

**-A SOCIAL REALIST ACCOUNT OF THE WAY SMALLHOLDER FARMERS
EXERCISED THEIR AGENCY IN THE ADOPTION OF CLIMATE-SMART
AGRICULTURE PRACTICES IN DEGRADED LANDSCAPES IN MACHUBENI,
EASTERN CAPE, SOUTH AFRICA**

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Declaration

I, **Idah Mbengo**, declare that this thesis is my original work, has not been submitted for any degree or examination at any other university and that the sources I have used are fully acknowledged by referencing. The thesis is submitted in fulfilment of the requirements for a PhD in Environmental Science in the Faculty of Science at Rhodes University, South Africa.

Signature

Date

Dedication

I dedicate this thesis to my dear and loving late son, Farai Mbengo, an academic who inspired this journey, and to my husband, Jabulani Mbengo, my dedicated farmer.

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Abstract

Over the last two decades, climate-smart agriculture (CSA) has been promoted as a way to address the challenges of climate change for smallholder farmers' productivity, food security and livelihoods. Given concerns about climate change, many studies have contributed to developing an understanding of resilience building and crop and livestock systems adaptation. Despite evidence of the effectiveness of CSA practices, several studies report on their limited uptake by farmers involved in various projects. The reasons for low rates of adoption remain unclear.

In this context, the study on which this thesis is based drew on Bhaskar's critical realism and Archer's social realism to explore the way smallholder farmers in five villages in a rural area in South Africa were enabled and constrained as they exercised their agency in a project intended to introduce them to CSA practices. The study was not about adaptation and resilience building *per se* but rather, following Bhaskar and Archer, sought to identify the generative mechanisms enabling and constraining the adoption of CSA practices.

Bhaskar's critical realism posits a view of reality as layered. The topmost layer of reality is the Empirical. This consists of observations and experiences of the world around us and is understood to be relative. The second layer, the Actual, is the layer of events from which observations and experiences located at the level of the Empirical emerge. Events at the level of the Actual and experiences and observations at the level of the Empirical emerge from an interplay of mechanisms at the deepest layer of reality identified by Bhaskar, as the Real. In positing a layered ontology, critical realism allows for the relativity of experiences and observations while, at the same time, acknowledging the reality of structures and mechanisms, which cannot be directly observed but nonetheless exist.

Archer's work on agency accords personal powers and properties (PEPs) to all individuals. Although all individuals have the power to act in relation to the world around them, they are nonetheless conditioned by their previous histories and experiences as they do so. As individuals set about exercising their agency, they are enabled or constrained by structures and mechanisms in two domains at the level of the Real which are understood to possess their own powers and properties: the structural domain and the cultural domain.

In addition to drawing on Archer's conceptualisation of the interaction between agency, structure and culture, the study also uses her "morphogenetic framework" which allows for the identification of 'whose conceptual shifts are responsible for which structural changes, when, where and under what conditions' (Archer, 1998: 361) and for understanding change as a series of never-ending cycles. The first phase of Archer's morphogenetic framework, entitled T₁, involves social and cultural conditioning. In the study, T₁ was understood to be the time until 2017 when the project on which the study focused began. The second phase, T₂ to T₃, is the phase of social and cultural interaction as agents exercise their PEPs to pursue concerns they have identified for themselves and encounter structural emergent powers and properties (SEPs) and cultural emergent powers and properties (CEPs) of mechanisms located in the domains of structure and culture as they do so. The final phase of the framework, T₄, allows for an evaluation of what has changed and what has not changed.

My claim is that the uptake of CSA practices is impacted by different forms of consciousness or ways of experiencing the world, which is the result of the social and cultural conditioning of different groups involved in the project at T₁, and clashes between them. The use of the framework drawing on critical realism and social realism allowed for the identification of these different forms of consciousness in different social groups (project facilitators, elderly farmers and the youth). These different forms of consciousness were understood to condition the agency of the three groups and thus enable or constrain the introduction of CSA practices and how they were taken up.

Elderly women in the project had been conditioned to be caregivers and to see their roles tending kitchen gardens as part of their identity. This consciousness led to the uptake of CSA practices in their home gardens. By contrast, young people engaged with the project shared a very different way of experiencing the world. They were better educated and had been socialised into using social media and watching films on electronic devices from a young age. As a result, they valued the role of money in accessing consumer goods and the good life and thus valued paid employment rather than working on the land to provide subsistence. This led to a limited uptake of CSA practices. It is envisaged that insights from the study will offer new ways of understanding what might otherwise be seen as resistance to adopting CSA practices as well as new ways of engaging with

different groups of agents involved in projects in the future. The study demonstrates the explanatory power of critical realism and social realism to analyse a climate change adaptation project.

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List of Acronyms/Abbreviation

BTO	Back to Office
CA	Conservation agriculture
CEP	Cultural emergent powers and properties
CLO	Community Liaison Officer
CSA	Climate-smart agriculture
DEAT	Department of Environmental Affairs and Tourism
DES	Department of Environmental Science
DoA	Department of Agriculture
DRDAR	Department for Rural Development Agricultural Reform
EPWP	Expanded Public Works Programme
ESE	Environment and sustainability education
ETD	Electronic theses and dissertations
FAO	Food and Agriculture Organization
GEF	Global Environmental Facility
GIZ	Gesellschaft für Internationale Zusammenarbeit
IEMP	International Ecosystem Management Partnership
ILA	Integrated Landscape Approaches
ILM	Integrated land management
IPCC	Intergovernmental Panel on Climate Change
LA	Landscape approaches
LCA	Land Conservation Activist
LR	Land Rehabilitation
MNI	Meat Naturally Initiative

MNP	Meat Naturally Pty
MSF	Multi-stakeholder forum
NGO	Non-governmental organisation
PEP(s)	Personal emergent powers and properties
PES	Payment for ecosystems
RU	Rhodes University
SAI	Sustainable Agriculture Intensification
SDG	Sustainable development goal
SEP	Structural emergent powers and properties
SES	Social-ecological systems
SLM	Sustainable land management
SRP	Social responsibility programmes
UNEP	United Nations Environment Programme

CHAPTER ONE: BACKGROUND AND HISTORICAL CONTEXT

1.1 Introduction

Climate change and variability are with us and will increasingly negatively impact vulnerable African populations. About 2.5 billion of the world's poorest people live on small farms and depend on agriculture for food security and livelihood (Food and Agriculture Organization (FAO), 2013; Muzorewa & Chitakira, 2022a). Climate change impacts the rural communities that rely on rainfed agriculture. The inhabitants of Africa, including South Africa, depend on rainfed agriculture and have limited ability to address climate shocks, trends and seasonality (Totin et al., 2018). The sixth Intergovernmental Panel on Climate Change (IPCC) 2021 assessment report confirms the probability of heat extremes and increases in the frequency and intensity of drought in Southern Africa. It is reported that about 26% of South African households have inadequate food security (Misselhorn & Hendriks, 2017; Stats SA, 2015; 2023). Climate change makes the situation worse for smallholder farmers in productive but degraded land in South Africa. Climate change threatens the degraded landscape's agricultural productivity, food security, livelihoods and other natural resources (Diko et al., 2021).

Against this backdrop, agricultural innovations such as Climate-Smart Agriculture (CSA) have been promoted as a remedy for smallholder farmers' productivity and food security challenges, reducing poverty and building smallholder farmers' resilience against the impacts of climate change (Campbell et al., 2014; FAO, 2013; Mutengwa et al., 2023). The CSA approach emphasises that farmers can recontextualise agricultural practices and policies already in use (Lipper et al., 2014). The CSA has three aims: i) sustainably increasing agricultural productivity and incomes, ii) adapting and building resilience to climate change, and iii) reducing or removing greenhouse gas emissions (Campbell et al., 2014; Lipper et al., 2014; Lipper et al., 2018). According to Brown et al. (2017a), conservation agriculture (CA) principles underpin CSA and Sustainable Agriculture Intensification. The three CA principles are the simultaneous application of: i) minimum soil disturbance, ii) crop rotation/diversification, and iii) permanent soil cover. These underpin techniques such as agroforestry and mulching (FAO, 2013; Makate et al., 2019a).

Further, climate shocks are affecting soils, the backbone of farming communities (Mogaka et al., 2021). Therefore, because of the highly degraded lands in the areas in which the study was sited, the adoption of CSA draws on sustainable land management (SLM) stewardship concepts. SLM refers to soil, land and water conservation practices to improve rangeland (Chirwa & Mahamane, 2017; Etsay et al., 2019). Soil degradation is the main issue, depleting the soil's ability to stimulate yield (Oduniyi et al., 2022). This longitudinal time series review of the literature on adaptation and resilience building above indicates that CSA is not a new concept but combines previously existing ideas such as CA and recent developments in agricultural systems (Lee & Gambiza, 2022; Scherr et al., 2012).

Therefore, in this thesis, CSA is used as an umbrella term for amalgamating biophysical principles, embracing a range of other farming practices. It is an integrated approach of a composite of crop and livestock husbandry interventions that help rural smallholder farmers to adapt current cropping and livestock farming systems (Döbert et al., 2021) to changing climatic conditions, leading to improved drought risks and management of erratic rainfall (Diko et al., 2021). CSA is a term that was coined in 2009 to promote a range of sustainable agricultural intensification practices in an FAO publication (Mann et al., 2009). The concept of CSA means different things to different scholars, resulting in the idea being criticised, sometimes unjustly (Saj et al., 2017). Hence, there is a need to clarify what the concept means. In light of these developments over time, CSA in this study refers firstly to reorientating the existing agricultural systems, namely crop and livestock systems and ecosystem rehabilitation, to enhance adaptation to global climate change's impact on agroecologically degraded landscapes. Secondly, the CSA practices and discourses are situated in the global sustainable development movement, elaborated on later in Section 1.3.

1.2 Global and South African Contexts

The CA principles originated in the 1930s as a response to managing prairie dust bowls, or the experience of desertification in North America (Swaminathan et al., 2022). They later resurfaced in the 1980s in South America and Australia in response to ravaging drought events. The main reason for the adoption of CA principles in Australia was water conservation (Baudron et al., 2015). In North America, the concept of no-tillage started in the 1960s and reached Brazil in the 1970s (Swaminathan et al., 2022). The CA principles evolved from no-tillage to minimum tillage,

mulching, crop rotation, mixed crop and livestock and agroforestry farming to enhance soil fertility (FAO, 2011a; 2011b). The adoption of CA principles is considered a paradigm shift in agriculture in the 21st century that answers human-induced land degradation, climate change and variability challenges. For these reasons, agricultural intensification innovations such as CSA embedded the CA principles (Pretty & Bharucha, 2014).

The CSA interventions are assumed to be effective in enhancing productivity, reducing the environmental impact of crop production and enhancing food system resilience in North America and Canada, and in South American countries such as Brazil and Bolivia (Bailey & Buck, 2016; Jacobi et al., 2018) and Australia (Llewellyn et al., 2012). As a result of these global successes, CSA has been introduced in Africa as a pathway allowing smallholder farmers to address climate change impacts on livelihood and income (Mutengwa et al., 2023; Ogunyiola et al., 2022; Pretty & Bharucha, 2014).

Over the past decades a great deal of research effort has focused on externally designed implementation and adaptation intervention strategies introduced by the government and non-governmental organisations (Hengsdijk & Verhagen, 2013; Kidane et al., 2019; Swanepoel et al., 2018; Van Staden, 2018). The assumption made by most of these studies is that, if CSA is introduced to smallholder farmers, they will adopt the practices associated with it, and thus increase yields and income, improve soil fertility and conserve water. The studies assume a cause/effect relationship, typically associated with positivism, between introducing practices to farmers and the outcomes observed and measured (Oduniyi et al., 2022; Siziba et al., 2019). Many studies related to CSA focus on the measurement of adaptive capacity (Wilk et al., 2013), increased productivity and yields (Kiwia et al., 2019; Mazvimavi, 2011) and improved livelihoods and income (Oduniyi et al., 2022). Other studies focus on barriers and enablers (Grabowski & Kerr, 2014; Rusere et al., 2019; Senyolo et al., 2018). In short, most studies focus on agronomic aspects, productivity and the socioeconomic drivers of adoption (Brown et al., 2017b). Over decades, the tendency has been to base agroecological and socioeconomic assessments on predetermined variables and statistical analysis (Brown et al., 2017a). The variables have included age, gender, education, income, household characteristics as well as yields from different crops, including

maize, sorghum, finger millet and legumes. These studies have contributed immensely to valuable knowledge of physical efficacy, building resilience and crop and livestock systems adaptation.

Despite its demonstrated effectiveness, the rate of adoption of CSA remains low in Africa (Baudron et al., 2015; Giller et al., 2009; Hermans et al., 2020; Lee & Thierfelder, 2017; Makate et al., 2019a; Mutengwa et al., 2023; Nciizah & Wakindiki, 2015; Nyagumbo et al., 2017), as compared to other developing countries such as Brazil and Argentina. Evidence in Southern Africa indicates that science and new agricultural technology are not necessarily implemented in a linear manner (Hermans et al., 2021b). Similarly, in South Africa, although there is awareness of the benefits of CSA, the enablers and constraints of CSA adoption by smallholder farmers are not clear (Abegunde et al., 2020; Molieleng et al., 2021; Obi & Maya, 2021). The next section discusses the background of the project from which this thesis explores CSA adoption, adaptation and resilience building.

1.3 Background of the Project

This section describes the project I joined in 2020, as I was interested in the strategies smallholder farmers used to adapt to climate change. In 2014, funding was received from the United Nations Development Program Global Environment Facility (UNDP GEF) and co-funding from the South African government for the United Nations Development Programme Global Environment Facility 5-year Sustainable Land Management (UNDP GEF 5 to support the SLM) project. The project title was ‘Securing multiple ecosystems benefit through SLM in the productive but degraded landscapes of South Africa’. The first three years were focused on procurement, so implementation of the project began in 2017. This thesis refers to the UNDP GEF 5 SLM project as “the project”.

The project's conceptualisation drew on the global discourses promoting a green economy (United Nations Environment Programme (UNEP) 2011; United Nations, 2015a). The South Africa National Development Plan 2030 (National Planning Commission, 2012) prioritises land reform and the development of structures to pursue a green economy. South Africa's primary approach is to adapt to the impact of climate change, strengthening national resilience through creating employment and enhancing the integrity of ecosystems. The project was anchored in global discourses stressing the need to transform the brown economy dependent on environmentally

destructive activities into a green economy that reduces carbon emission and pollution, enhances energy and resource use efficiency, and prevents the loss of biodiversity and ecosystem services (UNEP, 2011). To achieve the outcome of pursuing a green economy, the project drew on discourses prioritising the need to reduce land degradation and the loss of ecosystems in South Africa.

Over 80% of South Africa's land (12.76 million ha) is used for commercial agriculture and subsistence livelihoods (Goldblatt, 2011). The majority, 69% of the 12.76 million ha, is used for grazing, and 11% of 12.76 million has arable potential (Goldblatt, 2011). Livestock herding is a dominant practice in rural land use. According to the UNEP (2011) and the International Monetary Fund (IMF) (2012), 50% of South Africa's population is dependent on agriculture, and 36.2% of those dependent on agriculture are aged between 18 and 36 years (Stats SA, 2016).

According to the UNEP (1997), 60% of South Africa is degraded, while Hoffman and Ashwell (2001) estimate that 91% is prone to desertification (Mani et al., 2021). Socio-cultural activities may lead to land degradation. These include unsustainable crop cultivation and livestock management practices. Approximately six million people depend on the agricultural sector, nearly a million as farm workers on commercial land, while the smallholder agriculture sector employs 1.3 million people (Department of Environmental Affairs and Tourism [DEAT], 2016). These circumstances led to discourses prioritising the need to reduce land degradation to improve livelihoods in South Africa. Therefore, the project aimed at reducing land degradation through SLM mechanisms for ensuring ecosystem integrity, continued productivity and sustaining livelihoods.

The project outcomes in the Eastern Cape were: i) to enhance the capacity of government institutions and local communities to mainstream SLM, ii) to implement climate-smart ecosystems rehabilitation and management measures at government, institutional and local levels, and iii) to develop a financial and governance framework to support the adoption of the SLM approaches. The project focused on transformation through interaction with SLM and climate-smart innovations. This thesis explored the implementation of climate-smart ecosystems and resilience building at the local level within the larger project. The thesis, though small-scale, addresses the global policy agenda of the Sustainable Development Goals (SDGs) (United Nations, 2015a). The

four categories addressed through climate-smart farming practices are SDG 1: end poverty in all forms; SDG 2: end hunger through food security, improved nutrition and sustainable agriculture; SDG 3: ensure good health and well-being and SDG 13: climate change action. Overall, the study addresses SDG 13, climate change adaptations on a local scale (United Nations, 2015a; 2015b).

A team from Rhodes University (RU) was selected to implement the project in the Eastern Cape. The RU project team is referred to in this thesis as the “RU team”, the “project team” or “implementers”.

1.4 Statement of the Problem

In the context of the concerns on the limited uptake of CSA and sustainability in Africa, research on the ways farmers engage with its practices has increased. A seminary paper by Giller et al. (2009) have divided the CSA sustainability debate into proponents and opponents. Another study (Whitfield, 2015) has argued that the scope for smallholder farmers to adopt CSA practices is related to the introduction of alternative narratives in a wide range of settings. In addition, they also claim that African adaptation policies and interventions privilege certain forms of knowledge such as water conservation, and food security. Excluded narratives include little understood implications of soil stability and water in different agroecological regions and lack of understanding of socioeconomic, cultural and political drivers of food insecurity (Whitfield et al., 2015). Increasingly, studies acknowledge that agroecological and socioeconomic analysis cannot address questions about why and how the uptake of agricultural innovations by smallholder farmers is limited. Understandings of the reasons for the low adoption of agricultural innovations thus remain elusive (Brown et al., 2017a; Brown et al., 2020; Glover et al., 2016).

As indicated earlier, although studies have contributed to knowledge on the use of CSA to build resilience and adaptation, I argue they have portrayed the local rural communities, especially smallholder farmers, as passive recipients; that is, as people without the power of agency or a sense of initiative to respond to climate change in their unique situations using their own material and knowledge resources. Agency refers to the ability to act and do things. The role of smallholder farmers' agency in the adoption of CSA practices in a wide range of conditions and contexts has

received little attention in the literature thus far. In short, literature has paid little attention to local people's participation in shaping discourse on climate change and practices associated with it.

Furthermore, concern with the efficacy and achievements of wide-scale intervention programmes has largely ignored the need to investigate and document the unique underlying processes and mechanisms underpinning smallholder farmers' engagement with externally designed agricultural interventions at local levels. As smallholder farmers engage with intervention programmes and adopt the practices they introduce, they draw on profound local knowledge which often does not find its way into mainstream climate change adaptation literature. This creates a fundamental knowledge gap. Unless this knowledge gap is filled, climate change adaptation literature in South Africa will remain skewed, overlooking local initiatives and farmers' agency in climate change adaptation. The study aimed to fill this research gap by surfacing smallholder farmers' decisions on the adoption continuum of adoption, dis-adoption and non-adoption.

In addition, Vincent and Cundill (2021) noted a gap in integrating epistemology and theoretical underpinnings in adaptation research in the Global South. I concur with Vincent and Cundill (2021), that few studies have focused on smallholder farmers' ontology and epistemology (see also Bhatasara, 2015; Dirwai, 2020; Nciizah, 2019). In response, this study drew on Bhaskar's critical realism (1978, 1979, 2016) as the philosophy underpinning Archer's (1995, 1996, 2000) social realism to provide an understanding of the complexities surrounding the uncertainty of the adoption of CSA and its sustainability in South Africa. The critical realist philosophical lens allowed me to reposition both the ontology (nature of being) and epistemology (ways of knowing) of climate change innovation adaptation and resilience within local knowledge systems and initiatives. Critical realism provided theoretical guidance for the study and the interpretation of alternative climate change adaptation initiatives including those implemented by local less-educated resource-poor smallholder farmers in South Africa.

Archer's (1995, 1996) morphogenetic framework provided a means of describing change over time. The study went beyond the Empirical level of interpreting climate change adaptation (i.e. what has been done) to investigate the underlying mechanisms and conditions that enabled local communities to initiate and implement the adaptations they accepted or otherwise. Critical realism and social realism are explored in more detail in Chapter Three. The concept of causal mechanisms

enables shifts in our attention from the conventional tendency of analysing adaptation strategies in terms of scientific knowledge and statistical analysis. The study argues that rather than merely being recipients of agricultural intervention programmes, local resource-poor and poorly educated communities exercise agency when implementing initiatives over different spatial areas and time scales. Hence, they must be taken seriously as stakeholders in the climate change adaptation debate and the literature on climate change.

Given this background, this study's focus is not on conventional adaptation and resilience building per se but on how smallholder farmers exercise their agency interacting with externally introduced agricultural innovations in the face of the twin threats of climate change and a degraded landscape in a project in Machubeni, Eastern Cape, South Africa.

1.5 Aim, and Research Questions

The study aimed to understand the underlying generative structures and mechanisms of rural smallholder farmers' responses to CSA and ecosystem rehabilitation adaptation and resilience-building practices in a changing climate in Machubeni, Eastern Cape, South Africa.

This general aim was broken down into the following specific research questions:

- i. How were the smallholder farmers conditioned structurally and culturally to exercise their agency at the beginning of the project?
- ii. How do different farmer groups interact with climate-smart agriculture and ecosystem rehabilitation, adaptation and resilience-building interventions?
- iii. How do structural and cultural conditions interact to enable or constrain climate-smart agriculture home garden crop production?
- iv. How do livestock farmers interact with climate-smart ecosystem rehabilitation and resilience building? What enables or constrains adoption and adaptation?

1.6 The Study Site

The site in which the study was located is in the Machubeni area 31°30'53.92"S; 27°9'53.49" which is 16 150 ha in size. Machubeni is in the Emalahleni Local District Municipality in the Eastern

Cape, South Africa. The mean annual rainfall is 590mm received during the summer months between October and March (Shackleton & Gambiza, 2008). Residents depend on livestock grazing, cultivation in the valley bottom and the collection of wild resources. The study was conducted in five of the 14 villages of Machubeni within the GEF operational area. Figure 1.1 shows the spatial boundaries of the study area. Chapter Five further explores the study site's geographic location and environmental conditioning.

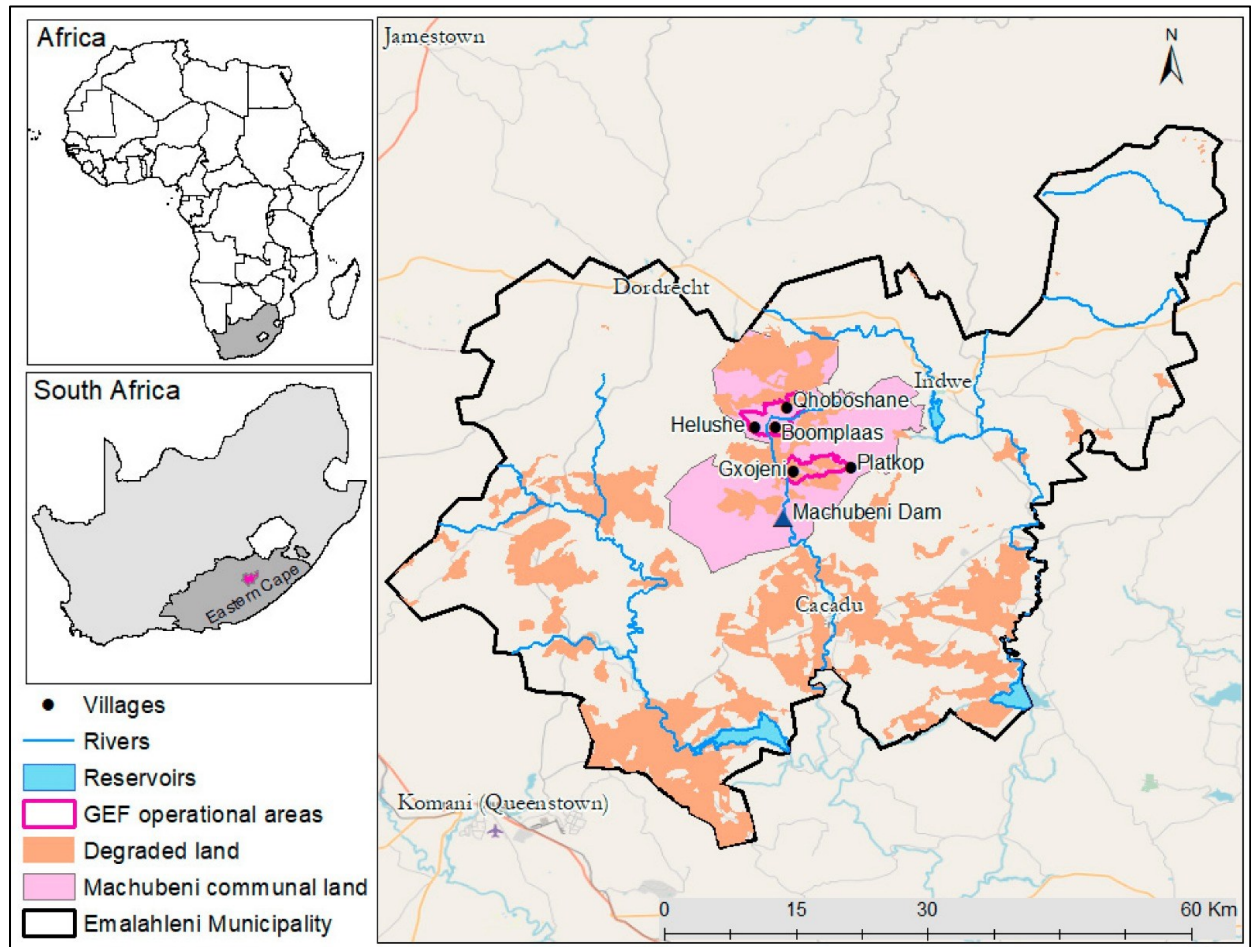


Figure 1.1: Location of the Study Area (Falayi et al., 2022)

1.7 Significance of the Study

The study is significant because the application of externally driven agricultural innovations within rural communities has not led to the adoption, adaptation and resilience building envisaged over the past several decades (Andersson & D'Souza, 2014; Giller et al., 2009; Hermans et al., 2020).

Furthermore, the study offers explanatory factors for why this is so, especially in the face of significant local and international financial investment in a system of implementation that clearly doesn't work. This study proposed critical realism and social realism as a lens to enable the understanding of the way local communities exercise agency, their knowledge for learning, and opportunities for climate change policy transformation. Instead of using the traditional quantitative and qualitative methodological approaches, the critical realist approach aimed to explore the underlying causal mechanisms leading to the limited uptake of adaptation and resilience-building interventions. The scholarly and research significance of the study has the potential to reposition rural communities as critical role-players in the production and transmission of climate change adaptation and resilience building. Hence, the study has the potential to reconceptualise the design of government and non-governmental organisation (NGO) interventions and their implementation. This could lead to positive ripple effects that could improve the implementation of intervention programmes by ensuring that local realities and practices are heeded by the government and NGOs in the future. The long-term intended benefit is to reduce the costs of ecological restoration in South Africa and increase the productivity of the land. This requires an innovative approach to CSA that appreciates epistemic pluralism, especially that which harnesses strength from both local adoption, adaptation initiatives and externally designed intervention projects.

1.8 Outline of the Thesis

The thesis has nine chapters informed by the research objectives. Chapter One outlined the research problem and background. The chapter advanced the argument that, despite a great deal of effort and research promoting CSA, its uptake and sustainability have been low. The chapter reflected on the foci in CSA research, successes, and challenges of its implementation. Chapter Two reviews explanatory theories related to CSA concepts, adoption, adaptation and resilience-thinking principles. The explanatory theories enabled me to make sense of the structures and cultural mechanisms underlying the uptake rate of CSA interventions. Chapter Three introduces

the substantive¹ theories underpinning the study: critical realism and social realism. Critical realism is a philosophy of reality. Social realism gives depth to critical realism and explains the way change occurs or does not occur, over time. Chapter Four discusses the research design, and introduces the methods used in this study with specific reference to observation, photographs, in-depth interviews with farmers and facilitators, and discourse analysis. Chapter Five discusses what Archer (1995, 1996, 2000) terms the “structural and cultural conditioning” of agents involved in the study.

Chapters Six, Seven and Eight analyse the interactions between various groups (elderly women and men farmers, the youth and the project team) as they set about exercising their agency in the introduction and adoption of CSA practices. These chapters draw on interviews and photographs to discuss how farmers interacted with the interventions and how they were enabled or constrained in climate-smart adoption, adaptation and resilience building. Chapter Six explores the way smallholder farmers exercised their agency in relation to the rehabilitation of ecosystems. Chapter Seven analyses the structural and cultural mechanisms enabling and constraining farmers' interactions with CSA home garden crop production. Chapter Eight analyses livestock farmers' interactions with the innovation of rotational resting without fences. Chapter Nine concludes the thesis by seeking to identify claims and insights emerging from the entire study. It also recommends ways to improve the uptake of CSA practices in water-scarce and drought-prone landscapes such as Machubeni.

¹ The distinction between explanatory and substantive theory is often employed by critical realists. My understanding is that substantive theory can be likened to a car engine. It is the means by which a study can generate new insights and understandings. Explanatory theory functions as the fuel without which the engine cannot function.

CHAPTER TWO: EXPLANATORY THEORY

2.1 Introduction

This chapter's main purpose is to outline the explanatory theory used in the study. As explained in Chapter One, critical realists distinguish between substantive theory and explanatory theory. In the study underpinning this thesis, the substantive theory was from the work of Bhaskar (1989, 1979, 2002, 2016) and Archer (1995, 1996, 2000), discussed in Chapter Three. Substantive theory outlines the ontological and epistemological assumptions on which a study draws and, in many respects, functions like the engine in a car. It is thus primarily philosophical. However, a vehicle will not move without fuel, and this is where explanatory theory plays a role. In the case of the study underpinning this thesis, explanatory theories consist of Western scientific understandings of the concepts of adaptation, resilience building and CSA.

Explanatory theories are used to make sense of the way the structures and mechanisms that are located at Bhaskar's (1989, 1979) deepest layer of reality, termed the "Real" function, lead to the emergence of events located at another level of reality, and experiences and observations of those events located at the topmost layer of reality termed the "Empirical" (Boughey & McKenna, 2021a). In addition to allowing me to make sense of the way structures and mechanisms led to the emergence of events and the observations and experiences of those events, the explanatory theories discussed in this chapter also helped me to interrogate empirical data in the form of observations and experiences and to move from these to identify the structures and mechanisms from which they emerged. As indicated in Chapter One, the substantive theory underpinning this chapter, Bhaskar's critical realism and Archer's social realism, will be discussed in Chapter Three.

As discussed in Chapter One, Section 1.3, the study is not about conventional adaptation and resilience building per se, but how smallholder farmers exercised their agency in the face of climate change agricultural interventions in a degraded but productive rural landscape.

The rest of the chapter is structured as follows. First, I examine the key concepts and salient aspects of CSA crop and livestock practices and SLM (Eilola et al., 2021;FAO, 2013;Hermans et al.,

2021b). The second section discusses landscape approaches (LA) or integrated land management (ILM) in conservation and development (Arts et al., 2017; Freeman et al., 2015; Pedroza-Arceo et al., 2022; Sayer et al., 2013). The third section focuses on adaptation and resilience-building theories and principles that guide climate change adaptation (Biggs et al., 2015; Carpenter et al., 2001; Walker et al., 2004).

2.2 Key Concepts

2.2.1 Climate-smart agriculture

As already indicated in Chapter One, in the context of the study underpinning this thesis, CSA is understood as an approach to agriculture that aims to transform and reorient existing agricultural systems (for example, CA) to support the development of, and ensure, food security in a changing climate by increasing agricultural productivity and incomes, adapting, and building resilience to climate change sustainably. This understanding identifies CSA as an approach to be used in agroclimatic conditions involving water scarcity and degraded landscapes. The study juxtaposes these biophysical conditions (Hoffman & Ashwell, 2001) with issues of resource poverty (Armstrong & Burger, 2009), one of the significant constraints to successful farming among rural smallholder farmers in developing countries, including South Africa. Importantly, the understanding implies that CSA is not a methodology but a set of principles or practices. The following section focuses on the CSA principles of simultaneous:

- i. minimum soil disturbance or zero tillage;
- ii. crop residue mulching;
- iii. crop rotation/diversification which may include intercropping (for example, intercropping cereals with legumes and permanent soil cover) (FAO, 2013; Ngwira et al., 2014; Pannell et al., 2014).

In this study, intercropping the added CA suite to promote a sustainable package to reduce land degradation and soil erosion (Ward et al., 2018) is considered. To the CA objectives, the FAO (2011) added CSA elements, such as access to quality seeds suited to smallholder farmers' contexts and access to inputs, credit and technical advice to improve farmers' resilience to climate change

and variability. Another recent trend in CSA involves the intensification of agriculture to achieve food security and sustainability while protecting the environment through carbon sequestration (Swaminathan et al., 2022).

2.2.1.1 Minimum tillage

‘No-tillage’ refers to seeding directly without soil tillage. Agronomic studies in Malawi, and other Southern Africa countries (Hermans et al., 2021b; Thierfelder et al., 2018) have shown that the no-tillage principle positively impacts erosion and reduces land degradation. However, the effectiveness of reduced tillage appears to be highly dependent on-site conditions such as pH, soil texture, and climatic conditions (Engell et al. 2022). Minimum soil disturbance has been reported to improve nutrient cycling efficiency, increase soil water infiltration, reduce soil erosion, and therefore, simultaneously reduce land degradation and increase yield (Hermans et al., 2021b; Thierfelder et al., 2018). In contrast Minimum soil disturbance results in improved and efficient nutrient recycling), improved infiltration, reduced soil erosion, and therefore, reduced land degradation (Araya et al., 2024; Rajbanshi et al., 2023) and increased yield (Mutengwa et al., 2023). In contrast, Kafesu et al., (2018)., argue that there is scarce empirical evidence on effectiveness in reducing soil erosion on degraded land. Other studies show that the no-tillage approach improves the biological activity of organisms in soil and carbon sequestration (Li et al., 2020; Parihar et al., 2018 ; Zheng et al., 2023). On the other hand, Ogle et al. (2012) and Powlson et al. (2014) argue there is limited empirical evidence of carbon sequestration and that the benefit is overstated. Permanent no-tillage has been reported to cause soil compaction. Thus, the agronomic recommendation for tillage is after every two years (Pittelkow et al., 2015; Swaminathan et al., 2022). Scholars also advocate the control of equipment compacting soils as an additional CSA principle (Swaminathan et al., 2022).

Lastly, as noted in Chapter One (Section 1.2), studies recognise that no-tillage reduces fuel and labour costs and reduces the costs associated with tractor wear and tear (Hobbs & Gupta, 2004, Thierfelder et al., 2015). No-tillage also works well in large commercial farms in Southern Africa (Thierfelder et al., 2018). In contrast, no-tillage in communal Africa leads to weed pressure, so much concern has been raised about CSA increasing the labour of women (Giller et al., 2015). There is evidence of reduced labour costs at the planting stage in smallholder farms, but this is

counterbalanced by increased labour costs associated with weeding (Lee & Thierfelder, 2017; Nyamangara et al., 2014). Introducing herbicides could remove the weed constraint (Baudron et al., 2007). In developing countries, however, herbicides are expensive and smallholder farmers often lack knowledge of their appropriate use. It is noted that where herbicides are affordable, CSA no-tillage is accepted and reduces smallholder farmers' labour (Brown et al., 2020; Vogel, 1995). However, it could be argued that herbicides negate soil biodiversity, and undoing much of what is achieved through CA.

2.2.2.2 Mulching

The second CSA principle of mulching refers to maintaining a permanent +/-30-centimetre cover with crop residue or live cover to protect the soil from evaporation and soil run-off. Mulch suppresses weeds, helps retain moisture and avoids soil compaction (Swaminathan et al., 2022). Mulching improves moisture retention and reduces evaporation, thus enhancing productivity in semi-arid areas in Southern Africa (Mupangwa et al., 2008; Rusinamhodzi et al., 2011). Some studies indicate improved organic content and water conservation (Abdallah et al., 2021; Cárceles Rodríguez et al., 2022; Parihaet al., 2018). However, mulching in humid tropical areas leads to waterlogging and reduced yield. Wang et al. (2020) indicate that keeping residual crops on the soil surface transfers fungal root rot diseases to the next season's maize crop. In yet another contrast, Vanlauwe et al. (2014) argue that there is little mulch in Africa because of inadequate biomass with the result that soils have poor fertility and produce low yields. The crop residue is prioritised as a source of livestock feed. The competition between livestock feed and crop fields reduces the availability of biomass in crop fields (Giller et al., 2009).

Further, Vanlauwe et al. (2014) contend that in the Global North, CSA was introduced in farms with access to fertiliser resulting in the accumulation of mulch over the years, and that the combined use of mulch and fertiliser results in high yields. Therefore, other studies propose including appropriate fertiliser application as the fourth CSA principle (Aune et al., 2015; Vanlauwe et al., 2014). However, other researchers oppose fertiliser use as the fourth principle (Sommer et al., 2014). These researchers posit that fertiliser use is a practice, not a principle. If affordable to farmers, fertiliser may be used in any given context. Further, the study (see Sommer et al., 2014) argues that several practices can contribute to the achievement of any single principle.

The contrasting positions on fertiliser use are clear but the knowledge gap is smallholder farmers' concerns and perspectives on fertilizer use, as indicated in Section 1.4., which are not documented.

In addition, and common with other developing countries, CSA uptake in African countries is constrained by farmers' inability to afford quality seeds and other inputs such as fertiliser and herbicides because of poverty in rural communities (Giller et al., 2009). These conditions have led to a trend in which CSA is actively adopted during the donor implementation phase but dis-adopted or abandoned when project input support ends (Pedzisa et al., 2015). The finding concurs with several scholars who note that CSA large-scale implementation occurs when input incentives are provided to ensure uptake, though dis-adoption occurs at the project end (Andersson & D'Souza, 2014; Brown et al., 2020; Giller et al. 2009).

The literature suggests the need for continued support for CSA beyond the project lifespan (Estrada-Carmona et al., 2014; Swaminathan et al., 2022). In contrast, some studies argue that input support creates a dependency syndrome among farmers (Chavula, 2021; Pedzisa et al., 2015; Smith et al., 2021). In general, the life span of CSA projects averages about five years. As a result, Estrada-Carmona et al., (2014) claim that the period is inadequate to build the required human capacity and technical backstopping to continue with CSA. In many cases, the first and second years of the five years are used for project establishment and to obtain farmers' buy-in through community and beneficiary engagement processes. Project support stops when smallholder farmers assess if concepts work or have not fully comprehended the concepts (Personal communication GEF 5 SLM Hub leader December 2022).

2.2.1.3 Crop rotation and intercropping

The third principle of rotation and intercropping with legumes improves soil nitrogen and helps break the cycle of pests and diseases (Bossolani et al., 2021; Kassam & Friedrich, 2009; Mupangwa et al., 2021). Moreover, crop rotation ensures a diverse diet for soil microorganisms and nutrient recycling by diverse root systems (Giller, 2001; Kornilowicz-Kowalska et al., 2022; Swaminathan et al., 2022). According to Baudron et al. (2007) Barnes et al. (2021) the challenge in Africa is the lack of markets for legumes. This influences farmers' decisions related to the adoption and dis-adoption of CSA practices.

2.2.1.4 Increased crop productivity

Concerning increased crop productivity, notable differences are recorded. Several studies report low productivity in the short-term at the start of CSA, followed by yield increases in the long term (Baudron et al., 2015; Giller et al., 2009b; Rusinamhodzi et al., 2011). In comparison, Hobbs (2007) reports that there is no yield change in some agroecological systems and that this influences smallholder farmers to dis-adopt CSA. In contrast, some studies argue that reduced production costs rather than increased yield motivate CSA adoption in the Global North (Baudron et al., 2015; Hobbs & Gupta, 2004). However, increased yield is one of the cornerstones of CSA promotion in Africa (Rusere et al., 2011, Thierfelder et al., 2015a).

Although the above studies have contributed a great deal to understanding the effectiveness of CSA, Hermans et al. (2021b) note that despite positive biophysical results, the CSA paradox of low adoption persists. My approach to the study draws from the rich body of research on the implementation of CSA principles as an explanatory theory for a critical realist analysis of the limited CSA-uptake phenomenon.

2.2.2 CSA livestock practices

Livestock production contributes to greenhouse gas (GHG) emissions (IPCC, 2014), thus the need for CSA in the sector. Methane and nitrous oxide are the leading greenhouse gases produced by animals' normal digestive processes, manure storage, treatment and land application (Sejian et al., 2016). Grossi et al. (2019) note that livestock production makes up 18% of global GHG emissions – methane affects global warming 28 times more than carbon dioxide and nitrous oxide contributes 265 times more to greenhouse gases than carbon dioxide. In communal areas in South Africa, livestock production takes place on common property. This is when livestock farmers or villages work together on the same land as a joint enterprise (Bennet, 2011; Molieleng et al., 2021).

The CSA livestock practices in a warming climate are anchored in sustainable grazing practices that comprise rotational grazing to ensure livelihood and food security and protect rangeland conditions to build a livestock-resilient landscape (Döbert et al., 2021; Eilola et al., 2021; Hillenbrand et al., 2019). The timing, intensity and frequency of livestock grazing influence

vegetation growth and soil dynamics (Naeth et al., 1991; Niraula et al., 2020). Rotational resting allows sufficient grass seed setting, the deepening of root systems and the development of new tillers.

Some studies argue for introducing nutritious rangeland grass species to improve pasture value and livestock productivity (Luscher et al., 2014; Nkonki-Mandleni et al., 2022; Ndhlovu & Mpofu, 2016; Niraula et al., 2020). These practices enable forage regrowth and the equal regrowth of diverse species. Other studies report that rangeland carrying capacity is increased by simple CSA practices such as planting pastures, palatable species and drought-adapted forage legumes (Ndhlovu & Mpofu, 2016; Niraula et al., 2020).

In South Africa, smallholder livestock farmers are reported to practice traditional CSA practices, such as adaptable breeds that are tolerant to heat stress, drought and disease tolerance (Singh et al., 2017). The challenge in South Africa is overstocking. It is reported that livestock numbers are above carrying capacity (WWF-SA, 2010; Gusha et al., 2024; Ravhuhali et al., 2020). The CSA fodder production and stall feeding could be viable for farmers (Onyeneke et al., 2018). Fodder flow production sustains livestock during periods of limited grass in the rangeland. In Bolivia and Uganda, CSA practices include silvopastoral systems that convert degraded land pastures by planting trees and shrubs interspaced with nutritious pastures and legumes (FAO, 2017; International Centre for Tropical Agriculture, 2017).

The above literature provides examples of the successful implementation of CSA livestock practices from across the world. However, CSA livestock production in Africa for example Kenya, is reportedly constrained by the age of farmers, and the fact that low levels of education make it difficult to understand complex CSA practices (Mutuku, 2017). Other constraints in South Africa, include low incomes, inadequate credit facilities and a lack of CSA knowledge and support from extension officers and relevant government departments (Nkonki-Mandleni et al., 2022). As a result, Molieng et al. (2021) argue that CSA livestock production is not difficult to adopt in South Africa, but farmers need knowledge and guidance. However, Molieng et al. (2021) also note the limited research on livestock farmers working with CSA in South Africa. This thesis has the potential to contribute to the literature in this field, which tends to be dominated by CSA crop production.

2.2.3 Sustainable land management

Chapter One (Section 1.4) notes that land degradation is one of South Africa's most significant environmental problems. Widespread soil degradation, river sedimentation and bush encroachment in the Eastern Cape and particularly Machubeni have been documented in the literature (DEA, 2009; Sepuru & Dube, 2018; Shackelton et al., 2013, 2015). Given the highly degraded lands in the study area, SLM through CSA and ecosystem rehabilitation was one of the central objectives of the project. Though erosion processes are natural, human activities cause most of the damage. Sustainable land management (SLM) is a human-focused approach to reducing land degradation (Musvoto et al., 2022). It has been defined as stewardship and using land resources, including soil, water, animals and plants, to meet changing human needs while ensuring long-term productive potential and maintaining environmental functions (Moller et al., 2022). In short, SLM is about people looking after their land for the future (Liniger et al., 2019; Oduniyi & Tekana, 2021) through practices such as soil/land and water conservation to improve rangelands (Chirwa & Mahamane, 2017). Further, Chirwa and Mahamane (2017) argue that the success of SLM depends on local people's capacity to exercise power, that is, the agency to inventory and manage local resources in social-ecological systems (SES). These SES are complex adaptive systems (Biggs et al., 2021; Folke et al., 2016). In addition, the SES are integrated, intertwined and inseparable with strong connections and feedback (Biggs et al., 2015). This thesis examined SLM through CSA and ecosystem rehabilitation practices.

2.2.4 Landscape approaches and integrated land management

Landscape approaches (LA) are used as a guiding philosophy in project implementation. LA or integrated land management (ILM) have gained prominence over the last two decades as a way to shift natural resource management and conservation to reconcile with development, climate change and livelihoods (Arts et al., 2017). Given environmental deterioration and social conflict in rural communities such as this study site, LA is being promoted in science and practice as an integrative alternative to sectorial landscape management, policy and governance (Arts et al., 2017; Padt et al., 2014). LA offer a common ground to various scientific disciplines, in the form of multifunctionality, interdisciplinarity, multi-actor and intersectoral collaboration for professionals to improve resilience in societies and ecosystems (Arts et al., 2017; Freeman et al.,

2015; Pedroza-Arceo et al., 2022). The concept has gained momentum in international environmental discourses. In this study, the development of the Hub system (Section 6.2) drew on LA to establish a multifunctional, multi-actor, adaptive management and resilient landscape in participating villages. This approach concurs with Scherr et al. (2012), who argue that sustainable CSA should take a landscape-scale approach operating at farm, village and national scales.

There is no universal definition of what constitutes an LA. Definitions range depending on the perceptions of people who interact with the natural space (Dupont et al., 2014). This study defines the LA as “encompass[ing] diverse geophysical/ spatial, social, environmental, and economic components of different land use goals, multiple ecosystems, and functions in a determined time and space” (Pedroza-Arceo et al., 2022, p. 3). Pedroza-Arceo et al. (2022) argue that sectoral approaches have been inadequate in complex socioecological system management. Sayer et al. (2013) identified 10 principles underpinning LA approaches.

1. *Continual learning and adaptive management*: This refers to the need for a learning process to continually adapt to the dynamic, non-linear potential surprises in landscapes. Adaptive management is required in unforeseen emergent circumstances. In this study, adaptive management was critical in relation to the farmers' resistance to commencing the resting of the rangeland in December (see section 8.2.2).

2. *Common concern entry point*: This is based on the argument for establishing shared values and beliefs among stakeholders. Establishing common ground is difficult as stakeholders tend to have different values, beliefs and objectives, which are challenging to align given the nature of project time frames. Sayer et al. (2013) hold that an approach of conscious building based on trust may assist in finding common ground. They note that stakeholders who join the process believe their interests are addressed. An example from this study was the motivation to improve pastures experienced by elderly livestock farmers who volunteered for climate-smart ecosystem rehabilitation (see Section 1.3). This concern provided a common entry point between the farmers and the project.

Landscape scholars (Arts et al., 2017, p. 447) propose “the so-called payment for ecosystems (PES) as an economic incentive for private sector investment in landscapes”. However, the

application of this proposal has been limited because of ethical, financial and organisational challenges (Engel et al., 2008; Moros et al., 2020). Critics of PES argue that environmental benefits are lost after the intervention ends. For example, Hiedanpää and Bromley (2014) noted that PES are not likely to result in durable behavioural change. In contrast, Pagiola et al. (2016) and Rasch et al. (2021) reported stable changes in land use four years after an intervention. Moros et al. (2020) also argue that PES redistributes the often-unequal costs and benefits of environmental conservation.

3. *Multiple scales*: This principle refers to the idea that the outcomes of interventions are shaped by processes operating at different scales at global, national and local levels. Various external influences and constraints affect feedback, flows and synergies. For example, in this study, global discourses are related to sustainable development and the impact of the green economy (see Section 1.3) on national and local scales.

4. *Multiple functionality*: This principle is aimed at achieving more resilient landscapes (Eilola et al., 2021). The authors contend that recognising the multitude of institutional actors, their roles and dynamics, helps to understand communal behaviour manifest in building resilient social-ecological rangeland landscapes in Tanzania. Landscape components have multiple uses and purposes and are valued differently by different stakeholders. Landscape approaches (LA) acknowledge the requirement of user trade-offs and difficulties in quantifying and managing communal behavioural interactions in changing complex socioecological circumstances.

5. *Multiple stakeholders*: This principle is based on the belief that stakeholders express their objectives and concerns in different ways. Failure to engage all stakeholders equitably can lead to sub-optimal outcomes. Scholars recommend iterative processes of recognising and negotiating with all stakeholders. The process requires building trust, conflict resolution and acknowledging power relations. According to Balint et al. (2011), the achievement of total agreement can be elusive and result from “wicked” environmental problems entrenched in public conflicts in natural resource management.

6. *Negotiated and transparent change logic* refers to trust based on transparency. Transparency is achieved through negotiation about the concept and process of change assisted by good

governance. The principle assumes that there are ways for all stakeholders to understand the “general logic, legitimacy, and justification for a course of action and be aware of the risks and uncertainties” (Sayer et al., 2013, p. 8535). Rist et al. (2010) note that conflict among smallholders and instructions arises because of a lack of transparency, unequal benefit sharing and absence of consent.

7. *Clarification of rights and responsibilities*: LA advocates argue that this can be achieved through a fair justice system and conflict resolution. This study applied the principle given the inter-generational conflict (see Sections 6.3.1 and 6.3.3).

8. *Participatory and user-friendly monitoring*: This involves a belief that participatory monitoring can facilitate shared learning. The process of gathering and interpreting information is reported to improve, and contribute to, mindset change. The approach acknowledges all knowledge systems as valuable, accepting plural epistemology among the participants.

9. *Resilience*: This principle entails the promotion of actions that address threats and allow recovery by improving the capacity to respond and resist. Resilience may be enhanced by learning from other places.

10. *Strengthened stakeholder capacity*. This refers to the idea that effective participation requires the enhancement of stakeholders' social, cultural and financial skills and abilities. The LA learning process provides shared experiences and improves the ability to judge and respond to the dynamic socioecological system.

Practitioners determine how the principles are applied and the context they find themselves in. In this study, the principles contributed to my identification of structures and mechanisms enabling and constraining the adoption of CSA practices. As in the project that was the focus of the study, the nature of five-year funded projects does not provide adequate time for the iterative implementation of all the principles. For example , it was not feasible to look at clarification of rights and responsibilities, as well as negotiated and transparent change logic.

2.2.5 Adaptation and resilience thinking

Adaptation is the first step towards reducing vulnerability and exposure to climate change and variability. The term ‘adaptation’ has multiple and competing definitions (IPCC, 2014) and was coined in natural sciences in the late 1970s to refer to the “development of genetic or behavioural characteristics which enable organisms and systems to cope with environmental change to survive and reproduce” (Smit & Wandel, 2006, p. 283). In this thesis, climate change adaptation is understood as the behavioural change process by which stakeholders (including smallholder farmers) reduce the adverse impacts of climate change on their livelihoods, lifestyles and economic structures to reduce vulnerability to climate change (IPCC, 2014). Adaptation options are a means of enhancing resilience building and adaptive capacity. Therefore, adaptability refers to the capacity of actors in the system to self-organise, influence and manage socioecological system (SES) changes. Adaptation is the process and actions taken by actors to assist system changes. Others define adaptation as planned or intentional changes in socioecological systems in response to expected climate change in the context of interacting non-climatic change (Moser & Ekström, 2010). Planned adaptations are human-controlled and directed, while autonomous adaptations occur as a spontaneous human reaction to an adverse condition (Easterling et al., 2007).

According to Smit et al. (2000), adaptation is about four questions: Adaptation to what? Who and what adapts? How do they adapt? How effective is the adaptation process? Thus, adaptation is about which resources are used, by whom, and with what measurable outcomes. Adaptation has boundaries in that it can occur at the farm, household or village level.

Increasingly, the literature on adaptation has been shifting towards resilience building (Ryan & Elsner, 2016). Resilience thinking goes beyond adaptation by acknowledging that change is inherent in natural systems (Bailey & Buck, 2016). Thus, Folke et al. (2004) note that adaptability is part of resilience building. Resilience is an ecological concept that was pioneered by Holling (1973, p. 14) as a “measure of system ability to absorb change and disturbance and maintain relationship population or stability”. Since Holling’s seminal paper was published, there has been no universal definition of resilience (Kamara et al., 2018). The definition varies with study discipline, area and focus of resilience: that is, the resilience of what, to whom, and why. According to Walker et al. (2004, p. 5), resilience refers to “the capacity of a system to absorb

disturbance and reorganise while changing to retain substantially the same functions, structure, identity, and feedback. In short, resilience is the ability to reorganise and adjust to disturbance and remain the same”.

The notion of resilience could be summed up as persistence with disturbance as opposed to resistance to disturbance (Carpenter et al., 2001; Gunderson, 2002; Pimm, 1984). However, Carpenter et al. (2001) argue that resistance compliments persistence; for example, social actors who self-organise to resist rotational grazing persist with free-range grazing despite adverse effects on the rangeland. Folke et al. (2004) define resilience as more than the system’s ability to maintain function stability but the capacity to take advantage of opportunities presented by disturbances.

Some scholars argue for the inclusion of transformation under resilience thinking (for example, Gunderson & Holling, 2002; Walker et al., 2004; Walker, 2020). Transformation refers to system actors (for example, rural small-scale farmers and traditional leaders) creating new ecological, economic and social conditions because the existing system is untenable (Walker, 2020). In the study transformation related to cultural gender stereotypes. Climate change is also viewed as having different impacts on women, men, boys and girls –scholars argue that improving women’s access to resources and adaptive capacity improves multiple aspects of food security and resilience (Bailey & Buck, 2016). Thus, in this study of CSA, resilience comprises adaptation by social and ecological systems.

Adger (2000) distinguishes between social and ecological resilience. Social resilience is defined as the “ability of groups and communities to cope with stress and disturbance as a result of social, political, and environmental change” whereas ecological resilience is “a characteristic of ecosystems to maintain themselves in the face of disturbance” (Adger, 2000, p. 347). Further, Adger argues that livelihoods are the link between the social and ecological systems as humans alter the natural system to meet their material needs in the form of, for example, food, fibre and fuel. In this study, resilience refers to the capacity of social, economic and environmental systems to cope with hazardous events, trends or disturbances, responding or reorganising in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation (IPCC, 2014). Thus, adaptations refer to smallholder farmers' strategies in the adoption/non-adoption of CSA initiatives in degraded landscapes.

2.2.6 Principles for enhancing the resilience of ecosystem services

Biggs et al. (2012, 2015) propose seven principles for enhancing the resilience of ecosystems. In this study, given the limited project implementation time of five years and budget constraints, it was not possible to look at all the principles. For example, it was not feasible to manage slow variables and feedback or foster an understanding of social-ecological complex adaptive system thinking. The attributes of the first four principles could be a focus for future research evaluating long-term project impact and sustainability. Thus, though aligned with resilience principles, this study focused on a mix of aspects of the principles relevant to the study context. These were: maintaining diversity, encouraging learning, broadening participation, and promoting polycentric governance.

1. *Maintain diversity and redundancy*: Refers to crops, livestock, flora and fauna. Scholars writing on the fostering of diversity refer mainly to the diversity of crops and less to livestock, livelihood strategies and income streams (Chapin et al., 2010; Jat et al., 2021; Kurgat, et al., 2020). Diversity fosters and enhances livelihoods and increases ecosystem adaptive capacity. Redundancy involves duplication or spare components that enable interchangeable use in the event of a disturbance and vegetation species.
2. *Manage connectivity*: Refers to the extent to which resources, actors, species and services are interconnected.
3. *Manage slow variables and feedback*: Refers to variables such as soil fertility that are slow in exhibiting negative or positive changes.
4. *Foster an understanding of social-ecological complex adaptive system thinking*: Refers to a scientific and management understanding of SES complexity.
5. *Encourage learning and experimentation*: Involves changing and modifying mindsets and values, integrating local and scientific knowledge, and allowing experimenting. According to Bailey and Buck (2016), combining local and scientific knowledge is one of the central elements of resilience building.
6. *Broaden participation*: Refers to stimulating active participation of a variety of stakeholders, for example, women, youths, the disabled, the disadvantaged as well as advantaged members of the community.

7. *Promote polycentric governance system*: Refers to various governing structures at different scales ranging from local groups, traditional leaders and municipalities within the landscape.

Although the seven principles are viewed as a bundle that interacts for service provisioning, it is impossible to achieve all the principles because communities and stakeholders decide on trade-offs depending on the local context (Biggs et al., 2012).

Scholars view the resilience narrative as an opportunity to re-engage local people in finding solutions to vulnerability (Chander, 2014; Tittonell, 2020;). The resilience approach also emphasises the empowerment of local actors rather than the imposition of externally developed solutions (Chander, 2014; Tittonell, 2020). However, the role of local knowledge has received little attention in the literature related to developing countries (Nciizah, 2019). Thus, my study focused on what local resource-poor households and village communities have been doing, and are still doing, to adapt to climate change to build livelihood resilience. I employed the critical realism lens to unpack the underlying structures and mechanisms in community adaptation.

2.3 The Relevance of Critical Realism

So far, the dominant approach to analysing CSA impacts and outcomes has been to look for connections between causes and effects (see sections 1.2.1 and 2.2.1). The approach is associated with the control of variables that cannot, for example, sufficiently capture the role of farmers in a system. Limited uptake of adaptation and resilience-building innovations is an empirical phenomenon which can be observed and statistically quantified, but stopping at this level cannot sufficiently account for what has been happening (see Section 1.3).

In this thesis, I argue that statistically expressed insights lack the explanatory and interpretive power provided by critical realism. Critical realism argues that phenomena occur in an open system and recognises that reality is layered. This ontological viewpoint allows for an analysis that moves from empirically observed events or phenomena to the level of generative or underlying conditions (Murata, 2021). Because of its concept of layered ontology, critical realism enabled my analysis to move beyond the empirical observations and mathematical calculations to the level of the ‘why’

and ‘how’ by identifying underlying generative mechanisms in an open system where variables cannot be controlled.

2.4 Conclusion

This chapter focused on outlining some of the main thinking behind CSA practices introduced to smallholder farmers in the project on which this thesis is based. In the next chapter, I outline the critical and social realist philosophy that underpinned the study.

CHAPTER THREE: SUBSTANTIVE THEORY

3.1 Introduction

As indicated in Chapter Two, critical realists make a distinction between ‘substantive’ theory and ‘explanatory’ theory. This chapter outlines the substantive theory that draws on the work of Bhaskar (1989) and Archer (1995, 1996). Chapter One noted a gap in integrating epistemology and theoretical underpinnings in adaptation research in the Global South. This chapter explains critical realist philosophy, which makes a distinction between ontology (the real) and epistemology (framing our knowledge of the real). Chapter One indicated that the study aimed to contribute to understanding the limited uptake of CSA by smallholder farmers in Africa, using a South African case study. As noted in Chapter One, the uptake of climate change adaptations and resilience-building interventions by smallholder farmers remains elusive. The motivation to use a critical realism philosophy, not widely used in environmental science and adaptation studies, lies in the need to understand smallholder farmers' limited uptake of CSA in South Africa in ways that go beyond explanations drawing on common sense experience and observations of events.

Critical realism posits that the research process attempts to access reality (ontology) to understand and generate knowledge of it (epistemology). Fundamental to critical realism is a distinction between what is real and what can be known. This study aimed to go beyond previous studies in exploring a depth of reality that lies beyond what has been revealed by studies relying on empiricism. In this study, critical realist philosophy functions as an “under labourer”, a term coined by an 18th-century philosopher, Locke (1894, p. 4), who describes the act of under labouring as clearing the ground to produce new knowledge (Bhaskar, 2016). Moreover, since critical realism aims at furthering human well-being and flourishing (Bhaskar, 2016), its use was suited to a study of the adoption of CSA as it seeks to allow humans to thrive in contexts challenged by climate change.

Critical realist philosophy provided a framework for me to organise and process information/data to understand the reasons for the limited uptake of CSA by smallholder farmers. The research

process attempted to explore the dissonance between practice and theory (Tshuma, 2018) in the limited uptake of climate change interventions by actors despite theoretically proven biophysical benefits. In addition to Bhaskar's work (1998, 2000, 2016), I also drew on Archer (1996, 1998, 2000, 2002). My exploration of the theories framing my research begins with Bhaskar before turning to the work of Archer.

3.2 Bhaskar's Critical Realism

Bhaskar coined the term 'critical realism' in the 1990s as an alternative to positivist and poststructuralist philosophy. Positivism regards recordable empirical evidence as reality. Under laboratory conditions, experiments are conducted, a hypothesis is advanced based on the outcome of the experiment, and insights are understood to represent the "truth". Positivism aims to generate universal laws based on understanding the world as a "closed system". In CSA, for example, field trials are conducted under controlled conditions to determine the impact of no-tillage on soil erosion and crop yields. The reduced soil erosion and increased yield outcome are taken to represent the truth. Bhaskar argues that the social world is not a closed system like a field trial but an open system. In an open system, outcomes involve a more complex interaction of structures and mechanisms, hidden from the senses, that are tendential and are often not synchronous with observed events (Bhaskar, 1978; Collier, 1998). Bhaskar argues that conducting experiments and determining causal relationships based on empirical evidence does not explain reality.

An alternative position to positivism is constructivism which argues that reality is relative in the sense that it is constructed by individuals. There are thus multiple realities, all of which can be considered valid. Knowing reality is based on interpretation and since researchers often draw on qualitative data that already constitute interpretations of the informants, knowledge claims involve a "double hermeneutic" or the interpretation of interpretations.

Critical realism offers a position that acknowledges both the ultimate reality independent of human action and thought accepted by positivists and the relativism of constructivism. It does this by arguing for a stratified ontology of three domains, the Empirical, the Actual and the Real (Bhaskar 1978, 1979). I have represented this ontology in Figure 3.1.

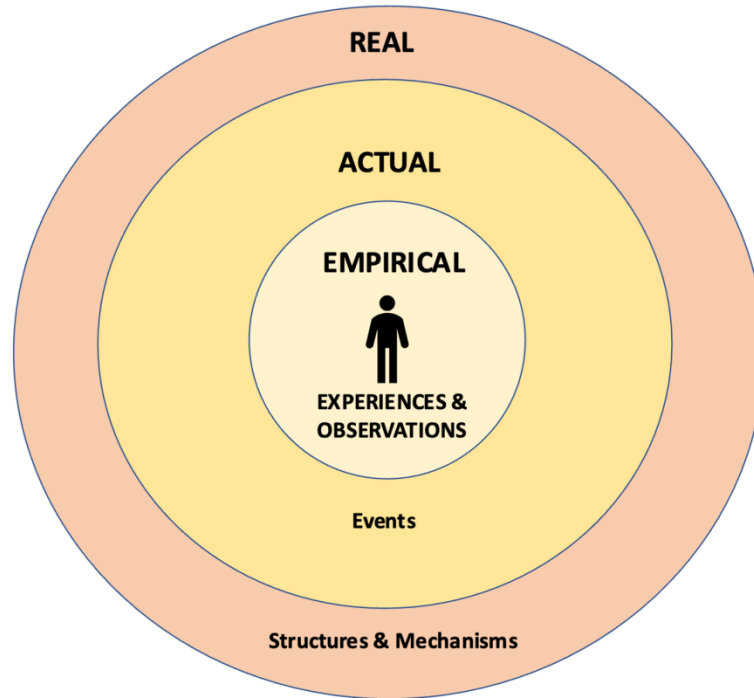


Figure 3.1: A critical realist account of causation (adapted from Bhaskar, 1979; Sayer, 1992)

The Empirical is the layer of experiences and observations directly accessible via the senses. The Actual is the layer of events from which experiences and observations emerge. In the context of this study, two smallholder farmers might attend the same workshop intended to introduce CSA practices but have very different experiences of it and have different interpretations of it. Both events at the level of the Actual and events and experiences at the level of the Empirical emerge from the deepest layer of reality termed the ‘Real’. At the level of the Actual, events may be observable or non-observable. Because those events are not observed, this does not mean they did not occur.

According to Bhaskar, the level of the Real consists of generative mechanisms which interact to lead to the emergence of events at the level of the Actual and observations and experiences at the level of the Empirical. No one level is more or less real than the other two. The three levels in Figure 3.1 interact and are laminated to represent reality. Using the term ‘Real’ in Figure 3.1 does not suggest that the Actual and Empirical are not real; instead, the generative mechanism powers are seen to originate in the Real (Westaway, 2016). A study drawing on critical realism aims to

move beyond phenomena observed and experienced at the levels of the Empirical and the Actual to explore the level of the Real to identify the interplay of the mechanisms from which they emerge.

3.2.1 Causality

Bhaskar argues that the structures and mechanisms originating at the level of the Real have causal powers. A structure is a “set of internal objects or practices” (Sayer, 1992, p. 92). Mechanisms are understood as interactions between things (Brönnimann, 2022). Critical realists see the interplay of structures and mechanisms as tendential rather than strictly causal. A critical realist view of causality is shown in Figure 3.2.

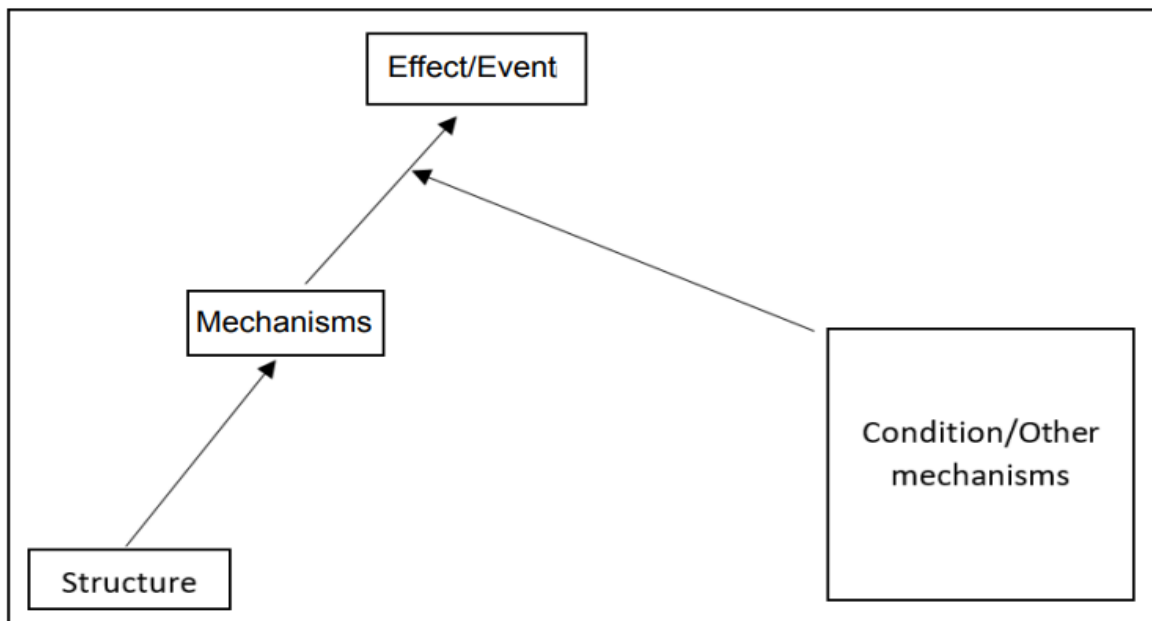


Figure 3.2: A critical realist account of causality (adapted from Bhaskar, 1979, Sayer, 1992)

Mechanisms may or may not exercise their causal powers to generate events observed or unobserved in the Actual stratum. Critical realists define the characteristics of generative mechanisms as physical, social or conceptual (Mingers, 2011). Boughey and McKenna (2021a) note that a virus could be considered a physical mechanism which has the power to lead to the emergence of symptoms in those it has infected. However, the emergence of symptoms (conceptualised as events at the level of the Actual) is dependent on other structures and

mechanisms, including the immune system, nutrition and even social class, since good nutrition is often associated with wealth. In addition, symptoms will be experienced by individuals differently. The existence of a virus in the human body is thus not strictly causal in that it may or may not lead to symptoms and if symptoms do emerge, they may vary in severity. In the context of Covid-19, we referred to individuals who do not show symptoms as asymptomatic.

Each stratum is emergent because it is a product of a reproducing mechanism (Harvey, 2002). However, Elder-Vass (2010) notes that lower levels in this context, the Real, do not always determine the top strata (the Actual and the Empirical) since multiple events and mechanisms at different levels interplay to produce the emergent phenomena. Danermark et al. (2002) point out that to the critical realist researcher, identifying and exploring the mechanisms at the level of the Real is the ultimate goal as the researcher attempts to answer questions about how and why mechanisms generate events and experiences observed at the levels of the Actual and Empirical.

As already indicated, the relationship between structures and mechanisms and events and experiences is not strictly causal (Sayer, 2000), as Figure 3.2 attempts to illustrate. The same causal power might affect smallholder farmers differently depending on other conditions in the context. Thus, Bhaskar (1975) describes generative mechanisms as tendencies rather than general laws. This study adopted the critical realist definition of mechanisms and contrasts with other views – see, for example, Muzorewa and Chitakira (2022b) – that construct mechanisms as CSA practices.

3.2.2 Emergence

Emergence is a notion that is central to critical realism. Emergence refers to causal powers or properties of the structure or mechanism and involves the capacity of two entities to interact and create a whole new entity with different properties and powers from the individual entities (Brönnimann, 2022; Elder-Vass, 2005). An entity is not necessarily physical (Elder-Vass, 2005). It can be a social construct such as traditional leadership. For example, traditional leaders have the power to authorise bylaws and regulations when circumstances become untenable in a social-ecological system. As I note in Chapter Eight, in such a case, traditional powers in interplay with those generated by other system elements lead to the emergence of bylaws and sanctions specific to the context to transform community actors' access to a resource. The emergent phenomenon of

bylaws cannot be reduced to its constituents, properties and powers (Archer, 1995; Sayer, 2006). Once a new phenomenon emerges it has autonomy from prior objects it emerged from and can exert causal influence in its own right (Archer, 1995). Emergence results from the “causal intertwining of people's powers with those of other mechanisms at the level of real life” (Archer, 1995, p. 15). An open system is complex and encompasses structures and mechanisms with powers that can be exercised or not, as the case may be (see Figure 3.1). Bhaskar argues that explanation depends on emergence and that emergence allows for the idea that multiple mechanisms can contribute to it. The Real is a complex makeup of the interplay of multiple generative mechanisms and structures that have tendencies to emerge as events at the Actual and experiences and observations at the level of the Empirical. Thus, Bhaskar (1978) asserts that reality is the lamination of the Real, Actual and Empirical (see Figure 3.1), with no single mechanism determining the whole. This implies that the underlying level creates conditions that emerge at the next level (Danermark et al., 2002). Meaning is not restricted to one level but the laminated reality (Bhaskar et al., 1989).

The notion of tendencies is also important in critical realism. The existence of a mechanism does not necessarily mean it exercises its causal powers to result in an event but a tendency for certain events to happen (Boughey & McKenna, 2021a; Danermark et al., 2002). Powers can be possessed, exercised and actualised, or they may not be actualised (Edwards et al., 2014). Sayer (2000) points out that mechanisms enable or constrain action/events initiated by agents. In the context of no-tillage practices to increase crop yield and reduce erosion, underlying mechanisms in the form of discourses or sets of ideas that link together in language and other sign systems and structures such as gender may constrain the adoption of CSA practices in projects that rely on self-help constructed locally through discourse as ‘volunteerism’. For example, a discourse constructing a man’s role as that of putting food on the table by earning money may work to constrain the adoption of CSA practices as described in Chapter Six (see Section 6.3). Thus, in this study, from the critical realist perspective, mechanisms are seen to lead to practices.

The interest of critical realist researchers is in explaining the emergence (or non-emergence in the case of the adoption of CSA practices) of observed phenomena (Edwards et al., 2014). Critical realism focuses on “structures and mechanisms, not regularities or patterns or events; that is the

domain of actual or empirical” (Bhaskar, 2008, p. 6). The critical realist's challenge is understanding the mechanism-generating tendencies within a specific context. My goal in the research was to uncover the often “hidden or dormant mechanisms” (Boughey & Niven, 2012, p. 642) that enable or constrain CSA uptake by smallholder farmers. To do this, I needed to start from empirical data generated by interviews with farmers and other stakeholders and work down to excavate the systemic interplay of mechanisms (Wynn & Williams, 2012). The critical realist asks the question, “Why does something happen?” to approach this excavation.

Bhaskar proposes that processes involving absence are essential to change (Bhaskar, 2008b). Hartwig (2015) and Bhaskar (2016) assert that absence – or non-being – may refer to an absence of an entity or feature from consciousnesses and does not necessarily involve absolute absence. In this study, farmers' adoption of practices often emerged from the absence of structures and mechanisms. Water scarcity and drought constraints resulted in the adoption of water conservation climate-smart practices. According to Collier (1998a), ills can be conceptualised as the consequence of absence. In the context of my study, youth unemployment can be linked to the absence of development programmes that create jobs.

3.2.3 Epistemology

As already indicated, critical realism holds that the real exists independently of human perception, imagination and theories (Danermark et al., 2002; Edwards et al., 2014; Wynn & Williams, 2012) and that multiple perspectives of the real are not reducible to human knowledge. Danermark et al. (2002) argue that the nature of the object under study determines the methodology used. Given that the layered ontology posited by Bhaskar means that structures and mechanisms located at the level of the Real are not directly accessible via empirical tools, the inferential methods of abduction and retrodution must be used to access them.

Abduction is a concept developed by Peirce in 1865 (Oltmann, 2009). Abduction involves the use of theory to move from empirical data to describe the sequence of causation (Danermark et al., 2002; Edwards et al., 2014). In other words, abduction comprises “the recontextualisation of existing theory to interpret and give new meaning to an already-known phenomenon” (Jasen, 1995, p. 148; Bhaskar, 2016). Danermark et al. (2002, p. 96) explain this as involving

a move from a conception of something to a different, possibly more developed or deeper conception of it. This happens through our placing and interpreting the original ideas about the phenomenon in the frame of a new set of ideas.

In critical realist research, a researcher can only work from empirical data. Abductive reasoning, therefore, involves using explanatory theory to posit the interplay of structures and mechanisms at the level of the Real, which is not accessible by empirical means.

Retroduction moves from empirical data to posit the structures and mechanisms that could have led to the emergence of phenomena. “New connections and internal relations of structures not directly observable are proposed” (Danermark et al., 2002, p. 102). Retroduction involves imagining a model of the interplay of structures and mechanisms which, if real, would account for the phenomena in question. The use of retroduction involves asking questions such as, “What must the world be like for this to be possible?” In this study, the one question used to guide retroductive reasoning was, “What must the world really be like to account for the low take-up of CSA practices among younger community members?”

To recap, in this study, I used abductive and retroductive inferencing to move from empirical data to identifying causal mechanisms. Critical realists start by describing the Empirical, in the form of, for example, a photograph of successful maize and legume intercropping in a farmer's CSA garden. They then move to positing the mechanisms that led to what they observed using abduction and retroduction. In this study, explanatory theories of resilience thinking, adaptation and climate-smart practices were used in abductive reasoning. In addition, I also asked questions such as, “What must the world really be like?” (Sayer, 2000) (i.e. “What is happening at the level of the Real for successful intercropping to be possible?”). As I have indicated, in critical realism, causation is not based on regular events but on the interplay of structures and mechanisms at the level of the Real. In using abduction and retroduction, the critical realist researcher is engaged in moving between theory and practice observed at the Empirical level.

Critical realists refer to the progression from empirical observation to clarifying the preconditions for something new, without which something cannot happen, as “transcendental argumentation”. At the same time, the argumentation that goes beyond the empirical is termed “transfunctional argumentation” (Danermark et al., 2002). Beliefs, ideas and theories are not automatically deemed

valid. Critical realism applies a method of reasoned rationality to choose one idea over the other, a process referred to as “judgmental rationality” (Archer et al., 2004). The use of judgemental rationality allows for discussion of reality claims which are understood to be provisional. The usual techniques of member checking and triangulation can be used as judgemental rationality exercised in a study. While the critical realism framework and strategies provided me with a structure and guidance for explaining observed phenomena in the study context (Danermark et al., 2002), my claims were reached through the exercise of judgemental rationality. Transcendental knowledge, like all knowledge, is “conceptually mediated, and therefore, fallible” (Danermark et al., 2002, p. 15). What is important is the philosophical position that a reality independent of human thought and action does exist.

What is also important is the critical realist understanding that reality is not reducible to the empirical domain. Bhaskar (1998) argues that reality has two domains: the transitive (socially and historically construed) and the intransitive (natural and relatively unchangeable). The intransitive dimension comprises real social structures such as institutions, monetary and traditional systems, gender and education. There is always a gap between the physical phenomena under study, the intransitive objects theorised about, and the transitive theories generated, that is, knowledge of the conditions which can limit emergence (Danermark et al., 2002). The intransitive objects exist regardless of whether knowledge/theories have developed to explain the phenomena (Danermark et al., 2002). Reality is intransitive; that is, the object under study, reality, exists independently of human knowledge of it (epistemology). The real is understood to remain intact, not changeable; the knowledge generated is transitive. The transitive domain of knowledge is relatively subjective, always open to change, review and contention as more knowledge becomes available. Key to critical realism is the concept of the “epistemic fallacy” (Bhaskar, 1989), or the conflation of what is with what can be known. Bhaskar argues that in failing to move beyond what can be known, empirical research is guilty of the fallacy.

As a researcher, I acknowledge that my interpretation of the identification and explanation of the interplay of mechanisms is open to challenge through, for example, engagement with this thesis.

3.3 Archer's Social Realism

The theory underpinning this thesis drew on British sociologist Margaret Archer's (1995, 1996) work which complements Bhaskar's theoretical work outlined above. This is because, although critical realism provides the researcher with a framework for understanding reality, it is not sufficiently detailed to explore the way human beings interact with the world around them. As my study involved exploring the way smallholder farmers interacted with other human beings who were part of the RU team and the introduction of CSA practices in a resource-poor environment, a theoretical lens which allowed me to explore this interaction in more detail was needed. Archer's social realism allowed me to do this.

3.3.1 Society, the individual and analytical dualism

Debates about the relationship between society and the individual have been going on for many years. Archer's contribution to these debates involves a primary distinction between what she terms "the parts" (structure and culture) and "the people" (Archer, 1995, 1996, 2000). Social structures enable or constrain access to resources and determine societal relationships. In the context of this study, social structures encompassed, among other things, race, gender, age, physical geography and the monetary system. Culture consists of a set of loosely held ideas, values, beliefs and concepts (Boughey & McKenna, 2021a) or societal formulations of mysteries and myths (Archer, 1995). In the study, culture was understood as discourses, or sets of ideas that are loosely bound together, enabling and constraining action, thought and even being (Boughey & McKenna, 2021a; Kress, 1988). Archer's thinking on agency is discussed in more detail below, but for now, it is important to note her insistence on what is termed 'analytical dualism' or the separation, for analytical purposes only, of structure, culture and agency in any attempt to understand how change occurs or does not occur.

Archer identifies three positions in the debate about the relationship between individuals and the societies in which they live before putting forward her own views. One perspective, identified by Archer (1995, 1996, 2000), is that man creates society through the exercise of rationality. The concept of 'Modernity's Man' can be traced back to the Enlightenment, or the Age of Reason of 18th century Europe and is termed 'upwards conflation'. A second position, involving the

understanding that society is paramount and that individuals are the product of the society into which they are born, is termed ‘downwards conflation’ or ‘Society’s Being’ Archer (1995, 1996, 2000). The final position identified by Archer and originally proposed by Giddens (1991), is termed ‘central conflation’ and involves the understanding that the systemic and individual aspects of social life are inseparable. Archer critiques central conflation, arguing that the locking together of what she terms ‘the parts’ (structure and culture) with ‘the people’ (agency) means that it is impossible to see how or when change occurs or explore the role of individuals in bringing about change. Archer concurs with Bhaskar's argument that society and the individual represent “two radically different things” Bhaskar (1989, p. 33), concluding that structure and agency cannot be conflated.

Archer’s position (called social realism henceforward) argues that society pre-exists humans. However, individuals born into a society are accorded the power to change it and are seen to be conditioned, rather than determined, by the worlds into which they are born. In this respect, Archer, who is a critical realist, agrees with Bhaskar, who accords different powers and properties to society (the parts) and individuals (the people) while noting that each is “essential to how the other is modelled” (Danermark et al., 2002, p. 181). Figure 3.3 depicts this understanding.

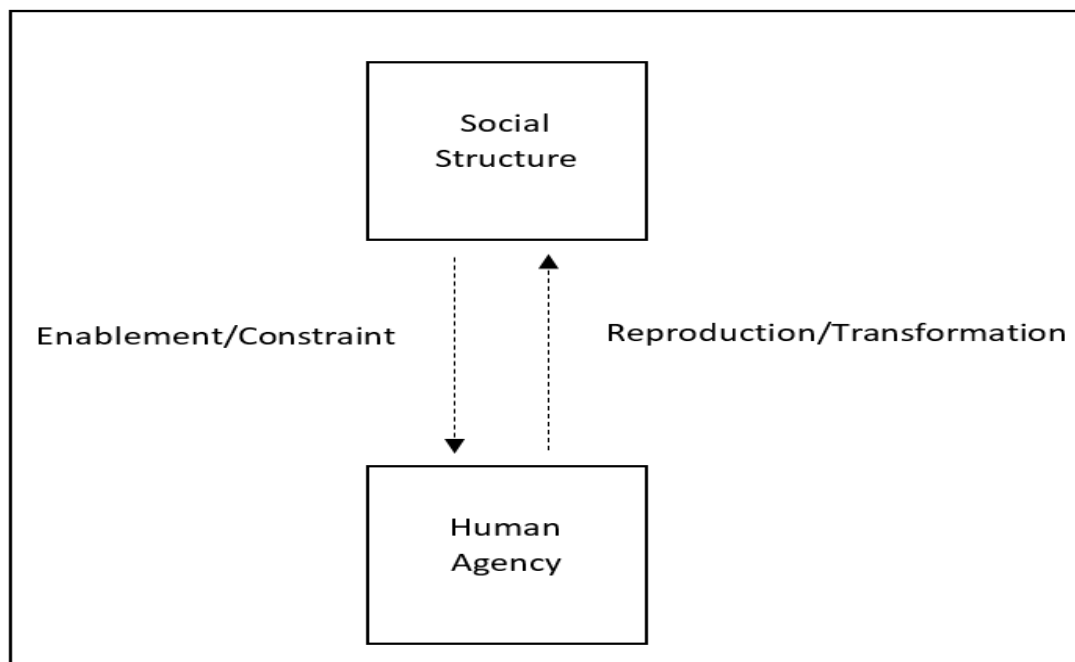


Figure 3.3: The parts and the people (adapted from Bhaskar's transformational model, 1993, 2016)

Archer argues that each social entity possesses causal power and properties. Agents have personal emergent powers and properties (PEPs), mechanisms in the domain of structure possess SEPs, and those in the domain of culture have cultural emergent powers and properties (CEPs). Analytical dualism involves the analysis of the three entities (structure, culture and agency) separately though they interplay continuously.

Archer accords a particular role to agents. Although all three entities possess powers and properties (SEPs, CEPs and PEPs), SEPs and CEPs are dormant until activated by agents exercising their PEPs. Human agents have concerns and priorities and develop projects to address these concerns. Archer hypothesises that agents make their way in the world using an internal conversation or reflexivity. According to Archer (2012, p. 1), reflexivity refers to “regular exercise of the mental ability, shared by normal people, to consider themselves in relation to their concerns”. Archer contends that people carry out an internal conversation about projects that may address their concerns. As a result, agents exercise their PEPs to interact with SEPs and CEPs, which may constrain or enable the fulfilment of personal concerns and projects. In the case of this study, a smallholder farmer’s concern might be to provide food for a household during a time of experiencing severe effects of climate change or a particular weather event. The farmer’s project to address the concern might be to adapt to increasing drought, for example, exercise agency by trying what they can in their personal capacity or engaging a few trusted neighbours or family members or in this study engage with a project introducing new farming methods.

The extent to which new methods (in the case of the example, CSA practices) were adopted would indicate change or non-change. The separation of structure, culture and agency for analytical purposes allows a researcher to see “whose conceptual shifts are responsible for which structural changes, when, where and under what conditions” (Archer, 1998, p. 361), and ultimately, to identify conditions impacting on the success of the project and others like it. My argument, therefore, is that although Archer's work is highly complex, drawing upon key components that provided insight into farmers' adoption and adaptation offered not only the potential for a greater understanding of what worked and did not work in the project, that was the focus of this study, but also guidelines informing future projects.

3.3.2 Agency

Archer distinguishes between three different types of agency. Archer (2000, p. 263) defines the first type of agents, primary agents, as “collectives sharing the same life chances”. Primary agents are accorded very little power and influence to confront the social structures and cultures into which they are born. A group of young people in a rural area, such as the one where the project was located, would be considered primary agents as the circumstances into which they were born are constraining and they lack the power to be able to change them. However, primary agents can transform themselves into a group of corporate agents by using their individual powers of reflexivity to share a common concern and identify a project to pursue this concern. In the project studied, a group of young people arguably transformed themselves from primary agents into corporate agents when they decided to leave the project and seek paid employment elsewhere. For Archer (1995, p. 258), corporate agents are groups

who are aware of what they want, can articulate it to themselves and others, and have organised to get it, can engage in concerted action to reshape or retain the structural or cultural feature in question.

The final type of agents are social actors – individuals who accrue PEPs from the roles they hold and those accorded to them as individuals. Although powers are accorded based on roles, the exercise of those powers will differ. Village headmen would be considered social actors, but each headman would exercise their PEPs differently as everyone’s reflexivity will influence the way they interact with the CEPs and SEPs that confront them.

3.3.3 The morphogenetic framework

Morphogenesis is a biological term for a change in form or shape (Porpora, 2013). Its opposite, morphostasis, refers to non-change. Archer argues that change occurs in never-ending cycles, with the end of one cycle indicating the beginning of another, as shown in Figure 3.4. The starting point of each cycle is termed T_1 and is the period when agents are socially and culturally conditioned by the contexts in which they find themselves.

The second period of the cycle, T_2 to T_3 , refers to the period when agents confront the CEPs and SEPs that confront them as they pursue a project identified to address a concern. As I have indicated above, CEPs and SEPs are dormant until agents interact with them; the interaction can enable or constrain them. T_4 represents the end of a cycle and as noted, marks the beginning of a new cycle. The outcome of the interaction is either transformation (morphogenesis) or reproduction (morphostasis).

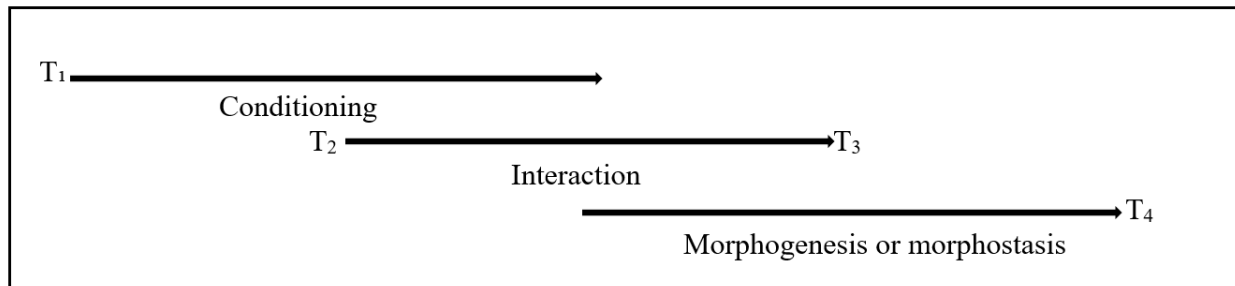


Figure 3.4: A morphogenetic cycle (adapted from Archer, 1995)

Importantly, and in line with Archer's insistence on analytical dualism, it is possible to account for change or non-change in the three domains of culture, structure and agency.

Archer's morphogenetic framework provides a set of tools that allowed me to identify boundaries in time. In this study, period T_1 represented smallholder farmers' social and cultural conditioning in the Machubeni village before the project introduced CSA practices. T_1 included the colonial period, apartheid and the shift to democracy in South Africa. Archer's (1995) social realism holds that social and cultural interactions are conditioned by history. Hoffman and Ashwell (2001), Uem (2023) and Van Huyssteen et al, (2023) concur that the problem of smallholder agriculture and land degradation in South Africa is rooted in history and politics. Thus, in Archer's terms, T_1 influenced smallholder farmers' uptake of adaptation and resilience-building interventions.

The period T_2 to T_3 represented the period of interaction between project leaders and farmers as CSA practices were introduced. T_4 is understood as December 2022, when the project was ending, and it became possible to evaluate the extent to which change or non-change had occurred. T_4 is also the start of a new cycle in that the conditions in place are understood to shape social and cultural interactions in the future. In principle, my analysis of T_4 could allow future researchers to

embark on new research using critical and social realism to explore what happened after the project ended. This thesis explored the period T_2 to T_3 in detail to try to account for the take-up or non-take-up of CSA practices.

3.4 Conclusion

The critical and social realism framework outlined above allowed me to explore the generative mechanisms underlying the emergence of limited CSA uptake by smallholder farmers in one project. The combination of critical and social realism allowed me to move beyond the empirical and delve into a deeper layer to unpack the multiple structural and cultural mechanisms and explain why things happened or did not happen (Brönniman, 2022) in the context of the limited uptake of climate change adaptation practices.

Archer's notion of agency has been critiqued for privileging agency over the powers of structure and culture. Caetano (2015) argues that Archer minimises the role of social origins and associations and adds that her understanding of agency is dependent on reflexivity. This critique does not appear to acknowledge Archer's insistence that, while we may not be determined by the societies into which we are born, we are shaped by them. South Africa has a troubled past and has experienced many failed hopes of addressing economic inequality over the last 30 years (Buthelezi et al., 2023; Fourie, 2024; Mlambo et al., 2023) Given this history and in the context of worldwide climate change, a study acknowledging the power of agents to make change happen seemed important, especially to activists of environmental concerns.

A second criticism of Archer's work involves her understanding of reflexivity as an internal conversation limited to the individual (Akram, 2013; Behari-Leak, 2015; Caetano, 2015). These studies argue that internal conversations (Archer, 2010a) do not only influence individual decisions: agents, that is, humans, negotiate with others to achieve identified projects in pursuing concerns. Akram (2013) notes that overemphasising reflexivity and intentionality could be interpreted as returning to individuality. In support of Archer's understanding, Muthama (2018) points out that the critiques fail to consider Archer's insistence on analytical dualism to identify the mechanisms leading to the emergence of phenomena being scrutinised.

Critical realism is also criticised for being too general (Cruickshank, 2010). In other words, it can be applied to anything. In addition, Cruickshank (2010) criticises the concept of fallibility as defined by critical realist philosophy arguing that fallibility refers to metaphilosophy rather than knowledge. However, Cruickshank accepts Popper's (1963, 1972, 1983) explanation that the fallibility of knowledge can lead to a new theory.

I was aware of these critiques when I chose critical realism and social realism. I will leave the reader of the thesis to decide whether these theories succeeded in allowing me to offer new and useful perspectives and insights into the relatively poor uptake of CSA practices. As I embarked on my study, I faced the challenge of a dearth of examples of research using this framework to explore climate change in micro-level contexts. I hope that my study will at least provide other researchers with an alternative way of looking at the problems that confront us in the context of climate change. The following chapter, Chapter Four, discusses the study's design in more detail.

CHAPTER FOUR: RESEARCH DESIGN

4.1 Introduction

The previous chapter noted that, in drawing on Bhaskar's (1979) critical realism and Archer's (1995, 1996) social realism, the study departed from current methods of assessing climate change adaptation in the Global South in the field of environmental science. Critical realism is a framework and not a method (Fletcher, 2017). However, the critical realism framework allows for employing flexible and adaptive methods (Danermark et al., 2002). This chapter provides a detailed description of the design of the study.

As already indicated in Chapter Three, critical realist research expects a researcher to move from the levels of the Empirical and the Actual to abduct and retroduct to the level of the Real. Bhaskar argues that, although we can only begin to know the world using the senses, it is necessary to move beyond observations and experiences to a deeper layer of reality. Critical realists draw on methodological pluralism to do this using both quantitative and qualitative data (Danermark et al., 2002). When quantitative data are drawn upon, the aim is to describe rather than prove a correlation between cause and effect.

I begin this chapter by outlining the research multi-case study research design before turning to the data collection methods. I then discuss the data analysis approaches and ethical considerations.

4.2 Case Study Research

According to Sammut-Bonnici and McGee (2014), a case study is a research methodology that involves the documented history and comprehensive analysis of different subjects and different situations. A case study is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident" (Yin, 2003, p. 16). Miles et al. (2014) define a case study as a study of a phenomenon happening in an existing bounded system, such as a village or another locale with a clear boundary. Stake (1995, p. 2), who has written extensively on research using case studies, defines the case

study as “a specific, a complex, functioning thing” and, more specifically, as an “integrated system” with a “boundary and working parts”. Merriam (1998, p. xiii) sees a case as “a thing, a single entity, a unit around which there are boundaries” and goes on to explain case study research as an “intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit”. Merriam’s exploration of the characteristics of case study research is particularly useful. She sees case studies as particularistic in that they focus on a particular phenomenon or social setting, descriptive in that they allow for a thick or very detailed description of what is being studied, and heuristic in that they allow readers to develop their own understandings of the phenomenon being studied.

Case studies are suited to critical realist research as they (i) allow for an understanding of the world that is accessed empirically and (ii) acknowledge that observations and experiences at the levels of the Empirical and the Actual are relative. The difference between critical realist research drawing on case studies and other kinds of research involves the move, on the part of the researcher, to explore the level of the Real. Since critical realism does not accept strict cause/effect relationships between the interplay of mechanisms at the level of the Real and the emergence of events at the level of the Actual and observations and experiences at the level of the Empirical, it is also in line with claims that generalisation from case study findings is not possible (Stake, 1995). Rather, the rich descriptions they offer mean that readers are able to make decisions about the extent to which a case might apply to phenomena, problems or settings in which they themselves are interested.

Creswell (2003) points out that the researcher can deliberately select a sample in a qualitative approach. This is termed “purposeful sampling” (Creswell, 2003, p. 185). For the study, I purposefully selected five out of 14 Machubeni villages practising CSA and ecosystem rehabilitation operating under the project. For this study, I was not interested in villages and smallholder farmers who were not participating in the project's climate-smart activities. As Chapter One noted, the project aimed to strengthen rural communities' knowledge of and ability to adapt and sustain their livelihoods through interaction with SLM knowledge and climate-smart innovations. The selection of five villages helped capture the variation and corroboration of evidence to enhance the reliability of my arguments and conclusions (Miles et al., 2014; Murata,

2021). As recommended by Crowe et al.,(2011), the case study design enabled detailed data collection using a variety of data collection methods over the sustained study period framework.

Stake (2000) maintains that a case study is not a methodological choice but a choice of what is to be studied by whatever method. Similarly, Robson (1993) claims a case study is a strategy rather than a method, such as an interview or observation. In the thesis, the case study design allowed the data collection in different project hubs at each village, making it an embedded collection of nested mini-cases (Lotz-Sisitka & Raven, 2004; Yin, 2009, 2012) across the different village cases, as shown in Figure 4.1. In this thesis, a Hub refers to the focal point of activities. The study's four operational hubs were the CSA home gardens, Land Rehabilitation, Improved Livestock and Rangeland Management, and Improved Governance. The Hub operations are detailed in Chapter Six. The four hubs' climate-smart intervention activities were intended to contribute collectively to improved food security, livelihood, climate change adaptation and resilience building. Each of the Hub cases was an entity in a specific village context. Each Hub had five participating households in each village, comprising 100 homes. My study therefore involved an overarching case (Machubeni) with several sub-cases focused on hubs.

The multi-case study design shown in Figure 4.1 allowed me to analyse the climate-smart innovation in the five Machubeni villages across four different hubs implementing climate-smart adaptation interventions. At the same time, the embedded case design helped me to identify the way individual and corporate agents exercised their agency at different sites. The approach allowed me to study contemporary CSA phenomena with a time-space configuration that was not easy to manipulate (Yin, 2003). In addition, the design allowed me to depend on “multiple sources of evidence, with data needing to converge in triangulation fashion, and benefits from the prior development of theoretical propositions to guide data collection and analysis” (Yin, 2002, pp. 13–14).

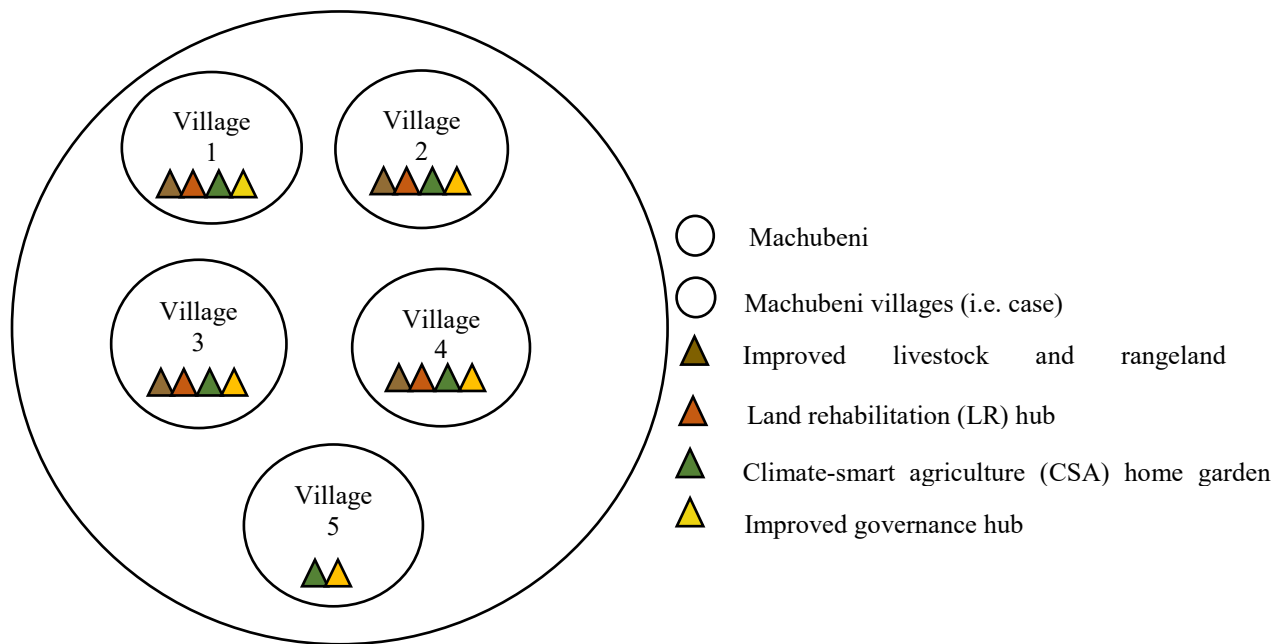


Figure 4.1: A multi-site/multi-case study design

A case study approach offers the potential to obtain deeper insight into why individuals, groups and organisations make particular sets of decisions, how these decisions are implemented and with what result (Schramm, 1971). Given that my study drew on Archer's (1995, 1996) social realism, the case study approach allowed me to explore the exercise of agency in some detail. The design enabled the identification of smallholder farmers' response to, and thus the uptake of CSA practices in a South African rural community setting. I sought to understand smallholder farmers' interactions within the case study design to capture the nuances of CSA complexities.

Critical realism, as indicated earlier, has no specific method components. The following section discusses and outlines the various data collection methods employed in this study.

4.3 Data Collection

Data collection involved a qualitative approach to making sense of farmers' understandings of adaptation and their responses to these. Different methods were used to collect data requiring many visits to the project site. The set of methods included observations, the collection of photographs,

data generated through in-depth interviews with individual farmers, focus groups discussions and semi structured informal and formal interviews with stakeholders. In line with the multi-site/multi-case study design shown on Figure 4.1 the data collection methods were employed in the five participating village and all the hubs.

4.3.1 Observation and photographs

As a critical realist researcher, I started with observations and experiences understood to be located at the level of the Empirical. I was able to draw on photographs taken between 2017 and 2021. The photographs were a primary data set generated by the RU team for the purpose of this research. Direct observation and photography were disrupted by the COVID-19 outbreak in 2020 as national lockdowns restricted my access to the study site. I identified the period between March 2020 to December 2021 as a time for collecting data from the field. Fetters et al. (2013) point to the need to adjust approaches as circumstances require. The COVID-19 outbreak made accessing the identified population virtually impossible. The COVID-19 lockdowns required me to adapt the initial methods I had identified as I could not get into the research site. As a result of COVID-19 lockdowns (which lasted from March 2020 to November 2020 and May 2021 to October 2021), I decided to depend on photographs taken by trained Community Liaison Officers (CLO), appointed local project representatives and residents at the study site. These photographs recorded the implementation of CSA home gardens, the establishment of Vetiver nurseries, the production of fodder crops by livestock farmers and land rehabilitation activities on demonstration plots and rangelands by Land Rehabilitation Activists (LCA), the participants responsible for rehabilitating rangelands. The tagged photographs were sent to RU by cellphone using WhatsApp. We uploaded the photographs to Google Drive for record keeping. An example is shown in Figures 4.2 and 4.3.

Direct observation was also used as a means of collecting data. Observation entails taking notes and recording events and feelings as things happen instead of asking about them (Kothari, 2004; Mandikonza & Lotz-Sisitka, 2016). The observation method has its roots in ethnography, which entails immersion by the researcher in the community (Dumont, 2023; Spradley, 1980). However, because of Covid-19 restrictions, direct observation involved taking photographs and carrying out

transect walks between November 2020 and April 2021, and between November 2021 and April 2022, when the Covid-19 lockdown restrictions were finally relaxed. The observation thus extended beyond the date on which I had planned to terminate data collection which was December 2021. Transect walks confirmed existing understandings or led to the generation of new observations indicated in photographs and interviews on climate-smart adaptation and resilience-building measurements. A major purpose of observation data was thus to triangulate interview data (Bowen, 2009).



Figure 4.2: Smallholder farmers' CSA home garden Figure 4.3: Smallholder farmers addressing water journey from adoption to improved food security and scarcity (RU Hub Team) income, Source (RU Hub Team)

4.3.2 Interviews and group discussions

I extracted photographs saved on Google Drive by the project team and arranged them into grids according to participants and Hub activities (see Figures 4.2 and 4.3). I used these photograph grids as a starting point for in-depth interviews with respondents. The participants were shown photographs of relevant training in the hubs and photographs of individual gardens, fodder fields and land rehabilitation activities over the study period (See Section 6.2. Figure 6.2). The participants were then asked to recall events related to their own activities as captured on the photographs and how they interacted with CSA and to identify the enablers and the constraints they faced. Finally, questions about the sustainability of activities after the project had ended were

asked. The interviews lasted 30 to 45 minutes, and group discussions averaged between one and one and a half hours.

The basis of selecting in-depth interviews as a method was the assumption that social reality is accessed by understanding how people construct their worlds and experiences and attribute meaning to experiences (Merriam & Tisdell, 2016). This is also in line with the critical realist view that it is only possible to begin to know the world because of empirical experiences and observations. The interviews were held with the assistance of an isiXhosa translator. Community-focused group discussions were also held in the local language. Interviews and discussions were recorded and transcribed verbatim (see Section 4.7). Participants' words were used as evidence to support claims and express meaning (Newing, 2010). Quotations were corrected grammatically for smooth reading and printed in italics to differentiate them from my comments upon them in Chapters Five, Six, Seven and Eight.

Informants were selected based on their willingness to participate during the data collection period and their knowledge or interest in CSA. A purposeful sampling technique was employed to identify potential interviewees from those participating in climate-smart innovations. An average of one or two interviews per Hub per village took place in each of the five participating villages. Interviews were iterative and conducted in natural settings, as advised by Greef (2011), such as the homestead, home garden, rangeland or village halls in the case of focused group discussions. The aim was to ensure adequate coverage of the CSA phenomena across varied village settings (Maxwell, 2012a; 2012b). A total of 20 participant interviews and six group discussions were conducted. The interview cut-off was when the saturation level was reached. Saturation refers to when no new information is observed in the data. As recommended in the literature, the saturation level was reached after five or six interviews per Hub as recommended by Guest et al. (2006). The cut-off met the analytical requirements as the number of participants per Hub was five households per village. The total number of participating households in the four hubs and five villages were 100.

Interviews with selected stakeholders, identified as "social actors" in terms of Archer's (1995, 1996) thinking, were conducted. Three traditional leaders, two local municipality officers and two agriculture department officials were interviewed. The actors were selected on basis of their

decision-making power and involvement in CSA activities. These informal and formal semi-structured interviews complemented other interviews and focus group discussions.

Project planning meetings were also used as a means of generating focus group data. Six group discussions were held in the five participating villages to supplement other information gained from interviews. Group discussions involved mixed gender groups (livestock and rangeland managers, LCAs, Eco Rangers, herders, local municipal officials and academics from RU involved in the project). The mixed groups allowed members implementing different innovations to express views on what was working or not and areas of shared visions or resistance. One focus group discussion with LCAs at the rangeland work site was conducted as they rehabilitated the rangeland. The focus group discussions were as important as collective conversations (Kamberelis & Dimitriadis, 2011). They served as a platform to extract tensions, dissonance and absence, and to identify congruence in discourse analysis (see Section 4.4.2). In the case of the youth interviews, most were conducted with TV soap operas playing in the background. A 'natural setting' for the emergent consumerist culture among the youth (see Section 5.2.2). The data generated in the formal, informal and group discussions complemented or contradicted direct observations and gave insights into the interplay of various forms of agency and mechanisms in the domains of structure and culture.

I drew on relevant literature to scaffold the interview process (Edwards et al., 2014) and help me focus on the interviews. I used the CSA principles and adaptation and resilience-building theories I identified in the literature (Arts et al., 2017; Biggs et al., 2012; Freeman et al., 2015; Pedroza-Arceo et al., 2022; Walker, 2020). to structure the open-ended interview guides as shown in Appendix D. The interview guides allowed participants to contribute their perspectives on CSA and ecosystem rehabilitation freely. Room was left for discussion of emerging issues raised by respondents. Questions also centred on understanding farmers' concerns and how they exercised their agency in interactions with innovations in the T₂ to T₃ phase of Archer's morphogenetic framework (Archer 1995, 1996). The aim was to elicit information on enablers of and constraints to the agents' adoption of practices and strategies related to adaptation and resilience building introduced in project training workshops. The idea was not to seek agreement but to identify challenges and share knowledge on the way the farmers replicated or transformed their existing

practices in the context of the training to which they had been exposed. In other words, to understand why and how respondents made certain decisions.

Using photographs to guide in-depth interviews helped to elicit narratives that shed light on conditions that enabled and constrained the uptake of knowledge and why respondents continued to draw on existing practices, adopted new ones or disengaged from aspects of the CSA adaptation. Photographs had the potential to depict what the photographer intended to depict. In the study, the tagged interviewees highlighted these issues contributing to effective corroboration of different data sources, limiting bias and thus improving data validity. The agents' interview responses revealed their internal conversations (Archer, 2010a) as they deliberated on their concerns and personal projects (Archer, 2000, 2003). I thus used interview data sets to extract information on how individuals and groups exercised their agency based on their reflexivity as mediated cultural or structural mechanisms in the T₂ to T₃ phase. The photographs and interviews also helped me to understand, describe and explain the concrete empirical, often complex situations in everyday language (Danermark et al., 2002). The study's knowledge claims are based on describing the reality from the participants' perspectives that must exist for CSA acceptance or low commitment (Wynn & Williams, 2002).

4.3.3 Field notes

Field notes record what is seen or heard during observation and interviewing (DeWalt & DeWalt, 2011). Throughout the data collection period, I made field notes. I wrote memos based on my observations of each interview and the participants' reactions, such as anger, joy and pain. The field notes were handwritten in A5 notebooks or typed on a laptop. Field notes are of three types: methodological, descriptive and analytical (Bernard, 2006). In this study, I did not divide my field notes into types. After each interview, I reflected on and documented what was happening and how this related to constraints, enablers and the way agents exercised their agency in relation to generative mechanisms in implementing CSA adoption and resilience-building innovations. I reflected on what adaptation and resilience literature regarded as a success by agents (for example, agents' self-organisation) and how interview observations confirmed or did not reflect what happened in documented literature in an open system. The following section details the approach used for data analysis in the study.

4.4 Analysis

In keeping with my understanding that discourses are mechanisms at the level of the Real, discourse analysis was used. I begin this section with an outline of discourse and discourse analysis. I then look at document analysis before turning to interview analysis.

4.4.1 Discourse

According to Kress (1989, p. 7), discourse consists of

systematically organised sets of statements which give expression to the meaning and values of an institution. Beyond that, they define, describe, and delimit what is possible to say and not possible to say (and by extension – what is possible to do or not to do) concerning the area of concern of that institution, whether marginal or centrally.

In other words, discourse is a set of ideas and values that expresses society's ideology. Discourse is how both written and spoken language expresses cultural identity and perspectives (Gee, 2014). Discourses can be discerned in language and any other sign system. For example, the arrangement of a group of homesteads around a common area can be read as indicative of a site of values and ideas about community and family relationships. Therefore, discourse is the social construction of reality by a society (Potter, 1996). In critical realist terms, as mechanisms at the level of the Real, discourses, in interplay with other mechanisms, lead to the emergence of events and observations and experiences of those events. These mechanisms are understood to possess causal powers that enable or constrain the way we think, talk and act (Bhaskar, 2008). In the example provided above, the building of the homesteads and the laying out of the land can be understood as events which are then experienced differently by individuals. In this study, discourses were understood as mechanisms that led to the emergence of events related to the adoption or non-adoption of CSA practices.

4.4.2 Discourse analysis

The discourse analysis involved, firstly, transcript analysis. According to Fairclough (2003), discourse analysis goes beyond textual analysis to be interpretative and explanatory. There are different ways of conducting discourse analysis. I employed discourse analysis using the following

steps (i) identifying a discourse because of iterative readings of a text; (ii) naming the discourse; (iii) giving an example of it and (iv) describing its effects (Oltmann, 2009). In my analysis, a description of the effects of the discourse involved a discussion of the way it served to enable or constrain the emergence of events understood as practices related to CSA and project participants' experiences and observations of these events. In naming discourses, I used phrases that seemed to capture the main ideas. So, for example, I named one discourse, "December is busy", as it encompassed a set of ideas about what were appropriate activities for December. I then moved from the named discourse to identify its effect across individuals and village local contexts. My analysis required me to look across all interview transcripts iteratively to confirm or question the identification of a discourse. As my analysis proceeded, I sometimes collapsed the discourses together or separated them. It was also possible to identify discourses in photographs of activities, and innovations. In line with Bhaskar's critical realism and Archer's social realism, the framework is summarized as shown in Table 4. 1.

Table 4.1: Framework of analysis following Bhaskar(1998;1979)and Archer (1995;1996)

<i>Village (i.e. 1,2,3,4 or 5)</i>	<i>Structure</i>	<i>Mechanism</i>	<i>Evidence</i>	<i>Deconstruction</i>	<i>Enabler/ Constraint</i>

In social realist terms, discourses are understood to possess CEPs which are dormant until the discourse is taken up by agents. One of the purposes of discourse analysis is to raise awareness of discourses and the way they work to enable and constrain so that agents can choose to resist them.

Social campaigns often seek to raise awareness of dominant discourses. On the RU campus, for example, activists have worked for many years to identify and challenge discourses constructing women as inferior to men, and thus, as available for their use.

Newman (2020) notes that discourse analysis is not about textual analysis of social practice but is part of the morphogenetic cycle. In other words, discourses reveal emergent tendencies over time. Often, discourse analysis identifies unanticipated emergent causal properties that influence (Elder-Vass, 2005) innovation acceptance. Thus, in this study, discourse analysis and the separation of people and parts for analytical purposes allowed me to identify properties that enabled and constrained the adoption of CSA practices.

4.4.3 Document analysis

Document analysis refers to a systematic analysis of printed and electronic material to obtain meaning and understanding (Corbin & Strauss, 2012). Regarding the morphogenetic framework, one of my first tasks was to identify the social and cultural conditioning at T_1 . To do this, I read the literature and analysed numerous reports and theses to develop insights into the conditions in place before the project started (Fletcher, 2017). Often, this analysis of documents and academic texts involved discourse analysis. However, it also allowed me to identify structures such as policies and those at a more macro level.

I attempted to confirm my analysis of the social and cultural conditioning in place before the project began in interviews conducted to explore the T_2 to T_3 phase of the morphogenetic cycle. In analysing T_2 to T_3 , I sought to identify the way individuals had exercised their agency in relation to the adoption of CSA practices. However, in doing this I could probe acceptance or non-acceptance by asking about conditioning in ways project participants could understand. This provided a means of triangulating data and checking the validity of my original conclusions about social and cultural conditioning gleaned from my documents and literature analysis.

The second way I used document analysis in my study was to obtain historical and contextual information to triangulate data obtained using other research methods (Bowen, 2009). For example, I used Hub leaders' Back to Office Reports (BTOs) compiled by project members after

each field visit. In reading the BTOs, I sought to understand the way participants interacted with project training and to identify evidence of the way they were exercising their agency in their interactions with project activities. Further, I triangulated the insights from BTOs with my field notes, memos, observations and discourses captured on photographs.

4.4.4. Abduction and retroduction

Tshuma (2018, p. 110) notes that abduction and retroduction “are two sides of one coin”. In this study, abduction drew on existing explanatory theories and explanations in the literature. For example, a high level of education increases the uptake of complex CSA concepts, while poor education and age constrain elderly farmers to take up climate-smart innovations (Mutuku, 2017; Molieleng et al., 2021). My understanding of the role of education in the uptake of innovations then allowed me to see that the valuing of training opportunities was, at least partly, related to the failure to provide educational opportunities to them by the previous apartheid system.

As I have explained in Chapter Three, retroduction involves asking the question, “What must the world really be like for this to happen?” (Bhaskar, 2016; Danermark et al., 2002; Price, 2016). An example of the way I used retroduction can be seen in my identification of a discourse I named ‘Livestock is our bank’ which explained the value placed by elderly farmers on looking after their livestock. Retroduction also allowed me to see how land ownership structures contributed to younger community members' poor uptake of CSA practices.

Table 4.2 summarises the research process and how the different methods outlined above were used to explore the different phases in Archer’s morphogenetic cycle:

Table 4.2: The relationship of methods to the morphogenetic framework

Archer phase	Data generation and analysis
T₁	*Document and literature analysis *Interviews with individuals and stakeholders *Discourse analysis of major ideas in the literature *Identification of structures <i>Data gathered from T₁ fed into T₂- T₃</i>
T₂ - T₃	*Photographs *Interviews with individuals and stakeholder groups in each village *Observations and transect walks *Field notes *Discourse analysis, identification of structures *Abduction and retroduction to reach the level of the Real <i>Data gathered and analysed indicates transformation status, that is, morphogenesis or morphostasis</i>
T₄	*Interviews with individuals and stakeholders *Group meeting with government officials <i>Data gathered and analysed indicates impact of project and reasons for this in Machubeni at T₄</i>

4.5 Ethical considerations

Spradley (1980) notes the importance of the obligation to respect informant rights and needs. Before commencing the study, I obtained ethical clearance from RU (Code 2021 28031 6052). In addition, gatekeeper permission was sought from traditional leaders and the local municipality. The interviews were held with the assistance of an isiXhosa translator and a different Xhosa transcriber was used to provide written versions of the recordings. This approach was adopted to reduce bias in the transcription. The isiXhosa assistants were required to maintain confidentiality. Before the interview commenced, participants received an explanation of the study objective and interview focus. They were informed of ways in which confidentiality could be maintained and told they could withdraw at any point. Formal consent to participate and for interviews to be recorded was obtained by each interviewee signing a consent form as required per the requirements imposed by RU's ethical approval processes (see Appendix C). Once consent was granted, the interviews commenced.

I removed all references to individuals in the quotations used in this thesis. Pseudonyms in the form of numerical symbols and letters are used to protect their anonymity.

4.5.1 Validity

The objective of using multiple methods (i.e. secondary data sources, photographs, interviews, observations, transect walks, field notes and member checking) was to corroborate data sets to overcome bias limitations, thus improving data validity (Wynn & Williams, 2002; Yin, 2003). The participants and my reflexivity helped ensure the trustworthiness and rigour of the research process. Drawing on several sources of data is a critical realist approach which acknowledges and tries to manage the fallibility of the researcher. Having five research sites or cases allowed for triangulation of the data on the uptake of CSA practices and the reasons for them, though triangulation was challenging as conditions in each site were not identical. As Lincoln and Guba (1985) advise, I engaged with peers, other experts and academics throughout the PhD journey through conference presentations. At the International Association for critical realism (IACR) 2021 and international conference on climate smart agriculture, Mauritius, 2023, I received comments on how best to improve methods and credibility.

Generalisation – applying research findings to a broader environment – is an important criterion in research studies (Polit & Beck, 2010). This thesis mainly intended to generate a rich contextual understanding of smallholder farmers' limited uptake of CSA innovation in particular cases. Danermark et al. (2002) emphasise the importance of not claiming strict cause/effect relationships between the existence of mechanisms at the level of the Real and the emergence of events at the level of the Actual and experiences and observations at the level of the Empirical. The aim of critical realist research is not to produce generalisations of the nature claimed by positivist approaches. As I have explained above, the case study approach was applied based on this understanding. Generalisation though not technical possible because of purpose sampling technique applied, the multi-case design me to explore similarities, differences, patterns and variations across different villages, sites and Hubs across Machubeni. The design aimed to provide a rich description of the case of Machubeni, which could then be interrogated by researchers working on other sites for comparison purposes.

Bassey (1999) maintains that case studies allow for generalisation about an instance or a particular class (which in this case would be that of smallholder farmers in South African rural areas). Cohen et al. (2007) concur that generalisability is only possible when a case involves people in similar institutions and positions. I leave it to the reader to evaluate whether insights developed from the study can be generalised given their specific circumstances or whether, as noted by Glaser (2002), these are unique to South Africa's post-apartheid homeland context.

4.6 Problems in the Research Design

The use of translators and transcribers had time lag limitations. I analysed all the interview transcripts myself. Only after analysis of transcripts was I able to identify opportunities to follow up on insights. I addressed this problem using interviews iteratively, seeking clarification of issues raised in previous interviews and subsequent engagements with informants.

4.7 Positionality

I am a Zimbabwean woman studying towards a doctoral qualification in environmental science at RU in South Africa. My passion is contributing to climate change debates and the way rural communities with little formal education adapt and realign their livelihood strategies. My interest in climate change adaptation and resilience building was motivated by developmental work in which I assisted smallholder farmers in rural villages in Zimbabwe as well as my personal experience of the hardships of years of drought-induced crop failure and literal hunger at the household level as a member of a household practising smallholder farming.

My study sought to contribute to the debate on the uptake of CSA practices using critical realism. The CSA practices have been proposed as a panacea for problems experienced by smallholder farmers in Africa in the wake of climate change (Mutengwa et al.,2023; Ogunyiola et al.,2022). Given my background and my passion for work in this area, studying smallholder farmers' limited uptake of the developmental project introducing agricultural innovations to reduce the impact of climate change on smallholder farmers, could have allowed a degree of bias especially when there is also little or no external critique (Lindergger, 2006). I had to remain conscious of my background as a member of a smallholder farming family and implement reflexive measures to detach myself

and remain critical. This was achieved through reflexive engagement with the research questions and in-depth analysis of multiple data sources in the case study design (Yin, 2012). I would also argue very strongly that my use of a critical realist ontology allowed me to see the world differently from how I had previously understood it. The theory, therefore, played a large part in allowing me to manage any potential biases. For this to happen, I had to hold rigorously to my theoretical framework and use it to interrogate my actions, my thoughts and any conclusions and insights I arrived at regularly.

4.8 Conclusion

This chapter outlined the design of this research study and attempted to explain the reasons for design decisions. It also provided a brief outline of my data analysis tools and techniques. Chapters Five, Six, Seven and Eight present insights from my study.

CHAPTER FIVE: STRUCTURAL AND CULTURAL CONDITIONING AT T₁

5.1 Introduction

This chapter is the first of a series of chapters where I draw on my theoretical framework to answer my research questions. In Chapter One, I noted that this study is not about climate resilience building per se but about how farmers exercised agency as they interacted with CSA and ecosystem rehabilitation innovations. Using Archer's social realism (Archer, 1995, 1996, 2000, 2007), I explore the way farmers in Machubeni in the Eastern Cape and leaders of the project who attempted to introduce CSA practices to the farmers, were enabled or constrained as they exercised their agency. Given concerns about the limited adoption of CSA in South Africa (Chapter One), Archer's social realism and particularly her morphogenetic framework (see Chapter Three, Section 3.3.3) allowed me to make statements about the extent to which change in the form of adoption of CSA practices, in Archerian terms, morphogenesis or non-change, morphostasis had occurred.

In this chapter, I look at T₁, which in terms of the morphogenetic framework is the social and cultural conditioning in place before the project began in 2017. Drawing on Archer, I analyse how the various agents (i.e. farmers and project implementors) were conditioned because of the contexts into which they were born and to which they were introduced over time. To explore the social and cultural conditioning at T₁, I draw on project documents and interviews conducted with smallholder farmers and leaders of the project. In addition, I analyse other evidence in the form of photographs, my observations in the field, field notes and discussions with Hub leaders (See Section 4.3.1 ,4.3.2 and 4.4.3).

In Chapter Six I look at the second phase of the morphogenetic cycle, termed T₂ to T₃. For Archer, T₂ to T₃ involves social and cultural interactions as various forms of agency (primary agents, corporate agents and social actors) draw on their concerns and attempt to implement the projects they have identified to address these concerns as they are confronted with CSA practices or

attempted to introduce these practices. Following Archer, I present agents as enabled or constrained by mechanisms in the domains of culture and structure. These mechanisms are understood to possess powers and properties, SEPs or CEPs that work to enable or constrain agents as they exercise their emergent PEPs.

My focus in Chapter Six is on the way smallholder farmers exercised their agency in relation to climate-smart ecosystems rehabilitation. Chapter Seven focuses on T_2 to T_3 of Archer's morphogenetic cycle, particularly on the way smallholders exercised their agency in climate-smart home gardens. Chapter Eight also focuses on T_2 to T_3 of Archer's morphogenetic cycle but this time on the way livestock farmers exercised their agency to implement rotational camp resting without fences, an innovation introduced by the project.

5.2 Social and Cultural Conditioning at T_1

As I have already indicated, this chapter aims to identify the structural and cultural conditioning enabling and constraining forces as agents engaged with the introduction of CSA practices in the project. In other words, the chapter focuses on the first research question guiding my study:

How were participants in the project introducing CSA practices structurally and culturally conditioned to exercise their agency at the beginning of the project?

Given the timing of the project and the ages of agents, this conditioning was understood to have taken place in the context of apartheid and the transition to democracy from the early 1990s onwards.

In my exploration of social and cultural conditioning in this chapter and of the way agents exercised their agency described in Chapters Six, Seven and Eight, I use the concept of consciousness. In this study, the term 'consciousness' draws on Bhaskar's (1978, 1989) critical realism. As explained in Chapter Three, Figure 3.1, critical realists posit a layered ontology. The first layer, the Empirical, consists of experiences and observations of the world around us which are understood to be relative. The second layer, the Actual, is the layer of events which are understood to take place regardless of whether they are observed or not. This layer is also understood to be relative. The final layer, the Real, consists of relatively enduring structures and

mechanisms from which events at the level of the Actual and experiences and observations at the layer of the Empirical emerge. In this thesis, the concept of consciousness spans all three levels of Bhaskar's ontology and different groups are understood to exhibit different forms of consciousness in relation to the world around them. Following Archer (1995, 1996, 2000) and her insistence on the way all agents are socially and culturally conditioned, the consciousness of a group of resource-poor farmers is likely to differ from that of a group of academics. Although the groups cannot be understood to be uniform, individuals in each group are understood to have been exposed to similar mechanisms, but which differ from those to which agents in another group have been exposed. For example, although the academics in the RU project team all came from different social and cultural backgrounds, all had been exposed to academic contexts and had thus engaged with the principles and theories associated with Western science. In a similar vein, although some may have been raised in deeply rural areas, all had been exposed to what I will term the 'modernity' of town and city life as they had studied and worked at universities located in urban areas. While project members may have developed a profound 'rural consciousness' as they grew up, the nature of social and cultural conditioning meant that exposure to different contexts as a result of education meant that the original consciousness expanded to include what I have termed 'modernity'. The extent to which and how each agent in the RU team exercised their agency in drawing on Western scientific knowledge is understood to have been tempered by other mechanisms constituting their social and cultural conditioning. Elderly rural farmers, on the other hand, were understood to have been socially and culturally conditioned differently. As a result, the way they observed and experienced the world and thus exercised their PEPs in pursuit of agency was understood to differ from the way the project leaders viewed the world, and the way youth experienced it. The study defines youth as individuals between the ages of 15 to 35 years (African Union, 2007). Elderly refers to individuals above the age of 35 years (Etwire et al., 2022) .

My use of Bhaskar's critical realism allowed me to identify different forms of consciousness in three groups: the project team, the elderly farmers and the youth. My use of Archer's social realism, and more particularly her morphogenetic framework, allowed me to see that these forms of consciousness acted to condition agents at T_1 socially and culturally. In the context of the project, they were therefore conditioned to exercise their agency in different ways as they proceeded to implement it. I now proceed to explore the different forms of consciousness.

5.2.1 The modern world/consciousness

The project implementation team comprised technical experts, all of whom had benefited from higher education. In addition, all had lived in rural communities, either because of the circumstances into which they were born or because their work in the field of environmental science had involved previous research and project work which required them to work in the field. Regardless of the circumstances in which they had been born, all members of the project team had been exposed to university contexts in which discourses privileging Western scientific knowledge, sound environmental practices, procedures, and SLM and environmental stewardship ('do good not harm') were dominant. Environmental stewardship refers to responsible management to ensure the conservation of natural resources (Welchman, 2012). In other words, it is the responsible use and care of nature (Cockburn, 2018). Other studies, for example, Chapin et al. (2010) advocated the promotion of a stewardship framework to address challenges faced in sustainable ecosystem management. The project team's conditioning often clashed with the conditioning of the farmers. For example, a community member suggested using chemicals when discussing invasive bush clearance in pasture rehabilitation. The project team's response drew on the 'do good not harm' discourse as the following example shows: "*Chemical use is not allowed because it will destroy nature. You cannot just put them in the mountains, the government does not allow that, but you can do it in your private garden.*"

Although the project team was aware that the government and some Machubeni workers applied arboricides – a chemical to control expansive and invasive woody species – the RU team stressed avoidance of chemicals as the project focused on climate-smart practices and, therefore, the emphasis was on organic or nature-based strategies to solve environmental problems. In addition, the team did not budget for expensive methods of rehabilitation, believing in the use of simple cheap locally available resources. In its Expanded Work Programme (EPWP) (Working for Water), the government used arboricides to clear invasive wattle trees in parts of the Eastern Cape. The project team felt that, however effective they may be, chemicals were not suitable for a project that sought to use nature-based strategies. In not using chemicals, project leaders were drawing on their consciousness which encompassed discourses privileging sustainable environmental management, which itself is part of broader Western thinking associated with the need to protect

nature. Environmental discourses emerged in mid-20th century Europe as a response to incidents of widespread environmental degradation in Europe and its African colonies (Beinart, 2003; Murata, 2021). The project team continued to draw on discourses promoting sustainable environmental management by referring to regulations. Section 24 of the South African Constitution sets out the right to an environment that is not harmful to health or well-being (du Plessis, 2018; Republic of South Africa, 1996). The adherence to and respect of the Constitution itself is part of Western consciousness, given the origins and intellectual roots of the concept.

However, although the community, including elderly livestock farmers and youth, did not challenge the idea that the environment should be protected, their relative isolation meant they had not been exposed to the dominant discourses and the scientific thinking associated with them to the same extent as project leaders. Having participated in multiple, externally driven intervention projects, sometimes for money and sometimes not as discussed later in Section 5.2.2., the community members were concerned mainly with identifying ways to stop the encroachment of the terrain by the invasive bush *Euryops floribundus*, named ‘lapesi’ locally.

The project team had also been exposed to discourses privileging the idea that order is achieved through adherence to written contracts and agreements as provided in the Municipal System Act (no 32 of 2000). For example, after introducing the project and training participants in conservation-relevant practices, the implementors explained the requirement for the community and RU to draw up contracts. These included an asset-use agreement and commonage management bylaws. The former was meant to regulate how participants used project assets to prevent their misappropriation. Following the Republic of South Africa (2000) Local Municipalities Act No 32, bylaws were drawn up to regulate access to, and use of, rangelands and common-pool resources. An RU team member explained:

Rhodes drew up a conservation agreement that indicated what Rhodes would assist with, what the community thought about things like fire guard, keeping animals, and so forth, and how Rhodes would help manage some of the stuff like employing Eco Rangers. Land Conservation Activists (LCAs) can work in the rangelands, close the gullies, and have the fire points.

Local project participants including the traditional leaders were involved in the meetings in which the drawing up of contracts and bylaws was facilitated. Their involvement in the meetings suggests

that they valued the use of written agreements and contracts. However, other interpretations are also possible and asking questions about why participants attended meetings based on critical realism could lead to different conclusions. A critical realist analysis could identify discourses constructing the project as highly participatory and enabling attendance at the meeting. It could also identify project funding as a structure enabling attendance. For example, funding allowed for Eco Rangers to be remunerated and also provided equipment and goods such as seeds. Written agreements (see Appendix A) were intended to bring order and structure to inter-party/organisational relations, that is, to what the community would do in relation to the implementation of the project. However, in developing the contracts, the project team drew on discourses that privileged written agreements. Formal written conservation agreements emerge from an interplay of mechanisms that includes discourses privileging the attainment of order through regulation through written documents. Governance is a cornerstone of environmental management and agreements related to governance can be formal and informal. The project team assumed that the community understood the conservation agreement written in isiXhosa (Appendix A) even though South African research (see, for example, Prinsloo & Brier, 1996) shows that, in many communities, oracy is privileged over literacy so that written texts are set aside even though they may originally have been acknowledged. Two of the four villages implementing rotational grazing without fencing did not sign the conservation agreement because they do not value written documents. This indicates that discourses constructing signed agreements as best practices in the regulation of relations between parties or persons were not readily taken up by all actors in Machubeni.

As Prinsloo and Breier (1996) point out, the dominant local practices tended to be governed by oral agreements underpinned by ethical values of trust and mutual respect (ubuntu). In critical realist terms, this would mean that discourses privileging trust and mutual respect lead to the emergence of oral, rather than written, agreements conceptualised as events at the level of the Actual. Because they did not value written contracts, even after signing the agreements, local people would often argue “*You said this...*” or “*You promised...*” (sometimes indicating misunderstandings) rather than cite the contents of contractual agreements. However, from the perspective of the project leadership team, a written contract was a means of, for example, ensuring that farmers understood the argument for the non-use of chemicals and good stewardship and that

they subscribed to the practices associated with environmentalism. It could thus be argued that there was a gap between the consciousness of local rural people and that of the project leadership team whose members drew on what might be termed a Western consciousness that valued a legal system originally derived from Roman-Dutch Law (Murata et al., 2022).

In all this it is important to recognise the position of the funders of the project, the United Nations Development Programme Global Environment Facility (UNDP GEF). Although the project also received co-funding from the South African government and RU, the UNDP GEF and the workings of foreign aid were alien to most people in Machubeni who, as I will argue in the chapters that follow, often constructed aid only as a means of employment. At the project conceptualisation stage, aims, objectives, methods of implementation and expected outcomes were discussed and established. Although the local people of Machubeni were not involved in conceptualising the project, some of the RU team of academics who had been working in the Machubeni landscape for over a decade activated their knowledge of Machubeni challenges (see Shackleton & Gambiza, 2008) and exercised their agency in doing so. The community were informed about the project by the leadership team and their roles in it were explained. The RU team exercised their PEPs to engage and access the UNDP GEF structure. This facility is a multilateral environmental fund intended to support developing countries in meeting environmental agreements related to climate change, biodiversity and land degradation (GEF, 2020). Considering my discussion so far in this chapter, the fund can be seen to draw on discourses related to environmental sustainability and stewardship, Western science and the value of written agreements. To accept the funding the project team at RU had to engage in an agreement with the facility.

Newell and Taylor (2018) argue that foreign aid as it is currently constructed is not beneficial to Africa. Rather the claim is that aid works to further the interests of countries in the Global North. Even the concept of CSA is seen as emerging from the activities of structures such as the United Nations Organisations, governments, research institutions, universities, and private companies to attract climate finance from which resource-poor smallholder farmers do not benefit (Newell & Taylor, 2018). The counterargument to these critiques is that global initiatives such as the GEF are based on science and are not driven by institutional, national or regional agendas. This counterargument assumes that science itself is objective and neutral, a view that is contested by

critical realists (Bhaskar, 1978, 1989) who see scientific observations as relative and as emerging from a complex array of mechanisms at the level of the Real. In addition, Boughey and McKenna (2021b) argue that foreign aid projects are complex and potentially problematic because of the power imbalances between donors exerting pressure to impose Western neoliberal ideologies onto others.

The RU team exercised their agency by drawing on project funding and labour requirements were outlined and agreed on; signed work contracts were provided to community members who acted as Eco Rangers and land rehabilitators or LCAs. In the project, local people were paid for playing different roles in restoring the landscape and its ecosystem services.

Thanks to their previous conditioning the project team could be understood to have been exposed to discourses that privileged rationality and individualism, in other words, discourses constructing the Enlightenment Thinker. The team's concerns were to meet the United Nations Development Programme, Global Environment Facility's 5-year Sustainable Land Management Project's (UNDP GEF5-SLM) objectives and targets (UNDP, 2018). In line with the project document, the United Nations Development Programme (UNDP, 2014, p. 34), stated the outcome of achieving an “economically viable, climate-smart land and ecosystem rehabilitation and management”, the project team identified projects focused on the improvement of livestock productivity and incomes, rangeland rehabilitation and the improvement of rangeland pasture, improvement in crop production and the building of livestock and crop farmers' resilience to climate change.

The RU team drew on macro- and micro-level understandings of livestock climate-smart projects across the globe and in South Africa in particular. The project team also exposed smallholder farmers to successful CSA livestock farming examples and used funding to allow for field exchanges and training workshops. In commenting on the introduction of bylaws and associated penalty systems, an RU member noted: “*MLN is one rural setting in Eastern Cape where bylaws and fines penalties have been set up, and it works*”. The team member at the social learning excursion added:

The lady who helped with the bylaws [in Machubeni] was from MLN, and she was not even suggesting amounts, she was saying, 'In my community where I grew up, this is what we do, what we charge'.

The project team therefore drew on their reason, their previous conditioning and examples they had encountered in other localities in South Africa to identify self-regulation as a means of addressing project concerns. However, although penalties might have been used in the community before the project's arrival, these emerged from an understanding of customary law. The system was introduced because of the project drew on statutory law, not the local customary law. The difference between the two laws and how they differently influence relations between persons and their relations with resources is explained by Bennett (2008). As Diala (2021, p. 1) points out, a notable aspect of Africa's struggle with its colonial legacies is the co-existence of "indigenous laws that emerged in 'agrarian settings' with state laws that emerged in 'industrial settings'". For Diala, the former are pre-colonial norms while the latter are remnants and adaptations of European laws. The result of these two forms of regulation, according to Diala, is often clashes between traditionalists and change agents. The use of bylaws to manage rangeland can thus be seen to have emerged from an Enlightenment worldview and, as Diala would see it, was always likely to result in clashes.

In summary, and in the context of Figure 3.1 above, I have attempted to identify the mechanisms that led to what I have termed the consciousness of the project team. I now move on to look at the way rural participants viewed the world.

5.2.2 The rural consciousness

In contrast to the project team, the rural community had been conditioned differently. Machubeni was established in 1948 as part of the former Transkei homeland (*local communication*). In critical realist terms, Machubeni is an outcome of apartheid structural conditions and mechanisms.

The location of Machubeni is 31°30'53.92"S; 27°9'53.49". It is 16 150 ha in size and is located between the Stromberg Mountains to the north and the Mount Arthur Range to the south. The geology comprises sandstone, mudstone and intrusions of dolerite. Most Machubeni villages are located on valley floors at 1 500m above sea level in mountainous terrain (iKwezi, 2004; Shackleton & Gambiza, 2008). The community lifestyle was conditioned by the geographic location, land size, geological landscape and susceptibility to winter snow, floods and drought. As

detailed in this section, the climatic conditions shaped livelihoods and what I have termed the ‘rural consciousness’ and, thus, individual and corporate agency.

The topography of Machubeni consists of shallow stones and fragile soils. Following their relocation to the area, the farmers exercised their agency by using the hills and steeply sloping mountains to practise crop cultivation on the valley slopes. Cropping on the sloping hills and mountain valleys loosens the fragile soils causing water erosion of loosened soils. Sheet erosion emerges as rain incises the fragile soils and massive gullying can be seen across all villages. This is of concern as sediments are driven to rivers and dams in the catchment, notably Machubeni Dam (Sibiya et al., 2023). Machubeni Dam is the primary water source for Cacudu (formerly Lady Frere) and surrounding villages (Sibiya et al., 2023). Another perilous geographic condition is that Machubeni receives an annual rainfall of 580mm and is drought prone. Temperatures can range between 15.50C and 40C in summer and between -5C and 11C in winter. The climate limits winter cropping to spinach and root crops. Under these conditions, crop production is not a sustainable livelihood source.

In response to the water scarcity and semi-arid conditions in the Eastern Cape, the original indigenous Khoisan population exercised agency through transhumant pastoralism (Scogings, 2004). Transhumant pastoralism is enabled by nature-based disease control, natural grass regeneration, fire regimes and kraaling. In addition to some crop cultivation, the relocated smallholder farmers continued with the traditional Khoisan livestock system. The community exercised agency by practising open grazing of livestock on rangeland. They also drew on the geology of the area to utilise the natural resource of boulders to construct kraals and houses. However, sedentary homeland agriculture later emerged because of apartheid which contributed to the degradation of the Machubeni landscape. In the confined area of Machubeni, dependence on livestock (Sigwela et al., 2017) and fragile soil structure contributed to overgrazing. An invasive bush *Euryops floribundus*, locally referred to as lapesi, covers large tracts of grassland used for grazing.

As a result of the conditions and developments described above, Machubeni has been described as one of the most degraded lands in South Africa (Cundill & Fabricius, 2010; Hoffman & Ashwell, 2001). Furthermore, Hoffman and Ashwell (2001) explain that, although soil erosion is a natural

process, human activities and climate change exacerbate degradation at a global level. The difference in the South African context is that degraded homelands emerged not only because of geophysical conditions but also as a result of the interplay of these conditions with apartheid policies that confined a large Black population to a limited geographic area. It will suffice at this point to note that large human and animal populations in a confined geographic space contributed to massive water erosion and the gullying evident from colonial and apartheid times onwards.

For years Machubeni was ignored and isolated by the state because of apartheid (Sigwela et al., 2017). The granting of self-determination or sovereign independence to ten areas designated as tribal homelands by the apartheid state resulted in Black people being forcibly removed from remote areas. The population of the homelands grew from four million to 11 million between 1960 and 1980 (Hoffman & Ashwell, 2001). As people were left to survive in densely populated rural areas, quality education was also denied (Molieleng et al., 2021). Partly because of the impoverished educational experiences available to them, the privileging of oracy over literacy continued (Prinsloo & Breier, 1996), a phenomenon I have already associated with my observations about the way written contracts may be set aside even though individuals may have signed them. For example – and as I will describe in more detail in Section 8.2.3 – although Eco Rangers signed work contracts, contract conditions were often not honoured by community members, as the following comment from a social actor in the community indicates:

We are observing you, so your working hours are applicable. We are not expecting you to go up to the mountain carrying alcohol and looking after livestock while drunk is impossible because you will make mistakes.

In the project, however, the setting aside of written contracts by community members constrained the effectiveness of rotational grazing practices as the community tended to tolerate a lack of adherence to agreements. The failure to engage with practices that had been introduced cannot only be attributed to the setting aside of written contracts, however, as participants were encouraged to self-help/volunteer for the individual and common good at the beginning of the project. As no money was exchanged in payment for services rendered, it was difficult to impose penalties for drinking at work, for example. Rather, adherence to project rules required the development of professionalism and subscription to project ideals.

In response to the overgrazing that resulted from high concentrations of people and livestock in small areas as well as the sense of hopelessness associated with this, the apartheid government introduced the Betterment Programme to Machubeni in the 1960s and 1970s (Cundill, 2008) to enforce rotational grazing. However, the Betterment Programme only led to the emergence of greater experiences of resentment and rejection and claims of oppression on the part of Black people. Chiefs in traditional social structures were co-opted to enforce unpopular programmes and mechanisms including the culling of livestock and land balkanisation (Cundill, 2008). A policy of culling forced Black people to reduce the size of their herds of livestock through selling or slaughter (Hoffman & Ashwell, 2001). Land balkanisation involves the re-arrangement of land use according to landscape zones. The results of this policy were multiple. Some households lost their arable lands to conservation and others were forcibly relocated away from their ancestors' graves. As a result, these apartheid mechanisms were hated by the community and livestock owners exercised their agency to destroy fencing, paddocking, and contour structures to maintain free uncontrolled grazing. The practice was to allow free grazing during the day and kraal at night.

Livestock ownership has long been an indicator of wealth in Black communities (Shackleton & Shackleton, 2006) and this contributed to the resentment of state programmes. Black farmers therefore exercised their agency to sustain livestock wealth. As democracy arrived from the early 1990s onwards, apartheid laws were relaxed and eventually lifted. As this happened, the community reverted to free-range grazing. As a result, paddocking collapsed as noted by one farmer:

When I was young at Machubeni, we had camps during white people's time. Yes, there were camps that I know of, but I do not know what happened. I remember growing up, and while working, I noticed no camps existed anymore.

The interview extract above shows that rotational resting is not a new phenomenon and was part of the apartheid government's reengineering Betterment Programme of land in the 1960s–1970s (Cundill, 2008). Rotational grazing requiring multiple camp systems is discussed extensively in the literature (see, for example, Briske et al., 2017; Teague et al., 2013). Rotational grazing and resting have traditionally been promoted as approaches to improve and manage degraded pastures in water-scarce or drought-prone environments. Resting has been shown to promote the productivity of palatable forage (Vetter, 2013).

As I have indicated, during apartheid the community drew on their PEPs to oppose practices introduced by the government. Since rotational grazing involving multiple camps was part of the apartheid state's strategy, it is not surprising that objections to it when introduced by the project ensued. Another mechanism of conditioning the older farmers can be traced back to labour laws. Labour laws enabled the movement of males to work in the mines. As a result, peasant agricultural male labour was transformed into cheap migrant labour (Andrew & Fox, 2004; McAllister, 1992). This historical conditioning can be seen to have led to discourses dominant amongst elderly farmers that work needed to be paid for families to be supported. This discourse continues to be strong despite a decline in employment opportunities in mines and the concomitant reduction in remittances sent to families (Dapira & Mpongwana, 2018). Historical conditioning can also be seen to have contributed to the gendering of roles. The male is constructed as the head of the family and is seen to be responsible for providing money for sustenance. Furthermore, the community draws on gender stereotyping of roles. In Xhosa traditional family structures, women care for children, the homestead and oversee kitchen gardens (Connor & Mtwana, 2018).

The Machubeni community can be seen to draw on a strong discourse of communalism or ubuntu with the result that individuality is eschewed. Discourses valuing humility and the need to respect the rights of others lead to communal decision making. The result was a consciousness of the community acting as a whole. For example, when asked about practices related to the control of veld fires, an informant responded, "*When we have a fire, we go as the community to stop the fire as the community members*". In a similar vein, when asked which camp should be closed for the upcoming rainy season (Section 8.2.3) one response was:

*When you are leading people, you call them. Let us call for a meeting to understand how we classify camps one, two, and three. Before we decide which camp, we are closing and for us to decide which one we are closing, we must involve **every** community member. I am only suggesting. **We** are not taking one decision, so we need to solve that [emphasis added].*

The extract above can be seen to be drawing on a discourse privileging African communalism and democracy. These discourses condition the community's consciousness with the result that they understand themselves as an entity united in decision making and in which individualism is not privileged. The years of isolation in hard conditions resulted in community members coming to

rely on each other to survive. Largely, therefore, the adoption, non-adoption or dis-adoption of CSA practices can be seen to result from discourses constructing the community as one entity.

Emerging from discourses constructing the community as one entity are experiences and observations related to the vandalism and theft of resources provided by projects intended to improve conditions and livelihoods in Machubeni. I have already noted the response to the apartheid state's Betterment Programme. Vandalism and theft of resources provided by projects have continued post-apartheid and it appears that community members are aware that other members of their own community are involved, as the following comment from one male member illustrates: *"The community are stealing our fences"*. Another female farmer added: *"The fence was removed in broad daylight while we watched"*. Yet another drew on a metaphor to refer to the same phenomenon: *"These goats that swallow fences, why do you not kill the goats?"* The response to this comment was subdued laughter. It is not only fences that are vandalised and stolen as the following comment illustrates:

I so wish this time around we do not get plastic tanks. I wish they built us cemented tanks with holes where the animals can be able to drink because Ruliev once gave us tanks, but people messed up the plastic tanks, and they got vandalised. The cemented ones can last forever and should have an opening so the cattle can drink independently.

The irony of these observations is that fences, cement water tanks and other resources are *donated* to the community and are therefore *their* property. Interviews with farmers revealed some awareness of this fact: *"It is crucial that when the government/ projects give us resources as the community, we must use them wisely. For instance, there [pointing] was a fence that was put there, and we will put it for the second time"*. Despite this awareness on the part of some community members, it would appear that this was not the case for all since some members did not see donated resources as *their* communal property. An alternative explanation is that their conditioning by the apartheid state meant that they experienced any attempt to better their lives as suspicious and, therefore, open to abuse. My explanation of the events leading to the establishment of Machubeni, and the homeland of the Transkei apply here along with my description of the Betterment Programme and the community's response to it.

Discourses constructing the community as a single entity and privileging togetherness which can be seen to have developed because of the community needing to work together to survive during apartheid mean that vandals and thieves of common property are tolerated rather than punished. I will return to the reluctance to punish transgressions in Section 8.2.3 below but, for now, argue that theft and vandalism are likely to haunt the community into the future and that the ideal of fenced rotational resting will remain elusive because of this.

The RU project leaders were aware of the historical theft and vandalism of resources resulting from previous projects – “*skeletons of failed development projects*” (personal communication) in the Machubeni landscape. Skeletons included vandalised water tanks, camp infrastructure and fencing that previously demarcated apartheid land use zones. Fences are reported to have been stolen three times by community members (Falayi et al., 2022), evidence that there have been previous attempts to address the land and pasture degradation in the Eastern Cape, particularly in Machubeni.

Drawing on their knowledge of historical experiences and conditioning and local farmers' testimonials, the RU team did not perceive fencing as an appropriate approach to rotational grazing and camp resting (see Section 8.2). As a result, they introduced the innovative practice of rotational grazing and camp resting *without fences*, an initiative that was dependent on the community buying into the logic of the approach, volunteering and self-help and the use of bylaws to punish transgressions. However, as I will show, conditioning in the community constrained the introduction of the innovation.

Up to this point, I have focused on an exploration of the role of geography/the environment and apartheid in the conditioning of the Machubeni farmers. I now move to mechanisms post-apartheid that have contributed to their conditioning and, thus, to their consciousness. The democratic government's social grant structure has provided an important income source for the community since child support grants were added to other support in the form of old age pensions in 1998. One traditional leader pointed to the impact of social grants on community consciousness: “*In the olden days, people had to work hard to make money. But nowadays, people are spoilt because they get social grants. Most rely on it, so they no longer want to work*”. Another social actor concurred

with this position by noting: “*We depend on social grants*”. Another lamented: “*Some of us are not getting grant money from the government, so we need to look after ourselves*”.

The observation on the part of the traditional leader quoted above that reliance on social grants has resulted in a reluctance to work on the land is supported by Sinyolo et al. (2017) and Ruzhani and Mushaje (2022). Other studies argue that over 60 years of sustained deagrarianisation in the former Bantustans or homelands has resulted in only 1% of rural households obtaining income from crop cultivation and only 4% from livestock production (Border Rural Committee, 2009; Dapira & Mpongwana, 2018; Shackleton et al., 2013; Shackleton et al., 2019).

Some studies argue that social grants reduce smallholder farmers' motivation to commercialise their farming activities (Sigwela et al., 2017; Sibiya et al., 2023). According to an agricultural household survey (Stats SA, 2016), between 2011 and 2016, the Eastern Cape experienced a decline in agricultural production from 35.4% to 27.9 %. This was the largest decline of all the provinces in South Africa. Other studies show subsistence agriculture has declined amongst South African rural smallholders since the 1950s (see, for example, Blair et al., 2018). What appears to be the case, therefore, is that over the years, smallholder farmers have switched from crop and livestock production to dependence on a mixed portfolio of remittances, social grants and some wages (Connor & Mtwana, 2018). As my study shows, the youth demonstrated a particular apathy to agricultural activities (see Chapter Seven).

Thirty per cent of the population – about 17 million people – receive monthly social grants in South Africa (Granlund, 2022). Though the social grants mechanism has redistributed wealth and alleviated poverty in poor provinces such as the Eastern Cape (Armstrong & Burger, 2009; Gwiriri et al, 2021), the mechanism has had unintended consequences. One of these is exemplified in the case mentioned above, that of the traditional leader arguing against the need to work. The interplay of the money economy, deagrarianisation and social grants has drawn farmers away from agricultural activities with the result that farming, either of livestock crops, is not part of the consciousness in many families. The phenomena conditioning the consciousness of farmers in the Machubeni community challenge the introduction of CSA practices. I would argue that these phenomena are not unique to Machubeni but are prominent across South Africa.

5.2.3 Youth consciousness

The conditioning of youth differs from that of their elders. Youth have arguably received a better education than their parents and grandparents, at least at the primary school level, since enrolments in primary education in the Eastern Cape have improved post-1994. Before 1994, compulsory education did not apply to Black learners (Claassen, 1995). Since 1994, the completion rate of learners attending primary school has increased significantly; Stats SA 2016 reports 47.3% of all learners completed primary school in 2002 which increased to 77.3% in 2013. Completion rates for secondary school level, while much lower show a similar trend, Stats SA (2016) reporting a secondary school completion rate of 19.5% in 2002 and 26% in 2013. Because of the poor quality of schooling in rural areas, the tendency is for learners to seek secondary education in urban areas. However, distance is a factor in the drop-out rates at the secondary level (Porter et al., 2010).

Elderly farmers in Machubeni were aware of enhanced educational opportunities available as one of them noted: *“The youth are better educated and more knowledgeable than us”*. In South Africa education is widely viewed as a way out of poverty and unemployment (Porter et al. 2010). Older farmers reported using their earnings from livestock to send their children to school: *“Livestock earnings can take our kids to school until university”*.

Not only have youth had more access to education than their elders, but they have also had more exposure to a world outside Machubeni thanks to the internet, social media and television. Most of the interviews conducted for this study were conducted with a television playing in the background. In many respects, the consumerist and celebrity-driven world to which younger farmers are exposed thanks to social media and television was aspirational and arguably conditioned them towards valuing a life based on the money economy over the one based on subsistence farming into which they had been born. A lack of interest in agriculture on the part of young people across Africa has been reported (Finca, 2019; Tafere & Wolderhanna, 2012).

To participate in a life based on a money economy the youth needed paid employment which, sadly, was not available to them even though they had attained higher levels of education than their elders. According to Stats SA (2022), the official unemployment rate for South Africa was 33.9 % in 2022. The Eastern Cape province recorded the highest unemployment rate of all the

provinces namely 42.8% followed by Limpopo at 36.3%. Given the unemployment rate and the general lack of employment opportunities in the vicinity of Machubeni, the most likely source of employment was projects funded by NGOs and the government. Opportunities to work on projects were therefore prized even though the nature of project work is that it is, by definition, short-lived and therefore does not represent a long-term, dependable source of income.

The absence of employment opportunities can be traced back to apartheid policies that encouraged migration for work (McAllister, 1992; Neves, 2017). For decades, the able-bodied migrated from rural areas such as Machubeni to seek employment leaving the elderly, the sick and children to sustain agricultural production that ultimately collapsed (Hajdu, 2006). Over time, ‘brown’ economic activities such as sand extraction and brickmaking emerged as livelihood pathways. The geophysical structure (river sand and banks) provided the resources needed; however, the activities contributed to further degradation along rivers and gullies. The challenge now is to transform ‘brown’ economic activities into ‘green’ economic activities.

The scale of the challenge in an area such as Machubeni is huge and the disposition of younger people to achieve a lifestyle based on the money economy adds to the difficulties involved in achieving a sustainable green economy. Following the shift to democracy, former homelands, such as the Transkei, were reintegrated into the Republic of South Africa (Sigwela et al., 2017). The new democratically elected South African government promulgated policies intended to redress historical injustices such as access to resources and, thus improve rural livelihoods (Cousins, 2016; Lipton & Lipton, 1994; Turpie et al., 2008). In critical realist terms, poverty can be conceptualised as a series of events at the level of the Actual and as observations and experiences at the level of the Empirical. This means that poverty is relative. What constitutes poverty for one person would not necessarily constitute poverty for another.

Westaway (2012) argues that poverty continued to be entrenched in rural communities even after 1994. For example, economic planning at both national and local municipal levels was based on a spatial economic perspective mechanism. As a result, the Eastern Cape was mapped onto zones designated as “strategic” or “unstrategic” (Amathole District Municipality, 2007). This resulted in investment being channelled to Industrial Development Zones and Spatial Development Initiatives while the large areas outside these designated zones received welfare-based resources (Westaway,

2012). In social realist terms, this approach to planning can be conceptualised as a mechanism that resulted in further development in (strategic) urban areas, where investment returns could be maximised, and under-development in (unstrategic) rural areas (Westaway, 2012). As a result, and again in social realist terms, in areas such as Machubeni, morphostasis has resulted in persistent poverty.

The DEAT identified Machubeni as one of the most impoverished communities in South Africa and recommended the introduction of social responsibility programmes to alleviate the poverty experienced by inhabitants (DEAT, 2004). In one example of an attempt to alleviate poverty, \$1 million was allocated to Machubeni for the repair of the ecosystem and the creation of employment. Labourers were paid daily as a means of poverty alleviation (DEAT, 2004) (see <http://www.deatsrp.co.za> for a full description of the programme). This led to what I have identified as a set of discourses privileging the idea that work must be remunerated, and volunteerism eschewed.

Another example of an attempt to alleviate poverty took the form of the Rhodes University Livelihoods (GTZ RULIV) GTZ/RULIV Programme funded by the German development agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). This programme ran from 2001 to 2005 and was guided by a baseline survey and the development of a Machubeni community-based natural resource management plan (iKwazi, 2004). Following a recommendation by the Department of Agriculture (DoA), resources for livestock farming were provided. The resource package covered the buyout of livestock to reduce overgrazing (an approach tried during the apartheid era that was not trusted), the introduction of stock rangers, the establishment of range land rules and regulations, rotational grazing, training on pasture farming and livestock management, clearance of invasive bush through resting and fire control, the fencing of degraded areas and the installation of erosion control structures in gullies (iKwazi, 2004). The DoA recommendation did not specify the introduction of programmes to employ young people.

According to Cundill (2008), the response from the community was to abandon other livelihood portfolios to seek paid employment in the GTZ RULIV programme. In social realist terms, the exposure to paid work conditioned the community, and especially the youth, to the idea of “no payment, no work” and emphasised the importance of seeking paid work on any project introduced

into the community. The benefits of land rehabilitation and manual removal of the invasive bush during the RULIV GTZ programme were improved ecosystem services (Macdonald, 2004; Marais et al., 2008; Turpie, 2004; Turpie et al., 2008). Turpie et al.'s (2008) study argues that invasive bush clearance in mountainous landscapes restores natural fire regimes, biodiversity, hydrological functions and land productivity. The benefits included an estimated increase of water supply of 46 million m³ annually (Marais et al., 2008), and the socioeconomic impact was 23 000 previously unemployed were employed and 52% of these were women (Milton et al., 2003). Though it could be argued the payment was for labour, Turpie et al. (2008) claim that the programme was the South African version of the Payment for EcoSystems (PES) model. The PES approach is a monetary or in-kind mechanism to promote, maintain and restore ecosystems (see for example, Blundo-Canto et al., 2018; Sommerville et al., 2010; Moros et al., 2020). The objective of introducing financial incentives in the PES model is to balance socioeconomic and ecological concerns (Jia et al., 2022). Arguably, the DEAT-RULIV GTZ project conditioned the Machubeni community into believing that land rehabilitation is paid work and thus led to the emergence of the “no pay, no work” discourse.

Cundill's (2008) study reported that a history of failure of interventions in Machubeni meant that the community had lost trust in external interventions from the government, consultancies, research institutions and NGOs. The GTZ/RULIV programme was marked by conflict and power dynamics involving traditional leadership, government structures, and community members who received training in the management of natural resources (Fabricius & Collins, 2007; Cundill, 2008). Plans, rules and regulations drafted to improve natural resources management were not supported by traditional leadership and therefore could not be enforced (Cundill, 2008). A local Machubeni company was set up to sustain the momentum after the project's completion failed to take off. Challenges were traced to a shortage of financial capital in the community, the lack of infrastructure for employment, the lack of distribution mechanisms, disputes about who should be trained, who should benefit, fee payment structures and, finally, financial greed (Fabricius & Collins, 2007). Furthermore, Cundill (2008) found that measuring adaptation, resilience building and improved livelihood was difficult.

As discussed earlier the community members exercised their agency by shifting from other livelihood activities to seeking employment in the GTZ/RULIV programme. There is thus evidence to support the claim that the Machubeni community has developed a project-employment-seeking culture rather than an entrepreneurial culture involving turning their concerns into a project that generates self-employment. A project-employment-seeking culture is, arguably, not the same as PES as it is inevitably conditioned by the dire socio-economic conditions in which most villagers in Machubeni live. In considering this statement, it is also important to note that the isolation experienced by community members over decades has meant they have not been exposed to examples of entrepreneurship. Rather, the youth in particular have been exposed to somewhat simplistic views of what it means to have access to consumer goods thanks to television and social media and have come to understand that money is the key to the attainment of those goods (Swarts et al.,2013).. In the absence of other models, their only way of gaining access to money is to rely on projects that offer the possibility of paid employment or to rely on child support grants (Dapira & Mpongwana, 2018).

In Machubeni communal land is held in trust by the state. The customary tenure system gives traditional leaders the right to permit people to conduct various activities on portions of land (usufructuary rights). Access to land is therefore through social relations (Bennet, 2008; Murata et al., 2022) A second form of tenure is ‘Permission to Occupy’ involving a user’s right to use or occupy certain pieces of rural, unsurveyed land without any form of registration being lodged with the Deeds Registry. In Machubeni, young people did not enjoy access to either system. Although young people worked on household plots, this work was usually unpaid and controlled by other members of the household with the result that many young people were looking for a means to escape a situation they experienced as exploitative (Geza et al.,2022;Porter et al., 2010).

Traditional leaders in Machubeni appeared to be aware of the value accorded to the money economy by young people; one of them said: *“If someone can farm on the land and use our youth to work there, it can help.”* The argument here was for the establishment of a commercial CSA project that would employ young farmers and not for an entrepreneurial activity which would see them managing their own livestock and cropping. In the absence of employment opportunities some older farmers constructed the youth as lazy with claims being made of the young

"Galivanting in the village, abusing alcohol, or stealing people's properties." Another smallholder farmer noted:

The young farmers do not support adults. Adult people work but do not get support from young farmers. Some elders are too old to work and walk properly. In our community, there are a lot of shebeens/ taverns where you find most of the young farmers spending time.

Yet another farmer added:

Young people like drinking liquor so much that they do not care to look after themselves, even at home. They do not want to work for themselves. They are dependent on the elders. They would learn from those growing vegetables and fixing dongas if they could learn. They are very lazy.

These comments draw on discourses that construct a role for younger members of families supporting the elders in activities that have long occupied them. It would appear, however, that the social and cultural conditioning of the young in Machubeni meant that these roles were not taken up.

Figure 5.1 below illustrates my analysis of the three forms of consciousness I have identified.

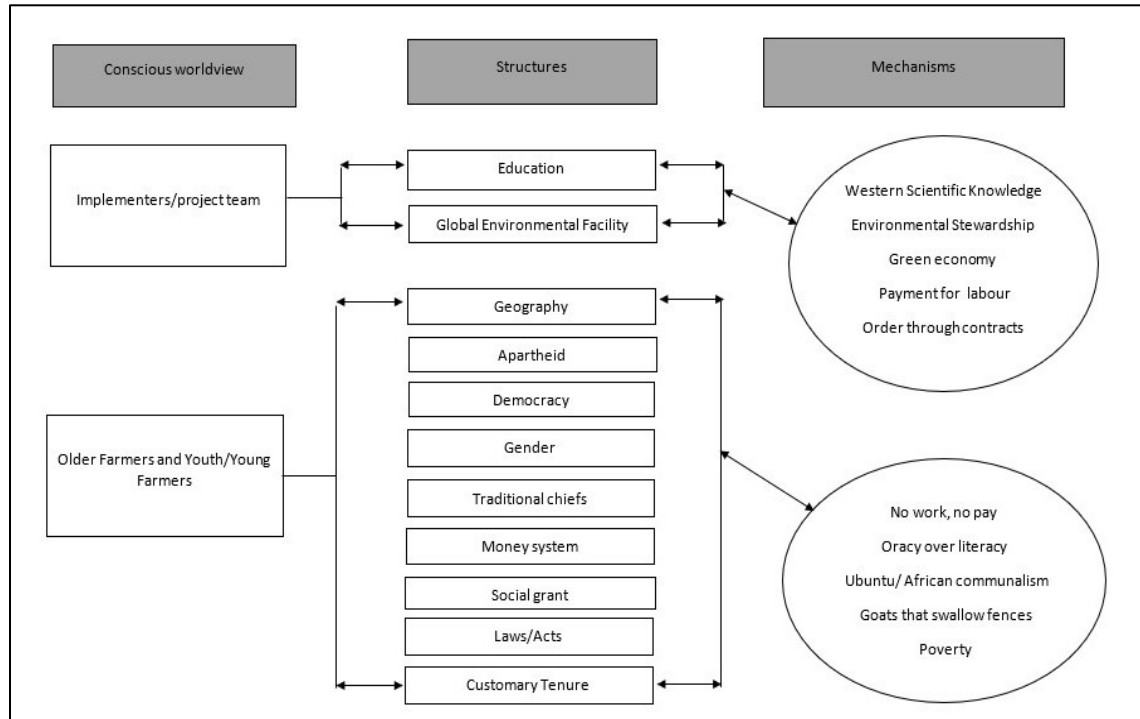


Figure 5.1: Consciousness/worldview at T₁

Figure 5.1 shows that the way the different groups experienced and observed the world emerges from a complex interplay of structures and mechanisms. These structures and mechanisms often contributed to the consciousness of more than one group. They are also associated with different historical periods. Social grants, for example, are associated with the democratic era while other mechanisms are associated with apartheid. In the following two chapters, my analysis of the way elderly farmers and the youth exercised their agency in relation to the CSA practices introduced to them by the project team attempts to show how the array of structures and mechanisms interacted to enable or constrain the pursuit of project goals.

5.3 Conclusion

The research question informing this chapter was as follows:

How were participants in a project intended to introduce CSA practices structurally and culturally to exercise their agency at the beginning of the project?

My analysis of project documents, hub leaders' back to office (BTO) reports, photographs, interview transcripts and observations recorded in the course of the study identified what I have termed three world views or forms of consciousness based on Bhaskar's (1978, 1989) understanding of reality as stratified. These forms of consciousness were associated with the project team, older rural farmers, and the rural youth. Following Archer, (1995, 1996, 2000) T₁ cycle, my understanding is that, as the project began, each of these groups drew on their social and cultural conditioning as they began to exercise their agency. For the project team, this involved exercising their agency in introducing the CSA practices they had identified as relevant to Machubeni. For the farmers, both elderly and young, it meant exercising their agency in the uptake of the practices that had been introduced to them.

CHAPTER SIX: FROM T₂ To T₃: THE EXERCISE OF SMALLHOLDER FARMERS 'AGENCY IN CLIMATE-SMART ECOSYSTEMS REHABILITATION

6.1 Introduction

The previous chapter explored social and cultural systems that conditioned the various actors at T₁ and influenced agents' interactions in T₂ to T₃ of the morphogenetic cycle.

As indicated in Chapters One and Two, although the study sought to contribute insights into the reasons for the limited uptake of CSA as an adaptation strategy, it did not look at adaptation and resilience building per se. Instead, it looked at why and how rural smallholder farmers exercised agency as they engaged with a CSA and ecosystem rehabilitation programme. I focus this chapter on the second research question:

How do different farmer groups interact with climate-smart agriculture and ecosystem adaptation and resilience-building interventions?

To answer this question, I drew on data generated in interviews with smallholder farmers and project leaders as innovative farming practices intended to contribute to the rehabilitation of ecosystems were introduced, and on observations recorded in field notes enhanced by photographs taken at the research site.

As noted in Chapter Three, Bhaskar's critical realism (1998, 2000, 2016) and Archer's social realism (1996, 1998, 2000, 2002) were used to inform the study. Bhaskar and Archer both argued for a stratified ontology consisting of three layers of reality: the Empirical, the Actual and the Real. I used abduction and retroduction as analytical tools (see Section 3.2.3) to move from observations and experiences captured in interviews and other data to reach the deepest level of Reality, termed the 'Real', understood to consist of relatively enduring structures and mechanisms from which

events at the level of the Actual and experiences and observations at the level of the Empirical emerge.

Chapter One outlined the project background. I begin this chapter by describing the organisation of the project itself before moving on to focus on the way community members exercised their agency in relation to land rehabilitation which, as I will explain, was in the first phase of the project.

6.2 The Hub System

In designing the project, the RU project team drew on Landscape Approaches (LA) or Integrated Landscape Approaches (ILA) to conservation and development in the hope of achieving a multifunctional, multi-actor, adaptive management and resilient landscape (Art et al., 2017; Freeman et al., 2015; Sayer et al., 2013) (see Section 2.2.4). Guided by the ILM philosophy, the RU team set up a Machubeni site-specific Hub organisational structure, consisting of a Land Rehabilitation Hub, a CSA home garden Hub, an improved livestock and rangelands management Hub and an Improved Governance Hub. The term 'Hub' indicates the focal point of activities. The Hub system drew on knowledge-based practices and technologies to rehabilitate ecosystem services and improve livelihoods impacted by climate change (Anderson et al., 2006) and focused on multiple functionalities to achieve the objectives of climate change adaptation, food security, poverty alleviation, biodiversity conservation and sustainable livelihoods.

As indicated in Section 5.2.1, the RU team had been conditioned by their experiences and studies in education, often at high levels, their lived and working experiences in rural communities, and their experiences in developing and running training programmes. Each Hub activity, which in critical realist terms, can be conceptualised as a series of events at the level of the Actual, emerged from, amongst other things, the interplay of research-based knowledge and theories related to participatory co-learning (Biggs et al., 2012; Sayer et al., 2013; Arts et al., 2015). The intention was to allow project participants to experience the benefits of drawing on this knowledge and to enable them to do this for themselves in the future. RU Hub leaders engaged the community in interactive learning processes that created and, in some instances, adapted existing practices, products, processes, methods, and systems to attain project goals. The intention was to avoid a

sectorial hubs system. The RU team exercised their agency to draw on expert knowledge and practice to engage rural stakeholders. In addition, the RU team's research-led approach involved action research (Frost et al., 2006; Freeman et al., 2017) as specific objectives were implemented in each Hub. The following section looks at each Hub in detail.

6.2.1 The Improved Governance Hub

The Improved Governance Hub's core objective emerged from discourses promoting the need to improve good governance practices and the knowledge that underpins governance structures (Sayer et al., 2013). Governance underpins three SDG objectives: (i) economic development, (ii) social inclusion and (iii) sustainable development (United Nations, 2015a; Sachs et al., 2016).

According to Eilola et al. (2021), landscape resilience is related to adaptation, raising awareness, wide stakeholder participation and bridging across organisations. Establishing the Improved Governance Hub involved setting up a multi-stakeholder forum (MSF), a structure consisting of traditional leaders and local community members. The MSF was led by the local farmers. The Hub also focused on raising awareness of the need for local government structures through training on, for example, the need to develop bylaws governing rangeland use and waste disposal.

Recognising that isolated intervention was not enough in this complex social-ecological system (Arts et al., 2017), an interactive systems approach with other hubs was implemented. For example, the generation of bylaws (Figure 6.1) was aimed at addressing concerns related to the Improved Livestock Rangeland Management Hub. The community designed the bylaws and agreed to assign penalties for actions contravening them, such as disposing of plastics and nappies in the rangelands. The acceptance of bylaws by the community enabled the implementation of rangeland rotational grazing through the Improved Livestock and Rangeland Management Hub. The resting of sections of rangelands was designed to allow the Land Rehabilitation Hub members named 'LCAs' (see Section 6.3.2 below) to plant Vetiver grass (*Chrysopogon zizanioides*) and construct stone packs in selected erosion control sites. Ultimately the aim was to enhance sustainable livelihoods through improved livestock health to improve the quality of meat and wool. Improved product quality translated into improved income and livelihoods.



Figure 6.1: A participatory workshop to develop bylaws (RU Hub Team)

The RU team drew on their knowledge and understanding of the way bylaws function in established rural and urban settlements to facilitate the participatory community process (Figure 6.1). They also used this knowledge to arrange learning excursions to South African rural communities where best practices in relation to bylaws could be observed. In doing this, community members were encouraged to draw on what might be termed modernist thinking, emphasising the need to regulate social and economic activities for the common good through SLM and formal structures such as laws and regulations, usually captured in written form. In doing this, and as I will show later, the project team drew on discourses related to the ILA (see Chapter Two, Section 2.2.4), the functioning of social and economic life and their own experiences of living in towns, cities and rural communities. The project set out to effect change in a community that had long been marginalised and denied the opportunity to engage with the development associated with modern societies.

6.2.2 The Improved Livestock and Rangeland Management Hub

The main objective of the Improved Livestock and Rangeland Management Hub was capacity building in livestock and rangeland management. Hub activities aimed to contribute to improved rangeland condition, livelihood sustainability and improved income and included ten training workshops in livestock disease control, livestock management (see Figure 6.2), rangeland management, fodder flow (lucerne and oats), the deployment of Eco Rangers, rangeland assessment, participatory rotational grazing mapping, market diversification, auctions and enhancing sheep farming for improved wool quality.



Figure 6.2: Sheep management training 3/25/2019 and 3/27/2019 (RU Hub Team)

The Hub aimed to strengthen existing livestock production. Sheep farming is a major enterprise in Machubeni, and sheep are the most abundant of all livestock. Wool production is a major livelihood activity. According to the Hub leader, one farmer made R 250 000 from his flock, while an 80-year-old woman made over R2 000 from a flock of four sheep in 2019.

Acknowledging that developing knowledge and skills without identifying pathways to improved income generation was insufficient, the Hub trained farmers in wool and cattle marketing. Regarding cattle marketing, the project team exercised their agency to draw on their knowledge of farmers' practices and farming markets to facilitate the emergence of events such as Machubeni livestock auctions to improve returns from livestock production and produce positive experiences for the local community (Figure 6.3). The skills training supported by access to alternative markets attempted to expose the community to how to engage in more viable markets. In ILM terms, the Hub objective was to move beyond livestock production to improve livelihood through marketing

and income enhancement. This would lead to a green economy (National Development Plan, 2012) and help reduce unemployment.



Figure 6.3: Meat Natural (Pvt, Ltd) set up and ready for cattle auction (RU Hub Team)

By introducing farmers to these events, the aim was that farmers would then exercise their agency to replicate them. However, this proved not to be the case as no further auctions were organised after that held in Machubeni in 2019 because of the Covid-19 outbreak. Nonetheless, the 2019 auction experience led to the emergence of auctions in the area.

6.2.3 The Land Rehabilitation Hub

The focus of the Land Rehabilitation Hub was the rehabilitation of rangeland which had been degraded over time. The LR Hub collaborated closely with the Improved Livestock and Range Management Hub. Some community members were recruited and trained to work as 'LCAs'. They were used as trainee farmers and coordinated the implementation of improved rangeland management and conservation practices and mobilised their fellow community members to adopt

and implement them. It was anticipated that rangeland rehabilitation would result in better grass veld improvement and, ultimately, in improved livestock health.

Critical components of the Hub included training in rehabilitation, the construction of stone packs (Figure 6.4) and the use of *Euryops floribundus* a local invasive plant named ‘Lapesi’, (Figure 6.5) for brush packing at erosion control sites. Additional training included establishing micro-Vetiver(*Chrysopogon zizanioides*) nurseries, planting Vetiver at erosion control points and planting palatable grass species in rested land after rotational grazing. These practices emerged as a result of the project team drawing on local knowledge. The RU team avoided using Western science-erosion control structures such as gabions, constructed using funding provided by *Deutsche GIZ*. The gabions were washed away within two years, and manually cleared *Euryops floribundus*/ lapsesi regenerated. Thus, the term ‘skeletons ’of failed development projects was coined by the RU team project leader Professor James Gambiza (*pers. comm. December 2022*).

The RU team’s climate-smart erosion interventions used locally available resources to construct stone packs and brush pack structures, as shown in Figures 6.4 and 6.5.



Figure 6.4: Stone pack erosion structures in the rangelands (Ru Hub Team)

Figure 6.5: Brush packs for sediment trapping in the rangelands (RU Hub Team)

Acknowledging Biggs et al.’s (2021) argument that local context is key to managing complex SES, the RU team promoted the use of local resources. The project thus challenged Shava's (2008) claim

that universities and colleges draw on modern forms of intellectual and cultural power, which tend to reproduce Western forms of knowledge and agricultural innovation practice as normal science.

6.2.4 The climate-smart agriculture home garden hub

The objectives of the Climate Smart Agriculture Home Garden Hub were to foster and improve the practice of home gardening by adopting climate-smart agricultural techniques. Hub activities aimed to empower several home garden trainee farmers with knowledge and CSA skills. The assumption was that these trainee farmers could then exercise their agency to transfer the skills to other community members. The CSA home garden Hub promoted activities that enhance soil conservation, such as mulching and zero tillage. Water conservation practices such as water harvesting, using grey water (see Figure 6.6), and establishing raised beds (see Figure 6.7) were also taught. To improve cropping skills, the Hub trained participants in crop diversification, rotation, and intensification and introduced micro-Vetiver nurseries. These activities were complemented by training in marketing. The home garden participants were encouraged to supply local school feeding programmes and other members of the local community

.In implementing this the project team again drew on hybrid knowledge of CSA practices, Western scientific principles and an understanding of the local community to design Hub activities.



*Figure 6.6: Tower garden with drip irrigation
(RU Hub Team)*

Figure 6.7: Raised beds (RU Hub Team)

The four hubs, following ILM philosophy, did not operate as silos. The project team's aim was that activities would interact to contribute to the emergence of the Machubeni climate-smart sustainable Livelihoods Kit (Figure 6.8). The project team thus drew on ILA to plan across the Hub systems to design the Livelihoods Kit.

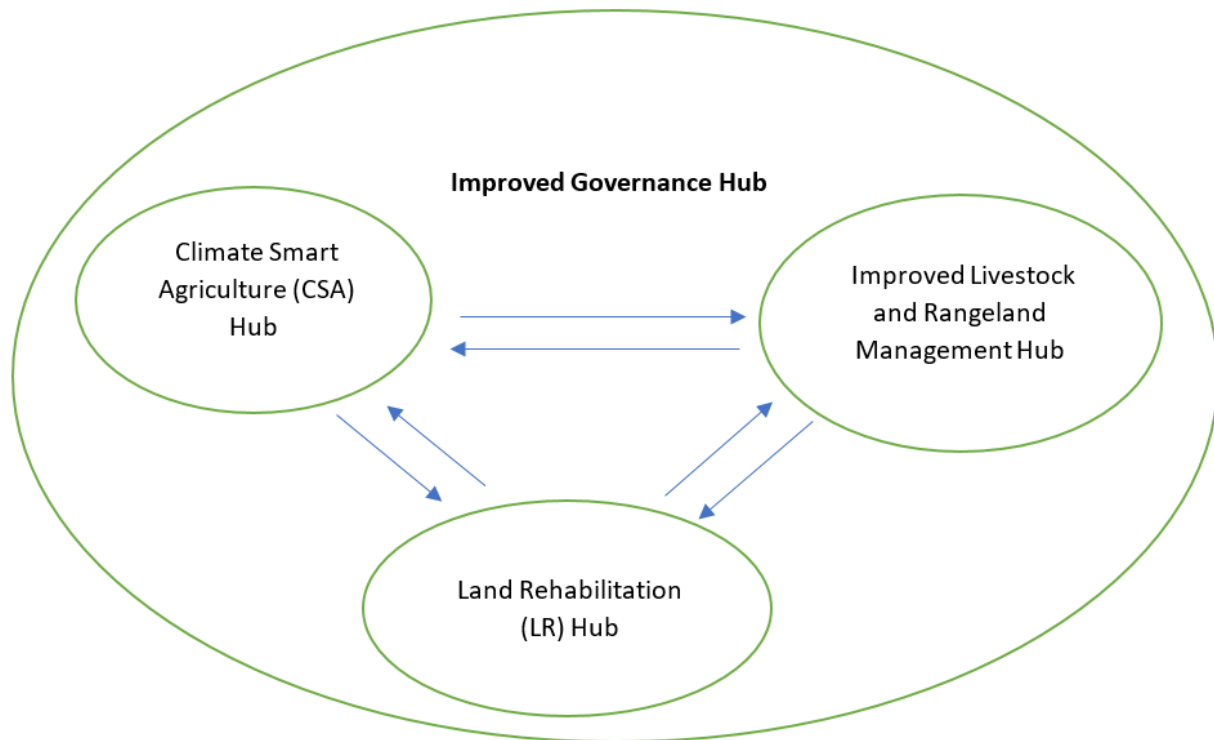
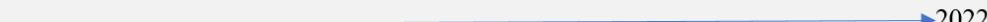
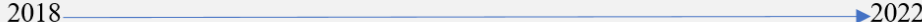
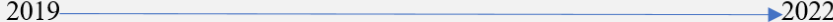
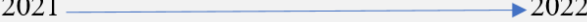


Figure 6.8: Machubeni Climate-Smart Sustainable Livelihood Kit

Figure 6.8 shows the project's conceptualisation of the Hub system. The Governance Hub forms the matrix in which the other hubs are embedded. Governance affects the Improved Livestock and Rangeland Management, Land Rehabilitation Hub and CSA Hub. The hubs interact with each other for a sustainable livelihood. For example, the Governance Hub generates the bylaws that maintain and govern the use of the rangelands, the Improved Livestock and Rangeland Management Hub provides manure to the CSA Hub, the Land Rehabilitation Hub provides rehabilitated pasture to the Improved Livestock and Rangeland Management Hub while Land Rehabilitation Hub help to conserve soil erosion at CSA homestead gardens under threat of gullies.

However, for this interaction to occur, governance structures and mechanisms need to be established and implemented for the common good. Though the hub concept conceived in 2017, the hubs they were introduced in several phases, as shown in Table 6.1

Table 6.1: Project phases and training activities

Phase	Activities Period
One	Land Rehabilitation 2017 
Two	Improved Livestock and Rangeland Management 2018  Improved Governance
Three	Climate Smart Agriculture home gardens 2019  Rotational grazing without a fence 2021 

At the level of Actual level, the RU team conducted extensive training before the establishment of hubs. All hubs were conceived at the beginning of the project in 2017. Drawing on Archer's (1995) 'analytical dualism' or the separation, for analytical purposes only, I separate the hubs analysis into phases based on the year hub activities began as illustrated in Table 6.1. The Land Rehabilitation Hub began work in 2017. The Improved Livestock and Rangeland Management Hub and the Improved Governance Hub were introduced in 2018, and the Climate-Smart CA was introduced in 2019. The concept of rotational grazing without fences was introduced in 2020 under the Improved Livestock and Rangeland Management Hub.

The next section presents the farmers' interaction with climate-smart ecosystem rehabilitation.

6.3 Land Rehabilitation in Phase One

As indicated in Table 6.1, the project began in 2017 with the RU team exercising their agency by drawing on the Machubeni traditional leadership structures (SEPs) and the discourses sustaining them to gain access to the community and villages. The RU team was granted permission to work in five of the 14 villages of Machubeni. The project team then exercised their agency to design and implement workshops on land degradation and related land rehabilitation intervention strategies.

To design training workshops, the RU team exercised agency by drawing on their knowledge of complex SES dynamics. The workshops aimed to provide insights into the causes of land degradation, the impact of biodiversity loss and how climate change aggravated the situation. In addition, the RU team drew on their PEPs to explain rehabilitation and adaptation and demonstrate resilience-building measures needed to restore the land. The well-travelled RU team was enabled by funding to organise farmer-to-farmer social learning excursions to expose the participants to examples of successfully rehabilitated rangelands. There is little consensus on the meaning of social learning and when it is considered to have occurred. In this thesis, I adopt Bandura's (1997) notion of social learning, which sees learning as occurring through observation imitation and modelling while, at the same time, being influenced by phenomena such as motivation and attitudes. Bandura's 1997 concept of social learning can be conceptualised within a critical realist framework if learning is seen as emerging from a series of events involving observation and modelling which themselves emerge from the interplay of a range of mechanisms at the level of the Real. Reed et al. (2010) argue that social learning is deemed to have occurred if a change in individual understanding is demonstrated. Learning should extend beyond the individual to incorporate practice in communities.

A cursory analysis using critical and social realism shows that, among other things, the team exercised their agency to draw on mechanisms such as funding, scientific knowledge, and knowledge of the local environment to run the workshops and excursions. The RU team believed that participating farmers would reach decisions that benefit the wider society.

Through the Hub system, the RU team exercised agency by drawing on ILM discourses and others privileging SLM. Landscape sustainability researchers acknowledge the need for the long-term maintenance of specific ecosystem services and stewardship to improve human well-being (Freeman et al., 2015; Wu, 2013). The RU team's objective was to “support sustainable livelihoods for local people through integrated landscape management that strives for a resilient socioecological system” (Fabricius et al., 2016, p. 8).

Having introduced some knowledge to the community in workshops, the RU team encouraged community members to use the knowledge they had acquired to rehabilitate the degraded range lands. In interacting with the community, they also drew on discourses privileging self-help. In the Machubeni context, self-help was understood to mean working on the land for the benefit of all with no expectation of payment. As an RU team member pointed out, “*We initially asked the people to work on their own rangelands to restore them*”. Another RU team member noted:

Initially, it [the project] was called 'Mabuyaze' (meaning you go home empty-handed). This was later changed to 'Masibambisane', which means 'Let us work together'. It was the community that coined these names, the latter name becoming the official name of the project. We discussed with the community that Rhodes University provided knowledge and not jobs. Our mandate as a university was to create and disseminate knowledge.

The latter name suggests community “buy-in” of the project: the transformation from expecting to be paid to self-help was a major outcome. The Rhodes team's rationale was based on the potential of knowledge to reverse negative ecosystems and land degradation. Discourses that can be traced as far back as the Enlightenment of 18th Century Europe construct human beings as having the capacity to use reason and knowledge to improve their condition. In the context of the project, this individual capacity can be seen to function socially given the communalism of the community.

In a community conditioned by discourses of “no pay, no work” (Section 5.2.2.4), self-help was interpreted as volunteering. In ILA, “no single stakeholder has a unique claim to relevant information, and the validity of different knowledge systems must be recognised” (Sayer et al., 2013, p. 8352). For community members who did not own livestock and the youth, the concepts of self-help and volunteering were associated with “no pay”. It appears it was difficult for the community to accept the concept of self-help as a collective as rangelands are common property.

This was acknowledged by the RU team member, who noted, “*The community made their position clear; they stated that they cannot work for free because some of them did not own livestock, and yet they have to put food on the table*”. There was thus a clash of consciousness between the RU team and some sections of the community.

It was then left to the project team to counter the payment for work discourse. Sayer et al. (2013) highlight the need to select an easy-to-reach intermediate target to facilitate engagement and build trust through the shared learning process. The RU team tried hard to engage the community and build stakeholder trust, efforts which impacted the renaming of the project as Masibambisane.

The initial self-help phase, named “volunteering by the community”, ran from 2017 to 2018. The community elders and young farmers exercised agency as individuals and as groups of corporate agents by drawing on their PEPs to respond to the project's self-help initiatives. The following section explores the way self-help/volunteering discourses, in interplay with other structures and mechanisms, worked to enable and constrain elderly farmers in exercising their agency to adopt climate-smart ecosystem rehabilitation practices.

6.3.1 The exercise of agency among elderly farmers

A cohort of elders exercised their agency to attend the workshops. However, the data from interviews revealed multiple and different experiences emerging from the same training workshops. Some farmers indicated they decided to be involved “*in learning new things/ ideas*”. Others noted, “*We were aware of degraded land but did not know how to fix it*”. At the same time, others indicated that they “*had lost hope*” and that the project training workshops were “*an eye-opener*”. Other comments illustrated concern for the reduction of the spatial area available for livestock pasture. Comments according to the value of the training and education can be seen to result from the farmers’ conditioning in an isolated area of the former Transkei with limited access to quality education. For these farmers, therefore, the project provided an opportunity to exercise their agency to learn more.

From this, it is possible to claim that, for some farmers, a concern was the acquisition of knowledge that had been denied to them (Archer, 2007). This aligned with a discourse promoted by the RU

team that acquired knowledge empowers local communities to improve their livelihood. The interplay of discourses valuing knowledge and those aligning knowledge with empowerment promoted the adoption of practices advocated by the RU team. This insight contrasts with those emerging from other studies that argue that the uptake rate of climate-smart innovations is a function of a high level of education (De Villiers et al., 2014; Djido et al., 2021; Molieleng et al., 2021; Mutuku, 2017). In this study, the absence of quality education can be seen to contribute to the farmers exercising their agency to interact with the project training structure and work on the land with no expectation of monetary payment. Elderly farmers exercised their agency differently, drawing on the same training. Each village experimented by selecting knowledge they considered to be relevant to their particular circumstances and adapting it to meet their local social-ecological conditions. One participant recalled the self-help period when farmers drew on their concerns about livestock by noting: *“In Machubeni, most of us own cattle, sheep, and goats. We can take our kids to school until university. We use our livestock when we have funerals, weddings, and ceremonies. So, the livestock is our bank”*

This extract is indicative of another discourse I have termed “livestock is our bank” that valued livestock production as a reliable source of income. This discourse was mainly drawn upon by elderly livestock owners in the community and not the youth who did not own livestock. The communal ownership or disownership as the case maybe revealed generational difference worthy noting as the actors exercise of agency in land rehabilitation activities... The comment above also shows the role of livestock ownership which, in critical realist terms, can be understood as a structure leading to the emergence of self-help activity to rehabilitate the land. The improvement in rangeland emerged as improved grass production. For these farmers, understood in Archer’s (1995, 1996, 2000) terms as a group of corporate agents, the entry point for mindset change was livestock ownership and their experiences of the way degraded rangeland impacted animal health. In ILA, an entry point for stakeholder engagement and the building of trust can be a common point of concern (Sayer et al., 2013). The analysis of the discourses I have offered above alone does not fully explain all the observations and experiences of the project. Nonetheless, it serves to illustrate the centrality of discourse to social change (Archer, 1995).

The participant cited in the extract above was one of the leaders appointed by the project team. He can therefore be what Archer (1995) terms a 'social actor' or an individual who can draw on the SEPs related to his role and his emergent PEPs. The social actor exercised these powers to motivate other farmers and contribute to what Archer terms 'double morphogenesis' or the transformation of a group of primary agents into a group of corporate agents, defined as a group "who are aware of what they want, can articulate it to themselves and others, and have organised in order to get it, can engage in concerted action to reshape or retain the structural or cultural feature in question" (Archer, 1995, p. 258). In this case, the group's concern for their livestock as a means of thriving led them to pursue a project to ensure their animals' well-being which involved self-help without payment.

Archer (2007) argues that agents draw on PEPs to activate dormant SEPs and CEPs to pursue projects identified as addressing their concerns. The following statement indicates how the social actor exercised his PEPs to engage with the community on the notion of self-help: *"I also told them that some homesteads are already at risk of collapsing due to gullies around the neighbourhood"*. He also drew on discourses valuing communalism and the ownership of assets: *"I had to sit with them and speak. Let's start doing our own thing. This is our land. We can benefit if we fix our land because our livestock feed on it"*.

The social actor drew on discourses privileging collective ownership of the land and the sense of communalism often termed ubuntu. Livestock and land ownership are important elements of the collective identity of the group. The arguments made by the social actor contributed to the elders, as a group of corporate agents, activating community structures and drawing on discourses that promoted self-help/volunteering to improve the health of their livestock. "The livestock is our bank" discourse and land ownership were then brought into play with discourses promoting environmental stewardship with the social actor asserting: *"I told them to let us take this opportunity and not worry about payment, after all. We are just sitting at home doing nothing. We rather do something for ourselves"*. He then added to his argument the concept of SLM by noting: *"You see, you convince a person to say you are doing this for the good of your land"*.

The social actor was able to draw from project training and resources to exercise agency to inspire the community to rehabilitate land and improve livestock pastures. In this case, the farmer's concern aligned with the objectives and concerns of the project. My analysis also shows how the social actor exercised his powers and properties to mediate between the project and community structure, thereby challenging discourses that privileged the idea that work needed to be remunerated.

The social actor's concerns as a livestock farmer led him to motivate other farmers to draw on discourses and the land ownership structure enabling the emergence of self-help/voluntary land rehabilitation activities at the level of the Actual. As previously indicated, the value of using Archer's social realism is that it allowed for an exploration of the interplay of underlying generative mechanisms that enabled or constrained farmers' adoption of particular CSA innovations. In resilience-building studies, these events are evidence of social resilience. Social resilience is defined as the ability of groups and communities to cope with stress and disturbance resulting from social, political and environmental change (Edgar, 2000; Copeland et al., 2020). In this case, social resilience was enabled by underlying mechanisms of the “livestock is our bank” discourse and land ownership structures.

In contrast, “the concept of ecological resilience is a characteristic of ecosystems to maintain themselves in the face of disturbance” (Adger 2000, p. 347). In short, this refers to maintaining the functioning of the system rather than the stability of the component population. Adger (2000) further argues that livelihoods are the link between the social and ecological systems as humans alter the natural system to meet material needs such as food, fuel, and in this case, the condition of veld pasture. In the case of Machubeni, concern for the condition of pasture led to the emergence of unpaid work activities.

The positive impact of the “livestock is our bank” discourse and the emergence of self-help activity to rehabilitate pastures is an indication of morphogenesis in the domains of structure and culture (Archer, 2010). Acceptance of self-help/volunteering to rehabilitate land represents a social and cultural transformation. In a community where the expectation is that all work should be paid for, the elderly farmers' subscription to discourses promoting self-help/volunteering along with livestock ownership structures led to the emergence of radical new practices as farmers exercised

their agency to address their concerns about degraded range land. However, in resilience thinking, the emergence of these practices is indicative of adaptability and transformability. “Adaptability is the capacity of actors in a system to influence resilience” (Walker, 2020, p. 5; Folke et al., 2010; Walker et al., 2004). Transformability is when system actors, in this case the smallholder farmers and traditional leaders, created new ecological, economic and social conditions because the existing system was unattainable (Walker et al., 2004; Walker, 2020).

Furthermore, in resilience-building thinking, the ownership of assets such as livestock provides buffer capacity in times of crisis for smallholder farmers (Carpenter et al., 2001). A social crisis occurs when individuals or families face illness, funerals or fee challenges. Buffer capacity is one of the three pillars in resilience-building thinking. Buffer capacity is defined as a condition for maintaining resilience so that it does not decline (Carpenter et al., 2001; Speranza et al., 2014). The initial baseline survey of Machubeni showed that assets were sold when households experienced shocks such as illness, death and drought (Didarali, 2018). It would therefore appear that the elderly smallholder livestock farmers' concern was to sustain their buffer (livestock) for times of crisis. This motivated the elderly farmers to exercise their agency to interact with the project training structure and accept that their contribution to rangeland rehabilitation should not be paid for. At the level of the Real, awareness of buffer capacity manifests in the “livestock is our bank” discourse added to elderly farmers' consciousness of themselves as livestock owners. The consciousness emerged as primary agents transformed themselves into a group of self-organised corporate agents.

6.3.1.1 Continual learning, experimentation and adaptive management

As mentioned earlier, the RU team drew on ILA philosophy and their scientific knowledge to develop land rehabilitation training workshops. The elderly farmers drew on their PEPs to experiment with the knowledge they acquired at workshops. Learning and experimentation are key principles in resilience capacity building (Biggs et al., 2012; Biggs et al., 2015; Sayer et al., 2013). One of the seven principles for enhancing the resilience of social ecosystem systems (SES) in the face of disturbance and ongoing changes is encouraging learning and experimentation (Biggs et al., 2012, 2015). The notion refers to modifying existing knowledge or acquiring new knowledge

(Biggs et al., 2015). To this, Sayer et al. (2013) add adaptive management. Sayer et al. (2013) argue that continued learning and adaptive management are essential in the face of surprises.

In the study site, continual learning involved changing and modifying mindsets and values and integrating local and scientific knowledge. Evidence of the process was revealed when participants were asked to describe and explain the rehabilitation activities depicted in photographs in Figures 6.4, 6.9 and 6.10. In Village 1, one elderly farmer responded:

No, we worked differently with brushbacks because our land is sloping, but we have problems with our brush packs. They are not straight because of the shape of the soil(topography). We devised snake formation [see Figure 6.9] because our land is not straight, but with stone lines and stone packs [see Figure 6.4 and 6.10]. We use the methods we were taught.



Figure 6.9: Brush pack formations on a sloping landscape (RU Hub Team)

Figure 6.9 shows a curved bush pack constructed by LCAs in Village 1. In the construction of the bush pack, the farmers drew on knowledge acquired in project training workshops related to erosion control. The corporate agency was exercised at the village level to develop an effective erosion control form that suits the local sloping, topographic landscape. The farmers experimented

to identify what worked in their rangelands. This observation supports Mukute and Lotz-Sisitka's (2012) observation that farmers learn in sustainable agriculture through doing, observing, trying and innovating.



Figure 6.10: Stone pack sediment trapping structures (RU Hub Team)

Meanwhile, in Village 4, one farmer noted:

Here in Village 4, our land is quite degraded and stony, and we have a lot of gullies. We mostly use stone lines and stone packs [see Figure 6.10] to try and trap sediment in the rangeland. We have been working in the rangeland mainly because that is where the biggest problem lies in our village.

In a similar fashion to their neighbours in Village 1, smallholder farmers exercised their agency by drawing on ideas and theories about how to stop further erosion using stone lines, stone packs and brush packs shared in project workshops. These theories or ideas can be conceptualised as part

of the project's knowledge structure. Notably, farmers were able to exercise their agency to draw on knowledge of local conditions to adjust what they had been taught to suit local topographic needs. This observation is corroborated by Biggs et al. (2012, 2015, 2021) who posit that learning and experimentation are vital in resilience building in complex SES.

Bailey and Buck (2016) concur that integrating local and scientific knowledge is one of the central elements of resilience building. In social realist terms, the farmers exercised their personal powers and properties to build erosion control structures, thus demonstrating adaptation and working towards resilience. They interacted with the project training structure to rehabilitate rangeland and regenerate grass to improve pasture, thus initiating change/morphogenesis. As corporate agents in different villages, the farmers exercised their agency in selecting the appropriate technique for the local environmental context. The selections, which can be conceptualised as events at the level of the Actual, also emerged from the geological and ecological conditions as farmers focused on the rehabilitation of rangeland. In other words, the same training workshops led to multiple interpretations of knowledge and its subsequent application in different villages.

Farmers in Village 4 indicated that the Machubeni landscape had been degraded over decades of colonial and apartheid rule. An example of the highly degraded landscape is shown in Figure 6.11.



Figure 6.11: Degraded Machubeni landscape (RU Hub Team)

As discussed in Chapter Five (Section 5.2.2.1), many studies concur that land degradation emerged because of the interplay between high densities of people and concentrated livestock populations accentuated by apartheid policy mechanisms (Hoffman & Ashwell, 2001; Rohde & Hoffman, 2008). Apartheid-era policies included the Native Land Act (1913) and the Black Self-Government Act (1959). Though concurring on the role of apartheid, Mani et al. (2021) argue that the causes of land degradation in South Africa are both physical and social, shaped by historically unjust land tenure and resource allocation which continues 30 years after apartheid. According to Mani et al. (2021), post-apartheid land reform, though designed to address historical injustices, is not directly connected with prioritising ecosystems, biodiversity or climate change. I argue that the project on which my study was based can be seen as part of the South African government's effort to address the land degradation shown in Figure 6.10. However, despite the implementation of climate-smart ecosystem innovations, reversing the degradation will require sustained long-term programmes. The morphostasis that emerged in land rehabilitation during the project was short-term due to the duration of funding. This observation supports research by Falayi et al. (2022) which shows that, in Machubeni, more radical steps such as prolonged rotational grazing, resting, reseeding and the

building of individual and group agency are needed. In Machubeni, fragile soil and dispersive conditions mean that the land is particularly vulnerable to degradation with low recovery potential (see Figure 6.11). This provides more reason for the need for projects longer than the five years of the project studied for this thesis.

In critical realist terms, the adoption of land rehabilitation practices evident in Figures 6.3 and 6.4 can be conceptualised as events at the level of the Actual and farmers' positive comments about the impact of their work as experiences at the level of the Empirical. Both events and experiences emerged from the interplay of many mechanisms at the level of the Real.

In conclusion, this group of elderly farmers can be seen to have drawn on their livestock ownership, discourses valuing knowledge acquisition and collective land ownership structures to exercise their agency and adopt innovative practices to address erosion. As discussed earlier, concerted long-term programmes are needed if the rehabilitation of complex SES is to be achieved.

The positive outcomes reported in this section were not evident across the board as my analysis of the response of some other groups of elderly farmers and the youth will show.

6.3.2 Elderly farmers' resistance to unpaid work

Some elderly farmers along with the youth who did not own livestock continued to draw strongly on discourses promoting the idea that all work should be paid for. Evident in the data was the way some elderly farmers exercised their agency to draw on a discourse constructing the role of men in the community. I have termed this discourse “the man's role is to put food on the table” discourse. Consider, for example, this statement from one farmer:

You need to be paid when you take a cow to the dip or somewhere on behalf of another farmer. Now let us say you take an older adult with children, look, now I am here with my child, and now I have to make means that she eats. These hours I am spending have to be considered. They count. I can do something about these hours. They can put food on the table because this child has to eat. When you say a person must volunteer, we must not ignore it.

What I have termed the “man's role is to put food on the table” discourse can be seen to relate to the gendered roles constructed for men and women in the community (see Section 5.2.2.2). In the community, a man is considered to be the head of the household and the provider for a family. During apartheid, the economic structure shifted a man's role from using labour to produce agricultural products to that of an income earner by opening job opportunities in the mines and industrial centres. As explained in Chapter Five (see Section 5.2.2.2), the community's consciousness had been shaped by exposure to apartheid and the transition to democratic structures. As a result, a discourse privileging the idea that work should be paid for was evident.

For this reason, the request of the project team for the community to engage in “self-help” work was seen as unacceptable by some. The interplay between the money economy expressed in the response “*hours have to be paid*” and the idea that the input of time cannot be ignored along with other discourses constructing the man as head of the household and provider for a family, resulted in the emergence of decisions not to do self-help/voluntary work. The youth shared some of this consciousness and worldview, as discussed later. What appears to be the case, therefore, is that other discourses that led to some elderly farmers exercising their agency to volunteer their labour to rehabilitate their land, such as the “livestock is our bank” discourse, were countered by a more dominant “no pay no work” discourse promoted by some elderly groups and the youth. According to one informant: “*It is difficult to involve them [some elderly community members] in this*

initiative because they want to be paid salaries or stipends". Another smallholder farmer, in a separate interview, said: "People want to get money. This is a project and Rhodes is just the school. There is no money involved. So, the community people were expecting to be paid, so they were not interested in working for free".

Despite the RU team's subscription to discourses promoting self-help and environmental stewardship, a group of farmers who did not own livestock, either as individuals or as groups (corporate agents), exercised agency by resisting unpaid work and not getting involved. At the level of Real, the interplay of the money economy, apartheid labour law mechanisms and gender stereotyping discourses constructing a 'man's role is to put food on the table' can be seen to lead to the emergence of this resistance – conceptualised as the absence of activities related to unpaid work at the level of the Actual. Hence, the emergent non-adoption phenomenon can be seen as an outcome of the interplay of multiple structures and mechanisms (Elder-Vass, 2010). The groups reproduced discourses citing the need that work must be paid. This then resulted in morpho-stasis or the absence of change. Carpenter et al. (2001) argue that resistance complements persistence. The interplay of generative mechanisms that can be broadly understood to have led to the emergence of (non) events associated with resistance can be seen to complement discourses privileging the idea of "no pay, no work".

This section presented the interaction of the elderly farmers with the self-help/volunteering discourse. I now turn to the youth who also exercised their agency to resist the self-help/volunteering discourse.

6.3.3 Exercising Agency: The youth

A RU team member noted that

the conceptualising of the project was a broad rural development programme, intending to stratify participants later based on the contextual setting of the community. The project site was constructed as occupied by male and female livestock and crop farmers. The youth farmers were a special group, an emergent phenomenon.

Arguably, the identification of the youth as a unique group emerged from large numbers of unemployed young people (Stats SA, 2022) who do not enjoy rights to access and use the land

(usufructuary rights). In Machubeni, the state owns the land, and the South African communal tenure system enables individuals and households to enjoy rights to access and use it. The communal tenure system results in property rights being derived from social relationships rather than from private and exclusive individual rights (Cousins, 2008). The tenure structure has led to the emergent phenomenon of a large population of landless youths in the former homeland communities, including Machubeni.

In the case of the project, traditional leaders resolved the issue by offering the youth a one-hectare plot to practise CSA (see Section 7.3). Young people were, however, conscious that they did not own either livestock or land. In social realist terms, the young people who were part of the project can be conceptualised as primary agents who “play no part in the strategic guidance of society because they literally have no say” (Archer, 2000, p. 268). However, and again following Archer, primary agents can draw on their powers of reflexivity to transform themselves into a group of corporate agents to pursue change.

Human beings have the powers of critical reflection upon their social context and of creatively redesigning their social environment, its institutional or ideational configurations, or both ... it is possible for human beings to become agentially effective ... in evaluating their social context, creatively envisaging alternatives, and collaborating with others in bringing about transformation. (Archer, 2000, p. 308)

In Machubeni, however, it would appear that young people did not use their personal powers and properties in this way to take up the opportunities afforded by the project to use the land allocated to them in an entrepreneurial venture. Rather, they exercised their agency to continue to draw on discourses privileging the concept of a money economy. For example, in response to a question about why the young people did not own livestock, one person noted, “*The youth don't have the money to maintain livestock. Yohho it is expensive*”. What appears to be the case, therefore, is that the interplay of land tenure structure and a lack of money and any access to credit that could allow young farmers to buy livestock served to constrain the exercise of their agency. This observation concurs with other studies that argue that youth participation in agriculture is constrained by a lack of access to resources such as finance, credit facilities and mentoring (Hawkins et al., 2022; Mthi et al, 2021; Mungai et al., 2018). Although structural mechanisms constrained young people’s access to livestock, dominant discourses constructed their failure to own animals as due to a lack

of interest. One traditional leader pointed out, for example, that: *“No, I would not lie; there is not much [youth] at all in livestock production. Even with us as their parents, we are not that much interested in livestock farming”*. Yet another traditional leader identified another mechanism in the form of recurrent drought by noting that

youths in the past were occupied by working in crop fields and livestock rearing. It is because there is drought now and then the young farmers do not have things to do like in the olden days. We were ploughing our fields in the past, so they worked in our fields, looking after sheep and cattle.

A CLO identified what he termed “cultural differences” as a mechanism:

Now, the African culture is different from the white culture. When white people grow up, they learn from their parents how to do things right, but black people must be pushed to do something. If you continue living like that, you cannot survive. That is why black people are suffering.

In making this statement the CLO was arguably pointing to the social and cultural conditioning of different racial social groups.

Discourses constructing young people as apathetic were frequent. However, frequent droughts and the topography of the land meant that farming was experienced as difficult. The change from traditional subsistence agriculture has left a vacuum. In the past, children were socialised into agricultural practices from an early age. Since 1994, the introduction of social grants has also contributed to a rejection of subsistence farming. Social grants are paid to contribute to the upkeep of children in the form of pensions for the elderly and disabled people (see Section 5.2.2.3). Young people have arguably been conditioned into expecting the state to provide by creating employment, paying child social grants and COVID-19 social protection grants. This is not necessarily the case for the elderly who are often seen leaning on walking sticks, herding livestock.

Some youth exercised their agency at the beginning of the project by attending project training workshops and volunteering with one young person noting: *“We were asked to go and volunteer up there in the rangeland mountain”*. This statement suggests that the young man saw his voluntary work as a response to a request and not as something he instigated of his own volition. However, another young farmer noted: *“We were also interested to learn something. Then we decided to go. We do not mind working. We are always willing to work”*. Here it is possible to see a discourse constructing the youth as “willing workers”. As the project progressed, however,

young people withdrew their labour while some elderly farmers continued to work on the project for the reasons described above.

Although the young people did not manage to transform themselves into a group of corporate agents with a concern to rehabilitate the land, they did effect a transformation of their agency in the sense that, as a group, they withdrew their labour from the project and exercised peer pressure to persuade others to do the same. In engaging with peers, those opposed to volunteering drew on discourses privileging paid work and the money economy. As one social actor pointed out: *“A youth may say yes, and others will laugh at him. Was he going to do that to get nothing? It became a joke. One young person loved going to the mountains and stuff. The young farmers didn't want to continue working because they wanted to get paid”*. This observation supports previous research showing that farmers do not implement innovations that do not address their concerns (Fujisaka, 1991, 1994) of wanting to participate in a money economy. It is thus possible to see a clash of worlds between elderly farmers socially and culturally conditioned into a consciousness that respected and valued work on the land and the youth whose consciousness was very different and expected payment for work.

The social and cultural conditioning of young people and dominant discourses privileging the idea of “no pay, no work” challenged the project team's attempts to win support for self-help and environmental stewardship. The RU term encouraged young farmers to work for the individual good by contributing to the communal good. However, a lack of access to anything other than the communal land allocated to them by the project constrained young people from drawing on discourses promoting a money economy and led to experiences and observations that, for the young, contributing to the common good did not bring individual benefit. As landowners, the elderly derived private goods from land rehabilitation activities. As no private goods were accessible and the youth may not benefit from the public good in land rehabilitation as they did not own land or livestock, they exercised their agency by resisting self-help/volunteering and drawing on the “no payment, no work” discourse. One elderly land rehabilitator confirmed the young farmers' conditioning, constructing them as individuals incapable of doing hard work:

There used to be youth involved when we were volunteering, but we were chosen to carry on with the project. I don't know why the youths were not chosen because the project selected Land Conservation Activists [LCAs]. Youth also want money constantly and cannot do hard work such as our rehabilitation work.

6.4 Paying for Participation

Although the project began by encouraging self-help, perceived locally as ‘volunteering’, some payments were eventually made to Land Rehabilitation Activists (LCAs) when the RU team exercised their agency to draw on project funding to pay smallholder farmers engaged in climate-smart rehabilitation of the common-pool rangelands. The decision to pay for labour was based on a realisation that rangeland rehabilitation was hard work, and the ecosystem services benefited the community rather than individuals. The observed benefits included reduced siltation and restored wetlands and springs. The decision on the part of the project team to pay for labour was in line with the South African government’s objective of prioritising land and ecosystem structures to pursue a green economy (see Section 6.2). The project leader indicated that the project was structured only to pay LCAs as they worked on communal rangeland and not individual household plots. Some did not even own livestock.

The LCAs’ activities contributed to the reduction of erosion and sediment washed downstream into the Machubeni Dam. The Machubeni villages are located in the Cacadu River catchment area. The amount of sediment entering the Machubeni Dam is indicative of high upstream sheet and gully erosion levels. The dam has reportedly lost 47.2 % of its storage capacity owing to siltation since its establishment in 1991 (Pretorius et al., 2021). Without intervention in the form of CSA practices such as grass reseeding (Shackleton & Gambiza, 2008), the dam is expected to be silted up by 2056. According to an RU team member, the project team’s decision to pay for labour was not guided by the philosophy of PES but drew on SLM discourse and payment for labour. However, I argue that accrued benefits of reduced siltation, improved wetlands and grass production align with many studies that argue for PES as a viable approach to ecosystem rehabilitation (Hayes & Murtinho, 2018; Lliso et al., 2021; Sayer et al, 2013). Future research could look at quantification of the improvement of ecosystem services resulting from payment for labour. Payment for labour was a means of addressing stakeholder clashes which, in Machubeni,

saw landowners/livestock owners pitched against the landless/non-livestock owners. A Land Rehabilitation Hub (LCA) community member expressed the experience of being asked to “self-help” in the following way: “ZGH never wanted to pay anything for participants, not a cent, so that's how it [the project] was structured”. In making this statement, the LCA member ignored discourses privileging SLM and the need to work for the common good to derive individual benefits as promoted by the project team. Rather, he constructed the lack of payment as a deliberate withholding of money on the part of the project overall. In contrast, another member of the RU team said that these were incorrect claims as an LCA and Eco Rangers payment mechanism was later put in place (see Section 6.4).

The apartheid regime, mainly because of its policies of racial segregation, left a very stubborn and complex configuration of racial relations which are still evident nearly 30 years after the dawn of democracy. Relations between Blacks and Whites in South Africa are conditioned by history and often involve mutual suspicion and a lack of nuanced understanding as the following statement made by the same LCA member indicates:

I think sometimes it's just put out of context simply because people who design these projects are whites, and they want them to be run by whites, and whites can be very arrogant, you know. You can have a government department from the chief director downward, all staffed by White people. And then you've got the private company that is writing these projects. It's all White staffed, by not even lower-middle-class whites, but upper-middle-class whites, you know? And the settings where these projects will be implemented are entirely Black and completely poor.

Other researchers have also identified the way race comes into play in environmental management discourses in South Africa. Khan (1994) and Beinart (1984, 1989) identified the way demands for payment on the part of Black communities have been constructed within a discourse of entitlement. Such clashes can be seen as resulting from very different forms of social and cultural conditioning. Environmental scientists are, indeed, often white and highly educated and have thus had, and continue to have, very different experiences of the world from people living in poor rural communities. Although the project on which this thesis was based was led by a black academic who himself came from a rural background and considerable hardship, dominant discourses in the community continued to construct team members as simply being unwilling to pay for labour and as being oppressive in the process – thus, discourses constructing unpaid work as an act of

environmental stewardship that would serve both the common and individual good in the process. One Hub member, for example, lamented: *“I cannot understand why they didn't want to pay them. I honestly don't know, and I still don't know. You sat there, saw the fights, and got the background of those fights. I couldn't understand. I was convinced that these guys were oppressing poor Black people”*. The Hub member explained the decision to introduce payments as resulting from a fight: *“No, there was a fight. There was a long, long, long fight until ZGH relented”*.

South Africa has a chequered history of state-sponsored conservation projects that mainly started in the 20th century. One major example is the Betterment Programme noted in an earlier chapter of this thesis (Beinart, 1984; Cundill, 2008), designed as a land rehabilitation programme. The programme led to the emergence of widespread cases of degradation of arable and grazing lands, which became severe in the 1940s and worsened in the 1970s. In implementing the programme, the apartheid state forcibly moved communities from their lands and even expurgated some land parcels from agrarian use without providing alternatives (Beinart, 1984; de Wet, 1998). This brewed rural resistance against the state which, at that time, was identified with the White race. Memories of such poorly planned environmental rehabilitation programmes are still alive in rural communities, and communities continue to treat externally designed projects with suspicion. From an Archerian perspective, therefore, community members can be seen to have been conditioned into experiencing any project as suspicious.

Members of the project team were highly sympathetic to the plight of the rural poor. Indeed, if they had not been concerned about them, the project would never have been initiated. One project member remarked, for example, that *“No sane person would volunteer to work when starving”*. However, the project team saw rehabilitation of the land as a means of alleviating poverty, a long-term project. The needs of the rural poor were, however, more urgent.

As negotiations about payment for work were taking place, elderly livestock farmers continued to contribute their labour to project activities. Over time, they exercised their corporate agency and negotiated for *“soap money”* to wash work clothes. *“Soap money”* is a Xhosa metaphor for a small amount of money, not a stipend. As noted in Section 5.2.2.3, Machubeni experiences extensive poverty (Stats SA, 2011). In this context, one smallholder farmer noted: *“We do a lot with little money”*, indicating the elderly farming community's consciousness of their isolation, resource-

poor status and their acknowledgement that they had developed strategies to maximise whatever little income came their way.

At the level of the Real, project funding along with discourses acknowledging the poverty and hardships experienced by the community contributed to the emergence of payments for work, conceptualised, in critical realist terms, as events at the level of the Actual. The emergence of payments demonstrates that reality in an open, dynamic system cannot be controlled (Bhaskar, 2016; Sayer, 2000). When the LCA's monetary concerns were aligned with the project objectives of rehabilitating degraded land, the climate-smart land rehabilitation innovation practices were successfully implemented in four out of five participating villages.

The interplay at the level of the Real of, among other things, structures such as race and the money economy and an array of discourses including one I identified as “no pay, no work” led to a shift in project practice. I, therefore, argue that smallholder farmers' rate of uptake of CSA innovation was not about the scientific effectiveness of climate-smart principles but was indicative of the way participants exercised their agency. A willingness to engage with project participants in what one participant experienced as a “*long, long, long fight*” through workshops and discussions showed the RU project team listening to the experiences and observations of the villagers, reflecting on the social and cultural conditions in the project sites, and using their agency to use project funding to pay a small amount of money to address farmers’ concerns in pursuit of project goals.

Young people, conditioned by the money economy and social grants, expressed disgruntlement with self-help/volunteering and the subsequent selection process of LCAs. One participant reported that “*all of us started as volunteers, and then the volunteering programme ended. They [the project] then chose people they would work with. Those who were selected got paid. All of a sudden, we were told that now we are getting eliminated*”. The youth's absence in rehabilitation activities was noted by a RU team member who, nonetheless, challenged the discourse in the extract above as being a deliberate attempt to exclude the youth:

There were no interviews for LCAs. Nonetheless, the selection was based on interest in rehabilitation. The project wanted energetic and agile young farmers. But the young farmers did not pitch up in the selection process, and the project ended up with mostly elderly women who couldn't lift the big stones. (See Figure 6.12. below.)



Figure 6.12: Elderly women land rehabilitation activists (RU Hub Team)

Another statement indicating the criteria on which the selection of LCAs was based appears below: *“We [the project] never discriminated against but selected LCAs in consultation with traditional leaders based on interest in rehabilitation. Furthermore, Eco Rangers were interviewed ... the panel included traditional leaders”*. It is important to note that young people had withdrawn their labour during the project’s self-help/volunteering phase, a point confirmed by a young farmer who himself noted that *“the payment was a bit after the youth had left”*. The conflicting claims and counterclaims revealed the clash of consciousness of the youth with the elderly farmers and the project team.

The existence of another discourse in the community constructing young people as lazy and uninterested is also pertinent to this discussion. When questioned about young farmers' absence from rehabilitation activities, an elderly farmer noted: *“There are no youths. We are old. We do not want them because we must push them and show them what to do”*. The youth viewed self-help or volunteering as exploitative. One young farmer summed up his experience with the project by noting: *“We got nothing except certificates”*. The youth had had more access to education than

the elderly as many were born following the shift to democracy. In contrast, and as I have already noted, the fact that the elderly had been denied education resulted in many valuing the training offered by the project. For young farmers, a certificate attesting to the training they had received in a rurally based project would probably not have contributed very much to their attempts to access the formal economy, whose benefits they had been awakened to through social media and information technology more generally. This observation supports Cundill's (2008) report that skills acquired as a result of project training are specific to local contexts and do not necessarily provide access to employment post-projects. In addition, the youth had limited access to project resources at the level of the Real. The way the young farmers exercised their agency to interact with project opportunities illustrated the complex interplay of mechanisms at the level of the Real that needed to be considered by project designers and leaders.

In conclusion, it would appear that many young people initially engaged with the project in the hope of receiving money. Conditioned by expectations related to the money economy, with no access to land or the means of buying livestock, they did not seem to value subsistence farming the same way as the elders. In many respects, therefore, their consciousness of the world was different from that of others involved in the project and this impacted the way they chose to exercise their agency.

6.5 Conclusion

In this chapter, I attempted to analyse the way different groups of farmers in the Machubeni villages involved in the project exercised their agency to interact with CSA and ecosystem adaptation and resilience-building interventions. I also analysed the way the RU project team analysed their agency as they interacted with different community groups. My use of the theoretical framework based on the work of Bhaskar (1979, 1989) and Archer (1995, 1996, 2000) allowed me to identify various mechanisms at play at the level of the Real which came together in different ways to condition agency. The result was different project outcomes depending on the community group. I now move on to look at farmers' interaction with the CSA Home Gardens Hub.

CHAPTER SEVEN: SMALLHOLDER FARMERS' INTERACTION WITH CLIMATE-SMART AGRICULTURE HOME GARDENS

7.1 Introduction

Chapter Six analysed the way smallholder farmers exercised their agency in Phase One of the project on which this thesis is based. To avoid the reification of agents, Archer argues that through the exercise of PEPs, SEPs and CEPs are triggered and act to enable or constrain the execution of the projects they had identified for themselves. This chapter builds on Chapter Six in that it seeks to understand why and how smallholder farmers' uptake of CSA was limited. The chapter therefore addresses the research question:

How do smallholder farmers interact with structural and cultural mechanisms to enable or constrain climate-smart agriculture home gardens (crop) production?

. In 2019 CSA home gardens were introduced as the project's second phase, though it was concept was initiated in 2017 as indicated in chapter 6. 1. I begin the next section with an outline of the project's second-phase operations. Then I turn to exploring the way the practices promoted in the project were taken up by different age groups .A total six elderly farmers (above 35years) and four youths between the age of 15 to 35 years were interviewed to answer the research question. Discourse analysis (see Section 4.4.2) showed that the uptake varied across age group cohorts. The discourses were divided into enabling and constraining narratives.

7.2 Climate-smart Agriculture Trainee Farmers' Selection and Training

The RU project team drew on their local knowledge of the land ownership structure to identify individuals to train as climate-smart practices trainee farmers. The RU team discussed the selection criteria with the local traditional leaders and farmers. Based on the criteria for participation agreed upon because of this process, the RU team and the community selected individuals from households with land measuring 50 x 50 metres that were fenced and had a roofed structure to enable water harvesting. The project selected five trainee farmers, one of whom would be a young

person per village. A total of 25 trainee farmers were selected. Out of the 20 elderly trainee farmers, only four were males. The trainee farmers concept was introduced in the belief that five individuals per village trained in CSA principles would be available to exercise their agency to train other farmers on CSA gardening. The trainee farmers were expected to disseminate their acquired knowledge to their neighbours, thus upscaling CSA innovations. The objective was to improve productivity, food security, income and livelihoods.

The RU team, drawing on their knowledge of CSA concepts, exercised agency to design home garden training workshops. The CSA home gardens researched in this thesis were underpinned by CA principles of simultaneous application of minimum tillage, permanent soil cover and crop rotation/ diversification (Brown et al., 2017; Thiombiano & Meshack, 2009). In Archerian terms, both older people and the youth exercised their PEPs to draw on the project training structures and resources.

7.3 The Elderly Smallholder Farmers' Interactions with Climate-Smart Agriculture Home Gardens

Following project criteria, the elderly (above 35 years) farmers involved in the project all owned a 50 x 50 metre fenced homestead. In contrast, the youth(15-35 years) did not own or have a vested interest in land as explored later in Section 7.4.

Insights gained from the study showed that farmers tended to choose one or two of these three principles: (i) minimum tillage/zero tillage, (ii) permanent soil cover and (iii) crop rotation/crop diversification in their implementation. Farmers rarely implemented three principles simultaneously but selected either one or two to execute because of resource limitations. This observation is confirmed by previous studies (Brown et al., 2017a; Lee & Gambiza, 2022). The farmers tended to take up water conservation-related principles because the study site experienced water scarcity, worsened by increased drought frequency and intensity. The elderly farmers selection of CSA practices in the project was in response to the geographic and climatic environment conditions (see Section 5.2.2.1). The tower garden, a water conservation technique, emerged as the most popular of the practices introduced to farmers. This observation shows

farmers' choice of CSA practice was influenced by the local context and climate conditioning, a structural mechanism, rather than only by resource limitations.

The farmers found a winning soil and water combination in the construction of towers. A tower garden consists of a garden in a bag, as shown in Figures 7.1 and 7.2, and comprises several sacks sewn together. The sack material is used to hold soil. A stone column is built at the centre using a bottomless bucket filter to remove solids and soap (see Figure 7.2). This porous core in the centre distributes water evenly throughout the soil in the bag. The bag is filled with alternate layers of 1/3 prepared soil, 1/3 manure and 1/3 mulch. The elderly farmers had access to livestock manure from family herds. The quality and quantity of biodegradable material enhance available nutrients and conserve soil moisture for three to five days. Grey water – water from washing dishes and bathing – is poured into the stone filter. Wood ash can be spread on the surface of a water bucket overnight to reduce and settle soap before use. In water-scarce and frosty/snowy winters, the tower system allows households to grow vegetables in small-sized gardens all year round.



Figure 7.1: Tower garden (RU Hub Team)



Figure7.2: Tower garden porous core construction (RU Hub Team)

Tower gardens emerged as popular amongst both the elderly and the youth, as the following extracts from interviews revealed:

Oh, the tower garden conserves water.

Yes, it [the tower garden] has an impact because everyone who planted vegetables in tower gardens did not break their production chain. AA and BB are still growing vegetables there. I even copied that.

In Villages 2 and 3 interviewees noted:

I can say we learnt more things. Like these tower gardens in winter, that's where you can plant because here [Machubeni], we have too much frost. It's freezing on this side, so plants don't grow well if you are planting there on the ground.

Also, this method scares the birds away, and they do not feed on our plants.

Apart from water conservation benefits, these extracts showed project participants' identification of additional non-intended benefits of tower gardens. The climatic conditioning noted in subsection 5.2.2.1 continues to constrain the vegetable production period to four to five summer

months. The tower garden enabled vegetable production throughout the year. One challenge, however, was the short life span of sack material (see Figure 7.1) which resulted in some households ceasing to use the technique. One farmer noted: *“Those sack materials got destroyed. So, I didn't do them again”*.

The high rate of adoption rate of tower gardens can be attributed to the fact that the technique addressed farmers' concerns. The farmers exercised agency drawing on project training but were constrained by the rapid wear and tear on the sacking needed to make the towers. In addition, the private company that had sold second-hand sacks to the public changed its policy preferring to recycle rather than sell sacks. This unexpected change led to the unavailability of sack material.

The RU team and the community discussed this emergent constraint. The replacement of sacks with stone packs was suggested. The elderly gardeners, in line with the principle of resilience building, co-learning and experimentation (Biggs et al., 2012, 2015), exercised their agency, drawing on colleagues trained in land rehabilitation (see Figure 7.3) to use resources found in the geological environment. A locally available natural resource – stones – emerged as a suitable alternative to sacking. Using simple and locally available resources was a fundamental principle of the RU team. As a result of social learning in farmer-to-farmer training, the acquired rehabilitation stone pack knowledge was transferred and transformed to build permanent stone tower garden structures shown in Figure 7.3. The emergence of these stone tower gardens was vital as it indicated a willingness to learn and use naturally available resources. The use of stone packs shows that knowledge acquired in different project hubs was shared. In geographic conditions without abundant stones, bricks can be used. In Archerian terms, the practice of using stone towers indicates agents drawing on their PEPs to activate cheap and locally available resources to create and maintain opportunities where ecosystem services sustain livelihoods. In the context of ILAs, the farmers demonstrated the use of their agency, both individually and as groups of corporate agents, in continuous learning and adaptive management recommended in studies (see Arts et al., 2017; Freeman et al., 2015; Pedroza-Arceo et al., 2022; Sayer et al., 2013). In the context of South African agricultural educational approach, the farmer to farmer learning is regarded as effective (Kelly et al., 2017; Metelerkamp, et al., 2019)



Figure 7.3: Stone tower garden (RU Hub Team)

Adaptation and resilience building were also evident in response to a change in policy emanating from the private sector SEPs in the form of the decision to recycle old sacks instead of selling them. Walker (2020) argues that resilience involves the ability to cope with shocks and to keep functioning. For the elderly farmers, adopting and adapting CSA water and soil conservation practices constituted an instance of morphogenesis, or change, in Archer's morphogenetic framework (Archer, 2010a).

The elders in the community tended to be less well-educated than the youth, as they had been raised during apartheid (see Sections 5.2.1; 5 2.2) . As a result, they drew on discourses valuing formal education and saw the education provided by the project as valuable as these examples show:

I have learned how to farm vegetables and create a livelihood for myself and others. The first thing we appreciate is the Rhodes people. Although we did not get paid, they taught us about farming. We use whether rain or sunshine.

Only lazy people will say they did not learn anything.

The project gave us seeds and other tools; they gave us tanks to store water, and they taught us how to farm so our kids would never sleep without eating.

The above extracts show how a concern for livelihoods and discourses valuing education and learning enabled the elders to address those family food security concerns. Consider too the following statement, which demonstrates an individual drawing on their agency to address health-related concerns: *“This one [pointing at a child] once had TB. I said a person with TB must eat green foods. I will take it from the garden”*.

In the cited extract, the farmer drew on acquired knowledge to improve family health by consuming nutritious fresh vegetables. The family structure is fundamental to elderly female farmers in particular. For example, one elderly farmer in Village 4 said: *“I am old now, and I have lived my life. Nothing concerns me as long as I live and breathe and can be there for my children and grandchildren”*. The farmer was drawing on a discourse that constructs the elderly in a particular way. Their lives are ending. There is nothing to strive for or achieve other than being there for children and grandchildren.

At the level of the Empirical, the uptake of climate-smart home gardens was dominated by elderly women. This could result from the Xhosa traditional structure that women are responsible for childcare, food security and homestead gardens (Connor & Mtwana, 2018). What appears to be the case, therefore, is that these elderly female farmers drew on their roles as women, constructed through discourses valuing education and learning to exercise PEPs and become involved in the project.

The following statement from a leader in the community encapsulates their valuing of education succinctly: *“I think sometimes it is not only about money but what is important is to have a piece of knowledge. You [the project] are leaving us with something to help us”*. Farmers exercised agency in the planting of various vegetables drawing on project training and resources as shown in Figure 7.4 to improve productivity and generate income.



Figure 7.4: Crop diversity (RU Hub Team)

A female farmer in Village 1 indicated that she

planted for summer and harvested many vegetables, including carrots, cabbages, tomatoes, spinach, beetroot, potatoes, and lettuce. I gathered four bags of potatoes that were also big. As for the lettuce, I didn't have a great harvest; I only had about ten bunches of lettuce as I was still trying it out. I had a great crop of approximately 200 bunches [of spinach] and more, and as a result, the spinach had a massive sale to the community members. I think we made more than 30 boxes of tomatoes we managed to sell. As we speak, we just sold the last bulk of the remaining tomatoes. Even John, who owns the shop, was buying tomatoes and lettuce from us.

The extract shows the farmer's experimentation to deal with complex contextual conditions. In Village 2, one female farmer indicated:

There is progress. I made money through my garden farming (spinach, cabbage, green pepper, and carrots). Even though the community supported me, I used to sell my products to the schools (creche). I had a great harvest of spinach people used to come from different communities to buy my spinach because it was outstanding." Also, the money I make through the farm garden helps me buy other foods from the shops and electricity, and I can support my family.

The extracts reveal that the interplay of project and gender structures enabled the adoption and emergence of crop diversification. The adoption of CSA enabled the elderly and middle-aged farmers to improve food security and income, allowing for the purchasing of other goods. Two males interviewed about their home gardens did not express satisfaction regarding boxes of tomatoes or income generated possibly showing that they did not experience gardening as a positive livelihood source. Archer's notion of social and cultural conditioning can be seen to be coming into play here in that gardening is constructed through discourse as a task for women.

Most farmers drew on project training to adopt minimum tillage methods in their gardens. As shown in Figure 7.5, one farmer noted that zero tillage was easy and fast as she did not have adequate labour at the household level and that the practice resulted in the provision of natural cover in the windy Machubeni landscape. As a result of her weeding challenges, she opted for minimum tillage opening only the section of her land planted with cabbage. This concurs with the insights of other studies that argue zero tillage decreases labour demands on women and children (Giller et al., 2009; Tambo & Mockshell, 2018). Although herbicides could control grass, they tend to be unaffordable for resource-poor farmers in the community. As a result, crops shown in Figure 7.5 were not flourishing as they were competing for nutrients with grass.



Figure 7.5: Cabbage production, minimum tillage (Ru Hub Team)

In addition to minimum tillage, farmers exercised agency by drawing on project training to practice mulching and intercropping maize, sugar beans, and eggplants, as shown in Figure 7.6. Other households used pumpkin and butternut as cover cropping to reduce raindrop impact (see Figure 7.7). A positive outcome of minimum tillage was a reduction in soil erosion on an average of 250m² per household, a total of 5ha in the five households per village involved in implementation. Overall, these study observations concur with agro-economic studies that minimum soil disturbance preserving cover and crop diversification reduce soil erosion and improves productivity and livelihoods (Jiri et al., 2017; Manda et al., 2016; Muzorewa & Chitakira, 2022a; Thierfelder et al., 2015a, 2015b).



Figure 7.6: Minimum tillage, intercropped maize and beans (RU Hub Team)



Figure 7.7: Cover cropping with butternut and pumpkins (RU Hub Team)

To sum up, the elderly women's adoption of CSA is an example of human-planned adaptation rather than a spontaneous human reaction to an adverse water scarcity condition (Smit et al., 2000; Moser & Ekström, 2010). The adaptation has improved productivity, income, and food security for families. The women's exercise of agency illustrates the three adaptation elements of 'for whom', 'of what', and 'how' (Meng, 2023; Smit et al., 2000).

The elderly women's emergent tendency was to adopt and adapt their vegetable cropping system to mitigate the climate change impact on their livelihoods. Thus, morphogenesis was achieved. In critical realist terms, positive events and experiences emerge from the interplay of structures at the level of the Real, including knowledge attained from the project and gender. Mechanisms in the domain of culture also contributed to the emergence of positive events and experiences including discourses privileging family food security, childcare, water and soil conservation. Fujisaka (1991, 1994) notes that when CSA innovation aligns and addresses farmers' concerns, farmers are more likely to adopt the innovation and resilience building occurs. Thus, adoption led to adaptation and subsequent resilience for this cohort of farmers as new shocks were encountered.

7.3.1 Alternative accounting mechanism

Another insight gained from the project was that the elderly women farmers did not keep records despite training in record keeping and financial management. This could be due to the poor quality of education previously available to participants. As indicated in Section 5.2.2.2, in the community, oracy is privileged over literacy and written documents. The farmers identified improved productivity in the number of boxes of tomatoes and bags of potatoes produced orally. Income improvements were defined as resulting in greater ease and freedom from stress related to paying bills and funding other household needs such as funeral insurance and electricity bills. In the context of oral reports of farmers' positive experiences, one noted: *"This has really supported me. I wish I had taken records as proof that we are profiting from gardening. For example, on a day, I would make a sale worth R100.00 and send kids to shop to buy other goods"*.

Interviews revealed that the measurement of success by elderly members of the community did not draw on conventional accounting measures, making it difficult to account for an increase in productivity, income, improved nutrition and adaptation cycle changes. Mechanisms leading to

this phenomenon included a lack of mastery of literacy practices on the part of the elderly women and historical conditions constraining access to formal education that would have developed these practices. In addition, in the Xhosa culture, the term 'kitchen garden' implies subsistence farming/home consumption, free sharing and bartering with neighbours and relatives. One farmer noted:

With the mealies, we eat while it is still fresh and share with the community members, and when the mealies are dry, we feed chickens. I do have some seeds for tomatoes, even though we give community members some other seeds. It is not like we have nothing. We need help here and there.

This insight concurs with studies that note the tendency to overlook these non-monetarised direct-use values of the home garden (Shackleton et al., 2001; Shackleton et al., 2001). Conventional accounting misses the home garden's importance as a contribution to a household's food security safety net and how it strengthens community bonds and networks. The lack of a traditional Western record-keeping records approach means the livelihood value is masked.

Another insight gained from the study is that the size of gardens was important. Size limits output per garden and motivation for record keeping and accounting. Garden size thus emerges as a mechanism contributing to the non-emergence of formal record keeping as a series of events at the level of the Actual. However, it can be argued that despite the size of the garden, it is necessary to keep records of expenditure and income in the monetary economy: the poor quality of education constrains some elderly women who cannot write.

Empirical evidence of the adoption of CSA practices took the form of photographs that were saved by date. Because of water unavailability in the dry season and low temperatures in winter, the seasonal nature of home gardening meant that the CSA livelihood uptake and value were masked. If, for example, the CSA-uptake rates were assessed in the winter when frost and snow are experienced (see Figure 7.8), one would assume the home gardens did not exist or were not successful.



Figure 7.6: Machubeni winter conditions source (RU Hub Team)

The interplay of temporal seasonal variation in the gardening period in the absence of record-keeping mechanisms could be assumed to constitute evidence of non or dis-adoption of CSA practices in winter. In this instance, smallholder farmer uptake was not evidenced unless captured through in-depth interviews and photography. I argue that the adoption and adaptations of CSA were taken up on the study site. The emerging phenomenon was revealed through photographs, alternative accounting record-keeping mechanisms and in-depth interviews.

7.3.2 Power relations

In Villages 3 and 4 the uptake of CSA by farmers was limited. The farmers adopted the climate-smart measures initially but then dropped them. According to informants, they were unhappy with the local seed input distribution system. The local project representative excluded some farmers as seeds were distributed, with one farmer claiming: *“The only challenge is XYZ does not give us*

seeds. I feel like sometimes only XYZ uses our names and provides the resources to her friends so, I do not know”. The farmer added:

Yaaa, it [seed] has not reached us. You see, it is like I am picking fights now. We do not get along with everything here. Sometimes, things come, and it is given to certain people. They [three farmers] already gave up, but I suggested we write a letter to Rhodes to enquire about this issue and plan how to get seeds.

His withdrawal from the project followed his experience of unfair seed distribution. Local power structures thus emerged as a potential mechanism impacting the distribution of seeds (conceptualised as events at the level of the Actual). It is arguably the case that XYZ accrued power during the project by being appointed as a facilitator as it allowed him to change his status to that of a social actor. He then drew on his networks and, potentially, discourses privileging friendship and kinship to engage in unfair distribution. Therefore, in Village 3, the exercise of agency by one social actor resulted in experiences of exclusion in the seed distribution mechanisms and resulted in some farmers leaving the project. The expected outcome of improved productivity, income and livelihoods in Village 3 was constrained by farmers’ diminished agency in relation to the project distribution structure.

For the informant above, however, what appears to have been the case is that he could not transform his agency by joining others to raise objections with RU project leaders as a group of corporate agents, choosing to leave the project instead. However, a lack of seeds was cited as a reason for leaving the project along with a sense that the seeds were being distributed unfairly. It is crucial to consider the morphogenesis of the agency (for example, the morphogenesis of primary agents into groups of corporate agents) in this example. Regarding LA, the observation illustrates the lack of negotiated and transparent change logic principles (Sayer et al., 2013). The use of a social realist lens enabled the identification of the underlying generative mechanisms and discourses that led to a tendency to dis-adopt CSA gardens in Village 3.

7.3.3 CSA trainee farmers

A traditional leader also identified a problem with the trainee farmer structure as follows:

Some of the selected trainee farmers worked according to how they felt and were not reaching out to the community people. They just wanted to get project resources [water tanks, seeds, tools] for themselves. I can give you [the project] 80% because some people in the community have kept the information you shared with them. However, they did not extend the knowledge to everyone in the community.

The trainee farmer concept was introduced to allow for farmer training on CSA gardening (subsection 7.2.1). However, the traditional leader noted that this did not always happen claiming that trainee farmers selectively trained those they wanted to work with. Others declared they would not teach unless they received payment from the project to train. This can be seen as an indication of the way the money economy functioned to constrain the emergence of events constituted as training activities.

7.3.4 Youth CSA trainee farmers

Trainee farmers were also identified among young people involved in the project. Between 2019 and 2022, all except one of the youth trainee farmers exercised their agency to withdraw from climate-smart gardens even though the young men and women benefited from access to project resources, including water tanks, seeds, tools and training. Their withdrawal was explained by an elderly farmer as follows: *“They don't give themselves time to go to the garden and look after it, and they are always on the streets and attending functions in the village”*. This is one example of a prevalent discourse amongst older people constructing the youth as lazy or preoccupied with trivial matters. The insights concur with Swarts (2011,2013) findings. When interviewed, the one young person remaining in the project responded as follows to a question about why he had not withdrawn: *“As for me, I don't have parents, or maybe it's just that I know that I have to wake up and do things for myself. Yeah, I have to survive.”* As an orphan, this young man had inherited land, and, like the elderly, he was benefiting from a private good (as discussed in Section 6.3.1). Likewise, Maele et al., (2013) study found only 12 % of youth had title deeds. Asked if any of the youth had approached him to learn the CSA practices, he provided a negative response.

However, one middle-aged female farmer summed up low uptake on the part of the youth due to discourses constructing agricultural activity as negative and privileging consumerism. She added:

They assume that someone who works in the garden is poor and can't afford to buy herself alcohol. They undermine work with soil. They do not want to work hard. They also wish for readymade stuff. They don't want to put effort into anything.

A traditional leader argued:

You know where the problem lies when we have specific criteria for choosing people that can work. For example, if we select people experiencing poverty to say we are supporting them without considering their work ethic, it becomes a problem.

A local project representative added:

Yet again, the youth of Machubeni still fails to deliver. Although the project brings seeds to the community so people can produce something, the youth still fail to create a positive outcome. While people outside of the project are doing well and harvesting. Also, people get into the project through their gender and pro-poor position and do not care about their land.

The RU team and traditional leaders exercised their agency to include marginalised and poor community members. Drawing from his observations of the household characteristics of those who had withdrawn from the project, the traditional leader argued that selecting youth, women and the disabled without considering their work ethic was a problem. The leader claimed that a simple pro-poor selection criterion was not adequate. In his words, the assumption that inclusion was helping the poor meant that “*we are shooting ourselves in the foot*”. This comment challenges the notion of broad participation promoted on the principles for enhancing the resilience of ecosystem services (Biggs et al., 2015; Freeman et al., 2015). The insights from this study suggest that social and cultural conditioning impacted the way participants were prepared to exercise their agency. There is evidence, for example, that young people had been conditioned to value what might broadly be termed a ‘consumer lifestyle’ and that this did indeed influence the way their agency was exercised.

It is possible to posit other mechanisms for the lower uptake of project activities by the youth including their status in relation to the land. Elderly farmers tended to own land and had a vested interest in maintaining it. The youth were restricted to working on land belonging to others or their

parents, and so did not experience the sense of responsibility and ownership that would have emerged from actual ownership. Thus, Metelerkamp et al.,(2019) argued that youth passions and ambitions are often subservient to family and community expectations to financial support them.

7.3.5 Elderly CSA trainee farmers

The dissemination of CSA principles knowledge by trainee farmers in the participating villages differed. While social learning through trainee farmers was reported in Villages 1, 2 and 4, Village 3 had no reports of knowledge dissemination through social learning. Social learning in this study refers to people learning from each other. Furthermore, social learning can bring together people from different backgrounds with different knowledge, values and perspectives from within and outside organisations (Wals et al., 2009). In Villages 1 and 2, four elderly trainee farmers trained two or three interested neighbours. The following observations made by respondents in Village 4 illustrate variations in the roles played by trainee farmers.

Despite the traditional leader's misgivings on the roles played by trainee farmers, one CSA trainee farmer responded as follows to a question about what she had achieved: *“I have shared my knowledge with a few neighbours in my area. Some of them approached me to help them out, and they formed a group”*. One of the trained neighbours confirmed this: *“A project trainee farmer trained us and taught us how to arrange the soil that before you plant, you must ensure that the ground is levelled”* [demonstrates]. The neighbours then appeared to have transformed themselves from primary agents into a group of corporate agents to approach the Department for Rural Development Agricultural Reform (DRDAR) for assistance with one informant noting: *“The Department of Agriculture gave us forms they requested us to draft a constitution, business plan, and all that”*.

According to the informant, the group exercised their agency by drawing on traditional leadership structures to activate the community structures, motivating the development of a self-organised group. She said: *“Initially, the project concept had to come with the Headmen Committee. The committee introduced the project to the people and the forms to be completed by interested people”*. The group of farmers was then granted permission to mobilise the community by the traditional leaders The leader said:

I decided to organise a group of youth, males and females so that we could start with these projects. It was easy because we had plenty of time. It was Covid-19, lockdown everyone was at home. The meeting was organised in the field, an open space. Everyone was there. So, people agreed that this was good, and they wanted it. But when I started organising people and all the required information, there were problems.

The extract reveals the interplay of the Covid-19 lockdown with traditional, community and government structures to enable a large community turnout:

We asked for their identity copies (ID) because, on these forms, there was a part where we had to fill in the ID numbers. They [DRDAR] asked us to put the ID copies to prove these people are the same. It is when people refuse to be part of the project. Only eight people, that is, women, submitted complete requirements.

The DRDAR drew on discourses of privileging documented, written contractual agreements, whereas the community drew on prioritising oral agreements underpinned by ethical values of trust. As I argued in Section 5.2.2.2, community conditioning emerged from the isolationist strategies of apartheid. A lack of trust in outsiders, in this case, the government and probably the female official working with the project, was also evident. Therefore, most people exercised their agency by not submitting their identity documents. This is another example of the clash of worlds I identified in Section 5.2.1.

The eight women registered with the DRDAR named themselves the *Siyanqoba* (in English ‘Winners’) and established CSA home gardens, as shown in Figure 7.8. As discussed earlier, the Siyanqoba group likely emerged because elderly members had access to land because of their age. Another mechanism leading to the group's emergence was a discourse valuing education training and family food security.



Figure 7.7: Siyanqoba Climate Smart Garden (RU Hub Team)

The group has since diversified its climate-smart activities to include chicken production. The exercise of corporate agency to diversify enabled the group to adapt to different aspects of variable climate change disturbance, as advocated by Walker (2020). Diversification into chicken production was necessary because of water scarcity, winter snow, frost and summer floods that limited gardening to a maximum of five months annually. The observation resonates with Walker (2020) assertion that investment in maintaining diversity and efficiency was essential in sustaining resilience in the projects the Siyanqoba group had embarked on.

Like most smallholder farmers in South Africa (Chipfupa & Wale, 2020), the group was conditioned to expect help from the government despite the suspicion of outsiders evident in some parts of the community. It could be argued this conditioning had taken place since the first democratic election in 1994. One of the mandates given to the DRDAR was to assist smallholder farmers in uplifting themselves from subsistence to commercial farming. The conditioning has been critiqued in the literature as creating dependency on donated inputs (Berhane et al., 2020;

Chipfupa & Wale, 2020; Pedzisa et al., 2015; Ruzhani, & Mushunje, 2022). Pedzisa et al. (2015) argue that farmers tend to adopt climate-smart practices during a project and abandon the measures adopted when it ends. However, without external inputs and monitoring from DRDAR, the women may never have established the Siyanqoba garden.

At the level of the Real, the emergence of the Siyanqoba CSA garden group can be seen to have resulted from an interplay of the trainee farmers' knowledge transfer intertwined with land ownership, age, gender, government and traditional structures and discourses of valuing education and family food security. The finding presented the morphogenesis of individual community farmers into a self-organised corporate group of eight women intent on improving their livelihoods. This illustrates the way agency has been exercised in pursuit of rural development concerns and projects (Archer, 1995). In the next section, I turn to the youth.

7.4 The Youth Communal Garden

As the home gardening project was set up, the RU project team knew that the young people residing in the villages did not own land. Most women accessed land through patriarchal family networks (Walker, 2005). However, Mutangadura's (2004) study of six Southern African countries noted that customary and statutory tenure systems tended to discriminate against women. Thus, the implication was that single or young women did not have easy access to land. Similarly, the involvement of young people in agriculture was also constrained by a lack of access to land, credit, markets, and farming knowledge (Maele et al., 2015; Mthi et al., 2021). As discussed later, the youth are primary agents and thus are accorded little power and influence in their social and cultural structures (Archer, 2000).

Given these circumstances, the RU team characterised the male and female young people as a special group in the local context. The general observation was that land was owned by the elders and rarely by a youth unless orphaned. Hence, after consultation with traditional leaders, the RU team exercised their agency and allocated a one-hectare youth communal garden plot to young people. The project objective was to develop the plot into a market gardening enterprise. The assumption was that the communal garden would solve the problem of the youth's lack of access to land. However, over time, the morphogenesis of agency became apparent in that the youth

appeared to develop themselves into a group of corporate agents who then eschewed the opportunities afforded to them in the form of the community garden.

As indicated in previous chapters, the youth had been exposed to a better quality of education than the elderly (see Section 5.2.3). They were also socially and culturally conditioned very differently from the elders by their television and internet exposure. As a result, they valued a cash economy and were derisive about the income that the garden could produce. For example, one youth indicated that “*The 10 rands per bunch of spinach could not purchase data*”. In contrast, elderly women appreciated the income generated, as discussed earlier (see Section 7.3).

In the case of the communal youth garden, initially, the youth exercised agency to work on the allocated one-hectare plot of land. They also attended the project training workshops and accessed resources. The youth were given inputs, including seeds, wheelbarrows, and other tools. The project team expected the youth to generate income from market gardening and assumed that the youth understood the project's purpose. According to one RU team member:

The vegetable garden was for home consumption and selling by the youths. They were given inputs and tools for use in the garden – seeds, water tanks, wheelbarrows etc. They were expected to generate income from market gardening and were never asked to volunteer to work in the communal garden.

Although the RU team had explained their approach to the young farmers in great detail emphasising that the home garden was intended to be self-sustaining and to provide them with an income once it was up and running, the expectation that the farmers would receive remuneration from the project appeared to have taken root: “*We joined the CSA Hub because it needed people for gardens, so we went and joined. We have been working and working but have no pay*”. This expectation was possibly related to the practice of paying workers to rehabilitate common-pool rangeland (see Section 6.5). The youth seem to have believed they would also be paid as they were working on the project in a different Hub. In contrast, the project team conceptualised CSA gardens as a form of self-employment and income generation. I have already noted discourses prevalent among the youth privileging paid work and consumerism (see Chapter Six Section 6.3.3). In addition, drawing on critical realism, I have defined discourses as mechanisms that have the power in the form of CEPs to lead to the emergence of events at the level of the Actual and experiences

and observations at the level of the Empirical (see Chapter Three Section 3.2.2). This example of the young farmers expecting payment for work on the communal garden despite copious explanations provided by the project team of the thinking behind its establishment is indicative of the power of discourse to lead to the emergence of observations and experiences despite the best efforts of the project team. This example indicates the importance of working with discourse as a powerful mechanism in future projects.

7.4.1 Youth entrepreneurship

Aware of youth unemployment and the importance placed on entrepreneurship in national thinking and strategic planning (see, for example, National Planning Commission, 2012), project and community leaders viewed CSA as a way of alleviating unemployment and improving food security and income generation. Community leaders backed the RU team in identifying the use of entrepreneurship to combat unemployment. According to RU team members:

The Rhodes project understood that the youth wanted something that gives income, so the youth were interviewed for Vetiver production as a quick way of generating income. Interviews were conducted at the headman homestead. The Vetiver plant is used for rangeland restoration. When money was overspent (see Section 7.4.3 below), the youth Vetiver activities failed to take off.

The idea was that the youth would establish Vetiver nurseries, and the project would purchase the Vetiver in a buy-back arrangement for planting and controlling erosion in the rangelands. The launch of the youth Vetiver project was thus intended to provide income for young farmers based on their entrepreneurship and to avoid dependence on project funding. The Vetiver project was thus an attempt to provide income for the youth on a long-term basis and not only for the duration of the project, as would have been the case had they simply been paid to tend the communal garden.

A project member also indicated his understanding that fodder production was identified as a youth project, with the youth harvesting and selling fodder to the local livestock farmers. Farmers travelled to nearby towns to purchase lucerne, as shown in Figure 7.8. To encourage Vetiver production, the project itself purchased produce from local growers to demonstrate that money could be earned from this form of farming.



Figure 7.8: Lucerne purchase and transportation from neighbouring towns (RU Hub Team)

One of the community leaders observed:

We wanted to give a chance to the youth because the youth is doing nothing to take them away from these drugs. Whatever they are doing, they are abusing it. So, I had to convince them they couldn't waste time doing anything. There is an opportunity for them to gain knowledge.

The community leader exercised her agency to engage community youth structures and mediate to address what was perceived as the problem of drug culture. Although the project team found no evidence of drug taking at the time of their engagement with young people in the community, once again the power of discourse can be discerned. Discourses constructing young people as drug takers led to the emergence of experiences and observations on the part of older members of the community despite evidence to the contrary.

However, the concern of the youth was paid employment, not the acquisition of knowledge to adapt to climate change. Nor, it seemed, did they want to be developed into entrepreneurs. Rather, they appeared to be drawing on discourses privileging regular paid work. Within South Africa overall, it is arguably the case that dominant discourses construct the need to provide regular paid employment as the responsibility of the government. These discourses appear to be related to the “better life for all” promised as the African National Congress came to power in 1994. Since that time, however, economic changes at a global level and the growth of neo-liberalism have resulted in governments shrugging off responsibility for the provision of work.

In the early years of the democracy, the South African economy performed relatively well. However, economic conditions have declined, and unemployment has risen, with the employment rate standing at 32.9% in the first quarter of 2023 (Stats SA, 2023). In the context of high unemployment, discourses constructing the state as responsible for well-being have arguably strengthened particularly in the context of social grants (Armstrong & Burger, 2009). In many working-class communities in South Africa, well-established social grants (including the older person’s grant, the disability grant, and the child support grant) and the newer Social Relief of Distress Grant introduced in 2022 following the Covid-19 pandemic, are the main form of income. These grants have contributed to the strength of discourses constructing the state as responsible for human well-being even though other discourses encouraging entrepreneurship are prevalent and actively promoted by the government. Despite the emphasis on entrepreneurship in the national discourse (Geza, et al, 2022), the relative isolation of the Machubeni community may have contributed to entrepreneurship discourses failing to embed themselves in the community.

7.4.2 Family first

Amongst the young farmers, the selection process for participation in the communal garden was constructed by discourses promoting nepotism. Once again, this shows the power of discourses in leading to the emergence of experiences and observations at the level of the Empirical. Project leaders advertised opportunities in the communal garden and selection was based on young farmers coming forward to participate. It would appear that members of one family (people with the same surname), exercised agency by coming forward to register. As this happened, dominant discourses

constructed the selection of youth participants as resulting from a failure to advertise the project widely. However, as the Hub leader asked, “*What should I do when others do not turn up?*”

The fact that large numbers of one family came forward to register for participation in the project (in critical realist terms, this would be conceptualised as a series of events at the level of the Actual) could be due to the power of a discourse that elsewhere (Section 7.3.2), I have termed ‘family first’. This discourse privileges the family as a community and can be understood as members looking out for each other. In the context of this discourse, any family member hearing of opportunities would inform others and encourage them to join.

Although there is no evidence that the project favoured particular individuals or groups of individuals in selection processes, the ‘family first’ discourse could be seen to contribute to experiences and observations on the part of some disgruntled young people that nepotism was at play. Once again, this emphasises the power of discourse in alerting the best intentions of project managers and points to the need for project leaders to be aware of, and consider, dominant discourses in the communities in which they work.

7.4.3 Operationalising the communal youth garden

The youth participating in the project exercised their agency by attending climate-smart training on minimum tillage, mulching, crop diversity and tower gardening. In a community that values oral agreements, the youth drew on trust and what they experienced as promises from the project of a water pipe, tank and tap for their garden. A canal supplied water to the communal garden and the RU project team engaged with LandCare about the provision of piping as part of their exit strategy from the community. However, promises of piping were made at the beginning of the project.

Over time, as the project progressed, a beautiful communal youth garden emerged, and young farmers were able to sell seedlings and spinach to the community. However, water scarcity constrained the youth with one gardener noting: “*The area was big, but now the challenge was the water source because it was not easy to water the whole area*”. While water scarcity was a

problem, discourses constructing the project team as having promised to supply piping dominated. In interviews, for example, one young person noted:

We were promised water through the installation of taps, and we did not want to stop the garden. But then since we did not have water, we were drawing water from afar, and that is how the garden ended up not functioning. We need pipes for watering our garden so that we do not put buckets on top of our heads and do not have resources. The project did provide us with a tank, but the tank was damaged. It got torn through the wind.

As this young farmer noted, the project had provided a water tank, but it was damaged. The impact of discourses constructing the project team as having made promises to supply piping was that young farmers began to cite the lack of a tap and pipe as a reason for leaving the project. The youth, conditioned to a hierarchical power structure, arguably experienced diminished agency, and failed to draw on the project structure to explain their concern and, thus, allow the project team to correct misunderstandings. In interviews, one community member denied claims that the youth had been asked to carry water to the communal garden in buckets noting the availability of water:

The youth was never asked to carry water by buckets. Water was available, and the plan was transportation by pipe from the spring to the youth garden. The goal was to reinforce the canal and pump water to the youth garden. [However] the project overspent, affecting the inputs purchases.

Again, this statement appears to be a misapprehension. The reinforcement of the canal and pumping of water to the communal garden was never part of the project budget. Misunderstanding of the way the communal garden was originally budgeted, led to other claims including some that alleged overspending. Project funding was allocated to transport, staff salaries, student grants and stipends and some inputs. The provision of piping to the communal garden was never part of the original budget. In critical and social realist terms, these claims can be understood to be discursively constituted. Once discourses exist individuals can exercise their agency by drawing on the discourses thus strengthening them.

The project team appointed an individual from the local community to manage the communal garden but discourses constructing the agent's actions as unfair emerged: “XYZ takes resources without consulting us, and she takes them as if you (Rhodes) want them. We even asked her why you (Rhodes) wanted the resources without our knowledge”. The youth's diminished agency owing

to their apparent inability to transform themselves into a group of corporate agents who could engage with RU leadership to voice their concerns emerges as contributing to their experiences of feeling disgruntled. Engagement with the leadership at RU could have challenged discourses contributing to the emergence of negative experiences with the garden but this did not happen.

The communal garden was never established as a commercial venture. Rather, its establishment drew on discourses promoting entrepreneurship and self-reliance. The garden was therefore never intended to provide a stable income for the young farmers although it did have the potential to contribute to their needs for daily living. Again, discourses prevalent amongst the group constructed the purpose of the establishment of the garden differently as this quotation from an interview shows: *“We must also provide for our families, like looking after our children and buying food. So, we realised that relying on the money from selling a bunch of spinach was insufficient. That is why others went to look for jobs”*.

According to the RU team member: *“Nine youths registered, and active members were six. They produced vegetables and seedlings for resale and their own consumption. However, the income raised ranged from R500 to R800 monthly”*. The initial income from the garden could have contributed towards living costs but could never have provided for them in their entirety. Nonetheless, expectations (conceptualised as observations and experiences at the level of the Real) emerged from discourses constructing the garden as a means of providing a living.

Some young farmers therefore exercised their agency by looking for jobs that could sustain their concerns, and it appears that the CSA gardening was carried out by individuals waiting for other employment opportunities. The observation was echoed by another, older gardener who left the project and who indicated:

I have left my garden to go and work because, with my garden, I cannot make a living. I cannot survive only in my garden. I also need money daily. Firstly, my garden is too small to survive on. With the garden, people don't buy so much. Those are some of the issues because if I plant spinach, I get R10 or R20 a day. If I grow potatoes in my garden, I don't sell them immediately, and I need money daily to survive. What would I be surviving on by the time I sell the potatoes? Secondly, there are seeds required. We do not make enough to buy seeds. There are also seasons for gardening. You cannot work on the garden throughout the year. I love gardening, but I also need money to survive, so it would be better if, with my garden, I could do a small business, like selling chickens. Those things don't have seasons. So, I need to do a garden with something else to survive.

The principles of resilience (see, for example, Biggs et al., 2015) identify the diversification of livelihood options. The establishment of the communal garden as part of the project needs to be understood as drawing on the principle of diversification. However, discursively constructed understandings in the community did not appear to appreciate the function of the garden as contributing to diversification. Rather the garden was constructed as a means of providing stable incomes. Once again, the power of discourse emerges as something that needs to be considered in project management.

In the project overall, elderly farmers' satisfaction with home gardens as contributing to family food security can be attributed to the fact that they were not relying on income from their gardens to fund their entire livelihoods. The elderly women noted that food from their gardens contributed to their households' food needs and any excess was sold to provide additional income. This was not the case for the young farmers who appeared to view the communal garden as a source of regular income.

7.5 Conclusion

Insights gained from this study suggest several implications. The first relates to the need for future CSA projects to address concerns about cash flows and budgeting. It can be argued the gardeners did not have start up capital and that providing some funding as the garden was established may well have sustained their need for income until earnings from the garden became more reliable.

Second, geographical conditions appear as a major constraint. The Machubeni area faces water scarcity worsened by climate change-related drought or mid-season drought, winter snow and floods during the growing season. Third, the garden's size constrained viable commercial production in a context where the market was also sluggish and erratic. Even if production had increased, the poor road network and distances from towns would have constrained the transportation of vegetables. Lastly, a history of zoned land use for vegetable gardening in the former homelands dating from the days of apartheid possibly led to the development of discourses that constructed home gardening as unsustainable (de Wet, 1989; McAllister, 1989).

However, possibly the most important insight from my analysis in this chapter, and particularly in relation to my analysis of the communal food garden, relates to the power of discourse. My analysis shows discourse to have exerted enormous power in contributing to misapprehensions and even to action in the form of decisions to leave the project. Acknowledging the power of discourse and taking note of which discourses may dominate at any one time could thus be a key element of project management.

To sum up, it is possible to see that the uptake of CSA practices by elderly women, conceptualised as events at the level of the Actual, resulted from an interplay of mechanisms including geography, water, gender, customary tenure and perceptions of the need for food security. A different set of mechanisms were at play in the initial adoption and subsequent dis-adoption of practices by elderly men and young people. In the case of elderly men, gender still played a role but discursive constructions of the role of men in the community did not privilege vegetable agriculture as an activity. In the case of young people, a different set of discourses privileging paid work and consumerism rather than subsistence farming constrained the long-term adoption of practices. Age also came into play as, unlike the elderly women, young women were conditioned by these discourses and not by those privileging the need to sustain a household and nurture a family and the health of family members. Education, access and familiarity with technology also played a major role in the way young people were conditioned to take up the opportunities made available to them (see section 5.2.3). The next chapter looks at livestock farmers' uptake of and interaction with rotational grazing-without-fences practices.

CHAPTER EIGHT: ANALYSIS OF LIVESTOCK FARMERS' INTERACTION WITH ROTATIONAL RESTING WITHOUT FENCES

8.1 Introduction

This chapter looks at the Improved Livestock and Rangeland Management Hub, phase three of the project, which introduced rotational resting without fencing from 2021 to 2022. The chapter explores how livestock farmers interacted with the practices and ideas of rotational resting without fencing and focuses on the way the exercise of their agency was constrained or enabled in the uptake of the practice. The chapter addresses the research question:

How do livestock farmers interact with climate-smart ecosystem rehabilitation and resilience building? What enables or constrains adoption and adaptation?

Before looking at the livestock farmers, however, I begin by exploring the way the RU project team exercised their agency by introducing the innovation into the community.

8.2 Rotational Resting/Grazing Without Fencing

The RU team exercised agency by drawing on CSA approaches that promote the contextualisation of policies and local farmers' practices to reduce the impact of climate change on livelihoods. The RU team drew on scientific knowledge of rotational resting and discourses promoting it (see, for example, Briske et al., 2017; Hatch & Tainton, 1997). Studies indicate that fenced rotational resting programmes, though successful in commercial endeavours, may not be effective elsewhere in shared communal rangelands (Molieleng et al., 2021; Vetter, 2013). In addition, the RU team drew on their knowledge of the historical theft of fences (Section 5.2.2.2). As a result, they promoted a “camp resting and rotation grazing without fencing is best” discourse. In critical realism, camp resting and rotation without fencing indicates a set of events (things farmers do) at the level of the Actual that emerge from the interplay of mechanisms at the level of the Real.

The RU team's conceptualisation of this part of the project drew on an integrated, holistic approach to improving livestock management and livelihoods. For example, during camp resting, Eco Rangers were trained to conduct veld assessments while monitoring and chasing away stray animals. The LCAs were trained in dam construction and reseeded the veld with nutritious grass species in the rested camps. The integrated training events promoted and advocated adaptive management through camp rest and rotation.

Rotational resting without fencing practices challenged the existing uncontrolled grazing system (Lipper et al., 2014). The RU team exercised their agency and drew on the knowledge of the uncontrolled grazing prevalent at the start of the project and knowledge of a controlled grazing system (Briske et al., 2017; Hatch & Tainton, 1997) to develop a system involving rotational resting without fencing. In addition, the RU team used their PEPs to motivate for the government and other institutions to provide native grass seeds, fodder seeds and training in free-range beef production. Niraula et al. (2020) report that the introduction of nutritious grass species improves the value of pastures and the production of livestock. Examples of native nutritious grass species planted are shown in Figure 8.1.

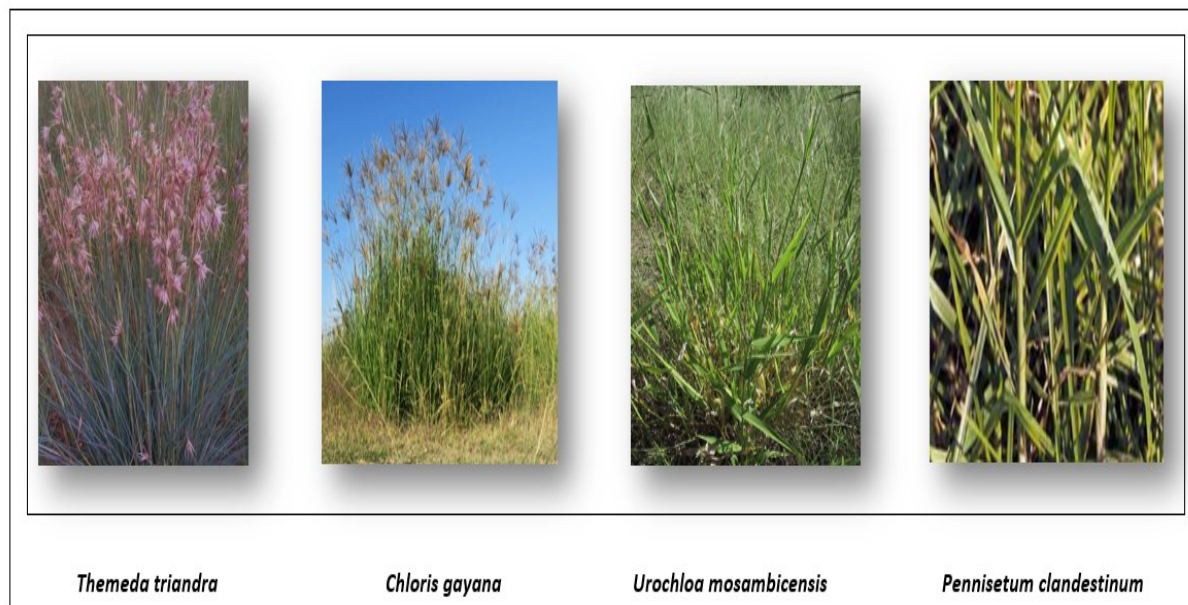


Figure 8.1: Examples of grass species reseeded at the Village 1 demonstration plot (RU Hub Team)

A Rhodes team member indicated that the ideas promulgated by the project team had been successful elsewhere:

The ideas do work in other Eastern Cape communities. In village MLN [a village successfully practising rotational grazing without fencing], they do everything together. ... On vaccination day, they all take out of their pocket to buy medication to vaccinate whatever needs to be vaccinated, dipping all their livestock. So, they work as a team. When it's dipping day, they all chip in.

This informant drew on observed examples and experiences from his travels across South Africa, showing how communalism can be exercised positively. In short, in implementing the new system, the RU team drew on the interplay of scientific and local knowledge, project funding structures, and their observations of previously vandalised fences to enable the emergence of camp resting and rotation grazing without fencing. The following section explores the way farmers exercised their agency as they engaged with the innovative practices introduced because of the project.

8.2.1 Mechanisms enabling the adoption of rotational resting without a fence

In contrast to the project team's advocating rotational resting without a fence, the community drew on apartheid experiences and discourses constructing camp rotation with fences as best practices. According to one sheep farmer: *"Our livestock was grazing wherever they felt like grazing. As a result, the rangeland and former camps had lots of gullies, so they needed rehabilitation"*.

Evident in the data are experiences of the theft and vandalism of fences (with theft observed by the project team and by members of the community). The fact that the *'former camps'* referred to by the sheep farmer also had gullies probably resulted from overgrazing on limited space after fencing had been stolen. The privileging of discourses constructing fencing as best practice by community members arguably emerges from experiences of funding for fences provided by both the apartheid and democratic governments and previous projects. The introduction of Eco Rangers because of this project arose from observations of the need to control grazing more widely. Before the project, some elderly farmers had managed their livestock, but others had let animals *"graze wherever they want"*. At the introduction of this phase of the project the community resisted the

practices promoted by the project team. The RU team therefore exercised their agency engaging with community structures to advocate for the camp resting and rotation without fencing approach in a series of training workshops.

The RU team also drew on project funding to take community members to visit South African rural communities (such as MLN referred to above) that were already practising rotational grazing without fencing successfully. In addition, the smallholder farmers visited a large-scale White commercial farm to observe a holistic grazing management system. Rotational grazing practices are widely reported in rangeland literature (Gosnell et al., 2020; Savory, 1999; Sherran & Kent, 2019). After the project training workshops and social learning exchange programmes, the community finally accepted rotational resting without fencing.

However, on average, 40 families attended the same training workshops (see Section 6.2.2), and many interpretations and understandings became evident because acceptance and uptake of this idea varied among the five participating villages. Though rotational resting was introduced during Covid 19 pandemic, four villages adopted the practices advocated and exercised their agency implementing the rotational grazing practices despite disruptions to everyday life. However, one of the five villages did not adopt the practice, a matter discussed in Section 8.2.2. Other farmers adopted and then abandoned rotational grazing without fencing (as discussed in Section 8.2.2.1).

The RU team drew on their knowledge of community structures to gain approval for the practices they sought to introduce:

The Professor and I were there. He was allocated the villages to work by the chiefs without considering the rangeland thing because it is a big thing for us. From the start, when the Professor was here, at the community consultation with the headman.

Some members of the RU team had been working intermittently with the Machubeni community since 2005. The rangeland boundaries framework developed by the project aligned with boundaries of the five villages.

Mechanisms enabling the adoption of rotational resting without fencing included discourses constructing “rangeland as the lifeline of the farmers” and “livestock as our bank” (see Chapter Six). These discourses were particularly dominant among elders. However, boundary disputes emerged as all five villages forming part of the project shared grazing with adjacent villages.

Though boundary disputes emerged in all five villages, as illustrated below, individual and corporate agency enabled resolution in four of the five villages. A smallholder farmer in Village 3 explained as follows:

This is difficult because Village 3 is part of the project. But now there is a different adjacent village next to Village 3. The adjacent village is not part of the project, but we use the same rangeland. We came up with the idea of closing the rangeland, but the people of the adjacent and our Village 3, could not understand.

A community leader at the meeting added: “*We must consider the other villages that are close to us. We can't leave Village 7 – but now we can't leave Village 8 also because we were joined with it by force [man agreeing with her], which can cause many problems*”. The boundary arrangements for the villages emerged during the 'Betterment Programme' introduced during the apartheid era that zoned land use in the former homeland of the Transkei (see Section 5.2.2). People from adjacent villages exercised their agency by indicating that the rangelands also belonged to them and not only farmers participating in the project.

Villages 1, 2, 3 and 4 agreed to share rangelands with adjustment villages, establish resting camps, and rotate grazing as one community. But in one of the five participating villages, Village 5, camp resting and rotation failed to occur because of disagreements about boundaries and ownership of the rangeland. According to the RU team and traditional leaders of Village 5 and the adjacent Village 6, boundary disputes could not be resolved. Therefore, in Village 5, rotational grazing without fencing was not adopted. In critical realist terms, it could be argued that, at the level of the Real, the outcome resulted from the interplay of old apartheid structures and the shared grazing Betterment Programme (de Wet, 1995). Traditional leaders in Village 6 made the inclusion of their village in the project a condition for the resolution of the dispute with Village 5. However, limited project funding meant that this was not possible (see Section 8.2.2). Arguably, the uptake of rotational resting without fencing was either enabled or constrained by the historical context inherited by the farmers despite negotiations to promote sharing, depending on the village. This observation concurs with a study conducted in Tanzania (Eilola et al., 2021) that argues that rangeland management evolves over time because of the negotiation of bureaucratic structures by locally embedded village social actors.

Negotiations were successful in Villages 1, 2, 3 and 4. In villages that reached agreements, a discourse privileging “oneness” or community in line with the principle of ubuntu was evident. Also evident were examples of social actors drawing on their knowledge of traditional leadership structures. As one individual recalled:

I had to call for a meeting with the livestock committee chairperson, our subhead man, and the adjacent sub-headman. We only shared the land with them, but we did not share the camps, and we wanted to close a camp on their side as it benefited us in winter because it was warm on that side.

This informant went on to add:

One day, the rangeland committee treasurer and I went to them (the village leaders) to update them on what will happen. We then called for a meeting to discuss the matter to resolve the problem amongst the villages. I was ready to answer all the questions that were directed at me. I gave them an example that the commercial farmers have rest camping. Let us have one resting camp at a time, and the land rehabilitators will work on that camp.

The extract shows how the social actor was able to exercise agency and draw on project training and knowledge of community structures to pursue the goal of improving livestock. It also shows how this individual drew on her awareness of the concept of ubuntu to ensure that she engaged with everyone in a spirit of mutual benefit for all. The ability of the social actors to exercise their agency was crucial in enabling acceptance of camp resting and rotation without fencing.

Drawing on project training workshops (see Section 6.2.2), the social actor suggested integrating camp resting and rotation with land rehabilitation and the reseedling of grass at a meeting intended to motivate other farmers to come together as a group of corporate agents. The acquired scientific knowledge and project funding that allowed for the purchase of grass seeds emerged as mechanisms leading to grass recovery in the camps. Although this study draws on a very different theoretical framework, the data indicate the significance of three pillars of resilience building and LA: self-organisation by smallholders' farmers (the morphogenesis of primary agents into corporate agents) and learning capacity (involving drawing on knowledge as a mechanism), and experimentation (Biggs et al., 2012; Sayer et al., 2013; Speranza et al., 2014). My use of a critical and social realist framework allowed me to identify the underlying mechanisms and explain who

was involved in achieving self-organisation as practices focused on rotational resting without fencing were adopted and adapted, as well as how and why this occurred.

At village planning meetings, the RU team asked how the villagers controlled the animals in the rested camps. One response was: *“We painted stones in White as boundaries so that no cattle could go beyond that certain point”*. In Village 4, these painted rocks were described as: *“The border gates. Yes, we put big stones that show a borderline/gate between the villages, and the rangers chase the animals away”*. The community self-organised and drew on mechanisms at the level of the Real which then led to the emergence of activities, including painting stones, to promote rotational grazing without fences. These “border gates” emerged from the hilly topography and geology in that local resources were used to create artificial boundaries. This intimate local knowledge also allowed for the selection of resting camps. One social actor noted:

I advised on the camp selection that it must not be up in the mountain as it is not easy to work during winter. The camp should keep our livestock safe and warm, and we must also build a water dam for our livestock.

Discourse analysis of data (see Section 4.2.2) and abduction and retroduction (see Section 4.4.4) show the social actor drawing on local knowledge of rangeland conditions and combining it with project training ideas. The social actor exercised her PEPs to identify the best locations for camps and, in addition, drew on her knowledge of stock theft to influence the choice of a secure location.

The emergence of practices such as those cited above shows the importance of co-learning and the RU team’s acknowledgement and acceptance of local input. The suggestion to paint boulders made by one Village 1 farmer extended beyond the agency of one individual in that it became a boundary control practice in four of the participating villages. This concurs with Biggs et al.’s (2012) definition of enhanced learning as involving the modification of existing knowledge or the acquisition of new knowledge at an individual level and moving beyond this to situate knowledge in the wider community.

One of the RU team members noted that the rotational grazing uptake depended on solid traditional leadership. In Archerian terms, the exercise of leadership, conceptualised as a series of events at the level of the Actual, involves the capacity of social actors to exercise emergent personal

properties (PEPs) and the SEPs accrued from the positions they occupied as headmen or subheadmen. In this context, the RU team member noted:

The sub-headman of Village 4 is strong, and he makes sure things are moving in his community, has good relations with his neighbours and interacts with the people in his community. We [the project] need to keep good relations with all. The sub-headman in Village 4 is very good at doing that, and he's always communicating with neighbouring villages, involving them in whatever they are doing, even when it comes to the project.

Mathonsi and Sithole (2017) claim that the authority of traditional leadership structures has been eroded in South African communal areas. This has resulted in various groups contesting the exercise of power by traditional leaders over rangeland resources (Beinart & Dubow, 1995). However, the data cited above shows how traditional local leaders still draw on the PEPs and the SEPs accrued from their positions to forge mutual agreements with neighbouring villages. In the four villages where the project was based, the exercise of agency by social actors and traditional leaders enabled the adoption of climate-smart practices in contested shared common-pool range lands.

However, as indicated earlier, in one instance, apartheid-era rangeland boundary structures emerged as a constraint on the community exercising its corporate agency to adopt the concept. It was claimed that one village, Village 5, did not have land and wanted to exclude an adjacent village, Village 6, from the project's rotational grazing initiative. As noted earlier (see Section 5.2.2) apartheid forced people and their livestock into sharing limited grazing (Yawitch, 1998). The observations I have made in this section support previous research (Falayi et al., 2022, p. 1) that notes the "host of environmental history lingers" and affects attempts to rehabilitate rangeland. As one sub-headman in Village 5 noted:

We did not do rotational grazing as in Village 5 because we do not have enough grazing area. Now we need to share the land for rotational grazing with the adjacent village. We can't do a rotation in our small area. You see, Villages 5 and 6 are adjacent and share a mountain with insufficient grazing area.

Furthermore, the Village 5 Headman added: "*We will never allow you just to come and feed in our rangelands*".

These extracts show the traditional leaders drawing on the apartheid-era Betterment Programme as a structure to make an argument for not sharing rangeland, even though apartheid related ideas had been scorned, in order to account for what, ultimately, was an unwillingness to compromise.

In response to the question of what enabled the adoption of rotation grazing and camp resting without fences in Village 4, and not in Village 5, one traditional leader said:

We [Village 4] first met with the other village. At the meeting, the discussions were clear on what will happen. We had a mutual understanding that when the camp was opened, they [the adjacent village] would come and bring their animals, but at Village 5, this did not happen. Village 5 did not have a discussion meeting with the other village and explain how it would work. They just decided to say 'You cannot cross this part' without explanation. Then the adjacent village said this is our land too. That is why they disagreed and could not work together.

According to another smallholder farmer:

The Headman of Village 5 took the project into his hands. They did not meet, and then they failed. I think it is because they thought they owned it since they were part of the project and felt that these people [from adjacent Village 6] could not be part of the discussion. They were supposed to meet with these people and discuss both parties. If they had a meeting, you would have understood this was about the land.

As this extract shows, despite being involved as the project was initiated and participating villages were chosen, some social actors in Villages 5 and 6 did not exercise their agency to encourage negotiation with neighbours to resolve problems related to access to rangeland.

After 11 months of implementation, the community and project team met to evaluate the introduction of rotational grazing and camp resting without fencing. Group discussions conducted in November 2021 revealed that the smallholder farmers were experiencing the benefits of the approach with comments such as “*This camp resting without a fence works*” and “*We did well*” appearing in the data. One informant from Village 1 added: “*We did not have hiccups. We worked well together, even the women (LCAs) implementing land and pasture rehabilitation innovations in the mountains*”. One of the traditional leaders in Village 1 commented on the effectiveness of land rehabilitation:

Yes, the LCAs land rehabilitators are doing well. I saw it myself. Even in places with no grass, now it is growing well. I cannot say the reason for the success. Still, I think the land rehabilitators

understand the reason for land rehabilitation and protecting rangeland. It motivates them if they can get compensated for what they are doing.

Drawing on project training workshops on using the local natural resource (stones and *Euryops floribundus* lapsesi), the LCAs exercised corporate agency to close gullies and re-grass the veld with nutritious grass species and Vetiver grass, as shown in Figure 8.2.



Figure 8.2: Land Conservation Activists in Village 1 rangeland planting Vetiver grass(*Chrysopogon zizanioides*) (RU Hub Team)

An informant from Village 2 noted:

We managed to close the camps. The grass has grown well for the animals. We did the right thing. I hope we can do the same thing because our livestock was not everywhere. We have improved grass growth and stopped uncontrolled grazing.

An individual from Village 4 added: “When we opened the camp that was closed, the grass was already growing there. But we could see a difference between closed and open camps”. Village 4 summed up their interaction with camp resting practices as follows: “There at the mountain, we

worked well. We closed the camps for a long time and opened them quickly. But we then opened the closed camp because there were veld fires". The Village 4 informant concluded: *"Rhodes has shown us a new and good way of conserving our rangelands"*.

However, the data indicate that the community did not experience long camp closures as entirely positive. Studies of cattle grazing in South Dakota shortgrass prairie and South Africa Tsomo grasslands (Hillenbrand et al., 2019; Hutch & Tainton, 1997; Mucina & Rutherford, 2006) identify the importance of a long rest period for grass to revegetate in degraded landscapes dominated by invasive bush. However, as the informant from Village 4 cited above, veld fires, a subject I will explore later (see Section 8.4) were a problem.

As also indicated in data cited above, one mechanism that enabled the adoption of innovative rangeland management practices introduced as part of the project was the availability of project funding to pay for Eco Rangers. As indicated in Section 6.5, payment for labour appears to be important in resource-poor communities who have been socially and culturally conditioned by the money economy. In Machubeni, the fact that some of the Eco Rangers did not own livestock made the situation more difficult as the RU team could not expect them to work without pay when they themselves would derive no benefit from improved animal health.

In critical realist terms, therefore, one could ask: What conditions enable the adoption of climate-smart rangeland management practices in a common-pool rangeland system? The data show the farmers exercising their agency to draw on project and traditional leadership structures, the monetarised economy system, and the geological environment, with local knowledge of the weather system in building pasture resilience to climate change and drought while, simultaneously, rehabilitating the gullied rangeland. The discourse analysis of the data also indicates the smallholder farmers' capacity to influence the socioecological system (Walker et al., 2000, 2004). For example, a Village 3 farmer commented: *"I went to this rested area in June during winter. It was so beautiful. The grass was grown, the camp was warm, and it was secure for animals"*.

The insight from this extract was that the community was positive about and appreciative of the change in the rested camps. Morphogenesis was enabled by the alignment of smallholder farmers' concerns for improved pastures and their willingness to draw on knowledge acquired from project

structure and workshop events. This study supports claims that uptake of climate-smart innovations is context specific. As noted in some studies (Pawson & Tilley, 1997; Smit et al., 2000), outcomes are related to what works for whom and why. In this case, the innovation worked for livestock farmers in specific villages because they shared similar concerns and were willing to exercise their agency to negotiate shared land use and to draw on knowledge and project structures.

Following the positive response to the rotational grazing and camp resting without fencing approach in four villages, the RU team exercised their agency by asking the community livestock committees to organise meetings to decide which grazing camps to close and rest the following year. The meetings would inform community members about the arrangements.

Despite the enablers and positive outcomes discussed so far, there were constraints as I explain in the next section. In order to lead the project, the RU team exercised their agency by drawing on their knowledge and understanding of scientific processes. The community exercised agency in response to the RU team's suggestions by drawing on discourses that privilege culture.

8.2.2 Mechanisms constraining the adoption of rotational resting without fences

In managing the programme, the RU team drew on scientific knowledge including studies that showed that, in grassland biomes, continuous grazing results in pastures being dominated by invasive bush of no forage value (Hillenbrand et al., 2019; Mucina & Rutherford, 2006). Adaptive grazing studies highlight the importance of short grazing periods followed by an extended rest period adequate for grass regeneration (Döbert et al., 2021; Hatch & Tainton, 1997; Hillenbrand et al., 2019).

As indicated earlier, in November 2021 the RU team exercised their agency by engaging with the community livestock owners, herders, and Eco Rangers to plan camp closures in order gain maximum benefit from the rainy season, which started in November. They advised farmers to rest rangelands at the bottom of valleys from December 2021 to March 2022 to allow grass seed to set. Instead of using the bottom of valleys, the advice was to move animals to higher ground for the summer period. Studies generally accept that perennial and annual grasses require a period of recovery after grazing to allow for the development of root systems and new tillers and the

regrowth of grazed tissue (Döbert et al., 2021; Fuhlendorf et al., 2017; Hatch & Tainton, 1997). An RU expert asked community leaders when they were going to call a meeting to organise the closure of camps from 1 December. In the meeting, the expert provided the scientific rationale for needing to close the grazing at the beginning of December, noting: *“Grass regrowth is a biological process because the grass is starting to grow. After all, it is raining. If the grass does not grow, then what we want won't happen”*. In a similar vein, a government agricultural expert from the DRDAR also spoke to the community, saying:

I am saying the grass is growing well because it is raining. It would be good if you close now [December] but we cannot force you. I want to remind you why we are closing the camps to have enough grass to grow and set seeds so we can have more grass for animals to feed.

The extracts show that the experts knew the need for community structures to buy into the idea of closing the camps in December, a practice which would respect scientific knowledge. For the RU team, the timing was essential to take advantage of the rainy period before the dry season:

Normally, we are supposed to close the camp now, but I guess it is best to close it because now it is the rainy season. Last year, we started camp closing in February [as] things were not moving because of Covid-19.

The data indicate awareness that the previous camp resting started late in 2020, limiting the benefits of grass regrowth. The response of the community to the notion of closing the camps in early December was not entirely positive. In Village 1, a community member immediately responded by drawing on what I have termed the “December is busy” discourse noting: *“On 3rd January, we can do it. This thing said in December does not make sense”*. Although herding and milking continue during the month of December, the smallholder farmers drew on discourses that constructed December as a time for initiations², cultural rituals /ceremonies, holidays, and parties associated with special occasions. Thus, traditionally, December is constructed as month of uncontrolled grazing. As I have indicated, discourses are a “shared way of apprehending the world.

² In Xhosa culture, initiation is a custom intended to prepare young men for manhood that involves circumcision followed by a period of seclusion in which initiates are instructed by elders.

Discourses construct meaning and relationships, helping to define common sense and legitimate knowledge” (Dryzek, 2005, p. 9).

Resistance to beginning rotational grazing in December by citing the month as a time for celebrations and holidays is not consistent with observed events (Bhaskar, 1978; Collier, 1998) of herding and milking, which do take place. The community's shared ways of constructing meanings and relationships clashed with those of the project team, who had been conditioned differently as trained scientists. For the community, the December camp closure did “*not make sense*”. What was evident, therefore, was a “clash of worlds” with the community privileging local customs and beliefs and the project team privileging scientific knowledge and practice.

Community leaders were aware that they would be busy because of their involvement in cultural practices in December and were mindful of the preferences of the villagers to adhere to customs:

People know what they want. The sub-headmen are part of the community. We need to call a meeting around January. There must be a meeting in January, so everyone, including the headmen, should be present.

Another member added: “*The sub-headman of this village excused himself because it was initiation time. The sub-headman could not be with us because he took the boys to the initiation school*”. Yet another noted: “*You know what I think – most people won't make it because this is a busy month. People are now busy with their things. People are busy now drinking as it is December*”.

This privileging of cultural practices emerged despite villagers’ observations of improved grass status in rested camps the previous year. Though the camps had been closed and rested late, all could observe the benefits of closing and resting. In hindsight, it is also possible to see that the late start to camp resting in February of the previous year had also emerged from the community's construction of December as a ‘busy ’month. One project leader’s response to the “December is busy” discourse was to note that, although a late start would reduce benefits, it was nonetheless necessary to respect community decisions:

We will have the same results as last year. We will start in February as we did last year. I would appreciate it if we could do something about this. I am not pushing anyone. I am just suggesting. The late start resulted in limiting our grass growth outcome.

In a community where oneness is valued, individual decisions are not tolerated. This was raised in meetings in Village 4:

We cannot make our own decision as the committee because we said that we work with people with different views. Because this one will say close that one and the other will say let us close the other one. So, we need to have a general meeting first as the community.

The extract suggests that social actors appointed by the project were constrained in exercising their agency to make and influence decisions because of discourses promoting communalism. As a result of the “December is busy” discourse and other discourses privileging communalism, none of the villages rested camps in December. This clash may have contributed to abandoning camp resting and rotation without fences in Village 3, discussed later in Section 8.2.2.1. Although community members stood firm in adhering to the “December is busy” discourse, they did appear to subscribe to the concept of resting camps: *“I hope we will close the same camp in January that was closed last year”* and *“I am sure the meeting will only be possible around January. People are busy now, as it is December”*.

The community would not, however, trade their cultural beliefs for scientific processes and evidence that grass growth starts at the beginning of the rainy season. In Village 3, the argument was *“[It] is difficult to control livestock from neighbouring villages as the tradition is [in] December uncontrolled grazing is the norm”*. This observation emphasises that adjacent non-project participating villages would not heed calls to rest camps in December. A local project leader admitted: *“The rainy season encourages us to close the camps because we can grow grass, but we can't force people to close when they do not see the need”*. The project's scientific objective of taking advantage of the onset of rain to maximise grass growth by activating a biophysical structure does not resonate with the community's traditional setting nor the community's consciousness of ubuntu. The local project leaders then drew on discourses privileging human rights, a strong Western discourse, to respect decisions made by the community (see Section 5.2.2).

Meetings about camp closures which, in critical realist terms, would be considered events at the level of the Actual, were not held in December or January. At the level of the Real, in the interplay between discourses privileging December as a time for celebration and rituals, other discourses respecting communalism and scientific knowledge, traditional beliefs dominated. Earlier in this chapter (see Section 8.2.1), I identify discourses privileging communalism as enabling of change. In relation to the closing of camps, the opposite appears to be true. This observation can be related to critical realists' understanding of the world as an "open system" and of mechanisms at the level of the Real not being strictly causal. The existence of a mechanism cannot be taken to lead to an outcome as outcomes are dependent on other mechanisms that may be at play at any one time.

In response to the question of when meetings could be held, it seemed that local project leaders were willing to compromise and accommodate the community's preference for a different period. The improvement in the veld was observed when camps were closed in February, so the community appeared satisfied with the change that did emerge. In social realist terms, it is possible to claim partial change or morphogenesis in the socio-cultural system in Machubeni in relation to the introduction of rotational grazing and camp resting without fences innovation.

8.2.2.1 Adoption and dis-adoption phenomenon

In Village 3 the community could not agree on which camp to close. One social actor said: *"I suggest we close the same camp. Our animals get full, and there is enough grass. Also, it is warm in winter, which will benefit the livestock"*. This statement identifies the benefits of resting and rotation in the past year. However, another community leader in Village 3 disagreed: *"I am not sure [about] what other people are saying about this"*. Yet another farmer added: *"My suggestion is that we must look at another camp to close"*. The responses suggest the emergence of conflict regarding which camp should be closed.

Disputes about which camp should be closed, in critical realist terms conceptualised as events at the level of the Actual, could suggest a positive response from a community empowered to make decisions about rotational resting. On the other hand, they could emerge from underlying struggles as individual and group concerns and vested interests, conceptualised as mechanisms at the level of the Real, are met or not met by novel rotational resting without fences practices. Drawing on

participatory democracy, another individual promoted a discourse privileging community decisions:

*Let us call for a meeting to understand how we classify the camps. Which one is camp 1, camp 2, and camp 3? Before we decide which camp we are closing and for us to decide which one we are closing. We **must involve every** community member. We cannot decide on behalf of the community' [emphasis added].*

Though the RU team used GIS maps shared with community members, indicating the boundaries of camps 1, 2, 3 and 4, the farmers did not refer to the documents. This was consistent with other evidence of the community privileging oracy over written documents. In referring to “*every community member*”, the speaker argued for extending decision making beyond those involved in the project to all community members. What I have termed an “inclusive” discourse resonates with notions of ubuntu and not imposing on others. These discourses were particularly prevalent in Village 3 though not so apparent in the other three villages. It is thus possible to identify yet another mechanism contributing to conditions constraining rotational grazing and camp resting without fences.

8.2.2.2 Adoption and dis-adoption

Although discourses privileging communalism were evident in the Machubeni community, it would appear that some community members also experienced exclusion. At a meeting, one social actor said: “*Mr X was once here but was not pleased and did not come to the meeting because he complained that he did not get any information about the meetings*”. Mr X's experience can be seen to result from the exercise of agency on the part of different groups. In a separate interview, Mr X confirmed he was excluded from camp resting planning meetings:

Nobody informed me or invited me. XYZ went to meetings without informing the committee, and we should have been a part of that meeting as the stakeholders of each Hub. When you are gathered there, all the hubs should be there as a board of the project. I am the chairperson of the livestock Hub.

He then added: “*The people of this Village 3 should know everything and how to look after the camps. People have livestock and live off that rangeland. This year [2022], we did not close the camp*”.

This farmer's experiences of exclusion mirror others in Village 5. In Village 5, rotational resting may not have taken off because the traditional leader excluded the adjacent Village 6 in arranging the mutual sharing of rest camps (see Section 8.2.1). In this case, it would appear the traditional leader exercised his agency as a social actor inappropriately. Tensions and disputes were identified earlier in this analysis as a reason for the failure to hold a meeting on camp closures in Village 3. Other instances of exclusion were also confirmed in claims made by one of the Eco Rangers:

People had left [the project] because they would hand in timesheets [an RU payment mechanism], then they were told that had not to work, and their timesheets would just be chucked aside. Those women (LCAs), you see, they worked for free. You left your house to go to work, but you're not getting paid. Maybe you think because we are quiet, everything is alright, and we are having a good time. You see, management should treat people in the right way. There should be no bias or favour. Otherwise, things will not be ok.

In social realist terms, the LCAs did not exercise the agency to transform into a corporation and approach the RU team to articulate their concerns. Another informant noted the need for oversight mechanisms involving timesheets by commenting: *"One cannot sign timesheets for unconfirmed work. How can one confirm that someone has gone to work without a signed timesheet? It can put one into trouble"*.

The LCAs were provided with one year employment contracts by RU. In order to provide monitoring and oversight of the project, project leaders appointed a local individual to oversee the work of LCAs and Eco Rangers. However, informants claimed that the individual appointed to this oversight position was able to decide who would and would not be paid. The result was disgruntlement on the part of LCAs and Eco Rangers and the withdrawal of labour and, eventually, the dis-adoption of rotational grazing without fencing practices. An Eco Ranger recounted the harm he experienced because of the way he had been treated:

*Eish, I didn't even want to continue with the project. I am no longer interested in the project. How things happened hurt me. We [Eco Rangers] were told to join the LCA. Then we started making the dams and removing lapesi [*Euryops floribundus*]. I realised that, no, I cannot work here. I'm the one who will suffer here, especially me alone, with lapesi [*Euryops floribundus*], you see. The other ranger left at the change of job*

description. So, I didn't get paid in January, so I did not go to work at all. That was because the money I was working for was not paid correctly. That thing hurts me very badly. I feel bad because I worked hard for them to pay me.

Because rotational grazing would not be practised during the dry season, RU project leaders decided that Eco Rangers should contribute to LCA rehabilitation activities. The Eco Ranger's negative experiences reported above resulted from this change in work focus. Eco Rangers in some villages did not appreciate a change in work type and this contributed to their decision to leave the project. In contrast, Eco Rangers in Villages 1, 2 and 4 embraced the shift to different work during the dry season. In critical realist terms, these different responses can be seen to result from discourses shunning a change in work type in some places and others embracing it in other villages.

The Eco Rangers and LCAs in Village 3 did not manage to exercise their agency as a group of corporate agents and approach the project leadership structures located at RU to express their concerns. They were constrained in doing so by the local social hierarchy of power. In addition, the Eco Rangers referred to the impact of the LandCare fence³ on the project:

I noticed that with these people, attention was given to [LandCare] the fence being installed. Because of that, they never really gave attention to what was happening with us. Yes. They stopped focusing on us. No one gave us attention after that. You see, there are these issues. When a person supervises you, they need to be around constantly to check on you to see or hear what is happening. But when the person is never around, that's a big problem.

LandCare's promise of a fence meant that rotational grazing without fencing practices were disrupted as some social actors drew on their social and cultural conditioning and subsequent preference for camps with fences, despite the history of theft and vandalism. In the community the absence of employment opportunities means that projects that provide potential employment are valued. Therefore, it is possible that those who favoured fencing were hopeful of jobs on the project financed by LandCare. The exercise of agency on the part of farmers resulting in the abandonment

³ As I will explain in more detail below, LandCare, a government agency, responded to a request from project leaders for support once the project had ended by offering to install fencing, thus negating all the work that had been done to promote camp resting without fencing.

of the CSA project to seek new employment opportunities is captured by one community leader as follows: *“The project came to train us, but now, I am putting it on the side. ... At Machubeni, we do things even if there is no need”*.

In an open system, the unanticipated emergence and causal properties (Elder-Vass, 2005) of fence provision influenced community members to return to fenced camp rotation and resting. The data illustrate the many mechanisms in an open system as CSA practices are introduced. In Village 3, one individual noted:

We did not close the camp in 2022. We were waiting for LandCare to come. When LandCare came, it requested five people from the five villages per village. They even added two more people per village to be employed in rangeland fencing.

Another informant noted: *“We are still waiting for the fence to come to us. It is still at Village 1”*.

At the level of the Real, the interplay of the money economy, the project, LandCare, and the inappropriate use of agency on the part of some social actors appointed by the project led to the abandonment of rotational grazing without fences in Village 3. Therefore, morphostasis was evident in the return to uncontrolled grazing. This contrasts with the morphogenesis, or change, apparent in Villages 1 and 2 that continued with the rotational grazing without fences in 2022. The limited uptake of climate-smart livestock practices in the outcome was not about the scientific principles of CSA and their knowledge of them. Instead, it emerged from the interplay of various mechanisms at the level of the Real.

8.2.3 Farmers' interaction with bylaws, contracts and agreements

As indicated below and previously in Section 5.2.1, the RU project team drew on their conditioning in modern urban societies to privilege discourses favouring regulations and agreements, particularly those in written form. Examples include drawing on government policy and the Local Municipalities Act No.32 of 2000 to facilitate the development of bylaws, conservation agreements (see Appendix A) and work contracts for Eco Rangers and LCAs (see Appendix B).

As noted earlier, the RU team exercised their agency by drawing on project funding to allow community members to experience successful camp resting without fencing practices in other

locations. Through a participatory process, the community then developed bylaws regulating straying animals in closed camps, veld fires and waste plastic (see Section 5.2.2). The bylaws were documented in English and isiXhosa.



Figure 8.3: Participatory development of bylaws (RU Hub Team)

A critical realist analysis requires questions to be asked about the mechanisms that led to the emergence of the event to develop bylaws and the attendance of community members at it. The critical realist principle of the exercise of judgemental rationality (see Section 3.2.3) makes it possible to identify several potential mechanisms at play. The RU team acted as trusted facilitators (Freeman et al., 2015) as community members debated and agreed on bylaws. The RU team were educated and experts in the CSA practices and blended scientific and local knowledge they emerged from. Arguably, their presence was thus able to influence community members who were largely poorly educated. It is also possible to identify project funding as a mechanism. Bylaws are an essential mechanism in the governance of natural resource management of complex SES (McGinnis & Ostrom, 2014; Ostrom, 2009). Ostrom (2009) argues for the need for strategies, rules and norms in governance systems of common-pool natural resources. This funding allowed for the employment of Eco Rangers and LCAs. Together, these several mechanisms could be seen to

contribute to the emergence of events such as meetings to develop bylaws and conservation agreements and attendance at them.

Conservation agreements have emerged from discourses constructing what could be termed ‘a Western view’ of the need to preserve the environment. They are associated with the free-range beef private company named Meat Naturally Pvt Ltd a South Africa organisation. A RU project member recapped on previous workshop on conservation agreements and explained: *“The conservation agreement stipulated rules on what the community thinks about fireguards, keeping animals, and how Rhodes would assist in managing and funding Eco Rangers and the LCAs”*.

After the explanation, the project member provided the community a written conservation agreement in isiXhosa to read and note any queries for further discussion. He invited committee members to sign after clarification of any issues. He explained that:

We won't discuss anything now, but you will read it at home. The form is written in Xhosa so that you can understand it. The document has an agreement on working conditions. If you are unclear about anything, please underline it. You must read it at home and sign it. If you are unclear, underline, and the project team will clarify.

However, rural people do not necessarily share an understanding of a world regulated by formal contracts and agreements. In addition, literacy practices in rural areas tend not to privilege written text (Prinsloo & Breier, 1996). According to the RU team, only two participating villages completed and signed the agreements, a possible indication of the community privileging oracy over written contracts. Following Street (1984), the fact that the agreement was written in isiXhosa would not have made an enormous difference as what matters is people’s relationship to text and their willingness to engage with printed matter.

The situation with bylaws was much the same. Though the bylaws were developed through a participatory process attended by traditional leaders and community members, as shown in Figure 8.3, the traditional leaders were reluctant to sign them for subsequent municipality authorisation. An RU team member explained that bylaws must be registered noting that the headman needed to sign them before submission to the municipality.

A municipal official who attended meetings in the villages indicated a willingness to assist with institutional issues noting:

I am interested in the bylaws. I want to have them on time so that they can be checked. You must have your bylaws so that, if people put their animals, they must know steps are taken for anyone doing that, and it will be good that it is registered so that even the police are aware of the law. There should be a stamp on the bylaw from the police. Things go according to the invitation at the committee [you] should have a letter going to the municipality and agriculture (DRDAR) for your bylaws so that there can be agreement on how to implement them. We are willing to advise you. My advice is before the headmen sign. You must invite us for advice so we [the municipality] can review the draft and see if it is ready to be signed.

In critical realist terms, the law and official bureaucratic procedures involving bylaw registration would be mechanisms. The data above reveals the complex process involved in developing bylaws, making it difficult for rural communities to act independently. In addition, the regulations require community participation in drafting bylaws and agreements on their content. The RU team and the municipality in drawing on democratic ideals understood their roles as involving advice and facilitation. However, the exercise of agency on the part of community leaders to participate in processes related to the development of bylaws did not mean that the outcome would be acceptable to the rest of the community.

In response to questions on the contents and operations of the bylaws in the four participating villages, a Village 1 committee member said: “*We had agreed that if someone's livestock is found on the closed camp, the individual will be charged R500*”. However, drawing on the resource-poor character of the communities, the municipality argued that the penalty was too high. The RU teams were spectators and facilitators of the meetings. The RU team's assumption was that the penalty figures were generated by participation and were, therefore, acceptable. It was agreed that the bylaws and penalties would be applied to rested camps. The fines generated by the application of bylaws were to contribute to the payment of Eco Rangers and the maintenance of rangelands to ensure sustainability of camp resting once project funding had ended.

When asked about the way violations of the bylaws had been handled, an Eco Ranger in Village 1 responded:

Some of the livestock came from another place [village] and came to our place [a closed camp], but we would chase them away. We chase the livestock away. We reported to the owners then they would come to us and beg us not to charge them.

The extracts reveal that the bylaws were not implemented. Instead, the Eco Rangers and community structures devised alternative mechanisms by drawing on what I have termed a discourse of “forgiveness” that contrasted with the modernist view of punishing offenders. As discussed previously (see Section 5.2.1), bylaws are constructed by discourses informed by statutory law, while historically, the community had always applied penalties according to local customary law (i.e. fines paid as livestock such as goats or livestock) but not municipal acts. As community members, the Eco Rangers had been conditioned by customary law. Arguably it was unrealistic to assume they would find it easy to impose penalties on offending neighbours and relatives. Once again, a “clash of worlds” between the experts working on the project and community members is evident. In addition, fines and penalties were a reminder of the management of rangelands under apartheid. One Eco Ranger noted: *“There was no problem. We were working together. No one charged all the owners with livestock straying in closed camps”*. This comment from the Eco Ranger suggests that the community, as a group of corporate agents, was exercising its agency and drawing on forgiveness practices in not charging for straying animals. In critical realist terms, the interplay of traditional structures and associated discourses with the regulatory mechanisms associated with statutory law resulted in the emergence of alternative practices to manage rangeland that encompassed acts of forgiveness. The community and its leaders do not seem to see anything wrong with acts of forgiveness. The concept of bylaws and regulations appears to seem contrary to community beliefs.

In Village 2, a committee member said: *“Let us not blame the Eco Rangers. Most of them serve notice, but you must follow certain steps with the law. We have two leaders, the chief and headmen, who refused to sign the bylaws”*. In in-depth interviews with one of the traditional leaders on bylaws registration and implementation, the leader claimed that bylaws could not be enforced:

This rotational grazing has not been working well. We can't enforce the laws while people have rights. Rotational grazing is helpful because the grass grows when animals are not there. The seasons are not the same. There are certain grazing areas where you can send livestock depending on the season. But now, we can't force people to follow the bylaw yet.

This extract indicates that the traditional leader was aware of the scientific reasoning behind the rotating and resting of camps but was exercising his agency to draw on discourses eschewing the implementation of bylaws. In response to a question about a way forward, the leader stated: *“There is no way forward, we used to get help from the justice department, but we do not get help anymore”*.

This statement indicates the diminished power of traditional leadership structures in the interplay with democratic and human rights discourses that have dominated South African society since the end of apartheid. The traditional leader claims that, without “help from the Department of Justice”, they cannot act. The excerpt also indicates how South Africa increasingly uses the law in political, social and cultural disputes. My observations regarding the implementation of bylaws also support the argument of legal pluralism as a challenge to customary tenure law in South Africa and Southern Africa (Murata et al., 2022).

In an open system, predicting an emergent outcome is difficult (Danermark., et al., 2002). In LA, attempts to introduce change are considered to be full of surprises and non-static. There is thus a need to consider trade-offs at many levels to manage adaptive capacity (Freeman et al., 2015; Jackson et al., 2010). A study conducted in three East African countries, (Mowo et al., 2016) argued that bylaws proved ineffective in the governance of natural resources because of inadequate participation by communities in processes to formulate and enforce them. My study provides a contrasting argument suggesting their ineffectiveness was due to the cultural context and discursive mechanisms. First, the traditional leaders failed to exercise their agency to implement the bylaws because of the dominance of discourses privileging human rights and democracy. According to Cundill (2008), the traditional leadership structures also failed to support rules and regulations introduced to protect natural resources in another project, the RULIV/ GTZ programme, which ran from 2003 to 2005.

In contrast to Villages 1, 2 and 3, in Village 4, the position appeared to be somewhat different. In a meeting held to discuss veld fires, one farmer noted: *“We once had an agreement as a community that we wrote when we met in the hall. It outlines what happens to someone caught setting the veld on fire”*. In response to the previous agreement, another farmer added:

I wish we could read that agreement again to remind each other even though we will get help to get equipment. So that when we catch someone burning during the day, we can report it to the sub-headmen in the community. If you find someone burning the veld, they will tell you I did not know I was not supposed to burn.

The agreement about penalties for burning in the veld was made before disruptions caused by the Covid 19 pandemic. The discussion in the meeting appeared to call for awareness raising of what had been agreed previously:

I wish we could visit our agreement and read the rules to everyone in the community and the surrounding areas so that if there is a fine of R500.00, at least people must know. Even the adjacent village people must know the agreement.

Yet another said:

The bylaws are good for keeping order in rangeland management and the rotational resting system. They should be enforced because people who break the rules should be punished. We also work in the rangeland, so if we have good bylaws and people comply, we can see a big difference.

It is apparent that some Village 4 community members drew on discourses privileging order through formal regulation suggestive of what I have termed a 'modernist' worldview. It would appear that not all community members were supportive of the bylaws, as the following comment suggests:

Please tell us about the bylaws. The last time I checked, it was like they were not welcome. What is happening regarding bylaws? From what we are talking about, you remember [referring to community members] we had signed the bylaws.

Though community members signed the bylaws, the legal system agreed upon as apartheid ended required that headmen should sign. Some community members drew on this legal point when headmen did not sign to resist the implementation of bylaws. In critical realist terms, it can be argued that Village 4's corporate agency in relation to the implementation of bylaws was constrained by the traditional, discursively constructed socio-cultural norms and legislative structures introduced after the first democratic election in 1994. As a result, despite the availability of knowledge (conceptualised as a mechanism at the level of the Real) of resilience building, community members could not exercise their agency to improve pasture and land rehabilitation. This observation echoes that of other studies (Fabricius et al., 2007; Folke et al., 2005).

The RU team member introduced a new element to the analysis of the failure to implement bylaws by referring to fencing: *“I think we started the project without a fence, which is why we had Eco Rangers to keep the animals away. We also put bylaws, so people do not bring their livestock to the closed camps.”* This comment identifies a series of decisions that resulted from an initial lack of fencing and awareness of a history of the vandalisation of fences. In Section 8. 2.1, I noted that the Machubeni community had been conditioned to use fenced camps. The experience of using fenced camps may well have led to observations that their use made the resting of camps easier even though the community was also aware that fences were frequently vandalised or stolen.

In Archer's (1995) terms, continued reliance on fencing indicates morphostasis (or lack of change) in the social and cultural systems in which the community exists. As I will show later, an offer of a fence from LandCare, a government department, was accepted eagerly, suggesting this was the case. The low uptake of rotational resting without fencing can thus be explained because of historical conditioning favouring other forms of rangeland management, the dominance of discourses privileging human rights and traditional leaders' failure to exercise their agency by signing formal agreements.

Before returning to explore the LandCare fence offer in more detail, I will briefly look at fodder flows and veld fires in the 2021-2022 phase of the project.

8.3 Fodder Flows

The RU project team exercised their agency to introduce fodder production at the same time as rotational grazing and camp resting without fencing practices were introduced. Supplementary fodders are argued to constitute good rangeland stewardship during droughts (Briske et al., 2020). The Rhodes team drew on their scientific knowledge to conduct a veld condition assessment. The evaluation indicated the rangeland was degraded to varying degrees. The Rhodes team pasture expert developed a traffic light classification system to describe the condition of rangelands in each village (see Figure 8.6). The assessment indicated that the rangeland was degraded to varying degrees. In the Red category was Village 4 and 3. The rangelands were severely overgrazed and continuously grazed without rest (see Figure 8.6). In Villages 1 and 2, rangelands were classified

as primarily green to amber as good, palatable grasses were evident. However, the assessment noted the nutritious grasses were located on higher ground where animals were not herded.

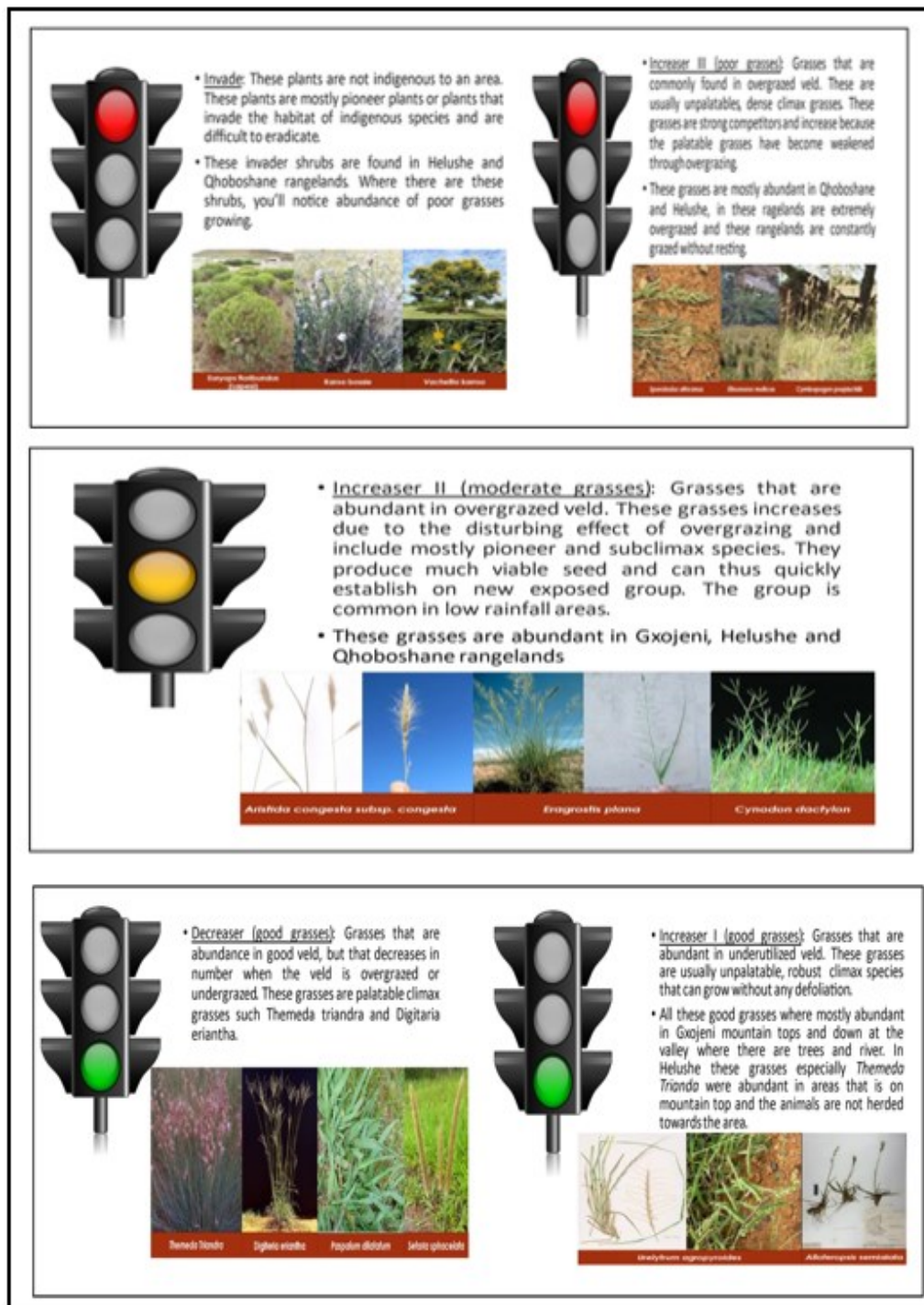


Figure 8.4: Veld conditions in Machubeni (RU Hub Team)

According to Onyeneke et al. (2018), fodder production and stalling are viable for farmers in lean or drought periods. To counter the condition of the degraded veld, the RU team drew on their knowledge of Western science to design supplementary fodder production courses focusing on the growth of lucerne and sorghum. The aim was to widen farmers' awareness of fodder and its possible use in their community. Fifty livestock farmers were allocated seeds and fertiliser to grow oats and lucerne in the 2020–2021 season. The farmers were familiar with oats production. Drawing on their scientific knowledge, the RU team introduced lucerne to expose farmers to an alternative long-term fodder option. A total of 10 ha was allocated to fodder crops, and 105 tons of fodder were produced in 2021. In-depth interviews with farmers led to several observations. The main constraint on the production of fodder was the late or non-delivery of seeds and the late arrival of rain. One farmer noted: *“It did not go well because of the rain.”* Despite the late delivery of seeds, oats were produced, and farmers reported decreased lamb mortality due to the availability of fodder: *“We fed sheep, and lambs were well fed. There was no loss of lambs”*. In the case of lucerne, farmers exercised their agency to attend training and planted the five to eight-year fodder crop.



Figure 8.5: Lucerne plot (RU Hub Team)

The farmers acknowledged the importance of lucerne, its impact on the health of sheep and its quality, as attested in the following statements:

We used to take them [the sheep and cattle] out to be scattered [free-range grazing]. But now we plant yellow maize and lucerne to feed them. I have two gardens, one for lucerne and one for bran. Sometimes we buy the one you saw. I bought it [lucerne], which is now about to finish.

So now I will take the sheep to that garden. There is a lucerne garden here. So, I want them [the sheep] to take it off by the time the rain comes. I want that space to grow something else.

However, one emerging tendency involved some lucerne farmers ploughing the crop under. A Village 1 farmer noted the constraints lucerne farmers faced: “It [lucerne] helped me a lot, But it is finished. It's no longer there”. When asked why he no longer had lucerne, the farmer explained:

The thing that caused it to finish was that it was with a family member. I was staying at my cousin's place, and when his son arrived from wherever he came from, he came and took his livestock and fed them the lucerne because it was his father's place. I was just there to look after the place. But he came and took his livestock and started feeding them the lucerne.

Even now, there is still a bit left because it does regrow quickly. So, what I do is leave it to grow. I closed a particular area and did not let any livestock go where it is growing so that it does not get affected. It doesn't go anywhere. You can see that it is growing there. My brother's son left all the livestock where the lucerne is growing, and they are feeding on it, but it regrows quickly. You can see that it is growing again, but it does not become fully grown. When I close it off, you can see that it is growing properly.

Data analysis identifies land ownership as a mechanism constraining this farmer's ability to grow lucerne to benefit his livestock. Though he exercised agency to plant the crop on an absent cousin's land, the return of the owner's son resulted in the farmer losing the bulk of the crop. The farmer then exercised agency by closing off a small section of the land to grow lucerne for his use. This example shows the dominance of the “family first” discourse identified in Section 7.2.3. The farmer could not challenge the owner's son even though the production of lucerne was due to his hard work. In addition, the owner's son did not appear to be willing even to acknowledge the possibility of sharing resources. Instead, he prioritised the needs of his own immediate family. To the question of whether the farmer was constrained by lack of land, he responded:

There is land available, but the problem with the available land is that it is not fenced, and therefore, the livestock will graze on the land that you have planted lucerne. It's about the finances

that one has. It would be possible, if I had the money, to buy my fence - to buy the material and hire a tractor to pull the fence into place.

Other farmers indicated similar problems: “*Lucerne was planted in the garden, but you see that field, the other person planted oats now*”. Yet another informant stated: “*Yes, others removed it, and they planted maize on the same land*”.

At the level of the Actual the emergent pattern was resource-poor farmer's low uptake of long-term CSA fodder crops. A cursory analysis would suggest that farmers failed to appreciate the value of lucerne as a 5 to 8-year crop. The above events could also result from previous conditioning, as none of the community members had grown lucerne, but as discussed earlier depended on purchases from nearby towns (see Section 7.4.1 and Figure 7.8). However, the extracts also identify the money economy and land ownership as mechanisms constraining the growing of lucerne with the result that farmers continued to purchase lucerne rather than produce their own permanent crop. In critical realist terms, the exercise of agency to grow lucerne can be seen to have been constrained by a lack of money, discourses of “family first”, land ownership structures, and the conditioning associated with using small, fenced plots for multiple crops. At the level of the Actual, this was evident in the ploughing down of a 10-year fodder crop.

Only in the case of one elderly farmer, who had a large, fenced area, was lucerne production thriving. The farmer indicated he experienced the following benefits resulting from growing lucerne:

Lambing percentage increased, improved lactation by ewes for suckling lambs, and mortality rates have decreased for the entire flock. The ewes are in good condition before mating and after mating season. The ewes give birth to twins and triplets. Ewes lamb twice a year compared to when they lambed once and the rams are healthy and fit with healthy semen that can produce well offspring. Wool quality has improved. It fetches a higher price at the market.

The farmer reported producing 10 lucerne bales at most, storing the lucerne and feeding his sheep during drought and the lactation period.

In December 2021 farmers were constrained when a private seed supplier, contracted by the RU project, failed to deliver seeds for fodder sorghum that had been purchased. As a result, the farmers did not grow fodder crops in the 2021–2022 rainy season. Despite several attempts to follow up

on the failure to deliver seeds by the RU project team and one of the farmers exercising his agency to hire a vehicle to collect the sorghum seeds and fertiliser inputs, the private company did not release the seeds. The seed company's constrained fodder flows thus impacted attempts to improve livelihoods in 2022. Efforts by the RU team and farmers to access the seed or have the cost refunded did not yield positive results. This observation affirms Newell and Taylor's (2018) claim that resource-poor smallholder farmers struggle to benefit from CSA innovations, despite efforts by global organisations such as the UNO, governments and universities to attract climate finance on their behalf.

In the case of fodder production, what conditions should be in place for acceptance of CSA long-term fodder production? At the level of the Real, the farmer's age, livestock and land ownership structures interacting with valuing of education enabled elderly farmers to exercise agency to access project structures and resources. However, most resource-poor farmers are constrained by access to financial resources. As described above, borrowing land from absentee owners and family dynamics did not guarantee the security needed to grow a long-term crop. Farmers were also conditioned in the use of small gardens to grow multiple crops with the result that lucerne tended to be ploughed under to make space for other crops. Though fodder production is recommended as a viable CSA option (Onyeneke et al., 2018), in degraded landscapes, my analysis has identified many mechanisms constraining its uptake.

8.4 Veld Fires

Veld fires constituted another constraint and resulted in farmers opening camps before prescribed times. Veld fires are not a new phenomenon as one female livestock farmer noted: *"It's not new. It is used to having veld fire during the winter period"*. The difference, however, was that once farmers started to rest camps to rehabilitate degraded land and plant nutritious grass species, they were desperate to protect their hard work from being undone by veld fires. Recurrent veld fires are a threat to rotational resting. Figure 8.6 shows the extensive destruction of regenerated pasture in a rested camp by veld fires in one of the village study sites.



Figure 8.6: Extensive damage to a rested camp due to veld fire (RU Hub Team)

Veld fires thus impacted farmers' positive experiences of rotational grazing without fences. In the four villages, arson was repeatedly identified as a problem. The communities blamed neighbouring villages and children for causing the veld fires. For example, one participant in Village 2 observed human agency in starting fires even though agents were not identified: *“The only challenge was the veld fire. We did not know who was doing that and for what”*. However, an informant in Village 3 claimed the fires started in a neighbouring village.

Most of the time, the fire comes from the direction of Village 5. In Village 1, [someone said] it's someone smoking, and then they throw the cigarettes on the floor. Sometimes it's the children when they are going to fetch the livestock. Then they try to make a fire because they want to warm up. After all, it is cold, and then the fires expand.

Deliberate acts of arson and other human actions resulting in veld fires are identified in other studies (see, for example, Dube, 2015). Although veld fires are blamed on intentional burning, the increased frequency of drought, excessive heat, and the presence of combustible vegetation can result in the spontaneous ignition of fires. The increased frequency and intensity of veld fires in the face of drought require community management and control of the veld itself. Though there are many studies on veld fires (Dube, 2015a, 2015b; Graham et al., 2023; Kruger et al., 2006; Nkomo & Sassi, 2009), few studies have focused on the farmers' experiences with veld fire hazards

(Becker, 2014). In the wake of frequent fires, in this study, farmers' responses show a range of experiences. For example: *"We need equipment when there is a fire because we can't stop fire using our hands."* Other farmers stated they use *Euryops floribundus*/ lapesi bushes, which are combustible, to firefight:

We need to have tools to stop the fire. We can use those long rubbers because the lapesi fuels the fire spread. We need proper tools to contain the fire. Using lapesi branches to prevent does not help because while you are busy on the other side to stop it using the lapesi branches, on the other side, the fire is spreading.

Though aware of the need to use fire beaters poor farmers did not have money to purchase these tools for each household. Drawing on project training workshops, leaders from all four villages exercised their agency and applied for fire beaters: *"We applied for fire beaters from DRDAR last year. But the fire beaters have not been received"*.

The DRDAR responded that the request should have been made to the municipal fire service department in Emahlaleni. The division of responsibility at the government and municipal levels thus emerges as a constraint. In addition, smallholder farmers were unlikely to be able to muster the literacy practices necessary to deal with officialdom and bureaucracy (Prinsloo & Breier, 1996). Farmers' lack of awareness of where responsibilities for managing fires lay led to requests to the DRDAR, a government department with a mandate to provide extension services with which most farmers are familiar. Community leaders appeared to believe that once an application for fire beaters had been submitted, they would be provided. As a result, no agency was exercised in following up on the request. The lack of response from DRDAR and a failure to appreciate where responsibility for fire management lay led to a discourse of the DRDAR being unresponsive to requests. One farmer thus lamented: *"We cannot wait for tools that we do not know when they will come. We will be wasting our time"*.

A lack of education to develop the literacy practices necessary to deal with officialdom and a lack of knowledge of contemporary government structures at local and national levels can thus be seen as mechanisms constraining farmers' agency in fighting fires. Once again, it is possible to see a clash of worlds here between the world of the farmers and educated extension officers and bureaucrats.

In response to questions about how the community fought infrequent fires, a discourse of 'we firefight as a community' was evident in three villages. For example, in Village 1, a farmer said: *"When we have a fire, we go as the community to stop the fire"*. Another farmer in Village 2 said:

We go out, and we put off. Or if there is one at another village, we go, or they come if there is a fire. Like last year, when there was a big fire, even the municipality came to help put it out. It was still challenging.

These extracts show that community members can exercise corporate agency and work together to fight fires and that the exercise of this agency is enabled by discourses privileging communalism. However, farmers are overwhelmed when confronted with fierce fires and need the municipality's support. These observations contrast with claims made by outsiders that, during the veld fire season, sometimes fires raged for days without intervention by the community. In Village 4, one farmer identified a lack of collective agency, however, by noting that, when confronted by veld fires, the village did not work as a community:

Yes, people did come out at first. Then as it was continuing, others ended up stopping. Others do not care at all. Others complained, saying, 'I won't go because I do not have anything on the mountain'. Others look to say, 'The fire is still far,' and that is when it starts spreading.

The above extract is arguably evidence of a diminished sense of communalism or ubuntu in this particular village. Another mechanism at play in the failure to act as a group of corporate agents may arguably have been the structures related to land ownership and livestock with community members without access to land not seeing the need to be involved in firefighting. Veld protection relates to personal concerns, projects to pursue those concerns and individual reflexivity (Archer, 2000). The data in this extract shows how that the community is divided along lines drawn by the social wealth hierarchy of livestock ownership and age (see sections 6.3.2, 6.3.3 and 6.3.3, Chapter 6).

In contrast to perspectives offered by the community, project leaders drew on discourses related to SLM, livelihoods and environmental stewardship, in other words, an environmental stewardship perspective in caring for the socioecological systems for the mutual benefit of the ecosystem and human livelihood. Thus, the RU team advised the farmers to self-organise as a community during veld fires. The National Veld and Forest Fire Act (1998) of South Africa requires all landowners

to stop the spread of fire. Self-organisation is promoted in resilience building and adaptation literature as an essential condition for sustained adaptation (Cabel & Oelofse, 2012; Speranza et al., 2018). Speranza et al. (2018) argue that self-organisation is the extent to which farmers can direct their actions and outcomes. I argue that a clash in world views drawing on discourses privileging SLM, environmental stewardship, responsible care and self-organisation is not as crucial as social hierarchies and wealth in uniting the smallholder farmers to protect rangeland. The uptake of CSA practices such as rotational grazing and camp resting without fences and veld fire protection depends on self-organisation based on mechanisms not necessarily sufficiently recognised, such as social wealth hierarchies.

8.5 The Machubeni Community at T₄

As the project concluded the RU team exercised their agency to approach the DRDAR's LandCare department which partners with public and private enterprises and universities in the conservation of natural resources. LandCare focal points – WaterCare, SoilCare and JuniorCare – collaborate with the project hubs. The RU team exercised their PEPs to generate a fundable proposal on behalf of Machubeni villages for LandCare to take over and continue with novel rotational grazing resting without fencing practices. The concern of project leaders was that the practices they had introduced to the community should be sustainable. As a result, their strategy was to design an exit plan that would enable the community to continue with the structural and cultural elaboration (Archer, 1995; 1996) that had begun. In resilience terms, the gains achieved by the project represented transformation (Walker, 2020; Walker & Salt, 2012), enabling farmers to cope with climate change in the future.

Several meetings and consultations occurred between the two entities, RU and DRDAR LandCare national, provisional and district departments. The two structures appeared to have agreed on a seamless handover of responsibility for maintaining practices introduced during the project. The assumption on the part of the RU team was that the arrangement would ensure continuity and would enable farmers to apply the knowledge they had acquired for themselves in the future.

However, ignoring all the gains achieved in developing CSA practices, LandCare unexpectedly offered to fence the rangeland. RU is a research and learning institution and LandCare is a government department. Each entity had different concerns. RU's main concern was research and imparting knowledge, while that of LandCare was more political in orientation in that it drew on policy formulated by the national African National Congress government and more conservative in that it did not draw on extant research on climate change. As a government department, LandCare exercised its agency to achieve its mandates of: (i) the creation of temporary jobs to reduce poverty through natural resource rehabilitation, (ii) the conservation of natural resources through veld care and soil care programmes, (iii) assisting smallholder farmers to improve and emerge as commercial farming communities. The temporary jobs are funded under the Expanded Public Works Programme (EPWP).

At a community meeting in November 2021, LandCare offered to fence the rangelands at one village per year over five years beginning in 2021. The Village 1 sub-headman exercised his agency to motivate that their rangeland be fenced first as follows:

I greet everyone. I will go straight to the point. I request that the fencing project it must start at Village 1. Right now, people are not talking straight. They beat about the bushes, not suggesting where to start. I am only suggesting.

In a follow-up interview, in response to a question of why he had proposed his village kick-start the fencing, the sub-headman responded:

I was the first to raise my hand. No one knew where it would start, and that is when I gave my reason – that we already had a camp that was being closed by Eco Rangers and opened without a fence. The others supported me, another woman from Village 4, including people from other villages.

To the question of why the other villages supported his request, he pointed out that:

No, I do not know if it can be that because sometimes people can support you so that they can see how you will cope with the situation. Maybe they wanted to see if Village 1 would cope. I am sure they are still watching. But according to the rule, it will rotate in all the villages, such as Villages 2, 3, 4, and 5, as long we are still working in unity.

The sub-headman's proposal was accepted and enabled by the community attitude of waiting and seeing if government/LandCare could keep to schedule.

In a separate interview, one of the traditional leaders explained:

LandCare is under the government, and we can't trust our government. It gives money to our people, and we misuse the money. It is not the first-time LandCare is coming here. White people did that LandCare boundary, and it [LandCare] was here then.

According to another informant: *"I also have something that I need to fix with LandCare to protect the camps. LandCare fenced the camps but did not finish"*.

The data cited above reveal negative experiences with LandCare in the past. The community interaction with the government was underpinned by mistrust and claims of corruption. In a community where daily business was based on oracy and ethics of trust, LandCare was viewed as a continuation of apartheid. The informant added that past attempts on the part of LandCare to fence the rangelands had not been completed.

Despite the mistrust by some parts of the community, the youths and some elders exercised their agency to register with the fence project. LandCare exercised its agency and trained selected community members, mainly youths, in fencing installation. Despite having begun to accept that rotational grazing and camp resting without fencing could work, many villagers were thrilled to accept the offer from LandCare. Other community members were excited because fencing provided a means of employment. Hence what appears to have been the case is that previous conditioning, mainly in the form of discourses promoting the use of fencing, the desire for employment in a money economy, land ownership, age and other mechanisms, led to a return to practices established during apartheid. The offer to fence the rangelands shifted the community to focus on a new income source and the innovative practice introduced by the project was abandoned in favour of the traditional approach of fence-controlled rotational grazing. Thus, the expected transformation and expected morphogenesis were stalled.

My analysis indicates the instability of discourses with discourses rising and falling in dominance over time because of their interplay with other mechanisms. The Machubeni context specifics explain the low uptake of CSA innovation. The five-year long programme to rehabilitate rangeland

pastures and gullied landscapes were not sustainable in the wake of prospects of new employment opportunities. In a community without any employment infrastructure, new project chasing is enshrined in the community belief system especially given exposure to the monetary economy. As a result, the community leaders in two of four villages withdrew from the rotational grazing and camp resting without fencing approach that had begun to bear fruit.

Drawing on insights from a growing body of knowledge on ILA and SES adaptive management (Biggs et al., 2022; Preiser et al., 2018; Sayer et al., 2013), the RU project team noted: *“We are doing a form of adaptive management. But then, if we now stop and wait for the fence, it is going to be a problem”*. The RU view was that villages that were targeted for immediate fencing could have continued with rotational grazing and camp resting without fencing until fencing arrived in their area. However, the community responded differently:

What conditions could have enabled the continuation of CSA practices? I argue that rotational grazing and camp resting without fencing could have been continued and sustained, not by providing fences, but by increasing the number of Eco Rangers to achieve 24/7 monitoring of stray livestock. This would have provided increased employment opportunities over a longer period than the fencing project. Arguably, the practices would also have been sustained had LandCare not responded to the request for assistance from the project team.

My analysis has shown that resource-poor smallholder farmers in the study exercised agency by taking a relatively short-term view of what is offered by foreign-funded projects or political structures. The smallholder farmers responded to contextual conditions by engaging in multiple internal conversations to pursue individual concerns. According to one elderly farmer: *“We learned a lot. The project came to train us, but now I am putting it on the side. At Machubeni, we do things even if there is no need”*. While acknowledging the interaction with project training workshops, the farmer still indicates a change in concern and approach. Younger members of the community also exercised their agency to seek employment in the LandCare fence project. A community leader summed this up as follows: *“Currently, the youth is involved in the fencing project that LandCare leads. We cannot say it is limited to a certain gender. There is a job for everyone”*.

As discussed earlier, the concern of young people is increasingly for paid employment in a formal monetary economy. Land ownership structures and their age mitigate the uptake of farming

activities, including those that are entrepreneurial. Extant literature explains the limited uptake of CSA phenomena because of barriers such as education and income (Lee & Gambiza, 2022; Mashi et al., 2022; Muriithi et al., 2021). This study shows that the youth had more education than their elders. Although the project offered education in the form of training, the youth were still heavily influenced by discourses privileging employment for money and, arguably, the glimpses they had achieved into a lifestyle made possible by cash thanks to social media and the internet.

While a return to T₁ was emergent in the context of the LandCare fence offer, the fencing project had not yet been completed. According to an informant close to the process:

The people working there for the fencing project signed the contract on 28th February [2022]. But nothing has been happening. No equipment has arrived. Other people working there use transport, and now the owner needs payment. They took their sizes for clothing, but nothing came. There are two bakkies outside. The owners are now complaining, saying they need payment. People from Village 3 and Village 4 are complaining because they use transport to come here, so they have to pay, but they have no money.

Evidence in this response indicates LandCare could not deliver the required fencing material, nor pay the community who had begun installing poles as part of the Village 1 fence installation, or contractors providing transport. Ironically instead of continuing with rotational grazing and camp resting without fences while waiting their turn to be fenced, and in the face of the lack of delivery on the part of LandCare, community members continued to focus on prospective employment opportunities. According to one RU team member: *“They [LandCare] have been politicking, ticking boxes that they had created employment and allocated fences to the community”*. Another stakeholder noted: *“If you have a good project running, do not involve government if you can avoid it”*.

This study supports the notion that in an open system, “multiple generative mechanisms make it difficult to anticipate the emergent outcome” (Danermark et al., 2002, p. 206). Thus, instead of elaboration, at the beginning of the new morphogenetic cycle, my analysis of T₄ largely indicates a return to the conditions evident in my study of T₁ (see Section 8.1).

8.6 Conclusion

This chapter looked at farmers' interactions with climate-smart ecosystems rehabilitation innovation aimed at improving and rehabilitating degraded rangelands. The novel approach of rotational grazing and camp resting without fences in common-pool rangeland was introduced. Given the nature of shared common pool rangeland, enabling conditions include discourses privileging ubuntu and inclusivity which led to the emergence of groups of corporate agents. In the one village that experienced diminished traditional leadership, boundary disputes constrained the acceptance of rotational grazing and camp resting without fences. As a result, the innovative practice was not adopted and morphostasis occurred.

The overarching constraints in villages that adopted the concept lay in the cultural domain. While acknowledging the positive effect of the approach on veld grass rejuvenation, the community were not willing to trade off cultural beliefs prioritising December for ceremonial activities for the scientific principle that grass growth is a biological process that starts with the onset of rains in November. The community preferred a late start to camp resting in January or February resulting in the accrual of limited benefits. Other constraints were related to the valuing of oracy over literacy in the community. As a result, documents, agreements and contracts were set aside, even though they had been signed by community leaders. The last constraint was the non-enforcement of bylaws to control stray livestock.

As the project ended the RU team exercised its agency by inviting LandCare to take over and continue the practice of rotational grazing and camp resting without fences. The LandCare conservative approach was to offer fences. Thus, at T₄, conditions pertaining at T₁ were evident indicating morphostasis in the form of the reproduction of uncontrolled grazing. My next chapter illustrates this claim in more detail and identifies some overall insights and recommendations that may be useful to other projects.

CHAPTER NINE: CONCLUSION

9.1 Introduction

The project on which this study was based was motivated by observations about smallholder farmers' limited uptake of CSA innovations in Africa (Mutengwa et al.,2023; Ogunyiola et al.,2022) I used a case study approach to study a project in Machubeni, Eastern Cape, South Africa. The study was part of a bigger project looking at securing multiple ecosystem benefits in the productive but degraded landscapes in South Africa. This project in Machubeni looked at adapting and maintaining climate-smart ecosystems and resilience building at the local level within the larger project. The central element of this study was understanding the way smallholder farmers exercised their agency in taking up adaptation and resilience-building strategies in the wake of climate change. The study was motivated by the desire to contribute to gaps in knowledge about the way the agency was exercised in Africa and South Africa in particular. This chapter synthesises the insights gained from the study, which drew on Bhaskar's (1978) critical realism and Archer's (1995, 1996) social realism as theoretical lenses.

Chapter One argues that, although many studies have focused on the uptake of CSA practices, they have paid little attention to the mechanisms from which uptake emerges or does not emerge. The chapter outlines the methodological challenges inherent in positivist studies accounting for the underlying mechanisms that enable and constrain adaptation and resilience building through CSA. Critical realists see the world as an open system in which many underlying mechanisms interact at a level of reality not directly accessible by empirical means. The many ways in which these mechanisms interact mean that events, which can be observed directly at another layer of reality known as the Actual and observations and experiences, also accessible empirically at another layer termed the Empirical, cannot be predicted in a strict cause-effect relationship. Rather, critical realist research can only identify tendencies. My study was, therefore, not about adaptation and resilience building per se but sought to identify generative mechanisms underlying farmers' adoption, non-adoption and dis-adoption of CSA.

As a result of its theoretical framing, and as explained in Chapter Three, the study draws on Archer's (1995,1996) morphogenetic framework which allows for the exploration of change (morphogenesis) or non-change (morphostasis) over time. The morphogenetic framework explores change or non-change over three phases: T_1 , understood to comprise the period when agents are conditioned, socially and culturally, to act, T_2 to T_3 , when agents exercise their agency as they go about pursuing particular projects and concerns, and T_4 , the end of the cycle and potentially the beginning of a new cycle when it becomes possible to see change or non-change.

9.2 Synthesis of Insights

Mechanisms enabling and constraining the uptake of CSA practices are identified in Chapters Five, Six, Seven, and Eight. This final chapter synthesises observations made in these chapters. The insights and observations resulting from the study are organised as responses to the questions informing the study itself.

9.2.1 Research question one

The first research question asked:

How were the smallholder farmers conditioned structurally and culturally to exercise their agency at the beginning of the project?

My exploration of the structural and cultural conditioning in place as the project began (see Chapter Five) revealed that it produced different forms of what I have chosen to call 'consciousness'. Drawing on critical realism, I define consciousness as "ways of experiencing the world". Project participants' ways of experiencing the world can be conceptualised as experiences and observations at the level of the Empirical, which emerge from participation in events. Both events at the level of the Actual and experiences and observations at the level of the Empirical emerge from the interplay of structures and mechanisms at the level of the Real. My claim is that different groups of project participants (for example, elderly female farmers, elderly male farmers, the RU project team and the young rural youth) all experienced the world around them in different ways.

My use of empirical data obtained through interviews and observations allowed me to abduct and retroduct (see sections 3.2.3 and 4.4.4) to identify the structures and mechanisms from which these ways of experiencing the world (or forms of consciousness) emerged. Elderly female farmers, for example, all had access to land in the form of their own homesteads. Land tenure thus emerged as a structure conditioning the way they saw the world. Thanks to apartheid, most elderly females had limited experiences of education. They also had limited exposure to social media and the dominant discourses constructing a “good life” as one involving a cash economy and consumerism evident in films, television programmes and forms of social media such as Instagram. Discourses constructing rural women’s roles as caregivers, along with others that construct them as nearing the end of their lives, also played a role in the emergence of their way of experiencing the world (see sections 5.2.2 and 7.3).

As a result, the elderly female farmers were socially and culturally conditioned to experience subsistence farming as a valuable means of contributing to their families' livelihoods. They were thus conditioned to be more disposed to adopt the CSA practices introduced to them.

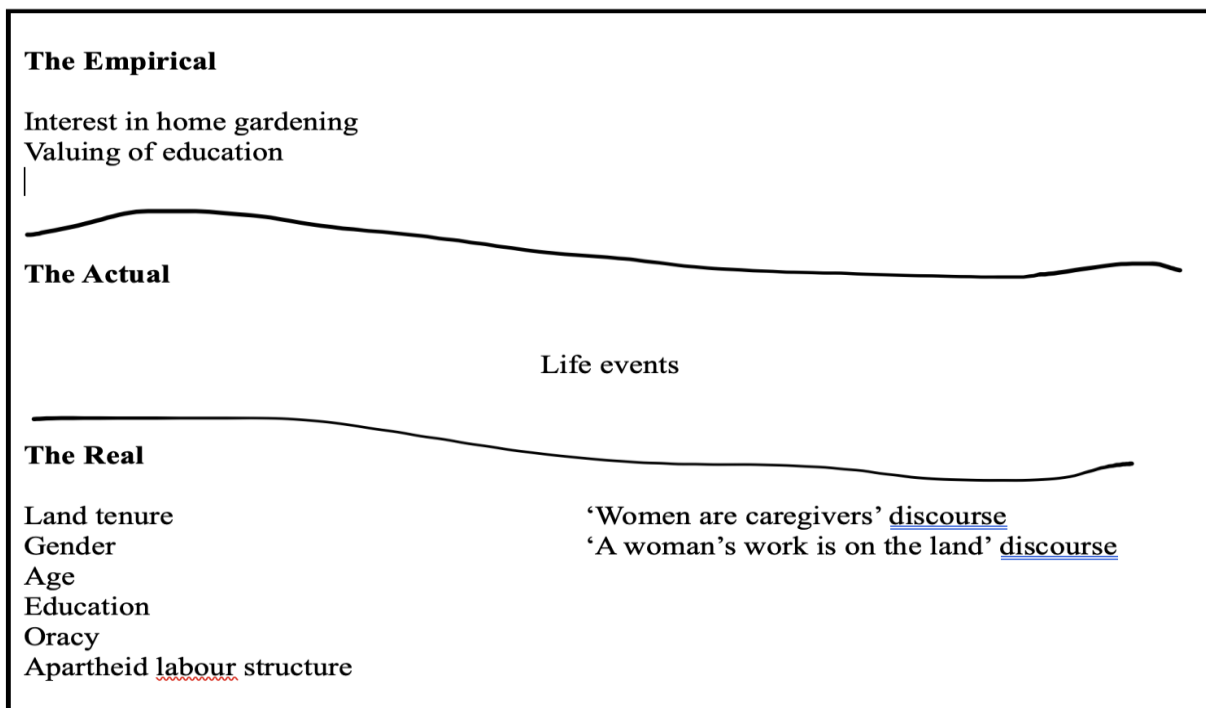


Figure 9.1: The elderly female consciousness

The consciousness of elderly male farmers differed somewhat in that they had been socialised by discourses constructing a man's role as finding employment outside the home and that constructed subsistence farming in the form of home gardens as work for women, a point borne out by the observation that of the 25 project participants who had home gardens, only three were male. The apartheid labour structure also played a part in that many men from the Bantustans were taken to work in the mines returning to their families only over the Christmas period. Women were left to farm the land to survive, and men became conditioned into earning a wage, however, meagre. Male elderly participants did, however, draw on discourses constructing appropriate work for men involving keeping livestock. They also drew on discourses constructing livestock keeping as important financially, not least because animals could be sold to provide income when most needed. As a result, the elderly men were prepared to work on rangeland rehabilitation.

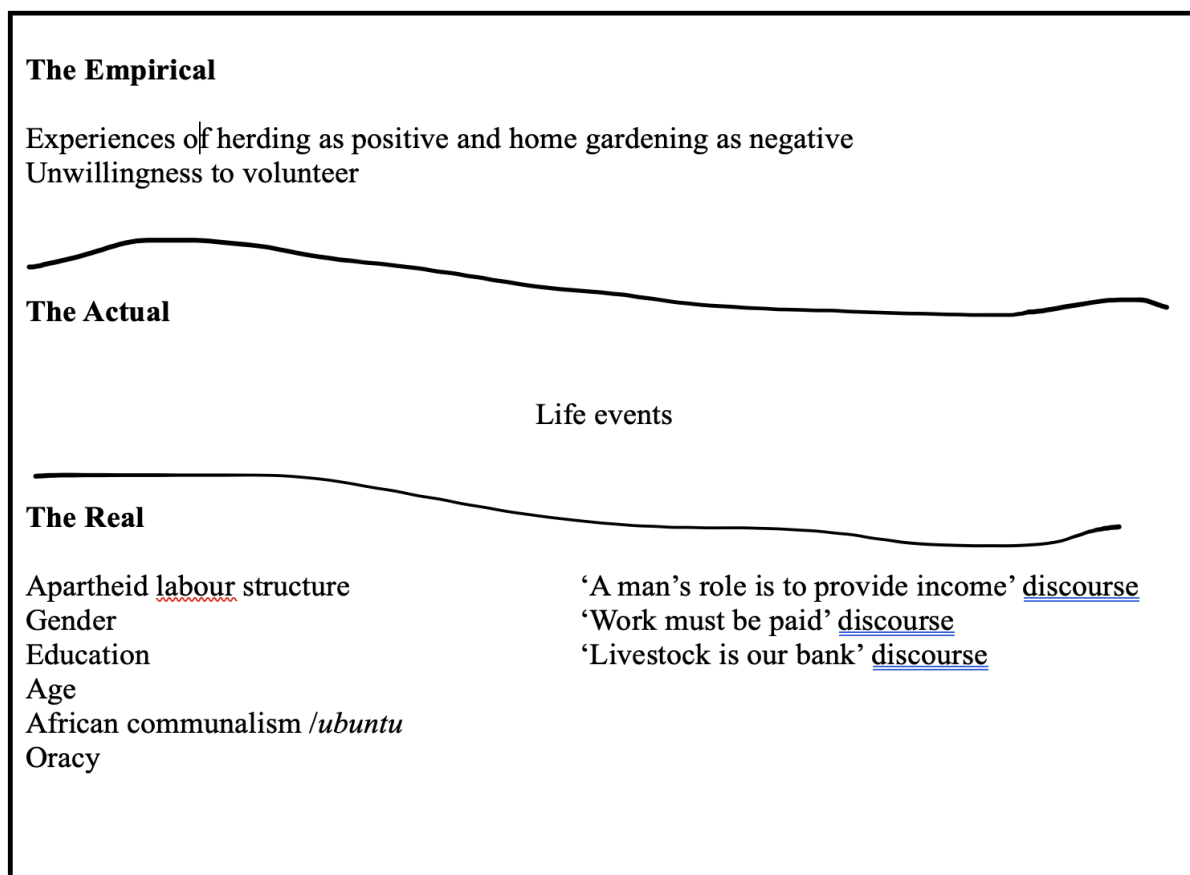


Figure 9.2: The elderly male consciousness

In contrast to the elderly, young people shared a very different way of experiencing the world. The young people involved in the project mostly did not have access to land of their own. However, they were more educated than their elders and had been socialised into using social media and watching films on electronic devices from a young age. As a result, they appreciated the value of money in accessing consumer goods and thus valued paid employment rather than working on the land to provide subsistence. Some researchers identify education as contributing to a willingness to adopt CSA principles and practices (see, for example, Molieleng et al., 2021; Mutuku, 2017). However, in this study, education did not seem to function in this way or perhaps the power of education to contribute to the emergence of CSA practices at the level of the Actual was tempered by discourses privileging paid work and consumerism. As a structure, technology (in the sense of having access to devices to access the internet) could be seen to challenge education. As with other groups of participants, apartheid can be seen to have played a role in that the system meant that young people were born into poverty and what is commonly termed ‘undeveloped’ circumstances. The glimpses of the good life accessed through social media thus functioned to make many young people want to escape.

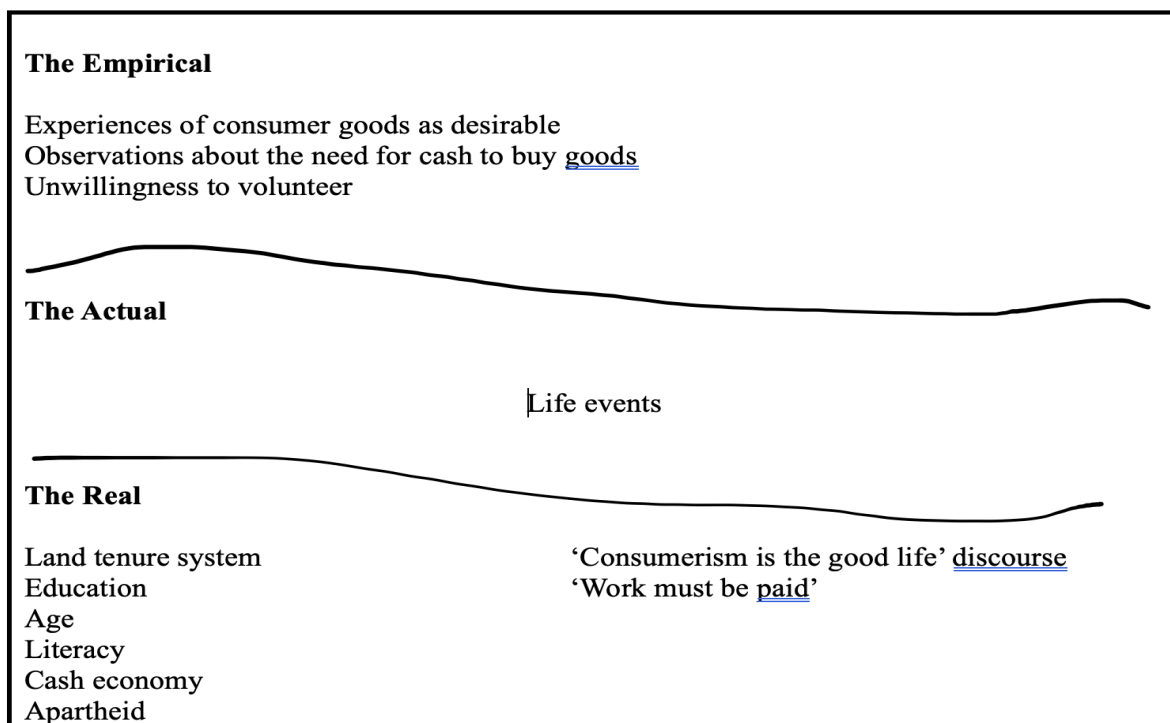


Figure 9.3: The youth consciousness

All the residents of Machubeni shared the experience of living in one of the most remote parts of South Africa. The elderly had lived in the area during apartheid when it had Bantustan status. The rural location and lack of quality education meant that residents had been socialised into a form of social life in which many features of life present in more developed parts of the country were absent. Their society was predominately oral rather than literate, and it was governed by understandings (which functioned as a form of 'rules') that were not necessarily recorded in writing. The society in which they lived had been regulated by what I will term a form of social consensus rather than formal written contracts. This aspect of their consciousness, in particular, made them very different from the RU project team who were all highly educated, relatively well travelled and who drew on experiences of living in a society and institutions regulated by formal laws and written agreements. Therefore, in many respects, the traditional consciousness of the rural people differed from the modernist consciousness of the RU project team.

In common with other researchers in the social sciences, my use of a theoretical framework based on Bhaskar's (1979) critical realism and Archer's (1995, 1996) social realism functioned as a lens through which I looked at the project. As a lens, the framework allowed me to see things I would not have otherwise seen or to see things differently. My understanding of the consciousness of the different groups in Machubeni resulted from using this lens. In setting up the project, the RU team drew on their knowledge of the literature reporting on adaptation studies which used very different theoretical lenses or methodologies. Some of the literature (see, for example, Jiri et al., 2017; Mango et al., 2018; Teklewold et al., 2019) identifies the impact of socioeconomic variables on the uptake of CSA practices. Awareness of the different ways of experiencing the world shared by the different groups participating in the project resulting from using a critical and social realist lens may have resulted in the project taking a different trajectory.

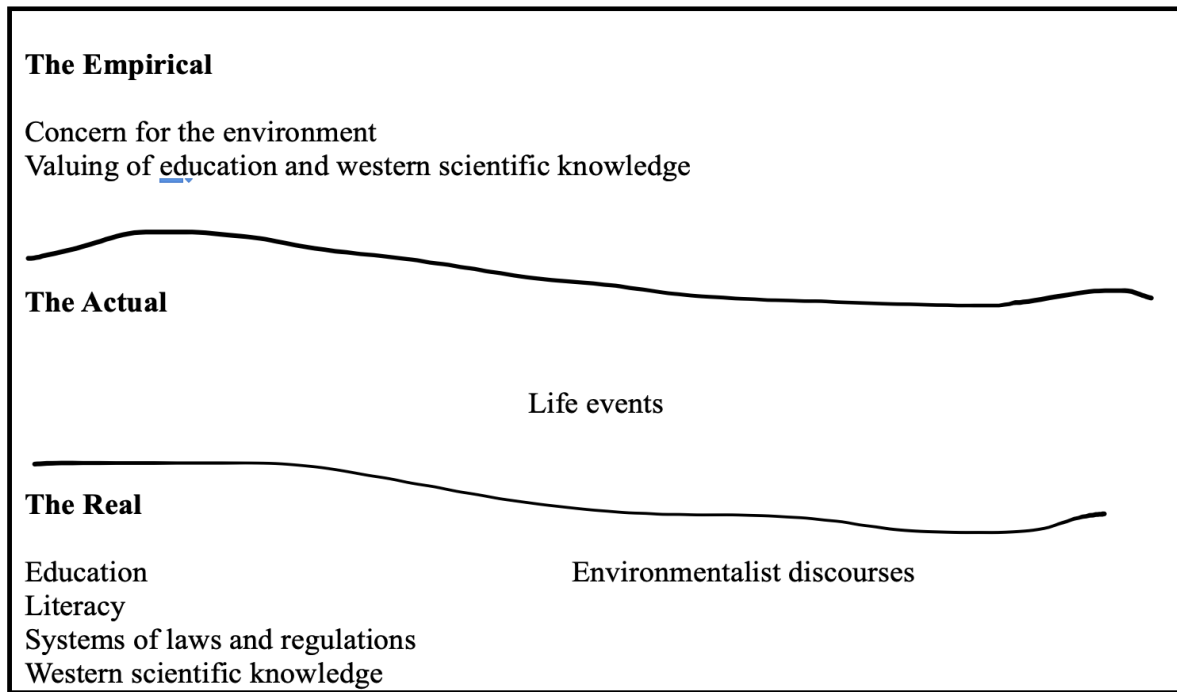


Figure 9.4: The modernist consciousness

My identification of these different forms of consciousness amongst project participants allowed me to account for phenomena observed in the project, such as a reluctance to volunteer. Participants whose social and cultural conditioning had exposed them to discourses constructing work as needing to be paid were more likely to eschew volunteering.

9.2.2 Research question two

The second research question guiding the study asked:

How do different farmers' groups interact with climate-smart agriculture and ecosystem rehabilitation, adaptation and resilience-building interventions?

This question drew on the T₂ to T₃ phase of the morphogenetic framework in that it sought to explore the way different groups exercised their agency as they went about implementing the project. The use of the morphogenetic framework required an acknowledgement that the social and cultural conditioning discussed in Section 9.2.1 above had shaped farmers' interaction with

structures and mechanisms encountered as the project progressed.

I have already noted some researchers' claims that education is a factor contributing to the adoption of CSA principles and practices (Molieleng et al., 2021; Mutuku, 2017). In this study, poor education or a lack of education led to experiences on the part of elderly participants that training was valuable. My data show that the elders valued formal education and exercised their agency to attend training workshops. They then put what they had learned into practice to rehabilitate the land (see Chapter Six) where their poor education had confined them to work as no other employment was available to them. However, poor education emerged as a constraint when farmers came to interact with government departments and local municipalities. For example, the farmers submitted applications to access firefighting equipment to the wrong departments and, as a result, received no assistance in their efforts to combat veld fires. My observations alert us to the need to be suspicious of identifying strict cause-effect relationships and, instead, to follow critical realist thinking to acknowledge the world as an open system and to see tendencies rather than causes and effects.

As I have indicated, the RU project team were all highly educated. They drew on scientific knowledge to advise farmers on starting rotational resting at the beginning of the rainy season on 1 December. The project team's rationale was the argument that grass regrowth was a biological process and hence camp resting should start from the beginning of the rainy season. As noted in Section 9.1 above, farmers drawing on their experience of the way the rural year had traditionally been structured subscribed to a discourse – “December is busy” – to argue against rotational resting beginning in early December in meetings. The farmers' experiences of the world led them to construct December as a time for initiation, other cultural rituals and parties associated with special occasions. As a result, the farmers saw the advice to begin camp resting at the beginning of December as constraining traditional practice.

The social and cultural conditioning of the RU project team led to the privileging of order attained through a formal, written agreement. The project team's privileging of written contracts can be seen to have clashed with the informal consensual practice involving oral agreement of the farmer groups. Even though the RU Project team negotiated and workshopped the formal agreements, only two of the four villages signed conservation agreements. Bylaws generated and agreed to by

the community to control stray animals were set aside as a result of dominant discourses constructing forgiveness as an appropriate response to transgressions of this nature.

Overall, the way different groups could be seen to have exercised their agency was strongly related to social and cultural conditioning. For example, the RU project team exercised their agency by drawing on their environmental science and ecosystem knowledge to promote SLM and CSA concepts. They did this to access funding for the project and continued to draw on this knowledge as the project progressed. The RU team also drew on discourses promoting the green economy. Green economies reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of biodiversity and ecosystem services. The team also privileged a particular form of social order by setting up a Hub system to organise the project. At the level of the Actual, the result was the emergence of a set of training activities aimed at operationalising CSA and ecosystem rehabilitation of the degraded Machubeni landscape.

The elderly farmers exercised their agency while interacting with the project training structure, the CSA and the ecosystem rehabilitation innovations within the Land Rehabilitation Hub. The project team drew on a discourse that privileged environmental stewardship and requested the trained community to use acquired knowledge to volunteer or self-help and rehabilitate the rangelands. From the perspective of the RU team, the benefits that would accrue from rehabilitating the land would far exceed any monetary payments that could be made and, in addition, would be long-lasting. One group of elderly farmers exercised their agency by drawing on discourses privileging the keeping of livestock and the acquisition of knowledge and, in doing so, followed the advice of the project team, self-organised and volunteered. A second group of elderly farmers exercised their agency to resist volunteering by drawing on a different set of discourses privileging paid work and constructing the role of men as being able to put food on the table. The result was the informal naming of the project as *Mabuyaze* or “you go home empty-handed”. This group eschewed volunteering as a result.

On the other hand, the youth exercised their agency by attending training activities and volunteering initially before withdrawing their agency. This group also drew on discourses privileging the idea that work needed to be financially rewarded. In addition, the land tenure system, which meant that only orphans tended to own land, constrained work on the land as this

form of investment was not to the benefit of the group. Discourses privileging the idea that work rehabilitating the land could contribute to the public good, an idea consonant with the concept of environmental stewardship, were shunned. The elderly, on the other hand, tended to have access to land and thus derived a private good from voluntary work contributing to CSA practice. Conditioned to value the cash economy and with no access to land, the youth drew on discourses privileging paid work as a means of feeding their families.

The valuing of paid work and, possibly, the conditioning of the social grant system amongst different groups can be seen to have contributed to the emergence of some extremely negative observations and experiences. For example, a member of one Hub claimed that environmental projects did not address local concerns because *“the people who design these projects are whites. They want them to be run by whites and the settings where these projects will be implemented in Black communities and completely poor”*. What this comment appears to suggest is the view that environmental projects constitute a form of racial oppression.

Discourses promoting volunteering for the public good of saving the environment clashed with those privileging the need for work to be paid for. As a result, some elderly farmers negotiated with the project team to be paid “soap money”, a Xhosa metaphor for the payment of a small amount of money to wash dirty clothes. One member of the RU team did acknowledge that *“no sane person would volunteer to work when starving”* and after that payment for those working to rehabilitate the land was instituted. As a result of this action, the project was renamed by the community *Masibambisane* or “Let's work together”. The successful alignment of the project team's concerns for the environment and community concerns for payment-enabled the CSA innovation to be accepted by one cohort of elderly farmers. Moros et al. (2005) state that pro-market, pro-poor discourse depoliticises nature-society relationships. In the case of Machubeni, it deracialized environmental stewardship and promoted land rehabilitation by enabling green employment. In a context where different groups were characterised by ‘consciousnesses’, the provision of green work for groups privileging paid employment and the willingness of project teams to change their stance on non-payment can be seen to be important.

9.2.3 Research question three

The third research question was more specific in that it looked at home gardens by asking:

How do structural and cultural conditions interact to enable or constrain climate-smart agriculture home gardens crop production?

This question is examined in detail in Chapter Seven. As noted in Chapters One and Two, evidence from most agro-economic studies indicates the physical effectiveness of CSA principles and practices, such as improved soil and water conservation, crop productivity and diversification and mulching. In the project on which this thesis is based the RU team exercised their agency by drawing on their knowledge of science and CSA concepts to develop training activities and social learning exchange programmes to enhance community knowledge. The RU project team drew on the land ownership structure, identifying individuals to act as climate-smart practices trainee farmers and also activated funding to purchase vegetable seeds.

One of the chapter's key contributions to understanding CSA uptake was that the farmers exercised agency in response to the project training structure. The uptake of CSA home gardens varied by age group and group consciousness. Another significant finding was that few males exercised their agency to learn about CSA practices used in home gardens because of gender stereotyping. By contrast, and as discussed in more detail later, the youth exercised their agency to train and implement CSA in the hope of being paid an income.

A second observation emerging from the study was that farmers tended to select one or two principles for implementation because of resource limitations (Lee & Gambiza, 2022). In the selection of principles, the location of the gardens in a water-scarce region suffering from land degradation played a part. Most farmers focused on water conservation (tower gardens) and soil fertility (using manure) conservation in the water-scarce environment. Most of the elderly farmers had access to livestock manure from family herds. The farmers exercised agency drawing on their PEPs to select CSA principles to adopt and dis-adopt. In the case of tower gardens, for example, enablers were water scarcity, discourses valuing subsistence farming and, eventually, the rocky topography. Constraints were monetary as farmers dis-adopted tower gardens when confronted

with the rapid wear and tear on sacks and, eventually, a policy decision on the part of the company selling sacks to recycle, rather than sell, used sacks. The rocky topography then enabled adoption as farmers learned how to use stones to build stacks for the gardens. Farmers whose gardens were in wetlands exercised their agency by drawing on the training workshops to use raised beds (Chapter Six, Figure 6.3). Once again, the landscape acted as an enabler. Training emerged as another enabler as farmers drew on what they had learnt in workshops to practise crop rotation and diversification as well as zero to minimum tillage.

Another condition constraining the adoption of tower gardening was seen in Village 3. Although farmers initially took up tower gardening, they later complained that they were unhappy with the way seeds were distributed, alleging that a project facilitator was engaging in unfair distribution favouring friends and relatives. If the allegation is true, then a discourse I have previously named ‘family first’ and the fact that a community member was able to accrue power as a result of his status as a social actor thanks to his appointment as a project facilitator can be seen to constrain adoption. If the project facilitator was indeed engaging in unfair practices, it would appear that community members were unable to organise themselves and complain to the RU team as a group. This would have involved the transformation of their status from that of primary agents to that of a group of corporate agents. In future projects, work supporting the morphogenesis of agency in this way may be beneficial along with research which looks at why some project members could not effect this transformation. Yet another possibility is that discourses constructing the project as responsible for the supply of seeds also served to constrain adoption.

Yet another set of constraints related to the fact that elderly farmers did not record their earnings. This failure to record earnings could have resulted from the lack of access to quality education. However, it could also be attributed to a ‘consciousness’ which accorded value differently. As I have previously indicated, elderly women, in particular, saw value in their ability to feed their families as a result of their gardening activities.

Upscaling CSA innovation remains challenging and unclear in smallholder farmers' studies (Schaafsma et al., 2018; Selbonne et al., 2022). Studies have demonstrated that upscaling climate-smart irrigation is hampered by top-down approaches, political interference and overdependency

on donors (Kadyampakeni et al., 2015). While other studies argue the need for institutional support in upscaling (Tanti et al., 2022), the project in which this thesis was cited provides insights related to the use of trainee farmers.

According to one of the traditional leaders, trainee farmers took on the roles allocated to them as they saw these as a means of gaining access to project resources rather than as an opportunity to serve the community through mentoring. Nonetheless, instances of mentoring appear in the data (see Section 7.2.2.4 for further explanation). In this particular example, mentoring contributed to the development of a group of corporate agents who were able to diversify into chicken production.

My response to Research Question Three above draws on a snapshot of my analysis presented in Chapter Seven. What I hope I have done in this chapter is demonstrate the explanatory power of critical and social realism in identifying enabling and constraining conditions. This process could then inform the responses of project teams. Critical and social realism have been used by practitioners in other fields to analyse the context in which projects are located. Quinn (2018), for example, argues for the use of critical and social realism to identify the conditions enabling and constraining efforts to develop academics in their roles as professional educators. It could well be the case that a framework of critical and social realism could be a useful tool in managing adaptation projects.

9.2.4 Research question four

The final research question asked:

How do livestock farmers interact with climate-smart ecosystem rehabilitation and resilience building? What enables or constrains adoption and adaptation?

Chapter Eight explored the third phase of the project studied and thus focused on livestock farmers' interactions with CSA and ecosystem rehabilitation. The overarching insight from this phase is that, although structural and cultural conditions worked to constrain or enable uncontrolled grazing, the agency played a key role. The RU team exercised agency by drawing on their scientific knowledge and observations that the Machubeni community had long suffered from the theft and vandalism of fences. Several studies (see, for example, Murata, 2020; Vetter, 2013) note that

programmes promoting fenced camp resting and rotational grazing tend to have been ineffective in the context of gates left open, fences being stolen and water points becoming dysfunctional (Murata, 2020). This led the project team to draw to introduce rotational grazing without fencing.

The RU also drew on the knowledge of community structures to gain approval for the project. Local livestock farmers were initially suspicious of the idea of grazing without fencing because of their previous exposure to projects that provided fences. Climate-smart agriculture (CSA) emphasises the need to reconceptualize local systems. The RU team integrated rangeland veld assessment by trained Eco Rangers, land rehabilitation and the re-grassing of rested camps by LCAs alongside camp resting and rotational grazing without fences. Following several project training workshops and social learning exchange programmes, the community exercised their agency by taking up the ideas and practices being promoted.

As noted in Chapter Eight, a major constraint emerged in the form of rangeland shared with adjacent villages. Boundaries had emerged because of apartheid structures that zoned land use in the former Transkei. Nonetheless, promoting alternative understandings resulted in community members exercising their agency by reaching agreements to share rangelands, establish resting camps and rotate grazing as one community.

The study also identified the roles played by social actors in promoting CSA practices. For example, the acceptance of camp resting without fencing and rotation in Village 4 can be seen to have emerged because of the sub-headman exerting his SEPs as a social actor drawing on discourses to construct his own village and others as an inclusive community. In Village 3 community members from the village and an adjacent village exercised their agency to form a group of corporate agents that agreed to share common pool grazing. To exercise their agency, farmers drew on a consciousness that promoted livestock as a means of providing for families and, thus, the rangeland as a lifeline.

Group discussions conducted in November 2021 revealed that the dominant experience of the new CSA practices was positive in all four villages. Despite positive observations made by livestock farmers on the improved condition of the veld, constraints emerged in the form of cultural practice that drew on discourses promoting the Christmas period as a time for customary rituals and

celebration. The RU project team, supported by officials from the DRDAR, had identified 1 December as an ideal time to start resting the camps. In many respects, the clash between scientific knowledge identifying December as the start of the resting period and discourses constructing December as a time for other activities halted the morphogenesis that had begun.

In Chapter Five, I discussed the different forms of consciousness of different groups in the project, noting that the RU project team drew on what I termed ‘modernist consciousness’ that privileged the regulation of society by written laws and contracts. By contrast, community members drew on a consciousness that privileged oracy and traditional practices involving forgiveness for transgressions. In December, the Eco Rangers exercised their agency to set aside the agreement that stated they would work even if cultural events were taking place in the village. In addition, traditional leaders, who had participated in generating bylaws to regulate access to grazing, backtracked and would not sign a document detailing the bylaws for submission to the municipality. Leaders argued that, in a democratic country, human rights would be infringed upon and that the fines identified were too high.

A final problem related to the need to control veld fire outbreaks. The farmers expressed dismay that the restored veld had been destroyed because of the absence of appropriate firefighting equipment. Drawing on project training, community leaders exercised their agency by applying for fire beaters from DRDAR. As noted in Section 8.4, applications were submitted to the wrong department because of a lack of understanding of government and municipal structures. The interplay of poor-quality education with literacy practices necessary to deal with officialdom and a lack of knowledge of contemporary government structures operated as mechanisms that constrained farmers’ firefighting.

However, some villages exercised agency at the local level, drawing on communalism to firefight together. In some cases, though, individuals without access to land refused to engage in firefighting as they observed the activity as contributing to the private good of landowners. A clash between discourses promoting environmental stewardship and the land ownership structure can be identified in this case.

Camp resting and rotational grazing were resumed at the end of January, so the benefits of grazing

were not as great as they might have been. It is thus possible to identify the partial morphogenesis of practice. However, a final development in this Hub related to a decision on the part of the RU Project Team to approach the South African Government's LandCare Programme for further support for the community once the RU project had come to an end. The LandCare programme did respond but not in the way anticipated by the project team in that an offer to fence rangelands was made. As the project had tried to introduce an alternative practice of rotational grazing *without* fences, in cognisance of the fact that fences installed because of previous funding had been vandalised or stolen, this offer by LandCare was retrogressive. What is clear is that administrators of the LandCare Programme, able to draw on government funding, responded with an easy solution in the form of offering to install fences. This response was indicative of a lack of awareness of the knowledge of CSA and environmental stewardship that conditioned the RU team and which they drew upon to design the grazing-without-fences approach. It can be surmised that officials at LandCare had been conditioned by the social and cultural conditions of apartheid which, as I noted above, resulted from the zoning of land in the former Transkei, and thus the drawing of boundaries marked by fences.

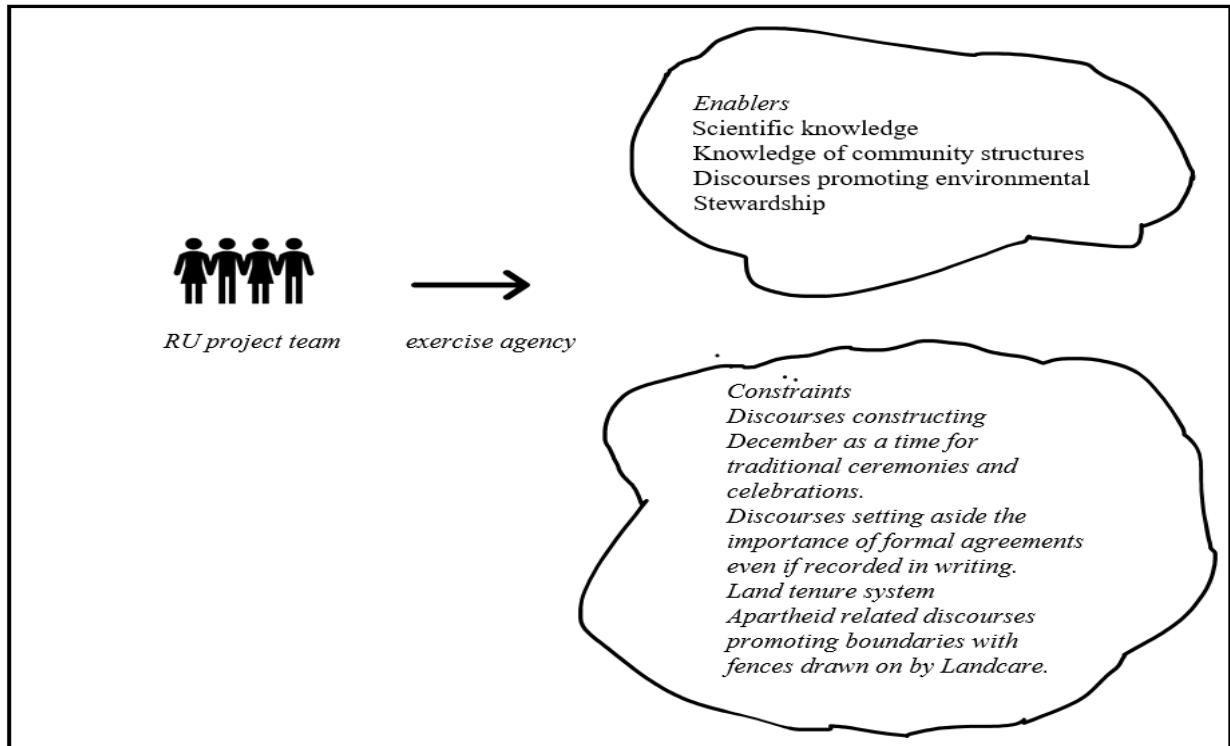


Figure 9.5: The exercise of agency by the RU project team

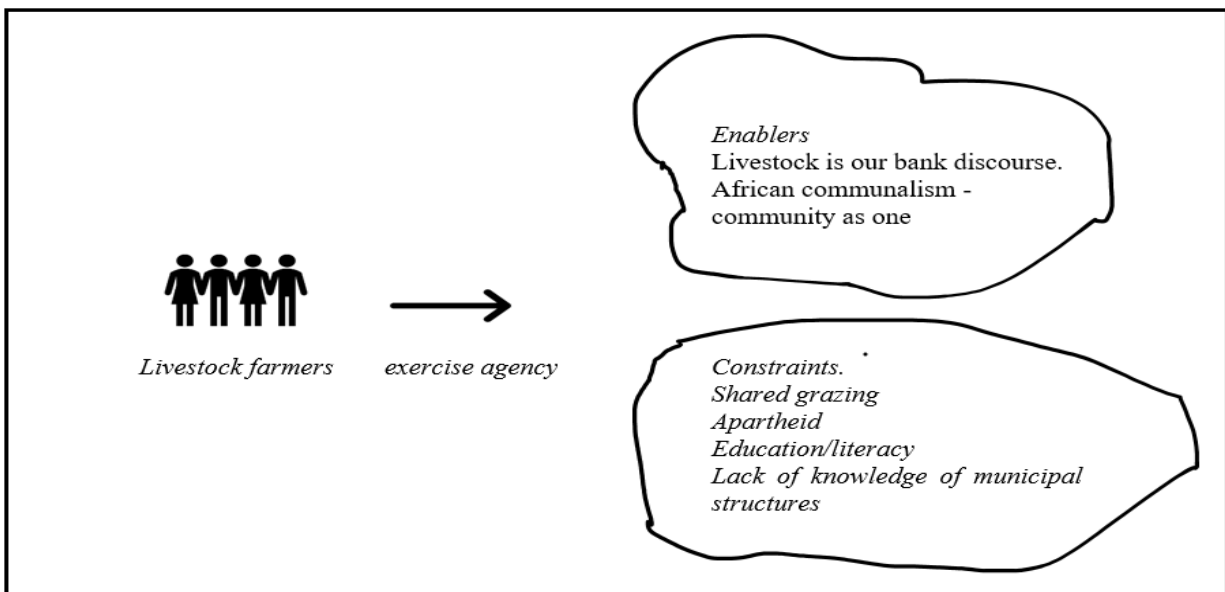


Figure 9.6: The exercise of agency by livestock farmers

9.3 Recommendations

As I have noted throughout this thesis, critical realists acknowledge the world as an open system where events and experiences and observations of those events emerge as the result of the complex interplay of structures and mechanisms at the level of the Real. Critical realists, therefore, do not identify strict cause-effect relationships but rather see the emergence of events at the level of the Actual and experiences and observations at the level of the Empirical as suggestive of tendencies. This means that, unlike studies based on identifying causes and effects, any recommendations need to be made very tentatively. It is in this vein that the following recommendations are made.

- I have already noted the first recommendation, which relates to the power of critical and social realism to identify phenomena that are not observable via the senses. My understanding is that critical realist studies in environmental science are relatively rare. My first recommendation, therefore, is that practitioners embarking on projects should consider using a critical and social realist analysis to explore the social and cultural conditioning in place as a project is being planned. I believe my exploration of the social and cultural conditioning in place in Machubeni could have benefited project leaders and it is possible that some of the actions taken later may well have changed as a result.
- My analysis of the social and cultural conditioning in place at T₁ also calls for the inclusion of community members in project planning from the outset. In making this recommendation I am aware that the timelines for submitting funding proposals are often very tight, and a full analysis might not be possible. Considering the way different ‘consciousnesses’ or ways of experiencing the world could impact the project would however be a useful start.
- Even if the involvement of community members in project planning is not possible, I believe my study identifies the need for ongoing exploration of the way members of the community may be experiencing initiatives introduced by project teams in the spirit of openness to consider the way different ways of being in and experiencing the world may impact on what is happening. Again, this requires time on the part of project leaders who may well be located at a distance from the project site, and I acknowledge that this is a

constraint. Nonetheless, more discussion and mediation in a spirit of openness to understand how different forms of consciousness may impact actions and attitudes could be very valuable.

- Given the power of remuneration for work discursive mechanism in the study site, future CSA projects could consider turning the degraded landscape structures into an employment opportunity. Trained youth climate-smart ecosystem rehabilitators could be paid for rangeland rehabilitation. Others could be employees on commercial CSA farms established on the large tracks of ideal or abounded productive communal land. Project partners could consider providing those interested in CSA home gardens with long-term start-up capital to cushion activities until the gardens become self-sustaining. I acknowledge the need for further research and designing a CSA employment framework involving different forms of consciousness participation in project planning.
- Lastly my analysis calls to question the ideological frameworks and agency of all involved namely local and international agencies, as well as local partners and grassroots organisations affected by climate change and its effects for improved attitude and action as South Africa and Africa face unprecedented challenges over the next 25 years .

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APPENDICES

Appendix A: Conservation agreements



Isivumelwano soLondolozo lwabaxhamli

UKUKHUTHAZA UKUSETYENZISWA KOMHLABA NGENDLELA ELUNGILEYO
KUMANTLA yeMZIMVUBU CATCHMENT

Igama lelali													
Igama lombutho Wabafama													
Igama kaSihlalo													
ID number kaSihlalo													

Phone number kaSihlalo			
Amalungu eKomiti (ukuba baphezulu kwintandathu bhala kwelinye iphepha)			
Igama	Isikhundla	ID Number	Phone Number
Umnxibelelanisi welali onyuliweyo			
Igama	Phone Number	ID number	Tyikitya

MNP Ummeli		
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Intshayelelo:

Esi sivumelwano sisekele kwintsebenziswano kunye nentando phakathi kwekomiti yemfuyo yelali kunye ne Meat Naturally Pty (MNP). Ngokutyikitya kwesi sivumelwano omabini amaqela avumayo ukulandela izikhokelo ezikolu xwebhu ngokobunono bawo.

Esi sivumelwano asibeki caleni amalungelo omphakathi ngokubhekisele kusetyenziso lomhlaba njengoko kuchaziwe ngabasemagunyeni bemvelo, kodwa ixhomekeke kuthembana kwaye ijonge ukungqinelana nemigaqo yendawo.

The Meat Naturally Initiative (MNI) linyathelo loLondolozo loMzantsi Afrika elifuna ukukhuthaza ukugcinwa kwemfuyo okuzinzileyo kunye nokusetyenziswa komhlaba kwindawo ekumantla yeMzimvubu Catchment. MNP lishishini lwezentlalo apho i-60% yenzuzo iyakutshintshelwa kwiMeat Naturally Trust ukuze iphinde ityale imali kwicandelo lemfuyo loluntu apho imibutho lwabafama ethathe inxaxheba iya kuxhamla kakhulu.

Esi sivumelwano sokuqala **siphelelwa emva konyaka (Oct 2019 – Sept 2020)**. Imigaqo yesivumelwano iya kuphinda ixoxwe kwaye ilungiswe ngaphambi kokuvuselelwa, ngokuxhomekeka kwizifundo ezifundiweyo ngokuphumelela kwemisebenzi.

Eyona nto ifunekayo kukuba ikomiti yemfuyo ikhokele abanini bemfuyo ukuba babeke ecaleni kwaye banyanzelise ukuthotyelwa kokubeka bucala ikampi ekungazotyiselwa kuyo ngehlobo (“Maboella/Dobo”). Oli dlelo ke lufumaneka njengebhanki yokutya ebusika kwaye inokusetyenziswa emva kwengqele yokuqala ngokwesivumelwano sombutho wemfuyo.

Ukutyikitya kwesi sivumelwano, Mna _____(igama) njengommeli we _____ikomiti yemfuyo, ndiyavuma ukulandela isikhokelo njengoko kucacisiwe kwesi sivumelwano:

1. Ukuzaliswa kolu lwazi lulandelayo (ngoncedo oluvela kumququzeleli we-MNP)
 - a. Isivumelwano soLondolozo lwabaxhamli esityikityiweyo;
 - b. Iinkcukacha zamalungu ekomiti emfuyo (ngaphezulu);
 - c. Igama, utyikityo kunye nophone number umnxibelelanisi welali onyulwe yikomiti (above);
 - d. Uluhlu olupheleleyo lwabanini bemfuyo kunye neenombolo zemfuyo yelali (uluhlu oluqhotyoshelweyo) abayinxalenye yombutho;
 - e. Indawo yokutyisa kufuneka izotywe kwimephu ebonelelweyo ngesivumelwano nekomiti yemfuyo;
 - f. Uyilo womgaqo-siseko wombutho.
2. Nyanzelisa ukuthotyelwa kokutyisa kwiinkampi ezithile ngokwexesha lonyaka, ngo-Okthobha ukuya ku-Epreli, (nceda uzobe iinkampi ezizakuphunyezwa ngehlobo kwimephu ebonelelweyo). Nika i-MNP ubungqina bokuzijonga ngohlobo lwephepha lokurekhoda labaphuli mthetho kunye nezohlwayo. Ukongeza, Ummeli we-MNP uzakweza ulandelelo, anike ingxelo kusihlalo wekomiti yemfuyo osayina ukwamkelwa
3. Bungqina benani lesitokhwe esibonelelweyo kwinyanga enye (kwiintsuku ezingama-30) ngaphambi kwawo nawuphi na umsitho wentengiso ngokugqitywa kwesitokhwe kuluhlu olunikezelwe ngumququzeleli welali onyuliweyo kwaye lubuyiselwe kummeli we-MNP (ubuncinci beenkomo ezingama-70)
4. Ukususwa kokuqala wemithi womnga kumadlelo akhethiweyo kwi 2 ha ukuba ubonelelwe ngezixhobo ngokwe-4 engezantsi

Emva koko, uMeat Naturally Pty (MNP), unika ezi zibonelelo kunye nenkuthazo kwikomiti yemfuyo:

1. Ifolda ebuyiselwe kwikomiti yemfuyo. Kwifolda iya kufakwa imephu eprintiweyo yendawo ezakuphunyuzwa kungatyiswa kuyo, iikopi zesivumelwano kunye nemfuyo kunye noluhlu lomnini.
2. Ukubonelelwa kweentengiso zeenkomo zalapha ekhaya, nangaliphi na ixesha lonyaka ukuba ubuncinci beenkomo ezingamakhulu asixhenxe ziyafumaneka kwiilali ezahlukeneyo. Ikhomishini emalunga ne-4% iya kuncitshiswa kubathengisi ekupheleni kwexesha lokukhula / ihlobo ukuba isivumelwano sigqityiwe satyikitywa kwaye kwafunyanwa ukuhambelana okufanelekileyo. Ukuba ayenzeki le nto, kuya kuhlulwa 6% ikhomishini. Nabaphi na abathengisi abangayonxalenye yombutho baya kuhlala behlawulwa ikhomishini ye-6%;
3. 3. Apho ukuthotyelwa kwafunyanwa ngexesha lesivumelwano kwilali ethile ezi zibonelelo ezongezelelweyo zilandelayo ziya kubuyiswa ngeenyanga ezintathu ezidlulileyo:
 - a. Ukubonelela isitofu sokugonya seCovexin10 ngoMeyi kuzo zonke iinkomo (njengoko zidweliswe apha ngasentla);
 - b. Ukuqesha abantu ababini abasuka kwumibutho (abonyulwe ziikomiti zeemfuyo ezichaphazelekayo) iintsuku ezimbini ukuya kwezintathu ngeveki yomsitho wentengiso nganye;
 - c. Ukuboniswa kwamashishini amatsha azinzileyo afana nokutya okuvela kwu-mnga apho kunokwenzeka;
 - d. Ukubhatalelwa isiqingatha ukufumana uphawu lwendlebe lemfuyo ukufakwa ukwahlula ngamabala kwimfuyo kumbutho nganye / kwingingqi nganye ukukhangela isitokhwe ukuya kwindawo sisuka kuso ukunqanda ubusela lweemfuyo;
 - e. Uncedo kubhaliso lokuchonga izilwanyana kwilungu ngalinye elinemali yenkxaso-mali engama-R80 kwisicelo ngasinye;
4. Ukubonelelwa ngeendawo zokucheba iigusha kunye nendawo yokuhlelwa kwexabiso ngokongezwa kwimveliso yoboya kunye nentlawulo ekhawulezileyo kubavelisi ngoSeptemba / ngo-Okthobha ka-2019. Ukuba inzuzo yenziwe yi-MNP le iya

kusetyenziswa ukubonelela amavolontiya ombutho (abantu abangama-5 ukuya kweli-10) izixhobo zokucoca izityalo zasemzini.

Izithintelo:

- Ndiyaqonda ukuba igalelo kunye nenkxaso ebonelelwe yiMeat Naturally Pty isebenza kuphela lo gama ndihambelana nesi sivumelwano kwaye izibonelelo ziya kumiswa xa ndingahambelani nemigqaliselo yesi sivumelwano.
- Ukungathotyelwa kwemigaqo kugqitywa emva kweziganeko ezibini apho ubungqina beefoto bubonisa ukuba amadlelo kwiindawo ekuvunyelwene ukuphunyuzwa kuyo. Umququzeli uya kwenza iingxelo ezimbini ngenyanga emva kokugqitywa ulandelelo aze anike ingxelo kusihlalo wekomiti.
- Kwiimeko apho esi sivumelwano asikho kwaye ukuthotyelwa kungafikelelwa, amaxabiso ekhomishini ye-6% kwiiifandesi aya kusebenza.

* Esi sivumelwano seMeat Naturally sisebenza ukususela kumhla osayinwe (ngezantsi) kude kube _____ 2019, emva koko ukuhlaziywa kwesiivumelwano kuya kuphinda kuxoxwe.

QAPHELA: Lonke uxanduva lokuthobela umthetho wesizwe nowamaphondo luphumle kumnini / umnini mhlaba.

USIHLALO WEKOMITI LWEMFUYO:

Tyikitya: (umhla)

Umhla wokutyelelwa nguMmeli we-MNP okanye umcebisi ovunyiweyo:

.....

Ummeli we-MNP:

Tyikitya: (umhla)

Appendix B : Participant informed consent form

PARTICIPANT INFORMED CONSENT

INFORMED CONSENT DECLARATION

(Participant)

Project Title: A critical realist exploration of rural small-scale farmers' strategies to enhance adaptation and resilience building in degraded semi-arid landscapes, Machubeni, South Africa

Idah Mbengo from the Department of Environmental Science at Rhodes University has requested my permission to participate in the above-mentioned research project.

The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

1. The PhD attempts to understand communal small-scale farmers' livelihoods response to drought risk, adaptation, and resilience building in degraded semi-arid landscapes in Machubeni, South Africa.
2. Rhodes University has given ethical clearance to this research project (***Ethics Approval Number***), and I have seen/may request to see the clearance certificate by contacting Mr Siyanda Manqele (s.manqele@ru.ac.za).
3. By participating in this research project, I will contribute to understanding drought and CSA intervention on your livelihood. Further, it will contribute toward critical reflection on why drought intervention measures such as CSA home gardens, rotational grazing, bylaws, and land rehabilitation succeed/fail. I will contribute recommendations to improve drought livelihood intervention in rural communities.
4. I will participate in the project by committing to at least monthly pre-scheduled interviews. The researcher requests to observe me working on GEF5 intervention activities such as Conservation Agriculture (CA) and land rehabilitation: Livestock management and

rotational grazing and governance matters. The researcher requested my reflection on the SLM interventions on household livelihood, your community, and ecosystems.

5. My participation is entirely voluntary, and should I wish to withdraw from participating further at any stage, I may do so without any negative consequences.
6. I will not be compensated for participating in the research.
7. The following risks are associated with my participation: There are a few potential risks or burdens to me if I decide to participate in this research. However, the researcher will mitigate as far as possible.
 - The research ran over a year to observe the SLM intervention activities. The time commitment for monthly interviews might be a burden to you.
 - Because of the nature of the study, sensitive or negative data may be reviewed in the interviews, observation, and documentation. You will access all the data and approve, remove or change it before it can be included in this report and publications.
 - The research takes place in Machubeni villages. Although the researcher will strive to maintain confidentiality, it might be possible to identify sensitive aspects specific to the village in reports. In such cases, the researcher will get your approval before such documentation goes public. Also, an independent academic or a member of the ethics committee will review the reports or publications.
8. The Principal Investigator intends to publish the research results as a PhD thesis. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conducting of the research *unless I indicate to the contrary/recognise that as a public figure, my identity will inevitably be/become known.* (**Agree/Accept** loss of confidentiality).
9. I will not receive feedback/will receive feedback in the form of a workshop regarding the results obtained during the study.
10. I agree/disagree to the Principal Investigator's request to take photographs or video me as part of this research project.
11. I agree/disagree to the Principal Investigator's use of voice recording of my comments and opinions during interviews.

12. Any further questions that I might have concerning the research or my participation will be answered by Idah Mbengo Rhodes University, imbengo2013@gmail.com
13. By signing this informed consent declaration, I am not waiving any legal claims, rights or remedies.
14. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I,, have read the above information / confirm that the above information has been explained to me in a language that I understand, and I am aware of this document's contents. I have asked all the questions I wished to ask, which have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressured in any way and voluntarily agree to participate in the project mentioned above.

.....

Participants signature

Date

Rhodes University, Research Office, Ethics

Ethics Coordinator: ethics-commitee@ru.ac.za

t: +27 (0) 46 603 7727 f: +27 (0) 86 616 7707

Room 220, Main Admin Building, Drostdy Road, Grahamstown, 6139

Appendix C: In-depth interview guide sample

Good morning,

Today's interview is designed to help me understand who, what and why households are vulnerable to drought hazards and your experience with the GEF 5 CSA land rehabilitation strategies as a Land Conservation Activistic (LCA) Hub member.

Personal Livelihood concerns and projects

What do you want in life? How do you plan to achieve your wants/ concerns? What are you worried about? How do you plan to address the worry? Is there anything absent that would enable you to achieve your wants/concerns?

Experience as a LCA Hub participant

1. When did you become a member of LCA? Was it difficult? Did someone persuade you to join the LCA Hub rather than the other hubs, e.g., CA, Livestock?
2. How did you reflect on the new opportunity personally or your group? What reasons did you have to think this way?
3. Who did you discuss with before joining?
4. Could you describe how you(events) became part of the Land Rehabilitation Hub LCA?

PHOTOS OF LCA HUB ACTIVITIES (Empirical experience as LCA Hub participant)

The following photos show LCA Hub activities at various points in 2019 – 2021:

Land Rehabilitation Training 2017- 2018



1. Could you describe events in each picture: a, b, c, d?
2. Which of these methods have you personally implemented? Where? Why? How?
3. Could you describe events/ structures/ culture that enabled you to implement the various methods?
4. Could you describe events/structures/ culture that have constrained your implementation of the various methods? How? Why?
5. Where have you rehabilitated the land? Was it difficult? Why? How did you solve the problem?
6. Have the rehabilitation activities contributed to the rangeland condition?
- 7.

Youths

8. Are the youths in the picture still part of the LCA Hub? Why?
9. What constrained/enabled them?
10. Who and what can change the conditions for youths to be involved in healing the land?

11. What would need to be available for the youth to participate?

Local Knowledge

1. Is there land rehabilitation knowledge from your past that you combined with training that you received?
2. If so, how did what work best for you? How did you experiment?
3. Did you share your experiments with your trainers, or did you colloque?
4. What were the enablers and constraints in your training? Are there any existing cultural values that support Land rehabilitation
5. In what ways did it affect your decisions? How?

Vetiver nurseries

1. Turning to your garden, could you describe what is happening?
2. Why have you planted Vetiver?
3. How are you using it to rehabilitate the land? Why? What are the enablers/ constraints that you face, if any?
4. What would be needed to be in place to use a Vetiver for rehabilitation?

Community self-organisation (Photos)

1. Can you recall events of how you self-organised your group to rehabilitate the rangelands? How were they used? Why?
2. What are the enablers/constraints of self-organisation?

Financial matters Monetary

1. How did the idea start?
2. How did you solve the problem?
3. Were there any challenges you faced in paying for your services
4. Looking back, has being an LCA addressed your goals/ wants / How? Why?

Sustainability

1. Describe how LCA rehabilitation will continue after the GEF 5 project ends in December 2021 – April 2022.
2. Is there a particular organisation that assists in land rehabilitation?
3. Has GEF 5 met your concerns and projects? How and why.

Thank you. We have come to the end of our interview.

Appendix D: Ethics Approval



Rhodes University Human Ethics Committee
PO Box 94, Makhanda, 6140, South Africa
t: +27 (0) 46 603 7777
f: +27 (0) 46 603 8822
e: s.mangale@ru.ac.za
NTRC Registration number: RC-24114-045
<https://www.ru.ac.za/researchgateway/ethics/>

27/05/2021

Idah Mbengo

Email: g20m4976@campus.ru.ac.za

Review Reference: 2021-2831-6052

Dear Professor James Gambiza

Title: Critical realist exploration of rural small-scale farmers' strategies to enhance adaptation and resilience-building in degraded semi-arid landscapes, Makhabela, South Africa

Principal Investigator: Professor James Gambiza

Collaborators: Mrs. Idah Mbengo,

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Human Ethics Committee (RU-HEC). Your Approval number is: 2021-2831-6052

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying you when the annual report is due.

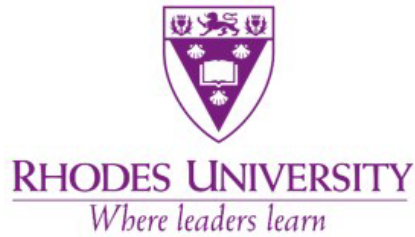
Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloging number allocated.

Sincerely,

Prof Arthur Webb

Chair: Rhodes University Human Ethics Committee, RU-HEC

cc: Mr. Siyanda Mangale - Ethics Coordinator



Rhodes University Human Research Ethics Committee

PO Box 94, Makhanda, 6140, South Africa

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13 August 2023

Mrs Idah Mbengo

Email: g20m4976@campus.ru.ac.za

Review Reference: 2023-2831-7931

Dear Mrs Idah Mbengo

Re: Human ethics renewal application: Critical realist exploration of rural small-scale farmers' strategies to enhance adaptation and resilience building in degraded semi-arid landscapes, Machubeni, South Africa

Researcher: Mrs Idah Mbengo

Supervisors: Professor James Gambiza,

This letter confirms that the above Annual Report has been reviewed and **APPROVED** by the Rhodes University Human Research Ethics Committee. Your Approval number is: 2023-2831-7931

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period.

Please ensure that the Human Research Ethics Committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the Human Research Ethics Committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Sincerely,

Dr Janet Hayward

Chair: Rhodes University Human Research Ethics Committee, RU-HREC

cc: Ethics Coordinator