

**Vulnerability, institutional arrangements and the adaptation choices made by farmers in the Western Cape of South Africa**

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## **Abstract**

From 2015 to 2018, South Africa suffered from the worst drought since 1904. Climate change is predicted to increase both the frequency and intensity of droughts in parts of South Africa. In this light it is evident that agricultural systems must adapt in order to sustain income and food security of rural populations. One set of adaptation measures offered to farmers regards Conservation Agriculture (CA). Variation in the form and extent to which farmers embrace adaptation measures in response to drought has been observed. A study was set out to explain variation in the adoption of adaptation measures by testing the particular impact of vulnerability attributes, the effects of which – we hypothesise – are mediated by institutional arrangements. Our sample frame consisted of 30 farmers in two drought-stricken regions: the Swartland (n=15) and southern Cape (n=15). Variation on vulnerability attributes was guaranteed by the selection of commercial (n=16) and emerging (n=14) farmers. Our results showed that vulnerability attributes, especially the lack of financial, natural, human and physical capital, account for variation in form and extent of adopting CA adaptation measures. In order to ensure inclusive agricultural adaptation, efforts are needed to further facilitate equal adaptation opportunities, especially for marginalised farmers.

## **Keywords**

Adaptation; Conservation Agriculture; Drought; Farmers; Land reform; South Africa

## Introduction

Droughts have been intensifying in South Africa and are expected to occur more frequently in the near future (Botai et al. 2017). Moreover, increasing temperatures and decreasing predictability of precipitation patterns are expected to continue (Lobell et al. 2008; Blignaut et al. 2009; Thierfelder and Wall 2010). Climate change and the effects of *El Niño* are argued to be responsible for unpredictable weather patterns (Gizaw and Gan 2016). These climatic changes affect the availability of water resources and may create a threat to human health and biodiversity (Gizaw and Gan 2016). Droughts affect agriculture through food production shortages and loss of livestock, which can result in food and income insecurity. South Africa is highly dependent on agriculture, which is the foundation of the rural economy and the main source of employment (Blignaut et al. 2009). In light of the exacerbating character of recent droughts and the predictions for the near future, adaptation to climate change has become vital (Adger et al. 2009).

The impact of drought on food production is largely shaped by the extent to which farmers adapt (Lobell et al. 2008). Adaptation is defined as the process of responding to environmental changes, in which resilience is preserved (Agrawal 2010). Resilience addresses the need for flexibility to respond to changes and emergencies (Nelson et al. 2007), and is a vital component of adaptation. With regard to agricultural adaptation, Conservation Agriculture (CA) offers a set of management principles that aims at sustainable, profitable and drought-resilient agriculture (Verhulst et al. 2010). Conservation Agriculture has been increasingly adopted by South African farmers in recent years (Hobbs et al. 2008). However, there is still variation in form and extent to which farmers adhere to principles of CA and their level of drought adaptation. Despite awareness about droughts and climate change, only 38% of South African farmers

had succeeded in taking adaptation measures in 2005 (Bryan et al. 2009; Shisanya and Mafongoya 2016). Even though the adoption rate in the Western Cape has been significantly higher than the rest of South Africa (Smith et al. 2017), the reasons behind the variety in the way in which Western Cape farmers adapt are not well understood and warrants research.

### *Adaptation to drought*

Adaptation can be applied both after experienced events and based on predictions for the future (Agrawal 2010). In comparison to coping measures, which are defined as short-term responses to an immediate threat using existing resources (Agrawal 2008), adaptation measures are more profound changes (O'Farrell et al. 2009). To carry out adaptation measures, the actor needs adaptive capacity, which is the ability to adapt to changes and proceed to action (Adger et al. 2005). Adaptation alone might not be sufficient to sustain agricultural production in the wake of climate change predictions (Adger et al. 2009), but there are adaptation measures that are nonetheless considered effective.

Currently, adopting CA principles is argued to be an effective way of enhancing resilience in agriculture (Niang et al. 2014) and alleviating the impact of droughts (Hobbs et al. 2008; Mesfin et al. 2011). The principles of minimal soil disturbance, i.e. a lack of soil tillage activities such as ploughing, maintenance of a permanent organic soil cover and crop rotation, support soil organic carbon sequestration and increase the water holding capacity of the soil (Hobbs et al. 2008; O'Farrell et al. 2009; Thierfelder and Wall 2010; Verhulst et al. 2010; Swanepoel et al. 2016). Besides better water infiltration and reduced erosion, CA also enables a more diversified and vigorous biotic component in the soil (Hobbs et al. 2008). As a result, crops are better able to

survive dry spells, positively affecting food security in the region (Thierfelder and Wall 2010).

Besides CA, there are other on-farm adaptation measures that can further enhance agricultural resilience. Two adaptation categories considered applicable to the South African context is firstly the storage of water, food, seeds and crops, which decreases the risk of scarcity (Agrawal 2010). For instance, storing seeds decreases the risk of depending on international companies for providing new seeds (Kneen 1998). The second category concerns diversification, both of livelihoods and of varieties of crops and livestock (O'Farrell et al. 2009; Agrawal 2010). Cropping systems in the Western Cape usually involve crop rotation, and are commonly integrated with livestock within dimensions of time and/or space (MacLaren et al. 2019).

Emerging farmers in the sample were in both commonage and rural areas, therefore access to water is not differentiated into productive and drinking water, but it is general access to water.

#### *Explanatory factors of adaptation behaviour*

Adaptation choices can be influenced by a range of factors, such as natural, social, human and financial assets (Ziervogel et al. 2006; Agrawal 2010; Osbahr et al. 2010; Behrman et al. 2014; Berger et al. 2014). The entrenchment of adaptation in livelihood processes (Mersha and Van Laerhoven 2016), make these factors important to address. Ethnicity, age and gender (Agrawal 2010), socio-economic status (Ziervogel et al. 2006), affluence, governmental support and access to farmland and credit (Bryan et al. 2009) are examples of such factors. Since many authors attribute adaptation choices to user characteristics (Behrman et al. 2014), and contextual factors such as extension services and information provision (Bryan et al. 2009), this broad

perspective was adopted in this study. Vulnerability and the institutional context were considered overarching concepts that include the essential factors to address, and are therefore the two independent variables central to the study. The aim of this study is to explain the variation in the extent to which and how farmers adapt to drought, by examining the influence of these two overarching concepts. The influence of vulnerability and the differentiated impact of institutional arrangements on the adaptation choices made by commercial and emerging farmers in the Western Cape of South Africa, such as the adoption of CA, is questioned and partially clarified.

Vulnerability can encompass physical and social marginalisation, a lack of power and sensitiveness to harm (Adger 2006). It can be determined in many ways: by socio-economic factors, such as poverty, dependency on risky resources, asset portfolios, occupation, set of skills etcetera (Agrawal 2008), and by the dynamic relationship between biophysical- and user-characteristics, access to information and technology and institutional arrangements (Behrman et al. 2014).

Institutional arrangements (both formal and informal) are defined as the regimes distributing decision making power and determining access to resources (Klijn and Teisman 2000). Institutions are argued to shape livelihoods, by giving people access to property and economic opportunities, based on social relations prevailing in society (Ellis 2000). As a result, institutions determine the access to capital, power and adaptation options (Davies and Hossain 1997).

The conceptual model, shown in Figure 1, is a visualisation of the hypothesised relations between the central concepts in this study. The vulnerability context, operationalised by the livelihood capitals, is the starting point. Institutional arrangements are treated as an intermediating variable between vulnerability and the

adaptation process. The extent to and the way in which farmers adapt to drought is regarded the dependent variable.

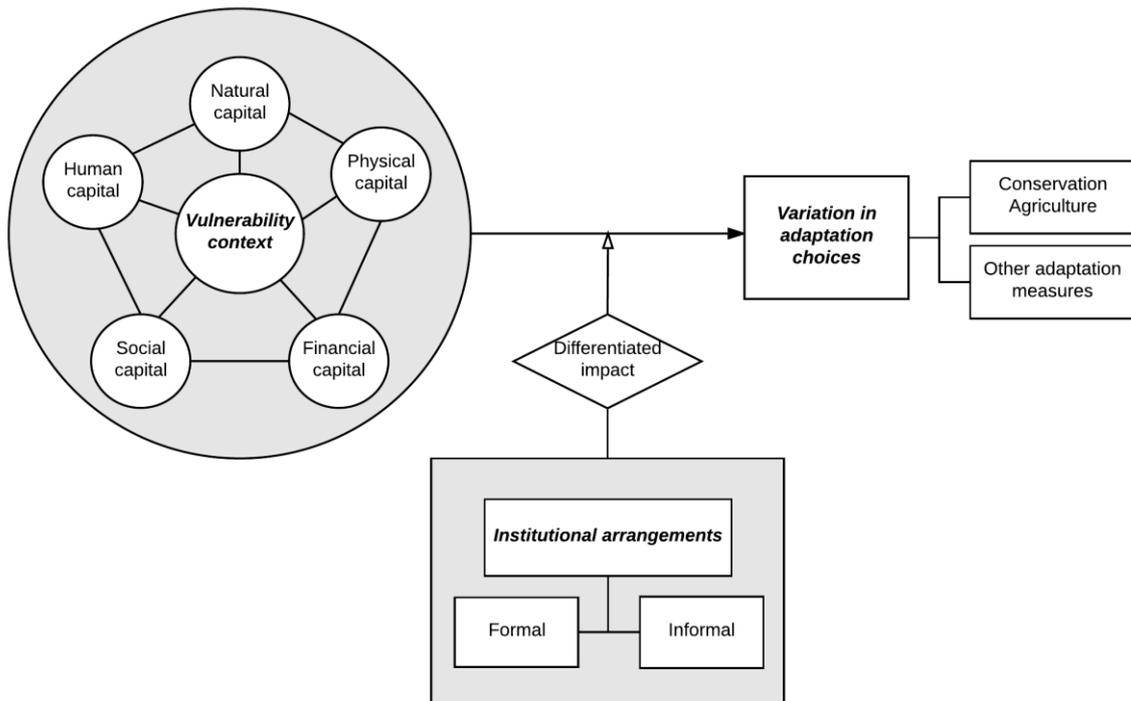


Figure 1: The conceptual model of a study on vulnerability, institutional arrangements and the adaptation choices made by farmers in the Western Cape of South Africa: the grey circle and box represent independent variables and the white boxes on the right represent the dependent variable

## Material and Methods

The analysis is based on a mixed method case study design, including both quantitative and qualitative analyses, in which farmer groups were compared to assess the variation in adaptation behaviour. The mixed method approach was employed to enable interpretation and give the results depth, while supporting the results with quantified output. In the sample selection, the control variables, i.e. the agricultural produce and the agricultural system in place were kept as constant as possible, despite the geographical and climate variety and in the Western Cape.

## *Study area*

Two drought-struck areas (2015, 2016 and 2017) were selected in which both commercial and emerging farmers reside, in order to gain results that can be generalised (The Climate System Analysis Group 2017). The two regions are Swartland and the southern Cape, located in the Western Cape of South Africa (Figure 2).

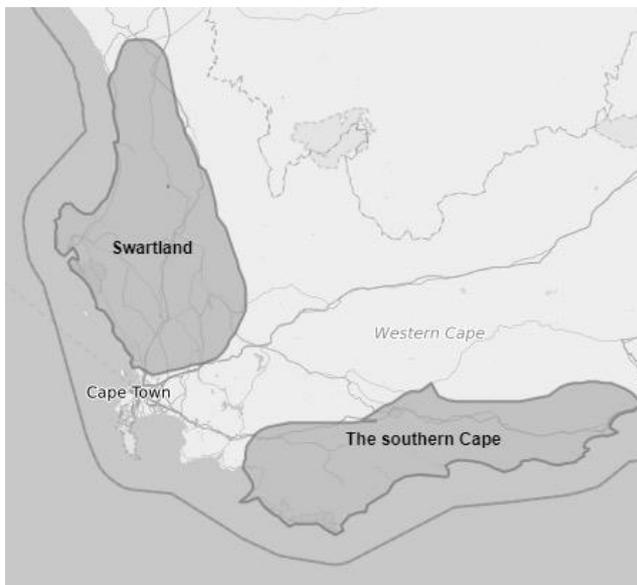


Figure 2: A map of the two study areas: Swartland and the southern Cape regions of the Western Cape, South Africa.

Within the two research areas, two groups were identified with a significantly different capital base: commercial and emerging dryland farmers. This study defines emerging farmers as those who have access to land, aspire to farm successfully within his or her given physical, and socio-economic limitations, but needs the assistance of an external facilitator to realise this aspiration. The aim was to create a diverse sample to effectively assess the influence of the two independent variables: the vulnerability attributes and the differentiated impact of institutional arrangements. The empirical foundation of this research consists of semi-structured interviews, conducted from

February to May 2017. Twenty-eight interviews were carried out on location and two interviews were conducted via phone. The participating farmers produced grain and/or vegetables: farming products that are suitable for the implementation of CA principles. Additionally, some farmers kept livestock. Through a questionnaire consisting of open and closed questions, the implementation of adaptation choices, the vulnerability attributes and the impact of institutional arrangements were explored.

The qualitative analysis embodied the transcription of the audio files and using a coding tool to assess the data. Repetitive coding was aimed at accurately assessing the patterns, important topics and trends in the results (Yin 1981), in order to provide a comprehensive overview of the research topic. The qualitative analysis enabled the potential to make statements on the attitude, opinions and perceptions of the participants. As part of the quantitative analysis, the data was used for statistical analyses and graphic visualisations. The differences between the farmer groups were assessed, and correlations between variables were tested. By consistently recording the actions undertaken in the data collection and analysis, a transparent dataset was established (Noble and Smith 2015).

Adaptation choices were operationalised into ten indicators that are part of the structured section of the questionnaire. Implementation of CA was assessed by planting methods, leaving crop residues on the field, direct seeding, soil cover and crop rotation. The additional adaptation measures composed of crop diversification, retaining seeds, aligning cultivars to the season, intercropping and rainwater harvesting. For each indicator, a question with three pre-structured answers (0 = no adoption, 0.5 = partial adoption, 1 = complete adoption) was posed to assess the level of implementation. The total adaptation level was calculated for each farmer, ranging from 0 to 10 (0 = no adoption, 10 = complete adoption of all adaptation measures).

Thereafter, the farmers were divided into two groups – low and high level of adaptation – using the mean adaptation level of all farmers (i.e. 6.82) as a threshold.

The vulnerability attributes were measured by four indicators per livelihood capital. In the questionnaire, all questions concerning the four indicators for each of the five livelihood capitals contained three pre-structured answers, ranging from 1 (low score) to 3 (high score). Per farmer, for each of the five capitals, the average score on the four indicators chosen to operationalise these capitals was calculated.

The questions with regard to institutional arrangements were of open character, and consisted of social, cultural, financial and political topics. The institutional arrangements that were found to have differentiated impacts were listed. Formal institutions were split up into property rights to land, property rights for water, land reform policy, extension services and weather forecasting, information provision, market linkages, import tariffs and drought assistance policy. Informal institutions composed of religious narratives and perceived institutional racism. For each institution, the constraining impacts on the farmer groups were assessed.

### *Statistical analyses*

Mann-Whitney U tests and Spearman regression analyses were carried out to explore potential correlations between the variables. The Mann-Whitney U test was aimed at analysing the differences between the farmer groups and low/high level adapters, respectively, on the independent and dependent variables. A Bonferroni post-hoc test was performed to determine significant differences at a 5% level.

## Results

### *Variation in adaptation choices*

Figure 3 shows the results of the farmer groups with regard to the implementation of the CA principles and other adaptation measures. Scores >4 on CA implementation were considered adequate. All commercial farmers who, during the interview, stated to follow CA principles, indeed implemented them. Out of the emerging farmers who stated to have implemented CA practices, only 50% turned out to implement them sufficiently. The representation of the commercial farmers in the high level adaptation was significantly higher compared to emerging farmers ( $p = 0.033$ ). Only 32% of emerging farmers had a high level of CA adoption, in contrast to 68% of commercial farmers. Instead of taking adaptation measures, some emerging farmers had to take drastic coping measures due to the drought. Selling off livestock, sacrificing crops of grain to make hay or for grazing, and taking up additional work, are examples of their ways to endure the drought.

One issue that is generally perceived as a hindrance to adopting CA is the availability of residues for soil cover. Emerging farmers are known to utilise residues for livestock feed rather than for soil cover. Although competing utilisation of residues was not explicitly clear from the farmer interviews, it could be expected this will be a factor that plays a role in low soil cover, perhaps more so for emerging farmers than for commercial farmers (Giller et al. 2009).

Commercial farmers were mainly positive about the effects of CA. This stands in contrast to the finding that emerging farmers did not explicitly praise the benefits of the management system. Arguments were brought forward by commercial farmers that CA ensures good water retention in the soil, increases the soil organic carbon

content which results in better crop yields. Commercial farmers also stated that by virtue of CA, moisture was conserved for the growing season, leading to increased resilience to droughts. Moreover, soil erosion was no longer considered an issue. However, the increased presence of snails, isopoda, frantic tortoise beetles and African bollworms, and decreased possibilities to control weeds were regarded as disadvantages.

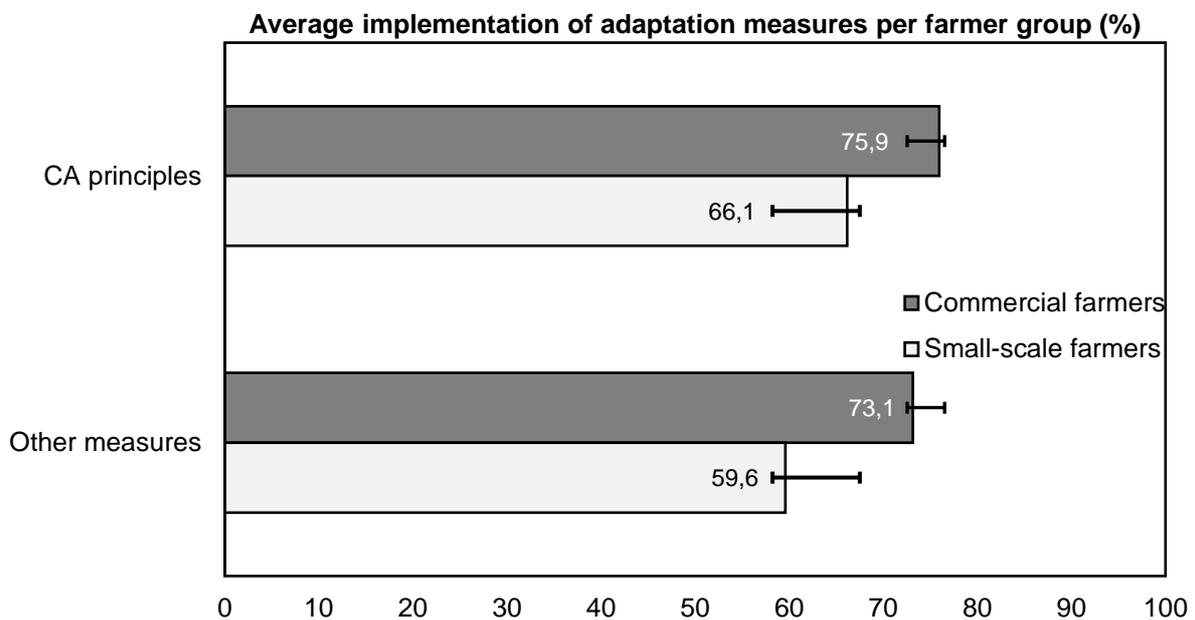


Figure 3: The average implementation (%) of Conservation Agriculture and other adaptation measures in response to drought

### *Vulnerability attributes*

To gain insight in the vulnerability attributes of the farmer groups, the scores on the livelihood capitals were assessed. The total capital base is significantly different between commercial and emerging farmers ( $p < 0.001$ ) (Figure 4).

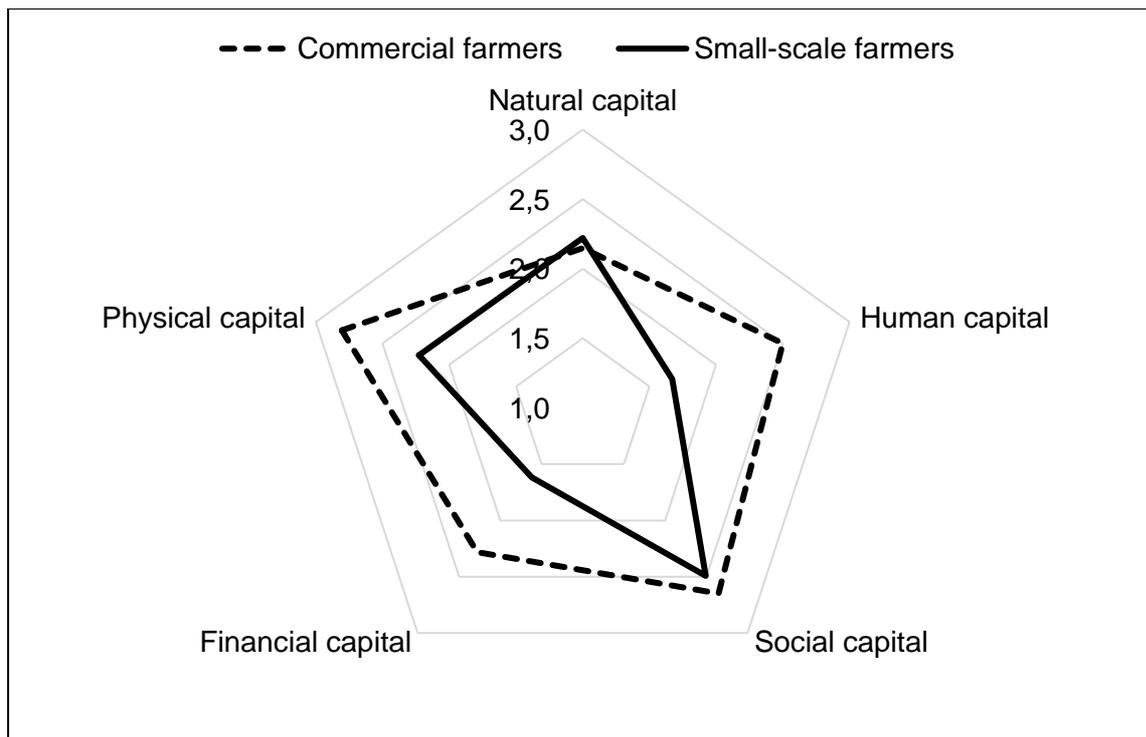


Figure 4: An overview of average scores on livelihood capitals of emerging and commercial farmer groups

When dividing the farmers into two groups with low and high adaptation level of CA practices, respectively, a higher average score ( $p < 0.001$ ) on the livelihood capitals is visible for the group of high level adapters (Figure 5).

The scores on natural capital were similar for commercial and emerging farmers, with a slight advantage for emerging farmers (Figure 4). The water quality available to the farmer groups differed for various reasons. Land dams that dried up resulted in farmers having to drill for borehole water, which is often brackish or of poor quality. Financial constraints prevented most emerging farmers from being able to abstract water from boreholes. Two emerging farmers in the southern Cape did not have access to a secure municipal water supply, making them dependent on the purchase of drinking water. In Swartland, a female farmer was also dependent on the purchase of drinking water, which was increasingly expensive due to the water crisis that

prevailed during the fieldwork. She used to have access to a natural river on her farmland, but a dam built on neighbouring commercial farmland constrained this. Dryland salinity and sodicity were common issues (Swanepoel and Tshuma 2017), but this affected farmers who adopted CA to a lesser extent than the farmers who did not. Most commercial farmers were able to apply techniques to resolve salinity issues, which was out of reach for many emerging farmers.

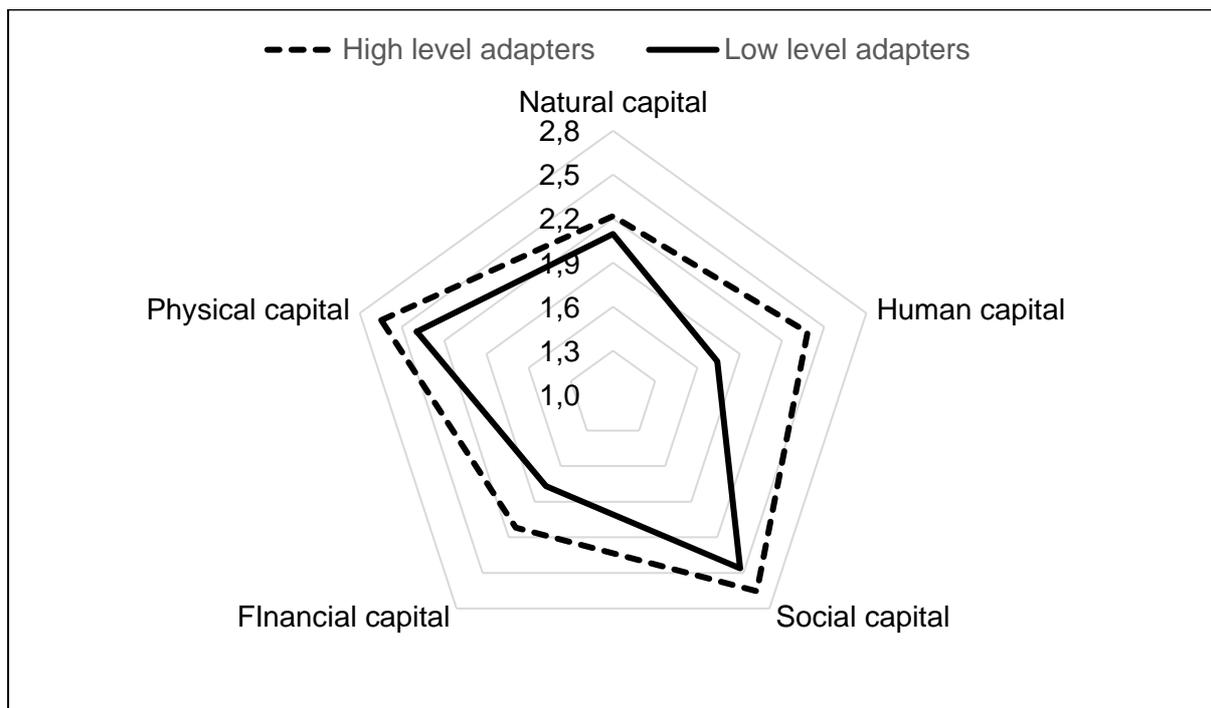


Figure 5: Average scores on livelihood capitals per level of adaptation to drought

Human capital showed a significant discrepancy between commercial and emerging farmers ( $p < 0.001$ ) (Figure 4). Many commercial farmers studied at universities or technical schools and emerging farmers often have had no education at all. Concerning access to health care, the tenancy of medical aid and the proximity of a reliable hospital were indicators. Nearly all commercial farmers had access to medical aid and favoured to visit private hospitals in the main cities. In contrast, emerging farmers often could not afford medical aid and were compelled to visit public hospitals.

Moreover, between low and high level adapters, a similar discrepancy exists ( $p = 0.002$ ) (Figure 6).

No significant differences ( $P > 0.05$ ) were found between the farmer groups with regard to social capital, but commercial farmers did have the highest score. Many farmers united in working and study groups, and local farming unions. These organisations offer social cohesion and functioned as a platform to exchange knowledge and experiences. For commercial farmers, modern technology such as social media offered this as well. Highly adapted commercial farmers most often described a low level of conflict surrounding their farms, in contrast to accounts of theft, and alcohol- and poverty-related issues conveyed by other farmer groups (Figure 6). With regard to mental and physical support provided by family and friends, this was something that could not be taken for granted. Only emerging farmers who were relatively well adapted mostly argued that they were able to rely on friends and family for help.

There is a large discrepancy between commercial and emerging farmers with regard to financial capital ( $p < 0.001$ ) (Figure 4). Despite the commercial farmers' higher scores on financial capital, some of them argued that they were not able to save money due to monthly instalments on the lands they purchased. Moreover, large investments were needed to keep the on-farm technology up-to-date, which was considered difficult to achieve. In contrast to the investments needed to sustain the commercial farmers' enterprises, for emerging farmers it was difficult to even sustain their livelihoods. Furthermore, emerging farmers collectively did not have any access to credit, in contrast to commercial farmers, who could obtain credit at banks and cooperations. A lack of property rights to land, significantly more present with emerging farmers compared to commercial farmers ( $p < 0.001$ ), was argued as limiting their abilities to access credit.

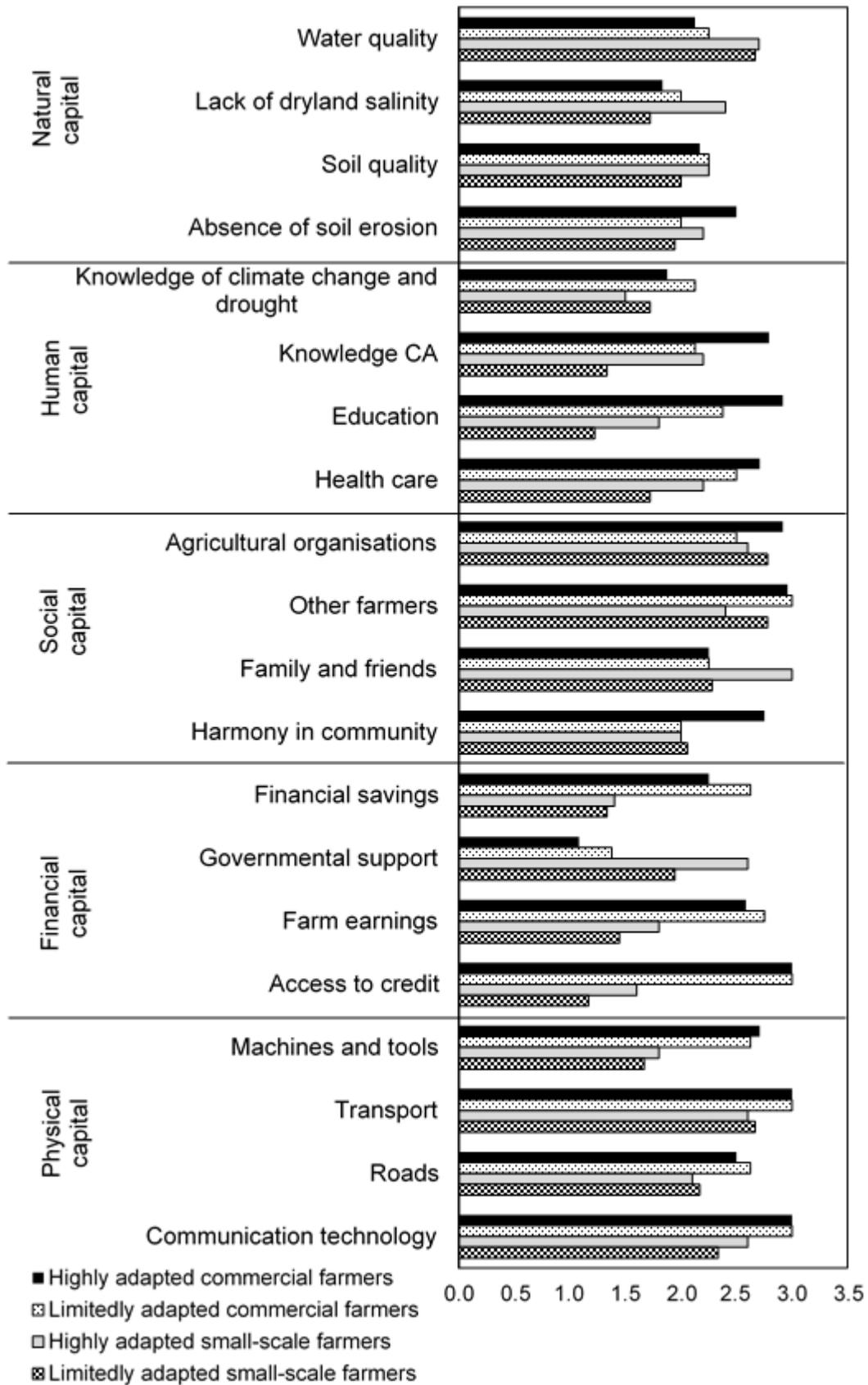


Figure 6: The capital base per indicator for emerging and commercial farmer groups

Another discrepancy was found for physical capital, on which commercial farmers had higher scores ( $p < 0.001$ ) (Figure 4). Many commercial farmers ought to stay ahead of technological advancements, aimed at precision farming. Emerging farmers had low levels of technology on their farms, in some cases using traditional implements and animals. Many emerging farmers were dependent on governmental support to acquire machinery, implements and computers. In contrast, all commercial farmers had access to smartphones, computers and internet. Concerning transport, almost all farmers owned a *bakkie*, a pick-up truck commonly used on farms. A few emerging farmers owned a normal car instead of a *bakkie*, and in a few exceptional cases the farmer did not own a transport vehicle. With regard to road infrastructure, almost all farmers stated that they were in good condition (Figure 6). A few exceptions were found at communal and emerging farms, where roads were in bad condition.

### *Institutional arrangements*

The formal institutions that were explored consist of property rights to water and land, land reform policy, weather forecasting, information provision, market access, import tariffs and drought assistance. Both institutions that indirectly influenced adaptation, as well as institutions that impacted farming in general were addressed.

Despite goals set for land reform, many previously disadvantaged people still did not obtain property rights to land. This lack of property rights to land is a direct constraint to adaptation, since it affects the motivation to invest in the land (Yegbemey et al. 2013). The insufficient implementation of land reform is not only a constraint to aspiring farmers, but also for current beneficiaries to the policy. Notwithstanding the opportunity to rent land and receiving fertilisers, production input and machinery, the assistance provided to emerging farmers is lacking. Criticism was expressed about

insecurity caused by short-term renting contracts, a general lack of transferring title, assistance that is constantly delayed causing financial setbacks and high monthly instalment costs that are above market prices. As a result, the facilitation with regard to the risk of farming was considered inadequate.

Commercial farmers mainly perceived land reform as a policy that creates an insecure and hostile environment for white farmers. The possibility that land would be taken from them without compensation, was argued to be a pressing concern. Yet, there are examples of commercial farmers actively contributing to land reform. One example is a trust that was established by two neighbouring commercial farmers, offering their employees the opportunity to start their own farm.

Regarding extension services, the involvement of agricultural organisations was generally identified as positive. Examples such as field days and information provision were put forward. However, emerging farmers, especially in the southern Cape, were not satisfied with the amount of information they received on adaptation. With regard to weather forecasting, commercial farmers were able to consult national and international websites, because in their opinion the national weather forecasting was not adequate. However, international weather forecasting did not suffice either. A lack of good weather forecasting was argued to be a severe constraint in the farming practices of commercial farmers. Opposed to this, emerging farmers were often limited to national weather forecasting.

For most farmers, access to markets was limited to the South African market. Low wheat prices were destabilising the income of commercial wheat farmers, by decreasing the national market value of good quality wheat. This was presumably caused by imports of low quality wheat, delayed implementation of import tariffs on

subsidised imports and the dumping of left-over products. This was argued to be a pressing concern to commercial farmers.

Drought assistance has been endorsed by the national government when the Drought Relief Fund was established, allocating financial resources to provincial governmental actors and agricultural organisations. These actors needed to deliver feed and water to farmers with livestock in need. Drought aid was aimed at assisting both commercial and emerging farmers, and seemed partially effective. However, commercial farmers partaking in the study did not receive any assistance, which enforced their perception of being neglected by the national government. For emerging farmers, drought assistance arrived too late in many cases, resulting in livestock deaths and deteriorating financial situations.

Two informal institutional arrangements were found to affect commercial and emerging farmers differently: religious narratives and perceived institutional racism. Religious narratives were constraining commercial farmers directly in their acknowledgement of climate science, more than emerging farmers ( $p = 0.024$ ). The impact of humans on the climatic conditions on Earth was questioned. It was argued that the climatic cycles are much larger than our current perspective on climate change. Institutional racism is the second informal institutional arrangement. Some small-scale farmers argued that a lot of white farmers do not see them as equals. Two emerging farmers in the southern Cape explained that the history of apartheid still affected them today. Their parents were driven off their farmland and relocated in areas with less fertile soil. It appeared that historically induced inequalities keep emerging farmers in a disadvantaged position. Commercial farmers spoke often about the perception of white farmers and the attitude of the government towards them. In their perception, the government solely wanted to restrict and oppress white farmers,

to compensate for apartheid. This feeling of injustice was widespread amongst the participating commercial farmers.

## **Discussion**

In light of three abnormally dry years and climate change predictions, agricultural adaptation in South Africa became essential. The variation in the extent to which and how farmers adapt to drought is influenced by a range of factors, such as socio-economic and contextual characteristics (Adger et al. 2005; Ziervogel et al. 2006; Agrawal 2010; Osbahr et al. 2010; Behrman et al. 2014; Berger et al. 2014). This study showed that the vulnerability context, intermediated by institutional arrangements, is of significance with regard to the ability of farmers to adapt to drought. The adaptation levels varied widely between commercial and emerging farmers. In general, commercial farmers had higher implementation levels of the CA principles and five additional adaptation measures.

Most emerging farmers in the study only got the opportunity to start farming after the start of democracy in 1994. Many of these emerging farmers argued that renting land from the government demonstrated a constraint (formal institutional barrier). The absence of property rights affected their motivation to invest in the farmland (Yegbemey et al. 2013). Ownership to land is needed to function as collateral when applying for credit, which causes emerging farmers to be deprived of the opportunity to invest (financial barrier). Financial capital is needed for investments such as the machinery that is needed for farming under CA principles. Due to limited information provision and education levels, there was often not enough knowledge to undertake adaptation action. Taking into account that CA is highly knowledge-intensive (Wall 2007), it can be understood that this constrained adaptation. The lack of information

was enforced by limited access to smartphones, internet and computers. These factors, combined and individually, appeared to have limited the adaptation of emerging farmers.

By contrast, commercial farmers implemented the adaptation measures more frequently, enabled by their relatively strong capital bases. The barrier to adaptation that appeared to be most evident, was a lack of acknowledgement of climate change due to religious narratives. Both commercial farmers who were well adapted and limitedly adapted conveyed this religious narrative.

Informational barriers did appear to constrain the commercial farmers' adaptation choices, in a way that unfamiliarity with climate change predictions and appropriate responses to drought limited their motivation. By informing commercial farmers on the development of climate change and its potential effects on agriculture in a more effective way, they are more likely to get acquainted with the subject, accept it and proceed to adaptation action. Showing how adaptation action can be successful and making it easily accessible, will help farmers overcome the last barriers.

Instead of being constrained in their ability to adapt, most commercial farmers felt they were thwarted in general. Uncertainty concerning land reform and financial instability due to a lack of price protection by the national government, amongst others, were said to demonstrate the insecure environment in which commercial farmers argued they reside. This insecure environment increased risk on investments needed for adaptation. Reducing these risks, by improving weather forecasting and price security, will increase the possibility to invest in CA and other adaptation measures.

The practical implication of this study is that emerging farmers are identified as a vulnerable group that needs additional attention when addressing drought and climate

change. In striving for environmental justice, i.e. avoiding disproportionate environmental impacts on marginalised groups, which are often defined by class, gender and socio-economic position, this focus is essential (Sze and London 2008). This is particularly so when considering that marginalised groups are especially vulnerable to climate change. Therefore, additional efforts are needed to prevent the division of South African society, based on race and socioeconomic position (Mthanti and Ojah 2017), to be further extended into the adaptation arena.

Improving (offline) information provision with regard to climate change, drought, adaptation, and CA can increase the probability of emerging farmers to take adaptation action (Zwane and Montmasson-Clair 2016). Furthermore, fair land reform, opportunities for education and training are essential to provide emerging farmers an opportunity to build a sustainable livelihood. Additionally, efficient and effective extension services and risk mitigation efforts are forms of support that are needed. As a result, the poor and vulnerable can be assisted in the adaptation process, enabling equitable adaptation to climate change in South Africa.

## **Conclusion**

Farmers need to adapt to conditions of drought, which is expected to become more severe and frequent in the Western Cape of South Africa as a result of climate change. The form and extent to which Western Cape farmers embrace adaptation measures in response to drought differ between commercial and emerging farmer groups. Conservation Agriculture was an important adaptation measure to commercial farmers, where emerging farmers were not particularly high adopters of CA. During times of drought, emerging farmers had to take up drastic coping mechanisms, rather than relying on a resilient production system built through time by CA practices. From

results obtained from interviews of both groups of farmers, it is clear that the socio-economic circumstances and the legacy of the historical political environment in South Africa still affect farmers after decades of democracy. The current uncertainty on land reform policies and political and economic stability of South Africa were demonstrations of an insecure environment. Emerging farmers have more barriers to adapt to climate change, are therefore more vulnerable to drought as a result of a lack of financial, natural, human and physical capital. Policies and additional efforts that consider emerging farmers are required to ensure environmental and socioeconomic justice. In order to ensure inclusive agricultural adaptation, efforts are needed to further facilitate equal adaptation opportunities, especially for emerging farmers.

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### **Conflict of Interest**

The authors declare that they have no conflict of interest.

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