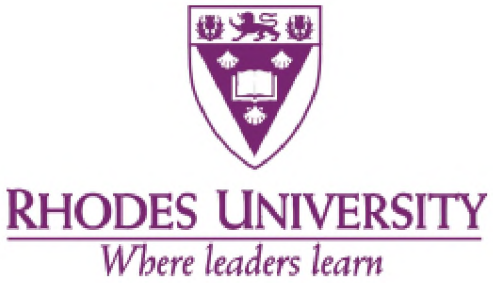
THE ROLE OF FIELD AND GARDEN CULTIVATION FOR FOOD SECURITY UNDER A CHANGING CLIMATE: THE CASE OF FAIRBAIRN AND NTLOKO VILLAGES, EASTERN CAPE



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ABSTRACT

The world is becoming more complex due to the increasing occurrence of social-ecological change. This is particularly evident in the developing world, especially on the African continent, where existing vulnerabilities (i.e. endemic poverty, weak governance, over-population and HIV/AIDS) are being exacerbated by the impact of climate change. Climate change poses a very real threat to millions of Africans, especially those who rely on the natural world for their livelihoods. The increasing variability of climate and rainfall patterns are said to have dire consequences on agricultural production which is the main livelihood activity of rural dwellers across the continent. The impacts of such change and variability include, changes in the frequency and intensity of droughts, flooding and heavy storms, leading to worsening soil conditions, desertification as well as disease and pest out-breaks which will likely result in reduced crop and livestock yields. A reduction in agricultural production will likely have a negative effect on the food security of millions of people. This study was conducted in the Eastern Cape of South Africa, in two rural villages, Fairbairn and Ntloko located in the former Ciskei homeland, with the purpose of exploring the nexus between climate change, cultivation and food security.

This study combined social-ecological thinking with that of political ecology to create a robust lens, in which to analyse the complex interactions between humans and the environment. A mixed methods approach was used to gather the data which consisted of a household survey, using a structured questionnaire as well as semi-structured interviews with various respondents. Quantitative data were analysed using Excel and Statistica 13, whilst coding was used for qualitative data. The main aim of the study was to explore the extent and characteristics of cultivation in the two study sites, the role of household food production in food security as well as the challenges that local cultivator's face with regards to climate change. In recent decades, there has been a decline in rural agricultural production with many fields that were previously cultivated, lying vacant and unused. However, as this study found, cultivation is still important as over 50% of sampled households cultivated a small area within the homestead. This was mainly done to supplement household food expenditure in order to save cash incomes. The results also found that although participants had perceived negative changes in climate and rainfall (amount, onset, duration), it was not considered the most important challenge for own production. Rather, lack of fencing and capital were seen as major hindrances to efficient own production.

Understanding the complexity of own production and food security under a changing climate can help form better and more resilient policies and strategies for rural development, in addition to strengthening future livelihoods of rural people in an ever changing world.

DEDICATION

This thesis is dedicated to my friend Wesley Day.

It was an honour and a privilege to have known you. I feel truly blessed, to have called you my friend.

"You will always be remembered

You will be celebrated

You will never be forgotten

These tears still haven't faded" – The Flatliners

DECLARATION

I, Haydn James Brooks, hereby declare that the work described in this thesis was carried out in the Department of Environmental Science, Rhodes University under the supervision of Professor Sheona Shackleton. The thesis has not been submitted to a university other than Rhodes University, Grahamstown, South Africa. The work presented here is that of the author unless otherwise stated.

Haydn James Brooks
……
Date: March 2017

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CHAPTER 1: INTRODUCTION, FRAMEWORKS AND STUDY APPROACH

Picture by Samantha Spooner, Mail & Guardian, 2015

1.1 CHAPTER OVERVIEW

In this chapter, I provide the overall introduction to this study. I set the scene by addressing the literature surrounding the complex interactions between climate change and agriculture, and the subsequent effects on livelihoods and household food security, focusing on small holder agriculture. This study specifically focusses on two rural communities in the former apartheid homeland of the Ciskei, located within the Eastern Cape province of South Africa.

I briefly discuss the concept of global climate change as a starting point for the rest of the thesis. In doing so, I address the causes and effects of this phenomenon, specifically the effects on agriculture and rural livelihoods amongst poor communities throughout the African continent including South Africa. Following this, I briefly explore the South African agricultural system, with a focus on rural household food producers. I seek to explain the complexity of this sector as well as the role it plays in household food security and rural livelihoods. Thereafter, I present the study aims, objectives and key research questions. Furthermore, I introduce the conceptual frameworks and theoretical perspectives that were used to frame this study, namely social-ecological systems and political ecology.

Following this, I present a description of my study areas and the methodologies that were used for this research, specifically household surveys and semi-structured interviews. In addition to this, I address how the data were collected and analysed. This section also highlights the limitations that were encountered in the study. Lastly, ethical considerations of the study are addressed and explained.

1.2 INTRODUCTION

1.2.1 Climate change and the global context

Globally, the climate and weather is changing. This is evident from research documented in numerous Intergovernmental Panel on Climate Change (IPCC) reports that have been published throughout the last 20 years. Global average surface and ocean temperatures are rising, with the last three decades being successively warmer than any since 1850. These changes are mainly attributed to the rise in greenhouse gasses such as carbon dioxide (CO_2), nitrous oxide (NO_2) and methane (CH_4) from anthropogenic activities. These activities include the burning of fossil fuels like coal and petroleum, de-forestation, commercial agriculture as well as the waste, energy and other demands of a rapidly growing world

population. A rise in global average temperature of even 2^0C will have a profound effect on all forms of life (IPCC: 2007, 2013 & 2014).

Some observable effects of climate change include: more frequent and intense flood and drought events, erratic precipitation patterns both inter and intra-annually, unpredictable season changes and season variability, more extreme forms of weather (violent storms, heat waves, etc.), sea level rise, biodiversity loss and in some cases species extinction (IPCC: 2013). Furthermore, the effects of climate change and climate variability are likely to impose additional pressures on water availability, water accessibility and water demand (IPCC: 2007), which could have disastrous effects in semi-arid and arid regions, which characterise the areas dealt with in this study. The effects of climate change are not limited to those mentioned above, but rather, there will be a wide range of knock-on effects including issues of health with the spreading of diseases (malaria, cholera etc.), infrastructural damage (from extreme weather events) as well as a massive impact on agricultural production, and in turn, food security (IPCC: 2014, FAO: 2014). The consequences of such change, pose serious risks for the fragile and vulnerable African continent.

1.2.2 Africa and climate change

Africa is plagued by development challenges, such as endemic poverty, weak governance and political institutions, debt, limited access to capital and investment, including markets, infrastructure and technology as well as ecosystem degradation, violent conflicts and natural disasters (IPCC: 2007). These processes create high levels of vulnerability and low adaptive capacity, which are unfortunately a feature throughout the developing world (Thomas et al.: 2007). Therefore, although the African continent has contributed very little to the causation of climate change, it will continue to suffer the greatest (Toulman & Huq: 2006) due to its inherent vulnerability and the complex combination of socio-economic, political, environmental and cultural factors and stresses that are being exacerbated by climate change and climate variability.

The climate and weather exert a significant control on the day to day economic development of Africa as well as many people's livelihoods, particularly those involved in agriculture who rely heavily on water and other natural resources (IPCC: 2007). For societies that directly utilise natural resources within their livelihoods, for example through cultivation, changes in climate during the 21st century may represent significant disturbances and threats. This

especially applies to change that is extreme and includes elements of surprise or unpredictability, through the occurrence of extreme weather events (Thomas et al.: 2007).

Agriculture plays a crucial part in local livelihoods and in many countries, it can contribute to up to 70% of GDP (Mendelsohn et al: 2000). In sub-Saharan Africa alone, it is suggested that 70% - 80% of people rely directly on agriculture and natural resources for their livelihoods (Toulman & Huq: 2006). Although, with the current levels of urban migration in South Africa, these figures would be considerably lower. However, the effects of climate change such as more intense droughts and floods, as well as increased variation in rainfall patterns pose a large risk to agricultural output, which are vital for Africa's food security. Specific impacts include reduction in the amount of land suitable for both cultivation and livestock agriculture, soil degradation, increase in pests and plant disease, the reduction in the length of the growing season and a decrease in yields, particularly for semi-arid and arid areas and those who rely on rain-fed agriculture (Madzwamuse: 2010).

1.2.3 South Africa and its agricultural landscape

Although agriculture does not make up a large portion of South Africa's GDP (roughly 3%) (DAS: 2012) compared to other sub-Saharan countries, it is still an important livelihood activity, especially for a large portion of the population living in rural areas (Aliber & Hart: 2009). Hence, South Africa is not immune to the above mentioned effects.

The South African agricultural sector is dualistic in nature (Aliber & Hart: 2009), comprising of a predominantly white owned, large scale, commercial sector which is situated on 87% of the total agricultural land and a small-scale, rural sector, usually found in the former homeland territories on the other 13% (Aliber & Hart: 2009, Kirsten & Van Zyl: 1998, Lahiff & Cousins: 2005). In this thesis, I shall only be focussing on the latter. According to Aliber & Hart (2009) this sector comprises of between 1.25 million and 3 million farmers, cultivating small fields or homestead gardens mainly for household consumption, although it is not uncommon to see some degree of commercial activity in times of surplus production. Many of these cultivators are situated within former homeland[1] territories on marginal lands with

[1] According to the Encyclopaedia Britannica (2009), Homelands or Bantustans as they are commonly referred to are any of the ten pseudo-national territories that were created by the former apartheid government for the black population living within South Africa during the mid to late 20th century. They were used as a major administrative device by the Nationalist Party for the exclusion of blacks from the South African political system. These areas were organized on the basis of ethnic and linguistic groupings. In theory, they were meant

little nearby infrastructure and access to markets (if commercial) (Aliber & Hart: 2009). Of the 4 million involved in this sector of agriculture, some 3 million are said to produce in order to meet household consumption needs (DOA: 2001 in Aliber & Hart: 2009).

Rural agriculture was previously characterised by the cultivation of one to two small to medium (1-2 ha) (Hebinck & Lent: 2007) sized fields, however, in much of the recent literature (see Shackleton & Luckert: 2015) this is shown to be changing and there is a general move away from field cultivation (see *Chapter 2*). Home gardens (or homestead gardens) have instead emerged as the most popular way of cultivating in rural areas, particularly in the Eastern Cape where this study is based. These gardens tend to be smaller in size compared to fields and usually range from a few square metres to around 1 ha (see Chapter 2). Although, not as common as before, larger, field-like plots are still cultivated by a few households (Shackleton, Shackleton & Cousins: 2001). Homestead gardens are usually cultivated for household consumption, yet some commercial operations do exist. These small home gardens have many different advantages over field cropping. Being in close proximity to the household, they are usually better protected from intruding livestock and theft as the homestead is fenced in addition to being easier to maintain and look after (Hebinck & Lent: 2007). Intercropping staples such as maize or sorghum, with additional crops like butternut, spinach, beans and a variety of others seems to be normal practise, although not for field cultivation which are usually mono-cropped with maize, potatoes or butternut (Hebinck & Lent: 2007). Production from these small plots is generally quite low relative to commercial enterprises as the area cultivated is much smaller. Other factors influencing small scale production include a believed cultural resistance to "modern" technologies, low inputs, inefficient practices as well as lack of capital investments (Fenwick & Lyne: 1999). Even though production is usually quite low, cultivation is still an important livelihood activity for many rural households and contributes to the food consumed by the household.

1.2.4 Cultivation and rural livelihoods

Up until the 1950's, rural households produced most of their own food (Baipheti & Jacobs: 2009). However, after the 1950's there has been a move towards livelihood diversification, which has seen an increasing dependence on cash based strategies and sources such as state

to be self-governed however, in practice this was not the case. These lands were often degraded and over-crowded.

social grants, remittances and urban employment (D'Haese et al.: 2013). As a result, food expenditure of low income households can be as much as 50-80% of their total income (OXFAM: 2014, Baipheti & Jacobs: 2009). Although agricultural practises like cultivation and cropping have experienced a steady decline over the past century and continue to (see Hebinck & Lent (2007), Byrceson (1998), Falayi (2017)), field and more specifically home garden cultivation, as mentioned above, continues to be an activity that many rural households, in particular women, engage in (Shackleton, Shackleton & Cousins: 2001). However, compared to the past, cultivation and own production is now mainly used to supplement household food and therefore reducing expenditure on food, thus freeing up cash that can be spent on other things, and in theory improving rural household food security (Baipheti & Jacobs: 2009).

1.2.5 Point of departure: The role of cultivation in household food security and rural livelihoods

Given this background, the point of departure for this thesis will be to address the current role of cultivation in household food security and rural livelihoods at the local level within the context of a changing climate. As agriculture and cultivation in rural areas continue to decline and dependence on cash based incomes and sources increase, it is vital to address the effects of such on rural household livelihoods and food security. Food security is a major issue in South Africa (see *Chapter 3*) with one out of four people suffering from hunger. It is estimated that around 36% of those living in the Eastern Cape Province (the most food insecure of the nine provinces) are suffering from food insecurity (OXFAM: 2014). In rural development literature, it is widely considered that agriculture is the best way in which to reduce rural poverty and food insecurity (Machethe: 2004), although this narrative is changing to include a more economic approach. Altman, Hart & Jacobs (2009) emphasise that access to appropriate state extension and support services are an important contributor to cultivation for food security. This is furthered by Baipheti & Jacobs (2009) and Drimie et al. (2009), who believe small scale agriculture can address the issue of food security especially among vulnerable households. However, these authors premise that there needs to be a significant increase in productivity which could be achieved by encouraging farmers to pursue sustainable intensification through improved inputs as well as developing a well-functioning market system for such farmers. In contrast, Scoones & Wolmer (2003) argue that the poor cannot effectively participate as small holders in a liberalised, market orientated

rural economy due to lack of skills, resources and capacities to do so. Furthermore, some studies suggest that household food production does not seem to contribute to a higher food security status and that rather human capital should be emphasised such as promoting education, employment and rural opportunities (De Cock et al: 2013). Shackleton & Luckert (2015) argue that the latter is a first step to improved production systems as the work of Ndlovu, Luckert & Shackleton (2014) found that households with more education applied their time more efficiently and productively.

The link between cultivation and food security is extremely context specific, in so far as it works in one place, will not mean it will work in another. There are many historical, environmental and institutional factors that are at play. Assessing the extent of cultivation and its importance (or unimportance) in rural livelihoods is the first step to addressing the way forward in which to combat the issue of food insecurity that is prevalent throughout South Africa. Furthermore, due to changing global climatic conditions and weather patterns, it is vital that the effects of these changes be addressed with regards to the likely further difficulties and challenges they bring for cultivators and future food security at a grassroots or local level. This is important, not only for rural livelihoods but sustainable rural development as a whole.

1.3 AIMS AND OBJECTIVES

In this thesis, I aim to address the above issues by further exploring the matter of cultivation and household food security status in two rural villages, located in the former apartheid homeland of the Ciskei within the Eastern Cape. Specifically, this study explores the extent and characteristics of cultivation in the two study sites, the role of household food production in food security as well as the challenges that local cultivators face with regards to climate change now and in the future. Study objectives and key questions include:

1. To examine the extent of cultivation in the two study sites.
    - What proportion of households are participating in cultivation?
    - Who is cultivating?
    - At what scale (fields or home gardens) is cultivation being practised?
    - What are the reasons for participating or not participating in cultivation?

2. To explore the characteristics of cultivation in both study sites.
    - What crops are being produced in fields and home gardens?

- What are the production levels?
- What inputs and practises are being used in fields and home gardens?

3. To assess the level of food security (access) and the role of cultivation in food security.
   - Where do people get their food from?
   - What is the average household food expenditure?
   - What is the general level of food security (access)?
   - What is the contribution of local cultivation and are cultivators more food secure than non-cultivators?
   - What are some other influences on food security?

4. To explore local people's perceptions of climate changes and impacts on cultivation.
   - What are some of the main experiences or challenges facing cultivators and how does this relate to climate change?
   - How do local people (cultivators or not) perceive climate change, specifically rainfall?

5. To consider the implications of the results for future agriculture and food security in rural households in order to make policy suggestions and recommendations.
   - Will food security be an issue in the future?
   - How can future livelihood trajectories be made more sustainable?

1.4 PROPOSITIONS

Three propositions based on a review of the literature, especially that relevant to the Eastern Cape, underlie this study. These will be returned to in the final chapter of this thesis and include:

1. Agricultural production in the previous Ciskei regions of the Eastern Cape is declining.
2. Declining agriculture will exacerbate food insecurity and, inversely, increasing agricultural production will have a positive influence on food security.

3. Climate change will result in new challenges that will superimpose on existing constraints, and further exacerbate and contribute to uncertainty for future food security.

1.5 CONCEPTUAL FRAMEWORKS: SOCIAL-ECOLOGICAL SYSTEMS (SES) AND POLITICAL ECOLOGY (PE)

In order to better understand the complexity that exists within the nexus of cultivation, food security and climate change, two different but complementing paradigms and theoretical frameworks have been employed throughout this research, namely, social-ecological systems thinking and political ecology.

1.5.1 Social-ecological systems

Social-ecological systems theory is founded on systems theory, and has emerged as a set of tools and concepts which help to analyse and understand complex systems that are multi-dimensional and multi-layered (Ostrom: 2009). A "system" is made up of differing parts that interact within an environment and form a complex entity. Therefore, a social-ecological system is an entity made up of social systems and ecological systems, or, as Andries et al. (2004) explain, it is a system whereby ecological systems are intricately linked with and affected by one or more social systems. The social-ecological systems framework, thus, helps to analyse the links and relationship between social systems and ecosystems. According to Watts (2000) the social-ecological systems framework helps to: "understand the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources and their implications for environmental health and sustainable livelihoods." (Watts: 2000: 257). The figure below outlines a social-ecological system and some of its relevant components.

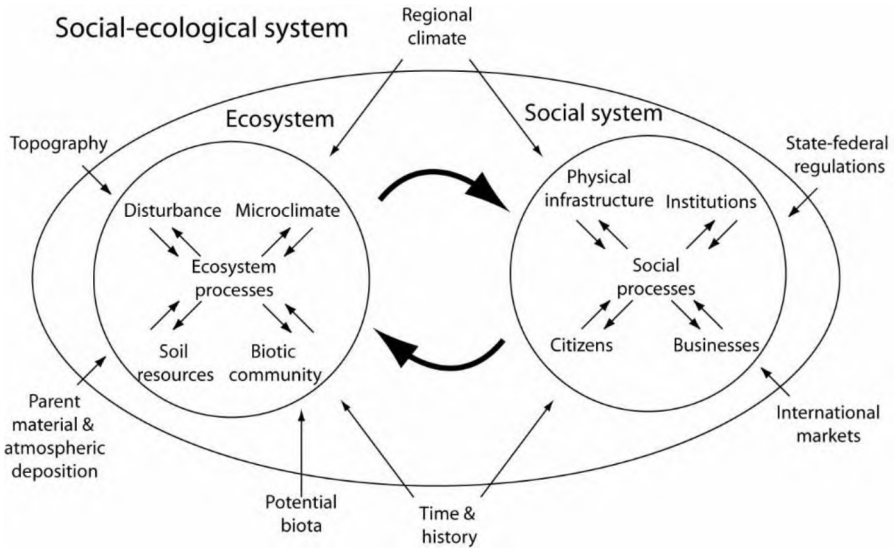


Figure 1.1 Social ecological systems diagram (Source unknown).

Chapin, Floke & Kofinas (2009) provide an in-depth explanation of how social-ecological systems interlink. The environment affects people through direct events such as floods, droughts in addition to providing ecosystem services like food and water, etc. In turn, through an array of economic, political and cultural processes, humans affect the environment through a complex web of social activities and actions such as mining, farming and even urbanisation. Together, these links and relationships between the social system and the ecological system intertwine, thus creating complex social-ecological systems.

Therefore, the social-ecological systems framework is an ideal lens for examining cultivation and food security, especially relating to small scale communal agriculture that is dealt with in this thesis. Rural communal areas in South Africa represent a complex system with many factors and influences interacting simultaneously to affect how people use land and its resources (Shackleton & Luckert: 2015). However, social-ecological thinking does not take into account the power relationships that exist within the social realm that influence human activities and actions. As such, social-ecological systems are embedded within power struggles and are not politically inert (Beirsack: 2006). Therefore, there is a need to incorporate political ecology into the social-ecological systems framing.

1.5.2 Political ecology

Political ecology (PE) finds its roots in political economy; however, instead of viewing nature and the environment as an economic commodity, like the latter, it attempts to uncover the complex interactions and relationships between the political sphere and the environment. One of the main focuses of political ecology is the study of power relations between humans and

their subsequent effect on the environment, both of which are inextricably linked (Robbins: 2004). Therefore, one can assume that environmental change and ecological conditions are the product of political processes and power struggles. For example, Amartya Sen's (1981) seminal work on famine has shown that food security is often a question of access or distribution rather than availability. Therefore, a political ecology lens can help us to observe how relations between humans can impact access to land, water and food, as well as highlighting the unequal distribution of such food. This is especially useful for this study as the issue of land rights, land redistribution and land tenure are all reliant on processes and institutions at different political levels (i.e. local village politics to government politics).

Political ecology also assumes that the costs and benefits of environmental change are unequally distributed between those with power and those without (Bryant & Bailey: 1997). For example, a household with a large amount of capital and a variety of livelihood assets or strategies will be able to cope better during a drought then a household that has limited capital reserves and assets. Political ecology also tries to understand the political, social and economic forces that are interacting with each other. By examining the links and changes of social-ecological systems, we can better understand environmental access, management as well as environmental transformation (Robbins: 2004). Using political ecology as a conceptual framing integrates well with research on household food security as there are a range of social, ecological and political factors that influence household food production and food intake, such as the government grant system, access to arable land and the power-relations that exist at multiple levels which influence such access.

Although political ecology has been criticised for being "too broad" or "fuzzy", it no doubt plays a significant role in helping to understand a wide range of causes and effects when looking at human-environment relations. According to Harnish (*unknown*) of the University of Kentucky's Political Ecology Working Group, "As an analytical tool, PE allows for a holistic understanding of human-environmental interactions in that it forces researchers to consider the role of history, culture, economics, and a myriad of other political variables in shaping this dynamic relationship".

1.5.3 Interlinking political ecology and social-ecological systems

The integration of political ecology and the social-ecological systems framework helps form a more concrete and stable framing in which to conceptualise the complex interactions between climate change, cultivation and food security. Social-ecological systems help us examine this nexus as an integrated system whilst political ecology helps to highlight the power relations (and lack of power) and institutions that influence human actions with regards to the environment and ecosystem services or in this case cultivation and food production. Thus, this integrated framework helps to emphasize both the politics surrounding human-environment relations as well as the links between human action and the environment.

1.6 STUDY AREAS[2]

1.6.1 Location of the two study villages

This research was conducted in two rural villages, Fairbairn and Ntloko, located in the former Ciskei homeland in the Eastern Cape Province. The villages fall under the Amatole District Municipality, although they are both situated in different local municipalities, namely Nkonkobe (Fairbairn) and Ngqushwa (Ntloko). These two villages were chosen for their similarities as well as their differences, in order to contrast and compare the experiences of their respective populations with regards to livelihoods, cultivation and possible challenges relating to food security.

1.6.2 Fairbairn

1.6.2.1 Location and Biophysical Characteristics

Fairbairn (32°33'19" S, 26°42'51" E) is a small village nestled at the foot of the Katberg mountains in the upper reaches of the Kat River Valley, which lies at an altitude of 640 m above sea level. The nearest urban centre is Fort Beaufort which is around 40 km away. A round-trip, from the village to "town" and back costs around R60. Fairbairn is a semi-arid area which has an approximate mean annual rainfall of 520 mm and an annual mean

[2] All data in this section were collected in both sites by the author unless otherwise stated

temperature of 16°C (Mucina & Rutherford: 2006). The climate can be considered mild with summer temperatures ranging between 20°C and 30°C and winter temperatures between zero and 20°C (Magni: 1999). The local weather and climate are strongly influenced by topography as there are mountains surrounding the area. Most rainfall takes place over the summer months (September-March) although winter rainfall from cold fronts is not uncommon. Frost is a common occurrence during the winter months as night time temperatures often drop to around zero degrees Celsius.

The vegetation surrounding Fairbairn is part of the Albany Thicket Biome, more specifically Eastern Cape Escapement Thicket (Mucina & Rutherford: 2006) which consists mainly of *Vachellia karoo (*previously known as *Acacia Karoo),* or "sweet thorn" as the locals refer to it as. The Kat River, which is a perennial river, runs through the village effectively cutting it in half. The Kat River is important for supporting agriculture in the valley as well as the valley's famed fertility. The river is even more important for its role in irrigating the many thriving commercial citrus farms that are littered throughout the middle and lower part of the valley (Hill et al: 2001). The soils in the area stem from the Mudstone and Arenite of the Adelaide Subgroup (Mucina & Rutherford: 2006). The soil (and topography) in the area has been recognised to be of high potential for production, with cultivation and livestock farming, historically, being the main land uses (Motteux: 2002).

Figure 1.2 Satellite image of Fairbairn village. Most of the fields that can be seen are no longer cultivated (Google Earth: 2016)

1.6.2.2 Socio-economic characteristics

Fairbairn has a population of approximately 362 people which consists of mainly *Xhosa* people who make up 95%, while coloureds make up the other 5% (Stats SA: 2012). There are between 65-70 households in the village. There is an average of five people per household, with an average of two dependents. Males make up a larger percentage of the population at 54%, with females making up the remaining 46%. *IsiXhosa* is the most widely spoken language however, Afrikaans and English are not uncommon to hear. Education levels are poor with only 9.7% of the population completing the school leaving matric qualification. Although there is a primary school located within the village, the high school is located in Balfour which is approximately 10 km away. There is no clinic in Fairbairn.

Current livelihoods in Fairbairn echo those of most rural areas located in former homelands, with extremely low formal employment rates (Stats SA: 2012). Government social grants are the most common sources of income with 90% of households receiving either an old age pension, child support or disability grant (see table 1.1 below). Most households own livestock (cattle, goats, chickens), however, only between 10% and 13% of households derive an income from selling these. The same can be said for crops, with 56% of households cultivating a garden or field for own consumption, with very few selling for profit. Other sources of income mentioned by respondents include remittances (13.3%), selling goods (3.3%), and work pension (1.6%). Furthermore, all households partake in the collection of wild resources or non-timber forest products for either home use or to sell (Falayi: 2017).

1.6.2.3 Infrastructure

Infrastructure in Fairbairn is fairly basic with the village only gaining access to electricity in 2013. The majority of households still rely on fuelwood for much of their energy consumption. There is access to piped-water by means of several municipal taps that have been installed within the village for household use. The roads throughout the village are all dirt and gravel which are not well suited for non-4x4 vehicles. Flooding of low lying parts of the road is a problem in the rainy season.

1.6.2.4 Governance and institutions

Fairbairn falls within the Nkonkobe Local Municipality. The municipality covers over 3725 km^2 and constitutes around 16% of the surface area of the Amatole District Municipality. The

mandate of the municipality is to provide basic services to all its areas as well as implementing development planning. There is no traditional chief or community leader within Fairbairn as it is under the full administration of the ward councillor. However, there is a community group which provides a link between the ward councillor and the villagers.

1.6.3 Ntloko

1.6.3.1 Location and Biophysical characteristics

Ntloko is a small village located approximately 20 km from Peddie, which is the closest urban centre. A round trip from the village to "town" costs about R20. It is situated about 5 km off the main national road (N2). The village sits 150 m above sea level on one of the valley ridges surrounding the Great Fish River and is part of Ward 9 of the Ngqushwa Local Municipality. Ntloko has a warm temperate climate, with dry winters and hot summers (CSIR: 2012). The area is also semi-arid with an annual mean rainfall of around 400 mm, which mainly occurs during the summer months (September-March), although some winter rainfall is common. The average annual temperature is 17.8 ^{o}C, with winter nights usually very cool. There are three different types of vegetation that is found throughout the study area, namely South Eastern Thorn Bushveld, Valley Thicket and Afromontane Forest (Low & Rebelo: 1996). *Vachellia karoo* trees litter the landscape on top of the plateau with intrusions of *Ibhubhusi (blue bushes-Pteronia incana)* as well as *Aloe ferox.* Just outside the village on the northern side, lie previously cultivated fields (except three) which are now mainly used as grazing lands for various livestock.

Figure 1.3 Satellite image of Ntloko village. Most of the fields that can be seen are no longer cultivated (Google Earth: 2016).

1.6.3.2 Socio-economic context

Ntloko has a population of approximately 708 with 100% of its residents being *Xhosa* people (Stats SA: 2012). There are around 170 households that make up the village which makes it about double the size of Fairbairn. There is an average of four people per household and each household has an average of two dependents (table 1.1). Females make up around 53% of the population, with males making up the other 47%. The Peddie district is reported to have one of the lowest percentages of resident males in the Eastern Cape (Ainslie: 1999). *IsiXhosa* is the most spoken language although a few people and much of the younger generation can speak some basic English.

Livelihoods are much the same as that in Fairbairn with formal employment being extremely low. Around 88% of households rely on government social grants, with the most common being the old persons pension grant (table 1.1). The sale of livestock and crops was not evident in Ntloko, although most households did own cattle and smaller livestock. Around 10% of households received remittances from family members working in urban areas. Cultivation of either a field or home garden is done by 56% of households for own consumption or to supplement household food expenditure. The surrounding land falls under a communal tenure system and is used for livestock grazing.

1.6.3.3 Infrastructure and institutions

Infrastructure in Ntloko is generally low, however, residents do have access to piped water by means of municipal taps scattered around the village, electricity, a primary and high school as well as a clinic. The road leading to the village is tarred, however, all roads within the village are dirt and gravel albeit of good quality.

Ntloko falls within the Ngqushwa Local Municipality which makes up only 10% of the Amatole Municipality administrative area. There is no chief or traditional leader but rather a democratically elected "community association". Although it lacks any official power or authority, its main function is the administration, organisation of the village and land allocation. Its role is also to represent Ntloko's interests and to engage with local and ward councillors and government (McAlister: 2012).

Table 1.1 General characteristics of the villages and profiles of respondents (data collected in this study)

	Fairbairn	***Ntloko***
Number of households	65- 70	170
Number of households interviewed	60	60
Gender of household head (%)	44 male 56 female	38 male 62 female
Average household size	4.95± 0.49	3.71± 0.30
Average number of dependents	2.04± 0.26	1.58± 0.20
Average household income (Rand)	3517	2585
Households receiving social grants (%)	90	88
Ethnic composition	IsiXhosa (black) and Coloured	IsiXhosa (black)
Main languages	IsiXhosa, Afrikaans and English	IsiXhosa and English
Electricity	Yes	Yes
Water source	Municipal taps, water tanks, river	Municipal taps, water tanks
Roads	Gravel	Tar and gravel
Distance to nearest urban centre (km)	40 (Fort Beaufort)	20 (Peddie)

1.7 METHODS AND METHODOLOGY

This study employed a mixed methods approach which combined both quantitative (in the form of household questionnaires) and qualitative (in the form of semi-structured interviews) methods in collecting the necessary data. Quantitative approaches aim to give statistical rigour while the use of qualitative approaches gives detail (Newing: 2010). Qualitative methods are more flexible and are better suited at exploring issues that cannot be clearly defined, in addition to providing in-depth description and understanding of key themes and issues (Newing: 2010).

A mixed methods approach was best suited for this study as social-ecological systems are complex and need a variety of methods to uncover the necessary information. Thus, the general characteristics and details of the sample population in each village was uncovered by the household surveys, and included questions related to how many people cultivated, household food expenditure as well as information on food security. Semi-structured

interviews were then used to further the understanding of the results found by the household surveys by answering the "why" and "how" questions that related to each theme. The data presented in all results chapters were obtained from the both household surveys and semi-structured interviews.

1.7.1 Household selection

Households were randomly selected in each village using Arc GIS. The following steps were taken to select the various households. Firstly, I uploaded the 2012 coloured aerial photos for Fairbairn and Ntloko (separately) into Arc Map 10.2. I then created a polygon around the village, encompassing the village entirely. Following this, I created a grid overlay of 50 m x 50 m using the fishnet tool. I then selected all the households in the particular village that fell inside a single "block". These "blocks" were then exported to Microsoft Excel 2008 where the program randomly selected 60 of the "blocks". These were then exported back to Arc Map using the joins and relate functions and with the aerial photo only having 60 households it was then printed. If for some reason no-one lived at one of the households that were selected (rarely the case) the nearest household was then selected by me.

1.7.2 Household surveys

I carried out a household survey in each village using a structured questionnaire (see *Appendix 1.1*). A total of 120 households were surveyed across both sites (60 in each village). Data collection was done in Fairbairn over October 2015 and in February 2016 in Ntloko. The household head was interviewed, however if not available, then the current decision maker was interviewed. Since there was a language barrier between myself and majority of respondents, a translator was employed, trained and prepped in order to present the questionnaire to the respondent in their preferred language, which was usually *IsiXhosa*.

The questionnaire consisted of four main sections, namely: household characteristics (socio-economic) and information about the household head, cultivation characteristics, perceptions of climate change, and lastly levels of food security.

The household characteristics section dealt with information about the household head (age, sex, education, employment etc.) demographics, household income status and whether the household had access to land.

The next section of the questionnaire explored the characteristics surrounding cultivation, such as what crops were grown and how much as well as what inputs were used. Crop yields were based on estimations given by each respondent and, therefore, there is a possibility of error. It is important to note that the sub-section which dealt with reasons as to why people chose to cultivate took the form of a two part question. The question "why do you cultivate?" was first asked with an open ended response, however the second time the question was asked, options based on previous work were given. This was done to ensure that all possible reasons could be recorded, in case the respondent had failed to mention less crucial or overarching reasons. Therefore, responses to the initial open-ended question would usually not be repeated by respondents in the second step, but rather the reasons they failed to mention or forgot to mention.

The third section of the questionnaire explored the respondent's perceptions with regards to climate change and variability, focussing on rainfall. The perception of changes in the amount of rainfall was gauged by respondents choosing between *decreased*, *increased* or *no change*. Trends or shifts in rainfall seasons were considered by respondents choosing between *starting earlier*, *starting later*, *inconsistent/variable*, *ends earlier*, and *ends later*. Respondents' perceptions of the length of rainfall seasons were assessed by giving them the option of *longer*, *shorte*r or *no change*. Respondents' perception of frequency of droughts, floods and heavy storms was gauged by giving respondents a choice between, *more, less* or *no change*.

The last section focussed on food security in which the Household Food Insecurity Access Score (HFIAS) was used to estimate the level of food security (access) of the household (FANTA: 2007). The Household Food Insecurity Access Scale was developed by the Food and Nutrition Technical Assistance (FANTA) project of US-AID. The method is based on the assumption that the experience of food insecurity (access) causes predictable reactions and responses that can be captured and quantified through a survey and summarised in a scale (FANTA: 2007). The scale provides insight into the following experiences of food insecurity on a monthly basis:

- Feelings of *uncertainty* or *anxiety* over food (situation, resources, or supply)
- Perceptions that food is of insufficient *quantity* (for adults and children)
- Perceptions that food is of insufficient *quality* (includes aspects of dietary diversity, nutritional adequacy, preference)

- Reported *reductions* of food intake (for adults and children)
- Reported *consequences* of reduced food intake (for adults and children)
- Feelings of *shame* for resorting to socially unacceptable means to obtain food resources

The "scale" consists of asking respondents nine primary questions that relate to food security (access). If a respondent answers "yes" to a question, a secondary question is asked which determines the frequency of occurrence per month, pertaining to the theme (action, response, condition etc.) of the initial question. This is repeated nine times although if the respondent answers "no" then the secondary question is skipped.

Questions include:

1) In the past four weeks, did you worry that your household would not have enough food?

2) In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?

3) In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?

4) In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

5) In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

6) In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?

7) In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?

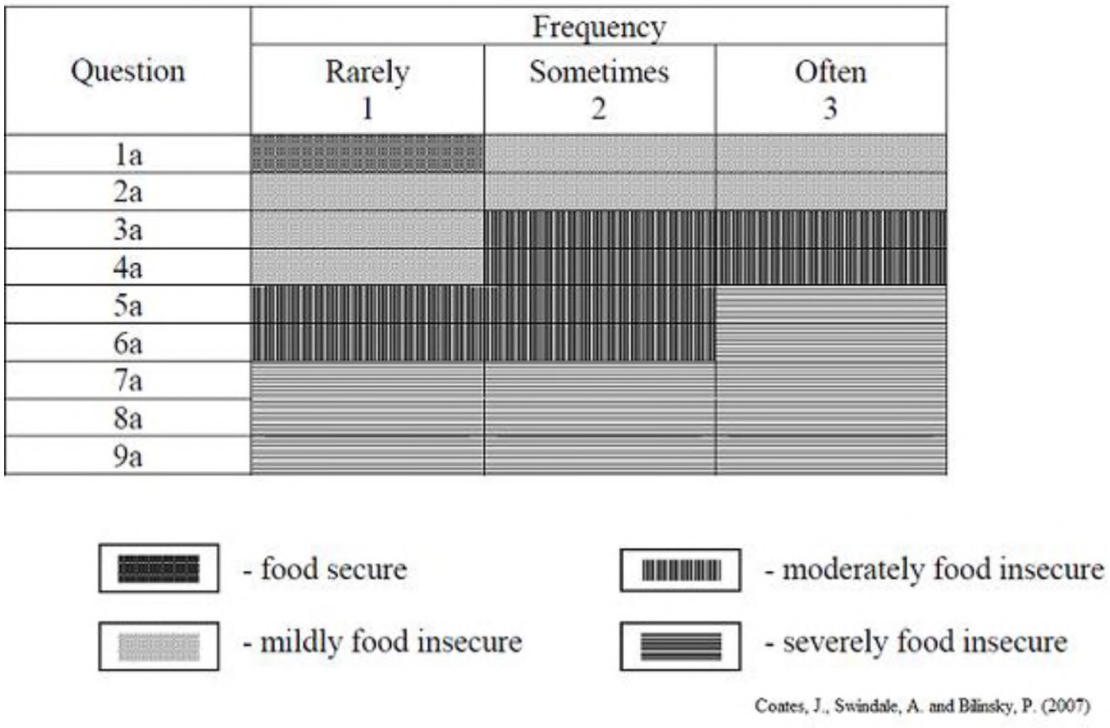
8) In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?

9) In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

The HFIAS was used to gauge the level of food security for each surveyed household. This was done by relating each answer for each of the nine questions discussed above, against table 1.2.

A household's food security status was also given as a score between 0-27 which was related to the answers from the nine questions. The additive approach described here is simple, but as a result one cannot assume that the intervals between 0-27 on the HFIS are *necessarily* equivalent, (i.e. that an increase in the score from 25 to 27 means the same thing as an increase from 18 to 20). For instance, it is not recommended that an average increase from 12 to 24 be reported as a "doubling of food insecurity", but rather as a "doubling of the food insecurity score" (FANTA: 2007).

Table 1.2 Categories of food insecurity (access)



1.7.3 Semi-structured interviews

In order to gain specific in-depth information on the various themes of this study, it was important to engage respondents on a more personal level in order to get valued and authentic

opinions and perceptions on a range of different issues. In doing so, 12 semi-structured interviews were carried out in each site. Interviewees were purposely selected making sure to cover the main groupings within each site such as male and female, old and young, etc. For instance, young, middle age and old males and females were interviewed in addition to male and female headed households, wealthy and not so wealthy households and so forth.

The main themes that were covered in the interviews were based on the results from the household survey. Themes included personal reasons for cultivating or not cultivating, various challenges faced by community members in both areas including climate challenges and perceptions, suggestions from local people as to how to make cultivation more fruitful in their community, as well as issues surrounding access to land and land rights.

1.7.4 Data analysis

All the data collected from household surveys were analysed using Microsoft Excel and Statistica. Spread sheets were used to organize the data as well as to aid in the creation of graphs and tables. All means, standard deviations and standard errors were calculated using their respective functions within Microsoft Excel. Statistica was used where necessary to test differences between one or more variables across villages (significant at $p< 0.05$). Semi-structured interviews were coded and analysed in Microsoft Word. Responses were colour coded into their various themes.

1.7.4.1 Crop yield data

The data on crop yields that are used extensively in *Chapter 2* were recorded within each village at different times. In Fairbairn, crop yields were estimated at the beginning on the 2016 planting season and at the end of the same planting season in Ntloko. Respondents were asked specifically about their previous crop yields, however, I believe that they also took into account what they hoped to reap from their current crop. Hence, the data pertaining to crop yields needs to be seen as an estimate rather than actual recorded yields.

1.7.4.2 Household income categories

Household income classes which appear in *Chapter 3* were determined by organising all households and their income per month into descending order (i.e. highest earners down to

lowest earners). Once in descending order, I split them into 3 even classes (20 households in each class) representing high income, middle income and low income.

1.7.5 Limitations

In the process of data collection there were a few difficulties and limitations. One of the main limitations was the language barrier that existed between myself and a large number of respondents. Although most respondents could speak very basic English it was not enough to gather the necessary information and data as some of the terms were difficult to understand. Unfortunately, I could not converse with them in their native language (*IsiXhosa*). Therefore, I employed a translator from each village who knew the language, as well as the layout of the village. I relied on this translator to honestly and accurately translate what respondents said.

Another key limitation was the timing of data collection in each study area. Data collection was done in October 2015 in Fairbairn which coincided with the beginning of the growing season therefore yields were based on the previous 2015 summer harvest. By contrast, data collection was done in Ntloko in February/March 2016 at the end of the growing season which meant that yields where based on people's estimations for the 2016 growing season. It is also important to note that this period represented a drought (Mail & Guardian: 2016) and so yields may be lower than normal.

1.7.6 Ethical considerations

The research undertaken for this thesis has given due consideration to the ethical standards expected by Rhodes University, highlighted in the Rhodes University Research Code. All relevant leaders and community elders were consulted before data collection began with numerous trips and meetings taking place to ensure all parties were content with the agreed arrangements. To help break down barriers, build trust and to be accessible at all times I lived in the village and socialised with residents.

All respondents were informed of the following before each interaction:

- Their right to consent to or decline participation in the research, i.e. verbal consent was requested.
- The nature of the research, its purpose as well as its usefulness was given to the respondent.
- A description of the procedures that the respondent would be asked to participate in.

- It was made clear that the respondent was allowed to withdraw from the interview at any time even after consent was given.
- The results of and feedback on the research will be provided and handed over to the relevant authorities.

Privacy was upheld to the highest degree by adhering to the following:

- Acknowledging that participants had the right to withhold or reveal any information they pleased.
- Permission was asked before entering any private property and precautions were taken with regards to livestock and pets.
- The respondents' anonymity was and will continue to be protected at all times as well as all information kept confidential.
- The use of a camera and tape recorder was only used with respondents' permission and the erasure of any of the respondents' information was done in their company.

1.8 THESIS STRUCTURE

This thesis is composed of seven chapters. In this chapter (***Chapter 1***) I have provided an introduction to the broader literature pertaining to climate change, agriculture and food security, the context and rationale for the research and the research objectives and key questions. Furthermore, I outlined the conceptual frameworks within which this research is located, namely political ecology and social-ecological systems, as well as providing a description of the two study sites, Fairbairn village and Ntloko. I also presented the methods and methodologies used in this research.

In the next three chapters (***Chapters 2, 3 and 4***) I present the results of the study. ***Chapter 2*** explores the extent and characteristics of cultivation in both study sites, in which I address the similarities and differences between the two. ***Chapter 3*** assesses food security and considers the impact of cultivation on household food security by using the Household Food Security Access Score (HFIAS). In ***Chapter 4*** I seek to explore the way in which local people from both sites have perceived changes in the climate and weather patterns, focussing specifically on rainfall and various extreme weather events. I then explore what this means for cultivation. Furthermore, in this chapter I seek to understand the challenges cultivators face and where climate change fits in amongst these challenges.

The concluding chapter, ***Chapter 5*** serves as a platform to synthesise the results and discussions from the previous chapters as well as addressing objective five. From the conclusions drawn in this chapter, I consider the implications, key messages and recommendations from this research and suggest various strategies and ideas that could help contribute to greater food and livelihood security in a future under climate change.

CHAPTER 2: FIELD AND GARDEN CULTIVATION IN FAIRBAIRN AND NTLOKO VILLAGES, EASTERN CAPE

2.1 CHAPTER OVERVIEW

In this chapter, I seek to address objective number one, namely, to examine the extent and characteristics of cultivation in the two study sites (see *Chapter 1*). I start with some contextual background on rural, small-scale agriculture, as well as reflect on the current trend of decline, particularly in the Eastern Cape. The results in this chapter are divided into two main sections. The first section aims to understand the extent of cultivation and the following research questions are addressed:

- What is the proportion of households participating in cultivation?
- Who is cultivating?
- At what scale is cultivation being practised?
- What are the reasons for participating or not participating in cultivation?
-

In the second section, I explore the characteristics of cultivation, covering the following research questions:

- What are the characteristics of field and home gardens?
- What crops are being produced in fields and home gardens?
- What are the production levels?
- What inputs and practice are being used in fields and home gardens and what are the challenges farmers face?

2.2 INTRODUCTION

2.2.1 Background

The rural agricultural sector, especially the areas within former Apartheid homelands is a complex space that has been painted and shaped by a myriad of different influences and powers for almost two centuries (Thornton: 2009). These areas have been subjected to a multifarious array of historical, economic, environmental, spatial and political processes. The former homeland areas seem to be the forgotten "bad-lands" of South Africa, with the political focus (in terms of land i.e. tenure, redistribution and rights) mainly centred on the urban and peri-urban areas (Hall: 2011). The social-ecological landscape of these areas has changed drastically over the last century and continues to change. These areas are a definitive reflection of how social change can have such a vast effect on ecological landscapes. As will be discussed below, social and political changes were the key processes that ignited the decline in agriculture and land use changes. More so, as political ecology assumes that social systems are embedded with power struggles, I aim to examine these struggles and their influence on land and land rights at a grass roots level.

Before the 1950's, livestock husbandry and cultivation has played a significant role in rural livelihoods (Shackleton & Luckert: 2015). Throughout much of the rural areas, livestock agriculture and field cultivation was still an important livelihood activity up until the early 20th century, as male migrants (who worked on the mines and factories) would use their wages to purchase livestock and would return home periodically to plough their fields, usually planting maize or sorghum (Hebinck & van Averbeke: 2013). However, with the increased demand for cheap labour (discussed below), the duration of labour contracts became longer, many started opting not to plough their fields in the short time they had at home during the festive season (Hebinck & van Averbeke: 2013). Furthermore, owing to the 1913 Land Act which forcibly removed most of the black population onto 13% of the national land (which became known as homelands) resulted in overcrowding and frequent environmental collapse (Nel & Davies: 1999). It was noted, that by 1918 the Ciskei homeland had already reached its carrying capacity and by 1948, only 20% of the homeland was deemed suitable for arable cultivation (Nel & Davies: 1999). The effects of the 1913 Land Act and the racially segregated land use brought about by Apartheid are still seen today as agricultural activities in the former homelands continue to decrease.

2.2.2 Agricultural decline and socio-ecological changes

The occurrence of agricultural decline within rural communities also referred to as de-agrarianisation by Bryceson (1996) and "under cultivation" by Hebinck & Lent (2007), is a global and Africa-wide phenomenon (Shackleton et al: 2013). Within South Africa, the decline of arable agriculture within the rural communal areas has been particularly noted by researchers working in the Eastern Cape (Hebinck & Lent: 2007, Shackleton & Luckert: 2015, Falayi: 2017)), with this decline forming a fundamental premise for this chapter. It is vital that the historical, social and current context surrounding communal area arable agricultural decline be explained and understood. By doing so, I aim to contextualise the effects that such decline has had and will continue to have on rural livelihoods in the Eastern Cape.

2.2.2.1 Rural out-migration

Over the last century, rural arable production has decreased dramatically, resulting in the issue of de-agrarianisation (Hebinck & Lent: 2007, Bryceson: 1996). It is believed that the initial catalyst for this decline was the labour migrations to mines and factories early in the 1900's (Hebinck & Lent: 2007) which was in part, due to the colonial powers creation of "labour pools" and the subsequent marginalisation of the black peasantry which saw the forced removal of 80% of the population onto a meagre 13% of the land (Bryceson: 2002). Much of this land was of poor quality and overcrowded which made agricultural activities fairly difficult. Hence, black people living in these areas (i.e. homelands) had little choice but to look for employment in the mines and factories located near the major urban centres. This loss of human capital in the form of rural out-migration of youths and middle aged males to urban areas in search of employment is still evident today, leaving the elderly and females to attend to household "chores" as well as farming duties (Hajdu: 2006). With rural village populations now consisting of mainly women, children and the elderly (also a consequence of HIV/AIDS (Shackleton and Luckert: 2015)), there has been a significant shift from large field cultivation to nearby small home garden cultivation (Hajdu: 2006). The advantages of home gardens (discussed in *chapter 1*) outweigh the disadvantages and can be viewed as an important form of livelihood adaptation.

2.2.2.2 Diversification of livelihoods

Another key process in the decline of cultivation was the diversification of rural livelihoods from land based activities (cultivation, natural resource harvesting, etc.) to a mixture of cash (social grants, remittances, off farm employment, etc.) (Shackleton & Luckert: 2015). Diversification is defined as the process by which households construct increasingly diverse livelihood portfolios, making use of increasingly diverse combination of resources, opportunities and assets (Niehof: 2004). With employment opportunities located in the urban areas and a switch from large fields to smaller home gardens, cash income and remittances from those working in urban areas provided the ability for people to purchase their food items instead of being fully self-reliant on own production. Small home gardens, although more manageable, do not provide enough to last households more than a few months. Therefore cash income from waged labour and government social grants (Falayi: 2017) was and still is, vital in supporting households throughout the rest of the year (Hajdu: 2006).

After 1994, the social grant system was expanded by the new ANC-led government to include child and disability grants (Neves et al: 2009). This allowed elderly, disabled and parents of young children access to cash on a monthly basis. This cash income, although barely enough, allowed the recipient to buy food for the household, which has ultimately discouraged many from cultivating (Kepe & Tessaro: 2014). Relying on small government grants usually means that there is very little left over to use as capital investment or to buy tools, etc. (Bryceson: 2004). Furthermore, Bryceson (2004) suggests that transfer payments (remittances, grants etc.) have sustained the rural areas for many decades and that there is little sign that this will suddenly be replaced by commercial agriculture or other enterprises.

2.2.2.3 Further reasons that compounded agricultural decline

Although labour migrations, as argued above, are seen as the main driving force behind the decline in agriculture within rural areas, there are a variety of other factors that have contributed to this steady decline over the course of a century. For example, previously the government had supported rural farmers with tractors and agricultural support services, however, after the 1980's and even more so after 1994, this support was either withdrawn or has declined in efficiency (Hebinck & Lent: 2007).

Symptoms of the continued decline of agriculture in rural areas include declining cattle numbers that are often used as draught power to plough the fields (Shackleton et al.: 2013), a

lack of commitment from the youth who view farming as the job of the elderly or uneducated, or who simply view urban lifestyles and off farm employment as superior (Porter et al: 2010), lack of capital and fencing (Hebinck & Lent: 2007, Kepe & Terrusso: 2014), low amounts of irrigation infrastructure, as well as the challenge of gaining formal access to fields due to the inefficiency of the current land tenure and land rights system which is discussed below (Kepe & Tessaro: 2014).

In addition to this, education within rural areas has seen higher levels of enrolment (Porter et al: 2010) and is seen as a means to a better life with more opportunities. Therefore, children seen previously as free labour within the household are now at schools rather than helping family members in the fields or gardens.

2.2.2.4 The issue of land rights, land tenure and land redistribution

In addition to the above mentioned factors, the role of land rights and land tenure in agricultural decline needs to be understood. Land tenure systems in the "communal areas" or former homelands of South Africa can be described as dynamic and ever evolving (Cousins: 2007). When the newly elected democratic government came into power, land redistribution, reform and tenure security were enshrined into the constitution (Kepe & Tessaro: 2014). However, the attempts at redistribution have been largely unsuccessful, as less than 10% of the land has been redistributed since 1994 (Umhlaba Wethu: 2011). Furthermore, tenure security within the previous homelands has also seen a lack of progress as it is complex and often contentious, as evidenced by the discontentment towards the Communal Lands Rights Act (CLARA) of 2004 (Cousins: 2007). The CLARA was a way in which state owned land could be transferred to communities. The interests of communities were meant to be represented by a land administration committee which was often headed by traditional leaders or community elders, who then distributed the land (Cousins: 2007). The main criticism came from those who were anxious that this new act would "result in control over land being vested in traditional councils ("transformed" Tribal Authorities) at the expense of current land holders" (Cousins: 2007). This "mix up" between state authority and traditional authority is a major inhibitor for the process of land tenure reform. CLARA, after it was challenged in the constitutional court, was de-promulgated in 2004 and nothing has since replaced it (Claassens & Cousins: 2008).

Therefore what we are seeing within the current communal tenure system is that it is rather difficult for landless households to achieve informal access within their villages, even if the land is currently not being used. As land is often viewed as a security asset, many villagers with access, but not currently using it, are reluctant to give access to other villagers in fear of losing it completely. This is especially evident with regards to community programmes or co-operatives (Fox: 2017: *unpublished,* Kepe & Tessaro: 2014) A political ecology framing gives us a way in which to analyse these power relations as "struggles over property are as much about the scope and constitution of authority, as about access to resources (Lund: 2002).

The above mentioned factors have aided the decline of agriculture in the Eastern Cape as well as limiting who has the ability to participate in agricultural activities. This context led to my proposition that: agricultural production in the previous Ciskei regions of the Eastern Cape is declining. To be able to determine whether this is the case or not, this chapter addresses the current rural cultivation context in the two study villages by looking at the extent of cultivation, reasons for participating, and who is involved as well as the characteristics and inputs used by those who are still cultivating. It is important to obtain an understanding of the current cultivation activity in these areas as it lays the foundation from which to examine food security and the issue of climate change that are discussed in the following chapters.

2.3 RESULTS

2.3.1 Extent of cultivation and decline

In both Fairbairn and Ntloko 56.6% of sampled households participated in cultivation of some kind (either field and/or home garden). The percentage of those cultivating home gardens covered more than half the sampled households in both villages with Fairbairn having 51.6% and 55% in Ntloko (figure 2.1). In both villages, the percentage of those cultivating fields was much lower than those cultivating home gardens with only 13.3% of respondents in Fairbairn cultivating a field and 8.3% in Ntloko (figure 2.1). These results are not mutually exclusive as some households cultivate both home gardens and fields, although very few. Of the households with access to fields in Fairbairn, most stopped cultivating or abandoned their field's post-2000. However one household stopped cultivating as far back as 1986. In Ntloko, most respondents had stopped cultivating their fields before the year 2000. A respondent from Ntloko mentioned that government had provided them with tractors at very low rental rates, however, this changed after 1994 when these tractors were removed (Rhodes Honours Report: 2016). Responses from interviewees as to why people had stopped cultivating or abandoned their fields varied, although old age and ill health were among the most noted, as well as lack of capital and other resources. One respondent believed that people were simply no longer interested in working the land. Furthermore, a prominent member of the Fairbairn community stated in an interview that land tenure was also a major issue:

"The main thing is the land tenure and access to the fields as they are state owned lands. The government does not have a clear plan to distribute the land. There were also people who got given the land and are not willing to share or give away part of their lands".

He further elaborated:

"The village made an application to get formal access to the land. Three main reasons; we want the land to live on, we want land to graze our cattle and we want arable land for commercial use and food security. But the government is not coming to the table. The government is not sure as to how the land should be distributed. They are confused. An example, there are people using the land but there is no monitoring by the government (who are funding it) to make sure that the people are using the land as they should. The government should then give the land to people who want to grow commercially".

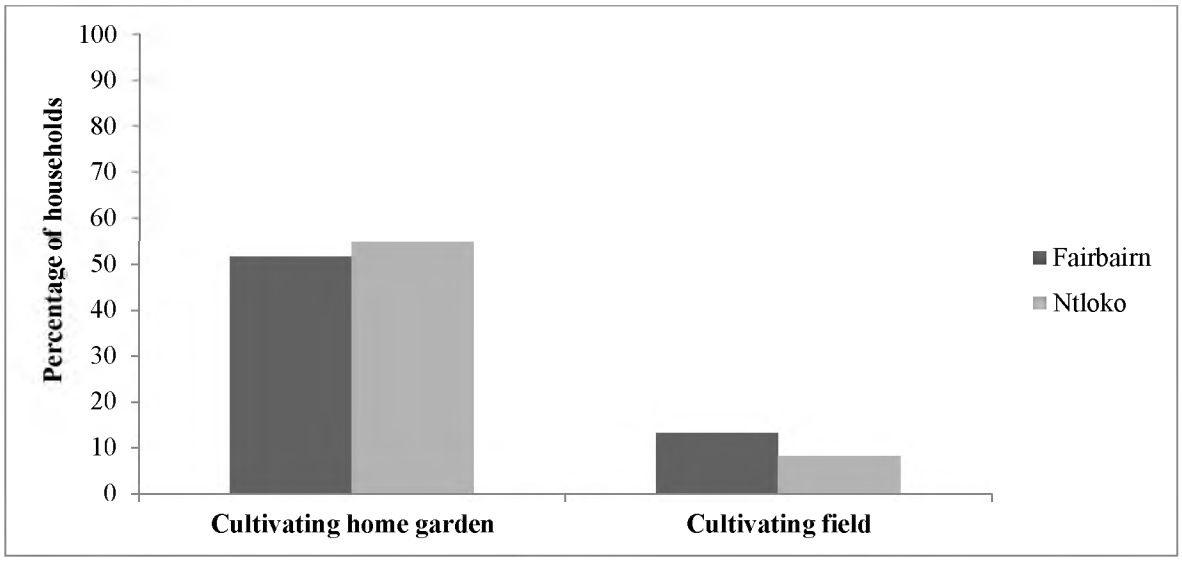


Figure 2.1 Percentage of households cultivating home gardens and fields (n= 60)

As mentioned above, access to fields is an issue in both sites, more so in Fairbairn where only 15 households (25%) currently had access to a field (table 2.1). However, only eight of those households cultivated their fields. In Ntloko 30 households (50%) indicated that they currently had access to a field, however, only five households cultivated their fields (table 2.1).

Table 2.1 Percentage of households with current access to a field/s and percentage who currently cultivate a field/s.

	Households with current access (n= 60) (%)	**Households that currently cultivate their fields (n= 60) (%)**
Fairbairn	25	13
Ntloko	50	8

2.3.2 Gender and youth participation in cultivation

Gender plays an important role in cultivation due to the various household and community dynamics within rural villages as well as cultural and stereotypical roles of men and women. In Fairbairn there were a total of 98 people (from all 60 households that were surveyed) that partook in cultivation. Out of this, 60% constituted males, 33% females and 7% children (figure 2.2). In Ntloko, there were a total of 76 people (from all 60 households that were

surveyed) that partook in cultivation. Females made up most of this total with 57%, with males only making up 33% and children 10% (figure 2.2).

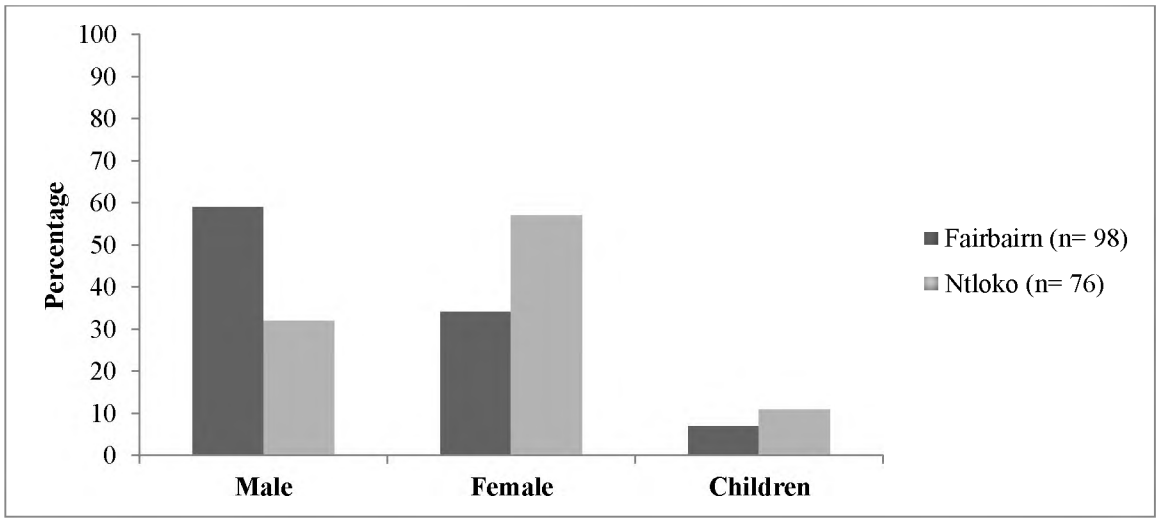


Figure 2.2 Percentage of adult males and females and children participating in cultivation. Fairbairn (n= 98); Ntloko (n= 76)

2.3.3 Reasons for participating in cultivation

For those who cultivated either fields or home gardens, respondents were asked to share their reasons for participating in cultivation (both field and home gardens). Two responses were required. In the first, they responded to an un-prompted question, and then in the second to a prompted question in which options were given (see *methods, Chapter 1* for a more detailed explanation). Ninety seven percent of respondents from Ntloko mentioned that the main reasons they cultivated was for "*survival*" followed by "*supplementing household food expenditure*" with 23% (table 2.2). In Fairbairn the most common response as to why people cultivated was for "*supplementing household food expenditure*" with 53%, followed by "*survival*" with 41% (table 2.2).

When prompted with various options, most households in Fairbairn mentioned they also cultivated "*for fun and enjoyment*" with an equal number noting that it is "*part of culture*" (77%). These were followed closely by "*for animal feed*" with 50% (table 2.2). In Ntloko, the most common response was to "*supplement household food expenditure*" (74%) and "*for animal feed*" (44%). Although "*for profit*" did not feature highly in either site, an interview respondent from Fairbairn stated:

"[*Cultivation] saves me money so I don't have to buy everything and when I harvest a lot of vegetables, I can sell them and get more money".*

This was echoed throughout both sites as most do not cultivate for profit specifically, however, if the harvest is good then they will try to sell what they don't need. Another respondent mentioned that with rising food prices, he needs to cultivate, also stating that if he has the ability to grow his own vegetables then why would he not do so.

Table 2.2 Percentage of respondents providing several un-prompted and prompted reasons for why they cultivate (n = 34 for Fairbairn and Ntloko)[3]

	Fairbairn		**Ntloko**	
	Un-prompted (%)	*Prompted(%)*	*Un-prompted(%)*	*Prompted (%)*
Hobby/ fun/ enjoyment	6	77	3	6
Supplement household food expenditure	53	29	23	74
Part of culture	3	77	0	21
Survival	41	9	97	6
Animal feed	3	50	6	44
Profit	20	6	0	0

2.3.4 Income and its influence on the extent of cultivation

In order to assess whether household cash income encouraged or discouraged cultivation, the data on income introduced in *Chapter 1* were used to create income classes. The cultivation data were then disaggregated according to these classes (table 2.3) and analysed to determine what "income class" cultivated more. The data shows that more households in the higher and middle income classes cultivate than those in the lower income class (table 2.3). In Fairbairn, 70% of households in the "middle income" bracket cultivated which was significantly different to 50% in Ntloko (X^2= 8.33; df= 1; p< 0.05). Well over half of all the households in the higher income class participated in cultivation with an average of 65% of such households

[3] In the prompted responses respondents tended not to repeat the reasons they had already given in the first unprompted response. See chapter 1, for a more detailed explanation.

cultivating across both sites. Households in the lowest income bracket cultivated the least with an average of 45% of households cultivating across both sites (table 2.3).

Table 2.3 Percentage of households cultivating according to income category. (Each group represents n=20 households)

	Fairbairn	**Ntloko**	
	% of households cultivating		X^2 results
Higher Income (n= 20)	60	70	2.20
Middle Income (n= 20)	70	50	8.33*
Lower Income (n= 20)	40	50	2.02
Total (n= 60)	56.6	56.6	

*Significant at $p < 0.05$

The influence of the presence of social welfare grants in the household was also assessed, regarding their effect on a household's decision to cultivate. The premise is that access to grants may discourage households from cultivating as they are a source of cash income for purchasing food. However, the results do not reflect this. In Fairbairn, 90% of households received government grants with 34 (56%) of those households participating in some sort of cultivation, mainly home gardens (table 2.4). There were only six households (10%) that did not receive any form of social grant. However, four (67%) of those households participated in cultivation. In Ntloko 53 (88%) households received grants and 31 (58%) of those households cultivated. There were a total of seven (12%) households not receiving any form of social grants, however, only two households cultivated (table 2.4). However, three of the households not receiving any social grant in Ntloko had formal employment and were in the highest income bracket.

Table 2.4 Cross-tabulation of number of households receiving social grants or not and whether they cultivate or not

	Fairbairn		**Ntloko**	
	Number of households (n= 60)	Number of those cultivating	Number of households (n= 60)	Number of those cultivating
Households receiving grant/s	54	34	53	31
Households not receiving grant/s	6	4	7	2

2.3.5 Characteristics of cultivation

2.3.5.1 Size of cultivated areas (fields and home gardens)

Home gardens in Fairbairn had an average size of 960 m^2 compared to Ntloko which had an average size of 457 m^2 (table 2.5). This comparison is slightly misleading as by my observation, home gardens in Ntloko were on average, larger than those in Fairbairn. This can be explained by the fact that there were two home gardens in Fairbairn that were around 10,000 m^2. It was not clear at the time if the entire plot was cultivated or only a small portion. If the two 10,000 m^2 home gardens are taken out of the calculation, the average home garden in Fairbairn would be 314 m^2 (table 2.5).

Fields in Fairbairn were located in the village which made access (location) easier. Fields in Ntloko were located far outside the village. Fields in Fairbairn were on average much larger than those in Ntloko with 23300 m^2 compared to 4681 m^2 (table 2.5).

Table 2.5 Size of area cultivated in Fairbairn and Ntloko

	Average Size of Field (m^2)	**Average size of home garden (m^2)**
Fairbairn	23300	314.55
Ntloko	4681	457.81

2.3.5.2 Crop production in fields

In Fairbairn, the mean number of different crops grown in fields was 2.75 and Ntloko it was 2.6. Altogether, a total of nine different crops were identified in fields in Fairbairn, in which the main crops produced were butternut, potatoes and maize (figure 2.3). More crops can be seen in figure 2.3. When asked why he chose to cultivate the crops he did, a field cultivator from Fairbairn said:

"Maize, butternut and melon are most important because they can be used for both feeding animals (pigs and chickens) as well as for staple meals".

Another field cultivator mentioned that he targeted crops that he believed were less water dependent than others, such as butternut, potatoes and maize, thus decreasing the risk of planting a large field.

Fields in Ntloko where planted with a total of seven different varieties of crops, mainly, potatoes, maize and sweet potatoes (figure 2.3). Besides maize, low ground crops such as potatoes (Ntloko) and butternut (Fairbairn) where favoured by both villages as they were believed to be slightly more drought resistant than taller, exposed crops. This means that they did not need to be tended to very often. Maize was cultivated extensively in both villages as it is an important crop, not only for household consumption but also for animal feed, which if bought from a store, can be quite expensive. Leftover maize stalks were often used to feed livestock, with left over grains given to chickens or ducks. Sometimes, melons were given to the pigs if there was an abundant harvest.

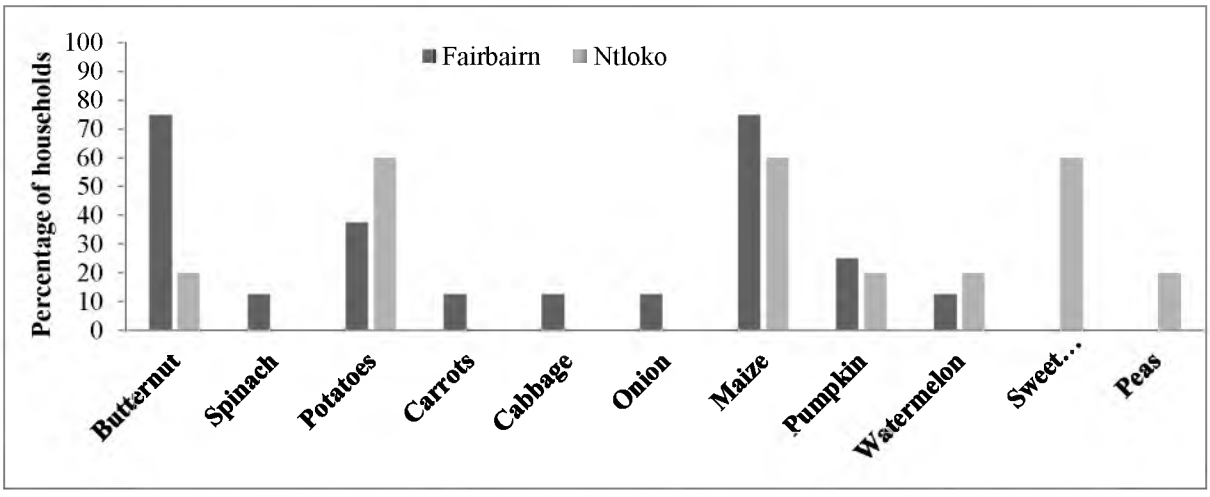


Figure 2.3 Percentage of households growing specific crops in fields in Fairbairn (n= 8) and Ntloko (n= 5).

Crops that were cultivated mostly in fields are staple crops such as maize, butternut and potatoes. The estimated mean amounts of staple crops produced in Fairbairn were 20.2 bags of maize per household, 147.5 bags of butternut per household and 110 bags of potatoes per household (table 2.6). These means are substantially higher than Ntloko's as there are two commercial cultivators in Fairbairn that grow intensively on large plots. The amounts produced in Ntloko were tiny compared to Fairbairn, with a mean of 4.3 bags of maize per household, 5 bags of butternut per household, 7.3 bags of potatoes per household and 3.3 bags of sweet potatoes per household (table 2.6).

There are many factors that influence how long a particular crop will last the household. This depends on the amount of crops harvested, the type of crop (as some perish faster than others) as well as the size of the household and the frequency at which the crop is used. Most crops lasted the household between 1-3 months, sometimes slightly longer.

Table 2.6 Mean amount of crop produced in fields and length it lasts the household.

		Fairbairn		Ntloko	
Crop	Units	Mean amount produced	Mean length produce lasts the HH (months)	Mean amount produced	Mean length produce lasts the HH (months)
Butternut	Bags	147.5±16.57	3.25	5	2
Spinach	Bunches	10	1	n/a	n/a
Potatoes	Bags	110±1.82	2	7.3±1.42	2
Carrots	Bunches	14	3	n/a	n/a
Onion	Bunches	40	3	n/a	n/a
Maize	Bags	20,2±2,36	4.2	4.3±0.64	4
Pumpkin	Count	520±87.59	3	1	2
Watermelon	Count	150	3	30	3
Sweet potatoes	Bags	n/a	n/a	3.3±0.2	2.5
Peas	Bags	n/a	n/a	1	2
Cabbages	Count	20	3	n/a	n/a

***** *The above mentioned data on crop yields are based on cultivators estimates as there was no way of getting the exact figures as log books are rarely kept by cultivators. Not all means have standard errors as only a few were cultivated by more than one cultivator.*

2.3.5.3 Crop production in home gardens

There was a much larger variety of crops produced in home gardens than in fields as both staple crops and "secondary" crops are cultivated. In Fairbairn, there were 17 different types of crops recorded and 13 different types in Ntloko (figure 2.4). Spinach, butternut, onions and beetroot where the main crops grown in home gardens in Fairbairn, however, in Ntloko, maize was grown by 78% of cultivators, followed by spinach, potatoes, cabbage and pumpkins (figure 2.4).

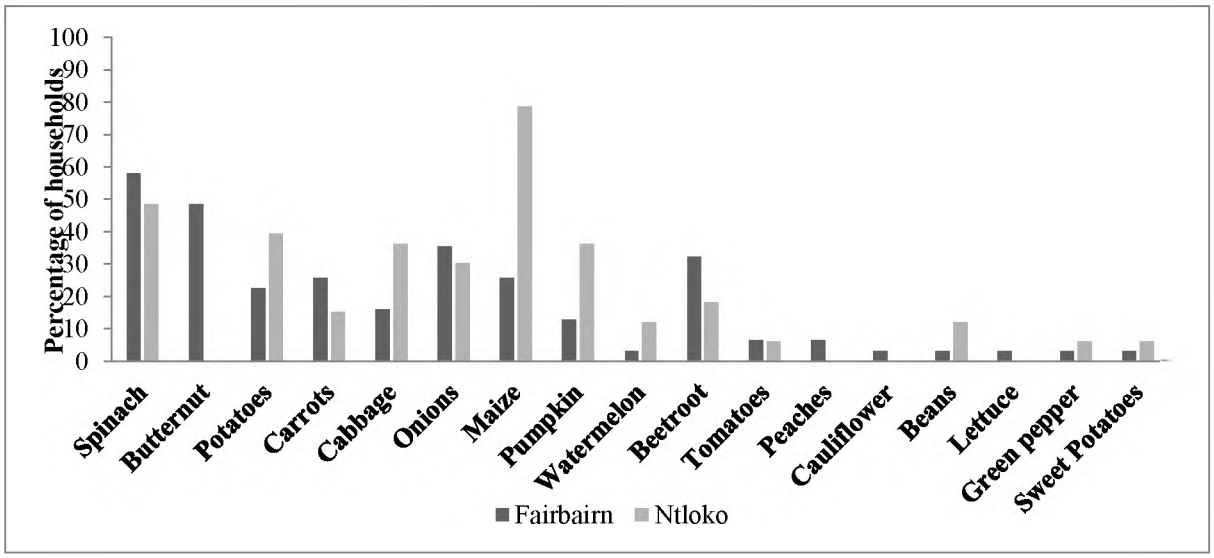


Figure 2.4 Percentage of different types of crops grown by home gardeners in Fairbairn (n= 31) and Ntloko (n= 33)

In Fairbairn, the main crops produced in home gardens were spinach with a mean yield of 15.8 bunches per household, butternut with a mean yield of 12.2 bags per household, onions with a mean yield of 10.5 bunches per household and beetroot with a mean yield of 9.1 bunches per household (table 2.7). In Ntloko, mean yields were far less as maize had a mean yield of 1.4 bags per household, compared to 2.5 bags per household in Fairbairn. Other main crops cultivated in Ntloko had a mean yield of 11.5 bunches per household for spinach and 3.2 bags per household for potatoes (table 2.7). Although average yields were a lot higher in Fairbairn, the two main crops in Ntloko, namely cabbages and pumpkins, had slightly higher yields in this village with 15 units per household compared to 10.4 units per household for cabbages and 13.7 bags per household compared to 10.7 bags per household for pumpkins. Home garden cultivators in Ntloko cultivated all the same crops as Fairbairn besides four,

which were butternut, peaches, cauliflower and lettuce. When asked why he chose to cultivate the crops he did, a respondent from Fairbairn stated:

"I grow water melon, butternut, pumpkins and potato. They are quite resistant to dry weather and fair better than other vegetables when it's hot and dry. We are trying to grow maize but when it's too hot it just dies and shrinks."

This was echoed by another home garden cultivator who said:

"I choose to grow butternut for the reason that it grows quickly and also doesn't need so much water like now during droughts."

Table 2.7 Mean amount of crops produced in home gardens and length it lasts the household.

		Fairbairn		Ntloko	
Crop	Units	Mean amount produced	Mean length produce lasts the HH (months)	Mean amount produced	How long it lasts the HH
Spinach	Bunches	15.8±1.57	2.4	11.4±0.85	3.4
Butternut	Bags	11.3±1.14	2.5	n/a	n/a
Potatoes	Bags	8.3±0.72	1.7	2.9±0.23	2.2
Carrots	Bunches	10.4±0.64	2.3	11.3±1.09	4.7
Cabbage	Count	10.4±0.12	2	12.6±0.97	2.7
Onions	Bunches	10.5±8.39	2.8	1.4±8.65	2.9
Maize	Bags	2.5±0.27	2.3	1.5±0.14	2.1
Pumpkin	Bags	8.25±1.14	2.7	12.5±0.99	2.9
Watermelon	Count	15	3	17.8±2.16	3.7
Beetroot	Bunches	9.4±0.76	1.9	3.5±0.46	5.7
Tomatoes	Box	5.6±1.04	1	2	2.8
Peaches	Bags	1±0.09	1.5	n/a	n/a
Cauliflower	Count	5	4	n/a	n/a
Beans	Bags	1	4	2.4±0.24	2.3
Lettuce	Count	3	2	n/a	n/a
Green Pepper	Count	10	3	9±1.09	3.5
Sweet potatoes	Bunches	10	6	3±0.36	3

***** *The above mentioned data on crop yields are based on cultivators estimates as there was no way of getting the exact figures as log books are rarely kept by cultivators.*

2.3.6 Agricultural inputs

2.3.6.1 Field inputs

Amongst the small proportion of households cultivating fields only three respondents from Fairbairn and one from Ntloko said that they hired labour to work in their fields (figure 2.5). In Fairbairn, this was due to the fact that some fields were cultivated for commercial purposes and therefore needed a small labour force to maximise crop yields. In Ntloko, it was different, as there were no fully commercially cultivated fields. That being said, if there was an abundance of a crop, many cultivators would either sell it to other villages or simply give away for free. This was evident for both fields and home gardens, although more prevalent with the former. Fields in Ntloko were ploughed using a tractor which is shared between neighbouring villages and at a cost of R100 an hour. In Fairbairn, only few were ploughed by tractor (mainly the co-op[4]) with most being ploughed by donkey. Kraal manure was used by 50% of field cultivators in Fairbairn and 60% of those in Ntloko (figure 2.5). Chemical fertilizer was not widely used as it would be expensive to use on such a large scale, although one cultivator in Fairbairn did use it on their field. Similar results were found with pesticides and insecticides, which were not widely used on fields. There was a furrow system that had been built in Fairbairn as well as a few small dams or ponds, however, the system had not been maintained and was not used any more. In addition to this, most of the small dams had silted up.

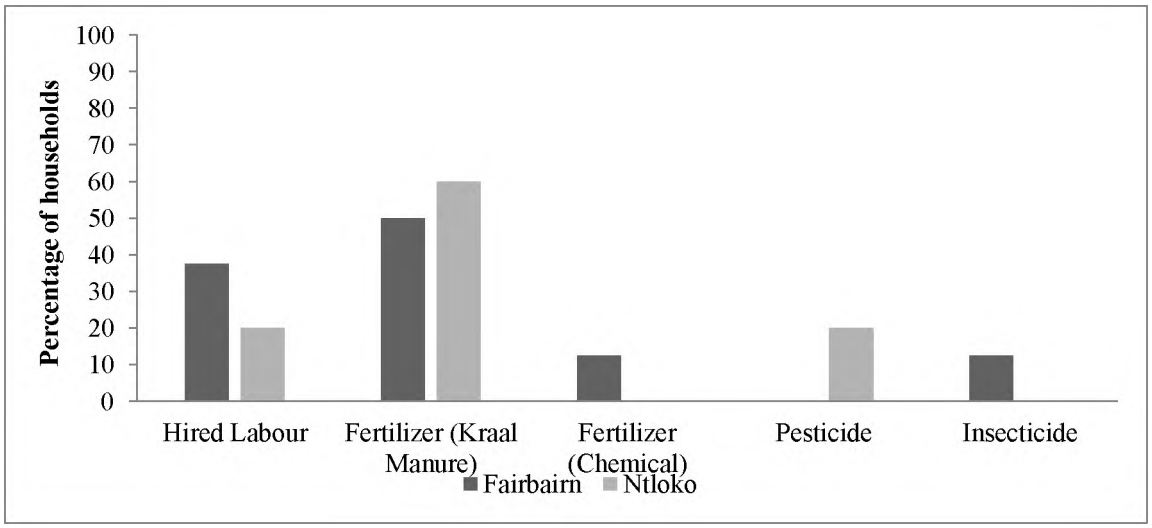


Figure 2.5 Agricultural inputs (fields)

[4] Fairbairn has a Co-Operative (Hertzog Agricultural Co-operative, HACOP). However, Ntloko doesn't have any community projects or programmes.

2.3.6.2 Home garden inputs

Cultivation methods in home gardens differ from those of fields. The hoe is the main piece of equipment used for tilling the land with 96% of cultivators in Fairbairn using it. Some respondents did mention that they used a donkey plough which is unusual as it is often oxen that are used. A respondent noted:

"*We have been cultivating and doing everything on our own since our forefathers so we can survive. We used to use cows like our forefathers had but we use donkeys now. However, we can only use them for 3 or 4 hours before they must go and eat.*"

In Ntloko, most home gardens were ploughed using a tractor at R100 an hour. This is because there is a tractor which circulates between neighbouring villages as well as the fact that home gardens in Ntloko were much larger than those in Fairbairn making it difficult to plough with animal traction as most cultivators are elderly. Most cultivating households in both Fairbairn (67.7%) and Ntloko (69.7%) use kraal manure as fertilizer. This is usually taken from the homestead kraal or from a neighbour's kraal. Chemical fertilizer is not used at all in Ntloko, however, two households in Fairbairn use it.

2.3.6.3 Irrigation

An overwhelming number of respondents did not have access to proper irrigation or irrigation equipment. There was only one household (commercial cultivators in Fairbairn) throughout both study sites that had a diesel pump and pipes that were used to irrigate their two fields from the Kat River. Other than that, not one field cultivator irrigated their plots. However, home garden cultivators did mention ways in which they watered their plots. It was observed that some households had 55 gallon drums located below the corners of their roofs which when it rained, water would run off the gutters and into the drums. Then a small bucket or watering can would be used to water the nearby home garden, although this would usually take a considerable amount of time.

Other methods of irrigation included filling up watering cans, wheel barrows, or large buckets from the closest municipal tap. This method is technically not allowed as municipal taps are for domestic use only, but many villagers do so anyway. It was observed in Fairbairn, that some households were even connecting plastic piping to the municipal taps, which ran through to their home gardens, although this was not observed in Ntloko.

2.3.6.4 Soil Quality

Soil quality in the two study sites was subjectively assessed by asking households that cultivated to rate their soil from 1 to 10 (1= poor and 10= highly productive). Fairbairn had an average of 7.1/10 and Ntloko, a slightly lower 6.9/10. By these results one can assume that the quality of soil in these areas is considered adequate by those who were cultivating.

2.4 DISCUSSION

2.4.1 Extent of cultivation

The extent and characteristics of cultivation in Fairbairn and Ntloko paint a very similar picture to many other rural villages within the former Transkei and Ciskei homelands of the Eastern Cape, although some differences do occur between both study sites. In both sites, just over half the sampled households cultivated either a field, home garden or both. This was similar to a study done by Mtati (2015) working in Koloni and Guquka, two rural villages also located in the former homeland of the Ciskei. She also found that about half (59%) of sampled households cultivated at least one type of crop in a field or home garden.

The percentage of households cultivating fields was fairly low compared to those cultivating home gardens. This reflects the well-documented shift (Hebinck & Lent: 2007, Shackleton & Luckert: 2015) from field cultivation to smaller, more manageable home gardens within the homestead boundaries, seen in the Eastern Cape and elsewhere.

Abandonment or "under cultivation" of fields as Hebinck & Lent (2007) refer to it, is a major feature in both Fairbairn and Ntloko in addition to other villages in the former Ciskei region. For example, Hebinck & Lent (2007) observed that in Guquka and Koloni, field cropping was low compared to that in the past. Fast forward a few years and Mtati (2015) observed that in 2013, there were no fields cultivated at all in Koloni. The main reason for the under cultivation of fields in both villages according to respondents in the household surveys was the lack of fencing which corresponds with results from a study done by Kepe & Tersusso (2014) and Shackleton & Luckert (2015) in a similar areas. Fences designed to keep livestock from roaming the fields and eating the produce have either broken down or alternatively been taken to fence the homestead (Hebinck & Lent: 2007).

Although many households in Ntloko (not so much in Fairbairn) still have formal access to fields, due to the above reasons most choose not to cultivate them. Ntloko had twice as many households with access to fields than Fairbairn which could be explained by looking at the

history of the two villages and how the land has been allocated and divided. The situation in Ntloko is different to that of Fairbairn. The village comprises of close kinship ties and minimal outsider migration (McAlister: 2012). Due to this and the fact that there is an abundance of land surrounding the village, access and control over it has been divided with little fuss. Today, the land around the village falls under communal tenure, and continues to be administrated by the local village committee (McAlister: 2012).

However, the history of land rights in the upper Kat river valley which includes Fairbairn is somewhat turbulent with ownership of land changing several times in the last two centuries between European settlers, coloureds and the *Xhosa's*. Up until the 1970's, Fairbairn village was white owned commercial farmland, however, according to Nel & Hill (2000) a *Xhosa* family (clan) were given title deeds to a section of land on the northern side of the river when the area became incorporated into the Ciskei homeland. Further information gathered when speaking to local residents indicated that this family's land is situated on the northern side of the village across the Kat River. This has been problematic within the community as the families on the southern side of the river, which constitutes most of the village, do not have formal access to the surrounding fields besides two households, a coloured commercial farmer and the head of a large *Xhosa* family. Land rights in the Kat River Valley area have always been a contentious issue and even more so today as Hebinck & Cousins (2013) state that after the change in political dispensation after 1994, the situation in the valley became even more confused adding, that nowhere in the valley was land title certain or transparent.

In Fairbairn, most people stopped cultivating their fields on average, about 11 years ago and around 16 years ago in Ntloko. The findings in Ntloko echo the findings of Shackleton et al. (2013) where by field cropping rapidly declined with the transition to a democratic South Africa and an increase in welfare grants by the newly elected government. However, it was also noted that government support after 1994 became virtually non-existent in Ntloko (Rhodes Honours Report: 2016). However, this was not the case in Fairbairn as interviews conducted by Mtati (2016: unpublished), revealed that there was a community-driven agricultural project (HACOP) which continued to cultivate many of the fields around the village. However, people started to leave for varying reasons, which was brought about due to unresolved internal politics between 2001 and 2003, which corresponds with the household survey data in which many people stopped cultivating fields.

Speaking with local people in Fairbairn, the issue of land tenure was a common theme as to why people were not making full use of the many fields that were lying vacant and unused. Many households that have access do not cultivate and are also tentative to loan or share their land with others as there is a fear of losing that land altogether. Many people use the excuse of "I will cultivate it next year" or "I am waiting for money". Since 1994, the newly elected post-apartheid government has implemented a multifaceted programme to amend past land issues by addressing the racial imbalances in land tenure and access of historically disadvantaged people. Unfortunately, progress has been extremely slow and the program has fallen short of expectations and targets (Lahiff: 2009). That being said, I believe that from observation and living in the village for some time, that if people *really* wanted to cultivate these fields, they could and would. However, a major problem is that the older generation which has previously been enthusiastic about cultivation, have lost energy to maintain large parcels of land. There has been a strong call for government subsidies for agriculture from local respondents, but no progress has been made as of yet.

2.4.2 Gender and youth participation

Cultivation in Ntloko was done mainly by women which ties in with the current rural context. Rural areas in former homelands usually consist of mainly women and children, with working aged men often migrating in search of employment (Aliber & Hart: 2009). The finding that there are more women participating in cultivation in Ntloko fits with work done by Aliber & Hart (2009) who state, using data from the Labour Force Survey (LFS) that women make up 60% of those involved in subsistence agriculture, which also upholds the current narrative of sub-Saharan Africa subsistence agriculture (FAO: 2011). Furthermore, Ntloko has a sex ratio[5] of 87.3 meaning there are more woman residents than male (Stats SA: 2012). According to De Wet & Van Averbeke (1995), the Peddie district in which Ntloko is located, has one of the lowest counts of resident males in the Eastern Cape.

The results from Fairbairn, however, tell a different story as there is almost double the amount of men cultivating then women. A possible reason for this could be that Fairbairn village is located on previously "white" owned commercial farmland (Shackleton & Shackleton: 2005) in which many of the older men worked as labourers on the farms up until the 1970's (Motteux: 2002). This was further substantiated by respondents from Fairbairn in

[5] This sex ratio can be explained by showing, for every 100 women, there are X- amount of males.

which there were many farmers who mentioned that they cultivated because it was "part of their culture" as well as for "enjoyment". In addition to this, Stats SA (2012) reveals that Fairbairn has a sex ratio of 118.1, meaning that there are more male residents than female.

In the past, the youth participated considerably in cultivation (Porter et al.: 2010), often helping the elders in the fields and gardens. However, this is generally not the case in rural areas today. There is growing consensus amongst scholars (for example, Shackleton & Luckert: 2015, Moller: 2005) that the youth are disinterested in cultivation and agriculture as a whole, although Falayi (2017) working in Fairbairn found that if given the necessary inputs and extension services they would possibly be interested in farming. However, this does not reflect in my data from both Fairbairn and Ntloko, as the number of children helping out with cultivation is extremely low. The reason for this, according to Aliber (2005), is that the youth do not see agriculture as a viable way to self-improvement and therefore are disinterested. This is further backed up by a study done on the Wild Coast by Shackleton & Luckert (2015) that shows the younger generations have different interests and aspirations compared to past generations. Interviews conducted by Clarke (2012) with youth from Lessington and Willowvale in the former Ciskei, indicated that the youth were disinterested in the activity of own production and preferred the idea of formal employment. Hebinck & Lent (2007) found that the youth felt "misunderstood and neglected" and in a mental state of "waiting to leave". This mental state of "waiting to leave" could be due to the schools in the area and the education that the youth are receiving in post-apartheid South Africa. Hebinck & Monde (2007) state that this increased education directly translates into young boys participating in labour migration straight after their final year (matric). One can draw the conclusion, that rural areas offer little opportunities for those youth that are educated yet cities boast a variety of opportunities, such as tertiary education, an attractive lifestyle as well as the possibility to earn a cash income (Hebinck & Monde: 2007).

2.4.3 Reasons for participating in agriculture

Increasing food prices and general inflation are stretching the low cash income of poor households to extraordinary lengths with many households struggling to make it last to the end of the month (*see Chapter 3*). Consequently, the main reason for households participating in cultivation is so they can reduce the amount of cash they spend on food. After purchasing food stuff and groceries little cash was left for extra items or costs. Cultivating thus allowed households to spend less on food and freed up cash that could be spent on other things like

electricity, school clothes etc. (Clarke: 2012). This is evident as responses from Fairbairn highlight "*Supplement household food expenditure*" as the main reason for cultivation.

However, in Ntloko, the most common reason people cultivated was for "*survival*". This shows high levels poverty and food insecurity in Ntloko. This can be explained by looking at the mean incomes per month for both villages; Ntloko's is R1000 less than Fairbairn which is a considerable difference, which may be a factor as to why residents are cultivating more for "*survival*" than to simply supplement household income. Although the numbers of those cultivating continues to decline, the practise of own production, especially home gardens, is nonetheless still important to many rural households and livelihoods (Aliber & Hart: 2009), even if only for supplementing household food expenditure or as a coping mechanism to various shocks and stressors (Baipheti & Jacobs: 2009).

2.4.4 Crop choices

Different crops are grown for different reasons and vary depending on whether one is cultivating in a field or in a small home garden. Home gardens allow for more variety and a "hands on" approach (also Galhena, Freed & Maredia: 2013) whilst fields provide the ability to plant more crops thus, a possibility of higher yields. Maize was favoured by field cultivators in both sites and home gardeners in Ntloko, but not Fairbairn. Maize is a multi-functional crop as it is used for household consumption as well as for animal feed (Hebinck & Lent: 2007). Home gardens in both Fairbairn and Ntloko boasted a large variety of crops as mentioned above, which is a typical feature of home gardens around the world (Mitchell & Hanstad: 2004). In addition to this, the more variety a garden has the more it adds to the nutritional status of the household. A study done by Faber et al. (2002) showed that yellow and green leafy vegetables (spinach, carrots, butternut, imifino i.e. wild herbs) produced in home gardens gave households higher levels of pro-vitamins, thus an increase in nutritional status. Although medicinal plants are sometimes grown in home gardens, this was not observed in Fairbairn and Ntloko.

Cultivation practices

Cultivation in both Fairbairn and Ntloko were characterised by low inputs and capital which is common throughout this area (Hebinck & Lent: 2007, Shackleton, Shackleton & Cousins: 2001). Production outputs in both Fairbairn and Ntloko were low compared to commercial enterprises (even those within the village). Reasons for this as stated by Shackleton,

Shackleton & Cousins (2001) are the small scale of home gardens, resistance to "modern" technologies and inefficient practices. The low income of most households do not allow for major cultivation implements and inputs to be used. Ploughing of fields is mostly done by tractor in Ntloko, which is usually hired from other villagers or from neighbouring communities. In Fairbairn, field ploughing is mainly done using a tractor which was obtained from an old government project. Donkey plough and hoes were used in a few cases. Labour was acquired from within the household which is common in rural areas (Hebinck & Lent: 2007) and hiring labour was not common besides one or two commercial cultivators who used unemployed villagers during ploughing and harvest season. Nearly half the home gardens in Ntloko were ploughed using a tractor. However, in Fairbairn most were tilled using hoes. Although it takes longer using hoes, this task can be shared between household members therefore reducing spending.

Due to the low income of most households in both villages, chemical fertilizers, pesticides, herbicides and insecticides were not widely used, although "traditional" methods were applied in rare cases, such as sprinkling ash over crops which keeps pests and insects away as well as kraal manure which help soil fertility. Kraal manure was used widely on both fields and home gardens and was usually acquired from the homestead kraal or obtained from a neighbour. Kraal manure offers three of the main nutrients needed for good plant growth, namely potassium, phosphorous and nitrogen (van Averbeke & Yoganathan: 1997). The extensive use of kraal manure meant that people perceived that soil fertility was relatively good compared to many other rural areas in the Eastern Cape (Mandiringana et al: 2007).

2.5 CONCLUSION

The two study sites exhibited the typical characteristics of contemporary cultivation in the rural Eastern Cape. Cultivation was mainly undertaken by the older generations in small home gardens within the homestead, and comprised of low inputs and minimal capital investments. Although proposition one (*see Chapter 1*) states that agricultural production in the previous Ciskei regions of the Eastern Cape is declining, it is evident from the high number of households that are cultivating home gardens, that own production is still important for both livelihoods and food security, as the crops grown were almost always for household consumption. However, as the older generations get older and the youth remain uninterested, the trend may be towards even lower levels of cultivation done by a select few. Due to the low input nature of rural cultivation, there needs to be an increase in productivity

if food insecurity is to be addressed effectively. However, the issue surrounding land and tenure security needs to be addressed further, for this to happen.

CHAPTER 3: FOOD SECURITY AND CULTIVATION IN FAIRBAIRN AND NTLOKO VILLAGES, EASTERN CAPE

Picture by Neil Palmer (CIAT). A farmer at work.

3.1 CHAPTER OVERVIEW

In this chapter, I address objective number two which aims to assess in detail, the level of food security in two rural villages, Fairbairn and Ntloko. In doing so, I also explore the role of cultivation in household food security and overall livelihoods. The main aim of this chapter is to build a further understanding of food security in the Eastern Cape by exploring how households from both study sites access and acquire the food they consume, whether purchasing from shops or markets, growing their own produce or using a mixture of both. Furthermore, in this chapter I seek to find out whether or not those who participate in cultivation are more food secure with regards to *access* than those who do not cultivate using the Household Food Insecurity Access Scale (HFIAS). Lastly, I aim to identify other factors that influence household food security in order to make the necessary recommendations to ensure households can achieve or remain food secure in the future, especially in the context of a changing climate.

Research questions that I address in this chapter include:

- Where do people get their food from? Market, own production or both?
- What is the average household food expenditure in each study site?
- What is the general level of food security (*access*) in both study sites?
- Are cultivators more food secure than non-cultivators?
- What are some other influences on food security?

The chapter starts with a general overview food security with a focus on the South African context. Following this, what is meant by the term "food security" is discussed. After this, the research results are presented, followed by the discussion of the results. I then offer a conclusion to this chapter.

3.2 INTRODUCTION

3.2.1 Background: Food security in the global context and the effects of climate change

Throughout the world, especially in developing countries, attaining food security is a considerable challenge. Globally, there are estimated to be around 805 million people who go hungry every day (FAO: 2014). In 2000 the United Nations and a large gathering of world leaders set out to achieve what became known as the Millennium Development Goals (MDG's). Goal #1 was to halve the amount of people living in poverty and hunger by 2015 (UNGA: 2000). Although halving extreme poverty (a person living on less than $1.25 per day) has been achieved, the halving of people living with hunger has not been reached as of yet (UNDP: 2014). Although there are many factors that influence food security, global climate change is becoming a very prominent factor to take into account (see *Chapter 1*). The effects will be felt mainly by poor rural communities in developing countries, who are particularly vulnerable, or lack the necessary adaptive capacity to mitigate the harmful consequences of global climate change as well as other social, political and ecological stressors (Besada & Werner: 2015). Furthermore, rural communities that rely mainly on agriculture and natural resources will face even greater livelihood stress as the climate continues to change and this is evident throughout the African continent which is likely to suffer the greatest impact (IPCC: 2013). In addition to this, rising food prices (as a result of droughts and poor crop yields) will create increased vulnerability as rural communities struggle to purchase sufficient and nutritious food (Faber & Wenhold: 2007).

3.2.2 Food security in the South African context

Food security in South Africa is complex, dynamic and multi-dimensional (Altman, Hart & Jacobs: 2009). In 2002, the South African government adopted the Integrated Food Security Strategy (IFSS) in which, much like the FAO definition of food security (discussed below), aimed to "attain universal physical, social and economic access to sufficient, safe and nutritious food by all South Africans at all times, to meet their dietary and food preferences for an active and healthy life" (IFSS: 2002). Another government programme named the Zero Hunger Programme, based off the Brazillian Zero Hunger Programme was implemented after 2011, however, it was short lived as funds were transferred into the Masibambane Rural Development Initiative (Battersby: 2011). This programme focuses on land reform through a recapitalization initiative which is to increase agricultural production, guarantee food

security, job creation and graduate small scale farmers to commercial farmers in the agricultural sector. Although, a great deal of effort has gone into many programmes to reduce food insecurity and hunger in South Africa, food insecurity is still a concerning issue that many South Africans face, especially those living in rural areas.

As food security is multi-dimensional in nature, measuring it is a complex task. Some of the means of measurement used in South Africa have included the General Household Survey (GHS), the Labour Force Survey (LFS), the Income and Expenditure Survey (IES) and the South African National Health and Nutrition Examination Survey (SANHANES), to name only a few (De Cock et al: 2013). In 2007, the GHS found that 41% of South African households were considered food secure (Stats SA: 2007). However, according to the SANHANES (2013), 45.6% of South African households were considered "food secure", with 28.3% at risk of hunger, and a further 26% experiencing hunger. This is lower than work by Labadarios et al. (2009) who found the national food security level to be around 51.6%. In the Eastern Cape specifically, Shisana et al. (2013) using the Community Childhood Hunger Index Program (CCHIP) reported that only 34% of households in the Eastern Cape were considered food secure, a further 32.4% were classified as "at risk" of hunger, with 36.2% said to be experiencing hunger. In addition, the GHS recorded that 22.4% of households in the Eastern Cape had moderately inadequate access to food and a further 7% of households had severely inadequate access to food (Stats SA: 2014).

Although the South African government have placed poverty reduction and food security high on their policy agendas (Kepe & Terrusso: 2013, D' Haese et al: 2013), food security cannot be addressed in isolation from other development challenges such as unemployment, rural and urban development, household demographics and access to resources, including access to water, credit, technology and land for own production (*see Chapter 2*) (Altman, Hart & Jacobs: 2009). In order to address the wider scope that food security encompasses, it is important to define and fully understand the complexity of food security.

3.2.3 Defining food security

It is vitally important that the definition of food security be understood. This thesis uses the definition issued by the United Nations Food and Agricultural Organization (FAO) which defines food security as, "*a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary*

needs and food preferences for an active and healthy life" (FAO: 2002). This definition is made up of four key dimensions: availability, access, stability and utilisation.

The first key dimension is **availability** and it refers to the availability of sufficient food and the overall ability of the agricultural system to meet food demand (Schmidhuber & Tubiello: 2007). It is determined by the physical quantities of the food produced and how it is stored, processed, distributed and exchanged (Rivera Ferre: 2014). Overall, availability refers to the amount of food that is produced by the agricultural system and whether it is enough to feed all people living in a particular area. Therefore, availability can be affected by things like soil fertility, labour intensity, the use of technology and machinery, infrastructure as well as climate and local weather conditions. Availability is not necessarily an issue in South Africa as the country is considered to be "food secure" producing enough calories to adequately feed every one of its 53 million people (OXFAM: 2014). However, at a localised scale, it is possible for availability to become an issue if cropping is insufficient, as evident from the 2015/2016 drought (see *Chapter 2*). With one in four people suffering from hunger (OXFAM: 2014) the major issue, especially in rural areas of South Africa is rather that of **access** to such food.

Access covers the way by which individuals gain adequate resources in which they acquire appropriate foods for a nutritious diet (Schmidhuber & Tubiello: 2007). Amartya Sen (1981), an Indian economist who did seminal work on poverty and the causes of hunger came to the conclusion that hunger and even famine were not always caused by a decline in food availability, but rather a loss of access to food, which could be explained by understanding people's entitlement relations. A person should have entitlements to his/her own production, the sale of labour in return for wages or the exchange of products for other goods (Sen: 1981). However, if an individual has no access to land, employment or goods to barter with, then access to food becomes extremely difficult. Access also pertains to the purchasing power of consumers and food prices. However, these resources do not need to be strictly monetary but may include traditional rights, such as common or shared resources (Schmidhuber & Tubiello: 2007). In South Africa, especially in rural areas, many rural households rely strongly on income and cash obtained through government social grants as well as remittances from family members working in urban areas (D' Haese et al. : 2013). These grants have played an important role in poverty reduction since 1994 (Leibbrandt et al: 2010). However, households that rely on purchased foods are at risk due to the constantly fluctuating price of food due to factors such as increasing oil and electricity prices, and climate change in

addition to the ever changing stability of the market systems (Faber & Wenhold: 2007). It is suggested that the rate of household food poverty increases with decreasing income, increasing household size as well as those households that are headed by females (Rose & Charlton: 2002). In the rural areas of the Eastern Cape Province, households can be characterised by low incomes and large families, consisting of many dependents and more often than not, headed by a female (Hebinck & Lent: 2007).

The next key dimension is **stability** which refers to how consistently food is available, over time. Food security is not a static thing and its stability is affected by many different factors. Therefore, food instability can be regarded as transitory, seasonal or chronic (FAO: 2008). If food is unavailable over certain periods of time, due to droughts (as seen in Southern Africa in 2015/2016), conflicts, market fluctuations or natural disasters, then food insecurity is transitory (Ecker & Breisinger: 2012). Chronic food insecurity is defined as an exceptionally long period without adequate food supplies and is often linked with the consistent reoccurrence of transitory food insecurity (FAO: 2008). Seasonal instability can result due to typical patterns of growing seasons (FAO: 2008). Transitory instability has been evident in South Africa as the crippling drought of 2015/ 2016 has seen a huge drop in crop production (almost 1 million tons less than predicted for maize), owing to one of the lowest periods of rainfall the country has recorded since 1904 (Gustafson: 2016).

Lastly, **utilisation,** which encompasses all food safety and quality aspects of nutrition which relates to health and sanitary conditions across the whole food chain, from production to plate (Schmidhuber & Tubiello: 2007). For food security to be achieved, the food that is ingested must be safe and nutritious. Definitions of food utilisation vary slightly, for instance FAO describes it as "the way in which the body makes the most of various nutrients in the food" yet the World Food Programme (WFP) takes a broader approach including in its definition "households use and treatment of food" (Aberman & Tirado: 2014). The way in which food is stored, prepared, processed and cooked within the household affects food safety (FAO: 1997). If food is not safe then in cannot be fully utilized. Food utilisation is usually measured with indicators of nutritional status (Ecker & Breisinger: 2012).

This research will briefly touch on the issue of utilisation and nutrition. However, as proposition two states that declining agriculture will exacerbate food insecurity and, inversely, increasing agricultural production will have a positive influence on food security, for the most part, access and availability will be the focus of this chapter.

3.3 RESULTS

3.3.1 Food acquisition

In order to get an understanding of where households acquire their food from, respondents were given a choice of four answers per food type as to whether they mainly, "*purchased from shops*", "*own production*", "*both shops and own production*" or "*purchased from neighbours*". As table 3.1 clearly shows, most households' food is bought from shops and markets, although many do rely on own production to varying degrees (see *Chapter 2*). In both sites, almost half of all respondents said that they solely purchased their vegetables and staples from the shops, with the other half of respondents relied on a combination of purchasing and own production. Purchasing from neighbours was not common practice as any surplus produced was usually traded or given freely to friends, family or neighbours.

Table 3.1 Percentage of households acquiring food in different ways

	Fairbairn (n= 60)				**Ntloko (n= 60)**			
	Purchase from shops(%)	*Own Production (%)*	*Both shop and own production (%)*	*Purchase from neighbours or villagers (%)*	*Purchase from shops (%)*	*Own Production (%)*	*Both shops and own production (%)*	*Purchase from neighbours or villagers (%)*
Fruit	92	0	5	3	100	0	0	0
Vegetables	51	3	43	3	50	0	50	0
Staples	82	0	18	0	45	0	55	0
Meat	98	0	2	0	100	0	0	0

Respondents were asked what proportion of food from each category did they purchase as this could be used to show the relative contribution of own production to households food supply (table 3.2).

3.3.1.1 Fruit

In Fairbairn, 5% of households said that they purchased *most* of their fruit (table 3.2). However, they did produce a small amount as some had a fruit tree within their homestead boundary. These fruits included apricots, mangoes and guavas. Besides these households, no other responding household said that they produced fruit relying solely on purchasing to acquire their fruit. However, when speaking to local residents, it was found that prickly pear

was gathered or purchased by a few households, although not within their homestead boundaries. No responding household from Ntloko produced any fruit of any type.

3.3.1.2 Vegetables

In Fairbairn, 16% of households said that they purchased *most* of their vegetables although they did produce a small amount as well (table 3.2). A further 18% of households said that they purchased *half* and produced *half* of their vegetables, with 10% saying they purchased a small amount but only when their own produce ran out. Only 3% of households produced *all* the vegetables they needed (table 3.2). When speaking to local residents, it was noted that if, at the end of the month the household runs out of money, they will harvest *imifino* or wild leafy herbs. Furthermore, a resident from Fairbairn stated:

"I grow vegetables that you can't live without. Spinach, butternut, cabbage, potatoes and carrots (and some tomatoes) are important to be healthy."

In Ntloko, 43% of households said they purchased *most* of their vegetables although they did produce a small amount (table 3.2). Only 5% of households stated that they purchased *half* and produced *half* of their vegetables and a mere 2% of households produced *most* of their vegetables but purchased on the odd occasion. No household in Ntloko relied solely on their own production for vegetables.

3.3.1.3 Staples

In Fairbairn, the overwhelming majority of households purchased all of their staples. Only 13% of households purchased *most* of their staples but produced a small amount with 5% of households purchasing *half* and producing *half* of their staples. No household produced enough staples to be self-sufficient (table 3.2).

In Ntloko, 50% of all households said that they purchased *most* of their staples but did produce a small amount as well. Only 3% of households said they purchased *half* and produced *half* with 2% of households producing *most* of their staples but purchasing on the odd occasion (table 3.2). No household relied solely on produced staples, although much of the time the grain was also used for feeding livestock.

3.3.1.4 Meat

In both Fairbairn and Ntloko, almost all responding households stated that they purchased *all* of their meat from shops with only one household in Fairbairn relying on his own small stock for his meat (table 3.2). The main source of meat in both villages was chicken, rarely beef or pork, with fish almost never being eaten, besides the odd tin of tuna. The amount of chicken purchased was not very much with most households buying a 2.5 kg tray of chicken once a month. Most households did keep chickens, goats, sheep and sometimes cattle although they were rarely slaughtered for consumption. This being said, those with small stock did slaughter one or two of their animals under certain circumstances like traditional ceremonies or when family came over, usually around Christmas time. According to my field observations, eggs were not often bought from the shops as most households acquired them from their own chicken stock. According to Falayi (2017) the amount of chickens per household had actually increased over the last few years in Fairbairn village.

Table 3.2 Percentage of households obtaining part of key food categories via own production (n= 60)

	Purchased all their food		**Produced a small amount**		**Produced half**		**Produced most**		**Produced all**	
	Fairbairn (%)	*Ntloko (%)*	*Fairbairn (%)*	*Ntloko (%)*	*Fairbairn (%)*	*Ntloko (%)*	*Fairbairn (%)*	*Ntloko (%)*	*Fairbairn (%)*	*Ntloko (%)*
Fruit	95	100	5	0	0	0	0	0	0	0
Veg	53	50	16	43	18	5	10	2	3	0
Staples	82	45	13	50	5	3	0	2	0	0
Meat	98	100	0	0	0	0	0	0	2	0

3.3.2 Food expenditure

There was a slight difference between Fairbairn and Ntloko with regards to average food expenditure with households from Ntloko spending almost R150 more than those in Fairbairn (table 3.3). Food expenditure was further broken down into the various types of food purchased, namely, fruit, vegetables, staples (rice, maize, potatoes etc.) meat, and sugar (table

3.3). Respondents from Ntloko spent more, on average, on all types of food excepting staples for which Fairbairn spent an average of R10 more per month. Food expenditure averaged around 23% of total household income in Fairbairn and around 37% in Ntloko. The largest amount spent on food in both sites was on staples such as maize meal, cereals, potatoes and rice which averaged between 45%-55% of total food expenditure.

Table 3.3 Average food expenditure (Rands) per household on different food categories

	Fairbairn		**Ntloko**	
Food Type	*Total household food expenditure (Rand)*	*% of total household food expenditure*	*Total household food expenditure (Rand)*	% of total household food expenditure
Fruit	67	8.1	83	8.5
Vegetables	83	10	143	14.6
Staples	460	55.6	451	45.9
Meat	131	15.8	169	17.2
Sugar	87	10.5	136	13.8
Total	828		982	
	Average across both sites = R905			

3.3.3 "Household food insecurity access scale" (HFIAS) and experience of food insecurity[6]

Households from Fairbairn village had an average HFIAS score of 4.65 (out of 27) whereas those from Ntloko had an average score of 6.72 (out of 27). This means that Ntloko was slightly more food insecure with regards to access than Fairbairn[7]. In total, 18.3% of households in Fairbairn can be considered "food secure" with only 8.3% of households in Ntloko considered as "food secure" (table 3.4).

The following sections, which are based on the nine HFIAS questions (see *Chapter 1*), pertain specifically to the key dimension of *access* (see *definition of food security* in the introduction to *this chapter*). However, from these questions, *utilisation* and *stability* are also covered.

[6] For a more detailed explanation of the HFIAS, refer to methods section

[7] The closer the score is to zero the more food secure the household is. A good score would be between zero and three, with a bad score being anything above 6. See *Chapter 1, Methods* section for more.

Table 3.4 Household food security categories (access) across both Fairbairn and Ntloko.

	Fairbairn (%)	Ntloko (%)
Food secure	18.3	8.3
Mildly food insecure	20	11.7
Moderately food insecure	40	21.7
Severely food insecure	21.7	58.3

3.3.3.1 Anxiety and uncertainty about the household food supply

In Fairbairn, 53.3% of respondents said that they worried, at least once a month, that their household would not have enough food to eat, with 58.3% of respondents in Ntloko saying the same (table 3.5).

3.3.3.2 Insufficient quality (includes variety and preferences of the type of food

In Fairbairn, 65% of respondents said that they were unable to eat the kinds of foods they preferred due to lack of resources, while in Ntloko 76.6% of respondents echoed this. When respondents were asked if they ever had to eat a limited variety of foods due to lack of resources, 91.6% of respondents from Ntloko said "yes" compared to 73.3% in Fairbairn. In Fairbairn, 48.3% of respondents said that they had to eat food they really disliked due to lack of resources to obtain any other food. In Ntloko, the response was almost double that of Fairbairn with 80% of respondents saying "yes" (table 3.5).

3.3.3.3 Insufficient food intake

In Fairbairn, 58.3% of respondents and 71.6% in Ntloko said that they had to eat a smaller meal in the last month, than they felt they needed because there was not enough food in the household. In addition to this, 46.6% of respondents in Fairbairn and 70% in Ntloko said that they had to eat fewer meals in a day, over the last month, because there was not enough food in the household. Twenty percent of respondents from Fairbairn and 58.3% of respondents from Ntloko said that there were times in the last month, when there was no food to eat of any kind in the household. In Fairbairn, 8.4% of respondents said that they had gone to sleep hungry in the last month, because there was no food to eat. Shockingly, 48.3% of respondents from Ntloko said they had done the same. Furthermore, 36.7% of respondents from Ntloko

said that they had gone the whole day and night without eating, usually around the end of the month, compared to only 5% in Fairbairn (table 3.5).

Table 3.5 Percentage of total respondents (n= 60) who answered "yes" to the various HFIAS questions, and the frequency of occurrence.

	Fairbairn				**Ntloko**			
	Percentage (%) of total respondents who answered "yes"(n= 60)	*Rarely (once or twice a month) (%)*	*Sometimes (three to ten times a month) (%)*	*Often (more than ten times a month) (%)*	*Percentage (%) of total respondents who answered "yes" (n= 60)*	*Rarely (once or twice a month) (%)*	*Sometimes (three to ten times a month) (%)*	*Often (more than ten times a month) (%)*
Q1 (enough food)	55	48.3	6.7	0	58.3	51.7	3.3	3.3
Q2 (food preference)	65	55	10	0	76.6	68.3	5	3.3
Q3 (limited variety)	73.3	60	13.3	0	91.6	86.6	3.3	1.7
Q4 (lack of choice of food)	48.3	35	13.3	0	80	66.6	6.7	6.7
Q5 (smaller meal than needed)	58.3	45	13.3	0	71.6	63.3	3.3	5
Q6 (fewer meals in a day)	46.6	28.3	16.6	1.7	70	63.3	5	1.7
Q7 (no food to eat)	20	18.3	1.7	0	58.3	55	0	3.3
Q8 (went to sleep hungry)	8.4	6.7	1.7	0	48.3	46.6	0	1.7
Q9 (whole day and night without eating)	5	3.3	1.7	0	36.7	36.7	0	0

In order to further gauge the level of food security, respondents were asked to say whether the household had access to a sufficient or adequate supply of food throughout the month of data collection. Although the perception of an "adequate" or "sufficient" supply of food (purchased and produced) can vary between each person and each household, it was deemed important in order to roughly gauge the respondents' perception of their own food security. As figure 3.1 shows, there were more respondents from Fairbairn that said they had an adequate supply of each category than those in Ntloko.

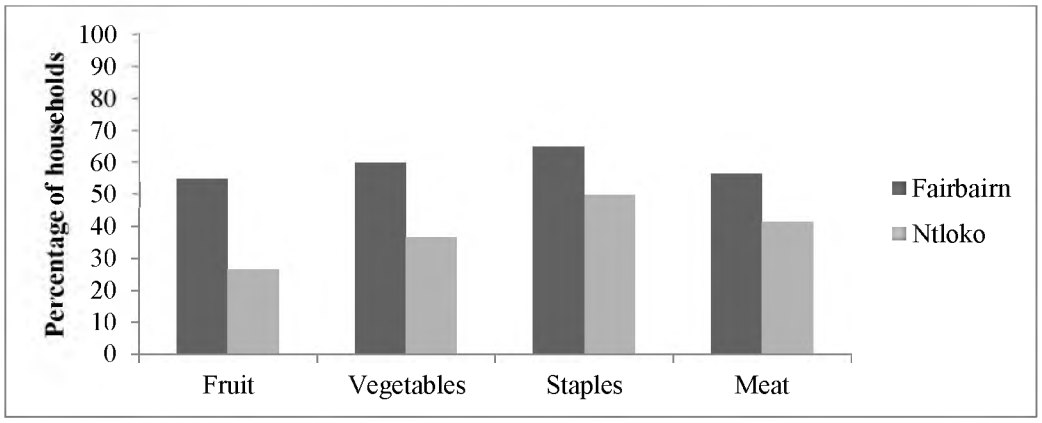


Figure 3.1 Percentage of households that said they had an adequate supply of each food category during the month

3.3.4 Comparing the food security of cultivators and non-cultivators

Of the households that were considered "food secure", cultivators made up a higher percentage in both sites, however, this was only significant in Ntloko (table 3.6). In Fairbairn, there were significantly more non-cultivators than cultivators that were considered "mildly food insecure". In Ntloko, the opposite occurred with more cultivators than non-cultivators in the "mildly food insecure" category. In both sites, cultivators made up a larger percentage of those considered "moderately food insecure" although this was only significant in Fairbairn. In Fairbairn, there were more cultivators in the "severely food insecure" category (table 3.6). In Ntloko there were significantly more non-cultivators that were considered "severely food insecure". In both villages, there seemed to be a contradiction as to whether cultivating made a household more food secure or not. In a discussion with a non-cultivator, the following was said:

"Life without a garden is not good. I have to purchase everything that we eat. The prices of food go up every year and we get less and less food for the same amount of money."

This was echoed again by another household that did not cultivate:

"Most of my government grant, I spend on food at the shops (in town). But if I cultivated a garden, I could grow crops and not have to spend so much money on food. I could use the grant to buy school clothes and other extra things."

However, when conversing with a man who did cultivate, he said:

"It is risky to cultivate because of the changing weather, sometimes it is easier to just buy food at the shops. When you spend your money (grant) on seeds and inputs and there is a drought like there was this year, you waste money that you could spend buying food at the shops.

*Table 3.6 Percentage of cultivators and non-cultivators and their respective food security categories. *Significant at $p<0.05$*

	Fairbairn				**Ntloko**			
	% of cultivators (n= 34)	*% of non-cultivators (n= 26)*	*X^2 Value*	*Total (%)*	*% of cultivators (n= 34)*	*% of non-cultivators (n= 26)*	*X^2 Value*	*Total (%)*
Food secure	20.6	15.4	1.22	18	11.8	3.8	4.35*	7.8
Mildly food insecure	8.8	34.6	19.70*	21.7	14.7	7.7	2.41	11.2
Moderately food insecure	47.1	30.8	5.38*	38.95	23.5	19.2	0.74	21.35
Severely food insecure	23.5	19.2	0.74	21.35	50	69.2	7.49*	59.65

3.3.5 Household characteristics and food security

Households that were considered *food secure* had a smaller average household size with those in Fairbairn and Ntloko having 2.6 and 2.8 people per household respectively (table 3.7). Those that were considered "food secure" in Ntloko spent the most per capita on food with R436. The least food expenditure came from households in the "severely food insecure" category in Fairbairn, only spending an average of R135 per capita. The percentage of total

income spent on food was lowest in Fairbairn with those in the “food secure” category with 17.9% and the highest being those in Ntloko in the “mildly food insecure” category with 5.

Table 3.7 Cross-tabulation of food security and selected household characteristic

	Food Secure		**Mildly Food Insecure**		**Moderately Food Insecure**		**Severely Food Insecure**	
	Fairbairn (n= 11)	*Ntloko (n= 5)*	*Fairbairn (n= 12)*	*Ntloko (n= 7)*	*Fairbairn (n= 24)*	*Ntloko (n= 13)*	*Fairbairn (n= 13)*	*Ntloko (n= 35)*
Average household size (People)	2.6	2.8	4	3.1	6.6	3.7	4.8	40.0
Monthly income per capita (Rand)	1256	1771	1035	540	640	1273	376	412
Percentage of households cultivating (%)	63	80	25	71.4	66.6	61.5	61.5	48.6
Food expenditure per capita (Rand)	225	436	200	314	142	348	135	204
Average percentage of total household income spent on food (%)	17.9	24.6	19.3	58	23	27.3	36	49.4

Household income for Fairbairn and Ntloko were plotted to determine whether there was any relationship between income and food security (figure 3.2). The HFIAS score was used as a measure of food security. There was some relationship between income and food security as shown by the lines of best fit. However, there were a few outlying households that did not fit with the hypothesis that food security and income are linearly related.

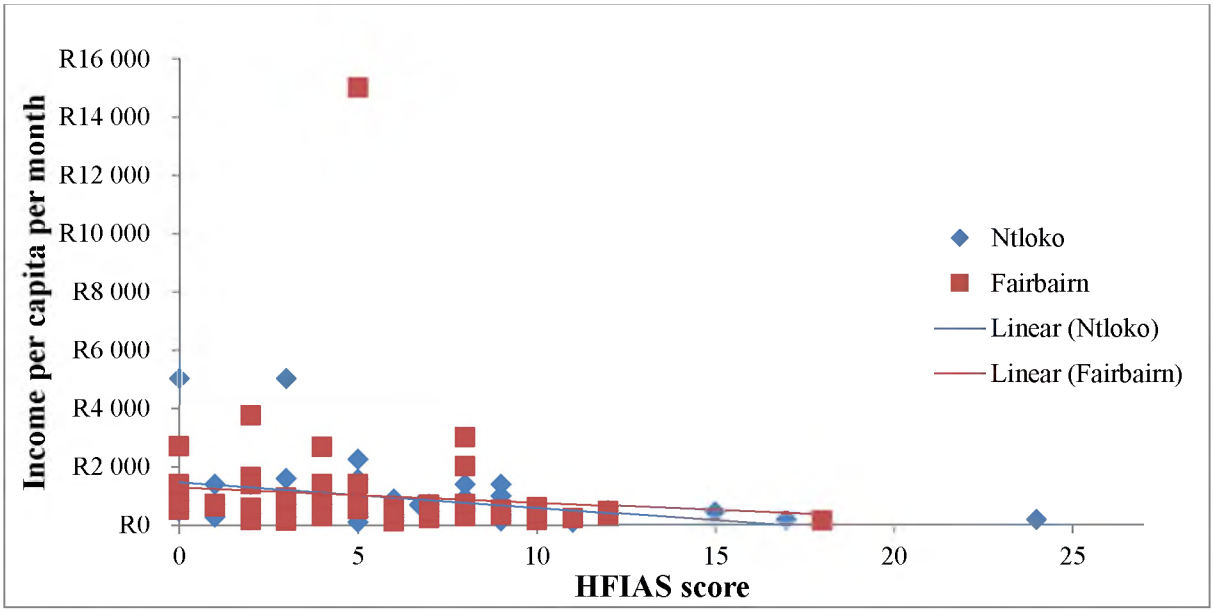


Figure 3.2 Household income per capita per month (y) and household HFIAS score (x)

3.3.6 Food Poverty Line

Food poverty, as explained by Rose & Charlton (2002), is when a household's food expenditure is less than adequate to purchase a basic, nutritionally sufficient diet. In 2014 (Stats SA) worked out the food poverty line to be around R400 per capita (this figure would be around R450 per capita per month in 2016). In Fairbairn, only 63% of households were above the *food poverty* line and in Ntloko 58% of households were above it. A possible reason for the low number of households above the food poverty line could be put down to the fact that over half of all households cultivate and therefore do not have to spend as much on purchasing food as they are supplemented by their own production, unlike the majority of their urban counter parts. Many households also spent a large amount on basic carbohydrates (maize meal, potatoes, rice etc.). So although they might be getting the correct amount of calories, the diets are not always nutritionally balanced.

3.4 DISCUSSION

3.4.1 Rural households now purchase most of their food

In the past, rural households produced most, if not all, of their food. However, this is no longer the case (Baipheti & Jacobs: 2009). Most respondents from both villages acquire their food by purchasing from shops and supermarkets with only a few households relying solely on their own production to meet their food needs. That being said, around half of all respondents said that they used a mixture of purchasing and own production to acquire their food. This is similar to a study done by D' Haese et al. (2013), in Kwa Zulu-Natal, where 70% of their sampled households purchased the majority of their food. As livelihood activities and strategies have diversified over the last half century from land-based into more cash-based activities (Shackleton & Luckert: 2015, Coetzee: 2003, Aliber & Hart: 2009), so too has the way in which people acquire their food, as it is easier and less risky to purchase from shops and markets than it is to produce, especially for those households receiving government grants.

In most rural villages one can find small "spaza" (Zulu for "hidden") shops which sell a variety of items such as maize meal and flour to cigarettes and cool drinks. These shops are usually more convenient, but they are also more expensive than the supermarkets they themselves purchase from as they add their own small mark-up (Food Pricing Monitoring Committee: 2003). People will usually only purchase a few items from "spaza" shops or in cases of emergency. The main grocery shopping is done in the nearest urban centre at supermarkets like Checkers, Spar and Pick n Pay and wholesalers like Boxer. Large supermarket chains have more effective and efficient management and procurement systems than small local "spaza" shops, therefore benefitting from economies of scale allowing them to sell food at a relatively low price (D' Haese & Van Huylenbroeck: 2005). However, travel costs to and from these towns can be quite high (see *Chapter 1*), as many rural villages are located upwards of 50 km (sometimes further) from the nearest town or urban centre in which a round trip can cost as much as R100. A way in which to address the difficulties of purchasing in distant towns would be to purchase locally from neighbours or other villagers. This would also create a small local market and possibly entice more to start cultivating, therefore making use of unused fields in the area. However, as table 3.1 show, there is very little being sold locally in both villages. A reason for this could be the current scale of

cultivation in both villages (besides the two commercial cultivators in Fairbairn). The small scale of cultivation may not be enough to create a viable local market and thus, discourages local cultivators.

3.4.2 Reliance on purchased food may increase vulnerability

Purchasing food instead of producing it, allows the labour in the household to engage in other income generating activities (D' Haese & Van Huylenbroeck: 2005), however it can create more vulnerability due to fluctuations of food prices (mainly increases). The price of food in South Africa has increased dramatically since 2007 (Wondon & Zaman: 2008) attributed to factors such as domestic electricity supply constraints, increasing oil prices, increased speculation in the commodity markets as well climatic events, such as the 2015/2016 drought (Altman, Hart & Jacobs: 2009, Faber, Witten & Drimie: 2011).

The increasing prices of foods especially maize and wheat (bread), which tend to be staple foods in most poor South African households, pose a serious problem to household food security, as such households are the main consumers of such crops (Altman, Hart & Jacobs: 2009). Increased prices will force low-income households to allocate a greater proportion of their income and expenditure to food, which will result in less diverse diets, poor quality diets as well as less calories consumed as households struggle to cope, ultimately becoming more and more food insecure (Altman, Hart & Jacobs: 2009). However, own production is an important livelihood activity and can help contribute to dietary diversity and nutrition. For example, Faber, Witten & Drimie (2011) found that home gardens decreased micronutrient deficiency as well as increasing vitamin A intake among households in KwaZulu-Natal.

3.4.3 Household food expenditure

Household food expenditure varies considerably between areas especially between urban and rural households (Bonti-Ankomah: 2001). Average monthly food expenditure was 23% and 37% of total monthly income for Fairbairn and Ntloko respectively. These results are much lower than those in a similar study done by D' Haese et al. (2013) in four rural villages in Kwa Zulu- Natal, where they found an average of 60% of total household income was spent on food. However, Fairbairn and Ntloko both had higher total incomes per capita than the KZN study, therefore the same amount of food purchased would count a smaller percentage of their total income.

The proportions of different foods purchased seemed to correlate with other studies in the area. For example, D' Haese & Van Huylenbroeck (2005) also found that maize meal (and other staples), meat (due to its high price) and sugar made up a large part of expenditure. Vegetables formed a much smaller percentage of expenditure for the reason that many grew a supplementary amount. Falayi (2017) found with regards to wild vegetables and herbs that consumption had declined due to the increased reliance on home garden vegetables as well as a decline in field cultivation where these weedy, leafy, wild vegetables are generally harvested. However, I found that many households still harvested near the end of the month if they ran out of money.

On average, households in Ntloko spent a total of R150 more per household on food than those in Fairbairn. This could be partly explained by referring to crop yields in the previous chapter (see *Chapter 4*) which were low in the study period due to severe drought conditions that plagued the country. Therefore households in Ntloko were forced to purchase more of their food as harvests were minimal. However, if data collection in Fairbairn took place at the same time as Ntloko, one can assume they would also have minimal harvests therefore possibly spending more on purchased foods.

Monthly income per capita and food expenditure per capita followed a logical decrease in Fairbairn with "food secure" households spending more than "mildly food insecure" households and so forth. This is substantiated by De Cock et al. (2013) who found a direct relationship between income and food security levels in their study in the rural areas of Limpopo province. However, this was not the case in Ntloko. Although households in the "food secure" category did earn and spend the most per capita on food and "severely food insecure" households spent the least, those in the "moderately food insecure" category spent more than those in the "mildly food insecure" category. A reason for this occurrence could be due to the fact that 71.1% of households in the "mildly food insecure" category cultivated as opposed to 61.1% in the "moderately food insecure" category, thus needed to spend less on purchased foods. That being said, the difference was only around R30. However, those in the "moderately food insecure" category did have a higher income per capita. One could make the assumption that although there is a direct relationship between food expenditure per capita and food security status between the two extremes (food secure and severely food insecure), this relationship becomes somewhat blurred in the middle categories.

Although household food insecurity generally increases with decreasing income and increasing household size (Rose & Charlton: 2002), which can be seen in figure 3.2, Ntloko boasts higher average monthly incomes (per capita) as well as smaller average household size than that in Fairbairn yet appears more food insecure. A possible explanation for this could be the 2015/2016 drought which affected the village of Ntloko severely. Crop yields were extremely low and therefore, households had to spend more money on purchasing food instead of relying on their own production. This is evident as "food expenditure per capita" in Ntloko was significantly higher than those in Fairbairn.

3.4.4 Levels of food security differ between sites

As mentioned previously, Fairbairn appears to be more food secure than Ntloko and this is reflected in the results of the HFIAS. The average HFIAS score for Fairbairn was 4.65 and 6.72 in Ntloko. These results are much lower than those captured by De Cock et al. (2013) in the Limpopo province which was 10.05 (the higher the score the more food insecure the household). However, Ntloko village appeared to be more food insecure than Fairbairn on all accounts, with the bulk of respondents falling into the "severely food insecure" category as opposed to Fairbairn where most were in the "moderately food insecure" category. Not only did Ntloko have a much higher HFIAS score, but also a higher percentage answering "yes" to the nine occurrence questions (table 3.5). The most commonly referred to of the three domains provided by the HFIAS questions, was "insufficient quality". For food security to be achieved, the food consumed needs to be safe and nutritious (see above *definition of utilisation* in this chapter). In both Fairbairn and Ntloko, a high number of respondents cited "limited variety of food due to lack of resources" as the most common issue. The responses from this occurrence question highlight the issue of a limited and monotonous diet in both villages which can often lead to under-nutrition. Even if a household's calorie intake is adequate, under-nutrition can still be an issue as it refers to a lack of micro-nutrients within a diet, such as important vitamins, iron and zinc (Aliber & Hart: 2009).

Although, over half of all responding households in Fairbairn stated that they had an adequate supply of fruit, vegetables, staples and meat all year round, this was not the case in Ntloko. Furthermore, just over half of respondents in Ntloko stated that they often run out of food before the end of the month (usually a few days around the end of the month) with many households (71.1%) having to decrease the amount of meals they had per day due to a lack of resources to acquire more food. Whilst conversing with a local woman, she had told me that

she often has to go out and harvest wild herbs or *Imifino* (*Bidens pilosa L, Chenopodium album*, *Sonchus asper*, *Solanumnigrum* and *Urtica urens*) in order to supplement her household when she ran out of money.

Another reason as to why Ntloko seemed to be more food insecure than Fairbairn could be due to the time of year the data was collected. Data collection in Fairbairn was done before the Christmas break (see methods i.e. data collection) where as Ntloko was surveyed straight after. Expenditure is often much higher through December and January as family members are home from the cities during this time. There is also the issue of income shortages especially unpaid leave for casual workers, meaning the months that follow can be quite tough (D' Haese et al: 2013). This ties in directly to the issue of *stability* (see above *definition of stability*) in which food needs to be consistent over time. During the early parts of the year (after the Christmas break) households are subjected to seasonal food insecurity as savings is often spent during this break to accommodate extended family and various celebrations.

3.4.5 The role of cultivation in food security

Although cultivation is said to play a part in reducing household food insecurity, there are many added complexities such as the agro-ecological and socio-economic climate in rural areas (Aliber & Hart: 2009), which, in turn, influence whether cultivation does or does not reduce food insecurity. A study done in the Limpopo province by De Cock et al. (2013) stated that household food production did not seem to contribute to a higher household food security status. I would argue that with the shift in livelihood strategies (i.e. decline in cultivation), cash based income has more of an influence on food security as reported above and in figure 3.2. This is backed up by Hendriks (2003) who states that while production for home consumption increases the availability of vegetables and increases micronutrient intake, it is rather, the income savings that is derived from such production that has a more positive impact on the nutritional status of households as they can afford to purchase more nutritious foods.

3.5 CONCLUSION

This chapter aimed to explore the issue of food security in the Eastern Cape with a focus on own production and its subsequent decline (*see proposition two*). Although food security levels are low in both sites, they are quite normal for this region. Addressing food security in the former homelands is a large undertaking as there are many different factors that have an

impact on a household's food security including household size, monthly cash income as well as access to labour and land, among other constraints to cultivation as seen in the *previous* and *next* chapter. It is difficult to say whether or not those who cultivate are more food secure than those who do not. However, those that do cultivate do have better access to available food than those who don't cultivate. Therefore, I would argue that in certain circumstances and contexts, cultivation will have a more positive influence on household food security, especially with regards to access and availability, and more especially if mechanisms can be found to increase this in extent and productivity. However, with the risks and constraints involved with cultivation (which will be covered in *Chapter 4*) having the ability earn cash income and purchase food is also an important livelihood strategy.

CHAPTER 4: CLIMATE CHANGE AND CULTIVATION: CHALLENGES FOR CULTIVATION AND LOCAL PERCEPTIONS OF CLIMATE CHANGE IN THE EASTERN CAPE

4.1 CHAPTER OVERVIEW

The overall aim of this chapter is to explore local people's perceptions of climate change, specifically, their perceptions on rainfall and climatic events (i.e. drought, flood and heavy storms). In addition, the challenges that cultivators face are examined. The general challenges of cultivation will be addressed in order to plot where climate change and the challenges it brings, fits into the greater scheme of cultivation and household food security relating to proposition three which assumes, climate change will result in new challenges that will superimpose on existing constraints, and further exacerbate and contribute to uncertainty for future food security. Some key questions are:

- What are the main experiences or challenges facing cultivators?
- How do local people (cultivators or not) perceive climate change, specifically rainfall?
- Have there been noticeable changes in local weather patterns and climate over the last 10 years?
- How does climate change and variability impact cultivation and local livelihoods?

This chapter starts off with an introduction in which I set the context of climate changes in South Africa as well as why local people's perceptions of these changes are important. Next I present the results relating to the key questions above. Following this, I discuss my results and give a brief conclusion to this chapter.

4.2 INTRODUCTION

4.2.1 Climate change in South Africa

According to the IPCC (2014), the southern Africa region is expected to become hotter and drier, with a higher frequency and severity of drought events. According to the Eastern Cape Province, Department of Economic and Environmental Affairs (2011), manifestations of climate change in South Africa are likely to include higher surface temperatures, altered rainfall patterns and more frequent and intense extreme weather events including heat-waves, droughts, storms and floods as well as seas level rise associated with storm surges. Precipitation models show a wetting trend to the east and north-east of South Africa with a drying trend expected for the south and south-west (DEEA: 2011). Precipitation models for the Eastern Cape Province suggest that rainfall trends are likely to remain stable or slightly higher than present. Although experience "on the ground" has seen an increasing trend of variability (see *figure 4.8*).

Although southern Africa has often been a victim of climate variability, there has been an ever increasing trend with regards to drought events (Rouault & Richard: 2005). Within the Eastern Cape Province, the north-western parts are said to experience the highest surface temperature increase with the coastal areas expecting the least. Furthermore, increased temperatures means increased rates of evaporation and therefore increasing the intensity of droughts (DEEA: 2011). This is already evident with prolonged periods of drought especially the most recent drought that hit southern Africa in 2015/2016. During this period (as well as the droughts of 1982/83, 2003/04, 2007/08 and 2009/10) the Eastern Cape was declared a disaster area (SABC: 2016). Periods of drought in southern Africa are often strongly related to the El Nino Southern Oscillation (ENSO) (Nicholson & Kim: 1997; Meque & Abiodun: 2015), and the 2015/2016 drought shows this correlation. With ENSO and the added effect of climate change, the severity of such droughts is believed to be getting stronger (Conway et al: 2015). Furthermore, the widespread implications will place a massive amount of pressure on the country's food security. During the 2015/2016 drought, maize (among other staple crops used for both human and animal consumption) were severely affected and subsequently lost, costing some South African farmers over R10 million in 2015 (Bahta et al.: 2016). This increased pressure has had dire consequences for many living in the Eastern Cape as the province is highly vulnerable to disasters due to the high levels of poverty, environmental degradation, poor household economies and lack of access to resources (Bahta et al.: 2016). It

is for this reason, that perceptions of these changes by the most vulnerable, i.e. those relying to a large extent on the environment for their livelihoods, needs to be addressed in conjunction with the other challenges that they face.

4.2.2 Why local perceptions of climate change?

Perception refers to a range of judgements, beliefs and attitudes (Taylor et al.: 1988) by an individual or group (community) from which it can be considered neither universal nor static but instead, value-laden and dynamic (Slegers: 2008). With regards to climate change (but not exclusively), one usually perceives an event in terms of magnitude, duration and frequency (Slegers: 2008). So long as one of the above mentioned factors are "unusual" or "uncommon" it will influence how that event is perceived in the future as well as whether or not people respond to it.

In the past, local people's perceptions and opinions where placed into the "indigenous knowledge" or "traditional knowledge" category which was usually separate to western scientific research. However, recently the value that "indigenous knowledge" can add to scientific research has become apparent and many researchers are opting for an integrated approach with each knowledge base complementing each other rather than competing (Nyong, Adesina & Elasha: 2007). In the context of climate change, Simelton et al. (2013) state that research using meteorological observations is commonplace within scientific literature, however, the information gathered remains largely separate from farmers' perceptions. This often causes a lack of understanding and disconnection between those "on the ground" and those in academia or science and weather services. Some of the reasons are that researchers analyse climate data at different timescales than those necessary for farmers to make adequate decisions (Ovuka & Lindqvist: 2000) as well as focusing on meteorological droughts while farmers tend to refer to agronomic droughts[8] instead (Slegers: 2008).

Scientific models and scenario planning have been helpful to a certain extent. However, they can often give contradictory results. Therefore, it is becoming increasingly important to recognise the limits of scientific knowledge and to instead, try to better understand what

[8] Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth. (NDMC: 2017)

uncertainty, variability and change, mean to those people who are directly affected, especially those who rely on the environment for their livelihoods (Thomas et al: 2007). Although scientific research and local perceptions differ on many levels, it is important for the research in this chapter that they be integrated. According to Marin (2010) not only do local perceptions (local knowledge) complement the analysis of climate change by providing data from a different spatial scale, but also by examining how changes are perceived at the local level. Furthermore, it is important in determining risk perception and whether there is a need to adapt or change current practices as only once a problem is identified can it be fixed.

With regards to the effects of climate change, coping (short-term) and adaptation (long-term) strategies consist of ways in which to lessen the extent or effect of climate stresses or events (i.e. drought, flood, etc.) (Thomas et al: 2007). Some examples include, using different crops that suit the local climate, planting trees, soil conservation, the use of social networks as well as changing planting dates to coincide with the rainy season (Bryan et al: 2009). According to Bryan et al. (2009), although many farmers do perceive changes in rainfall and temperature, most do not make any adjustments (see *results* in this chapter). This is often due to a lack of information and credit or capital to do so (Bryan et al.: 2009). Therefore, understanding local perceptions and other aspects of the livelihood context is important in addressing why and how households cope or adapt. In this chapter, the issue of increasing rainfall variability is a key theme.

4.2.3 Local perceptions of rainfall

Attempts to quantify the unpredictability of rainfall usually refer to the onset of rain (or rainfall season), the amount of rain as well as the frequency of rainfall (Osbahr et al.: 2011), all of which I will cover in this chapter.

In order to bridge the gap between "indigenous knowledge" and "scientific knowledge" in this research, local perceptions of rainfall and rainfall variability were supplemented with observed meteorological data from each study area (see *results* in this chapter). This was done in order to compare and contrast the perceptions of local people with the actual rainfall data. By integrating both spheres of knowledge, it in turn, creates a better way in which to answer the research questions provided in Chapter 1 and above.

However, it is important to note that perceptions can differ depending who you speak to, which is often a main flaw in this type of research. This can be as a result of differences in

age, past experiences (which are very important in moulding perceptions), personal motives, interests, attitudes, current situations as well as the complexity of the entire local situation (Marin: 2010). Memory of past climate events or variability may be distorted in systematic ways, sometimes reflecting wishful thinking by distortions consistent with decision goals as well as being shaped by personality characteristics and pre-existing beliefs (Hansen et al: 2004). Therefore, we can make the conclusion that personal experiences, amongst other influences are all important to take note of when trying to understand peoples' perceptions. For example, cultivators with access to irrigation might not witness much of a change. However, a farmer dependent solely on rainfall will be more inclined to notice various changes no matter how small. The next section of this chapter will address perceptions of rainfall in Fairbairn and Ntloko villages, the challenges that cultivators face in addition to those that are weather related, and most importantly, where climate change fits in.

4.3 RESULTS

4.3.1 Experiences of cultivators[9]

Regarding years of poor yields, in Fairbairn, 68% of households said that they had experienced crop failure in the last 10 years with 91% of households in Ntloko saying the same. The most common years in Fairbairn were the 2013/ 2014 growing period which coincided with an intense hail storm which damaged a lot of crops. In Ntloko, the most common years were the 2015/ 2016 growing period with nearly all respondents saying they had experienced crop failure and poor harvests. This was due to the drought that occurred throughout the region. I would argue that due to the severity and extent of the 2015/2016 drought, Fairbairn would have also been affected negatively.

The most common reasons as to why respondents thought they had experienced crop failure or poor harvests in Fairbairn were "high temperatures" and "insufficient rainfall". Trespassing animals and pests were mentioned by a few cultivators as well. A respondent from Fairbairn also mentioned that goats had broken through her fence and eaten a large amount of her crops, but fortunately she managed to repair the gaps with plastic mesh. In Ntloko, the majority of respondents stated that the current drought (see *introduction* to this

[9] The number of total responses for this section for both sites is (n= 34) as only those cultivating were surveyed.

chapter) affecting southern Africa was to blame for their poor crop harvests as rainfall was scarce and temperatures were very high.

Coping or adaptation strategies were not widely used in either village, besides a few cultivators who switched crop varieties that would be better suited for drier conditions. Most cultivators, if their crop failed, would use what they had for animal feed or simply wait until the next year.

In terms of good crop harvests and high yields, respondents from Fairbairn said that in the 2014/ 2015 growing period they had particularly good crop yields. Respondents from Ntloko also stated that the 2013/2014 season was a good year. When asked why they thought that particular year was a year of fruitful harvests, respondents from both sites stated that rainfall was plentiful with many also saying hard work and determination was key to a good crop harvest.

4.3.2 Challenges of cultivation

4.3.2.1 Challenges of field cultivation

The most common challenge that field cultivators faced in Fairbairn was that fields are costly to maintain (with regards to weeds, inputs and time) with 62.5% of respondents saying this (Figure 4.1). This response was closely followed by lack of irrigation with 37.5% (figure 4.1), which related to the perceptions of increasing dryness as presented below. Some other challenges mentioned by Fairbairn respondents were pests (12.5%), weeds (12.5%), changing climate conditions (12.5%), lack of equipment as well as lack of market opportunities (12.5%), among others (figure 4.1). In an interview with one of the few commercial cultivators in Fairbairn about the challenges he faces, he states:

"*The first challenge is a lack of machinery (equipment) as I am still using donkeys which take very long to plough a large field. I am also having problems with rain as it is very scarce.*"

He further mentions:

"*There is not a stable market where I can sell my produce which is a problem because I have to drive my own car and spend my own money on petrol to go to all the different places*"

In Ntloko, 60% of respondents stated that lack of fencing was the most common issue followed by the lack of irrigation with 40% (figure 4.1). One respondent also mentioned that

fields were costly to maintain. Interestingly, changing climate conditions were not mentioned by any field cultivator in Ntloko.

Although climate changes were not listed as a major challenge by field cultivators in the household surveys, it did come up numerous times when conducting the semi-structured interviews, and it could be argued the increasing dryness and drought could be behind the challenge related to a lack of irrigation. A commercial field cultivator from Fairbairn had the following to say about climate change:

"*We have noticed the changes in climate because we used to plough in early summer but the only rains we got were end of winter. When we wanted to plough in early summer it was already dry, so now we have to start later however that leaves us with a shorter growing period.*"

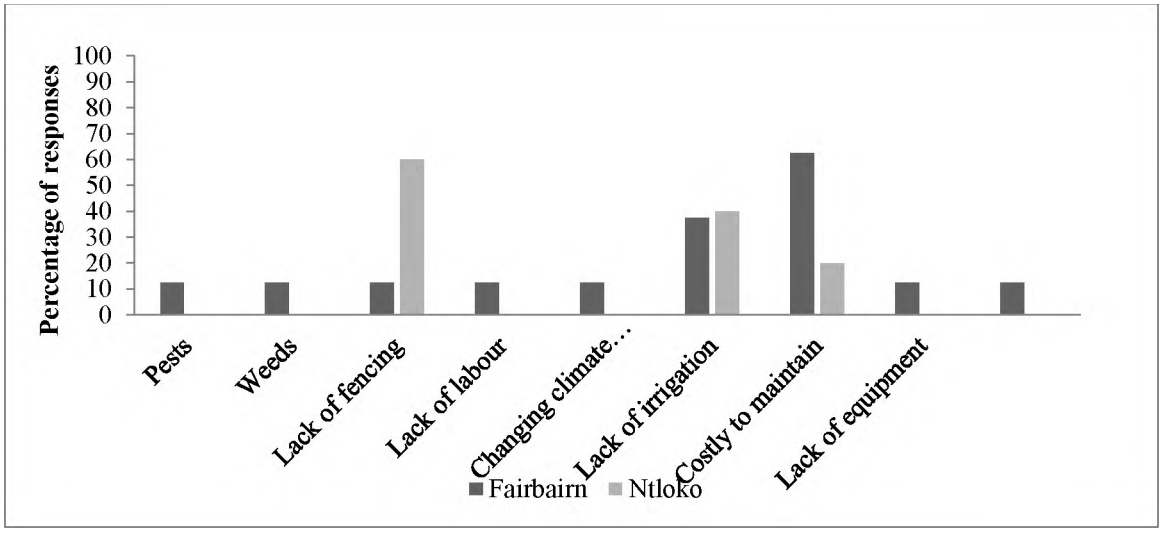


Figure 4.1 Challenges to field cultivation (percentage of responses)

4.3.2.2 Challenges of home garden cultivation

The most common challenges that home gardeners faced in Fairbairn was lack of fencing (32%), pests (29%) and lack of irrigation (23%) (figure 4.2). Other challenges included costly to maintain, theft, lack of equipment as well as a lack of labour. One respondent mentioned the fact that some of his crops had been eaten by little flies and "*nunu's*".

In Ntloko, the most common challenges were lack of irrigation (36%), changing climate conditions (27%) and pests (24%). Other challenges included lack of fencing as well as high

maintenance costs (figure 4.2). A home garden cultivator from Fairbairn said the following about the challenges he faced:

"*Climate change is an issue. When it is very hot and the rains don't come then all the crops die. Pests are a problem as sometimes small flies eat the butternut and pumpkins, and worms also eat the potatoes because I don't have any pesticide.*"

Another home garden cultivator said:

"It is very costly. I depend on the crop that I'm growing and my own pocket. The money that I should use on fertiliser and pesticides has to be spent on my children or other important extras. And when the climate changes and the harvest are bad, it will be a waste to buy fertiliser. Cultivation at the moment is very risky. Bore holes would help us so we can full up the reservoir but we don't have that."

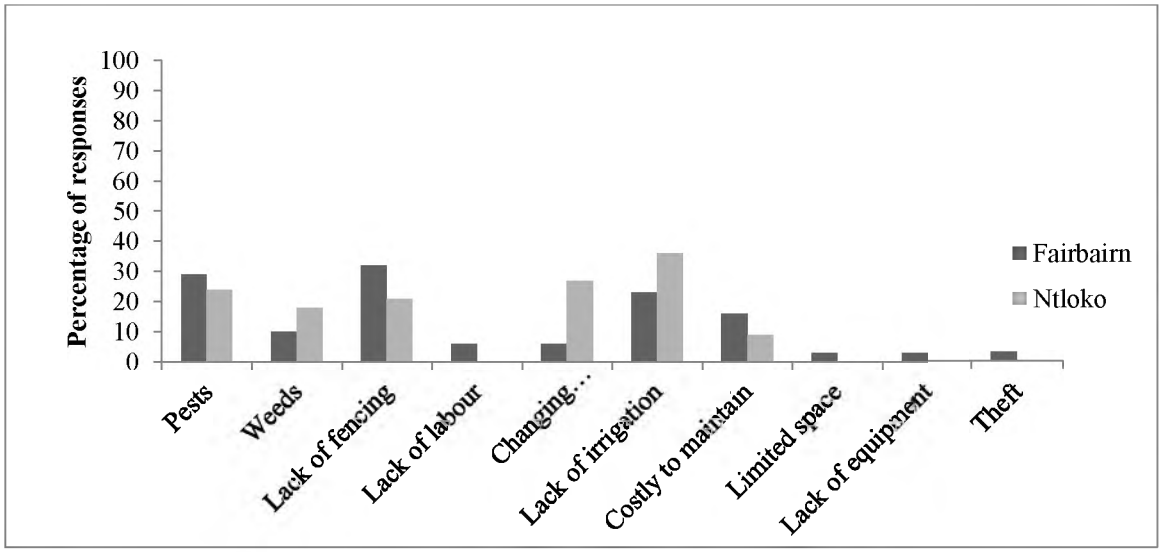


Figure 4.2 Challenges to home gardening (percentage of responses)

4.3.3 Awareness of climate change as a global phenomenon[10]

When respondents were asked if they had ever heard of the term "climate change" (translated to isiXhosa), 62% in Fairbairn and 77% in Ntloko said "yes". In Fairbairn, 46% of respondents stated that they had heard about climate change from the radio which was the

[10] This section pertained to all respondents in both Fairbairn and Ntloko, therefore (n= 60) for both villages unless otherwise stated.

most common way (figure 4.3). This was followed by the television and word of mouth with only two respondents saying they had learnt about it in school.

In Ntloko, the most common way in which respondents had heard about climate change was by watching television with 74% saying this (figure 4.3). This was followed by 10 respondents saying they had heard about climate change by listening to the radio with only two respondents saying they had learnt about it from school.

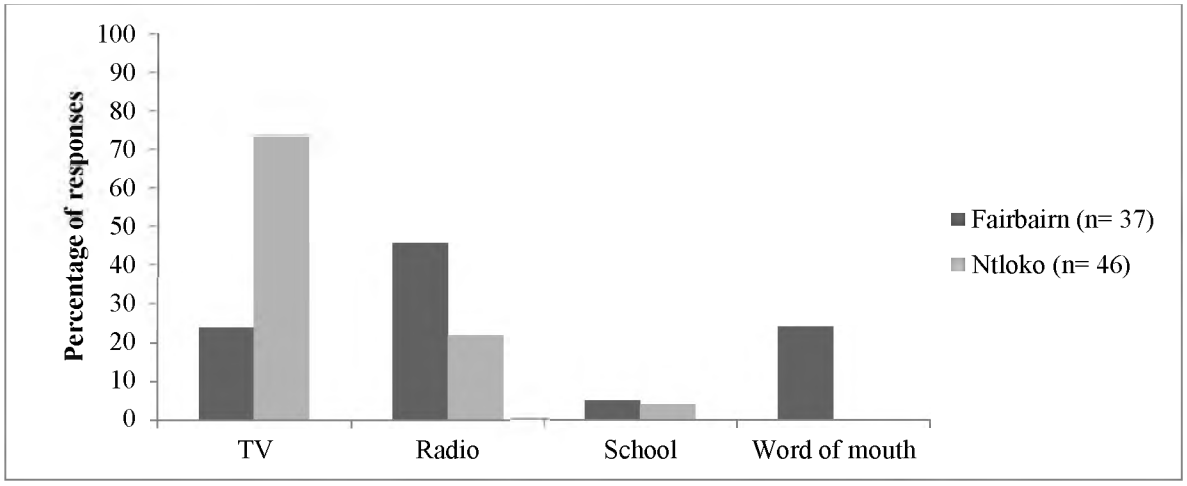


Figure 4.3 Sources of information on global climate change (percentage of responses amongst those who had heard of the phenomenon)

Respondents were asked whether or not they believed that the overall climate was indeed changing with almost all respondents in both Fairbairn (90%) and Ntloko (92%) saying that they did believe that there had been some overall changes in the climate. One respondent in Ntloko and six in Fairbairn stated that the climate was not changing with four respondents in Ntloko saying they weren't sure or had not noticed any changes.

4.3.4 Perceptions of climate trends, variability and changes over the last 10 years

In Ntloko, 100% of respondents said that they had noticed changes in the amount of rainfall in the past 10 years with 98.3% (only one respondent hadn't noticed any changes) of respondents in Fairbairn agreeing. Although they are observing a change in rainfall, some do not attribute it to climate change as a whole. In Fairbairn, half of all respondents said that there had been a decrease in rainfall over the past 10 years, which also came up numerous times in the semi-structured interviews. Furthermore, 30% of respondents said they had noticed changes, but were not sure exactly as to how it had changed (figure 4.4). In addition,

18% of respondents said that rainfall had actually increased with only one respondent saying there was no change.

In Ntloko, almost all respondents said that rainfall had decreased in the past 10 years with only four people saying they had noticed changes but were not sure as to what those changes were (figure 4.4).

A home garden cultivator in Fairbairn, when asked how climate was affecting him, stated:

"*There has been a change in weather patterns and climate. For a few years now we have noticed an extreme heat and also the rain is scarce and doesn't come at the time which we expect it. It rains later which gives us a short growing period. Maize takes five months to grow so leaving it late reduces produce and quality.*"

Another home garden cultivator mentioned that he was disinterested in preparing his soil as there hasn't been any rain:

"*There were stuff that we used to plant in winter but now we are unable to plant it these days. The drought is also an issue. I harvested some potatoes but now the land is bare and I am not interested in preparing it because there is no rain.*"

Furthermore, a home garden cultivator from Fairbairn mentions rises of food prices due to the drought:

"*Weather is a problem. We used to cultivate as dry lands but now there is a problem and that has discouraged people from cultivating. You can plant seeds but now you don't get a lot out. Climate change is a problem. It used to be something far away from us but now it's a reality. The prices (of food) are also going up, made worse by the drought.*"

On the contrary, a commercial cultivator dismisses that there is any change at all. However, this particular cultivator had his own irrigation system and diesel pump:

"*You can't see the drought here. There is no problem of water here because we are under the dam so we get enough water.*"

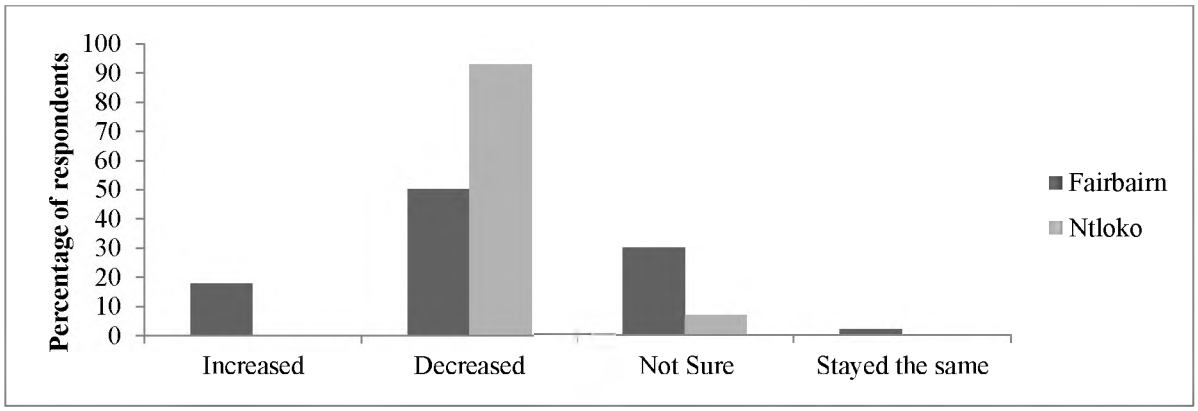


Figure 4.4 Percentage of responses to "how has the amount of rainfall changed in 10 years?"

When respondents were asked if they had noticed any shifts in the annual rainy season, 100% of respondents from Ntloko and 96.6% from Fairbairn said "yes". Nearly all of the respondents from Ntloko (96%) said that rainfall patterns had become inconsistent and variable with only 2% saying the season starts later, and 2% saying it ends later (figure 4.5). In Fairbairn, half of all respondents (50%) said that the rainy season has been starting later than usual (figure 4.5). This was closely followed by 45% of respondents who said the rainy season had become inconsistent and variable.

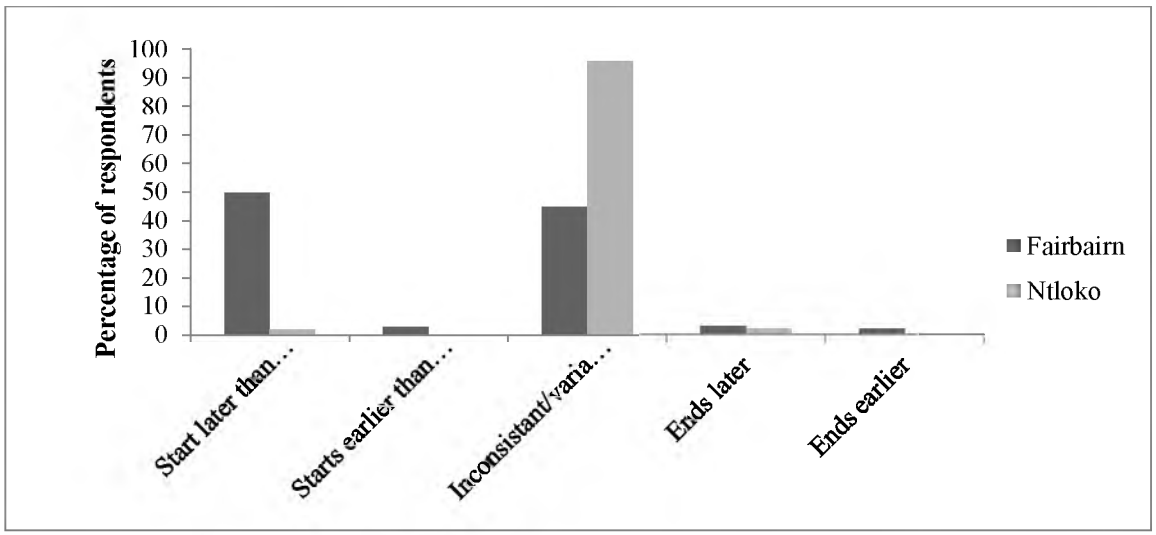


Figure 4.5 Percentage of responses to "how has the rainy season shifted?"

Respondents were asked if they thought the length of the rainy season had changed in the last 10 years (figure 4.6). In Fairbairn, 100% and 98.3% in Ntloko said that they had noticed a change in the length and duration of the rainy season. In Ntloko, 88% of respondents said that the length of the rainy season had got shorter. In Fairbairn, over half of respondents also said

it had got shorter in length and duration. However, 22% of respondents said that the rainy season is lasting longer, with 26% saying that they noticed a change but weren't sure as to how it had changed.

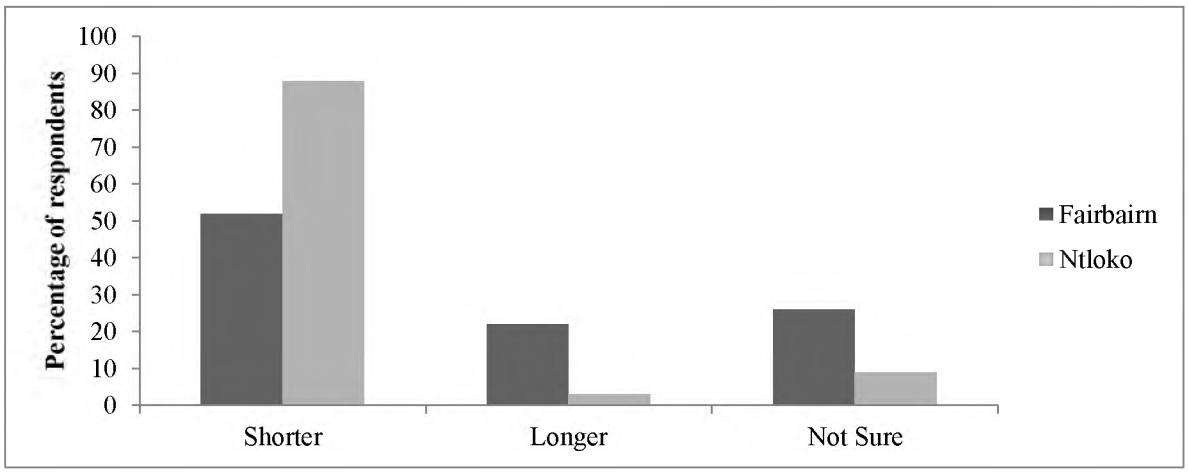


Figure 4.6 Responses to "how has the length of the rainy season changed?

Respondents were asked if the frequency of extreme weather events had changed over the past 10 years. Perceptions of flooding were similar in both sites with the most common response in Fairbairn and Ntloko being "less frequent" with 58.3% and 90% respectively (table 4.1). In Fairbairn, 31.6% of respondents said that floods had become "more frequent". There was a difference in perceptions between Fairbairn and Ntloko with regards to heavy storms with 56.6% of respondents from Fairbairn stating that they were "less frequent", however, 83.3% of respondents in Ntloko said that they had become "more frequent". In Fairbairn "no change" and "more frequent" had a similar number of responses with 20% and 23.3% respectively. The majority of respondents in both Fairbairn and Ntloko stated that droughts had become "more frequent" with 65% and 100% respectively (table 4.1). In Fairbairn, 21.6% said that droughts had become "less frequent" with 13.3% saying there had been "no change".

Table 4.1 Perceptions of the frequency of extreme weather events with in the last 10 years (percentage of respondents).

	Fairbairn % of respondents	**Ntloko % of respondents**
Floods		
No change	10.0	3.3
More frequent	31.6	6.6
Less frequent	58.3	90.0
Heavy storms		
No change	20.0	1.6
More frequent	23.3	83.3
Less frequent	56.6	15.0
Drought		
No change	13.3	0.0
More frequent	65.0	100
Less frequent	21.6	0.0

4.3.5 Sources of weather information

Respondents were asked how they obtained information on climate forecasts and the daily weather, with over half of all respondents from both Fairbairn and Ntloko stating that they used weather services on the television, radio and even internet with 50% and 60% respectively (figure 4.7). Traditional ways were used by some with a quarter of respondents in Ntloko saying they relied on traditional methods to predict the weather. When asked if it was easier to predict the weather today (2016) than it was 10 years ago, 35% in Fairbairn and 23.3% from Ntloko said "yes". However, the majority from both sites said "no". It was not easier, even with the amount of technology available today.

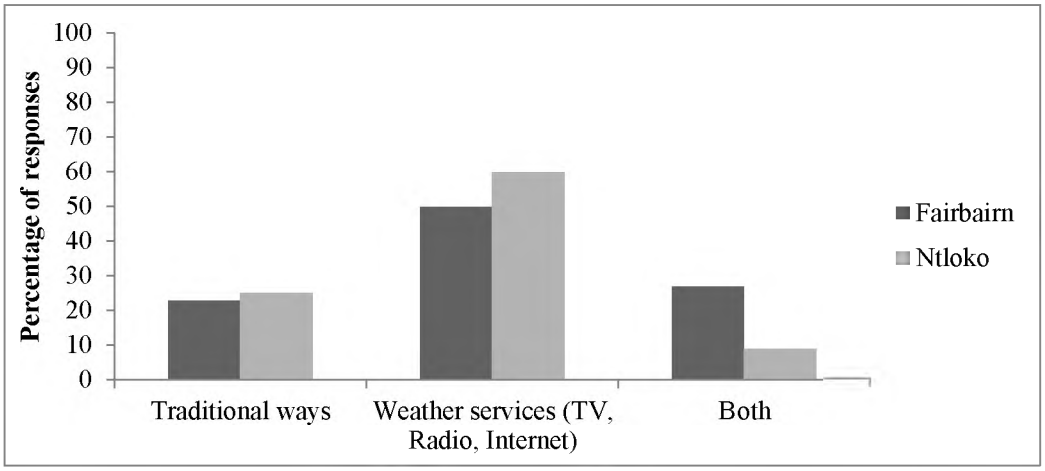


Figure 4.7 Responses to "how do you predict the weather and climate?"

4.3.6 Observed local climate data over the last 10 years [11]

Figure 4.8 shows the mean amount of annual rainfall and the long term averages for the nearest weather stations to both sites over the last 10 years. The data shows that rainfall for both weather stations follows a similar pattern with corresponding periods of high and low rainfall. That being said, Fort Brown (nearest station to Ntloko) received on average less rainfall than the station in Fort Beaufort (nearest station to Fairbairn). The *red* line represents the 10 year average rainfall for the Fort Beaufort weather station which is 553.6 mm and the *yellow* line represents the 10 year average rainfall for the Fort Brown weather station which is 426.9 mm. In the last 10 years, Fairbairn has had seven below average rainfall years. Ntloko has received six below average rainfall years in the past 10 years. Hence, we can conclude that average annual rainfall has in fact decreased in both areas, coinciding with the observation and perceptions of most respondents from both Fairbairn and Ntloko. However, it is difficult to say whether this is directly attributed to climate change as weather patterns are naturally variable from year to year, especially in semi-arid areas such as the study site.

[11] The weather stations used were the nearest ones to each of my study sites, however both were over 20 km away. Fort Brown weather station is about 60 km inland from the Indian Ocean where as Ntloko is situated in the coastal belt around 18 km inland as the crow flies, Ntloko is around 50 km from Fort Brown. Fort Beaufort weather station is located around 25 km from Fairbairn and lies at the bottom reaches of the Kat River Valley. Therefore the data may not accurately represent the two sites however, they were the closest weather stations, especially the Ntloko site.

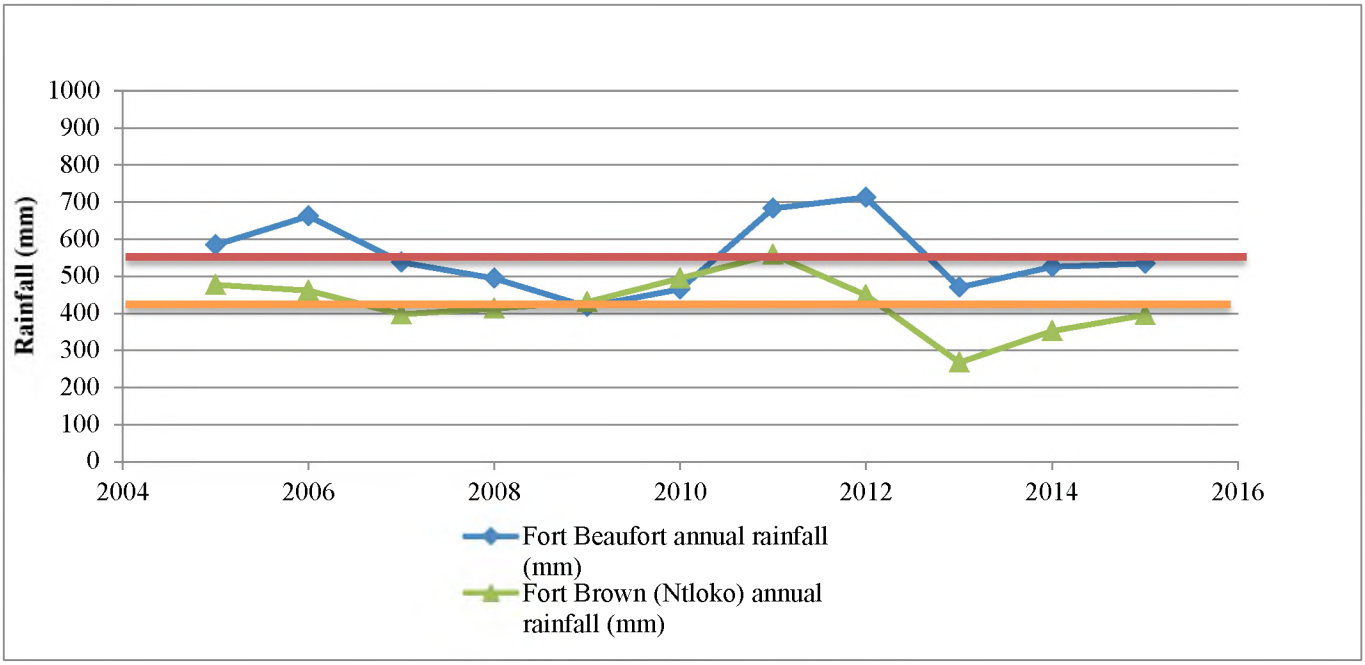


Figure 4.8 Average annual rainfalls for the nearest weather stations, Fort Beaufort (Fairbairn, Red) and Fort Brown (Ntloko, Yellow) Weather SA: 2016

4.4 DISCUSSION

4.4.1 Awareness of climatic changes

Awareness and experience of climate variability and change was fairly high with over 90% of respondents in Fairbairn and Ntloko saying that they believe the local climate patterns are changing. These results are much higher than those in a study done by Mandleni & Anim (2011) which explored the perceptions of livestock farmers to climate change in the Eastern Cape. He found that only 57% of a total of 250 farmers mentioned changes in the climate. People were not unaware of the phenomenon of global climate change, with most respondents in both sites having learned about it either from watching television or by listening to the radio. It was observed that the majority of households in both sites had a television (and in many cases DSTV) which has a comprehensive weather channel.

4.4.2 What makes cultivation challenging?

Although awareness of climate change throughout both sites was quite high, it wasn't considered a main challenge among those who cultivated. Perhaps, if there were more

cultivators or if fields (and gardens) were cultivated more intensely climate change would become a factor. The most common challenges to field cultivation were that fields were costly to maintain (Fairbairn) and there was a lack of fencing (Ntloko). Climate changes were only mentioned by one field cultivator in Fairbairn. With regards to home gardeners, the most common challenges were lack of irrigation (Ntloko) (which could be related to the increasing dryness of the area over the last 10 years) and the issue of fencing (Fairbairn). Climate variability and change was the second most common challenge listed by home gardeners in Ntloko, but one of the least common in Fairbairn. This could be due to the fact that data collection was done right after a good growing season (2014/2015) in Fairbairn (*see Chapter 2)*. However, data collection in Ntloko was done amidst the 2015/2016 drought which was fresh in respondent's minds. Although climate change did not feature too highly as a challenge from the results of the household survey data, it did come up numerous times in the semi-structured interviews. Climate change was an important theme in these interviews and many respondents said that they worried about the future of cultivation in their village.

One would assume that with all the information on the negative effects that climate change will have on cultivation and subsequent livelihoods (see *Chapter 1*), that it would be considered a major challenge by cultivators. This is explored further by Reid & Vogel (2006) in a study done in KwaZulu-Natal, who found that the perception of climate variability by farmers was one where climate stresses were not seen to be of key importance to their daily livelihoods. This is further backed up by Gandure et al. (2013) who state that farmers expressed greater concern about the impacts of weeds, insects and worms, poor physical and human security as well as weak market environments than they did about rainfall and temperature. Furthermore, Muller & Shackleton (2014) found commonage farmers in the Eastern Cape Karoo were aware of changes in local climate parameters, however, these perceived changes were attributed to the expected climate variability of the region. Farmers often see climatic changes through a short term "lens" (Gandure et al: 2013). Moreover, due to the commonality of climate variability, they deal with such issues only if and when they occur (Reid & Vogel: 2006). In a sense, people only act once they feel the effects of an event.

However, the results above, show that adaptive or coping strategies (see *introduction* in this chapter) were not often put in place by cultivators when extreme weather events occurred (such as the current drought) with most cultivators simply praying for rain or waiting until the following season to cultivate again. Some cultivators did fill up buckets with water and tried

to manually irrigate but this was only done for small home gardens that were located close to a tap or river (see *chapter 2*).

In a study done by Bryan et al. (2009) on small holder farmers in South Africa, 62% of those interviewed had not taken any sort of adaptive action, even though changes in temperatures and rainfall were perceived. Furthermore, a study done in Limpopo by Gbetibouo et al (2010) found that although a large number of farmers indicated that they noticed long term changes in temperatures and rainfall levels, only one third of those actually took remedial action. In South Africa, reasons for the lack of adaptation or coping strategies often include a mix of financial, social, physical and informational factors. These include a lack of access to credit, insufficient access to water or irrigation, inadequate or inaccessible information about climate change in addition to insecure property rights and even local level politics (Bryan et al.: 2009).

South Africa has been in the midst of a severe drought (refer to *introduction* of this chapter), stated to be the worst drought since 1986 (Mail & Guardian: 2016). This drought has negatively impacted cultivators in both sites, although, more so in Ntloko. This is evident as almost all cultivators from Ntloko stated that they had experienced complete crop failure in the 2015/2016 summer growing season, with high temperatures and scarce rainfall to blame for their poor crop yields (see chapter one)[12].

4.4.3 Climate and rainfall variability

Research was done in Fairbairn over the month of October 2015, and most cultivators were still waiting for the first rains which usually come in late winter (August/September). I returned in early January to find that cultivators were still waiting or had received very little rainfall. This is a testament to the growing issue of rainfall variability, both intra and inter annually. According to Jennings & Magrath (2009) rainfall in southern Africa is becoming unpredictable and more erratic. This is evident in both study sites as respondents perceived rainy seasons to be inconsistent as well as starting later than usual. Furthermore, a large number of respondents from both sites stated that the rainfall season had become much shorter. Thomas et al. (2007) found that rainfall variability (inter and intra) is a common occurrence in many areas, especially semi-arid, as 80% of respondents across three different

[12]There is also a high possibility that the same would have been recorded in Fairbairn as the drought affected the majority of southern Africa. However, due to the timing of data collection this has not shown up in the data relating to Fairbairn village.

study areas (Limpopo, Kwa-Zulu Natal, North West Provence) stated that they had noticed an increase in such variability as well as an increased unpredictability of seasons.

Respondents from Fairbairn and Ntloko stated that the amount of rainfall had decreased in the last 10 years. Although it is difficult to tell if the total amount of rainfall (in mm) has actually decreased over the last 10 years or if the frequency of rain showers has decreased, as rainfall naturally has a high degree of annual variability in addition to local residents not being able to accurately tell how much rain each downpour brought. However, the last four years in both sites have seen below average rainfall. Furthermore, in both sites, respondents stated that the frequency of droughts had increased. Gbetibouo et al. (2010) found that farmers' perceptions may be based on more recent short term trends rather than long term changes. In addition, Simelton et al. (2013) state that there is a lack of understanding as well as definition between those "on the ground" and meteorological scientists as perceptions often differ from actual scientific data. There also seemed to be slight confusion in Fairbairn as almost a third of respondents had said that although they noticed changes, they weren't sure exactly how it had changed. According to Marin (2010) different groups may perceive the same rainfall in the same location, differently. This can be a result of age differences, interests, attitudes, livelihood strategies as well as current situations (Marin: 2010). For example Thomas et al. (2007) found that livestock farmers in Kwa-Zulu Natal did not perceive heavy rain as a major risk. However, as risk increases awareness, due to its potential of damaging crops, cultivators saw heavy storms as a major risk and were more aware of changes and trends.

The majority of respondents from both sites stated that floods had become less frequent. This would make sense as the last couple of years showed below average rainfall in both areas, which would have a strong influence on local perceptions (Slegers: 2008). That being said, just less than one third of respondents in Fairbairn mentioned that there have been more floods compared to only a tiny number from Ntloko. The reason for this could be due to the location of Fairbairn, which is situated alongside the Kat River, unlike Ntloko which is located on a hillside. Hence flooding would be more noticeable to those in Fairbairn. There was a key difference between the two sites with regards to heavy storms which included high winds, hail and lightening, however, heavy storms are location specific and therefore will vary from place to place, depending on topography, height above sea level and daily temperatures. This being said, when speaking with residents in Ntloko, they pointed out that they had had a disastrous storm/ tornado in 2010 in which houses and crops were damaged (Rhodes Honours Report: 2016).

4.5 CONCLUSION

It can be concluded that the current drought and the increasingly variable rainfall trends have had a negative impact on many cultivators in this region. Although changes in climate have had a significant impact on those who cultivate (and indirectly on those who don't in the way of food price hikes due to drought) it is usually not the first challenge that is mentioned. Main challenges that cultivators face are lack of capital and fencing. However, the issue of irrigation is usually inadvertently an issue of climate due to most cultivated land being purely rain fed. In terms of rainfall, local perceptions seem to fall in line with meteorological data as most years within the last ten have been below the annual mean. Rainfall patterns are becoming increasingly variable (more so than usual) and this increase in risk could be a disincentive for people to cultivate. Household food security of those cultivating will be strained with the increasing amount of insufficient yields or poor harvests brought about by the increasing variability of rainfall and rainy seasons.

Furthermore, household food security of those who purchase most or all of their food (see *Chapter 3*) will become more difficult to achieve as their incomes continue to be stretched financially, as prices of staples such as maize and cereals continue to rise with the increasing frequency of drought. It is vitally important that further work is done in order to gain a better understanding of how local people perceive the weather and climate, as well as their reactions to weather events, in order to bridge the gap between adaptation policy and the grass roots level. Doing so can provide valuable insight into ways in which to help rural residents adapt earlier to a changing climate.

CHAPTER 5: CONCLUSION, IMPLICATIONS OF FINDINGS AND POLICY RECOMENDATIONS

5.1 OVERVIEW OF CHAPTER

While much of the data have been discussed in chapter 2, 3 and 4, this chapter aims to incorporate and synthesise the key findings and results of this thesis. In doing so, objective five will be addressed which aims to consider the implication of the results for future agriculture and food security in rural households in order to make policy suggestions and recommendations (see *Chapter 1*). The two key questions that I address in this chapter are:

- Will food security be an issue in the future?
- How can future livelihood trajectories be made more sustainable with regards to household food security?

I start this chapter by highlighting the important findings and implications of this research relating back to the theory and propositions covered in *Chapter 1*. I then consider the future trajectories for these rural areas of the Eastern Cape in terms of cultivation and food security. Following this, I offer some policy recommendations to support future farming and livelihood security in these areas.

5.2 KEY FINDINGS

5.2.1 Own production of fields is low, however, home gardens are still important for livelihoods

Evidence from this study supports proposition one (see *Chapter 1*) that agricultural production in the Kat River Valley and elsewhere in the Eastern Cape is declining (Bryceson: 1996, Hebinck & Lent: 2007). Field cultivation has continued to decline in both Fairbairn (Falayi: 2017) and Ntloko with very few households cultivating large parcels of land, but it is important to note that farming is still happening. Those that are still cultivating large fields are doing so mainly for commercial reasons and have the equipment, capital and secure access to land that most other households do not. The study revealed that the high costs and risks involved with cultivation, lack of fencing to keep out livestock as well as the lack of secure land tenure (a recurring theme in both the household surveys and interviews, especially in Fairbairn) seem to be the main catalysts for the continued decline and discouragement of cultivation (see *Chapter 2 & 4*). Changes in climate patterns were seen as a challenge for those cultivating in both sites (in the interviews see *Chapter 4*). However, changes in farming practices (adaptation strategies), were not often put in place (see *Chapter*

4). This result is similar to that of Bryan et al. (2009) in the Limpopo Province, whereby it was found that adaptation strategies were often not implemented due to a variety of factors such as lack of capital and credit, as well as a lack of necessary information. As climate change becomes more and more evident (as observed by the 2015/2015 drought), I suspect many cultivators will be discouraged to cultivate large fields as the risks become unbearable.

With the low number of field cultivators and the adoption of multiple livelihood strategies (Shackleton & Luckert: 2015), it is obvious that rural livelihoods are under-going sustained change. Although agriculture no longer seems to play the pivotal role in rural livelihoods that it had in the past (see Baipheti & Jacobs: 2009). However, its importance as a livelihood activity and diversification strategy should not be overlooked. My results found that, although there were very few cultivated fields, over half of all households in both Fairbairn and Ntloko cultivated smaller, more manageable home gardens (see *Chapter 2*). Similarly, Falayi (2017) found that while own production of fields had declined in Fairbairn, there was a corresponding increase in cultivation of home gardens. These gardens are located within the homestead boundaries and are thus more accessible and easy to maintain as they require less inputs and capital (Mitchell & Hanstad: 2004). The results also show that these smaller home gardens are usually intercropped with a variety of different cultivars which may aid in diet diversity. Since only half of households are cultivating home gardens there is opportunity for expansion of this activity to include a larger number of households, especially where these hold large homestead plots.

5.2.2 Cultivation is important for food security

As food security, in South Africa at least, is more often a question of access rather than availability (see *Chapter 3*). It has been argued by Machethe (2004) that own production is the foremost way to gain access to "*...sufficient, safe, and nutritious food that meets a person's dietary needs and food preferences for an active and healthy life*" (FAO: 2002). This sort of cultivation (and cultivation in general) supports proposition two (see *Chapter 1*) which states that, increasing agricultural production will have a positive influence on food security.

Own production has two important ways of achieving this. The first is by enhancing household nutrition and improving the quality of diets (Faber, Witten & Drimie: 2011). The results from the HFIAS survey revealed that the general level of food security in both villages

was low, with 'insufficient quality' and 'lack of preferred food' being the most common issues (see *Chapter 3*). The variety of crops that are usually grown in home gardens can be extremely important in combatting this situation. By growing a range of crops, such as leafy greens, cultivation can have a significant benefit on a household's nutritional status and dietary diversity. Furthermore, cultivators should be encouraged to grow "traditional" herbs and vegetables as they often have higher amounts of vitamins and micro-nutrients than some conventional vegetables and are usually more "hardy" (Shackleton et al: 2015, Afolayan & Jimoh: 2009).

Secondly, cultivation can have a positive effect on food security through supplementing household food, therefore decreasing food expenditure (Baipheti & Jacobs: 2009). By participating in own production, households can reduce dependence on purchased food, which made up between 23-37% of total household income across the two study areas (see *Chapter 3*). High unemployment rates in both areas meant that most households relied on government social grants (see *Chapter 1*). Although grants undeniably play a major role in poverty alleviation, they can act as a disincentive for recipients to seek any other formal employment or apply their time productively to activities such as cultivation, thereby increasing vulnerability (Neves et al: 2009). Furthermore, "social grants are neither permanent nor secure and are lost when the pensioner passes away or the child grows up, thereby plunging households into extreme states of vulnerability" (Shackleton & Luckert: 2015). Therefore, cultivation can help by supplementing household food, and decreasing expenditure, therefore enabling households to free up cash for savings or to spend on other items, such as school supplies, tertiary education or other food stuffs, etc. (see *Chapter 2*).

However, the small holder agricultural sector is notorious for its low productivity and minimal inputs (as evident in *Chapter 2*). Therefore, for own production to be sufficient in increasing household food security, there needs to be an increase in productivity through sustainable intensification (see Baipheti & Jacobs: 2009, Altman et al: 2009). However, increasing inputs and intensifying production may lead to higher risks, unless measures are put in place to curb such risks, especially those associated with climate variability.

That being said, the future of rural food security is dependent on several factors including an increase in employment, education and entrepreneurial opportunities, as well as a revived and more effective small-scale and supplementary farming sector, depending on different interests (De Cock et al: 2013, Hendriks: 2003, Machethe: 2004, Baipheti & Jacobs: 2009,

Drimie et al: 2009). Ideally, in the future all of these opportunities should be open to rural households.

5.2.3 Rural agriculture and food security face many challenges

Achieving household food security is a taxing task for poor rural households, especially through own production. This study found an array of factors that prevented households from successfully participating in own production (see *5.2.1* in this chapter). Some of these challenges included lack of fencing, lack of access to land as well as lack of capital. The challenge of climate change and variability did not feature as highly as expected in the household surveys. However, it was regarded as a major factor by several of the interviewees during the in-depth interviews (see *Chapter 4*). According to proposition three, climate change will result in new challenges that will superimpose on existing constraints, and further exacerbate and contribute to the uncertainty for future food security. This study found, when looking specifically at rainfall, that respondents in Fairbairn and Ntloko are perceiving a decrease in the amount of rainfall during the season, an increase in the variability of this rainfall (both intra and inter annually) as well as a shorter length of the rainfall season (see *Chapter 4*). The consequences of increasing rainfall variability will increase the risks of poor crop yields and, therefore, possibly act as a disincentive to cultivate, both for those currently cultivating as well as those who may want to start. Therefore, with regards to rainfall variability, if food security is to be attainable in the future it is important that methods for water capture and irrigation are considered. There are different types of irrigation schemes that could be considered, from micro-level for gardens to those similar to the previous one in Fairbairn for fields. Micro-irrigation technologies have seen success amongst poor rural farmers in India, Nepal and Kenya (Shah & Keller: 2002). These technologies can help to combat rainfall variability and more frequent droughts, although, they are still relatively costly.

5.3 FUTURE FOOD SECURITY: RECOMMENDATIONS AND POLICY SUGGESTIONS

This study suggests that a decline in rural cultivation will continue unless measures are put in place to address the causes and influences of this phenomenon. Compounded with the impacts of a fast changing global climate, rural livelihoods will face increasing vulnerability and risk. Although rural household food security is a complex and dynamic issue, the

policies, strategies and changes needed, are relatively simple. In the following section, I suggest possible ways in which to create healthy, sustainable rural livelihoods, whilst increasing own production and thus, achieving higher levels of household food security.

5.3.1 Extension and input support

"Appropriate support is required to improve the current levels of small-scale production..." (Altman, Hart & Jacobs: 2009).

In order to increase household food security through own production, it is crucial that the government plays its part. The post-apartheid government has invested minimally in land reform and has devoted only a fraction of its budget to agricultural development which constitutes about one percent in the Eastern Cape (Bank & Minkley: 2005). However, lack of interest, initiative and efficiency by various government departments may be a root cause in the slow development process.

Throughout the interviews conducted in this research (see *Chapter 4*), many respondents brought up the issue of government support (or lack thereof). Many suggested a cultivation grant of some sort as this would alleviate own cost (and thus, own risks). It was also mentioned that government support could also be in the form of free seeds, subsidised tractors for use not only in the villages but their surrounding areas (as previously done, see *Chapter 2*), integrated extension services (and regular follow ups), annual clearing of furrows and silted dams, information on climate and weather patterns as well as new, less water demanding cultivation techniques, etc. The effectiveness of this was evidenced by Dorward & Chirwa (2011) who found that in Malawi, nationwide disbursement of government subsidized fertilizers and seed to large numbers of beneficiaries'(small-holders) increased national maize production and productivity, contributing to increased food availability, higher real wages, wider economic growth and poverty reduction.

Furthermore, promoting efficient extension services, by monitoring and training extension officers regularly, could bring about sustainable change and many benefits. However, this change needs to be directed to the most marginalised groups, namely the young working aged males and females, and the poorest households.

5.3.2 Increase land use and reinvigorate agricultural activities

Issues surrounding land tenure and access to land are major drivers behind the continued decline of cultivation. There are countless fields of land that lie fallow and unused in both Fairbairn and Ntloko. If food security is to be achieved through own production, this needs to change, before the land becomes over grown with trees and shrubs making it difficult to be revived when or if a person decides to cultivate it. The issues surrounding land (tenure, access, rights, etc.) processes in communal areas need to become more efficient and direct if agricultural production is to be increased. For example, by enabling greater certainty over the legal status of land rights on arable land, practices such as sharecropping and loaning (leasing) of unused fields could be revived, therefore, bringing more land into production (Lawry: 1993, LIMA: 1999, Turner: 1999, Shackleton et al: 2015). In addition, I believe that those who are able and willing to farm, specifically young males and females who fall outside the social grant system, should be given preference or incentives.

Another way could be to revitalise (in Fairbairn's case, HACOP) or start (Ntloko) cultivation co-operatives or programmes. De Haese et al. (2013) found that an Empowerment for Food Security Programme in KwaZulu-Natal improved dietary diversity as well as better access to resources, although improvement in food security levels could not be established yet. These programmes pool together resources (land, labour, capital, etc.) directly from the community as well as transferring knowledge and information to those who lack the adequate skills required for cultivation. However, these programmes are often riddled with internal politics, as was found by Fox (2017: *unpublished*) in Fairbairn. Therefore, the programmes would need to be monitored by an outside authority or central committee.

Specifically relating to Fairbairn village, it is vital that the nearby Kat River, which is one of the most reliable rivers in the country, be fully utilized (Nel & Hill: 2000). Revitalising the irrigation scheme would provide a greater incentive for people to cultivate as it would eliminate the risks associated with climate change, rainfall variability and drought. According to van Averbeke, Denison & Mnkenu (2011), who reviewed 320 small holder irrigation schemes, there was evidence that smallholder irrigation schemes have contributed positively to rural livelihoods and poverty alleviation in parts of the country that are most disadvantaged. Furthermore, Cousins (2013) found that the Tugela Ferry Irrigation Scheme allowed cultivators the ability to produce lucrative cash crops in an area with low rainfall and frequent droughts. In addition, micro-irrigation technologies such as rainwater tanks and

wells could benefit those households cultivating fields or home gardens, who are not next to a river as is the case in Ntloko.

5.3.3 Make rural areas "attractive" to young males and females

"..Young people's interest in farming will likely be positively related to their ability to secure reasonable remuneration through farming, which implies gaining accesses to the resources needed to farm" (Swarts & Aliber: 2013).

Although there is a widely held view that the youth are less enthusiastic about farming (Shackleton et al: 2013), Falayi (2017), in interviews with the youth, found that agriculture could be made more appealing with the right kinds of measures and support. It is vital that local opportunities are considered to help reduce the outmigration of working aged males and females. This can be done by making rural areas more attractive to this age group, through not only agricultural opportunities but a number of entrepreneurial ventures. It is important to stop homogenising rural areas and rather focus on strengths and skills at a personal level. It was suggested at a workshop I attended on communal area agriculture in the Eastern Cape that personal skills should be developed (Hobeni Workshop: 2015). For example, if a person within the village is good at or interested in bee keeping, they can be supported to provide at minimum a local (but potentially a regional) supply of bee related products, honey, lip balm etc. If a young person is strong, hardworking and is interested to farm, there needs to be a way in which he or she can access land, be supported, at least at start up level and have the necessary advice and information passed on. There is also a need to make raise awareness of farming as a skilled, necessary and legitimate activity, and to remove the stigma attached to it as an 'old fashioned way of life'.

5.3.4 Markets

Given that most households purchase their food, there is great opportunity for local cultivators to become commercially orientated and offer their produce to local markets. Baipheti & Jacobs (2009) give three examples of market destinations where crops could be sold, namely fresh produce markets, informal markets and supermarket chains. Fresh produce markets like the Johannesburg Fresh Produce Market (JFPM) act as important outlets for not only local but regional cultivators. Initiating something similar in the Eastern Cape could act as an incentive for people to cultivate. Informal markets, located in most urban centres are

also important market places for low-level cultivators. Furthermore, linking small-scale village cultivators with large retail chains, especially those located near smaller towns can provide an ever increasing market (Baipheti & Jacobs: 2009). However, cultivators may need to diversify away from staples towards niche or cash-crops. This raises the question of whether this supports food security and whether the commercial market model is the correct one for rural communal areas. Indeed, the benefits of small-holder cash cropping is a contested issue (see Masanjala: 2006).

Local village-level markets could also provide a way to sell surplus within the village and throughout, although storage facilities are often an issue. However, Shackleton et al. (2015) suggest that drying, pickling, canning and processing can aid in preservation and extend the shelf life of produce to be sold at different times or in emergencies. Selling produce locally can have many benefits. Firstly, money would be saved on transport costs as food would be locally available (Shackleton et al.: 2015), hence expensive trips to the nearest urban centre would not be needed as frequently. Secondly, food prices would be cheaper as foods would be locally sourced, eliminating procurement costs. Fresh produce could also be supplied to government programmes for schools, hospitals and clinics (Shackleton et al.: 2015). There is ample opportunity in both Fairbairn and Ntloko to do this as there are schools and clinics in the immediate area. Thirdly, this commercialisation could lead to partnerships and employment opportunities for unemployed young people in the village.

However, for the above suggestions to become viable options there would need to be a substantial increase in production. I would advise that a gradual bottom-up approach be implemented. For example, if production at a village level increases then that surplus be sold directly in the village. As production increases then a focus on outside markets (local and regional) could then be explored.

5.3.5 Education at all levels of society

"Knowledge is power"- Sir Francis Bacon

Education at all levels of society is fundamental in ensuring that household livelihoods become sustainable into the future. In the Limpopo Province, De Cock et al. (2013) found that education for both employment as well as education for building skills was directly related to increased food security. Educating cultivators about climate smart agriculture, regular training and small business workshops, providing nutritional advice within school

curriculums and even teaching home gardening are some ways that education can help drive a positive change for rural communities (Shackleton et al: 2015).

5.3.6 Climate smart agriculture

Climate-smart agriculture (CSA) is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change (Lipper et al: 2014). Climate change and rainfall variability have been key themes throughout this study, therefore, it is of great importance that a climate-smart approach to agriculture be implemented. Climate Smart Agriculture can be defined by three main objectives: firstly, to increase agricultural productivity to support increased income, food security and development; secondly, to increase adaptive capacity at multiple levels and scales, and thirdly, to decrease greenhouse gas emissions while increasing carbon sinks (McCarthy, Lipper & Branca: 2011), however, the latter is not a key focus in this study.

Examples of climate-smart agricultural practises include[13]:

- Integrated crop, livestock and agroforestry systems as well as improved pest, water and nutrient management.
- Improved grassland and forestry management.
- Reduced tillage and use of diverse crop varieties and livestock breeds.
- Integrating trees into agricultural systems (especially fruit, which will improve food security).
- Restoring degraded lands, i.e. vegetative contouring.
- Improving the efficiency of water through rain water harvesting, mulching, etc.
- Enhancing soil quality through organic fertilizers and mulching, planting soil enriching crops like legumes (Arslan et al.: 2015) etc.

5.4 CONCLUSION

The themes addressed in this study have only but scratched the surface of the rural cultivation -food security nexus. Evidence from this study suggests that this nexus is highly complex and dynamic, especially with the current and continued challenge of climate change. The future

[13] These suggestions were taken from the International Assessment of Agricultural Knowledge, Science and Technology for Development (2009).

of rural cultivation, food security and livelihoods are uncertain. However, what is certain is that without drastic policy changes and support from all tiers of government, rural livelihoods could be face increasing vulnerability, especially with regards to increasing food prices, rural out migration of the youth and working aged males and females as well as climate changes. It is imperative that future studies address further, the issue of rural food security and livelihood changes in the former homelands of the Eastern Cape and how cultivation could be reinvigorated and expanded as an important livelihood option.

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