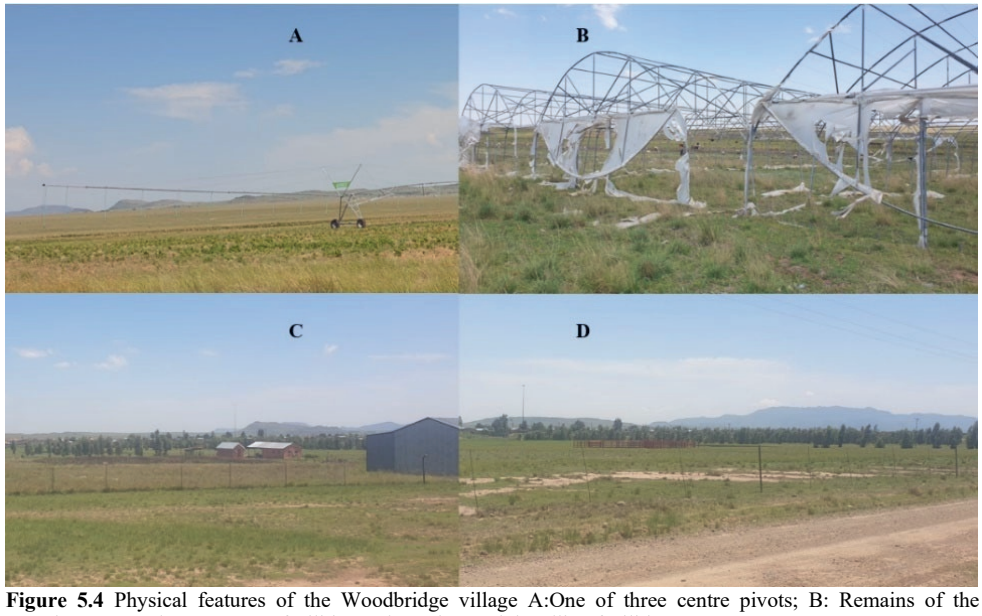


Figure 5.4 Physical features of the Woodbridge village A:One of three centre pivots; B: Remains of the greenhouse tunnels; C: Storage facilities and D: Livestock handling facilities.

With a feed price (premixed at the cooperation) of 7.4 ZAR/kg, and an assumed feed conversion efficiency ratio of 3.5 kg feed/kg weight gain (Kemm, 2002), the piggery system would have a very thin profit margin. As pigs are already reared in the area and some people seem to be making money from them, we consulted these pig-rearers to find out if and how they are generating income from pig farming. The pig-rearers indicated that feed, which constitutes the bulk of the cost in this system is expensive and to bring costs down the pigs are supplemented with left-over food from restaurants and fresh produce markets, bread from bakeries as well as dairy products approaching their expiry dates.

Pigs can be sold at auctions while chickens are only sold to local butcheries and retailers. With chickens, it is important to note that the proposed system entails a preference for sale of slaughtered over live chickens. However, there would be an additional cost of the slaughterhouse and packaging, but these are offset by the value addition through packaging. A critical condition is that the slaughtered chickens are transported directly to the market or 'buyer' from the slaughterhouse to avoid storage costs and associated post-slaughter handling and management.

In the perennial crop rotation system, livestock is only allowed to graze on the stubble of wheat and canola. From this exercise, the perennial crop system could also contribute substantially, with 33% for those who aspire to farm and 23% at village level and seem to be the best bet option for Thaba Nchu (Table 5.1). Adoption of more than one system would increase the total contribution of small-scale farming at village level in case systems are not mutually exclusive. For example, several households could keep broilers while others participate in the grazing system or the perennial system. The alternative is also possible where the same household could be involved in more than one system. In both cases, the contribution of farming to the living income at village level is increased.

Table 5.1: A summary of the cost-benefit analysis of the five proposed systems for Thaba Nchu and what their potential contribution to the living income (LI) of households (HH) could be.

System	Profit in ZAR /production unit	Profit in ZAR/ha	Land requirement for a LI (ha)	Production units for a LI	Land available (ha)	Number of households with a LI	Contribution to LI of farmers aspiring farming (n=90)	Contribution to LI at village level (n=130)
A weaner system	3,555/ cow	545	198	31 cows	900	4.6	5.1%	3.5%
A small stock unit	614/sheep	482	224	176 sheep	900	3.9	4.%	3.1%
Piggery	-4626/pig	-154,200	N/A	N/A	0.0045	N/A	N/A	N/A
Broilers	24/bird	14,290,200	0.0075	4529 birds	0.0045	N/A	N/A	N/A
A perennial	2,702/ton	20,720	5.2	40 tons	157	30	33%	23%

5.3.1.2. Explored systems

During the focus group discussions some systems were more preferred than others. In Thaba Nchu, three systems, i.e., the weaner systems, the small-stock unit system, and the perennial system were not considered acceptable by the household heads during the FGD. The main reason was that the success of these systems relies heavily on cooperation at village level not just for the purposes of market participation but also for the livestock or crop management – something that the community considered they could not manage. It was clear from the FGD that these systems would only be considered by the community if they were to take place outside the confines of tribal laws within which the village is governed. This is because of the implication of common property resource rights that entitles all community members to the use of the grazing lands. Furthermore, the size of the area was deemed too small for rotational grazing by the livestock in the community. The piggery and the poultry options were considered feasible on the condition and understanding that cooperation would only be for market participation and every household would be individually investing in the daily management of their piggery, although, as proposed by the participants, this would be taking place in a common area outside the village. In the FGD, it was suggested that the piggery and the poultry be designated an area where each family could be allocated “a few” pig houses for

them to raise their pigs in, a setup commonly referred to as "masakeng"[11]. It would then be required of the participating households to follow the same management program. For example, households would have to follow the same vaccination schedules but in essence, true cooperation would only be in pursuing markets.

5.3.1.3. Prospective small-scale farming scenarios

Although some systems were unaccepted in the FGD, there seemed to be an understanding that cooperation provides an advantage for market participation. With this understanding, the communities could evolve into the S*aam werk* scenario. This would require a positive change in the transforming structures and processes. An example would be an external actor such as Meat Naturally (PTY, 2024), currently operating mainly in the Eastern Cape province, was to come on board. The organisation not only assists communities with onsite auctions, but also provides training and incentives for sustainable management of natural resources. Another requirement would be a policy framework that incentivises state contracted suppliers to source for example, at least 10% of their supply locally from this village and surrounding villages.

5.3.2. Emmaus Region

5.3.2.1. Proposed farming systems

In Emmaus, the soil conditions are suitable for cultivation of most crops. Climatic conditions on the other hand exclude tropical and sub-tropical fruit trees. Some shrubs such as blue berries are excluded as under this climate, they act as a host for forest tree diseases. Stone fruit (nectarines, plums, and apricots) are excluded because of the high humidity in the region. The choice of farming systems was therefore limited to field crops, vegetables, and livestock. However, livestock was excluded from consideration on the basis that it is reared for social purposes and not for the market (Chapter 3), and there are no dedicated communal grazing camps.

The configuration of the homesteads was taken into consideration in the assessment of farming systems (Figure 5.5). A typical homestead in this region is about 2.24 ha in total with arable fields accounting for a larger proportion (1.6 ha). The backyard is 0.24 ha and the livestock area 0.4 ha in size. Additionally, a consideration was made for the physical features of the

11 Masakeng is a place outside the main settlement where livestock is kept, what would be an equivalent of a cattle post (Ndobochani, 2020).

village landscape (Figure 5.6) which includes springs, wetlands, streams, and forested patches. Finally, the households' desire to be food self-sufficient (Chapter 4) was considered.

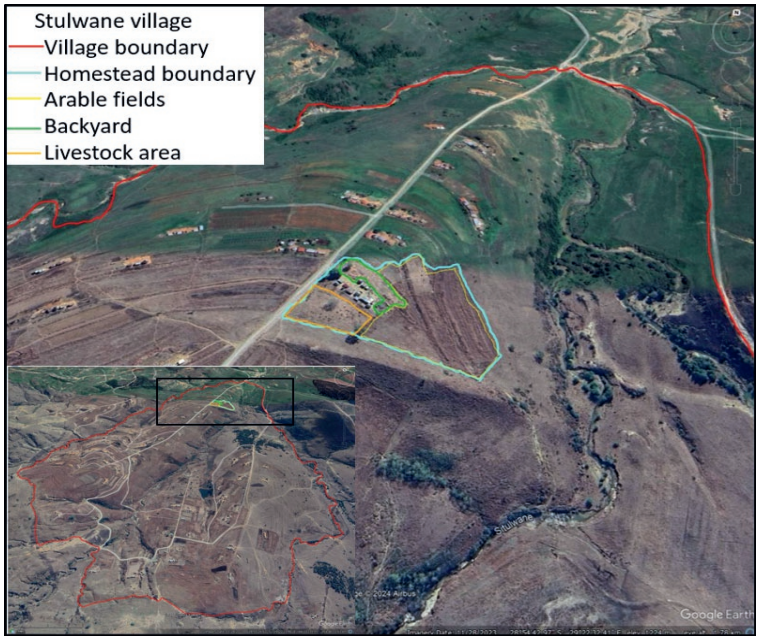


Figure 5.5 The layout of the landscape in the Stulwane village of the Emmaus region.

Figure 5.6: Physical features of the Stulwane village A: A perennial spring; B: Patches of wetlands in the low-lying areas; C: A water stream running down from the higher lying areas and D: A forested patch of eucalyptus (*Eucalyptus globulus* Labill.) and pine (*Pinus* sp.).

With the above considerations, five systems were proposed for the Emmaus region as summarised in Table 5.2. The details of the cost-benefit analysis of these systems are provided in Appendix 5.1.

Table 5.2: A summary of the cost-benefit analysis of the five proposed systems for Emmaus and what their potential contribution to the living income (LI) of households (HH) could be.

System	Profit in ZAR /production unit	Profit in ZAR/ha	Land requirement for a LI (ha)	Production units for a LI	Land available (ha)	Contribution to LI at household level
Backyard piggery	-4626/pig	- 131,420	N/A	N/A	0.4	N/A
Broilers	24/bird	14,290,200	0.0075	4,529 birds	0.4	100%
A perennial	2,995/ton	59912	1.2	23 ton	0.8	68%
Vegetables	3,369/ton	56,426	1.2	21 ton	0.8	64%
Macadamia	42,115/ton	54,750	1.3	1.7 ton	0.8	62%

The piggery and the poultry systems are similar to those in Thaba Nchu but because of the larger land areas of Emmaus, herd or flock sizes are bigger. Similarly, the same broiler system contributes more LI in Emmaus than in Thaba Nchu because of the larger available land areas. The preference for sale of slaughtered chickens as is the case for Thaba Nchu also applies. Given the supplemental feeding required in Thaba Nchu to make the piggery more profitable, it would be more challenging to do the same in Emmaus given the remote location of the area from urban centres from which this supplemental feed is sourced.

Lucerne is cultivated on 0.8 ha under dryland. The lucerne is to be baled and collectively sold to dairy farmers in the Winterton and Bergville area.

Relay cropping of the vegetables by households on the 0.8 ha is key to enabling continued market supply. The choice of vegetables is based on the menu of the National School Nutrition Programme (NSNP) by the department of Basic Education (JET, 2016), as it is the suggested market for this system. Through this programme, learners are provided with meals daily at school to enhance learning capacity. JET (2016) found that the programme delivers better outcomes (all children are fed every school day) when the food prepared is sourced locally.

For the macadamia system, 200 trees are planted on 0.8 ha, with the first marketable yield in year 5. The remaining 0.8 ha are similarly allocated to the production of maize and beans for household consumption. Total costs include input costs for the first 4 years plus the shortfall to be covered in subsequent years. Profit was calculated from year 5 to year 8 with 0.2 t of yield increase per year from 1 ton per ha in year 5. From this exercise, the broiler system had

the highest contribution to the LI income of households followed by the perennial system. The piggery system was unprofitable.

5.3.2.2. Systems after explorations

In Emmaus, vegetable production for the market was the preferred system. The participants even suggested, in addition to our proposed market, pursuing a similar approach with the Emmaus hospital. However, the discussions highlighted the need for secure and fair markets as well as improved management of cooperatives. The participants were in favour of the relay cropping system and emphasised how this could ensure continuous supply to the market. In addition, they were also mindful of the irrigation water challenges especially in winter when there is no rainfall to recharge the streams from which water is collected. Another challenge noted with this system was the lack of fencing to keep roaming livestock from grazing on the fields. While some participants were interested in combining vegetables with poultry while gradually investing in macadamia nut production, the lucerne was the least preferred system, with roaming livestock once more cited as the main challenge. With the proposed vegetables, an issue of recurrent soil-borne diseases in potatoes was raised.

5.3.2.3. Prospective small-scale farming scenarios

Given the easier inclination for collaboration by households in Emmaus, we concluded that two scenarios, the *Haibo* scenario and the *Saam werk* scenario were potentially possible. However, in the absence of secure markets, perhaps in the form of pre-concluded contracts, the vegetable system would not be viable. The likelihood of the *Saam werk* scenario would depend on a policy framework that encourages commitment from the identified markets. This is especially important given the shorter shelf-life of vegetables. Suffice to say, the realisation of this scenario would also be a lengthy process during which village level cooperations may be possible if some part of the system is subsidised (e.g., input subsidies) making it more likely that the prospective of small-scale farming in Emmaus would be in a trajectory from the *Haibo* to the *Saam werk* scenario.

5.4. Discussion

Our study sought to propose alternative farming systems suitable to the biophysical and socio-economic contexts of the study regions as well as explore plausible scenarios, in terms of

market participation and level of cooperation, within which these systems may evolve. We found clear region-specific differences that were not only biophysical in nature (demonstrated by the assessment of the potential contribution of systems to the LI) but also socio-economic (demonstrated through system exploration in FGDs). Furthermore, region-specific nuances were demonstrated through likely scenarios in each region.

5.4.1. Proposed versus explored systems

The cost-benefit analysis of our proposed systems may have given an overestimation of systems' potential contribution to rural livelihoods as they were based on extrapolated data and subsequent assumptions. An optimistic assumption here was that systems would be implemented using recommended good management practices, which is hardly a reality in the context of small-scale farming systems (Wilk *et al*., 2012; Gwebu and Matthews, 2018). For example, while the poultry system seemed to be economical in both regions, it is also management intensive and prone to detrimental risk. The system only generates a LI if the households are able to sustain six cycles a year which would require timely acquisition of chicks and feed and appropriate management of chicks. Furthermore, we neglected labour costs assuming labour is provided by household members. Allocating labour to farming activities reduces the options to earn off-farm income which in turn, limits the potential of off-farm income to be invested into farming. Hence, we cannot draw precise conclusions regarding the absolute contribution of proposed systems to rural livelihoods. Nevertheless, we can still use our findings in relative terms.

In Thaba Nchu, it was indicated that the profitability of the piggery could be increased by providing cheaper alternative feed sources. However, this has implications for the productivity of the animals in that, the availability of these sources varies, and the nutritional content would be presumably less than the optimal feed. This further increases uncertainties and risk in the system, further decreasing its profit margins. Therefore, the thin margins emphasise the need for cooperations to draw on economies of scale to help reduce transport costs for feed as well as for marketing purpose. The profitability of the system could also be possible through bulk sourcing of feed and optimising the feed conversion ratio. This would be required for the system to be competitive in the market, making this a management intensive system.

Systems that are profitable according to the cost-benefit analyses, are not necessarily the most socially accepted. Outcomes of the FGD revealed a preference for systems managed at

individual household level (piggery and poultry) over systems that are require collective management of common property resources (the weaner system, small-stock unit as well as the winter-crop rotation system). This was not due to the perceived suitability of the systems to the bioregion but rather an avoidance strategy for common property resource management-related challenges that FGD participants associated with failed agricultural intervention programs (Figure 5.4). This is also a widely reported issue in other communal areas in the country (Ainslie, 1999; Rohde *et al*., 2006; Fay, 2010). Participants did not see a future unless internal communal conflicts could be resolved and were therefore not willing to invest in systems that require collective management of common property resources. To this end, the findings illustrate that although from a production system point of view, small-scale farming has the potential to substantially contribute to rural livelihoods, realising this potential will not be easy due to the absence of functional cooperation among household and poorly managed community projects ending in unproductive investments (Figure 5.4).

In Emmaus, all proposed systems were managed by households individually. The broiler systems contributed the most to the LI income. However, people preferred the vegetable system, which was related to its perceived contribution to food self-sufficiency. Here, the logic was that, should you not be able to sell it, you should at least be able to feed your family with it. Reasonably so, as Wangu *et al*. (2021) noted that food insecurity risk is increased when food crops are substituted for a cash crop that is not consumed by the household.

As notable from the contrasting examples of explored farming systems in the two regions, preference for particular systems were not based on the cost-benefit analysis or suitability to the bioregion, but rather, on what participants saw as 'less risky'. Therefore, while we acknowledge that we may have overestimated the expected outcome and underestimated the required input costs in the cost-benefit analysis resulting in an overestimated profit per production unit, this does not change the outcome of what is plausible and socially acceptable in each region. Furthermore, because of the intensified management practices required for the proposed systems, economics of the system are subordinate to the actual management of the systems.

5.4.2. Prospective small-scale farming

Applying our two-step approach in this study gave valuable insights regarding what is feasible and plausible. From our results, we can see that prospective small-scale farming will, in addition to the two critical driving factors (Figure 5.2) - market participation and sound

cooperation - be subject to other potential drivers such as land ownership and political leadership which we highlight in this section.

The estimated contribution of farming systems to rural livelihoods will be higher with the adoption of several systems that are not mutually exclusive. An example here would be with households adopting a grazing system, a feeder system as well as a cropping system in Thaba Nchu – or households in Emmaus participating in a feeder system alongside a cropping system. However, an increased level of risk that comes with investment in multiple systems that are vulnerable to similar external factors is acknowledged such as in cases of livestock disease outbreaks (Bett *et al*., 2017) or even unexpected harsh climatic events that can decimate both crops and livestock (Thornton *et al.*, 2009; Raza *et al*., 2019), thereby impacting more than one production system. Evidently, some systems hold more potential than others but conversely, those also tend to be riskier and more intense in terms of management. The potential of some systems such as the agroforestry in Emmaus was intriguing, not necessarily in their expected monetary gain, but rather in the opportunity for households to gradually invest in them. This would reduce pressure on investment capital.

The contribution of proposed systems is realised under the *Saam werk* scenario that entails market participation as well as village level cooperation. Some degree and form of cooperation remains necessary as small-scale farmers do not have the advantages of scale for market participation. There is promising evidence that public food procurement from small-scale farms can serve as a powerful policy instrument that drives market participation (Gaitán-Cremaschi *et al*., 2022). A policy framework that incentivises sourcing products from small-scale farming households will therefore be instrumental in fostering market participation.

While it is evident in our results that the communities would need more land than they currently have to be able to generate a LI from agriculture for those who aspire to farm, our study finds that it is not so much 'access to land' as is the 'right of use' that is of a higher priority in these areas. Similarly, land size and access was not a limiting factor in rural Northern Ghana (de Jager *et al*., 2023) as otherwise suggested by land reform policies. It stands to reason that measures should be taken to secure tenure rights for small-scale farmers (Hamann *et al*., 2012; Lidzhegu and Kabanda, 2022), implying that the current approach of customary tenure rights is not conducive to the uptake of agricultural investments by farming households as amply reported in literature (Hall and Kepe 2017; BFAP, 2022; Lidzhegu and Kabanda, 2022). Changing the ownership of land would lead to positive contribution to the LI of rural households only if it leads to higher carrying capacity of grazing land and higher yields on

arable lands. Otherwise, changes in land tenure rights without these impacts would mean that only a proportion of farmers would be able to make a living from farming. Therefore, complementary sources of income remain necessary in the future of rural livelihoods.

5.5. Conclusion

Although small-scale farming systems may make a sizeable contribution to the living income of rural households, the differentiated socio-economic contexts within which they exist dictates that these systems should be framed as a complementary part of a broader rural livelihood strategy. We conclude that social acceptability studies need to be flagged as a critical step in planning rural interventions. The management of common property resources is a major challenge in Thaba Nchu while the general disinclination for cooperatives is a real hindrance in both regions as some level of cooperation is required in all systems. Therefore, addressing the issue of disfunctional cooperatives is an important pre-condition for small-scale farming interventions.

While general improvements to the management of existing extensive systems may be seen as the 'low-hanging fruit', it will not provide the production outputs required to generate a living income for a substantial proportion of households. Realistically, therefore, rural livelihoods will not solely depend on farming and should be complemented with alternative employment opportunities as well as social protection programmes. We conclude that a detailed "*ex ante*" quantitative analysis should be done to explore the scope of any interventions before they are implemented. This is a critical area to which research can contribute.

6. General discussion

6.1. Overview

Farming features prominently in policy formulations for improved rural livelihoods in South Africa. Even so, farming activities in the former homelands of South Africa are typically limited to small-scale crop and livestock production. So, how important is farming in the livelihoods of rural people? To respond to this question, I looked into both the current (Chapters 2 and 3) and prospective (Chapters 4 and 5) contribution of small-scale farming to rural livelihoods in the former homelands of South Africa through the following objectives:

- Collating and analysing evidence on the productivity and constraints of small-scale farming systems in South Africa (Chapter 2).
- Determining the current contribution of small-scale farming to rural household welfare (Chapter 3).
- Understanding rural households' perspective on farming and the extent to which farming features in rural futures (Chapter 4).
- Proposing alternative small-scale farming systems and exploring the potential of those systems to contribute to rural livelihoods (Chapter 5).

In this chapter, I first highlight the main findings from the research as related to the research objectives (Section 2). These findings were based on data collected from two study regions. Therefore, it was necessary to reflect on the study areas in the broader context of the former homelands of South Africa (Section 3) before they could be used as the basis for exploring the broader implications of my results for small-scale farming as part of rural livelihoods within the South African context (Section 4). Upon elaborating on what shapes the South African context and makes it unique in contrast with other African countries, I look at how small-scale farming could be reframed (Section 5) within the said context and further engage with what would be necessary and appropriate theories and frameworks (Section 6) to support such a reframing. I conclude the chapter with my personal reflections (Section 7) on the future of small-scale farming in South Africa.

6.2. Main findings

Data compiled from a literature review (Chapter 2) indicated that the low productivity of small-scale farming could not be solely ascribed to biophysical constraints at the field level as there were prominent socio-economic factors such as labour and capital at the farm and regional level (Table 2.3). Therefore, interventions should not only be sought at a field scale. The review

further highlighted that prospects for small-scale farming to become more commercially oriented are limited by the country's thriving large-scale farming. We concluded from the review that there is a dearth of information on small-scale farming systems in South Africa regarding the contribution of these systems towards rural livelihoods.

In Chapter 3, we contributed to the understanding of small-scale farming in SA by determining the relative contributions of on-farm versus off-farm sources towards household welfare and found stark differences at household and regional levels that we attributed to the importance of crops vs. livestock toward household welfare and the proximity of the regions to urban centres. On-farm production and consumption did not guarantee nutrition and food security in either region. In Thaba Nchu, livestock sales contributed more to potential food availability (PFA) than in Emmaus (Figure 3.3). However, livestock consumption provided minimal contributions towards PFA in both regions. An important component of the household income was the social security grant, the contribution of which we could not fully capture. Nonetheless, when we compared the total household income against poverty benchmarks (Figure 3.4), including our calculated living income benchmark, we found that only households relying strongly on off-farm sources could surpass a living income threshold. Small-scale farming, therefore, appeared to have a limited contribution to household welfare.

We followed this up in Chapter 4 by investigating how households positioned small-scale farming within their current livelihoods and to what extent farming featured in their future aspirations. In both regions, we found that perceptions and aspirations related to farming differed between household heads and their dependents. Household heads saw farming as a source of food and or income, while dependents saw it as a stepping stone, or a fall-back plan should things not work out in the urban life strategies. The picture of what future livelihoods in Emmaus could look like was a mixed one. Some people saw themselves practicing small-scale farming in the future (Table 4.1), while others aspired that their dependents be successful (outside agriculture). In contrast, farming featured more for household heads in Thaba Nchu – showing traces of the history of the 'betterment villages'. Even so, it appeared that in the grand scheme of things, farming was not prominent in the livelihood aspirations of rural people.

Although most households in our study seemed to have little potential (Chapter 3) or interest (Chapter 4) to develop into small- to medium-scale commercially oriented producers, few farmers obtained substantial incomes from farming activities and appeared able to invest in intensifying production. Through a participatory scenario analysis, we explored and proposed alternative production systems for households with farming aspirations. On the basis of the

poorly draining clay soils and frost prone conditions in Thaba Nchu, fruit trees, most vegetable crops, and summer field crops were excluded from consideration. In Emmaus, the soil conditions are less restrictive and suitable for cultivation of most crops. However, because of the high humidity of the region, tropical and sub-tropical fruit trees, some shrubs such as blueberries and stone fruit were excluded. Of the proposed systems, a broiler system (raising day-old chicks to slaughter size) had the highest potential contribution to rural households in both regions. However, two interesting alternatives in Emmaus were a perennial system (producing lucerne bales) and a macadamia nuts system. The likelihood of proposed systems contributing to rural livelihoods was limited by internal community conflicts over the use of common property resources and past experiences with dysfunctional cooperatives in Thaba Nchu. In Emmaus, the economic potential of small-scale farming was further constrained by the preferential allocation of land to staple crops over cash crops.

6.3. The study areas in the broader context of the former homelands of South Africa

This study took place in two regions (Emmaus and Thaba Nchu) situated in the Grassland biome of the summer rainfall area of South Africa with sites located in the KwaZulu Natal and the Free State provinces. Therefore, I do not claim to have provided the be-all and end-all picture of small-scale farming systems in South Africa with this thesis. Literature on small-scale farming systems in the former homelands of South Africa has provided a solid base for understanding these systems. For example, we know that rainfall variability increases abandonment of croplands, as has been the case in several former homelands (Blair *et al*., 2018). We also have documented evidence on characterization of smallholder systems (Chikowo *et al*., 2014; Pienaar and Traub, 2015; Materechera and Scholes, 2021) potential drivers of production in these systems (David and Grobler, 2022; Materechera and Scholes, 2022), the importance of managing risk through livelihood diversification (Neves and du Toit, 2013) as well as the importance of natural resources in rural livelihoods (Ainslie, 1999; Mbiba *et al*., 2019). In my study however, the two regions' differentiated livelihood contexts, related primarily to the proximity of the areas to urban centres, provide nuances from which we can draw lessons for other former homeland areas in the country. Closer urban centres not only provide easier access to markets but also affect opportunities to diversify livelihood portfolios outside of farming.

While the outcomes of this study are specific to the South African context as discussed in the next section, it does not take away the general learnings for other sub-Saharan countries such as Zimbabwe where land reform dominates politics and thriving rural livelihoods through small-scale farming remains the 'low hanging fruit' in the midst of it all (Scoones, 2015). Land-based interventions are seen as the low-hanging fruit as they capitalise on the emotional history of land dispossession during apartheid. Consequently, this has put undue pressure on small-scale farming systems to drive rural livelihoods. The outcomes of Chapter 3 in this study have demonstrated that contrary to popular political claims in both South Africa and Zimbabwe, small-scale farming is not the economic engine to drive rural livelihoods, at least not in its current form.

Lastly, while I recognise the valuable contribution from existing literature on small-scale faming systems in the former homelands of South Africa, I purposefully opted for an explorative study. So instead of starting out with explicit hypotheses, I allowed the study to evolve from one chapter to the next, guided by the findings on the question of whether small-scale farming can serve as an engine of economic activity in the former homelands of South Africa.

The intention was not to optimise current systems, nor was it to particularly focus on a specific area of the system such as soil fertility dynamics or impacts of certain factors (such as climate change) on the systems. My exploratory research trajectory led to use of self-reported data (e.g., yields, dietary habits, income, life histories, etc) based on memory recall. Using the DEED research approach allowed me to generate a rich picture of the livelihoods of people living in the communities where I worked.

6.4. Small-scale farming in the South African context

Understanding the farming system in its broader context allows us to situate small-scale farming and its contribution to rural economies. Several research reports, scholarly literature, and policy briefs often conclude with a call for "context-based" agricultural interventions, but what is the South African context? Certainly not the poor productivity of small-scale farming systems or the multiplicity of constraints associated with these systems as these are not unique to South Africa. The peculiarity of the South African context is twofold. Firstly, the opportunity for market participation is unwittingly stifled by the thriving large-scale farming sector and secondly, ownership of land is misrepresented as the principal precondition to small-scale farming by 'populist politics'.

6.4.1. Market participation

Functional and accessible markets are necessary for a more commercial trajectory of small-scale farming systems. However, the large-scale farming sector in South Africa already saturates both domestic and export markets (Chapter 2; BFAP, 2022). This leaves little room for growth and possibilities of breaking into formal markets. While small-scale farmers in other countries may possibly benefit from, for example, regional market opportunities through agreements such as the African Continental Free Trade Area (AfCFTA) (Obeng-Odoom, 2020), small-scale farmers in South Africa are likely to remain overshadowed by large-scale scale farmers in these markets. Even so, the well-developed food sector in South Africa also offers opportunities for small-scale farmers to engage in already existing and well-established value chains. For instance, farmers can sell weaner calves to feedlots through auctions as proposed in Chapter 5. In many sub-Saharan countries this is hardly an option (Chriatiaensen, 2020).

At a more local level, Thaba Nchu with closer proximity to urban centres holds opportunities in participation in already existing value chains to serve the affluent urban markets. While this will be no easy task, it remains a possibility. However, these cannot be achieved by merely trying to improve the management of already existing systems, except perhaps for livestock in grazing systems wherein reducing stocking rates or improving grazing management can lead to better output. Alternative production systems suitable for both the biophysical and socio-economic context would have to be explored, as we did in Chapter 5.

For Emmaus, however, niche markets would need to be developed. An opportunity may exist for a farm stall, or as commonly known in South Africa, a ‘padstal’ that could source local produce from farming households, process it and sell along the tourism corridors of the Drakensberg Mountains. The padstal could also target the blooming market for healthy foods (Cheng *et al*., 2017). How much would such an opportunity contribute to rural livelihoods would have to be determined and whether this would be attractive enough to actually drive the market for these systems is at this point, speculative.

An alternative for Emmaus could also be in exploring the booming hemp market. There is already evidence of some hemp cultivars or associated varieties growing in the Emmaus region. Although this may be existing in the grey area of informal versus illegal, it is making some contribution to rural livelihoods (Chapter 3). In 2018, the South African Constitutional Court legalised the use of cannabis for personal and medicinal use which led to an increased production and use of hemp products (Quansah, 2023). Small-scale farmers in Emmaus could

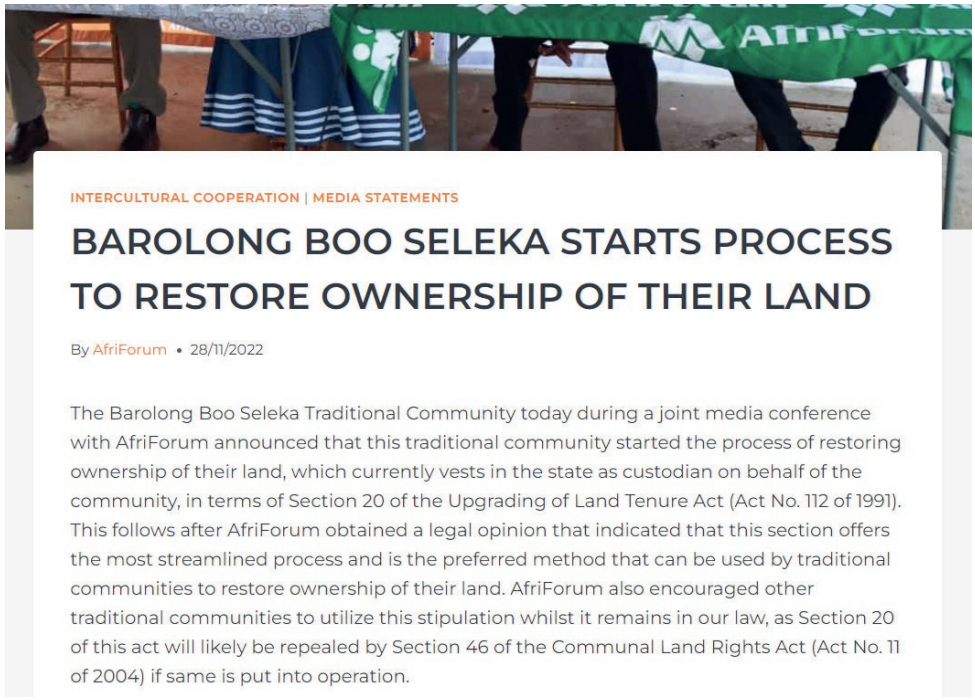
tap into this market by supplying the manufacturers of such products. Exploring this market would require issuing production licences to farmers as has been done in Lesotho (Dube, *et al*., 2023). Furthermore, there would need to be tight regulations in place to support small-scale farmers so that the large-scale farmers do not dominate the market. Because of the many shades of grey with this system – the main one being the association with cross-border livestock smuggling (Mathinya *et al*., 2022) - I did not consider it for the proposed systems in Chapter 5. However, this does not negate the potential it could have.

It is important to acknowledge the time it will take for farmers to establish themselves as active participants in any market and the informal nature of activities in this time. Therefore, this informality should not be equated to illegality (Weng, 2015) as this will further constrain breaking into markets.

6.4.2. Ownership of land

In Chapter 3, labour and not land availability was found to be a primary constraint of production in both regions and in Chapter 5, it was rather the ownership and not access to land that was perceived to be the most limiting factor for small-scale farmers. A shortage of labor and not land was also reported by de la Hey and Beinart (2016), a finding we also made in Chapter 3. These findings indicate that simply increasing the available arable land of households alone is unlikely to increase small-scale productivity and contribution to rural livelihoods. Furthermore, the results of Chapter 4 highlighted a mismatch between people's low regard for farming as a livelihood strategy whilst rural development policies hinge on farming as the anchor of thriving rural livelihoods. So why are we focusing debates and intervention efforts so intently on land ownership as if it is a precondition to small-scale farming?

It appears all too politicised at the expense of focusing on the real bottlenecks of small-scale farming, one of which is the management of common property resources. A recent undertaking by the Barolong tribal authority in its bid for ownership of the Thaba Nchu trust lands (Figure 6.1) is a good case in point. If successful, this effectively changes the "ownership" of the land from the state to "the community" but how does it address the main constraints experienced with intervention programmes such as the internal community conflicts over common property resources?



INTERCULTURAL COOPERATION | MEDIA STATEMENTS

BAROLONG BOO SELEKA STARTS PROCESS TO RESTORE OWNERSHIP OF THEIR LAND

By AfriForum • 28/11/2022

The Barolong Boo Seleka Traditional Community today during a joint media conference with AfriForum announced that this traditional community started the process of restoring ownership of their land, which currently vests in the state as custodian on behalf of the community, in terms of Section 20 of the Upgrading of Land Tenure Act (Act No. 112 of 1991). This follows after AfriForum obtained a legal opinion that indicated that this section offers the most streamlined process and is the preferred method that can be used by traditional communities to restore ownership of their land. AfriForum also encouraged other traditional communities to utilize this stipulation whilst it remains in our law, as Section 20 of this act will likely be repealed by Section 46 of the Communal Land Rights Act (Act No. 11 of 2004) if same is put into operation.

Figure 6.1 Undertaking by the Barolong tribal authority in its bid for ownership of the Thaba Nchu trust lands … (https://afriforum.co.za/en/barolong-boo-seleka-starts-process-to-restore-ownership-of-their-land/)

While I conducted focus group discussions (FGD) in the Thaba Nchu region (Chapter 5), two men invited themselves through and without saying any word, listened and observed the entire proceedings. When the discussions were over and I was preparing to leave, one of them came to me and said: "*Sorry we showed up uninvited. We just had to make sure we were not being 'left out'*". This got me thinking about an interview I had conducted with a representative of the Barolong Tribal Office. At the time, the interview was part of a triangulation effort for the life history interviews I conducted in Chapter 4.

"…It is what we call a permission to occupy, and it comes with a three in one right. So, inseparable from the residential right. So, you cannot have residential rights and be denied grazing rights and the same goes for crop land. You have an indivisible stake on that crop land."

This shows that trust issues regarding that "indivisible stake" on common property resources run far deeper than we acknowledge and may explain to some extent, the poor success of intervention programmes in this region which has resulted in poor investments (Chapter 5). These failed investments have been reported in several parts of the country (Bradstock, 2005; Aliber and Hart, 2009; Obi, 2011; Naumann, 2014).

People want to benefit from common resources as is their communal right, regardless of what the resources are used for – even if they are used for agricultural purposes and they do not aspire to farm themselves (Chapter 4). This further reiterates the findings of Cousins (1996) and Bradstock (2005) that the management of common resources presents difficulties that should receive priority when defining and implementing interventions.

While not entirely pertinent in the Emmaus region, the issue of the custodianship of the land could just as well present a key limitation towards intensified production. Ownership of land, given past experiences (Lipton, 2009), could be monopolised by tribal authorities and the elite (Hall and Kepe, 2017). In such a scenario, they could for personal gain, opt to grant land to big forestry companies for production of trees as already evident in the landscape (Figure 5.6) to expand their current operations on communal land. This would be detrimental to both the farmers and the environment in terms of depletion of groundwater resources. Therefore, instead of arguing about and politicising the 'land issues' and how and who should implement South Africa's land reform policies (Zantsi and Nengovhela, 2024), perhaps it is time to refocus attention on efforts and skill sets in empowering communities to effectively manage the natural resources on which we all depend.

6.5. Reframing small-scale farming within the South African context

In Chapter 3, our findings illustrated the different meaning of seasonality in Thaba Nchu and Emmaus. In Thaba Nchu, the "good season" for food availability was unrelated to the agricultural production calendar. Instead, it referred to the months of November and December, generally known as the "festive season," a time of the year when off-farm income is received from family members (mostly men) working away, and food availability is at its highest. In Emmaus, situated about 129 km away from the city of Pietermaritzburg, crop production formed the base of the livelihood portfolio to the extent that households related the "good season" to the months of harvest (May to July). During this time, maize and beans were harvested for household consumption but households experienced food shortages in the period just before the next harvest.

Against this differentiated meaning of seasonality in the two regions, I propose an alternative to reframing small-scale farming in South Africa. This is a proposal to shift from portraying small-scale farming as an engine of economic growth in the former homeland areas but rather as a 1. Food and nutrition security measure or 2. A "Januworry" strategy.

6.5.1. Food and nutrition security measure

In South Africa, food security received much attention after 1994 when South Africa became a democratic country and led to the development of the National Policy on Food and Nutrition Security (NPFNS). The FNSP was formulated within the Department of Agriculture, Forestry and Fisheries in 2014 with the objective to ensure food security at the national and household levels. However, the FNSP has been criticised for lack of coordination in implementation (Boatemma, *et al*., 2018). Of course, this is not an issue unique to the FNSP.

Reframing small-scale farming as a food and nutrition security strategy within this policy may improve the implementation thereof. For example, production in Emmaus could be targeted towards nutrition security through crop diversification as crops already provided sufficient energy for the households in terms of potential food availability. I therefore argue that, besides focusing on increasing the production of current extensive systems, production research should aim at exploring the necessary combination of crop or livestock systems required to provide nutrition to households to curb the persisting malnutrition (Govender *et al*., 2021). This research should further look into what proportion of nutritional needs of a household could potentially be provided by small-scale farming within the regional contexts. Unlike what I did in Chapter 5 (which was based on the economics of a system), results of such an enquiry would emphasise food and diets, and not only income. Implementation of such a reframing could also entail provision of storage facilities to enable longer retention of the previous season's harvest until the next harvest to make provision for the lean period. It is worth noting that the nutrition literature highlights that socio-cultural preferences and customs determine peoples' diets beyond food availability alone (Muggaga *et al*., 2017; Akinola *et al*., 2020; Assan, 2023). This means that an important component of this research would be to focus on "nudging" people towards better consumption patterns through appropriate forms of education and knowledge transfer (Walsh *et al*., 2003, Everett-Murphy *et al*., 2015; Mbhatsani *et al*., 2017).

6.5.2. A "Januworry" strategy

In Thaba Nchu, January represented the lean month and was unrelated to the cropping calendar. Therefore, the solution to the lean month should not be sought from cropping. The gap between the availability of foods and the foods needed for a nutritious diet is largest during this time which has come to be known on social media platforms as Januworry, depicted in Figure 6.2. Januworry is an abrupt transition from the time of ample food availability during the festive season, to a lean month of January when food sources are scarce. On social media platforms, users continuously share ideas of how to get through this lean period, something they refer to as a Januworry starter pack.

Figure 6.2 A depiction of Januworry on social media (https://www.thesouthafrican.com/lifestyle/this-is-how-south-africans-survived-janu-worry/).

For Thaba Nchu, livestock sales – which already forms a substantial portion of income for some households (Chapter 3)- could form the base for the Januworry starter pack. Practical implementation of this framing would entail planning the livestock production systems to have animals ready for sale towards the end of November for use during this lean period. Of course, market access will also have to be ensured and this is where organisations such as Meat Naturally could play an active role of facilitating market access by for example, organising local auctions. As emphasised by our findings in Chapter 5, a reframing such as this could be possible in the '*Saam werk'* scenario which requires functional cooperatives to pool resources together for a more competitive market advantage.

6.6. An approach to small-scale farming interventions in South Africa (appropriate theories)

Government investments in rural development through small-scale farming in South Africa are more often than not, framed as neo-endogenous (Eversole and Campbell, 2023), meaning, they should be driven by communities from the ground up while government departments take on a steering role from the top down. This came out of a review of seventeen policies on food and

nutrition security in the country by (Boatemma *et al*., 2018). For example, the Ilima/Letsema and Fetsa Tlala food security initiatives pooled together farmers to plant maize and dry beans for the market with the income generated then being used to buy food. These initiatives were also rolled out in our study region and, as reported in the cited literature in Section 6.4 and evidenced by our findings (Chapter 2 and 5), these investments have reccorded little success.

Although I have demonstrated the importance of considering the socio-economic contexts of the regions when planning intervention strategies, it is no easy task because of all the multiple levels of management (field, farm, and region) and the complexity that exists within and among these levels. This complexity increases when social systems interact with natural systems (Cox *et al*., 2010).

I now use the 'Eight design principles' of Ostrom (1990) as an appropriate theory on which to base and guide such considerations. The principles of Ostrom (1990), as reviewed by Cox *et al*. (2010), do not provide a checklist for intervention programs and have also received substantial critique from scholars. However, they do provide a basis on which the differentiated contexts of our study regions can be applied for a practical look at the main factors that need to be addressed – dominant at farm and regional level (Chapter 2, 3 and 5) if intervention programmes are to stand a chance.

Principle 1: Well-defined boundaries: stipulate the presence of well-defined boundaries around a community of users and boundaries around the resource system this community uses.

With this principle, it can be recognised and accounted for that governing rules in communal areas are often politically malleable and greatly influenced by power dynamics. Therefore, there should be clear administrative arrangements as well as division of roles before implementing any intervention programmes. As such, attention needs to be paid to the way "power reproduces inequality" (Francis and Webster, 2019). Furthermore, spatial boundaries, often fluid in communal areas, also indicate the need for clear arrangements regarding both resource allocation as well as administrative roles to be in place before commencement of any technological interventions. Clearly delineating geographical boundaries in our study regions (Chapter 5) enabled an estimation of what a realistic contribution of a proposed system at village level could be, moving completely away from the expectation of 'indivisible stake' that comes with communal property rights. Such contributions and the number of households that could potentially benefit (Table 5.1 and 5.2) needs to be communicated and understood beforehand.

Principle 2: Congruence between appropriation and provision rules and local conditions

Much like the first principle, this principle makes provision for institutional congruence with the resource condition. For example, in Thaba Nchu, intensifying grazing livestock production needs rules that should be adhered to in terms of grazing management which, without any clear appropriation and provision rules, has proved challenging for many communities (Cousins, 1996; de Wet, 2007). Appropriation and provision rules perceived as fair may also help with equity principles in intervention programmes (Thuijsman *et al*., 2022).

Principle 3: Collective-choice arrangements: most individuals affected by the operational rules can participate in modifying the operational rules.

From the review of the design principles, (Cox *et al*., 2010) highlight that a lack of a functional collective-choice arrangement is frequently correlated with management failure in common property resource. As mentioned in the above sections of this discussion chapter, challenges with co-management of the natural resource currently presents a substantial bottleneck to improvements in small-scale farming systems. Therefore, communities need to collectively agree on strategies for use and management of the common resources. However, bureaucratic imposition, especially in Thaba Nchu, seems to have ignored this aspect. At the time of data collection, some community members in Thaba Nchu were involved in a 'construction project' to erect irrigation lines from the dam to the fields (Chapter 3). However, it was unclear to the households what crop, by whom and when those irrigation lines would be used. Households seemed far removed from the planning of interventions. This principle is therefore essential as it sheds light on the potential political power play that may render the communities powerless and excluded by the elite in the society as was also indicated for Emmaus in Section 4.2 of this Chapter.

Principle 4: Monitoring

Plans should be put in place to monitor intervention programmes, something that is currently lacking (Chapman *et al*., 2021). Monitoring and evaluation plans should also account for environmental monitoring to make people aware and accountable of their actions. In Emmaus, communities have noticed the decline in stream flows and attribute that to the eucalyptus plantations that are slowly expanding around the villages. As there are no strong monitoring activities in the area and poor accountability, this continues on unabated while degradation in the uThukela catchment area on which the community depends (Mathinya *et al*., 2022) continues to be perpetuated by grazing on wetland areas. This means that the monitoring and

evaluation should also be on the communities themselves for those to also make provisions for sanctions on those who do not comply with the rules.

Principle 5: Graduated sanctions: stipulates the efficacy of graduated sanctioning systems

Sanctioning deters members from excessive violations of community rules. Without effective monitoring and evaluation (Principle 4), those transgressing cannot be identified and held accountable. Unfortunately, this is a weakness that spans many communities and government departments alike.

Principle 6: Conflict-resolution mechanisms: states that systems with low-cost conflict resolution mechanisms are more likely to survive

Flowing from the above principles, conflicts over resources are likely and therefore, there should be measures in place to resolve them. Unresolved conflicts are detrimental to interventions as issues of trust and sabotage continuously arise.

Principle 7: Minimum recognition of rights: stipulates that external government agencies do not challenge the right of local users to create their own institutions

While this a matter that could easily reside under traditional authorities in these regions, I have indicated how they could also fall prey to elite capture and political influence. Nonetheless, these institutions may be well-positioned to manage and protect the rights of communities.

Principle 8: Nested enterprises: states that in successful systems, "governance activities are organized in multiple layers of nested enterprises"

This principle addresses the interconnectedness of common property resource systems. Linkages can be horizontal in terms of community connections or vertical in terms of jurisdictional levels. Both connections imply cross-scale physical relationships and thus require mechanisms to facilitate cross-scale cooperation. While this would be no easy task, it is a critical requirement in multifunctional landscapes such as the ones in our study regions. A case study of Indonesian smallholder oil palm (Jelsma *et al*., 2017) demonstrated that with a strong institutional arrangement taking cognisance of this nested enterprise principle, smallholder participation in supply chains was possible.

A South African case study by (Cockburn *et al*., 2019) on collaborative stewardship in multifunctional landscapes of the Langkloof region in the Eastern Cape province identified that less focus has been placed on the nuances of social-relational processes that underpin effective collaboration. From this study, five overarching factors that influence collaboration: contextual, institutional, social-relational, individual, and political-historical were identified.

The study further proposed a bottom-up patchwork approach to collaborative stewardship premised on the notion of pluralism. While I do not contest the idea of pluralism, I suggest it could be better nested in the eight design principles I have contextualised above. In fact, the principles address all the five overarching factors identified by (Cockburn *et al*., 2019), supporting my conviction on using the design principles as a base to any bottom-up interventions for rural livelihoods through farming.

The findings from this research, accentuate the precondition of functional cooperatives and conducive policy environments that should be created by engagements with the evidence base and not dictated by party politics. If the country is to make meaningful improvements in regard to achieving the NPD goals, engaging with these principles beforehand is critical to develop coordination mechanisms for a more holistic approach to rural intervention.

6.7. Final and personal reflections

While I have acknowledged the thorny nature of the political discourse on the general developmental progress in the country and for small-scale farming in particular, I seem to have tip-toed around it a lot. I started this journey in 2019, an election year and it comes to an end in 2024, yet another election year. Election years are usually marked by heightened political tensions that most people, including myself, have learned to quietly ignore. This is why I am cautious to make policy recommendations. However, a rather eloquent opinion piece in EyeWitness News[12] on the upcoming elections of 2024 by Dr Zamani Saul (the Northern Cape provincial chairperson of the ruling party – the African National Congress) reminded me of my findings from Chapter 2 of this thesis.

An extract from the opinion piece below highlights our findings that debates on rural development, especially through farming, are highly politicised at the expense of the real challenges in rural communities.

"*How many more decades it* [removing the impact of apartheid] *will take should not be a matter of conjecture; but a determination that is an outcome of a meaningful engagement which should take place across party lines*". Dr Saul, January 2024

There is deep inequality and injustice in South Africa as the opinion piece describes in detail. However, because a lot of the development challenges in South Africa indeed have their roots in apartheid colonialism, rural development debates often fall victim to political rhetoric at the

[12] https://www.ewn.co.za/zamani-saul-is-30-years-enough-to-remove-the-impact-of-apartheid-colonialism/

expense of identifying and addressing the real challenges faced by rural communities. This in turn leads to ideologically driven policies that are often not effective or really helping the people they are supposed to help, as demonstrated in this thesis.

"*From all this, an observation is that policy interventions are often based more on ideology and party-political wishes than on empirical research*". This thesis: Chapter 2.

The results of this thesis provides some insights to those prepared to listen and engage past 'apartheid politics'. I have, throughout this thesis, emphasised the need for contextualisation, and apartheid history is a considerable component of the South African context. However, it cannot perpetually be the main point of departure and the 'cornerstone' of political party manifestos which subsequently become main point of departure of many policies and interventions.

While I am by no means minimising the impact of apartheid on the skewed socio-economic landscape of the country, I propose that given the status quo of the country, progress to reaching the NDP goals will not move at such an unprecedent pace (in contrast to the pace thus far) that we will achieve the goals in the next six years. Do we then extend the timeframe by, yet another decade come 2030? We need to rethink how we do things in terms of how and where we look for interventions and the subsequent implementation of such interventions.

Therefore, instead of arguing along party lines, we need to be engaging with those we intend to bring solutions to! This implies moving the engagements away from 'populist politics' with a narrative that 'small-scale farming will drive thriving rural livelihoods', to evidence-based co-creation and exploration of solutions to address society's most pressing challenges. And yes, these will include some degree of engagement in agriculture but should also incorporate attention on efforts and skill sets to empower communities to diversify their livelihood portfolios and progressive economic growth of the country will be paramount in this regard.

I can only hope that this thesis will stimulate a deeper dialogue between scientists and policymakers, irrespective of the outcome of the 2024 provincial and national elections. I further call on the scholarly community to acknowledge the political dimension of scientific research and take on an active role to ensure considerations of their findings in policy discourse. Even with my truncated misgiving about the NDP - specifically Sections 6, 8 and 11 as discussed in Chapter 4 of this thesis - and the future of small-scale farming systems in particular, I end with acknowledging and commending the developmental progress that the country has made thus far.

While race is the major division line of the inequality in the country, I have witnessed the citizens' capability and willingness to blur those lines through camaraderie and pride that can bring South Africans together beyond racial, language and tribal lines. This has been evident in the collective support for those representing the country in several international competitions. May this positive vibe translate into better dialogues for the benefit and livelihoods of all my fellow four-times-reigning Rugby World Cup Champions 😊.

Morena boloka setjhaba sa heso!

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Chapter 2: Productivity and constraints of small-scale crop farming in the summer rainfall regions of South Africa

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Chapter 5: Prospective small-scale farming systems for rural South Africa: A participatory scenario analysis

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Note for **Appendix 2.1**

To identify eligible literature, a systematic search was conducted in the following electronic databases: Cab Abstracts, Scopus, and Web of Science, as well as local agricultural journals, namely: South African Journal of Plant and Soil, South African Journal of Science, African Journal of Agricultural Research, and Agricultural Economics Research, Policy and Practice in Southern Africa. The systematic search was conducted from April to May 2019 and consisted of three concepts: smallholder, South Africa and
production. Different combinations of these concepts were used as search terms based on the requirements and limitations of each database. The search strategy for Cab Abstract, for example, was:
Concept 1: Smallholder* or (small adj2 holder*) or (small adj2 farm*) or (small scale adj2 farm*) or (family adj2 farm*) or (subsistence adj2 farm*) or (rural) or (emerging farmers)
Concept 2: South Africa* or exp South Africa
Concept 3: Producti* or output or yield or capacity or efficien* or sustainab* or (alternative adj2 farm*) or feasible or viable or intensif* or intensive or enhance or increase or empower* or support. The three concepts were then combined with AND, and these results were recorded. Only outputs published from 1994 to 2019 (prior to April) were included. Reference lists of selected literature were also reviewed to find any additional potential literature that may have been missed by the searches. Studies that did not make any clear connection between the development or intervention strategy proposed, evaluated or analysed and how it was intended to increase production, efficiency or sustainability of smallholder farms were eliminated.

Appendix 2.1: Literature on agricultural constraints of small-scale farmers and proposed intervention strategies at field, farm and regional scale.						
Reference	**Constraint**	**Scale**	**Production improvement strategy**	**Scale**	**Recommendations**	**Scale**
(Chikanda and Kirsten, 1996)	Poor input use	Farm	Input market and distribution channels	Region	Improved training institutions and infrastructure	Region
(Achiano *et al*., 1999)	Post-harvest infections	Farm	Aloe ash for protection of stored maize seeds	Farm	Application dosage rate of 5g/100g	Farm
(d'Haese, *et al*., 1999)	Farm economics	Farm	Plant more trees per ha	Field	Improvement of technical knowledge	Farm
(Mukhala *et al*., 1999)	Dietary nutrient deficiency	Farm	Intercropping	Field	Change eating patterns to accommodate legumes/pulses	Farm
(Beyers *et al*., 2002)	Production efficiency	Farm	Biotechnology	Field	Cautious optimism regarding the impacts of biotechnology	Farm
(Mkhabela, 2002)	Soil fertility	Field	Application of cattle and chicken manure	Field	Appropriate policies and institutional arrangements needs to be strengthened	Region
(Yousouf *et al*., 2002)	Economic impact of biotechnology	Farm	Biotechnology	Field	more detailed data on labour and other aspects of adoption before final judgment of the benefits	Region
(Bennett *et al*., 2004)	Insecticide overuse	Region	Biotechnology	Field	Caution against extrapolating benefits of biotechnology	Region
(Schmidt and Adriaanse, 2004)	Soil fertility	Field	Nitrogen fertilizer guidelines	Field	Farmers should be encouraged to manage inorganic levels in the soil to obtain a certain percentage of the expected yield	Farm
(Berry *et al*., 2005)	Impact of cultural practices on nematode management	Farm	Organic soil amendments and intercropping	Field	Knowledge generation on recommendable intercrops	Farm
(Motiang *et al*., 2006)	Lack of business development	Farm	Partnerships	Region	Adoption of the profit-thinking framework to make informed decisions	Farm
(Perret, 2006)	Lack of technical and managerial skills	Farm	The Smile approach for smallholder action research	Region	Clarification on land rights, and some form of land reallocation	Region
(Singels and Smith, 2006)	Poor adoption of irrigation scheduling techniques	Farm	Provision of irrigation scheduling advise	Region	Reduce irrigation during winter and when the crop is young	Farm
(Mathews, Lengwati et al. 2007)	Foliar diseases	Field	New resistant varieties	Field	Planting more than one variety with diverse growth characteristics	Field
(Perret and Geyser, 2007)	Financial costs of irrigation	Region	The average yield on Negotiable Certificates of Deposit (NCD) is suggested as a surrogate for treasury bills and hence as a substitute for the discount rate	Region	A shift in the underlying policy and societal mind-set about the water charging system for smallholder irrigation	Region
(Chaminuka *et al*., 2008)	access to and use of service infrastructure	Region	Provision of services infrastructure	Region	Policy should address farmers' access to services	Region
(Mahlangu and Lewis, 2008)	Socio-economic challenges	Region	Best management practices	Farm	Challenges need to be holistically addressed	Region

(Sikhwari, 2008)	Lack of mechanical operational knowledge	Farm	Knowledge on the use of tractors	Farm	Require outside assistance to help farmers acquire machinery, to train operators, and to provide after-sales services	Region
(Speelman *et al*., 2008)	Technical efficiency	Farm	Improved water use efficiency	Farm	Additional research on allocative and economic efficiency can further determine the scope for production improvements	Region
(Armitage et al., 2009)	Input access	Farm	Input procurement and distribution to communal areas	Region	Access to credit from agricultural development institutions	Region
(Baloyi *et al*., 2009)	High input costs	Farm	Crop rotation and fertilization	Field	Increased fertiliser application rate	Field
(Berry *et al*., 2009)	Nematodes	Field	Intercropping	Field	Additional knowledge needs to be gained on the best intercrops	Region
(Fanadzo *et al*., 2009)	Bird damage to emerging seedlings	Field	Transplanting maize seedlings	Field	Fertilizer management of transplants	Region
(Fanadzo *et al*., 2009)	Agronomic factors	Field	Farmer training programmes on basic management practices	Region	More focused research addressing agronomic constraints	Region
(Gillespie *et al*., 2009)	Access to information	Region	Demonstration plots also used as seed cane nurseries	Region	Strengthening relations between growers and other stakeholders	Region
(Yokwe, 2009)	the feasibility of water markets	Region	Improve Water productivity	Field	extension and training required to improve the productive use of water for farmers whose returns are insufficient to cover the cost of supply	Region
(Adewumi *et al*., 2010)	Market access	Region	Contract farming for securing production inputs	Region	Policy to formalise contracts	Region
(Fanadzo *et al*., 2010)	Weed management	Field	Reduced herbicide dosages	Field	incorporation of reduced herbicide dosages and narrow rows to achieve adequate weed control	Field
(Fanadzo *et al*., 2010)	Management practices	Farm	Training programmes in the areas of crop and irrigation water management	Region	A research focus on labour-saving production technologies and establishing farm-specific fertiliser recommendations	Region
(Murray, 2010)	Reduced incentive to invest	Farm	Grower returns	Region	Restructuring current debt levels through lobbying financial institutions for debt restructuring	Region
(Odhiambo *et al*., 2010)	Access to fertilizers	Region	Grain legumes	Field	Ground nut cultivars recommended	Field
(Antwi and Seahlodi, 2011)	Market access	Region	Formation of farmers' cooperative	Region	Provision of quality extension services	Region
(Campbell *et al*., 2011)	Lack of knowledge on calibration of inputs	Farm	Appropriate selection and application of herbicides	Farm	Method validation	Region
(Kasirivu *et al*., 2011)	Weed proliferation with manure application	Field	Composting ruminant animal manure before application	Farm	economic and agronomic benefits need further investigation	Region
(Murovhi *et al*., 2011)	Soil fertility management	Farm	Soil fertility management with fruit trees leaf litter	Fam	Soil fertility management strategies should consider influential factors such as age, income and farm size	Farm
(Odhiambo, 2011)	Soil nitrogen deficiency	Field	green manure legumes	Field	Use of green manure legumes in combination with N fertilizers	Farm
(Baloyi *et al*., 2012)	Technical efficiency	Field	On-farm training	Region	Improved extension services delivery	Region
(Muchecheti *et al*., 2012)	Soil fertility management	Farm	Leguminous tree pruning	Field	Pruning of leguminous tree species can be used as a source of N for vegetable production	Farm

(Andersson *et al.*, 2013)	Water scarcity	Farm	Water harvesting and ecological sanitation	Farm	Reduce uncertainty by further researching methodological variabilities	Region
(Chiduza and Dube, 2013)	Inadequate CA biomass	Field	High biomass input CA systems	Field	A multidisciplinary approach to CA research	Region
(Hosu and Mushunje, 2013)	Optimal farm resource use	Farm	Crop-livestock integration	Farm	Improving farmers' managerial capacity	Region
(Lefophane *et al.*, 2013)	Technical efficiency in input use	Farm	Access to credit to improve efficiencies	Region	Existing farm credit systems should be reviewed, refocused, and made more accessible to emerging farmers	Region
(Odhiambo *et al.*, 2013)	Soil moisture availability	Field	Conservation Tillage practices	Field	Need to conduct long-term tillage study in order to ascertain the results	Region
(Sikwela and Mushunje, 2013)	Institutional obstacles	Region	farmer support programmes	Region	Support Programmes and collective marketing activities for a significant and positive impact	Region
(Manzana *et al*., 2014)	Animal nutrition	Farm	Optimal feeding systems	Farm	Mentoring by commercial dairy farmers; veterinary and extension services	Region
(Luvhengo *et al*., 2015)	Socio-economic challenges	Region	Improved resource use efficiency	Farm	Implement policies that promote access to credit and transport	Region
(Hitayezu *et al*., 2016)	Technological factors	Farm	Crop diversification	Field	Further research to unpack the complexities and ambiguities of crop diversification	Region
(Mandiriza-Mukwirimba, *et al*., 2016)	Crop diseases	Field	Identification and management of diseases	Farm	Information on pesticide (fungicide) application and guidelines on their use	Region
(Maponya *et al*., 2016)	Lack of agronomic training	Farm	Provide training	Region	Smallholder farmers should have access to research and training institutions	Region
(Ntshangase *et al*., 2016)	Poor planning	Farm	Succession planning	Farm	Succession planning should be taken seriously and encouraged by agricultural extension personnel	Region
(Sinyolo *et al.*, 2016)	Liquidity constraints	Farm	Social grants	Region	The objectives of social grants and smallholder farming be synchronised so that the potential complementarity between the two interventions may materialise	Region
(Koppen *et al.*, 2017)	Market access	Region	Smallholder irrigation schemes	Region	A comparative analysis to generate new lessons informing government about a broad range of measures to revitalize irrigation	Region
(Manyevere *et al*., 2017)	Soil fertility	Field	Creation of management zones for micronutrients	Farm	Field studies to establish the extent to which Zn is limiting yields and nutritional quality of crops	Region
(Munzhelele *et al*., 2017)	No training	Region	Improved production management	Farm	Agricultural training and government incentives	Region
(Cele and Wale, 2018)	Land and water-use rights	Region	Productive use of irrigation water	Farm	A holistic approach that considers the accessibility of input and output markets	Region
(Mthembu *et al*., 2018)	Soil fertility	Field	Intercropping	Field	Include lablab in traditional maize cropping systems while avoiding maize entanglement by delayed under sowing of lablab	Farm
(Ncube, 2018)	Access to in information	Region	Collaborations	Region	Development of a comprehensive information package for smallholder farmers that includes all the available support	Region

(Popoola *et al.*, 2018)	Climate change	Region	Adaptation measures	Farm	Immediate government interventions are required for appropriate extension service delivery	Region
(Rangoato and Oluwatayo, 2018)	Market access	Region	market infrastructure and marketing information services	Region	Government inputs subsidy	Region
(Sinyolo and Mudhara, 2018)	Input access	Region	Farmer groups	Region	Policymakers should target the less educated, increase the assets of the poor and improve access to extension and information	Region
(Rusere *et al.*, 2019)	Poor production intensification	Farm	Ecological intensification	Region	The need to consider farmers type heterogeneity as a strong decision parameter for targeting ecological intensification	Region

Appendix 2.2: A matrix for the different components of Appendix 2.1.

	Number of studies in each component of the research		
Scale	Constraint	Production improvement strategy	Recommendations from studies
Field	15	21	4
Farm	28	17	12
Region	18	23	45
Totals	**61**	**61**	**61**

Appendix 5.1: Cost-benefit analysis results for the proposed alternative production systems

Appendix 5.1A: Cost-benefit analysis of the weaner system. A production unit is one cow with the associated calves, bulls and heifers.

Component		**Input costs (ZAR)**			
	No.	Maintenance costs/head	Total maintenance costs	Grand total cost	Cost/production unit
Cows	120	1499.3	179910	277752	2315
Bulls	3	1288	3864		
Heifer	36	2610.5	78315		
		Revenue (ZAR)			
	Number sold	Price per production unit	Total revenue	Total	Revenue/production unit
Calves	78	7000	546000	704400	5870
Old cows	18	8800	158400		
Profit/production unit (ZAR)	3555				
Living income per annum (ZAR)	107886				
Requirements for LI		Number of cows	Area of land (ha)	profit per ha	
		31	198	545	
	Land/ head	Total land	Total	Land/production unit	
1 cow + calf	5.5	660	783	6.53	
1 bull	5	15			
1 heifer	3	108			
	Price per bull	Slaughter price	Cost per bull per annum	Bull cost per cow per annum	
	65000	14300	8450	211.25	

Appendix 5.1B: Cost-benefit analysis of the small-stock unit system. A productive unit is 1 ewe with associated ram and lambs.

Component		**Input costs (ZAR)**			
	No.	Maintenance costs / head	Total maintenance costs	Grand total	Cost/ production unit
Ewes	160	800	128000	181300	1133
Rams	4	825	3300		
Lambs	40	1250	50000		
		Revenue (ZAR)			
	Number of sheep	Price/ sheep	Total revenue	Total	revenue/ production unit
Feeder lamb	144	1290	185760	279535	1747
Cull sheep	41	2287.2	93775		
Profit/ production unit (ZAR)	614				
Living income per annum (ZAR)	107886				
Requirements for LI		Number of sheep	Area of land (ha)	profit per ha	
		179	224	482	
Grazing land needed per sheep					
	Land (ha) / head	Total land (ha)	Total	Land / production unit	
1 sheep + lamb	1	160	192	1.3	
1 ram	1	4			
1 lamb	1	40			
	Price per ram	Slaughter price	Cost per ram per annum	Ram cost per ewe per annum	
	12000	2812.5	1531.3	38.3	

Appendix 5.1C: Cost-benefit analysis of the piggery system. A production unit is one sow with associated boar and piglets.

Component		**Input costs (ZAR)**			
	No.	Maintenance costs / head	Total maintenance costs	Grand total costs	Cost/production unit
Sow and piglet	20	5880	128755	413765	18807
Growing piglets	400	700	280000		
Replacement sow	3	970	2910		
Replacement boar	2	1050	2100		
		Revenue (ZAR)			
	No.	Price/ pig	Total revenue	Total	revenue/production unit
Young pigs	400	750	300000	309120	14050
Culled pigs	3	3040	9120		
Profit/production unit (ZAR)	-4756				
Living income per annum (ZAR)	107885.99				
Requirements for LI		Number of pigs	Area of land (ha)	Income per ha	
		N/A	N/A	-3790125.9	
Land needed per head	Land (ha) / head	Total land (ha)	Total	Land / production unit	
Boar and sow	0.001	0.022	0.702	0.03	
Gilts	0.0005	0.2			
Weaner house	0.0012	0.48			

Appendix 5.1D: Cost-benefit analysis of the broiler system. A productive unit is one chick.

Component		**Input costs (ZAR)**		
	No.	Maintenance costs / bird	Total maintenance costs	Cost/ bird
Birds	450	90.18	40582.35	90.18
		Revenue (ZAR)		
Slaughter bird	No.	Price/ bird	Total revenue	Revenue/ bird
	427.5	120	51300	114
Profit/ bird (ZAR)	23.82			
Living income per annum (ZAR)	107885.99			
Requirement for LI		Number of birds	Area of land available(ha)	Profit per ha
Land needed/ bird		4530	0.045	14,290,200
	Land (ha) / head		Area needed (ha)	
Birds	0.00001		0.00075	

Appendix 5.1E: Thaba Nchu: Cost-benefit analysis of the perennial system in Thaba Nchu. A productive unit is one hector.

Component		**Input costs (ZAR)**			
	yield (tons/ha)	Total costs/ ton	Grand total	Cost/ton	
Lucerne	20	12088	34739	1510.4	
Wheat	1.5	8831			
Canola	1.5	13820			
		Revenue (ZAR)			
	tons / ha	Price/ ton	Total revenue	Total	revenue/ ton
Lucerne	20	3600	72000	96900	4213
Wheat	1.5	6100	9150		
Canola	1.5	10500	15750		
Profit/ ton (ZAR)	2702.7				
Living income per annum (ZAR)	107885.99				
Requirements for LI					
Land needed per ton		Number of tons	Area of land (ha)	Profit/ ha	
		40	5.2	20720	
	Land (ha) / ton	Total land	Total tons	Total	Tons/ha
Lucerne	0.05	3	20	23	7.6
Wheat	0.67		1.5		
Canola	1		1.5		

Appendix 5.1F: Cost-benefit analysis of the vegetable system. A productive unit is one ton.

Component		**Input costs (ZAR)**			
	yield (tons)		Total costs	Grand total	Cost/ ton
Butternut	12		4896	70432	1051
Cabbage	30		15371		
Potatoes	10		36402		
Onions	15		13763		
		Revenue (ZAR)			
	Ton/ha	Price/ ton	Total revenue	Total	revenue/ ton
Butternut	12	2676	32112	296137	4420
Cabbage	30	2186	65580		
Potatoes	10	7906	79060		
Onions	15	7959	119385		
Profit/ton (ZAR)	3369				
Living income per annum (ZAR)	107885.99	Corrected for home consumed food	65% ; 70125		
Requirements for LI	Number of tons	Area of land (ha)	Income/ ha		
	32.03 → 21	1.91→ 1.24	56426		
	Land (ha) / ton	Total land	Total land (ha)	Total (ton)	ha / ton
Butternut	1		12	67	0.060
Cabbage	1		30		
Potatoes	1		10		
Onions	1		15		

Appendix 5.1G: Cost-benefit analysis of the agroforestry system. A productive unit is one ton.

Component		**Input costs (ZAR)**		
yield (tons)	Costs/ton	Total costs (per year)	Grand total	Cost/ ton
1.3	30645	398388	39838	30645
		Revenue (ZAR)		
Tons/ha	Price/ ton	Total revenue per ha	revenue/ ton	
1.3	72760	94588	72760	
Profit/ ton (ZAR)	42115			
Living income per annum (ZAR)	107885.99			
Requirements for LI	Number of tons	Area of land (ha)	profit/ ha	
	2.56	1.97	54750	
Land (ha) / ton	Total land (ha)	Total ton	Land / ton	
0.77	1	1.3	0.77	

Summary

In the former homelands of South Africa, farming activities are typically limited to small-scale crop and livestock production. At the same time, farming features prominently in policy formulations for improved rural livelihoods. So how important is farming in the livelihoods of rural people? With this thesis, I have explored the current (Chapters 2 and 3) and prospective (Chapters 4 and 5) contribution of small-scale farming to the livelihoods of rural households in South Africa. In doing so, I contribute to the empirical evidence base for the ongoing debates on how state resources should be invested in supporting small-scale farming.

The research approach for this work was framed around sequentially describing small-scale farming systems, explaining, and understanding the contexts within which they exist, exploring their prospective potential and lastly, designing alternative systems as guided by the Describe-Explain-Explore-Design (DEED) research methodology. The study took place in two rural communities. Located in the Grassland biome of South Africa, the two study regions - Emmaus in KwaZulu Natal (KZN) province and Thaba Nchu in the Free State (FS) – share a natural border (The Drakensberg Mountain Range) that creates distinct biophysical differences between the two regions resulting in Emmaus being wetter and hotter than Thaba Nchu. Emmaus and Thaba Nchu also share a similar political history of being part of the then KwaZulu and Bophuthatswana homelands. However, the regions have distinct socio-economic landscapes. Emmaus is remote, with the closest urban centres located in Winterton (25 km away) and Bergville (29 km) and the nearest city, Pietermaritzburg, 129 km away. In this region, livelihoods are primarily supported by remittances from migrant labour. By contrast, the Thaba Nchu region is closer to major urban centres (63 km to Bloemfontein city and 28 km to Thaba Nchu town). The daily commute to these centres forms part of livelihood portfolios in this region.

A starting point of this research was to, through a systematic review, compile empirical data that can be used to describe and analyse the productivity and constraints of small-scale farming systems. The findings of this review, presented in Chapter 2, highlighted that the low productivity of small-scale farming systems cannot be solely ascribed to biophysical constraints. We found that the main constraints arise at farm and regional level, and as such, intervention strategies should not be solely sought at field scale, which seems to be the norm. The chapter also found that, while the prospects of small-scale farming may seem gloomy at first glance, opportunities such as investing in horticulture, do exist. However, prospects of

such opportunities appeared to be limited by the country's competitive and thriving large-scale farming that saturates most agricultural markets. A key conclusion from the review was that the evidence base on small-scale farming systems in South Africa is incomplete. Notably, the review found the contribution of small-scale farming systems towards rural livelihoods to be poorly understood. As such, this became the focus of the next chapter.

To probe the contribution of farming to rural livelihoods, we framed a broad question, can small-scale farming systems serve as an engine of economic development in the former homelands of South Africa? To answer this question, a rural household multi-indicator survey (RHoMIS) data from 57 households in Emmaus and 75 households in Thaba Nchu was used to calculate indicators of food and nutrition security as well as income were calculated. These results were used to determine the relative contributions of on-farm versus off-farm sources towards household welfare. Results revealed stark differences at household and regional levels regarding the contribution of crops versus livestock toward household welfare. This was demonstrated by more reliance on arable farming in Emmaus, unlike Thaba Nchu, where nearby cities allowed diversification of income portfolios. In both regions, consumption of on-farm produce did not guarantee nutrition and food security. More than half of the households fell in the "low" (<1,500 kcal MAE^{-1} day^{-1}) potential food availability (PFA) category. In Thaba Nchu, livestock sales had a more prominent contribution to PFA than in Emmaus. However, livestock consumption provided minimal contributions toward PFA in both regions.

When we compared the total income against our calculated living income benchmark, the South African poverty line, and the international poverty line, we found that most households were below these poverty benchmarks and that, at best, only a third could meet the international poverty line, mindful of the social security grant that many households received but were often not reported. Additionally, only households relying strongly on off-farm sources could surpass the living income threshold. Our results demonstrated that off-farm sources contributed more to household welfare than on-farm production. While the potential for small-scale farming to serve as engine of economic development in these regions appeared limited, some households obtained substantial incomes from farming and appeared able to invest in intensifying production and generate a more substantial portion of their livelihoods through farming. The question was then, do these households also see farming in this light and do they aspire to farm? Aspirations of rural farming households then became my focus for the next study (Chapter 4).

In Chapter 4, we zoomed in on a subset of the farming households (from Chapter 3) in the two regions to explain the positionality of small-scale farming in future rural livelihoods. The

subset was purposefully selected using the PFA indicator to have a representative sample of all PFA classes (classified as Low (<1500); Medium (between 1500 – 4000) and High (>4000) kcal MAE^{-1} day^{-1}) in each region. PFA was deemed a more reliable indicator than household income to group the households according to the contribution from both off-farm and on-farm sources to household welfare and food security. The chapter employed a range of qualitative methods (observations, life histories, in-depth interviews, and mapping exercises) to explore the extent to which farming features in future rural livelihoods. While the concept of aspirations proved challenging for our interviewees to engage with, we received diverse responses from which it was apparent that only a few people aspire to farm. This finding highlighted a mismatch between people's low regard for farming as a livelihood strategy, whilst rural development policies hinge on farming as the anchor of thriving rural livelihoods.

Although most households in our study seem to have little potential (Chapter 3) or interest (Chapter 4) to develop into small- to medium-scale commercially oriented producers, some farmers did obtain substantial incomes from farming activities and appear able to invest in intensifying production. However, it was unclear how, under what context, and which agricultural interventions may suit such farmers. Hence, we integrated the outcomes of the preceding chapters (Chapters 2 to 4) to explore scenarios in which small-scale farming systems in the two former homelands may be sustainable, profitable, and attractive to those who want to farm. This chapter employed participatory scenario analysis to design farming systems - accounting for biophysical limitations in the respective regions and farmers' aspirations - that could increase the contribution of farming to rural livelihoods at the village level. A two-step approach was used: a desktop approach through which alternative prospective small-scale farming systems were proposed and a participatory approach allowing an evaluation of the proposed systems.

We found that, from an economic perspective with all our underlying assumptions, a broiler system (raising day-old chicks to slaughter size) had the highest potential contribution - among the proposed systems - to rural households in Emmaus. However, two interesting alternatives in Emmaus were a perennial system (producing lucerne bales) and an agroforestry system (macadamia nuts). While the cost-benefit analysis of the proposed system indicated a potential monetary contribution of small-scale farming to rural livelihoods at the regional level, the likelihood of realising that contribution was limited by internal community conflicts over the use of common property resources and past experiences with disfunctional cooperatives in Thaba Nchu. In Emmaus, the economic potential of small-scale farming was further

constrained by the preferential allocation of land to staple crops over cash crops. Therefore, we concluded that addressing the issues around the management of common property resources and disfunctional cooperatives is a pressing condition for small-scale farming interventions.

Given the centrality of small-scale farming to hunger and poverty alleviation policies of the country, we conclude that it is important to step back and question whether the answers for thriving rural livelihoods in the former homelands truly rest within small-scale farming. While small-scale farming systems have the potential to make a sizeable contribution to rural livelihoods, our findings have demonstrated that these systems should be framed as a complementary part of a broader rural livelihood strategy as people want to also grow some of their own food. Therefore, crop production and animal keeping will remain a livelihood activity for some households. General improvements to the management of existing extensive systems may be seen as the 'low-hanging fruit.' However, such efforts would not provide the production outputs required to derive thriving rural livelihoods. Therefore, developing skills needed to succeed in the modern economy needs more emphasis and attention than agrarian reform in South Africa.

Acknowledgements

"Montsamaisa bosigo ke mo leboga bo sele" Bosele bagaetsho!

Dumelang! If you have had the opportunity to glance through my thesis, you would have picked up that I am a firm believer in "perspectives" and how they differ in both "dimension" and "time". Several communities of families, friends, and colleagues impacted different dimensions of who I am. It is from the privilege of several encounters with all these communities that the journey of my life led to this beautiful pitstop.

Neokie: Mosetsanyana wa Motswana

I am the woman I am because of the men and women who nurtured me. An unwavering appreciation to my mother, Osinogeng Goiwakae, for all your love that shielded me from the ills of life. You have set the stage on which I confidently walk! My sister Moleboge Thabalaka and my late grandmothers (Ohaletse Mokgadi, Segametsi Thabalaka, and Francina Goiwakae) were always in your corner and I remain grateful to them. To the men (My fathers, Gosenkamang Goiwakae and Lehatshe Thabalaka; my brother - Thapelo Goiwakae, and all my uncles) who kept the fire burning for my next cup of coffee, thank you all. A special thank you to Si Kgalalelo from P.H. Moeketsi Agricultural High School for exceeding her call of duty to help me secure funding for my first degree. That was the step without which this would not have been possible, a gateway to my university life.

Neo: A Soetdoring damme

In addition to the academics, my residency in Huis Soetdoring at the University of the Free State (UFS) was marked by learning and exposure to multiple facets of life from which I developed my fluency in other official languages of South Africa (I am pretty fluent in 7 of the 12 now 😊) and forged a lifetime friendship with Lehlogonolo Chiloane. Hlogi, words alone will never be enough, so I pray for a life where you and I remain together long enough for you to at least experience my love for you. While I found a spiritual refuge with the Association of Catholic Tertiary Students (ACTS Free State), I also met my boyfriend, Lebo, who, among many other things, supported my, at the time, unrealistic plan of studying until I complete my Ph.D. If only you were here to see it, but don't worry, those who came after you saw the dream through. You should be proud!

MaToka: Ngoetsi ea Bataung

As my family would tease me, my every degree has a child attached to it, and we have my husband (Lebohang Mathinya) to thank for that. In addition to your role as my husband and father to our children, you have been my biggest cheerleader, and my mother has no regret for entrusting my care to you. You gave me another set of parents without whom I couldn't have made it to this glorious pitstop. Thank you, mma le papa (Matumane and Teboho Mathinya), for your endless support. I could do what needed to be done and be wherever I needed to be for however long it required without worrying about my people. Your role in this achievement is unsurmountable, *kea leboha*. Of course, you had help from my brother and sister (Tumelo and Mantoa Mathinya), who joyfully listened to all my office talk and shared in my small achievements along the way, took time to read and share articles and even spared some time and effort for my relatively slow sense of humour.

Ms Mathinya: SCCS Lecturer

I have been and continue to both a student and lecturer in the Department of Soil, Crop, and Climate Sciences (SCCS) at UFS. My lecturers became my colleagues in 2016 and openly welcomed me as such. Since then, I have continued to learn the ropes from them while pursuing my final degree, and in both attempts, I have enjoyed their unwavering support. A warm and heartfelt thank you to Prof. Leon van Rensburg for recognizing and grooming the academic in me. Thank you to all my colleagues at SCCS for always having my back. A special thanks to ntate Elias, George, Bello, Tfwala, Tshabalala, Barnard, Dlamini, Palo and Mc Lean for the wonderful learning experiences I have shared with them. To all the students who have been through my soil science classes, you have challenged me to be better and do better, and I can only hope that I have inspired you enough to see through what you start sustainably, as we have learned in class.

My heartfelt gratitude to my line manager Prof Linus Franke for believing in me and acting on that belief by sending me through to a course (Farming Systems and Rural Livelihoods: pathways to Sustainable Development, 2018) in Uganda, during which I formalised my transition into the next phase of my academic life.

Neo Mathinya: PhD candidate at Wageningen University and Research

In Uganda, I met several people who would become instrumental in my PhD journey. Firstly, there was the intimidating (both literally and figuratively) Ken Giller I had read about and wanted to meet for a while. It has been an honour ntate Ken.

Gerrie, you have kept me and my numbers in check from the first day to the last. Thank you for your meticulous supervision. You somehow managed to keep that going while maintaining a genuine interest in my social life, which I sometimes turn to overshare.

To Jens and Rosa, you can be proud of this half-baked social scientist wanna-be that I have become. Because of you guys, I can give my fellow researchers in the 'soft sciences' a run for their money. Thank you.

My research would not have been possible without all my participants and their families. Thank you for welcoming me into your homes and investing your time in this research. I am grateful to Mahlathini organization and the Free State Department of Agriculture, as well as the tribal authorities in both regions, for their active role as gatekeepers. Tshiamo, Phahlakazi, Cappi, Mlindi, Hlengiwe, Bab' Madondo, Thomas, Sam, and Jim, thank you all for assisting with my data collection and/or analysis.

A special word of thanks to the UFS and WUR for all the logistical arrangements throughout this journey. Additionally, I am grateful to the libraries at both these institutions for providing access to the required learning materials. Thanks to the support staff at WUR and UFS, julle was altyd op it, dankie mense! These include but are not limited to Rida, Debre, Nozi, Karen, Linda, Lize, Marcel, and Irma.

To all my friends (Linda, Eva, Kelebogile, Makhosazana, Glory, Edgar, Tshabang, and *Malinga: may your soul rest in peace*) who made this journey lighter in their own ways, thank you guys. To my fellow PhDs: Durk, Paul, Wilson, Deo-Gratias, Rika, Danny, Arouna, Marius, Gildas, and Hannington, thank you for the joyful ride.

I express my gratitude to the entire community at PPS and at SCCS. I sincerely thank the PE&RC graduate school for organizing well-interactive weekends and training. Lennart and Claudius, thank you very much for your support. All participants of the courses Farming Systems and Rural Livelihoods in Uganda (2018) and Land Dynamics in an Era of Change in South Africa (2023) for challenging me intellectually while sparing a few minutes for genuine laughter and taking cool photos with each other.

To the following families and friends: the Cloetes, Smiths, Sibizos, Thabanas, le baha Tau, mamane Naledi le mamane Botho, thank you for stepping up to minimise the impact of my absence on my people.

To all the reviewers of our published papers for scrutinizing our work to ensure that what I shared with the world was up to par, thank you. Similarly, I am thankful to my opponents for ensuring that the last hurdle of my PhD is intellectually stimulating and worth the wait.

To those who took care of my physical (Dr. Kleyn at Kovsie Health and the friendly staff at Clicks Mimosa Mall pharmacy) and spiritual (Sacred Heart Cathedral in Bloemfontein and the International Catholic Community (ICC) at the Sint Johannes de Doper parish in Wageningen, Netherlands) health, thank you for keeping me together to see the journey through.

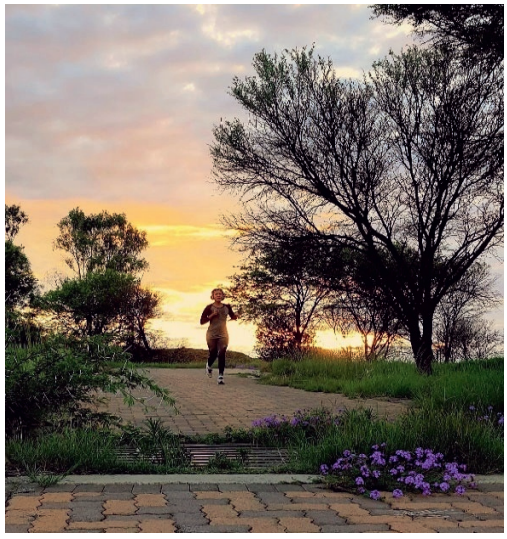
In the end, I sincerely thank my paranymphs, Eva and Paul. Not only did you make my experience of the Dutch culture exciting, but you also provided me with constant support. *Bedankt!*

Thank you all for your contributions which have carried me through this journey.

All things purple and more

Tom Tom, Girla le Onzie, thank you for the random "*mama o smart*", and "*kea o rata mama*" and your unexpected words of encouragement, " *o mamele teacher oa hao mama*". You have kept my cup full, and I remain eternally grateful for the gift of you guys. "…*re mmoho*"!

To my person, thank you once more for all things purple and more. You have delivered in style. *Thata tota!*



About the author

Virginia Neo Mathinya (a.k.a. MaToka) was born on the 04th of December 1991 in Taung, in the North West province of South Africa. She grew up in a small village named Norlim, where she attended Lekwene Primary School and Pelotshweu Secondary School before completing her basic education at PH Moeketsi Agricultural High School in Taung. It was at this school that she first had the thought of studying towards a PhD someday. In 2010 she enrolled at the University of the Free State (UFS) for a B.Sc. Agric. majoring in Agronomy and Soil Science. At the completion of the B.Sc., she enrolled for B.Sc. Agric. Hons. in Soil Science, where she worked under the supervision of Prof. L.D. van Rensburg who further encouraged her to enrol for a M.Sc. in Soil Science. In 2016, she joined the UFS as a Junior Lecturer in the department of Soil, Crop and Climate Sciences.

With the completion of her M.Sc. eminent, she took a people-centric approach to her research interest in soil science going forward. In 2018, her new line manager suggested that she attend a course: *Farming Systems and Rural Livelihoods in Uganda (2018)*. It was at this course that she committed and redirected her research interest toward a holistic approach to farming and, more especially, to sustainable development and resource use in small-scale farming. In 2019, she enrolled in the PhD program at the Plant Production Systems Group (PPS) at Wageningen University and Research. Neo enjoyed the different academic culture at PPS so much that she envisioned replicating the same atmosphere at the UFS, where, as a lecturer, she took on the role of "Postgraduate Student Community Coordinator". When she's not worried about deadlines and students or where and when the next race is, with a cup of coffee in her hand, MaToka enjoys her life with Lebohang and their three blessings Toka, Bohlokoa and Selekane.

List of publications

Articles published in scientific journals:

VN Mathinya, LD van Rensburg, SSW Mavimbela, JH Barnard (2019). Malt barley (Hordeum vulgare L.) water use and grain yield response to saline irrigation under shallow groundwater table conditions: *Irrigation and Drainage* 68 (5), 867-880

VN Mathinya, JH Barnard, ZA Bello, E van der Watt (2021). Response of malt barley grain quality characteristics to increasing irrigation water salinity: *South African Journal of Plant and Soil* 38 (2), 159-170

VN Mathinya, AC Franke, GWJ Van De Ven, KE Giller (2022). Productivity and constraints of small-scale crop farming in the summer rainfall region of South Africa: *Outlook on Agriculture* 51 (2), 139-154

VN Mathinya, AC Franke, GWJ van de Ven, KE Giller (2023). Can small-scale farming systems serve as an economic engine in the former homelands of South Africa? *Frontiers in Sustainable Food Systems* 7, 1222120

Book chapter(s):

NV Mathinya, VR Clark, JJ van Tol, AC Franke: Resilience and Sustainability of the Maloti-Drakensberg Mountain System: A Case Study on the Upper uThukela Catchment: IN: Human-Nature Interactions: Exploring Nature's Values Across Landscapes, 155-167

Manuscripts submitted for peer review:

Mathinya, V.N. Living income benchmark of rural households in South Africa. Submitted

Mathinya, V.N., Molomo, M.L. Distribution and redistribution of salt ions in saline soils with shallow groundwater tables. Under revision at Water SA. Manuscript no: *Water SA* 4089

PE&RC Training and Education Statement

With the training and education activities listed below the PhD candidate has complied with the requirements set by the C.T. de Wit Graduate School for Production Ecology and Resource Conservation (PE&RC) which comprises of a minimum total of 32 ECTS (= 22 weeks of activities)

Review/project proposal (9 ECTS)

- Productivity and constraints of small-scale crop farming in the summer rainfall region of South Africa

Post-graduate courses (6.6 ECTS)

- Farming systems and rural livelihoods: pathways to sustainable development; PE&RC (2019)
- Introduction to R for statistical analysis; PE&RC (2019)
- Land dynamics in an era of change: learning from the past to face the future; PE&RC (2023)

Invited review of journal manuscripts (3 ECTS)

- Development Southern Africa: a typology of emerging farmers in two rural provinces of South Africa (2020)
- Land Degradation and Development: effects of water deficit level and irrigation method on soil salt balance and highland barley (*Hordeum vulgare L.*) yield in the oasis of Arid Inland Basin, northwest China (2021)
- Global Food Security: the nutritional feed gap: a review of seasonal variation in ruminant forage availability and quality in Southern Africa (2024)

Competence, skills and career-oriented activities (2.1 ECTS)

- Project and time management; WGS (2019)
- Searching and organizing literature; WGS (2019)

Scientific integrity/ethics in science activities (0.3 ECTS)

- Ethics in plant and environmental sciences (2019)

PE&RC Annual meetings, seminars and PE&RC weekend/retreat (0.9 ECTS)

- PE&RC Weekend for first years (2019)

Discussion groups/local seminars or scientific meetings (8.5 ECTS)

- Global symposium on salt-affected soils (2021)
- Qualitative methodologies (2021-2023)
- The future of small-holder farming in South Africa (2022)
- Sustainable intensification of agricultural systems (2022-2023)

International symposia, workshops and conferences (2.5 ECTS)

- Southern African mountain conference; KwaZulu Natal, South Africa (2022)

BSc/MSc thesis supervision (6 ECTS)

- Characterization of small-holder farmers in the former homelands of South Africa to explore the adoption of sustainable intensification practices (2021)
- Food security and poverty in rural areas: evaluating the contribution of small-scale agricultural production towards improved food security in Thaba Nchu, Free State province (2022)

Funding statement

The Research Directorate, Faculty of Natural and Agricultural Sciences and the Department of Soil, Crop and Climate Science at the University of the Free State in collaboration with the Department of Higher Education and Training through the new Generation of Academics Programme (nGAP), all contributed financially to the research activities undertaken for this thesis.

Financial support from Wageningen University for printing this thesis is wholeheartedly acknowledged.