

**An investigation to discover the various challenges faced by sugarcane farmers in
Kwa-Zulu Natal**

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Declaration:

I hereby declare that the Research Report submitted for the Bachelor of Commerce Honours degree to The Independent Institute of Education is my own work and has not previously been submitted to another University or Higher Education Institution for degree purposes.

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Abstract

According to SASA (2009), around 2% of the South African population are dependent on the sugarcane industry for a living. This activity however faces challenges throughout the whole process. Taking this into consideration, and to understand the impact, the important question is, what are the various challenges faced by sugarcane farmers.

The sample used for the study were two sugarcane farmers from Darnall, Kwa-Zulu Natal. The data was collected using a semi-structured interview schedule, as it enabled the researcher to gain an in-depth understanding of the phenomenon through exploring the experiences, views and beliefs of the participants on challenges faced by them and solutions implemented.

The study found that *viability* and *climate change* are the most significant challenges facing the sugarcane farmers in Kwa-Zulu Natal. Furthermore, the study also found that the sugarcane farmers make use of their own strategies to address challenges. These strategies include outsourcing key functions, such as the use of labour for harvesting and the hire of transport companies to transport the farmer's cane. Another strategy involves cash reserves being built up to sustain the farmer in difficult times. Recommendations were made towards the challenges faced and areas for possible future research avenues were highlighted.

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1. Introduction

1.1. Contextualisation

Arceneaux (1967) as cited by Webb (2014) provides that “Sugarcane is a C4, perennial, sucrose-storing grass that belongs to the genus *Saccharum* that originated in Asia and is a cultivated crop in tropical and subtropical countries throughout the world”. According to SASA (2009), around 2% of the South African population are dependent on the sugarcane industry for a living. This activity however faces challenges throughout the whole process, from the planting of sugarcane, to the processing of it, and making payments to the farmers (SASA, 2009). In addition to this, SASA (2009) further provides that most sugarcane farmers who invest much in the activity and follow the correct procedures, expect high returns but these challenges provide a major barrier to their success. According to Nel and Davies (1999), environmental, economic and political challenges are some of the challenges that South African sugarcane farmers face. Eweg (2005) supports this and states that sugarcane farmers in South Africa face challenges such as lack of access to financial resources, land availability, labour availability and the cost of inputs. Overall, the sugarcane industry in South Africa can be regarded as vital to the economy, farmers and communities; and therefore, it is important to understand and address the challenges that can potentially impact the success and sustainability of sugarcane farmers, as well as the impact to the various stakeholders involved.

1.2. Rationale

The sugar industry in South Africa is a R12 billion, cost competitive industry; thus, showcasing the importance of this industry (SASA, 2013). According to Nel and Davies (1999), significant problems face the sugarcane industry and solutions are required to improve the situation. Dubb (2013) provides that recent years have shown an increase in cheap sugar imports to South Africa regardless of the tariff protection, simply because other countries are able to produce sugar cheaper. Local farmers therefore receive less money per ton due to low demand; which impacts their profitability and spending power. This leads to unemployment and decreased investments in infrastructure and mechanisation, thereby slowing down economic growth and progress in the agricultural sector concerned. Kwa-Zulu Natal (KZN) sugarcane farmers will therefore benefit from this study, as it will shed light on the challenges faced by them. Awareness to government can

then be initiated, which can help find ways to address the problems more easily. KZN sugarcane farmers will also obtain an insight on sustainable, realistic and innovative ways to counteract problems faced due to the increasing complexity in sugarcane farming. This will contribute to their continued existence and in turn sustain employment and the local economy of KZN. The sugarcane farmers of KZN will also benefit from gaining insight and an understanding of Mintzberg's 5p's of strategy applied within the context of this study. From an academic stance, this study hoped to provide sugarcane research institutions and representatives with updated knowledge around the challenges being experienced in the sugarcane farming sector.

1.3. Problem Statement

According to Phillips (2018), even though recent rains are likely to boost the morale of South African sugarcane farmers recovering from the recent drought, there are other factors such as escalating production costs, decreased consumer spending and cheap sugar imports that continue to impact the sugar industry. The sugarcane sector, among other agricultural sectors, is highly unrecognised in terms of the hardships faced by sugarcane farmers (Phillips, 2018). Little research has been conducted on the challenges being faced and possible solutions for farming sugarcane in KZN. This research study therefore aimed to contribute, improve and provide an understanding on the various challenges faced by sugarcane farmers in KZN, and exploring what solutions are, and can be made available to them, to help solve some of the problems and mitigate future risks.

1.4. Research Goal

1.4.1. Research purpose statement

The purpose of this research study was to explore the various challenges faced by KZN sugarcane farmers using a case study approach. Furthermore, the aim was to gain an in-depth understanding of the various challenges faced by the sugarcane farmers in KZN in order to explore or describe what solutions can be implemented to address these challenges. The researcher collected and analysed data from two sugarcane farmers to gain an in-depth understanding of the challenges being faced.

1.4.2. Research objectives

This research study will aim to achieve the following objectives:

To investigate the various challenges faced by sugar farmers in KZN.

To explore available solutions that have been implemented by sugarcane farmers in KZN.

To provide recommendations on solutions that can be adopted by sugarcane farmers in KZN, in light of their challenges.

1.5. Research Questions

This research study will try to answer the following research questions:

1. What are the various challenges faced by KZN sugarcane farmers?
2. What solutions are available to the challenges faced?
3. What recommendations can be provided to address the challenges faced by the sugarcane farmers in KZN?

2. Literature Review

2.1. Theoretical Foundation

Mintzberg's 5 P's of strategy

In 1987, Henry Mintzberg, a professor at the McGill University in Montreal, proposed his theory of the 5 Ps of strategy (Campbell, Edgar and Stonehouse, 2011). These 5 Ps are strategy as a plan, position, ploy, pattern and perspective (Campbell et al, 2011). The article was published in the California Management Review in 1987 (Mintzberg, 1987).

The premise of this theory exists in an article written by Phillips (2013), which provides that escalating input costs, environmental challenges and the decreasing availability of arable land, have led to sugarcane farmers starting to consider other alternatives in order for their businesses to remain profitable and sustainable. This is where strategy comes in, as it can help farmers in making decisions and planning for the future.

Of the 5 Ps provided by Mintzberg (1987), the following can be regarded as applicable in this study according to the researcher:

Strategy as a plan: According to Louw and Venter (2013), it gives an overall direction and plan of action. Therefore, “strategy is formulated through a rational analysis of the organisation, its performance and external environment” (Louw & Venter, 2013, p.17). In this case, strategy is formulated by sugarcane farmers through analysis of the farms in terms of their performance on production, as well as other posing threats. Therefore, the concept of strategy as a plan can help sugarcane farmers in planning for uncertain events in order to mitigate risk and avoid uncertainties. Threat of droughts can result in farmers planning to build dams to collect water, which can be used in periods of drought to irrigate the sugar fields.

Strategy as a perspective: This refers to an organisation's method for execution of activities (Louw & Venter, 2013). According to Louw and Venter (2013), future strategies are formed based on the adaption of past strategies and on the collective experience of individuals, as well as their way of doing things, which is embedded in the cultural web of an organisation. In order to get maximum revenue out of their tonnage, sugarcane farmers may have a certain way of doing things based on the challenges faced such as droughts, financial difficulties and so forth. Small sugarcane growers or large growers may see it necessary to hire the available transport companies to transport their cane to the mills, as

it is a cheaper option than to carry out the activity themselves. This activity may be difficult because they are unable to fund their own transport due to financial and tonnage constraints.

Strategy as a pattern: According to Louw and Venter (2013), this is referred to as doing something the same way over time. Furthermore, “as a pattern, strategies also evolve out of their past” (Louw & Venter, 2013, p.17). Due to the frequent droughts being faced by South Africa, some sugarcane farmers may fertilise only during rainy periods and when rain is predicted. This is done so that the fertiliser melts in the ground providing the nutrition needed, as compared to fertilising at set intervals, regardless of weather conditions, thereby constraining the farmer even more by wastage of funds, labour and fertiliser.

Mintzberg’s 5p’s of strategy is relevant to this study, as the study uses strategy to identify various challenges faced by sugarcane farmers in KZN, to solve some of the complex issues and to explain the reason behind certain practices or behaviour. It further helps sugarcane farmers to think critically and strategically in order to develop viable solutions. This theory also helps the researcher understand the phenomena at hand and this will assist in critical & strategic thinking in the researcher’s studies.

2.2. Review of past literature

The purpose of this literature review is to provide and critique information that relates to the various challenges faced by sugarcane farmers globally, nationally and locally. Through engaging with the past literature, the researcher was able to gain a deeper understanding of the problems that exist which assisted in cementing the findings of this study. Furthermore, the purpose of reviewing the past literature was also to criticise the literature and identify shortcomings. Three themes are used in this review namely; an overview of sugarcane farming and sugarcane farmers; challenges faced by sugar farmers; and a review of solutions for the challenges faced.

An overview of sugarcane farmers and sugarcane farming

According to Chidoko and Chimwai (2011), sugarcane has the most by-products compared to other agricultural crops, but despite the benefits that exist in the cultivation of sugarcane, production has been decreasing over the years. In contrast, Hess et al (2016) provides that on a global scale, sugarcane cultivation is rapidly growing in response to the increasing demand for bioethanol and sugar for human consumption. Sugarcane is widely

cultivated in Sub-Saharan Africa (SSA), with the by-products being used for various other purposes (Hess et al, 2016). According to Nelson et al (2014), climate change brings about variations in weather patterns and conditions, thereby directly impacting biophysical effects on agricultural production. Brazil is the largest sugarcane producer in the world and despite being more advanced in production, farmers and the industry still face considerable challenges, with the most serious problem being climate change (Marin et al, 2013). According to Conningarth Economists (2013), a symbiotic relationship exists between sugarcane producers and the millers, as they both need each other for survival. According to SASA (2013), the national economy receives a fundamental contribution from the South African sugar industry as a result of the cultivation of this commodity, industrial investments and earnings from exports.

Hess et al (2016) suggests that even though there is a debate around the health effects of sugar consumption, continued and expanding sugarcane production is economically and socially important in the development of many SSA countries. Growing sugarcane ultimately dominates the land, including the land near mills (Hess et al, 2016). This activity therefore requires considerable infrastructure support such as housing, roads, schools, medical facilities and recreational facilities, as part of social responsibility efforts towards the people employed that assist in the cultivation and other procedures, and their families (Hess et al, 2016). Through such expansion and creation of infrastructural support for communities, employment and economic growth may increase. Government should therefore recognise the importance of this sector and intervene where possible.

According to Principal Extension Specialist for small-scale farmers at the South African Sugarcane Institute, Eweg (2005), the sugar industry had an estimate of 50000 farmers, of which 48000 were small-scale growers. However, Author and research assistant at Institute for Poverty, Land and Agrarian Studies (PLAAS), Dubb (2013) states that in recent years, the number of small-scale growers declined to around 25200. As a result, the number of farmers currently practicing sugarcane farming is less than in the previous years. In contrast, according to Tena, Mekbib, Shimelis and Mwadzingeni (2016), sugarcane farming in Ethiopia takes place through smallholder farming communities (997,240 households growing sugarcane on 22,388.48 hectares of land). Therefore, these smallholder communities may face challenges that are different to those faced by individual commercial farmers. However, they are likely to experience universal challenges such as climate change, thereby impacting their success and long-term sustainability. Hence, Mintzberg's P's of strategy highlighted in the theoretical framework can allow for all

sugarcane farmers large-scale or small-scale to plan certain activities or implement solutions that will address the challenges strategically in an attempt to ensure success.

Gillespie and Mitchell (2006) provide that increased cultivation activities and the involvement of the community, as well as other stakeholders with small-scale growers, have increased sugarcane yields and production levels in the Noodsberg mill supply area in KZN. However, Coetzee et al (2014) state that sugarcane yield and production levels are in decline in other mill areas and household income is decreasing, therefore resulting in dependence on other activities to supplement losses. As a result, the industry would continue to deteriorate with more farmers seeking to rely on government funding in order to continue production (Coetzee et al, 2014). This means that if small-scale growers are not educated on practices of how to farm sugarcane, the number of growers could decline due to lack of knowledge in production and dealing with challenges. It is therefore important to form collaborations between mill groups and small-scale famers, as well as mentorship from large-scale farmers so that small-scale growers and upcoming growers are well educated on the practice of sugarcane farming, and the challenges that go with it. This will result in efficient productions and contribute towards the growth of the industry. Tongaat Hulett Sugar (2016) supports this and has put in place cane and rural development initiatives. Their strategy includes developing more sugarcane farmers and enhancing existing ones to improve the quantity and quality of sugarcane produced (Tongaat Hulett Sugar, 2016). Furthermore, there is an aim to improve rural communities and to facilitate the involvement of relevant stakeholders, as well as providing training and skills development to small-scale growers (Tongaat Hulett Sugar, 2016).

A shortcoming identified, is the limited access to research on the activities of sugarcane farmers, in terms of how they go about cultivating the sugarcane and measures adopted by them currently to ensure security, transportation of the sugarcane and employment. This gap identified will be addressed by asking the participants relevant questions. Answers given will provide more information on this theme as well as more insight on the challenges faced. Furthermore, it is evident that through much of the practices, strategy is involved throughout the different activities and approaches. Obtaining information on the shortcomings identified will also contribute towards the theoretical framework, in terms of how the sugarcane farmers make use of strategy in their own way, to achieve their objectives.

Various challenges faced by sugarcane farmers

Various challenges that sugar farmers face globally and in South Africa are discussed. According to Girei and Giroh (2012) as cited by Tena et al (2016), challenges such as inconsistent rainfall, soil acidity and limited access to credit have been mentioned as some of the major challenges facing sugarcane farmers in African countries such as South Africa and Nigeria. Furthermore, Tena et al (2016) conducted a study to determine the constraints faced by sugarcane farmers, particularly small-holder farmers in the Southern and South-Western parts of Ethiopia, and found that the respondent sugarcane farmers faced challenges that were similar to those faced in South Africa and Nigeria. The challenges identified include “drought stress, low soil fertility, fluctuating prices, shortage of land, high cost of inorganic fertilisers, lack of improved pest resistant varieties and pest and diseases” (Tena et al, 2016). Therefore, it is evident that sugarcane farmers in South Africa and in other countries in Africa are faced with considerable challenges that have a significant impact on their success. Similarly, Muli (2010) provides that a major concern facing the sugar industry and farmers of Kenya is the impact the level of productivity of sugarcane has on the level of profitability. It is therefore apparent that the level of productivity is impacted by various challenges and ultimately impacts the profits of sugarcane farmers. However, it can be argued that the focus around Muli’s study of the challenges facing small-holder sugarcane farmers was aimed at focusing on challenges faced from the farmer’s ability such as lack of education and experience. A gap can therefore be highlighted in Muli’s study, where challenges beyond the control of sugarcane farmers are not mentioned. To address the gap, this study will attempt to unpack challenges from a sugarcane farmer’s ability as well as external challenges.

Climate change is a major challenge, with factors such as droughts and floods negatively affecting large-scale and small-scale growers on the production of sugarcane, thereby causing a decrease in tonnage and resulting in lower income received. As stated by Editors Inc. (1997), agricultural practices are not ideal with drought being a continuous problem and rainfall being unreliable, thereby resulting in only 15% of the agricultural land available being arable. This is supported by Dubb (2013), and states that the industry is facing a decrease in the tonnage of sugar produced, due to the drought being experienced over the past 5 years. “Aggregate production of sugar in South Africa has declined dramatically, from a peak of 2.75 million tons in 2003 to 1.82 million tons in 2012” (Dubb, 2013:13). It is therefore apparent according to the statistics provided by Dubb (2013) that a significant drop in production has occurred due to the drought. According to Marin et al

(2013), 60% of the sugar produced by Brazil is in the State of Sao Paulo with a considerable reliance on rainfall. The high dependence on rainfall by the sugarcane farmers and other stakeholders emphasises the role and importance of weather in sugarcane farming, and hence in the sugar, ethanol and electricity sectors at a local, national and global scale (Marin et al, 2013). In relation to this, Lakshmanan and Robinson (2014) as cited by Ferreira et al (2017) provides that sugarcane is a crop that has a moderately high demand for water and is impacted by water shortages. A limitation to sugarcane farmers in South Africa and the sugar industry is not being able to benefit from the production of ethanol and electricity as by-products of sugar production.

Walton and Conlong (2016) state that *Eldana saccharina* (Eldana) is a pest that eats into and breeds in many crops throughout Africa such as sugarcane. According to Goebel and Way (2007), one of the most common pests affecting sugarcane and its producers in South Africa is Eldana. The study undertaken by Goebel and Way (2007) found that Eldana impacted sugarcane by reducing its yield and bringing about inferior sugarcane crops. In addition to this, Way et al (2010) provides that in addition to Eldana, *Thrips* is another pest that eats into the sugarcane and depletes its cells thereby causing widespread damage to sugarcane fields in South Africa and impacting sugarcane yields. Furthermore, Zhao and Li (2015) provide that pest and diseases like the ones mentioned have strengthened due to climate change where droughts are favourable conditions for these pests and diseases to flourish and affect the fields of sugarcane farmers.

According to Nel and Davies (1999), another challenge is the lack of incentives provided to small-scale sugarcane farmers and lack of funding for large-scale sugarcane farmers during periods of drought, flood, fires and other negative impacts. As a result, it is difficult for farmers to re-plant and recover from damages quickly and it would therefore take time to recover from the costs incurred. Complementary to this, the South African Cane Growers Association (SACGA) Report (2017) provides that even though recent rains have brought relief, it has however been a long and difficult drought which has depleted the resources of the farmers. Furthermore, as a result of the drought, the cane quality in 2016 was ranked the worst in a decade (SACGA, 2017). Therefore, recovery will not take place instantly and replanting will have to take place on a large scale especially in the small-scale sector, thereby constraining resource availability and accessibility (SACGA, 2017). Nel and Davies (1999) claim is further substantiated by the SACGA Report in that it provides that even though efforts were made for drought relief, call for grants and low interest loans remain unanswered by the government.

Other challenges faced by sugarcane farmers as provided by Eweg (2005), include the cost of inputs, where the cost of production is higher than the income received. This is due to higher expenditure on fertiliser and chemicals, thereby resulting in lower savings. Similarly, Kamruzzaman and Hasanuzzaman (2008) found in their study conducted on the factors impacting the profitability of sugarcane farming in Bangladesh, that high input costs, lack of capital and low price of outputs impact the profitability of sugarcane farming. Furthermore, the study found that the cost of fertiliser (specifically urea) and frequency of application, cost of seed cane and cost of family labour were factors that frequently impacted the farmer's profitability and production (Kamruzzaman & Hasanuzzaman, 2008). In contrast, according to Masuku (2011), factors affecting the profitability of small-scale sugarcane farmers in Swaziland were the farmer's experience, distance between the farm and mill, sucrose content in the sugarcane and yield per hectare. It is therefore evident that sugarcane farmers are faced with various challenges in different locations around the world. In relation to the challenge of farmers' experience identified by Masuku (2011), Chidoko and Chimwai (2011) provide that management skills and training has an impact on a farmer's sugarcane production. However, even though findings of Chidoko and Chimwai (2011) found that all the sugarcane farmers in the Lowveld of Zimbabwe had some form of training, 97% said more training was needed to ensure efficiency and effectiveness.

In addition to this, Eweg (2005) provides that labour challenges are experienced by sugarcane farmers, where the availability of labour is becoming more complex and the cost of labour being high and continuously rising. Complementary to this, Professor at the Faculty of Crop Science at the University of Philippines, Mendoza (2016) provides that even though mechanisation can be regarded as a solution towards labour challenges such as the decreasing availability of labour, not all forms of mechanisation are suitable for different countries, such as the Philippines. Mendoza (2016) further states that many imported machineries are not suitable for their local sugarcane farming activities due to slopes. Therefore, sugarcane farmers in many countries associated with hilly terrain are unable to take advantage of certain machines such as sugarcane cutters, and hence are forced to deal with increasing costs of labour, among other issues. A limitation identified in much of the available literature, is the inability to address the challenge of mechanisation impacting sugarcane farmers in South Africa. Therefore, this study will attempt to gain insight from the sugarcane farmers about mechanisation that reduces the amount of labour needed, and whether it has been tested.

Eweg (2005) further provides that land availability is decreasing as urbanisation is increasing, thereby decreasing the amount of land available for sugarcane farming, as found in the KZN region. Complementary to this, Philips (2013) as cited by Matavire (2015) provides that the land under sugarcane fields has decreased due to rapid urban and infrastructural development along the coast of KZN. As emphasized Matavire (2015), the area under sugarcane in Nonoti and Zinkwazi wetlands have decreased from the year 2000 to 2012. Furthermore, the issue of decreasing land availability exists in the Southern and South-Western parts of Ethiopia, as Tena et al (2016) provides that decreasing land availability in the highlands, forced sugarcane farmers to cultivate steep slopes and unsuitable land. This has therefore increased deforestation and land degradation (manifested through soil erosion and loss of fertility) in the region (Tena et al, 2016). As a result, the number of sugarcane farmers are likely to decrease, thereby impacting the concern for the challenges faced by sugarcane farmers and increasing unemployment levels. However, while these authors mention the concern of decreasing land availability, a shortcoming is the inability to provide solutions to address this challenge.

As highlighted earlier on, irrespective of the tariff protection, recently there has been an increase in cheap sugar imports to South Africa, due to other countries being able to produce sugar cheaper (Dubb, 2013). Therefore, Phillips (2013) provides that sugarcane farmers are faced with the problem of receiving less money per ton due to demand being low and companies obtaining it cheaper from other markets; thereby impacting the profitability and spending power of the farmers. According to Greenberg, Thow and Hara (2017), many countries subsidise their sugarcane farmers and this results in cheap sugar production that impacts countries such as South Africa where it is costlier. Greenberg et al (2017) further highlights that there has been a decline in the amount of sugarcane being cultivated in South Africa due to an ineffective tariff protection. This leads to unemployment and decreased investments, thereby slowing down economic growth and progress in the agricultural sector of sugarcane farming. In relation to this, one of the major challenges concerning the sugar industry in South Africa right now is the introduction of sugar tax (Lemmer, 2017). This is likely to cause a major decrease in demand for sugar, as companies and people look for cheaper alternatives. As a result, the price of sugar will drop further, and farmers will still not be able to recover from the low sugarcane prices. According to economist Lemmer (2017), the South African Cane Growers Association conducted a study which indicated that an introduction of a 20% sugar tax would cause a 15% decrease in the gross income of sugarcane growers. This is likely to force sugarcane

farmers to consider other agricultural practices that yield greater returns and have a positive impact on their social and economic well-being.

According to Bezuidenhout (2012) as cited by Mokgoko (2015), farm attacks in South Africa are eight times higher than in other countries. Mokgoko (2015) further provides that farm attacks involve aggravated robbery, assault, arson, murder and other crimes. Such attacks usually evolve from racism, economic inequalities and failed land redistribution efforts among other factors (Mokgoko, 2015). Political analyst Venter (2017) states that the problem of attacks on farmers and farm workers has not been given the attention it deserves and will therefore affect food security and economic investment. According to agricultural economist Coetzee (2017), in recent months the number of farm attacks has seen an increase. As a result, farmers need to adapt to the dangerous conditions or would be influenced to sell up or tighten security which could be costly (Coetzee, 2017). Farm attacks are taking place across South Africa irrespective of the type of farmer. The increasing insecurity at farms, displays a significant threat to safety of sugarcane farmers and farmers in general, the agricultural sector and the future of farming in South Africa. A shortcoming in previous literature of farm attacks is the inability to express how farmers react to farm attacks that take place in other areas. This research study therefore aims to further explore how sugarcane farmers safety needs are impacted and how they react to the ever-increasing events of farm attacks throughout South Africa.

Solutions to the challenges faced by sugarcane farmers

Solutions are available to farmers and sugarcane farmers. According to Zhao and Li (2015), some alternative and adoption solutions against climate change include the cultivation of drought and pest resistant varieties, creating and improving drainage systems, improving the practices performed by the community and management, crop rotation as well as crop scheduling to ensure that not all fields are planted at the same time to avoid impacts. Complementary to this, Ferreira et al (2017) states that crop yield and enhanced sugarcane growth can possibly be achieved by dehydration tolerance mechanisms being developed into the sugarcane genotypes. However, even though the specific mechanisms for creating such drought resistant plants are not well understood, some traits have been adapted to create better performing sugarcane crops that can handle minimal to medium water stress (Ferreira et al, 2017). Sugarcane farmers must therefore continually follow research developments on drought resistant seed cane and purchase the certified seed cane from the registered sellers. In contrast to these solutions provided in response to climate change, Chandiposha (2013) addresses a possible gap in

such solutions by providing that reduction in the burning of sugarcane and its tops can reduce the effects of climate change. Furthermore, Chandiposha (2013) provides that sugarcane farmers in Zimbabwe still burn and remove trash (tops and leaves) even though it contributes to climate change. The trash can however serve as a benefit by providing nutrients to the soil such as nitrogen, reducing soil erosion, increasing moisture content and suppressing weeds from growing (Chandiposha, 2013). In addition to this, the proposed solution should therefore receive more recognition, as the sugar mills can benefit from excess trash and bagasse from the sugarcane, which can be used towards addressing the limitation of not benefiting from ethanol and electricity, as mentioned in the second theme. Baucum, Rice and Schueneman (2006) define bagasse as fibre material that results from the sugarcane stick once all the juice is squeezed out of the stalk. As provided by Khatiwada, Leduc, Silveira and McCallum (2016), bagasse and trash (biomass) can be used to produce biofuels, electricity and ethanol through technologies such as cogeneration. As a result, an increase in trash and bagasse will ensure the success of such activities while also reducing other impacts on the environment. Sugar associations in South Africa should therefore challenge mills and the government to get involved in such advanced activities that will not only benefit sugarcane farmers, but also communities and the sustainability of the environment.

Former member of Congress at Kansas and Secretary of Agriculture Glickman (2015), on the other hand, offers solutions that are opportunities to credit institutions, agricultural technology companies and insurance companies. Firstly, Glickman (2015) says that grant institutions should become more flexible in response to the different challenges faced by farmers. This will reduce the financial constraints faced by sugarcane farmers and enable sugarcane farmers to manage funds more effectively. Secondly, Glickman (2015) suggests that sugarcane farmers should be educated on the use of technology for producing hybrid seed cane. However, a possible limitation is that only large-scale sugarcane farmers would have the capacity to produce their own hybrid varieties. Lastly, a possible solution is getting the insurance industry to develop risk management packages (Glickman, 2015). This will essentially provide sugarcane farmers with the required capital and flexible payment plans, in light of challenges faced. Furthermore, risk management packages can help curb issues such as lack of capital to replant after a drought, inability to pay for mechanization and labour, as well as infrastructural development after disasters such as wind, fire and floods.

Shortcomings of the solutions provided by Zhao and Li (2015) and Glickman (2015) is the inability to address the use of unmanned aerial vehicles (UAV's) more commonly known as drones for security and irrigation. Drones can also be used to monitor fields and for the spraying of chemicals over fields (Zhang, Walters & Kovacs, 2014). According to Simelli and Tsagaris (2015), drones can and are being used to monitor fields and areas of deficiencies as well as for crop spraying. Thus, a possible future exploration is the use of drones by sugarcane farmers in KZN for security and pest control. For example, large-scale sugarcane farmers can invest in drones for the spraying of fields with chemicals as well as for security purposes, therefore reducing the amount of labour required and ultimately reducing labour cost and increasing profitability over time. Sugarcane farmers that have invested in such technological advancements can rent it out to other farmers, and thereby generate a different revenue stream. In contrast to drone technology, Łabędzki (2016) postulates that using remote-sensing and GIS in water systems control can assist in efficient irrigation.

Martínez Beltrán and Koo-Oshima (2004) provide that desalination of seawater and treatment of sewage water can act as a solution for water shortages, but state however that farmers would not be able to bear the costs of carrying it out. While desalination would be too costly and a far-fetched solution, government should rather invest in setting up sewage water recycling plants in order for farmers to irrigate sugarcane fields and other crops, as an alternative plan to mitigate against droughts. Furthermore, Chami and Moujabber (2016) state that addressing the drought as part of climate change requires efficient irrigation. This means that irrigation must be managed systematically by farmers in South Africa, through making the most of rainfall, treating and using non-conventional sources of water, efficient irrigation systems and the reduction of water losses from irrigating (Chami & Moujabber, 2016). This can be achieved according to Chami and Moujabber (2016), through reservoirs and tanks that can be used to collect rainfall and supplement the sugarcane farmers in periods of droughts, especially small-scale sugarcane farmers. Despite the quality issues raised about the treatment of non-conventional sources of water, it can be a major source of water, with effective management (Chami & Moujabber, 2016). Reduced irrigation on windy days can minimise water loss and the construction of dams and canals in-between the fields, particularly the sugarcane fields, can result in the storage of excess water from irrigation and rainfall (Chami & Moujabber, 2016).

While there are various solutions to help ease the problems faced by sugarcane farmers and farmers in general, only a few solutions have been implemented. This is because some solutions can be costly or do not apply to certain areas or crops. Furthermore, even though many of the authors mentioned solutions that can be adopted by sugarcane farmers in response to some of the challenges faced, some challenges remain without solutions. A lack of solutions for the issue of farm attacks, the decrease in arable land, and the introduction of the sugar tax, remain. Farm attack incidents therefore need more attention from the South African police force as well as government. The urbanisation process in South Africa needs to be reviewed by various stakeholders. Furthermore, much of the by-products of sugarcane that are not fully exploited should be considered, as well as the potential for exporting sugar cheaper to other countries, thereby minimising the impact of the imposition of the sugar tax.

2.3. Conclusion

The sugarcane industry is arguably one of the most significant agricultural sectors locally, nationally and globally. Many people particularly in South Africa (around 2% of the population) depend on the sugar industry to make a living. Many challenges are faced by sugarcane farmers that impact all stakeholders involved in this practice. An interpretivist approach was therefore selected to discuss and gain an in-depth understanding on the importance of sugarcane farming and the challenges faced by sugarcane farmers. The importance of sugarcane farming and farmers therefore emphasizes the need for Mintzberg's 5 P's of strategy even though only 3 of the 5 P's are useful in order to use strategy to identify problems and address them through strategic and sustainable solutions. Through the review of past literature, the issue of climate change is potentially the most serious constraint facing sugarcane farmers. Frequent droughts impact the sustainability and profitability of sugarcane farming. Furthermore, lack of incentives for sugarcane farmers are becoming major stumbling blocks due to the increasing cost of fertilisers, chemicals and decreasing profitability due to climate change and sugar price. Sugar tax will ultimately impact sugarcane farmers as they will receive less money per ton as demand decreases and that is why alternative solutions need to be established. Farm attacks pose a major threat to food security and safety of sugarcane farmers. Interventions are needed by the state and local authorities to help curb this issue. Many advanced solutions are provided to address challenges faced by sugarcane farmers. Pest resistant variables and better drainage systems are possible ways to maintain crops during drought

periods. Less burning of sugarcane can also benefit sugarcane farmers through increased nutrients and moisture in the soil. Sugarcane farmers must also approach financial institutions for more flexible financial assistance which may also lead to improved risk management packages. Furthermore, adoption of technology such as the use of drones for spraying and security, can benefit sugarcane farmers in the long run by decreasing labour costs and increasing revenue. While desalination is too costly for sugarcane farmers to implement, other methods such as efficient irrigation, treating non-conventional sources of water and building dams create additional sources of water for their needs. Therefore, the review of past literature has also helped the researcher understand the challenges more in-depth and through the identification of limitations/shortcomings in the research of other authors, this research study aims to further explore the shortcomings identified.

3. Research Methodology

3.1. Research Design

Tradition or Worldview

The paradigm chosen for this research study is interpretivism. According to du Plooy-Cilliers (2014), in this paradigm people are significantly different from objects. Humans change continuously and the environment that they are affiliated with constantly influences them. Furthermore, du Plooy-Cilliers (2014) provides that interpretivism supports social sciences and has been influenced by three key sciences namely Hermeneutics, Phenomenology and Symbolic interactionism. Hermeneutics deals with the theory and method of interpretation of human action; phenomenology is concerned with the way in which individuals make sense of the world around them and symbolic interactionists perceive reality to be highly symbolic and constructed (du Plooy-Cilliers, 2014).

This paradigm therefore expresses concern of a particular situation or people and attempts to gain a deeper understanding. Interpretivism was applied to this study as it explored how sugarcane farmers face several challenges which influence them negatively. As a result, it enabled the researcher to gain a deeper understanding of the challenges faced, which ultimately influenced the purpose of this study. This paradigm further applied to this research study because rich expressive data was required from participants.

Interpretivism best suited this research study as it is qualitative in nature. Interpretivism was therefore selected for this research study as it explored how sugarcane farmers in KZN face several challenges which influence them negatively and only subjective interpretation best described this phenomenon. It is therefore relevant to the research study in the context of describing the challenges faced by KZN sugarcane farmers and attempting to gain an in-depth understanding of the specified challenges, even though solutions are provided.

According to du Plooy-Cilliers (2014), the dominant research traditions and interpretivist paradigm include:

Epistemology: this study favoured subjective knowledge as the aim was to explore the challenges faced by the sugarcane farmers.

Ontology: the reactions and expressions of the sugarcane farmers were looked at by interacting with the farmers.

Axiology: uniqueness of complex understandings is valued, and sugarcane farmers had the opportunity to discuss their complexities.

3.2. Conceptual Approach and Design

3.2.1. Conceptual Approach

The nature of the chosen research approach is qualitative research. A qualitative approach to research aims to explain how and why a specific phenomenon operates the way it does in a particular context (Strydom & Bezuidenhout, 2014). Furthermore, McLeod (2017) provides that human behaviour or a phenomenon is understood from an information perspective and data for a qualitative study can be collected through interviews and participant observations.

In this case, qualitative research was applied to this research study as the aim was to provide an understanding of the challenges faced by sugarcane farmers in KZN, as well as the interpretation of solutions that can be adopted. Furthermore, a qualitative approach was best suited to express the challenges faced by sugarcane farmers.

3.2.2. Conceptual Design

3.2.2.1 Line of reasoning

According to Bezuidenhout (2014), this type of reasoning involves the research moving from the general exploration of broad aspects of a theory, to the application on a specific topic under investigation. Therefore, deductive reasoning is building on existing knowledge and synthesising knowledge that is already out there.

Deductive reasoning was used for this research study as it used existing knowledge to gain an in-depth understanding of the various challenges faced by sugarcane farmers. Furthermore, the study is related to Mintzberg's 5 P's of strategy, which is an existing theory and relates to the research study in the sense that strategy was used to provide a strategic solution towards challenges identified.

3.2.2.2. Type of study

This type of study relates to that of applied research. According to Davis (2014), applied research involves describing practical or social issues with the aim of determining whether

solutions can be found, assessing and evaluating existing practices, recommending and providing solutions, as well as identifying new areas of research.

Applied research relates to this study as the challenges faced by sugarcane farmers in KZN was described, thereby creating an understanding of the challenges which then aimed to provide recommendations to those problems. Ultimately, the challenges that could not be addressed due to lack of solutions or ineffectiveness of existing solutions will highlight new areas of research.

3.2.2.3. *Type of approach*

The type of approach that was used for this study is the case study approach. According to Strydom and Bezuidenhout (2014), the case study approach is a detailed explanation of a social phenomenon that exists. The situation is therefore severely described to understand the phenomenon.

The researcher used a descriptive case study approach in order to describe the challenges being faced, thereby providing insight and an in-depth understanding of what challenges are being faced by the sugarcane farmers.

3.2.2.4. *Time dimension*

According to du Plooy-Cilliers and Cronje (2014), the use of a cross-sectional study creates an overall picture of a phenomenon at one specific point in time and data must only be collected from participants once.

The time dimension that was chosen for this study is the cross-sectional design, as the sugarcane farmers were only interviewed once to create an overall picture of the challenges faced by the sugarcane farmers. Furthermore, data was only collected once, as the researcher does not intend on continuing the study.

3.3. Research Plan

3.3.1. Population

The unit of analysis for this research study was individual sugarcane farmers.

The target population was all sugarcane farmers in KZN. The accessible population were the sugarcane farmers in Darnall, KZN.

Population Parameters:

- (1). Individuals whom are sugarcane farmers.
- (2). Sugarcane farmers in Darnall, KZN.

3.3.2. Sampling

3.3.2.1. *Non-probability sampling*

As provided by Pascoe (2014), the use of non-probability sampling can take place when it is almost impossible to determine who the entire population is or when gaining access to the entire population is difficult.

Non-probability sampling was used in this study because it is almost impossible to reach all the sugarcane farmers in KZN. Furthermore, every sugarcane farmer of the target population did not have an equal chance to be part of the research study. Hence non-probability sampling was used as the sample could easily be identified and accessed from the accessible population of Darnall, by including sugarcane farmers in the surrounding Darnall area.

3.3.2.2. *Sampling method*

The sampling method that was used is convenience sampling. Etikan, Musa and Alkassim (2016) provide that this sampling method is used when the subjects of the population are easily accessible to the researcher. It is affordable, easy to carry out and subjects are already available. This sampling method is generally used if the participants are known (Etikan et al, 2016).

Convenience sampling is relevant to this research study as the researcher is familiar with the sugarcane farmers in the Darnall area. Convenience sampling was utilised, by visiting each sugarcane farmer in the sample, who were known to the researcher and they were interviewed. The farmers were conveniently located from the researcher's workplace which made reaching them easier. Although convenience sampling is generally associated with biasness as stated by Pascoe (2014), bias was avoided as the farmers answered the questions truthfully as it was their plights being expressed.

3.3.2.3. Sample size

The sample size was 2, narrowed down to the sugarcane farmers conveniently located in the surrounding Darnall area.

3.4. Data Collection Method

According to Strydom and Bezuidenhout (2014), underlying qualities of subjective experiences and the meanings attached to phenomena, is what qualitative research deals with. It is therefore difficult to quantify these experiences and meanings. A qualitative data collection method is thus used to obtain richness and depth out of data obtained by the researcher from a complex phenomenon in a social context (Strydom & Bezuidenhout, 2014).

A qualitative data collection method was relevant to this research study as the researcher attempted to gain an in-depth understanding of the experiences, in terms of challenges faced by sugarcane farmers in the sample. In order to express their plight and meanings attached to phenomena in sugarcane farming, quantification was not possible.

An interview schedule with open-ended questions was utilised to collect information from the participants about their views and experiences as a sugarcane farmer. Therefore, the interviews provided detailed subjective information on the challenges faced as a sugarcane farmer. Interviews were chosen for this study as it was cost effective for the researcher and had the ability to provide rich and expressive data. The researcher contacted each sugarcane farmer from the sample by phone and arranged a meeting. At the time of the interview, the participants were thanked for their time and agreeing to the interview before commencement. The questions asked during the interview was formulated by the researcher, with careful consideration and alignment to the problem at hand, thereby ensuring specific and relevant information. Furthermore, the interview schedule was recorded using a voice recorder app on the researcher's smartphone with the consent of the interviewees in order to ensure that all verbal communication was transcribed.

3.5. Data Analysis Method

According to Braun and Clarke (2006) as cited by Joffe (2012), thematic analysis involves the identification and analysis of patterns of meaning in a dataset, thereby highlighting

which themes are important in the phenomena being studied. It can contain manifest content, where something is directly observable, and latent content such as references mentioned implicitly (Joffe, 2012).

Thematic analysis was used to analyse the data collected. The voice recordings obtained from the interviews were transcribed and the researcher familiarised himself with the data (Braun & Clarke, 2006). Through a process of coding, initial codes were developed, and the researcher searched for themes (Braun & Clarke, 2006). The themes were reviewed, and the data was represented in the defined themes (Braun & Clarke, 2006). Lastly, the analysis enabled the researcher to produce a write up that discussed the findings and contextualised the literature (Braun & Clarke, 2006). Patterns obtained from the analysis were related to the research questions. Ultimately, thematic analysis was used to examine and identify themes and concepts within the recordings of the interviews, and it provided an important description of the challenges faced by sugarcane farmers in KZN, as well as other relevant information obtained from the answers to questions. This approach was the best approach because it helped express the sugarcane farmers perceptions, feelings and experiences.

4. Presentation of Findings

4.1. Findings and interpretation of findings

The interview schedules that were conducted using open-ended questions underwent a thematic analysis and the main themes found, were analysed. The data analysis was laid out according to theory, evidence and then followed by discussion. The quoted paragraphs represent the evidence that will form the main structure. The themes are also informative and concise.

The data was obtained from two sugarcane farmers that were interviewed at their farms in Darnall. To ensure confidentiality the names of the participants will not be mentioned, rather the alphabets A & B will represent each participant. The themes arose from the data deductively and each theme will be presented in a coherent order.

Theme 1: Viability

The participants are faced with the challenge of viability of their operations. The participants had strong emotional reactions when speaking about this challenge. Viability continues to impact their productivity and performance. To represent the scale of this theme, sub-themes arose:

Sub-theme 1: External support

External support goes a long way in ensuring sustainability of operations fostering growth within the agricultural sector. The participants are unhappy with the lack of support from government. They believe that the challenges faced are major and deserves adequate attention from government as ultimately such challenges affect the economy in terms of unemployment and other implications. Both participants highlighted the lack of financial incentives from government to assist in challenges.

A: [...] *“If we do have drought like we’ve had recently there’s no relief for commercial growers you know...there’s no seed cane subsidy, no transport subsidy, no chemical and fertiliser subsidy”.*

B: *“Uh I’m sorry to say there’s been no relief for us commercial growers. Smaller growers have received some form of aid recently. Although there has been vigorous campaigning for government assist with drought relief and financial support, but none-has materialised”.*

The participants did not hesitate in expressing how they feel and state that they have been left to assist themselves without intervention. Also, input factors such as seed cane, chemicals and fertilisers mentioned by participant A receive no form of aid which impacts the participants financially. This indicates a lack of subsidies from government even though approaches to government for support have been made. This is in line with the past literature where Nel and Davies (1999) provide that a challenge faced by sugarcane farmers is the lack of incentives and funding for small-scale and large-scale sugarcane farmers during periods of drought, flood, fires and other negative impacts. Complementary to this, the SACGA Report (2017) provides that even though efforts were made for drought relief, call for grants and low interest loans remain unanswered by the government. This is found in participant B's response where he said that government has not responded to their grievances. While discussing financial incentives the participants also shifted the focus to lack of intervention in affairs that usually involves government:

A: [...] *"we have a serious problem with our sugar price uhm [...] How does one compensate that loss of income you know..it is economies of scale..so the bigger you are the more you can absorb however the smaller guys like myself face a problem because of the fact that the tonnage is often small..uh..so we don't really have much to offset the poor price, and also importation of sugar in this country uhm our tariff protection fell due and it was not renewed"*.

B: *"I think my biggest challenge is an economic one [...] which is cheap imported sugar uhm, So, what happens is a sugarcane farmer like myself gets less and that impacts me and my operations. You know the main problem with this importing of sugar is that we used to have a tariff protection uh but that has been problematic due to the inefficiencies of government thereby creating a gap"*.

This indicates that financial challenges also extend to more external affairs. Imported sugar has been allowed to saturate the local market causing a decrease in the money received by the sugarcane farmers for their sugarcane. The 'loss of income' by the growers is likely to impact the motivation level of the farmers judging from their expressions. The participants' feelings towards lack of intervention is supported by past literature, as Dubb (2013) says that recently there has been an increase in cheap sugar imports in South Africa, due to other countries being able to produce sugar cheaper. Furthermore, the data provided by the participants is supported by Phillips (2013) whereby sugarcane farmers are faced with the problem of receiving less money per ton due to demand being low and companies obtaining it cheaper from other markets; thereby

impacting the profitability and spending power. Both participants feel that government has a chance to intervene and assist them even if it is not financially, but by imposing a strong tariff protection:

A: *“they have not assisted with any of my direct challenges such as poor cane price, where tariff protection lies in their hands”.*

B: *“You know the government can at least assist us and give us a decent tariff protection and that would not cost the government and it would go a long way in increasing employment and improving the agricultural sector”.*

The participants convey that these issues are beyond their control and more political/economic in nature. Here government has direct influence in terms of tariff protection and the participants are pining for their intervention.

The participants further expressed concern over the situation by highlighting the recent introduction of sugar tax. The participants believe that the demand for sugar will decrease and that the sugar price will drop further. Participant A talks about a cycle effect where the demand will decrease as companies explore alternatives, including customers/consumers, and in turn farmers will receive less income which will contribute towards unemployment in the long-term.

A: *[...] “the sugar tax is now affecting the consumer and the consumer buys sugar in many forms from companies, and the miller produces and the farmer [like myself] grows the sugar...so it has cycle effect and we ultimately get affected as well as all stakeholders”.*

B: *[...] “There’s now a sugar tax being implemented which poses a major threat to us”. For me I think the government has introduced the sugar tax as another income stream and not really for the concern of health. Us as producers will possibly be impacted especially with an even lower sugar price”.*

Participant B blatantly believes that government issued the sugar tax in order to increase its revenue. It is important to note that available literature supports these findings where Lemmer (2017) provides that one major challenge concerning the sugar industry in South Africa right now is the introduction of sugar tax and as a result, the price of sugar is likely to drop further due to a decrease in demand, and farmers will still not be able to recover from the drought and low sugarcane prices.

Sub-theme 2: Returns

In the activities of the farmers, returns play a major role in ensuring continued success and constant motivation levels. The participants feel that the returns they receive is not enough given the high input costs. When speaking about the challenges faced the participants said:

A: [...] *“Uhm it is very disheartening when you put in all that effort and things are out of your control and uhm it is very frustrating due to the ever-increasing input costs” [...].*

B: [...] *“you know I would say the present return on investment given the challenges like climate change, I’d say the return is not worth it. In fact, if one would have to look at the figures it would show the activity is not worth the risk and effort of being involved. You know I look at it and think this is crazy you know all these things we cannot control uhm but anyway we still do it”.*

The information provided by both participants relates to Eweg (2005) who provides that sugarcane farmers are faced with the challenge of cost of inputs, where the cost of production is higher than the income received. This seriousness of this problem is conveyed by the participants using words such as “disheartening”, “crazy” and “not worth it”. Analysing the use of such words provides a view that the sugarcane farmers encounter serious stress and negative impacts to their emotional and physical capacity.

The participants then expressed the situation more in-depth where input costs were specified:

A: [...] *“so, with the poor cane price your input costs have gone up and the increasing fuel price also challenges me which all fall part of the input costs and are adversely affecting me and my profit margins. On this same basis, the price of fertiliser and chemicals also challenge me...”.*

B: *“One of the other big challenges is inputs. This includes fertiliser, herbicides, tractors and equipment, diesel and transport and labour. You know, the cost of inputs is ever increasing, and I face serious difficulty in trying to survive given the revenue we receive for our cane and when we have a drought that just makes things worse”.*

The participants express difficulty in ensuring sustainability due to increasing input costs. Both participants agree that the costs involved impact returns which in turn impacts

viability. The seriousness of the high input cost situation is highlighted further by participant B stating that it is difficult to remain productive. Essentially these farmers still do what they do because they have been in the industry for a long time and have adapted to obstacles that come their way. The high impact of this challenge is echoed in a study by Muli (2010) who provides that a major concern facing the sugar industry and farmers of Kenya is the impact the level of productivity of sugarcane has on the level of profitability. It is therefore apparent that efforts and costs involved in productivity impact the profits of sugarcane farmers in South Africa and Kenya.

The sub-theme of returns is further strengthened by the information provided by the participants that relates to the study of Kamruzzaman and Hasanuzzaman (2008) who found in their study conducted on the factors impacting the profitability of sugarcane farming in Bangladesh, that high input costs, lack of capital and low price of outputs impact the profitability of sugarcane farming. Furthermore, the study found that the cost of fertiliser frequently impacted the farmers profitability and production (Kamruzzaman & Hasanuzzaman, 2008). The challenges found in Bangladesh align to that provided by the farmers interviewed which shows a relationship whereby farmers in another country face the same challenges.

Sub-theme 3: Labour and challenges

Another challenge that questions viability for the participants is labour and associated challenges. Increasing labour challenges has challenged the sustainability of operations causing a rise in uncertainty. The participants recognised that labour is important, but government needs to recognise the employer as well:

A: *“wages have gone up as a minimum wage has been introduced into our industry and has affected me considerably, it looks at your productivity and all our costs and therefore challenges me by asking myself am I sustainable?”*

“You know I always ask myself can I survive employing people with increasing wages. Don’t get me wrong it is a good thing, but high input costs challenge me ...and I cannot afford the labour, so I retrench excess staff”.

B: *“Uhm, on the point of labour, the high minimum wage and complex labour laws make it unattractive to employ more people”.*

This links to past literature where Eweg (2005) provided that labour challenges are experienced by sugarcane farmers, where the availability of labour is becoming more complex, and labour costs are high and are continuously increasing.

Labour challenges are therefore apparent in the sugarcane industry and the complexity is increasing. These increasing complexities provides insight as to why external support is needed to promote balances.

Theme 2: Strategies

Strategies come into play in the operations of the sugarcane farmers in terms of their approaches to problems. The participants implement strategies in their approaches. The theme of strategy came up frequently in the interviews:

A: "I have no back up to rain fed water [...], it all depends on the severity and how quickly you get your relief rains but ja drainage wise we do have a lot of slopes in our areas uhm we do have some flat lands that we do have some drains and have self-draining soil to do well in drought conditions...so unfortunately I do not have a plan B to a drought...I am negatively affected".

B: "Uhm...you have to box clever hey...in the good years I attempt to build up cash reserves for the bad years as there will be bad years. You know keep unnecessary expenditure to a minimum. One cannot change the weather; therefore, I have adopted a water wise approach on the farm. I also try to harvest rain water in my dam, but long droughts deplete the water reserves fast".

The concept of strategy as a plan as highlighted in the theoretical foundation can help sugarcane farmers in planning for uncertain events in order to mitigate risk and avoid uncertainties. Participant A deals with water and droughts only through drainage systems. Participant A's approach to drought does not align to the concept of strategy as a plan highlighted in the theoretical foundation. Interestingly, participant B confirms to the example of strategy as a plan by harvesting rain water in a dam. The strategy is however faced with the challenge of possible depletion during long droughts. Participant B's strategy around planning further extends to saving up capital to try and counteract bad financial times like when droughts occur.

The participants providing information around their approaches then steered towards perspectives in doing things to counteract their problems:

A: *"I hire from [...] to have someone that can actually harvest for me and plant for me and in that way reduce my own costs [...]. I am part of a fertilising syndicate and a harvesting syndicate uh..just because..uhm, the securities around fertilisers uhm storage of fertiliser..I do not have a water tight storage facility to avoid theft so I bring in a contractor who then brings in the fertiliser that is required and is applied thereby minimising theft and on the harvesting side [coughs] [excuse me]..I have had my own cutting team before which comes with major challenges but what we did is brought in contractors who come cut the allocation for the day and gone. Also, my transport is outsourced uhm I do not undertake my own transport uh I have a hired haulier the most feasible I could find to transport my cane given my tonnage and distance and have been doing this for me for 4 years now uhm then again if I had to look to purchase my own vehicle for transport I do not have enough tonnage to support that vehicle and in order for me to run that truck and trailer I need the minimum tonnage in order for it to be feasible...and I'm not a transporter I'm a farmer [laughs]"*.

[...] "and in a drought my tonnage decreases significantly..so ja one of my strategies is to cut the crop and decrease my expenses in terms of labour, diesel etc as much as possible".

B: *"Another strategy of mine to combat weeds and save on chemicals is mowing my firebreaks and applying chemical to kill off excess grass on the sides. This saves on labour as well as the amount of chemical that would be used had the firebreak not been maintained. For me it is about how can I save money. I also never put too little fertiliser because then my tonnage would possibly be impacted"*.

"Some sugarcane farmers like myself are using contractors for economies of scale as it is not financially viable to buy new equipment or have our own equipment and I even get contractors to apply fertiliser or cut our sugarcane".

According to the element of strategy as a perspective, sugarcane farmers may have a certain way of doing things considering the challenges faced. It is clear that participant A and B differ in the perspective approach in the theoretical foundation. However, some of their approaches based on their perspectives do relate in terms of trying to achieve financial sustainability. Both participant A and B see it necessary to hire contractors to transport their sugarcane, apply fertiliser and cut their sugarcane as it is in line with their financial and tonnage capabilities.

The participants also mentioned a strategy for coping in a drought but neither of them practices it due to other problems or practiced it partially:

A: *“In a drought situation you also want to retain as much moisture in the ground, however I still burn because the cost to trash cane is higher so that’s a major downfall as one of the options available to us sugarcane farmers and in a drought there’s probably a higher change and risk of that trash serving as fuel for runaway fires and stuff like that. However, the risk can be dealt with”.*

B: *“Where possible I practice green cane harvesting. The trash blanket helps with moisture retention and reduces evaporation of moisture from the soil [...] however uhm...it is a complex activity that is frowned upon by labour and we are not supported by mechanisation that is suited to our terrain you know...”.*

Both participants agree that green harvesting can be beneficial during droughts and retains moisture in the ground through the trash blanket. However participant A is reluctant to it due to high costs that cannot be absorbed. This is supported in past literature as Chandiposha (2013) provides that sugarcane farmers in Zimbabwe still burn and remove trash (tops and leaves) even though it contributes to climate change. Participant B on the other hand undertakes both burning and green harvesting where and when possible. The participants believe that green harvesting can contribute to moisture retention in the soil. This is supported by Chandiposha (2013) who provides that the trash can serve as a benefit by providing nutrients to the soil such as nitrogen, reducing soil erosion, increasing moisture content and suppressing weeds from growing. The participants however did not mention the additional benefits provided by Chandiposha (2013) above, which indicates the possible lack of acknowledgement towards the solution. Furthermore, even though there are many benefits towards the solution of green harvesting, the fact that participant A is not open to it means that it remains unpopular and needs more recognition. Chandiposha (2013) however failed to mention the disadvantages as discussed by participant A and B where the cost involved is higher due to labour and a lack of mechanisation for their terrain as mentioned by participant B.

The theme of strategy that involves actions towards their challenges then encountered technology. Interestingly enough participant A has explored the possible use of drones whereas participant B is quite adamant to adhere to traditional practices:

A: *“Uhm, well I basically looked at the new drone technology that is now out and has really been excellent in mapping my farm and giving me visual uh visual from*

above that can really look at problems on our farm such as drainage problems to nutritional problems to uh populations you know uh your ratoons uhm as well as other issues relating to pests so ja that has really been a fantastic uh revelation to use this imagery and it is very accurate but it is costly. So, it's now down to precision accuracy and we now getting into a new era of precision farming uhm we don't have flat land so that in itself is a big challenge uh so we cannot just suddenly [clicks finger] flip the switch and say we going to mechanise 100% no more labour other than drivers we cannot do so we are slope dependent...".

B: *"To be honest I'm quite old school and haven't really explored any technologies".*

Participant A has been putting drones to the test aligning to the literature of Zhang, Walters & Kovacs (2014) who provide that drones can also be used to monitor fields and for the spraying of chemicals over fields. Participant A's motivation for trying out drone technology is substantiated by the lack of mechanisation available for the topography of South Africa. However, with ever-increasing advancements in technology such as drones, it is likely that mechanisation suitable for hilly terrain will be developed in the future.

It is also interesting to note that since participant A has put drones to the test, means that the use of drones is still being explored, however, it is capital intensive at the start. But it can be said that as participant A mentioned that it is impossible to mechanise overnight, it is impossible to reap the rewards of drones in the shorter term. With regards to participant B, the lack of insight into technological advancements indicates a lack of recognition amongst some farmers on the use of potential technologies that are available to counter certain challenges faced.

Theme 3: Climate change

The impacts of climate change were emphasised throughout both interviews. Due to climate change droughts and flash floods are becoming a regular occurrence and have also contributed to many of the other challenges faced by the sugarcane farmers. Climate change came up frequently in the interviews:

A: *"Uhm, I think the biggest challenge faced is the weather due to the fact that we rely solely on rain in order to grow our crops especially dry land sugar um uhm sugarcane farming um the weather patterns changing because of the carbon emissions and all, that we have seen a dramatic change in climate changes and how it affected us as sugarcane farmers um so I think that is number one challenge*

for me uh you know our seasons vary so much that from season to season you can never say on such and such a date I planted and I can do the exact same next year on that date because of the changing seasons and we have even felt that certain seasons overrun or are delayed. Also, the longer and more delayed winters affects our spring summer planting and spraying, and it affects our operational uhm, factors on the farm considerably”.

B: *“Another challenge I face is an environmental one. Global warming and climate change are very real. We have seen in the last 15-20 years that frequent droughts happening. You know recently we have had 2-3 drought years in a row and then excessive rains which impact the distribution and climate change is happening you know we go through many months with no rainfall whereas in the past we were faced with consistent rainfall”.*

Interpretation of the extract indicates that interviewee 1 and 2 both feel that climate change significantly challenges them and their activities. Interviewee 1 states that the climate is a dry one in which sugarcane is grown and it is therefore essential for consistent rainfall. However, participant A provides that climate conditions have changed thereby challenging them in the practices they are used to carrying out. Consistent with the element of strategy as a pattern from the theoretical foundation, participant A does indicate that patterns are followed. These patterns are however impacted by climate change. Similarly, participant B emphasises the impact of climate change by discussing that irregularities in weather patterns has resulted in frequent droughts. Ultimately, climate change is seen as the biggest challenge and rainfall is essential for the sustainability of the sugarcane and the farm. Climate change has resulted in frequent droughts disrupting the weather and seasonal patterns by which farmers abide by to undertake their activities. This is supported by prior literature where Editors Inc. (1997) discuss that agricultural practices are not ideal with drought being a continuous problem and rainfall being unreliable. The findings are also supported by Dubb (2013), and states that the industry is facing a decrease in the tonnage of sugar produced, due to the drought being experienced over the past 5 years.

Flash floods as a result of climate change damage the farm but interviewee 1 is open towards flash floods rather than a drought due to the severity of a drought as highlighted by interviewee 1:

A: *“I can kind of deal with flooding you know, flooding we have a topography that isn’t all that flat, and therefore can handle severe downpour rain and it is shown.*

Over recent years flash floods have become a regular. Once the rain stops I repair and still function, however with the drought...it is almost like we cutting off the blood supply you know the plant is dying the roots are dying so the losses I think are greater on a drought than they are with flooding you know...low lying areas of the farm are more susceptible to the impact of flooding and ja climate change to me is a big challenge”.

Due to climate change flash floods are becoming common but the impact of a drought is greater emphasised by the participant mentioning “cutting off the blood supply”. That basically means that in a drought the dry spells will cause roots to perish and ultimately, loss of crops. Through this the tonnages of the sugarcane farmers decreases thereby causing loss of income, increase in input and operating costs and an impact on stakeholders such as communities.

Theme 4: Pests and Diseases

The participants acknowledge that pests and diseases are a challenge to their crops. One of the common pests and disease that came up was Eldana:

A: “Another problem for me is the issue of Eldana. This pest makes it difficult for me to keep cane for the next season and has also increased my costs in terms of trying to combat it. What happens is that the fields that get Eldana lose their sucrose content and impact our yields thereby impacting our tonnage and profitability for that crop”.

B: “Uhm other challenges I am facing is pest and diseases in the sugarcane, you know one of the major infestations is Eldana which is a worm that bores into the sugarcane. [...] It has made it impossible for me to age my cane...you know to carry it over and therefore we are faced with cutting younger cane and trying to use chemicals to try and achieve harvestable cane. The younger cane cut also impacts input costs and therefore impacts profitability”.

Being forced to harvest your entire crop before the end of the season due to pests and diseases is a major problem, as it impacts the farmers in their strategy of planning to keep certain crops for the next season, in order to have an instant crop to deliver to the mill and receive returns. While the pests and diseases challenging sugarcane farmers such as Eldana can be counteracted through the application of appropriate chemicals, the cost of chemicals also pose a problem for the farmers and the crops are still open to the risk of

Eldana still damaging the crop. The issue of Eldana is supported by past literature as Goebel and Way (2007) provide that one of the most common pests affecting sugarcane and its producers in South Africa is Eldana. The study undertaken by Goebel and Way (2007) found that Eldana impacted sugarcane by reducing its yield and bringing about inferior sugarcane crops. As evident in the interviews the participants state that they must harvest the crop and minimise carrying it over to the next year in order to avoid inferior crops with low yields.

Theme 5: Safety and Security

When speaking about the challenges, the participants expressed concern over security:

A: "I think security is a paramount issue especially us farmers and we currently now faced with land expropriation without compensation..so there's a lot of uncertain times and uncertainties. With safety being a major problem due to a lot of farm murders it provides me with concern and thoughts of calling it quits. Uhm, I have a security company that checks the farm for me and house and ja I have been a victim of a farm attack and ja I had an attempt on my life and fortunately uhm, I came out of it, but it was a very scary situation".

B: "I have not been personally affected by any farm attacks. However, I have been a victim of theft of produce, and theft of agricultural chemicals, fertilisers and equipment. There would always be the threat of being a victim of farm attack. I think safety is a major concern you know we basically living in the wild west. We are proactive as we have a private policing security service".

Both participants believe that farm attacks and safety is a major concern. Participant A has been a victim of an attack while B has not. Even though participant B has not been a victim of farm attack, he has been a victim of theft which provides an interesting view that theft also challenges the safety and security of sugarcane farmers, as the possibilities of other safety/security issues may exist. Land expropriation without compensation mentioned by participant A is yet to be carried out and there is a lack of credible information regarding the issue. It therefore remains a possibility for future exploration on the impact it has on safety and security. Participant A's fear is much stronger than participant B where he mentions he thinks of "calling it quits" whereas participant B is more accepting towards the safety issues. A common solution adopted by both participants is the hire of private security to try and combat safety and security issues. Complementary to the findings, agricultural economist Coetzee (2017) provides that in recent months the number of farm

attacks has seen an increased. As a result, farmers need to adapt to the dangerous conditions or would be influenced to sell up or tighten security which could be costly (Coetzee, 2017).

4.2. Trustworthiness of the findings

Trustworthiness is referred to as the credibility of research findings. The aim is to gain an understanding of a phenomenon within a context, rather than to generalise findings to a broader population (Koonin, 2014). Four dimensions of trustworthiness that were taken into consideration to ensure the trustworthiness of this research:

Credibility: According to Koonin (2014), this entails the accuracy with which the researcher interpreted the data obtained from participants. The researcher ensured credibility by carefully analysing the data received from participants in order to produce accurate results of the challenges being faced by the sugarcane farmers. By using in-depth interviews to collect data from the sugarcane farmers participating in the study, the explicit and in-depth results obtained during the research was able to ensure credibility.

Transferability: Koonin (2014) provides that this can be referred to as the results being able to be applied to a similar situation and produce similar results. This would allow for generalisation even though the aim is not to generalise findings. Seeing that the researcher has a passion in agriculture and sugarcane farming, the researcher can conduct the study in a different sugarcane farming area such as Gingindlovu which may produce similar results. The researcher also ensured that the findings reflect the participants' views and experiences rather than that of the researcher. Furthermore, this study will be made available to others, making it transferable should it be applied in the correct context.

Dependability: Koonin (2014) describes this as the quality of the process of amalgamation that occurs between the data collection method and the data analysis process. The researcher ensured dependability by immersing himself in the process and being as precise as possible by analysing the data carefully to provide accurate results. Therefore, the researcher remained objective and unbiased.

Confirmability: Lincoln and Guba (1985) as cited by Nieuwenhuis (2016) describe confirmability as the extent of neutrality and the degree to which the findings of the study are shaped by the participants and not influenced by researcher bias or motivation. Confirmability was ensured by avoiding biasness and refraining from leading the

participants towards desired responses. The responses of the participants are therefore in inverted commas that can be linked to the transcript and interview recordings.

5. Conclusion

5.1. Review of findings

The researcher aimed to discover the various challenges faced by sugarcane farmers in KZN. The research conducted and analysed, has resulted in the conclusion that sugarcane farmers in KZN are faced with various challenges. Increasing uncertainty such as climate change, lack of external support and safety and security has resulted in such challenges. The researcher aimed to gain an in-depth understanding of the challenges faced by the participants and from the data analysis it is evident that the participants are faced with and have to deal with extensive challenges, in order to ensure that they remain sustainable.

The research objective to investigate the various challenges faced by sugarcane farmers in KZN was achieved. The objective of available solutions being adopted by the farmers was also unearthed in the interview.

The ultimate research question of what are the various challenges faced by KZN sugarcane farmers was answered thoroughly. The farmers in KZN are faced with challenges of lack of external support, viability, pest and diseases and issues of safety and security, that impact their survival. The research question of what solutions are available to the challenges faced was answered by the participants who highlighted their strategies in trying to deal with the problems.

In addressing the third research objective and question the following recommendations are provided:

Sugarcane farmers in KZN must improve their knowledge on technological products and advancements available that will help in reducing the impact of challenges such as labour costs and security. By affiliating themselves with drone technology, spraying of chemicals can be done faster and more efficiently thereby reducing labour costs and labour challenges in the long term. To support and recover the costs of drones, drones can be rented out to other sugarcane farmers who are unable to afford their own drones.

Sugarcane farmers must also look at engaging extensively in green harvesting. Green harvesting presents a solution towards increasing the moisture content in the soil to help in drought situations and reduce weed growth, thereby saving on chemicals. If all the sugarcane farmers in KZN can petition towards green harvesting, millers will likely be

forced to undertake ethanol and cogeneration production in order to utilise the excessive by-products from the non-burnt cane. As a result, farmers can receive more money for their cane which can help in compensating the higher labour costs for cutting non-burnt cane.

Sugarcane farmers in KZN should also look at constructing dams to try and supplement water shortages during short droughts thereby improving the yield of the sugarcane crops.

Government assistance for challenges such as input costs remain a major challenge. A recommendation is to continue efforts towards appealing to government for their intervention.

Sugarcane farmers in KZN should also look at better and productive financial management practices. For example, building cash reserves as highlighted by participant B and investing in other revenue sources. Those sugarcane farmers not involved in the pooling of resources should engage in it as it is likely to curb expenditure on mechanisation and other inputs.

5.2. Final conclusions & Heuristic value

Undertaking this study helped highlight and detail the hardship faced by sugarcane farmers in KZN. The findings were insightful and provided an in-depth understanding of the challenges faced that supported past literature. The participants therefore provided the researcher with insightful information that was used to address the research goals of the study.

The research study that was conducted contributes towards the strategic management discipline, in that it will allow students and others to gain an understanding of how strategy can be utilised in the context of sugarcane farming. This will demonstrate that strategy does not only apply to a traditional business organisation but can be applied elsewhere successfully. It therefore built on the application and development of strategy.

The research study aimed to contribute to the existing body of knowledge by adding to the literature that is already available on the challenges faced by sugarcane farmers, and possible solutions. More specifically, it added to existing but limited literature on the challenges faced by sugarcane farmers in KZN. It therefore aimed to cement the existing literature by addressing shortcomings. By contributing to the existing body of knowledge, it

re-affirmed that there is a growing concern on the topic and that intervention is needed by government and other relevant parties.

This case study also provided the sugarcane farmers in KZN with a sense of recognition and importance as they had the opportunity to express their problems. Sugarcane farmers also practice the activity similar to how a business runs its operations and most sugarcane farmers operate under a business name. The study therefore aimed to provide solutions that can be used by sugarcane farmers to address a business problem. It also aims to enlighten communities and people on how challenging it is to produce sugarcane, as most only know sugar as an end product. Furthermore, large and small-scale growers will be able to access the research study to learn more about the research findings of the challenges faced by the sugarcane farmers in KZN.

It is evident that the challenges highlighted by past literature still exist to date and needs intervention. This provides the possibility of future research where the inclusion of a larger sample size will contribute towards a more in-depth data collection on the challenges and impacts. The future research will allow for exploring different solutions and highlight why sugarcane farmers in South Africa are unable to undertake certain solutions applied in other countries. Furthermore, this study briefly explored technology as a solution to certain challenges. Given the continuing advancement and acceptance of technology, a possible opportunity for the future exists in exploring the use of technology such as drones to assist with challenges such as labour complexity. In addition, the increasing concern of farm attacks and security provides an opportunity for future research on the issue and possible solutions that can be implemented by sugarcane farmers and government, in order to provide a safe environment for sugar farmers and farmers in general, to work and live in.

5.3. Ethical considerations

As provided by Louw (2014), the following ethical considerations was considered:

5.3.1. Ethical issues relating to participants

The researcher gained informed consent and the participants were allowed the freedom to withdraw from the study at any time. Each sugarcane farmer in the sample was contacted telephonically to arrange an informal visit, where each farmer was enlightened about the study and written consent was obtained. This ensured that each participant understood

what was expected of them during the interview. The participants were informed that the interviews will be recorded, and that their privacy will be protected.

The participants were assured confidentiality in order to protect their identities as a matter of principle, even though they are known to the researcher. The interviews were kept as confidential by labelling the recorded interview as “participant” with a corresponding alphabet and was transcribed according to those labels. The interview recordings will be stored on the researcher’s computer that is password protected and will be deleted after 5 years.

Sensitive information of the participating sugarcane farmers was protected. The researcher understood the nature of the situation and acknowledges that it will be unethical to reveal the information. The personal feelings of the researcher did not interfere with the data collected from the participants as the aim of the study was to explore the challenges faced by the sugarcane farmers, and not to influence the results to get the desired outcome.

5.3.2. Ethical issues relating to the researcher

The researcher ensured that there is no false information by firstly not fabricating the interview, and secondly, by collecting and analysing the information provided by the participants himself, and lastly by not fabricating or changing the results to reflect the researchers desired outcome.

The researcher remained objective, even though the researcher believed that there are significant challenges faced by the sugarcane farmers. In the event that the results were inconclusive, the researcher did not emphasise/provide evidence that supports the desired outcome, while disregarding the findings that points to the contrary. Leading questions was avoided. The interview flowed naturally, and predetermined questions was asked.

The researcher will not use the information collected for this study for any other purposes. Contact details and the audio recordings will not be shared with other sugarcane farmers unless the participants agree to the sharing of information. Ultimately assurance was given that this information will not be made available or shared with third parties such as other farmers and government.

The researcher applied for ethical clearance from the ethics committee before any research was conducted and the approval letter can be found attached. Audio recording clearance was also applied for from the ethics committee before conducting the interviews

and the participants acknowledged that the interview was being recorded and written consent was given.

5.4. Limitations

Time acted as a major limit to the researcher as responses were long, given the scope of the situation and therefore analysis of the data to produce findings took up considerable time. Given the time-consuming process, the researcher was limited in terms of time available to do additional work.

Budget constraints limited the researcher as it was costly to visit each sugarcane farmer in terms of travelling costs.

Further limitations identified by the researcher include:

Lack of previous research on the challenges faced by sugarcane farmers, particularly in KZN, as well as the solutions that can be adopted in light of the challenges being faced, has affected the ability to build a foundation in the literature review relating to the research problem. Following the completion of this study, the limited literature on the activities of sugarcane farmers was addressed by the participants expressing their ways of doing things such as hiring transportation and ensuring security. This helped in aligning to the theoretical framework on how the sugarcane farmers used strategy. The gap highlighted in the study of Muli (2010) was addressed by unpacking the various challenges faced by sugarcane farmers which included challenges beyond their control. Through exploring the various challenges faced, increased awareness and intervention is required from government towards the problems. The shortcoming of mechanisation was partially addressed by the participants stating the cost of advanced mechanisation that reduces the amount of labour required is high and is not suited for the terrain that they farm on. This therefore highlighted the challenge of mechanisation that past studies failed to address. Lastly, the shortcoming identified in the literature review of how sugarcane farmers are impacted by safety and security was addressed. The sugarcane farmers attempt to mitigate this risk through private security companies but concerns and fear still exist.

Another limitation is that the research study was limited to sugarcane farmers in Darnall, but the researcher has concluded that all farmers face similar challenges within the same context.

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Annexure A: Information sheet for participants

To whom it may concern,

My name is Mishen Moodley and I am a student at Varsity College Durban North. I am currently conducting research about the challenges faced by sugarcane farmers in Kwa-Zulu Natal in order to generate greater awareness on sugarcane farmers and their importance. I hope that this research will enhance the understanding of sugarcane farming and why intervention and more research is needed.

I will be clearly explaining to you exactly what participation in my research study will involve, which I have done below. I have listed these in the forms of questions that I will try to fully answer. If you have any questions that you feel are not addressed or explained fully in this information sheet, please do not hesitate to ask the researcher for more information. Once you have read and understood all the information contained in this sheet, please complete and sign the consent form below.

What will I be doing if I participate in your study?

I would like to invite you to participate in this research because you are a sugarcane farmer. If you decide to participate in this research, I would like to conduct an interview with you. The interview is estimated to take approximately 45 minutes to an hour of your time. It will be scheduled at a time that is convenient for the both of us and will take place at your farm if that is convenient for you. I will be asking you questions related to the challenges faced by sugarcane farmers.

You can decide whether or not to participate in this research. If you decide to participate, you can choose to withdraw at any time or to decide not to answer particular interview questions.

Are there any risks/ or discomforts involved in participating in this study?

Whether or not you decide to participate in this research, there will be no impact on your work. There are no direct risks or benefits to you if you participate in this study. You might, however, indirectly find that it is helpful to talk about your challenges experienced. If you

find that it is distressing to talk about your challenges, you may withdraw from the interview.

Do I have to participate in the study?

- Your inclusion in this study is purely voluntary;
- If you do not wish to participate in this study, you have every right not to do so;
- Even if you agree to participate in this study, you may withdraw at any time without having to provide an explanation for your decision.

Will my identity be protected?

I promise to protect your identity. I will not use your name in any research summaries to come out of this research and I will also make sure that any other details are disguised so that nobody will be able to recognise you. I would like to ask your permission to record the interviews, but only my supervisor and I will have access to these recordings. Nobody else, including anybody at Varsity College, will have access to your interview. I would like to use quotes when I write a summary of the research, but I will make sure that nobody will be able to recognise you.

What will happen to the information that participants provide?

Once I have finished all interviews, I will write summaries to be published in academic journals or books or presented at academic conferences. You may ask me to send you a summary of the research.

What happens if I have more questions about the study?

Please do feel free to contact me should you have any questions about this research, or if there is anything you need to know before you decide whether or not to participate.

You should not agree to participate unless you are completely comfortable with the procedures followed.

The contact details of the researcher are as

follows: Mishen Moodley

The contact details for my supervisor is as follows:

Taurayi Sihamba

Annexure B: Consent form for participants

I, _____, agree to participate in the research conducted by Mishen Moodley about the various challenges faced by sugarcane farmers in Kwa-Zulu Natal.

This research has been explained to me and I understand what participation in this research will involve. I understand that:

1. I agree to be interviewed for this research.
2. My confidentiality will be ensured. My name and personal details will be kept private.
3. My participation in this research is voluntary and I have the right to withdraw from the research at any time. There will be no repercussions should I choose to withdraw from the research.
4. I may choose not to answer any of the questions that are asked during the research interview.
5. I may be quoted directly when the research is published, but my identity will be protected/anonymity ensured.

Signature

Date

Annexure C: Consent form for audio-recording

I, _____, agree to allow Mishen Moodley to audio record my interviews as part of the research about the various challenges faced by sugarcane farmers in Kwa-Zulu Natal.

This research study has been explained to me and I understand what participation in this research will involve. I understand that:

1. My confidentiality will be ensured. My name and personal details will be kept private.
2. The recordings will be stored in a password protected file on the researcher's computer.
3. Only the researcher, the researcher's supervisor and possibly a transcriber (who will sign a confidentiality agreement) will have access to these recordings.

Signature: _____

Date: _____

Name: _____

Annexure D: Non-disclosure agreement

I, Mishen Moodley, hereby promise that I will not divulge any proprietary information regarding the farmer/company being studied in this research.

I will allow the relevant participant access to my research before it is submitted, to ensure that they are satisfied that I have not divulged any sensitive information about themselves or their company.

Signature: _____

Date: _____

Mishen Moodley

Annexure E: Interview Questions

1. What challenges are you faced with as a sugarcane farmer?
2. What impact do these challenges have on your farm?
3. What are you doing about these challenges?
4. Has government intervened and assisted in any of challenges being faced?
5. Sugarcane farming is an intense activity in terms of finances, time, skills and other factors required to cultivate sugarcane. Do you get the desired outputs from what you put in?
6. What technologies have been considered to mitigate some of the challenges?

Annexure F: Ethics clearance letter

Annexure G: Originality Report

Annexure H: Summary Document Table

TITLE: *An investigation to discover the various challenges faced by sugarcane farmers in Kwa-Zulu Natal.*

Research Purpose/ Objective	Primary Research Questions	Research Rationale	Seminal Authors/ Sources	Literature Review – Conceptual Framework	Paradigm	Approach	Data Collection Method	Ethics	Key Findings	Recommendations
To express the challenges faced by the sugarcane farmers. Achievement of a research report that expresses issues with possible solutions that farmers will appreciate.	What challenges are faced by sugarcane farmers in Kwa-Zulu Natal?	This study is important because agriculture is vital to South Africa's economy and sugarcane plays a major role in that.	South African Sugar association.	Theme 1: Current status of sugarcane farming & sugarcane farmers. Theme 2: Challenges faced by sugarcane farmers. Theme 3: Solutions to the challenges faced	Interpretivism Epistemology: subjective knowledge was favoured as the aim was to explore. Ontology: reactions and expressions of sugarcane farmers was looked at. Axiology: the sugarcane farmers had the opportunity to discuss their complexities.	Qualitative	Interview	Confidentiality, Informed consent, dealing with sensitive information, Falsifying information, Bias and misusing information. Audio recording clearance. Consent form.	The sugarcane farmers in KZN are faced with various challenges including challenges beyond their control. The use of strategy by the farmers to deal with certain challenges.	For sugarcane farmers: improve knowledge on technological products, consider green harvesting, construct dams and increased financial management practices. Future research: explore challenges in-depth and a bigger sample, explore the increasing concerns over farm attacks and explore solutions for challenges such as technology.
	Population									
	Population was sugarcane farmers. Characteristics are individuals whom are sugarcane farmers and sugarcane farmers in Darnall, Kwa-Zulu Natal.									
Research Problem	Secondary Questions/ Hypotheses/ Objectives	Key Concepts	Key Theories			Sampling	Data Analysis Method	Limitations	Key Contribution	
Highlighting the challenges faced by the sugarcane farmers.	To investigate the various challenges faced by sugar farmers in KZN. To explore available solutions that have been implemented by sugarcane farmers in KZN. To provide recommendations on solutions that can be adopted by sugarcane farmers in KZN, in light of their challenges.	Sugarcane Climate-Change Industry Bagasse Eldana Thrips	Mintzberg's 5p's of Strategy			Non-probability sampling Convenience sampling Sample size- 2	Individual sugarcane farmers. Thematic analysis	Misinterpret questions. Time Lack of previous research Budget constraints	Contributes to society and helps raise awareness on the situation. Contributes to existing literature and helps to address shortcomings of existing literature.	