

An evaluation of the risks in South African citrus farming

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DECLARATION

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ABSTRACT

The citrus industry in South Africa faces many of the same challenges as other industries, which can be associated with emerging economies. However, because it is such a lucrative and promising industry, it is advisable to identify and address issues that may prevent the industry from contributing to the well-being of the country's economy, employment of the population and food security. This paper examines and assesses these risks to determine whether each risk has the potential to destroy the industry, seriously disrupt it, or have little impact on it. Those risks that can be controlled by the farmer and which are critical because of their nature are also examined. Compared to other literature on the subject, it looks for new innovative ideas to mitigate the risks mentioned and improve the industry and, thus, the South African economy. Risks include political risks, macroeconomic factors, resources and their management, and technology. The Porter model is applied and discussed, as are various competitiveness models like relative trade advantage, net export index and constant market share. The risk model used is the Swiss cheese risk model, which is very effective in predicting disasters. Some exciting technological advances in agriculture are presented, as well as some recommendations for solving the industry's problems. This study used secondary data; it is, therefore, clinical and unbiased. It contains some interesting statistics and information from local and international sources that are insightful and paint a complete and inclusive picture. The citrus industry in South Africa is very promising, and the opportunities in the industry are exciting and can be approached with great anticipation.

Keywords: Citrus, agriculture, farm, risk, market, export

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LIST OF ACRONYMS

B-BBEE	Broad-Based Black Economic Empowerment refers to the transfer of skills from white workers to black workers to empower the latter. The Broad-Based Black Economic Empowerment (B-BBEE) programme provides a legislative framework for the transformation of South Africa's economy.
Bullwhip effect	(Also called the Forrester effect) is defined as the demand distortion that travels upstream in the supply chain from the retailer to the wholesaler and manufacturer because of a variance of orders that may be larger than that of sales (Daniel, 2019).
CGA	Citrus Growers Association
Citrus	This fruit grows on trees, including lemons, grapefruit, oranges, and soft, easy peelers like nartjies.
CPA	Communal Property Association
CRI	Citrus Research International
DALRRD	Department of Agriculture, Land Reform and Rural Development, a government department
DAFF	Department of Agriculture, Fisheries and Forestry, a government department
Expropriation	the action by the state or an authority of taking property from its owner for public use or benefit.
Food security	The basic need of people in Maslow's hierarchy of needs is to eat/food (McLloyd, 2020).
Fairtrade	Allows emerging economies to sell their produce at fair prices and not be exploited by first-world countries (Shoenthal, 2018).
FPEF	Fresh Produce Exporters Forum

PPECB	Perishable Products Export Control Board
POPI Act	Protection of Personal Information Act
Risks	Events that can or cannot be managed, and that have a material impact on the profitability or sustainability of the business
Secondary data	Data collected by someone else for a purpose other than the researcher's current project and has already undergone statistical analysis.
WFSP	Water security, water footprint and water sustainability and productivity

CHAPTER 1 INTRODUCTION AND BACKGROUND

1.1 BACKGROUND

Agriculture is an ancient practice that humans used from the beginning of human existence to produce food for their families. It was already a pertinent and important activity as a way of life in the Holy Bible's time. It is used in many practical lessons from the Bible and is associated with prosperity and survival. For example, it is written that "those who sow with tears shall reap with joyful singing" (Ps 126:5) and "whatever a man sows, this and this only is what he will reap" (Gal 6:7).

There has always been some war or turbulence about land and other agricultural problems, and this is because food forms one of the basic needs of humans on Maslow's hierarchy of needs (McLloyd, 2020) which includes air, food, drink, warmth, clothes, sex and sleep. Perhaps the most important of these needs, food, is satisfied through agriculture.

The agriculture industry is imperative to the South African economy due to its significant contribution to the gross domestic product, alleviation of unemployment as a significant employer and its involvement in the national accounts because of material exports. This is certainly not only applicable to farming as a primary activity of agriculture but has a material spill over effect on the entire supply chain. The supply chain includes packing, trucking, forwarding, cold storage, and shipping.

It is common knowledge that farming and its challenges are needed to produce food. However, the farming function is constantly under severe pressure, even more so in emerging countries. South Africa has many advantages, such as a climate conducive to farming, and the availability of resources, skills, and land. However, some land is still undeveloped while skills in agriculture are also a constraint to be addressed by training. South Africa and most of the remainder of Africa have some of the last undeveloped arable lands to expand agricultural activities. Many suggestions were tabled to solve

some of the obvious problems and challenges. Still, very few take post-pandemic changes into account, and this is what this study aims to include as well as a different angle to solutions. It is important to continuously evaluate and mitigate agricultural risks because changing circumstances, the eminent population growth, and current food production make starvation a real threat. Agriculture should continuously seek new and more innovative solutions to address the problems associated with feeding the population within the constraints of consumer choice.

Citrus farming plays an important part in South Africa's agricultural industry and contributes to food security and economic growth. Citrus fruit forms 55% of South African fruit production (Brodie, 2022). Even though citrus is not a basic food, it contains vitamin C (oranges contain about 51mg, grapefruit 38mg, and lemon contains about 30mg). Vitamin C supports the body's immune system by enhancing the production of white blood cells, which are necessary to fight infections. Vitamin C also promotes skin health by increasing the production of collagen, it is high in fibre and potassium, good for heart health and helps the human body to absorb nutrients from other foods. It costs a fraction of dietary supplements (Canning, 2020).

1.2 PROBLEM STATEMENTS

1.2.1 General risks

The main problem under investigation is the sustainability of citrus farming in South Africa. The world of citrus farming in South Africa changed after the onset of the Coronavirus. One dramatic change is that the traditional knowledge of citrus demand and supply was soon proven to be the old normal. In addition, other challenges such as land claims, labour demands, exchange rates, interest rates and loadshedding also affect citrus farmers in South Africa. These challenges pose risks to citrus farming worthy of investigating.

1.2.2 Specific risks

1.2.2.1 Political risks

Political risk and disagreement within the ruling party over the pace of land exploitation are obstacles to economic growth (Anon, 2021:4). Many farms have been subjected to successful land claims by traditional owners and transferred during the past 25 years. Unfortunately, these restitution actions by the Department of Agriculture had limited success, and many farms no longer produce food. Typical examples are Zebediela (which used to be the largest citrus producer in the country) and Champagne citrus farms. Adequate compensation for land claims is also a contentious issue. Expropriation without compensation seriously threatens the farming operations and the country's economy, a concern intensified by the ruling party's aim to 'nationalise' land. Nationalising land will also negatively impact food security and with it the morale of all South Africans. Likewise, farm security and the government's inability to guard against land grabbers and other farm encroachments further increase the risk of farming (de Villiers, 2018). The progress of the government's land reform initiative, which is supposed to be completed in 2030 according to its development plan, was last noted in 2016.

1.2.2.2 B-BBEE and minimum wages vs productivity

The government has clarified the B-BBEE rules and strengthened enforcement. If this broader B-BBEE regime persists, it will be an obstacle to attracting new, foreign, and other investments needed to significantly reduce unemployment and grow the economy (Anon, 2021:4). Angela Thoko Didiza, Minister of Agriculture, Land Reform and Rural Development, faces the challenge of choosing to use her political influence to retain her office or reform land responsibly. Citrus farmers struggle to recruit and retain skilled black farmers because citrus is not a high-value product and wages are lower than other agricultural products. Minimum wages are increasing more than productivity does, forcing farmers to mechanise, thus leading to more unemployment.

1.2.2.3 Macroeconomic challenges

The almost total closure of the economy to contain the coronavirus and the fact that medical services were not prepared for the projected number of infections also led to the abrupt closure of international travel and imports for some time. Since the gross margins of importers of fertilisers and chemicals are low, good business practices led them to keep their stocks low and order just in time, leaving them without stocks to supply farmers for five months during the closure in 2020. This unavailability of products hiked fertiliser prices. Trees need fertiliser immediately after harvest because they spend all their energy producing fruit.

Fruit production and the condition of the trees suffer under poor fertigation. Trees can continue to perform poorly for years if fertiliser is not applied in time. This is called the bullwhip effect. The cost and accessibility of road transport from farms to ports is becoming increasingly problematic, while driver safety cannot be guaranteed. Trains can currently access ports, but cargo space is limited and insufficient to meet demand. Exchange rate fluctuations benefit citrus farmers in terms of income but are also associated with a large part of their input costs, such as shipping, fertiliser, and commissions. Interest rate increases pose an additional risk as they start to rise in 2022. Farmers must repay debt for financed newly developed orchards, given the number of new orchards coming into production (WCO, 2022).

1.2.2.4 Water crisis

Water security, water footprint, sustainability, and productivity (WFSP) are likely to be the research areas and solutions that will ultimately carry the most weight. The results of the studies on water security show that awareness of the issue is only 2% in South Africa but a whopping 22% in China, 16% in the US, 14% in India and 7% in the Netherlands (Adetoro, 2021). At present, the sustainability of water supply is not an axiom for South Africa. Still, it would be prudent not to ignore the red flags arising from poor management in maintaining dams and political interference in water distribution for the benefit of specific areas when the government controls supply and storage facilities. The closure of

factories has led to reduced air pollution and changed rain patterns (The science of air, 2022).

Production Areas

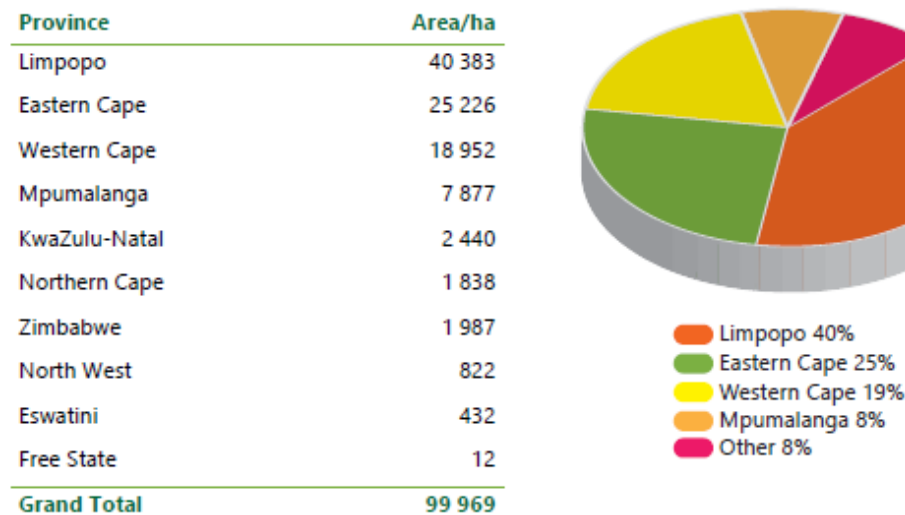


Figure 1-1 Citrus-producing regions in South Africa

(Source: Citrus Growers Association annual report, 2022)

Figure 1-1 illustrates the demographic location of citrus production in South Africa. This should be considered in comparison to rainfall per area. The highest rainfall in South Africa occurs in the eastern and southern mountains, such as the Drakensberg, from Limpopo through Mpumalanga and KwaZulu-Natal to the northern parts of the Eastern Cape. High rainfall and sustainable water storage is critical because Citrus trees need constant irrigation; if irrigation is ineffective, the trees will die.

Other mountains with high rainfall are the Outeniqua Mountains, the mountains of the south-western Cape and Winterberg and Amatola Mountains in the central parts of the Eastern Cape. The high rainfall in the mountains is due to orographic rainfall. The orographic rainfall in the mountain regions is extremely important for irrigation in the dry agricultural regions, sometimes hundreds of kilometres away (South Africa, 2022). This rain feeds into storage facilities, of which Blyderiver dam is an example of irrigation for citrus farmers in Limpopo.

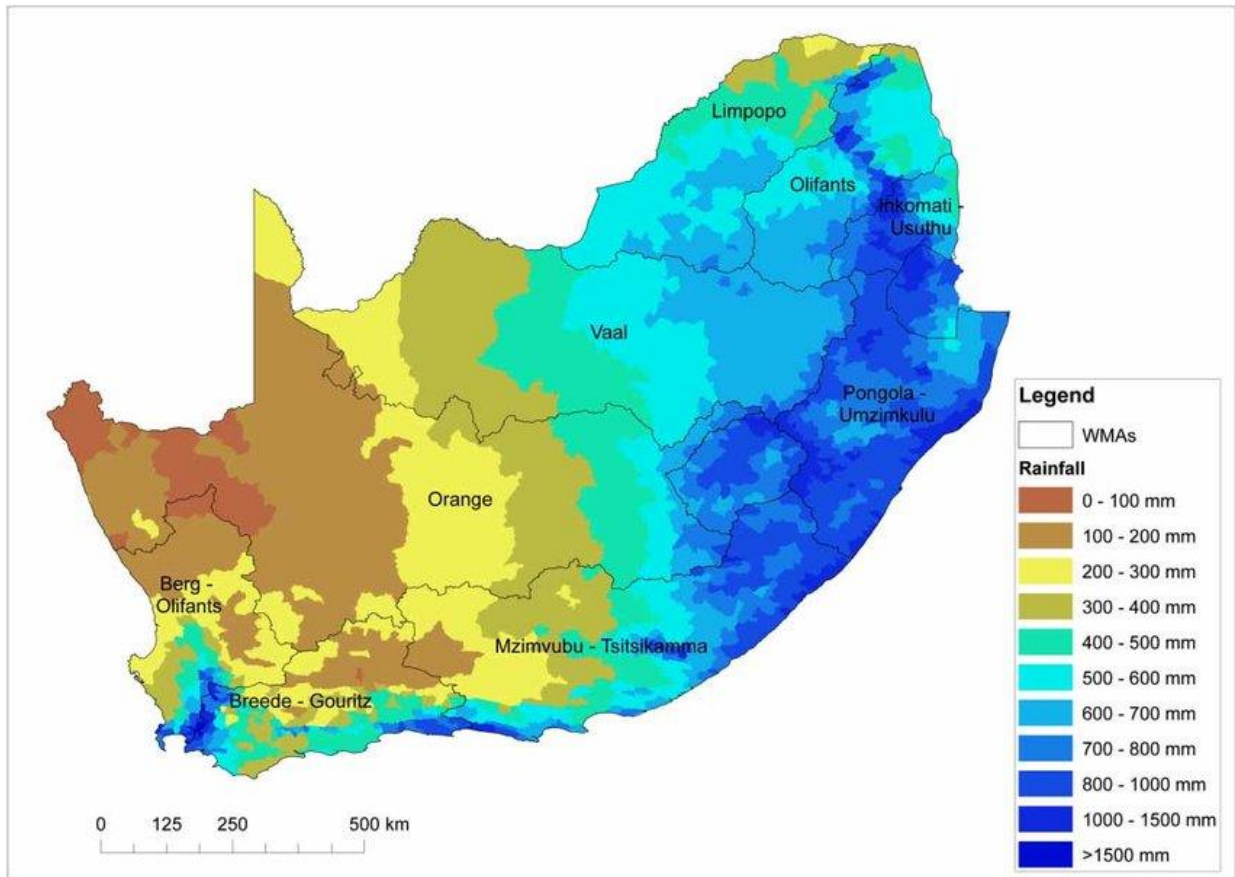


Figure 1-2 Rainfall millimetres throughout South Africa

Source: Research gate. Map of South Africa's annual rainfall across water management areas, 2022.

Figure 1-1 and Figure 1-2 compare natural rainfall with citrus-growing areas in South Africa. Citrus farms are mostly established in regions where rainfall is naturally abundant.

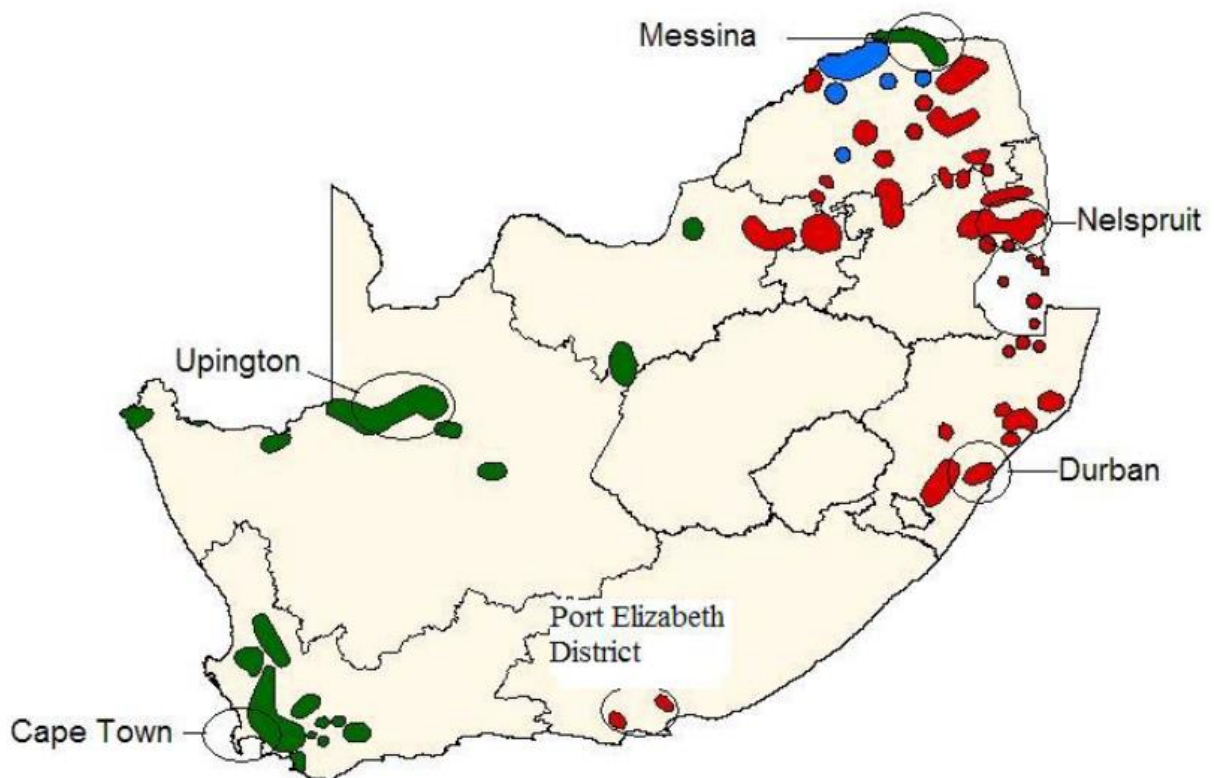


Figure 1-3 Citrus production areas in South Africa

Source: Research gate. Citrus production areas in South Africa. 2022.

Figures 1-2 and Figure 1-3 show that citrus is grown in areas with naturally high rainfall per year. The red areas are susceptible to black spot, a citrus disease that denies fruit access to markets in the US, and the green areas are free of black spot. Higher rainfall areas are black spot areas because diseases flourish in humidity (Folnovic, 2014).

1.2.2.5 Electricity crisis

Eskom, a government-owned entity, is currently the primary electricity provider to businesses in South Africa. Eskom was the main target of state raiders during former President Jacob Zuma's reign. By March 2020, the gross domestic product fell from 1.7%

to 0.9%, largely due to Eskom's inadequate capacity and power outages (Anon, 2021:29; Eskom 2022a). Eskom's new management has promised to address many of these problems, but confidence in these promises is lacking as load shedding continues on an even larger scale in 2022. Loadshedding varies from hourly downtime per day to 12 hours downtime on other days, as stages of loadshedding is adapted to accommodate Eskom breakdowns.

1.2.2.6 Fairtrade

Although belonging to the Third World, South Africa and other African countries produce a considerable amount of food for the whole world. Like any other business, farmers will stop producing if they cannot make a reasonable return on investment. If a significant number of farms were to cease their farming activities, it would have a detrimental impact on the country's already under-pressure food security. It is, therefore, important to find a solution to the problems of fair trade. One challenge in selling citrus is that consumers' disposable income has decreased, and consumer behaviour has changed to focus on necessities rather than luxuries (Jones, 2020).

Citrus is an export product that earns highly needed foreign capital for South Africa. There is a small local market in South Africa. This is a threat because the low- and even negative population growth in recipient countries, the inability to increase the local market, and the rate at which citrus production is expanding postulate a scenario where excess production cannot be absorbed by suitable markets (Statista, 2021). A balance must be struck between the scale of expansion and the size of the local and international consumer markets, considering the ideal target markets, which consist of consumers who can purchase a product that is not necessary.

South African citrus exports largely target Europe, where population growth is almost non-existing. When citrus plantations are expanded, it is important to open new markets with the expansion. Citrus orchards are also expanding globally.

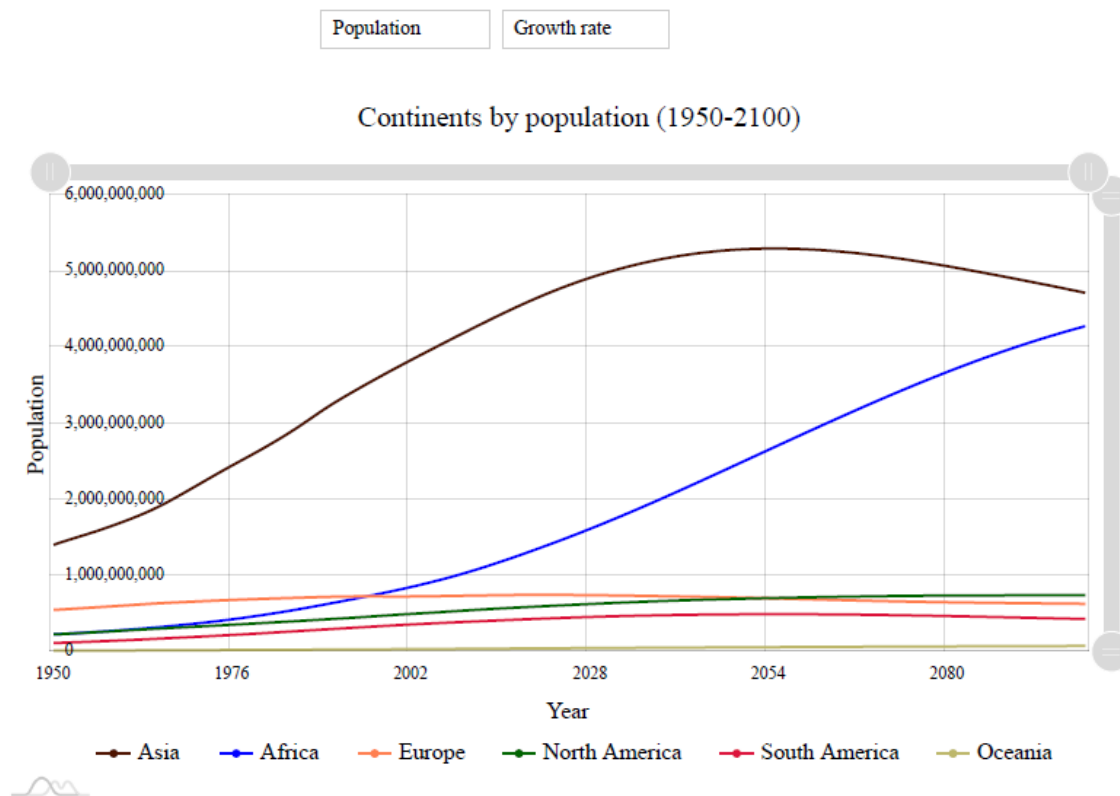


Figure 1-4 Population growth per country

Source: Statisticstimes, Continents by population 1950-2100, 2020

The rate at which new orchards are being planted worldwide for export to developed countries far exceeds their population's growth rate. Most of these orchards are planted with export markets in mind. If the population does not grow or the citrus consumption per capita does not increase, there will eventually be a surplus of citrus fruit.

1.3 JUSTIFICATION OF THE STUDY

The above problems are not new to anyone. However, only minimal and outdated solutions to these problems have been formulated so far. From the research questions, some areas are poorly understood, with little or obsolete literature already published that does not address the new normal and changes due to Covid and other challenges. As South Africa's roads, harbours, and other facilities deteriorate annually, these risks need to be assessed annually and new solutions formulated.

These issues have already been researched and published mostly by international institutions like Comtrade and somewhat by Citrus Growers Association. Still, it needs more work after the changes in the world due to Covid-19 and the new opportunities and challenges. The researcher wanted to exclude the feelings and opinions of respondents due to previous bad publicity and incidents and focus only on facts and realistic solutions to problems.

The study aimed to formulate new and more innovative solutions to problems and risks that are exacerbated by changing circumstances. It attempted to break the habit of doing the same thing repeatedly and expecting different results (Einstein, 1950).

1.3.1 Limitations of the study

The study depended on the timing of official reports to be published. Historically, they are sometimes published late and are, to some extent, dependent on the efficiency of government institutions.

A disadvantage of using secondary data is that it may not answer the researcher's specific research questions or cover certain information that the researcher would like to include.

1.4 RESEARCH OBJECTIVES

1.4.1 Primary objective

The overall objective of this study is to assess and evaluate whether there are opportunities in the new normal that have not been explored fully to mitigate the risks mentioned above, improve sustainability, and improve South African citrus growers' competitive advantage in international markets.

1.4.2 Secondary objectives

The secondary objectives are to:

1. Give an overview of the citrus industry in South Africa.
2. Assess the practices commonly used and accepted by growers to identify and quantify specific risks associated with the cultivation of citrus in South Africa, distinguishing between critical risks and smaller but manageable risks.
3. Quantify the costs associated with mitigating critical risks and ensuring food safety. Consider the value of yield or yield security compared to the costs incurred to mitigate the risk.
4. How to mitigate and minimise risks in citrus farming while ensuring that the spill over effect is positive for the communities in which they operate.

1.5 SUMMARY

This chapter introduces the scope of this study and states the problems that warrant investigation. It describes the problems associated with the citrus industry in South Africa and why this topic needs to be studied in more detail.

The next chapter will explain the framework of the study and give an overview of the risk analysis of the citrus industry in South Africa.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

The government heavily regulated South African citrus production and marketing until 1997 when the Marketing of Agricultural Products Act (MAP) No. 47 of 1996 (SA, 1996) came into force (Dlikili & van Rooyen, 2018). After this new deregulation law was enacted, numerous marketing agents entered the scene, resulting in a largely competitive market and better outcomes for citrus growers' returns. New challenges came with the various agents, and the integrity of some export agents was under suspicion. The Agricultural Produce Agents Act of 1992 (SA, 1992) and a regulatory body called the Agricultural Produce Agents Council (APAC), were introduced to mitigate this risk. These acts regulate export agents and their responsibility for growers' trust funds. #South African farmers are a small group of people with nerves of steel. According to the International Trade Administration in the US, agriculture is South Africa's most promising industry (Essay, 2021). South Africa has one of the most diverse agricultural sectors in the world. It includes corporate and private orchards, fruit, nuts and grains. #The country's agricultural economy relies heavily on the established commercial agricultural sector. The agricultural sector is in a perilous situation due to its backward and forward linkages with other sectors of the economy. It suffers from the contagious consequence of what happens in other sectors of the economy, impacting the agricultural sector due to Covid-19 and other disruptions such as an unstable political environment, inefficiency, and cybercrime.

Despite the threats they face daily, they provide food to the nation and continue to be the second-largest exporting economy in the country (mining is the largest), ensuring a constant inflow of foreign exchange. As employers, farms employed about 4.989% of South Africa's working population in 2020 (Statistics SA, 2021). South Africa is one of the most important fruit-growing countries in the world and a country that produces abundant fruit. Fruit exports account for more than 35% of our total agricultural exports and contribute 2.5% to South Africa's growth domestic product (GDP) (Brodie, 2022). Citrus exports contributed R30 billion in export earnings in 2021 (Chadwick, 2022).

Considering the sector's contribution to the economy, it is pretty sad that it faces several challenges and receives little support from the government. These challenges include rising input costs, including minimum wage increases, fuel and fertiliser price increases, and a significant increase in freight rates (domestic and maritime). Bureaucracy hindering access to some overseas markets, such as Europe since July 2022, as well as continued inefficiencies in operations at the country's ports, threaten not only profitability but also the viability or feasibility and, inevitably, the sustainability of producers.

Of the total proverbial "basket" of fresh fruits exported by South Africa, citrus fruits account for 63% (Fresh produce export directory, 2022).

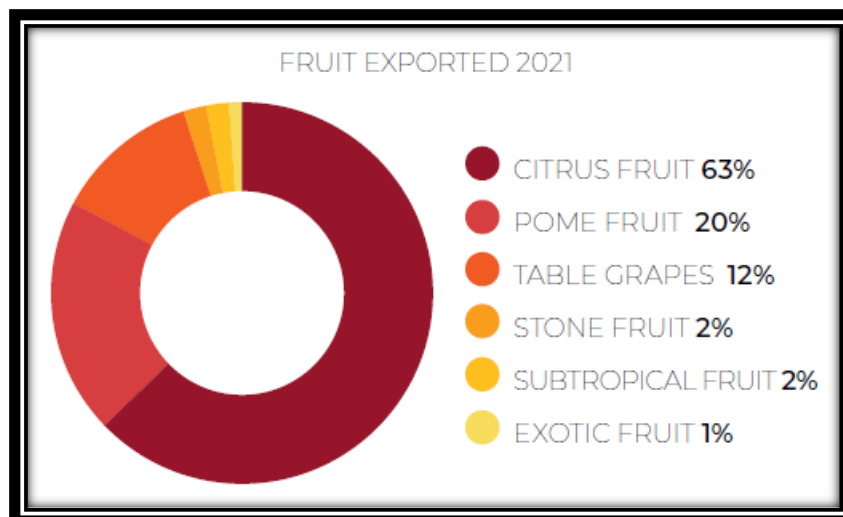


Figure 2-1 Fruit exported 2021

Source: Fresh produce export directory 2022, www.fpef.co.za

From South Africa, 159 million cartons of citrus (99 969 ha) were exported in the 2021 season, of which about 51.16 million were produced in Limpopo Province (40% of the total cultivated area in South Africa) (Sikuka, 2021).

Fruit is seasonal, and citrus fruit is no exception, which brings its own challenges and opportunities.

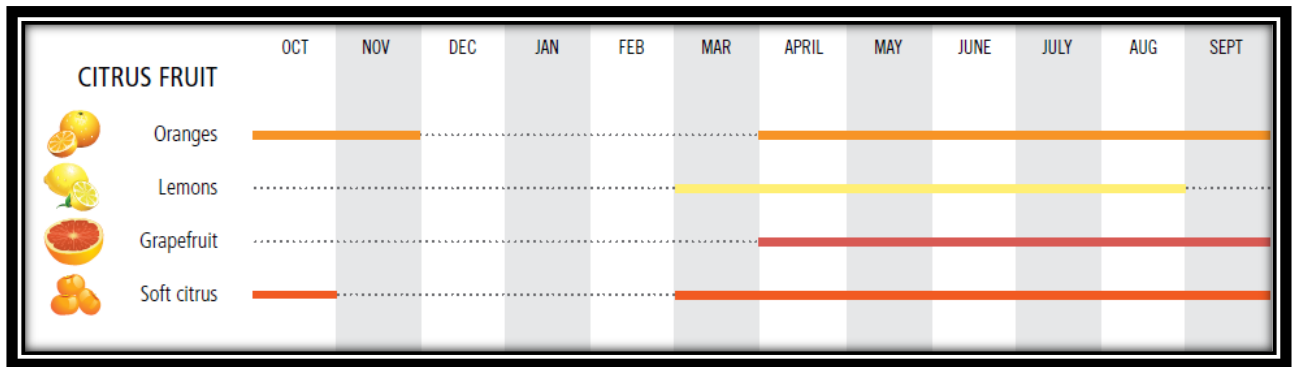


Figure 2-2 Seasonal fruit illustrated

Source: Fresh produce export directory 2022, www.FPEF.co.za

Overall, South Africa exported more citrus in the 2021 season than at any time in its history (Figure 2-3) and expects to export even more in 2022 (Chadwick, 2022) (Citrus Growers Association).

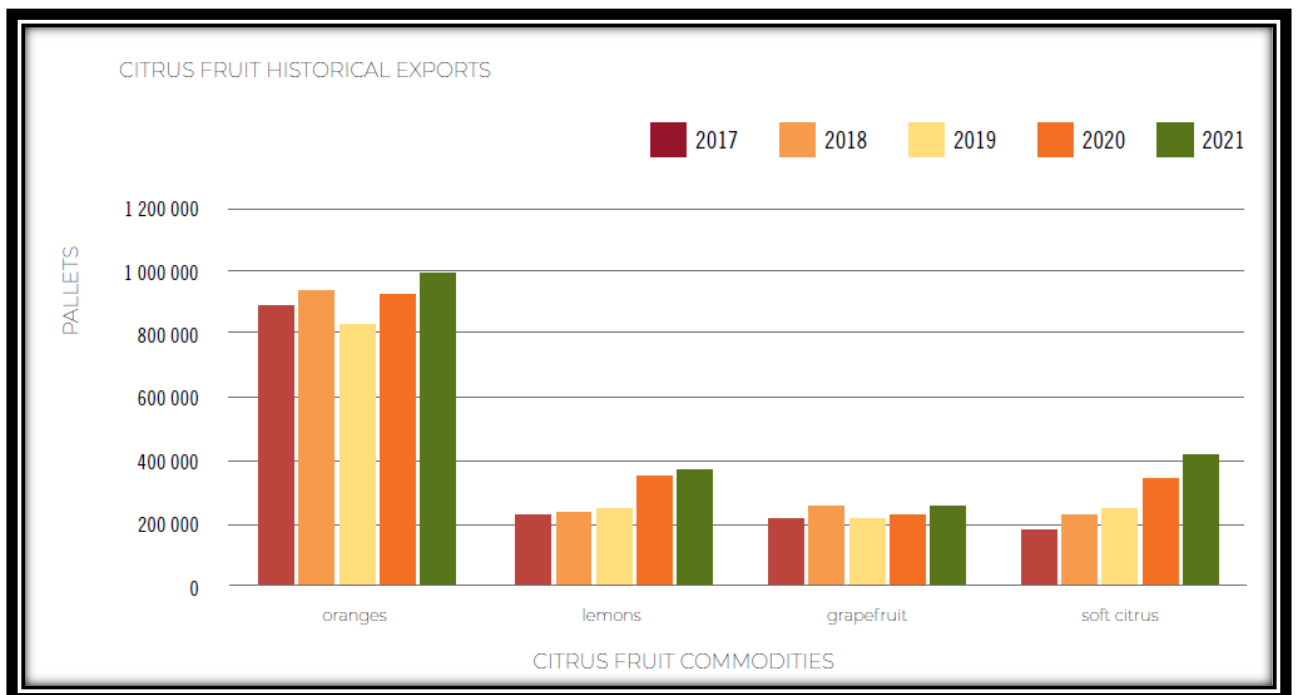


Figure 2-3 Citrus fruit historical exports

Source: Fresh produce export directory 2022 www.FPEF.co.za

Combined fruit exports from South Africa hit an all-time high in 2021, despite challenges from Covid-19, looting at ports, inefficiencies, and other challenges. The industry continues to grow, and an overall increase of 6.8% is expected in 2022 (CGA, 2022). Global demand for citrus is not yet saturated, and South Africa plays a vital role. There are threats, however. For example, Egypt is South Africa's biggest competitor, exporting fruit from many newly established orchards to European, Asian and Middle Eastern markets. Alos, the recent changes in the cold treatment requirements for accessing the European market with citrus from South Africa pose a new threat, as Europe is an important market.

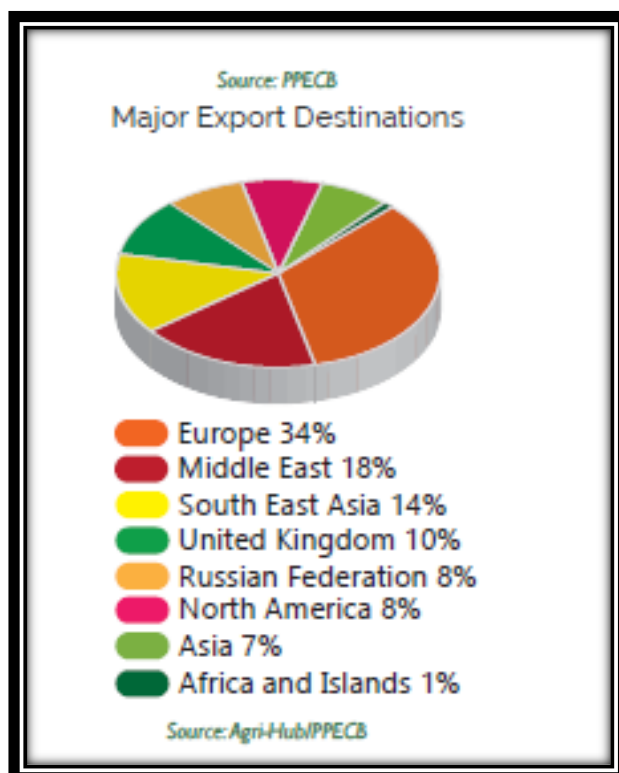


Figure 2-4 Major export destinations

Source: AgriHub/PPECB

Figure 2-4 illustrates that Europe buys 34% of South African citrus and Russia buys 8%, and therefore recent access problems to these markets pose a major risk to the South African citrus industry.

2.2 CONCEPTUAL FRAMEWORK OF THE RESEARCH

In this study, secondary data were used to examine the risks in the citrus industry according to Saunder's Research Onion guidelines (see Table 2-1).

Table 2-1 Saunder's Research Onion methodology

Saunder's Research Onion

	<u>My choice</u>	<u>Reason</u>
Research philosophy - the set of beliefs the research is based on (positivism, interpretivism, pragmatism)	Positivism	Clinical and fact based
Research approach - the broader method used (inductive, deductive, qualitative and quantitative)	Quantitative deductive	Begins with a theory and plans to build on it
Research strategies - how the research was conducted (experimental, action, case study)	Archival	Secondary data research ie already existing data
Choices - how many methods were used (mono, mixed or multi)	Mono	Quantitative
Time horizons - the number of points in time at which data was collected (corss-sectional or longitudinal)	Longitudinal	Compare 5 years' data or more in some instances
Techniques and procedures (data collection methods, data analysis techniques, sampling strategies)	Secondary data	

This study is based on positivism as a philosophy because it does not consider subjective opinions but is fact-based and clinical. The approach is quantitative-deductive. For example, it starts with a theory and then builds on a hypothesis. Only quantitative data is considered to keep the emotions and feelings of sector participants out of the process and hopefully give perspective to sector participants. The time horizon will primarily be limited to three years, but more than three years will be included where more data is

available and applicable. The data were collected from reputable institutions, the analysis were scientific and clinical, and conclusions were drawn impartially.

2.3 DEFINITION OF RISKS INFLUENCING THE SUSTAINABILITY OF THE CITRUS INDUSTRY IN SOUTH AFRICA

2.3.1 Dependent risk variable

The sustainability risk: farmers will farm if they can without going bankrupt, as many have done since 2021. They do it out of passion, but they need to be able to pay for inputs with the yield they get. Agriculture is a sector that works in good and bad years, meaning there are bigger and smaller harvests depending on weather conditions and rain patterns. Farms need to be able to survive in bad years until they have another good year. Farm sustainability threatens not only the farmers but also the families who are supported by the salaries of the farms and their service providers, as well as the entire supply chain. This includes the vendors of irrigation equipment and implements for the farms, trucking to the ports, cold storage, freight forwarders and shipping in the narrow sense.

2.3.2 Independent risk variables

The independent variables include:

- Transport and harbour challenges
- Cost constraints
- Electricity/energy crisis
- Fertiliser availability and cost
- Water management and water quality

These independent variables affect the competitiveness of South African citrus in the international market (Chadwick, 2022). To be competitive, a farmer must produce good quality fruit and have access to export/international markets or local/informal markets. The citrus industry is very dependent on international markets. Farmers are constrained and need to take improvement measures to improve their competitiveness. These

measures include training the younger generation, dealing with trade barriers, innovative ways to regulate input costs, more experience, better water management and proactive understanding and compliance with global safety standards.

The lack of adequate training in South Africa and the generally older age of farmers are widespread barriers to competitiveness. Farmers who are knowledgeable, energetic, and somewhat younger are expected to produce higher-quality fruit and thus access high-yielding export markets. Farmers of the younger generation are more likely to adopt available innovative technologies. High-yielding export markets are less likely to reject good-quality fruit. Lower-quality fruit is sold to informal markets with lower prices or to local markets. Emerging citrus farms with inexperienced farmers produce low-quality citrus and, therefore, must sell large quantities of fruit to local fresh fruit markets. They cannot export fresh fruit to international markets priced far above the local market. The major problems affecting competitiveness in the study area are constraints in agriculture. Access to new markets is limited to high-quality fruits and can affect the competitiveness of commercial and emerging farmers. Farmers must comply with food safety, good agricultural practises, and traceability, which incurs additional costs but gives them access to high-priced international markets. (Manenzhe, 2021).

2.4 SOUTH AFRICAN AGRICULTURAL RISK ANALYSIS REVIEW

Step 1: Identify the risks.

Sustainability is the most significant risk and is affected by all subsequent risks such as land reform, B-BBEE and minimum wages, availability and cost of fertilisers and chemicals, water security and quality, conservation of natural resources, power crisis and Fairtrade.

Step 2: Decide who might be harmed and how.

Table 2-2 Ratings of risks

<u>Risk</u>	<u>Resulting harm</u>	<u>Risk rate</u>
Age of farmers	Unwilling to apply new technology	Medium
Availability and cost of fertilisers and chemicals	Quality and yield limitations	High
BBBEE	Employees & farms	Medium
Cost and availability of containers	Farms, supply chain, employees	Medium
Electricity cost and availability	Farm sustainability, labour, cold storage, pack houses	High
Exchange rate	Imported goods unaffordable	Medium
Fuel prices	Farms, supply chain, employee transport	High
Fairtrade	Farm sustainability	Low
Harbour inefficiency	Farms, supply chain, employees	High
Lack of training	Scholarships for citrus related tertiary education	Low
Land reform	Lack of investment	Medium
Market access restrictions - international	Farm sustainability, supply chain, employees, consumers	Medium
Minimum wage	Employees	Medium
Road transport	Farms, supply chain, employees	Medium
Sustainability	Farms, consumers, supply chain	High
Technology	Unaffordable	Low
Train transport	Farms, supply chain, employees	High
Water quality	Farm sustainability	High
Water security	Farm sustainability & labour	High

The risk ratio indicates whether a risk is critical or not, and it is amazing how many high risks there are in the citrus industry at the moment. All high scores could potentially harm the industry if not addressed.

Step 3: Evaluate the risks and decide on precautions.

Table 2-3 Precautions to risks

Risk	Necessary precautions	Acting party
Availability and cost of fertilisers and chemicals	Ensure farms remain feasible in the long run	Suppliers
BBBEE	Increase bursaries for agricultural students and train black participants.	Government & private sector
Cost and availability of containers	Sort out access into harbours and make docking attractive.	Suppliers
Electricity cost and availability	Negotiations into reduction of electricity prices for agriculture and installations of privately owned solar & hydro backup systems.	Government
Exchange rate	Hedging and forward cover, natural hedges.	Farmers
Fuel prices	Produce bio fuel for farm use.	Farmers/Government
Fairtrade	Ensure a fair price is paid by the customer by comparing prices with competitors.	Customers
Harbour inefficiency	Divert volumes to Maputo while Durban harbour is privatised.	Government
Land reform	Responsible reform without negatively impacting food security, transparency and investors confidence.	Government
Market access restrictions - international	Form strategic partnerships with clients and authorities in receiving countries.	CGA
Minimum wage	Protect employees while ensuring decisions don't cause increase in unemployment.	Government
Road transport	Government to apply fuel taxes to improve conditions of roads by using competent contractors.	Government
Sustainability	Apply innovative ideas to mitigate cost hikes and increase value of income.	All parties
Technology	Mechanise, automate, embrace 4IR.	Farmers
Train transport	Improve and maintain rail.	Government
Water quality	Sanitation to be upgraded and maintained.	Government
Water security	Ensure increased water storage facilities and provisions for expansion.	Government

The necessary precautions must be taken to mitigate the specific risk and improve the industry's sustainability. Many precautions are under government control, so government interference is important.

Step 4: Record your findings and implement them.

All the above risks reinforce the one critical risk, which is the sustainability of the citrus industry in South Africa and the impact that will occur if the risk is not mitigated.

Step 5: Review your risk assessment and update it if necessary.

According to the above analysis, the critical risk in citrus farming is sustainability, not in terms of resources, but rather in terms of profitability. For example, currently only the ability to service debt and working capital requirements. In a constantly changing world, no risk assessment is set in stone. Risk assessments are living documents that need to be updated and revised frequently.

2.5 SUMMARY

Farmers are inevitably entrepreneurs who generally decide whether to continue their business, make significant adjustments or close it down depending on how much money they make and the price they pay in terms of mental energy (joy, motivation, etc.). Farmers seem more resilient when it comes to continuing despite a lack of enjoyment and financial returns because businesses take up to five years to establish and cannot be adjusted immediately.

In addressing financial rewards first, a business must raise bridging finance elsewhere. At the same time, the farm does not yield sufficient returns for the owner to be self-sustainable and to sustain the farm dependents and workers. Once the farm starts to be profitable, it becomes self-sustainable, and the owners could consider expanding their operations and growing the farming business.

However, many of the challenges (such as the climate, rainfall, and inputs prices) farmers face are beyond their control, and they cannot make major adjustments to increase profitability.

CHAPTER 3 A DESCRIPTIVE OVERVIEW OF THE CITRUS FRUIT INDUSTRY

3.1 INTRODUCTION

South Africa has a rich and diverse agricultural sector. The country has a diverse range of smallholder farming models. The country hosts different emerging farming models, namely owner-farmers, communal land reform farmers (CPAs), state farmers, and commercial farmers. The different farming models show a diversity of agricultural production systems and resource endowments for emerging farmers, which are determined by ownership, farm sizes, cropping systems, technology use, management, and income levels. Emerging farmers are the most resource-rich. All cropping types represent the central citrus-producing farms. It was expected that emerging farms would be more likely to produce lower-quality fruit and focus on local markets rather than export markets.

The citrus industry is a market with perfect competition. Citrus growers are price takers because their products are homogeneous, there are many buyers and sellers, buyers have access to perfect information, and it is easy to enter or leave the market. Producers cannot dictate the prices they obtain for their products (CFI Team, 2021). The demand in the market determines the price of products. If demand exceeds the volume available, the price will be higher. If the supply is greater than the demand in the market, the price will be lower. Therefore, exporters are sensitive to the actions of their competitors because flooding the market could lead to a drop in price, which is detrimental when the producer already bears all the costs of the supply chain and production.

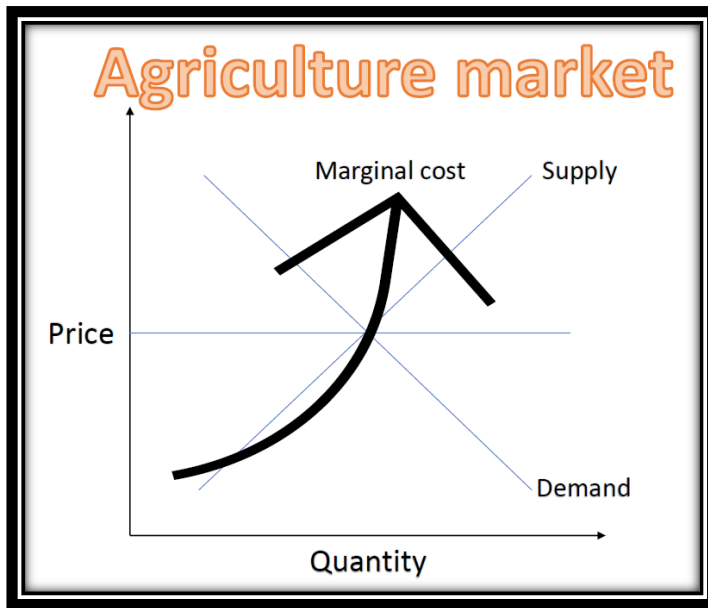


Figure 3-1 Price takers in a perfect competition market illustrated

Farmers are threatened with imbalance because they are price takers on the income side and equally price takers on the input cost side. Suppliers of inputs to agricultural producers are price setters because they have pricing power either because of tight supply and overwhelming demand or because of imperfectly competitive markets such as monopoly or oligopoly markets in which they trade. Fertilisation of citrus trees is important if the grower wishes to obtain an optimal crop of good quality. Fertiliser includes nitrogen (N), phosphorus (P), potassium (K), calcium (CA) and magnesium (Mg) in various combinations for different citrus species. Table 3-1 estimates the required NPK amounts of the different fertilisers to achieve specific citrus yields.

Table 3-1 Fertiliser requirement per hectare citrus.

Valencias, lemons, grapefruit and tangelo - tonnes of fruit per hectare				
Nutrients (kg/ha)	20	30	40	50
Nitrogen (N)	40	60	80	100
Phosphorus (P)	14	21	28	35
Potassium (K)	60	90	120	150
Calcium (Ca)	32	48	64	80
Magnesium (Mg)	5	7.5	10	12.5

Source: Department of primary industries and regional development (2019).

The timing of these fertiliser applications is also important. Suppliers running out of inventory can affect the next season's crop. See Table 3-2 below for an example of the timing sensitivity of fertiliser application.

Table 3-2 Nutrient application times as a percentage of annual application.

	Nitrogen	Phosphorus*	Potassium	Calcium
Pre-bloom to Flowering	40-50%	100% (50%)	30-40%	70-80%
Cell Division	25%	(50%)	30-50%	
Cell Expansion	25%		30%	20-30%

Source: Department of primary industries and regional development (2019).

The same principles and schedules apply to chemicals for pest and disease control. Global Gap is a regulatory agency that reviews and approves the spraying programmes

of any farm that wishes to export. Global Gap sets the formula for spraying, and timing is critical as there is a withholding period after application during which the fruit cannot be sold. Farms must follow a set of rules, and auditors visit each farm annually to check spray and fertiliser records. No farm can export without a Global Gap certification.

The citrus value chain concerning cost contributors is shown in Figure 3-2.

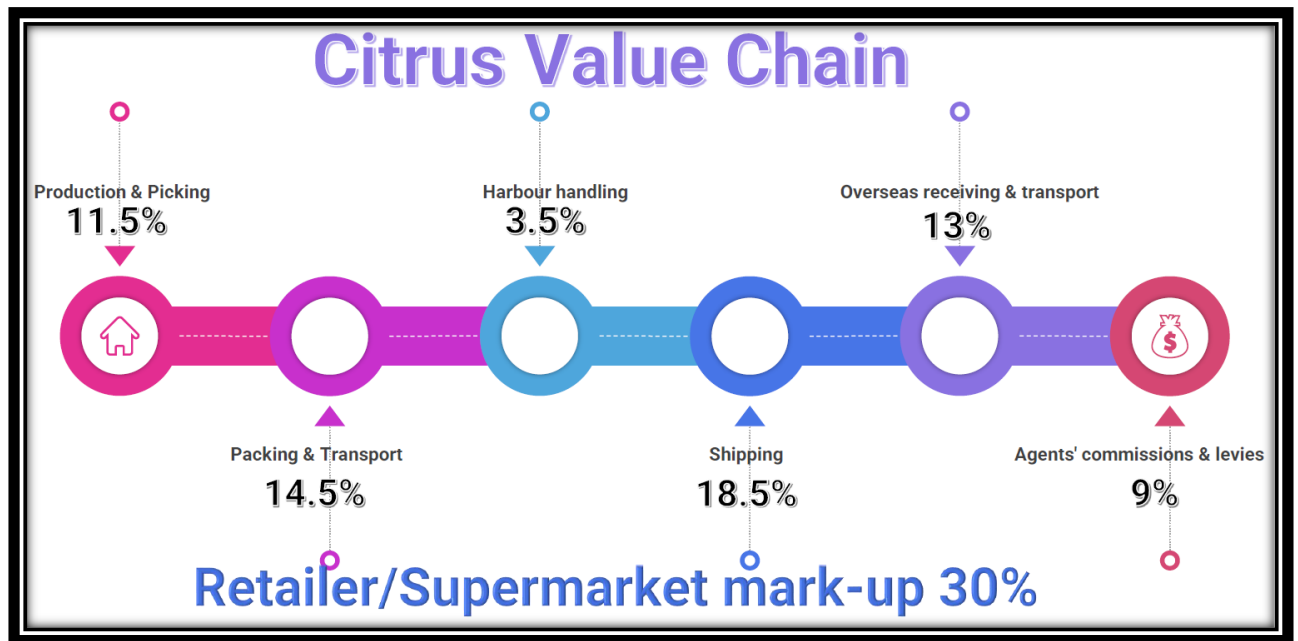


Figure 3-2 Cost contributor's percentages

Source: Citrus resource warehouse, 2022

Figure 3-2 shows approximately how the total costs of citrus production are calculated, focusing on the costs of packaging and transport, overseas reception, and transport and shipping, which account for almost half (46%) of total costs. The rest of the large share of total costs is out of the producer's control. Some growers are integrating and having their packaging facilities shared with other external operations to reduce overheads and inevitably save some input costs. It might also be marginally cheaper to have their own trucks for transport to the ports, but that is expensive to finance and an entirely separate business to manage.

3.2 GLOBAL PERSPECTIVE OF THE CITRUS FRUIT INDUSTRY

According to the World Citrus Organisation, the global supply of citrus from the Southern Hemisphere will increase by about 1 149 tonnes (4.85%) as newly planted orchards come into production. This increase can be reliably estimated as freshly planted citrus trees take about three years to go into production (World Citrus Organisation, 2022).



World Citrus Organisation

Southern Hemisphere citrus forecast 2022*

Soft citrus	%2022/2021	2022	2021
TOTAL PRODUCTION	-0.11%	3,044,652	3,048,022
Destined to export	2.08%	1,063,634	1,042,009
Destined to processing	0.90%	4,048,363	4,012,394
Destined to domestic market	0.05%	16,176	16,168
Orange	%2022/2021	2022	2021
TOTAL PRODUCTION	5.01%	16,596,973	15,805,556
Destined to export	6.43%	1,760,604	1,654,207
Destined to processing	6.40%	10,788,006	10,138,955
Destined to domestic market	0.90%	4,048,363	4,012,394
Lemon	%2022/2021	2022	2021
TOTAL PRODUCTION	8.28%	4,754,260	4,390,553
Destined to export	6.96%	1,058,368	989,539
Destined to processing	19.47%	2,089,729	1,749,234
Destined to domestic market	-2.76%	1,606,163	1,651,780
Grapefruit	%2022/2021	2022	2021
TOTAL PRODUCTION	-0.58%	436,386	438,951
Destined to export	-1.23%	257,941	261,145
Destined to processing	2.68%	143,807	140,052
Destined to domestic market	-8.25%	34,638	37,754
ALL CITRUSES	%2022/2021	2022	2021
TOTAL PRODUCTION	4.85%	24,832,270	23,683,082
Destined to export	4.91%	4,140,547	3,946,900
Destined to processing	8.32%	13,210,832	12,195,595
Destined to domestic market	-0.79%	7,480,891	7,540,587

* Based on data from Argentina, Australia, Bolivia, Brazil, Chile, Peru, South Africa, and Uruguay.

Figure 3-3 Southern Hemisphere citrus production forecast 2022

Source: World Citrus Organisation, forecast, 2022.

The Southern Hemisphere increased its citrus orchards by 4.85% overall, which includes a 0.58% decrease in grapefruit, an 8.28% increase in lemons, a 5.01% increase in oranges and a 0.11% decrease in soft citrus (World citrus organisation, 2022). Soft citrus appears to be a problematic export commodity, and grapefruit is not as popular in international markets as Valencia orange varieties and lemons. In addition, the South African grapefruit season often overlaps with the Spanish citrus season, especially during heat waves in Europe, which cause the Spanish fruit to ripen earlier. This prompts European buyers and supermarkets to replace South African shelf space with fruit from Spain. Therefore, it makes perfect sense to limit the expansion of grapefruits destined for the European market.

3.3 PRODUCTION TRENDS

Population growth is expected to reach 9.7 billion globally by 2050, so increasing production is justified. Water resources will decrease by 40% globally by 2030, which is also a reality for South Africa (Goedde et al., 2020). But, demand is increasing, and production is under pressure for various reasons.

Due to their production and trade volume, citrus fruits are one of the most important categories of fruits and vegetables. Global citrus production has been steadily increasing, with a growth of 125% and 130 million tonnes over the past 30 years. However, the fruit and vegetable sector grew by 155%, while citrus only increased by 125%, meaning that citrus has lost some market share compared to other fruits and vegetables (World Citrus Organisation, 2022). In South Africa in 2022, fresh fruit accounts for 35% of South African agricultural exports and citrus accounts for 63% of all exported fruit (FPEF, 2022).

Some volumes of citrus are sold to local juice factories, but two-thirds of the total production is exported (CGA, 2022). A similar trend has been observed in citrus's global export and import trade. Global citrus exports have increased by 120% over the last thirty years, reaching 16 million tonnes, while global exports of fruits and vegetables totalled 88 million tonnes, representing a growth of 280% over the same period.

In the coming years, citrus will face significant challenges to remain the leading fruit and vegetable category in an increasingly competitive, globalised, and complex market. There is also strong global product growth in commodities such as mango, kiwi, table grapes and avocado, as well as changing consumer behaviour resulting in the decline of fruit consumption due to lifestyle changes and increasing competition with other food categories (World Citrus Organisation, 2022). In South Africa, all these commodities are also successfully grown due to the country's favourable climate.

South Africa competes in a market with producers in the Southern Hemisphere, including Argentina, Australia, Bolivia, Brazil, Chile, Peru, and Uruguay. Globally, demand for fruits and vegetables is increasing due to consumer health consciousness following Covid-19 (WCO, 2022). The World Citrus Organisation forecasts a 4.85% increase in production from 2021 to 2022 and a total available volume of 24 832 270 tonnes. Exports from all competing countries, including South Africa, will increase by 4.91%.

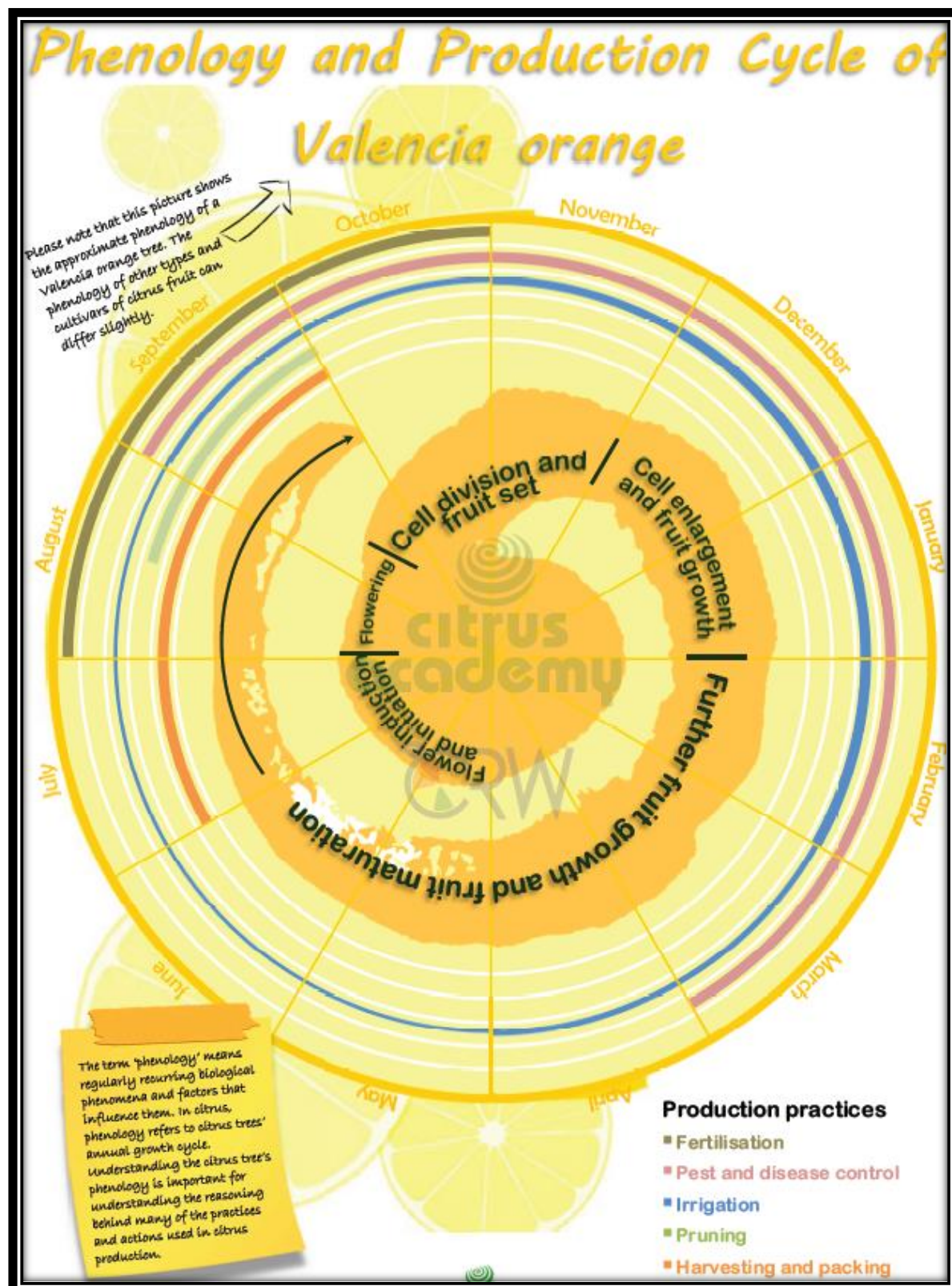


Figure 3-4 Production cycle of Valencia orange

Source: Citrus Academy, 2022.

The production cycle in Figure 3-4 explains why a farmer cannot take his produce off the market immediately because it takes more than 12 months to produce a crop from established orchards. During that time, money is spent on inputs such as fertiliser, pruning, irrigation and labour. Newly planted citrus trees need 3-4 years of input before they start producing (Haryasz, 2022).

3.4 POLITICAL RISK TRENDS

The current ruling party in South Africa is in dire need of a strategy to prevail in the upcoming elections in 2023 as was often stressed by various political analysts and economists. Typical campaign issues, such as the expropriation of land without compensation despite other parties' refusal in parliament, could bring them some extra votes.

Land reform aims to transfer land from the state and private white landowners to black South Africans who had been deprived of their land and rights by apartheid. New legal entities, many of which are group-based, were required to conform to a set of de facto land tenure practises. Beneficiaries of the land reform, restitution and redistribution programmes who wish to acquire, hold and manage land as a group may establish legal entities. Consequently, Communal Property Associations (CPAs) were created. CPAs are land tenure institutions established under the Communal Property Associations Act No. 28 of 1996 (CPA Act) (SA 1996b). The law provides for state registration of CPAs and state supervision to enforce the rights of ordinary members. The biggest challenge for CPAs is compliance with the CPA Act. Another major challenge for CPAs and agriculture is the poor performance of agricultural produce and the inability of CPAs to obtain funding for working capital with land as collateral, as the title deed still belongs to the government in most cases.

In her 2020/2021 annual report on CPAs, Minister Thoko Didiza, Minister of Agriculture, Land Reform and Rural Development, uses the word "challenge" in its various guises at least 82 times. She mentions the lack of clearly defined rights and procedures and that

individuals exploit this uncertainty to their advantage. Exploitation seems to be the order of the day and does not necessarily end with land expropriation.

The Land Rights Management Facility (LRMF) was established in 2007 to assist selected dysfunctional CPAs in compliance with the Communal Property Associations Act 28 of 1996 (SA, 1996b). In 2022, 1707 registered CPAs in South Africa (2020: 1650) (DALRRD, 2022). Many more are dysfunctional due to a lack of government involvement, support, and training. Management companies run some CPAs for profit, backed by financially strong shareholders.

Some CPAs lease the land directly to farmers, generating rental income but not expecting profits. It is unclear how many of the communal lands are managed by management agents and whether there is a governing body that controls these management agencies. According to Peter Setou, Executive Director of the Vumelana Advisory Fund, even CPAs that manage their own land need to be governed (Manoko, 2022b).

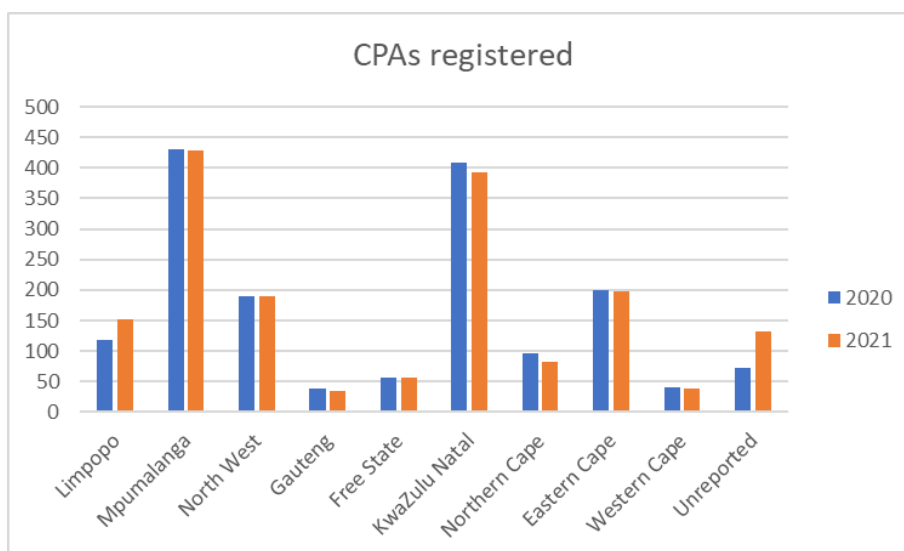


Figure 3-5 Communal Property Associations registered 2021 compared to 2020

Source: Annual report of the minister of DALRRD on CPAs

Figure 3-5 illustrates the number of CPAs registered in 2021 compared to the previous year, proving that land reform is still underway, albeit very slowly.

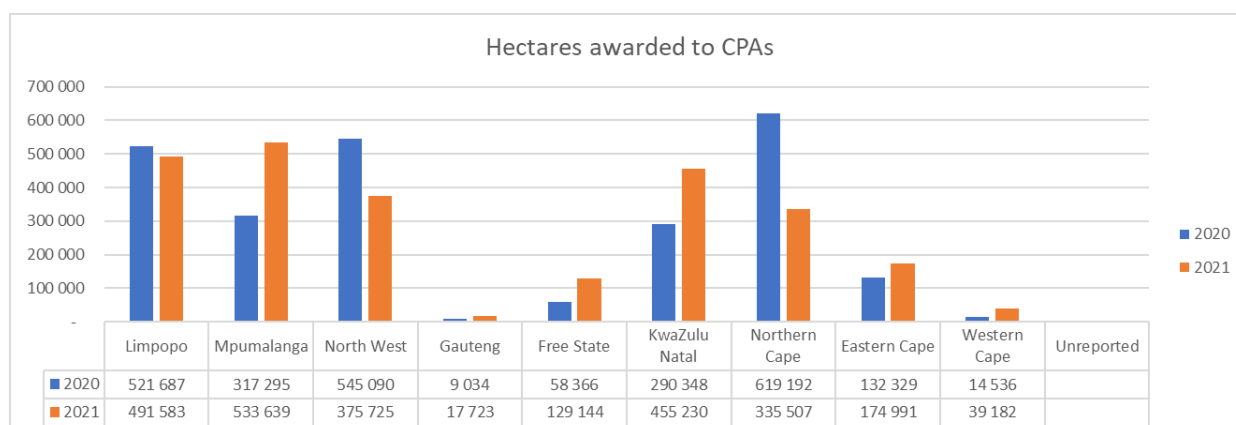


Figure 3-6 Hectares of land awarded to CPAs

Source: Annual report of the minister of DALRRD on CPAs

Figure 3-6 illustrates the amount of land (ha) allocated to CPAs. In Northern Cape, less land was allocated to CPAs in 2021 than in 2020. There is no reasonable explanation for this other than poor information unless the land is repossessed from CPA's. In the 2021 report, only 51 CPAs were referred to the LRMF (2020: 38), while 20 CPAs are under judicial management. An indication that the DALRRD lost control of the redistribution process at some point is the fact that the Minister bluntly reports that in 2021 spatial data (for example, hectares) was not available for some CPAs, while the DALRRD was responsible for allocating the land to the applicants, i.e. the CPAs.

The National Development Plan 2030 focuses mainly on job creation in Chapter 6 by expanding irrigated agriculture by 500,000 hectares through better use of existing water resources and developing new water systems. It also promotes using unused land in communal areas and land reform for commercial production, together with increased cooperation between existing farmers and land reform beneficiaries (NDP, 2009). In 2009, the South African Land Reform Committee reported that 6 million hectares of agricultural land had been redistributed since 1994 - 3.4 million hectares through land redistribution and 2.4 million hectares through the restitution process. Of the 79 696 land claims filed since 1994, 95% were reportedly settled at that time (NDP, 2009: Chapter 6).

3.5 B-BBEE AND MINIMUM WAGE VS PRODUCTIVITY TRENDS

The Broad-based Black Economic Empowerment Commission reports stagnation in property changes in its 2021 National Status and Trends Annual Report. The report shows a 1.5% decline in changes, with the overall share of black ownership falling from 31% in 2020 to 29.5%. Overall management control is at 51.6%, down from 57% in 2020. Furthermore, none of the companies listed on the JSE was 100% black-owned. This is the same as in 2020, while the corresponding percentages were 3% in 2019, and 1% in 2018 (B-BBEE Commission, 2022). In 2021, there is even a decrease in reports from Seta and public entities. The report is based on 130 companies listed on the JSE, 82 organs of the state and data from 1373 companies whose B-BBEE certificates were uploaded to the B-BBEE certificate portal. Overall, 76% fewer certificates were uploaded in 2021 (B-BBEE Commission, 2022).

The employment of black leaders in the citrus industry remains an undefeated challenge because black participants are less interested in studying horticulture at university level. Horticulture studies available through AgriSeta is low level. Those who study it are limited and seek employment in well-paying environments such as avocado farms. It could be beneficial for both private sector producers and the South African government to offer bursaries and internships for agricultural studies and ensure that employment for these candidates remains in the citrus industry. Student interest in such opportunities is also limited, making it difficult for the industry to meet B-BBEE targets. Citrus-focused study opportunities are limited to internships, and the content of these studies is not at the top management level.

Because of the exponential increase in minimum hourly wages and the increase in other input costs, a larger percentage of workers must work for minimum wages today than in the past. The wage gap between supervisors and common labourers is narrowing as farmers strive to farm sustainably. In Figure 3-7, the increase from 2019 to 2020 was manageable at 3.8%, but from 2020 to 2021, the increase was 16.1% (Sectoral Determination Agriculture, 2022). Wages on citrus farms account for about 30% of the production cost; therefore, a 16.1% increase is detrimental to the farm.

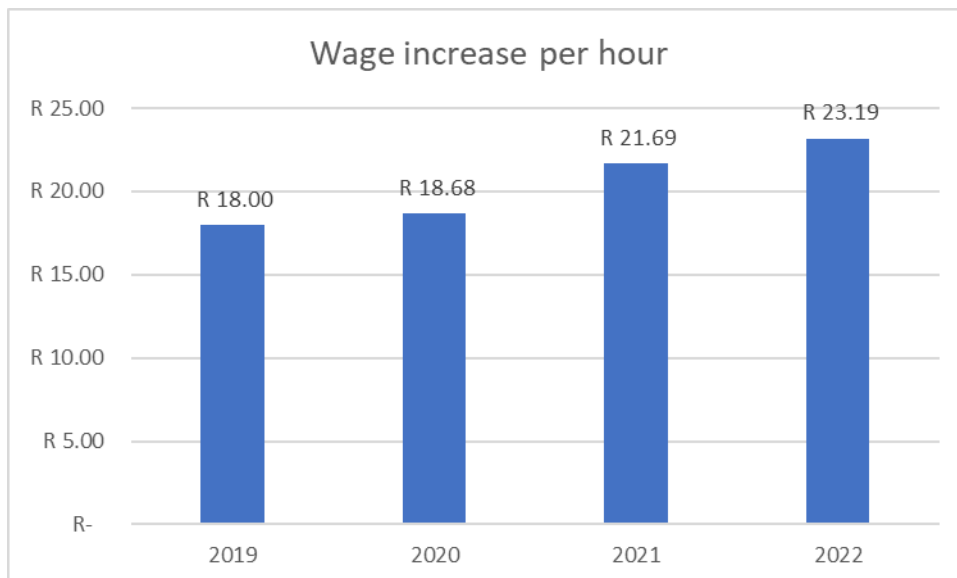


Figure 3-7 Wage increases 2019-2022

Source: Sectoral determinations for agriculture, 2022.

The decision farmers must make when calculating production costs is whether it is not more cost-effective to automate than to employ people. For example, citrus fruits can be picked with easily adapted berry-picking machines. If this becomes a more viable option to implement, unemployment will increase significantly.

Automation and mechanisation can reduce labour costs. However, smaller farmers find such high mechanisation costs difficult to afford. Yet, it is imperative to transform and adapt technology to ensure food security and agricultural sustainability and manage disruptions. Available technologies include robots, temperature and moisture sensors, aerial photography and GPS technology (Goedde et al., 2020).

3.6 MACROECONOMIC CHALLENGES TRENDS

Inputs critical to citrus production and the lack of control over them are the most common trend. The cost of inputs is increasing due to scarcity and exchange rates. Many agricultural products use the same fertiliser but in different NPK mixtures. Grain SA's

January 2022 report on fertiliser costs shows that prices for imported fertiliser increased between 128.3% and 285.1% (in USD) from December 2020 to December 2021. Increases for locally produced fertiliser ranged from 94.7% to 182.2% over the same period. Between December and July, the increase seems to have levelled off, but it is still too high, leading to uncontrollable shortages (Grain SA, 2022). The price hikes per type of fertiliser are shown in Table 3-3, where KCL increased 127% in the past year.

Table 3-3 International fertiliser price increases in one year.

Average international fertiliser prices (Rand terms)

Year on year change	July-21	July-22	% change
Kunsmis/Fertilizer	Rand/ton	Rand/ton	%
Ammonia (Middle East)	8739	15592	78,4
Urea (46) (Eastern Europe)	6398	7990	24,9
DAP (USA Gulf)	9771	15609	59,7
KCL (CIS)	6267	14230	127,1

Source: Grain SA input cost report, August 2022.

International prices are also exponentially affected by the exchange rate as the purchase price is quoted in foreign currency, and shipping costs are incurred.

Table 3-4 Local fertiliser price increases in one year.

Local fertiliser prices (Rand terms)

Year on year change	Aug-21	Aug-22	% Δ
Kunsmis/Fertilizer	R/ton	R/ton	%
KAN (28)	8587	13059	52,1
Ureum (46)	10919	15291	40,0
MAP	15498	22978	48,3
Kaliumchloried	10897	23660	117,1

Source: Grain SA input cost report, August 2022. [Kalium chloried=potassium chloride]

Local fertiliser prices have risen because demand has exceeded supply, while imports have been limited.

The price of fuel, which is a high cost in agriculture, has risen exponentially in a relatively short period. A huge increase of 54.19% from August 2021 to September 2022 poses a potential future risk to automation, as most machines will consume fuel. These increases are influenced by the exchange rate and the availability of crude oil, as indicated in Figures 3-9 and 3-10.

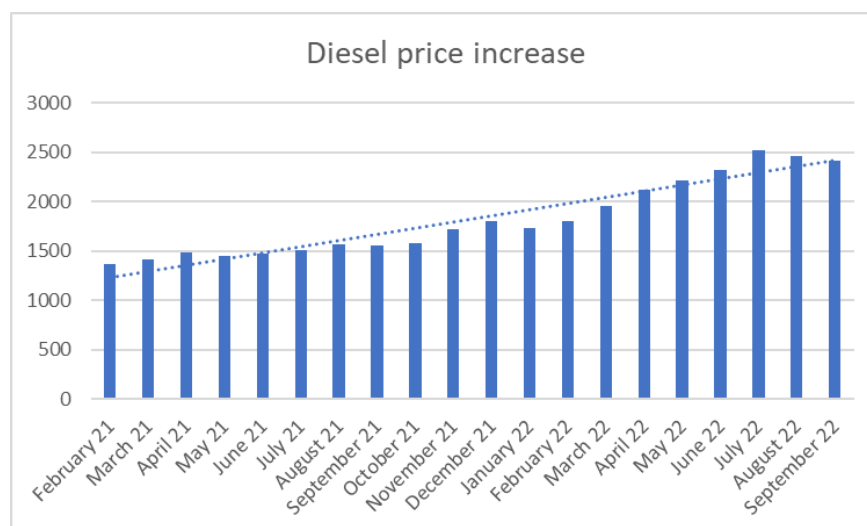


Figure 3-8 Diesel price increase January 2021 – September 2022

Source: South African Petroleum Industry Association, Old fuel prices, 2022.

South Africa imports most of its fuel which makes it exchange rate sensitive, and the price of oil dictates the price. Figure 3-9 shows these oil price trends stated in USD for the past ten years:

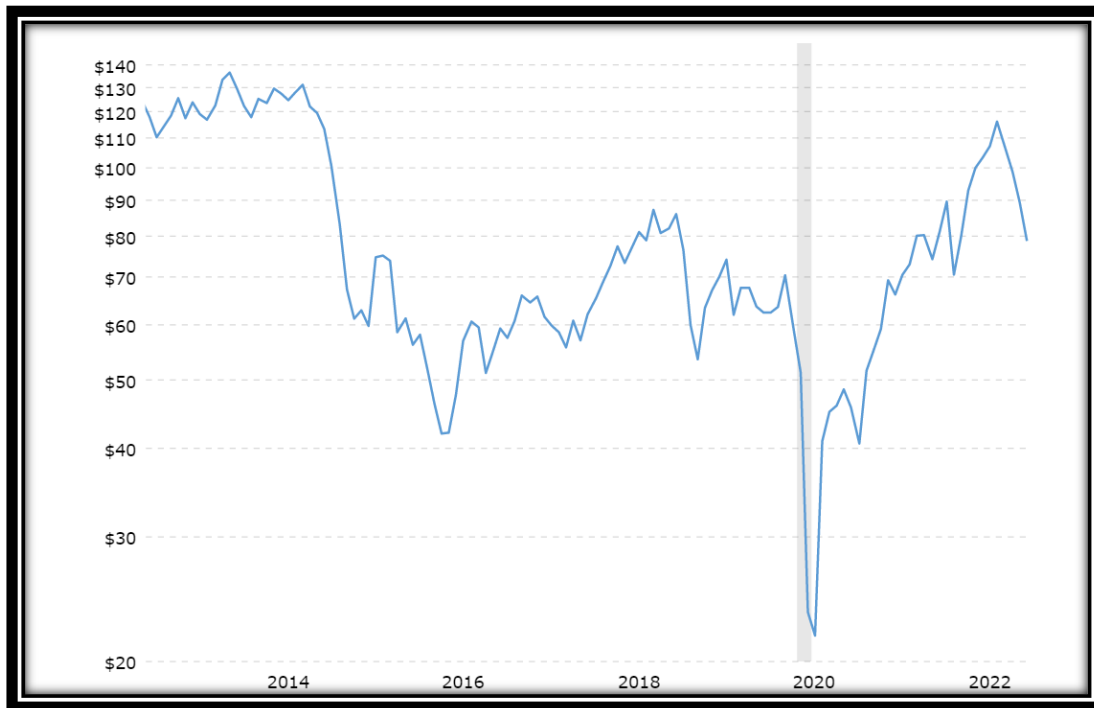


Figure 3-9 Oil price affecting the price of fuel in South Africa

Source: Macrotrends (2022).

Exchange rates influence the price of fuel.

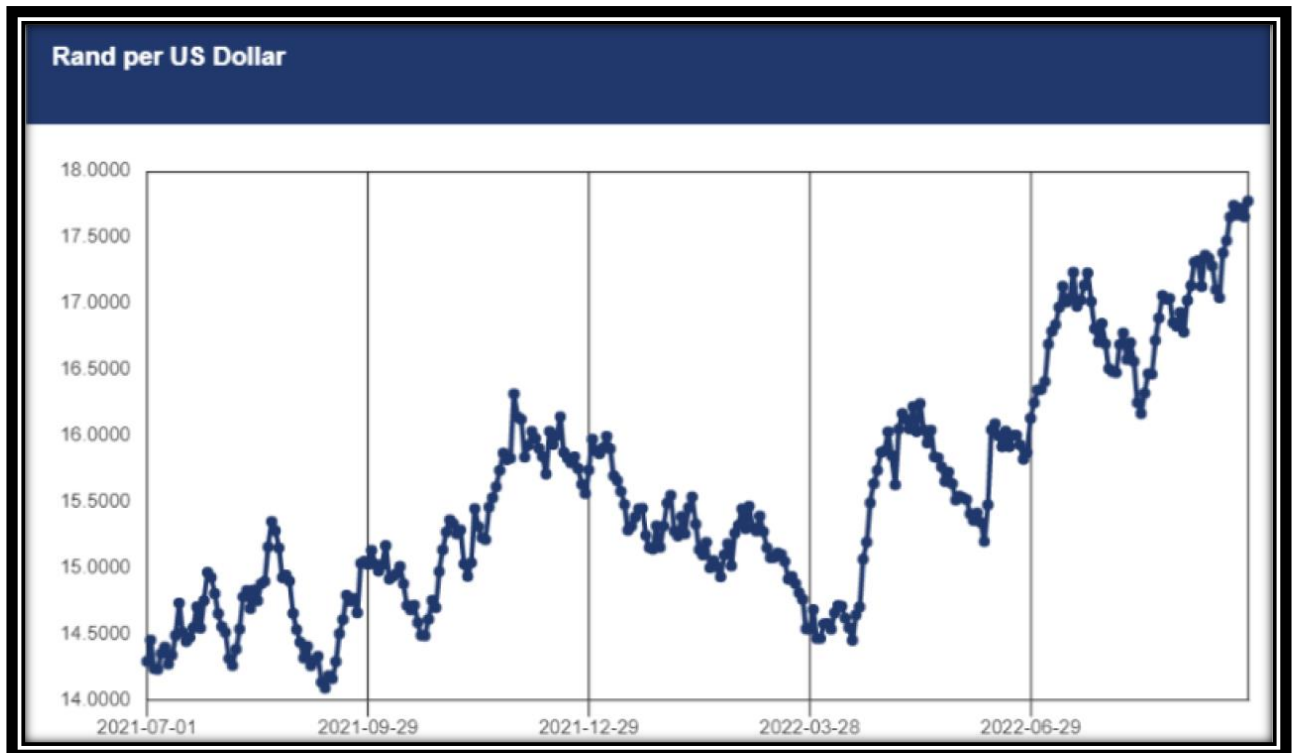


Figure 3-10 Increases in exchange rates affect higher fuel prices.

Source: SA Reserve bank (2022).

All these factors affecting the price of diesel and fuel levies lead to increases that often cannot be passed on to consumers. However, the South African government allows farmers and mines to reclaim a portion of fuel levies as a diesel rebate to subsidise agriculture, mining, and forestry in South Africa. Farmers and miners can claim back the entire road accident tax and 40% of the other taxes (Vercuiel, 2022) (see Table 3-5).

Table 3-5 Diesel rebates available to VAT-registered farms and mining

1 The current rebate.						
DIESEL PRICE			DIESEL REFUND			
Date	RAF c/ℓ	Tax c/ℓ	RAF c/ℓ	Tax c/ℓ	Total c/ℓ	Tax %
April 2021	218	370	218	148	366	40
April 2022: Temporary reduction in fuel levy	218	220	218	88	306	40
July 2022	218	295	218	118	336	40
August 2022	218	370	218	148	366	40

Source: Grain SA, 2022

3.7 WATER AND ELECTRICITY CRISIS TRENDS

The National Development Plan 2030 aims to expand irrigated agriculture by about 500 000 ha and ensure sustainable water supply for the existing and the new 500 000 ha. The directive of the Department of Water and Sanitation (DWS), as set out in the National Water Act No. 36 of 1998 (SA, 1998) and the Water Services Act No. 108 of 1997 (SA, 1997), is to protect, manage, use, develop, conserve, and control the country's water resources by regulating and supporting the provision of effective water supply and sanitation. The National Water and Sanitation Master Plan, published in October 2018, comprehensively highlights the National Development Plan's perspectives. However, there is some overlap between the NDP and the NWSMP. Much of the latter's plan focuses on the lack of funding and how it intends to control water user associations, watershed managers and water authorities. However, its contribution is limited because of a poor management track record (Igamba, 2022).

In addition to other Global Gap regulations, farms must have their irrigation water regularly tested to confirm that it does not contain human faeces and other contaminants. This comes at an additional cost to the farm.

Despite all the other increases in farm input costs, note the extraordinary increase in agricultural electricity charged by Eskom (see yellow line in Figure 3-11). Also striking is the difference between the unit costs for agriculture and, for example, mining, South Africa's largest industry and energy consumer (Figure 3-11).

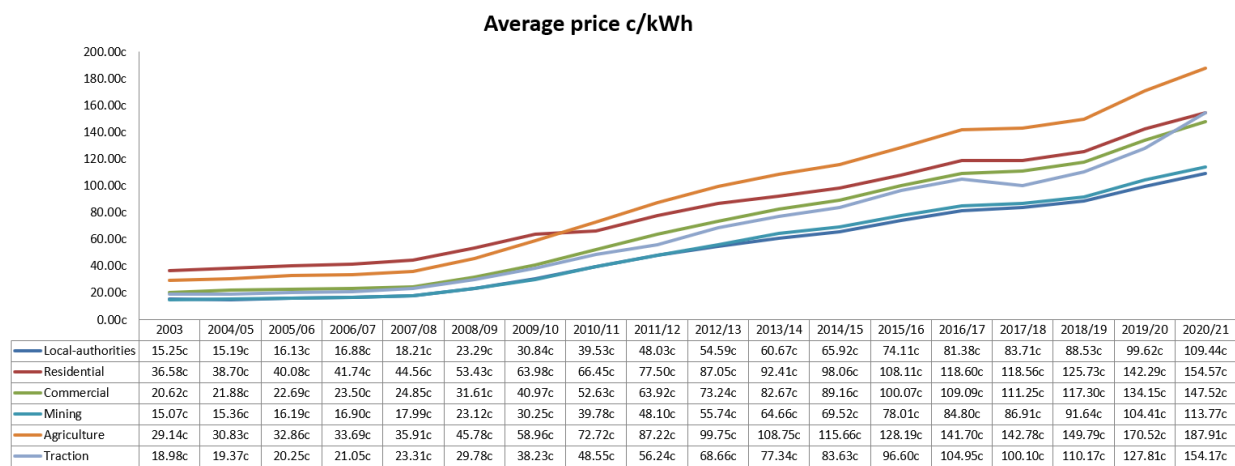


Figure 3-11 Electricity price increase graph

Source: Eskom holdings (2022b).

As evident from Figure 3-11, agriculture pays by far the highest unit price of electricity in the country. The electricity price is increasing exponentially while the supply continues to deteriorate. Less electricity is available at a much higher cost, affecting farm productivity and the ability to plan irrigation. The installation of renewable green energy is a priority, and funding for larger systems is needed.

3.8 MAJOR TRADING COUNTRIES AND FAIRTRADE

Spain remains the largest exporter of citrus fruits, while USA remains the largest importing country. In the context of this study, it is important to note that the largest importers of citrus are the USA importing \$1.81 billion and Germany importing \$1.516 billion, France imports \$1.32 billion, Russia imports \$1.267 billion, the Netherlands imports \$1.139 billion, and the UK and Canada imports \$825.9 million and \$656 million respectively. From

these statistics can be seen that Russia is the fourth largest importer of citrus in the world. The sanctions against this country because of the war on Ukraine thus affected not only Russia but also the citrus export trade from South Africa and other citrus-exporting countries.

According to Justin Chadwick of the Citrus Growers Association in South Africa, citrus exports from South Africa to Russia fell from 32% to 5% in 2022 (Manoko, 2022a). Growers did not produce less, but volumes had to find a new market. This market was found in the UK and exports to UK increased from 24% to 61%. The difference between the two markets is the prices importers are willing to pay, and UK is a lower price market (Trademap, 2022) thus resulting in lower earnings.

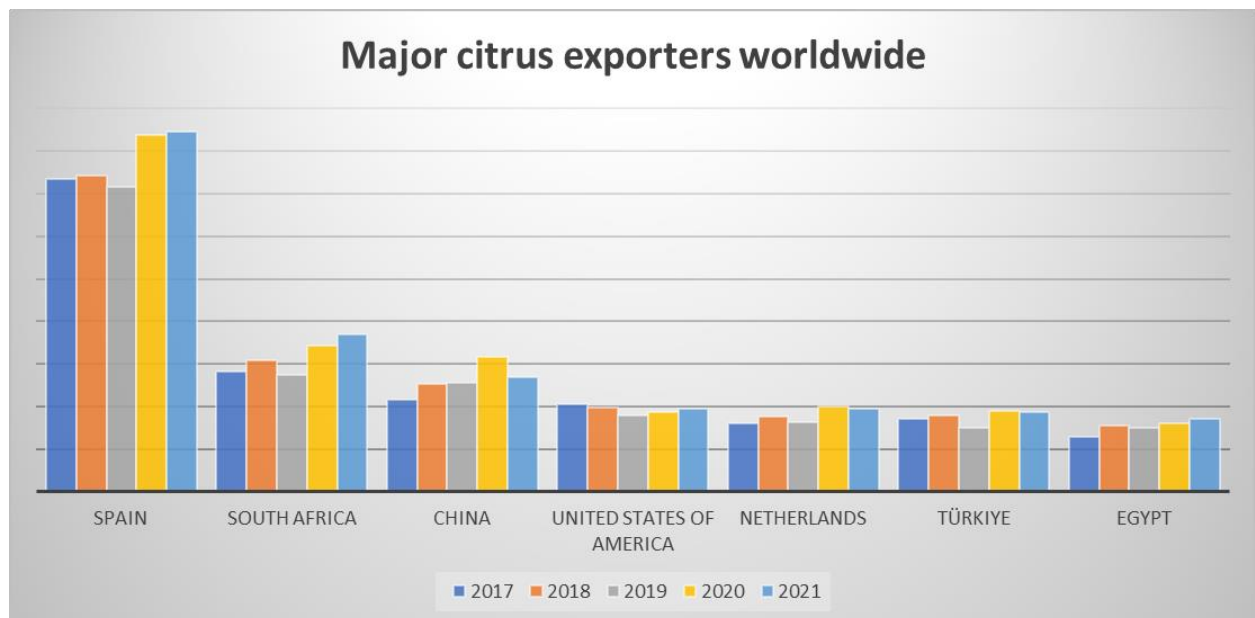


Figure 3-12 Major citrus exporters worldwide.

Source: Trademap (2022).

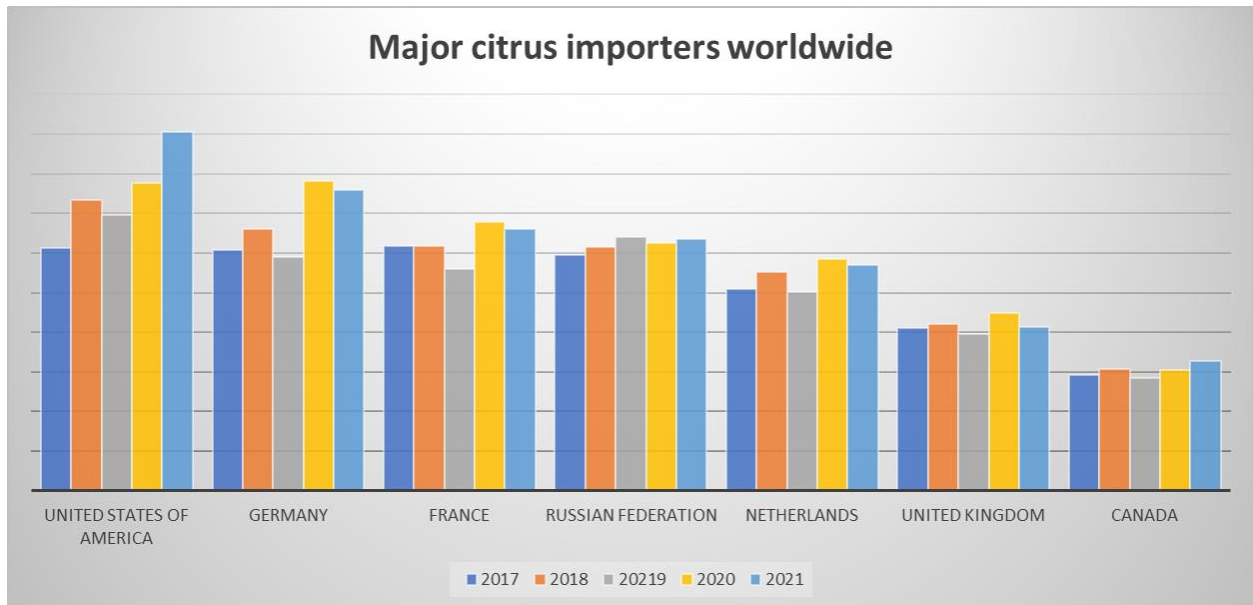


Figure 3-13 Major citrus importers worldwide.

Source: Trademap (2022).

South Africa exports more citrus fruits than it imports due to the large quantity and large variety of citrus fruits grown locally. The same is true for Spain. The United States of America and the Netherlands import more than they export to ensure the availability of citrus throughout the year.

3.9 THE SOUTH AFRICAN PERSPECTIVE OF THE CITRUS FRUIT INDUSTRY

The South African citrus industry compares favourably with other countries, especially first-world countries. It has a fair competitive advantage due to the favourable climate, water availability, quality of soils and diversity that the country offers. However, comparative and competitive advantages are somewhat distorted when the country's unique risks are considered. Comparative advantage describes how South African citrus compares to the rest of the world and other commodities. This means that South African citrus has to be of similar quality or better than that from Spain, China, and Egypt so that buyers do not switch to another supplier.

The two most important factors for the sustainability of citrus production in South Africa are (1) the quality of the product and (2) the crop yield. These two aspects are decisive for the sustainability of a citrus producer.

3.9.1 Market share

The total value of the global fruit and nuts market is \$133.6 billion, of which South Africa supplies \$4.428 billion, which is a 3.31% share (Comtrade UN, 2022).

The total value of the global citrus market is \$16.226 billion in the 2021 season (Comtrade UN, 2022). South Africa exports \$1.84 billion (11.36%) of the world's citrus, a significant market share for a developing country. The top 5 countries supply more than 90% of the market share. Of these five countries, only South Africa is in the Southern Hemisphere, and while the South African citrus season is from March to October, the Spanish season is from November to April. The two major citrus exporters, therefore, have complementary seasons. On the other hand, Egypt has a season from mid-November to April (sometimes extending to May). This season overlaps with some of the South African citrus cultivars.

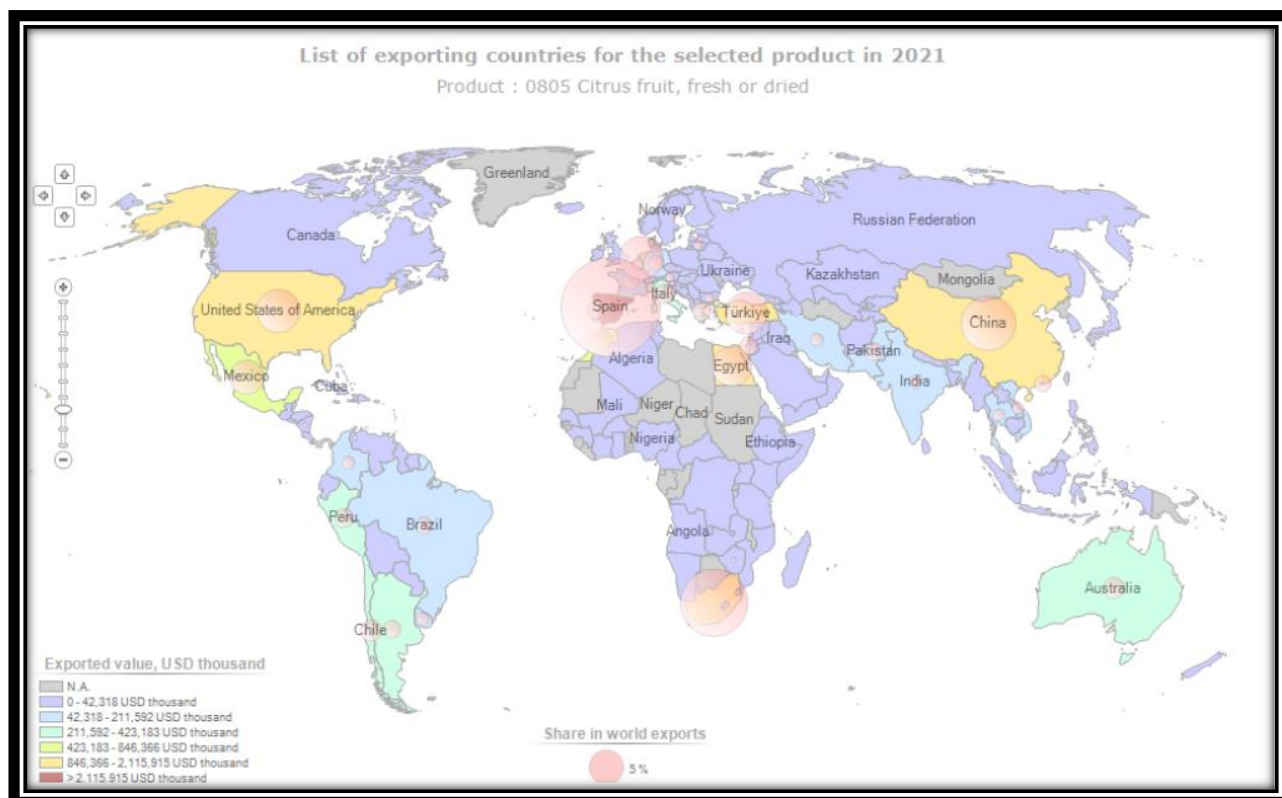


Figure 3-14 Market Share map

Sources: ITC calculations based on UN COMTRADE and ITC statistics.

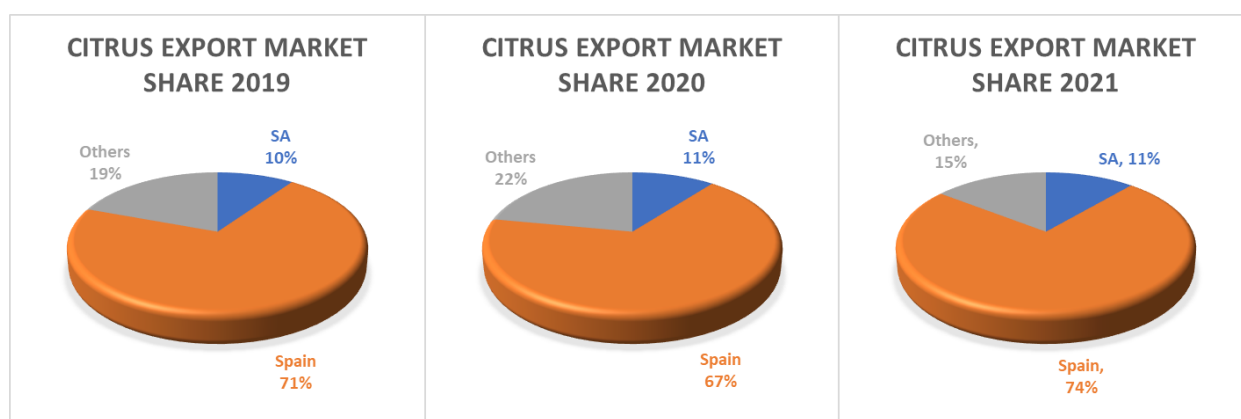


Figure 3-15 Three-year comparison of SA citrus market share worldwide

Source: UN Comtrade Database, 2022

South Africa's market share relative to global players increased by 1% from 2019 to 2020 and maintained its share until 2021, while Spain lost some market share from 2019 to 2020 due to Covid and regained it in 2021.

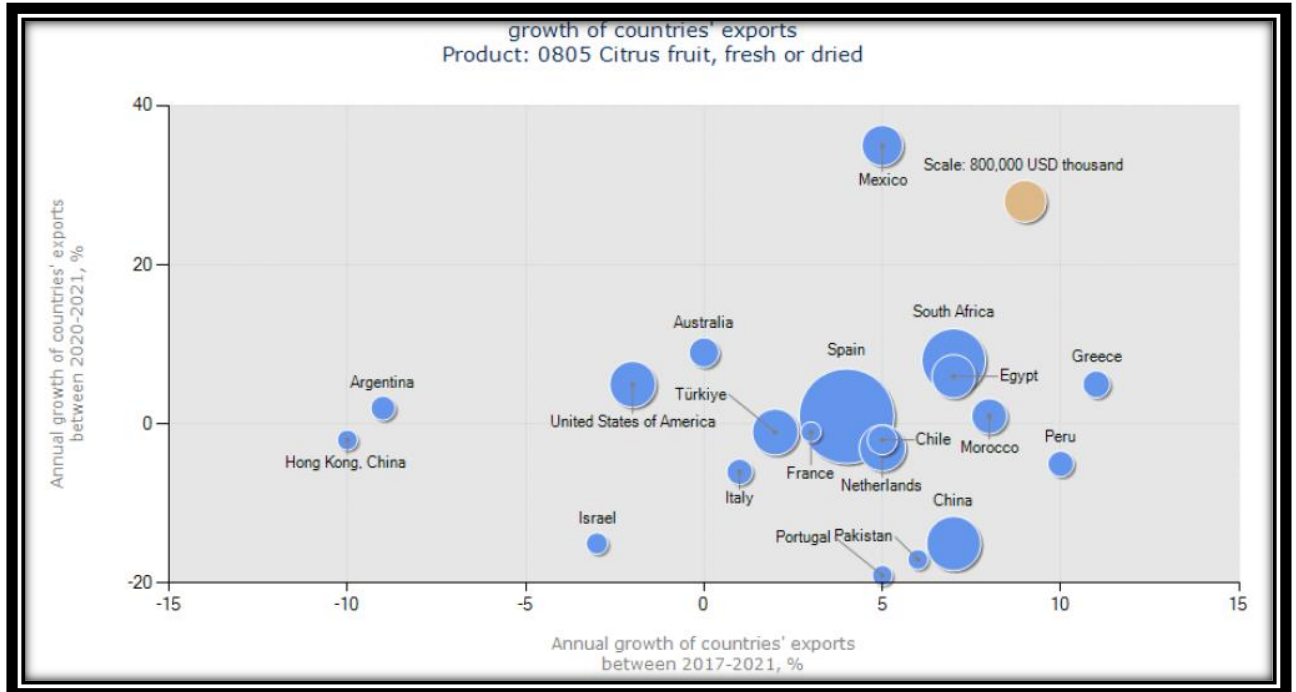


Figure 3-16 South Africa's market share graph – citrus only worldwide

Source: Trademap.org (2022).

South Africa is the largest producer in the Southern Hemisphere, competing with Australia, Brazil, Chile, and Peru (WCO, 2022).

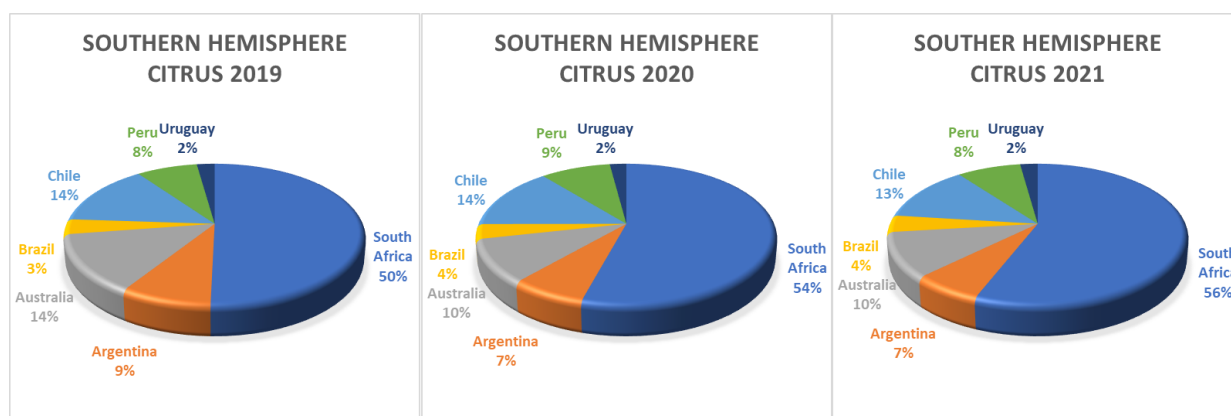


Figure 3-17 South Africa's contribution to citrus production in the Southern hemisphere

Source: UN Comtrade Database, 2022

South Africa exported \$1.84 billion worth of citrus in 2021. Chile was second with \$420.6 million, and the other countries were even less significant. South Africa's volume has increased by 35% in the last three years, while Chile increased by 10.5% and Australia decreased by 7.1%, allowing South Africa to gain market share from the Southern Hemisphere's citrus supply (UN Comtrade database, 2022).

3.10 THE INDUSTRY'S CONTRIBUTION TO THE SOUTH AFRICAN ECONOMY

South Africa's net trade in citrus was positive in 2021, with exports of \$1.84 billion against imports of \$7.327 million, and remained so in subsequent years (2020: \$1.701 billion) (Trademap, 2022).

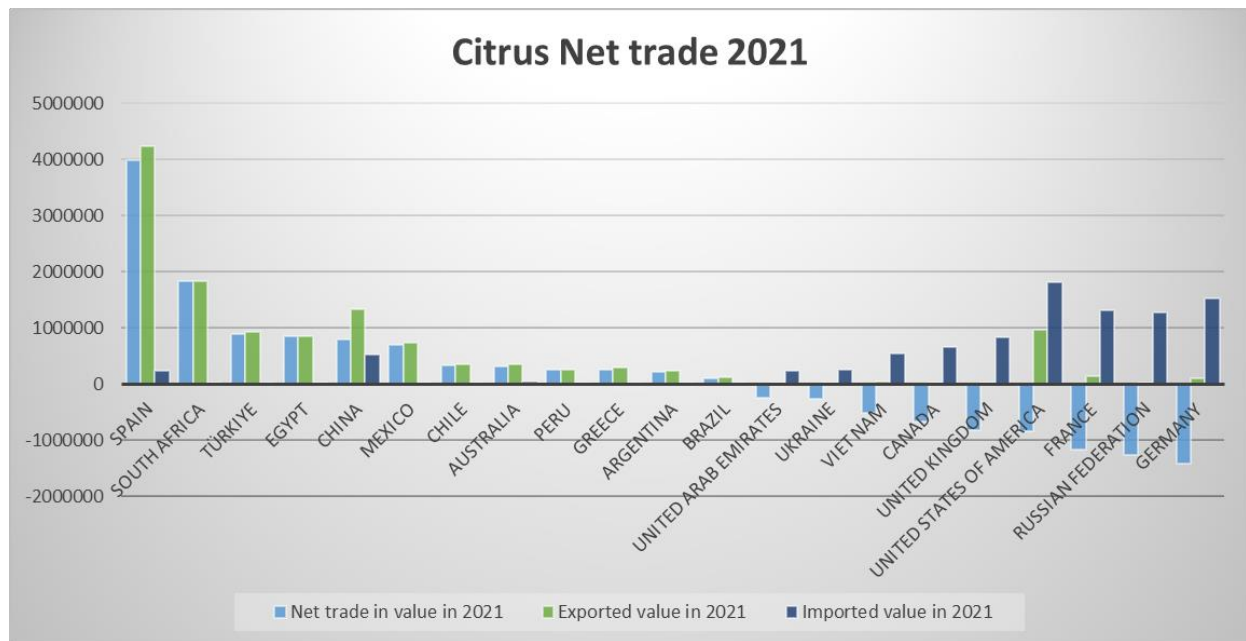


Figure 3-18 Net citrus trade statistics 2021

Source: <https://www.trademap.org/>

South Africa is second in the world with a net trade of \$1.833 (2020: \$1.82) billion, after Spain, which brings in \$3.98 (2020: \$3.83) billion, followed by Turkey with \$901 (2020: \$948) million and Egypt with \$854.9 (2020: \$941) million and then China with \$804 (2020: \$836) million net trades.

The citrus industry is a significant contributor to South Africa's economy and the positive net inflow of foreign exchange into the country.

3.11 MAJOR KEY PLAYERS IN THE INDUSTRY

The stakeholder analysis model analyses the most critical stakeholders and their influence on corporate sustainability in the industry.

Key players	Impact on				
	Finance (gain/loss)	Environment (noise, pollution, green space)	Legislation (planning, building regs)	Business as Usual (sustainability)	Reputation
Chemical/Fertiliser suppliers	✓	✓		✓	
Labour force	✓		✓	✓	✓
Pack houses	✓			✓	
Transport companies	✓	✓		✓	
Cold storage	✓		✓		
Forwarding agents	✓		✓		
Shipping companies	✓			✓	
Customers	✓			✓	

Figure 3-19 Impact of key players on citrus farming.

The leading players all have a financial impact on citrus businesses that threaten the sustainability of farmers. The price increases of all the leading players exceed the rise in prices that customers pay for citrus. The risk above is critical as citrus farmers have little to no control over the exponential increases. Many of the actors mentioned are price makers, and growers are price takers, which prevents them from successfully managing the risk.

3.12 DISTRIBUTION OF SOUTH AFRICAN CITRUS PRODUCTION

The transport of packed citrus fruit to the cold storage facilities at the ports by road is the most common distribution channel in the industry. The channel efficiency is affected by fuel price increases, the condition of the roads, and the inadequate accessibility to the Port of Ethekeini (Durban) due to congestion.

Train transport of packaged citrus to the ports is an alternative to the lorry transport mentioned above. The trains have different access to the docks and are therefore not affected by the congestion of trucks waiting to enter. Like the ports, the trains are managed by Transnet, which theoretically means they should work well together.

Overseas shipping is operated by profitable companies, for example, AP Moller-Maersk (the largest), Mediterranean Shipping Company (MSC), Diamond Shipping, Evergreen (Break-bulk), CMA Shipping and other smaller ship management companies. These ships are privately owned, and shipping companies manage the ships on behalf of their owners. This means that they expect fair profits every year. It also means that they direct the ships to the most profitable routes, and sometimes these do not include South African ports because political unrest and other problems make it difficult to access the docks. The port of Maputo is an alternative to Durban. However, Chinese contractors restricted access to this port by constructing a bridge at the port entrance. The bridge is too low for large ships, so only smaller vessels with longer journey times and limited cargo space can enter.

South Africa could have been largely self-sufficient in providing shipping for its producers. SAF Marine was a South African managed shipping company. It was founded in 1946 by South African industrialists and American ship owners, lost control to the Americans in the 1950s but was reinstated by the Industrial Development Corporation (IDC) in 1959. In 2020 it was sold to the AP Moller-Maersk Group. It would have been strategic for South Africa to retain ownership of SAF Marine, which would have benefited the South African citrus industry and all other export-dependent industries in 2021 when the industry struggled to get space on ships for export.

3.13 CONSTRAINTS AND CHALLENGES FACING THE DOMESTIC INDUSTRY

The majority of constraints in the recent landscape of citrus production in South Africa are challenges that cannot be controlled or mitigated by the grower or his direct allies.

The history of agriculture shows seasonal patterns with higher and lower yields, higher and lower prices and cost fluctuations. During the season of higher costs and lower prices, producers need working capital financing, which seems to be very scarce in post-Covid South Africa. The difficult times for agriculture, in general, bring a lack of credit or investment capital, and commercial banks do not understand the business of agriculture.

Weather conditions are constantly changing, and the last citrus season was marked by an exceptionally rainy season. Rain is usually beneficial, but when orchards remain wet, harvesting becomes difficult because tractors get stuck in the mud. Moreover, the constant wetness and humidity in the orchards favour the occurrence of diseases.

Citrus pests and diseases thrive in the pleasant climate of South Africa. The incidence of false codling moth (FCM) and black spot disease is a significant barrier to European entry, a major export destination. The market demands that laboratory tests for pesticides be below maximum residue levels (MRLs), making it difficult for growers to control pests and diseases. In laymen's terms, if a grower uses pesticides, there is a cut-off safety period before it can be consumed. The amount of chemicals left on the fruit must be below the prescribed levels to allow entry into the European market. Low pesticide content carries the risk of pests or diseases.

The exponential increase in production and distribution costs calls into question the industry's sustainability, as explained earlier in this chapter.

Poor and unpredictable market conditions are challenging because the fruit travels by ship between 14-30 days, depending on the destination. When something changes, such as the sudden change in entry regulations for Europe in June 2022, many containers full of fruit are already on their way to their European destinations. In mid-June 2022, Europe announced new cold treatment measures that came into effect in early July 2022,

blocking the entry of about 2000 containers of fruit worth about 500 million rupees (Vecchiatto, 2022). These containers were stuck for months in the ports before they were released and unloaded after a special regulation was enacted. This meant that the quality of the fruit deteriorated during this time, the storage costs were extremely high, and the producers were not paid until much later.

The challenge for citrus producers, however, starts much earlier in the production chain. Poor road infrastructure and the unavailability of trains have implications for the sustainability of the citrus industry. The cost of diesel in South Africa includes about 20% fuel duty, a tax that is supposed to generate revenue for the government to maintain roads but is not used in this way (Rossouw, 2022). The South African government's revenue from fuel taxes was R80 billion in 2019/2020 (Statssa.gov.za, 2021).

3.14 THE ANALYSIS SUMMARY OF THE SOUTH AFRICAN CITRUS FRUIT INDUSTRY

The analysis summary sums up the risks discussed in this chapter.

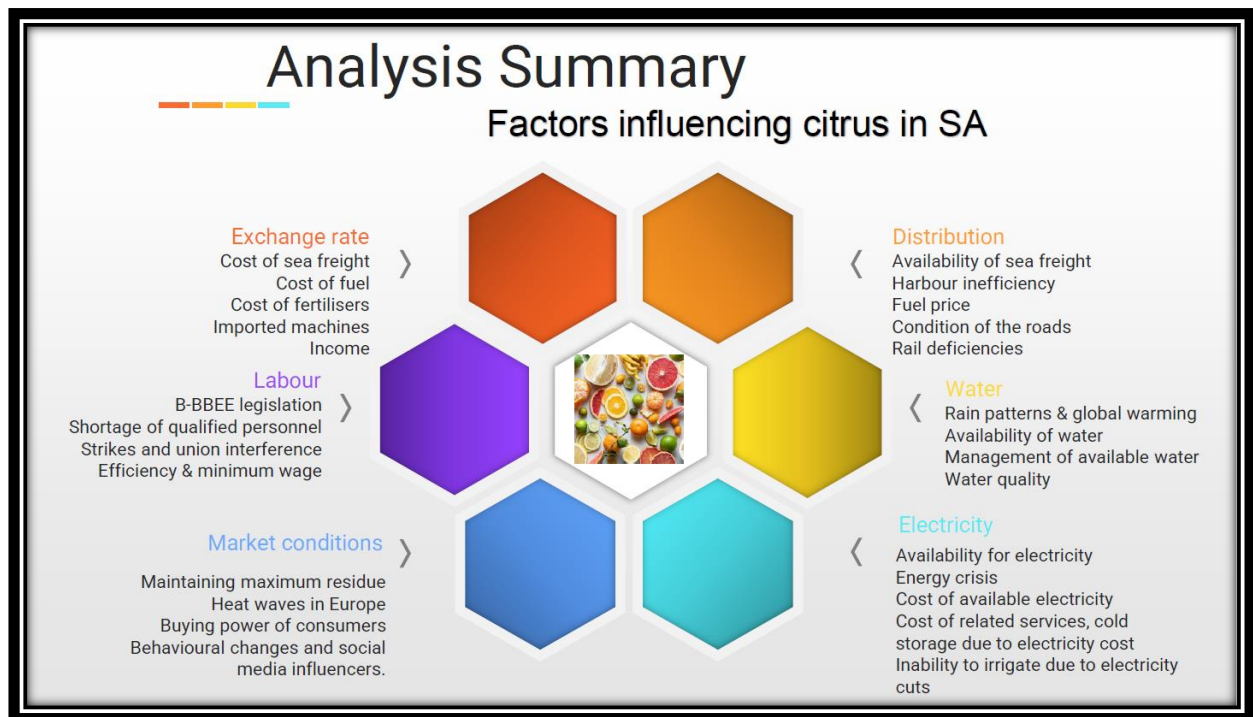


Figure 3-20 Analysis summary.

The external analysis of the citrus industry conveys a sad message, as the identified risks that severely affect the industry are largely beyond producers' control and cannot be adequately avoided or limited.

It is evident that the environment for citrus producers has changed in recent years and judging by the influencing factors in the industry, it will continue to change. Therefore, citrus producers must be robust and prepared to change with the industry. Financing the short and medium-term challenges will be at the forefront of solutions to improve sustainability in the industry and possibly government support.

3.15 SUMMARY

This chapter provided insight into the citrus environment, an overview of all risk trends, and other important information about the citrus industry in South Africa.

The next chapter looks at the methodology used in this study and the specific models used to analyse the data.

CHAPTER 4 METHODOLOGY AND MODEL SPECIFICATIONS

4.1 INTRODUCTION

"Sustainability means the ability to produce food and fibre indefinitely and profitably without damaging the natural resources, environmental resources and environmental quality on which all humans depend." (Du Plessis, 2020). Optimal biological productivity, economic viability, natural resource protection, risk reduction and social responsibility are high priorities in agriculture.

Agricultural risks are composed of several risk factors, each contributing to a greater or lesser extent to the overall agricultural risk. Some of these risk factors significantly impact agriculture, such as grain yield or grain price, while the impact of other factors is negligible, such as brown rust in maize.

South Africa competes globally in the citrus industry with countries in the southern hemisphere. These include Argentina, Australia, Uruguay, Chile, and Peru. The competitiveness of South African citrus is analysed in Chapter 4 using the Net Export Index (NXi), the Balassa Revealed Comparative Advantage (RCA#) Index and the Relative Revealed Comparative Trade Advantage (RTA) Index. Time series data on citrus imports and exports from South Africa and the major producing countries in the Southern Hemisphere were used to calculate the competitiveness indices using Excel spreadsheets.

4.2 STUDY AREAS

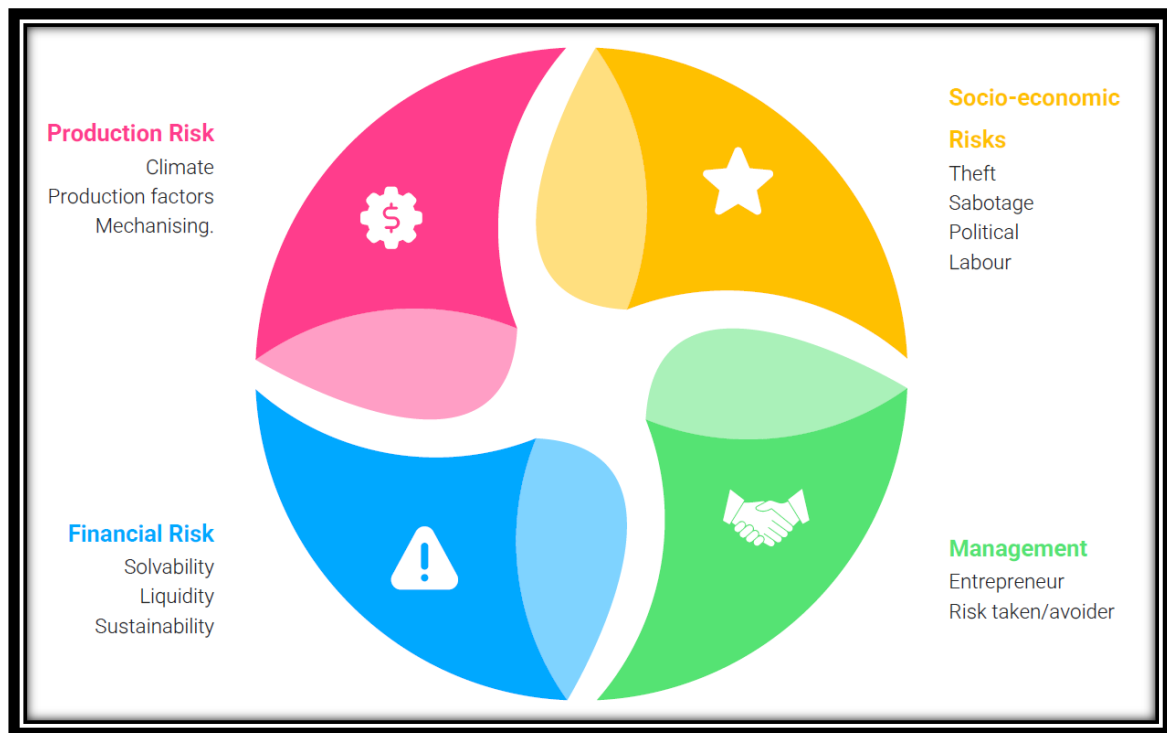


Figure 4-1 Schematic presentation of the study areas.

4.2.1 Production risks

- **Climate**

Natural risks in agriculture include drought and heat, floods, storms, and frost. Some natural climate changes cause abiotic stress in citrus trees, negatively impacting yield or fruit quality. Compared to citrus, a complementary crop like mango flowering is better after a drought. When water is omitted from mango trees, the tree stresses and produce more flowers. When flowers set into fruit, and water is omitted, the tree will reject the fruit in order to maintain its own health. Citrus trees, in opposed to mango, drop their fruit when the tree is stressed, or the flowers do not produce fruit (SAMGA, 2022). The incidence of diseases increases during floods or continuous rains, for example, during the rainy season and late rains in the picking season. It is more difficult to contain such diseases when the climate

is favourable for them to thrive, and the same applies to pests. Hail and frost physically damage the flowers or fruits, so they cannot be packed in boxes and do not earn income.

- ***Production factors***

In the immediate environment of the citrus grower, shallow soils, soil compaction and soil acidification can hinder a good harvest and create additional costs to be managed. The importance of sufficient and timely fertilisation, weed control, disease control, pest control and irrigation management is emphasised.

- ***Mechanising***

Mechanising is to replace labour-intensive tasks with machines and robots. Irrigation scheduling, activated by probes measuring soil moisture content, is designed to optimise and adjust irrigation according to the specific requirements of the trees when they bear fruit. Harvesting with machines is uncharted territory in South Africa, but canopy pruning is usually done with large machines. Labour in South Africa is expensive and turbulent, which is a risk for farming, therefore mechanising can mitigate such risk (Bafana, 2019).

4.2.2 Socio-economic risks

- ***Theft and Sabotage***

Additional controls and measures must be taken to prevent or limit the theft of fruit and chemicals. One theft factor that is sometimes not considered is the time of employees that the company pays for and that is not used for company business.

- ***Politics***

Farms perish under excessive laws, the uncertainty of land value, and the expropriation of land. Some of these policies make it more difficult, if not sometimes impossible, to get much-needed financial support.

4.2.3 Financial risks

Financial risks include managing rising costs and budget management in uncertain times and markets, raising finance, price risk, maintaining liquidity, interest rates, leverage, and exchange rates.

Agriculture has always been affected by the observable fact that input costs increase faster than income. This is because farmers are price takers on income and input costs. This is called the agriculture cost-pincher effect.

4.2.4 Management

Entrepreneur

Entrepreneurs are known for their ability to innovate and think outside the box. This will prove to be an advantage for citrus farmers at a time of great uncertainty, unmanageable cost increases, lack of control over revenues and all the risks over which farmers have no control. This research does not aim to determine whether South Africa is in a recession, but it identifies a recession for the citrus industry and even a major depression. History shows that recessions create opportunities for innovation (Scott, 2022). Game-changing propositions, simple, affordable solutions and bold strategic moves follow major events, such as the totality of the runaway impact on citrus farming. Farmers are entrepreneurs with very limited support from the government and even less finance available for working capital or expansion.

4.3 RESEARCH METHODOLOGY

This study did not collect primary data. As such, no population or sample was drawn. The data was collected from secondary, validated sources using archival research, agricultural reports, and official government documents. In addition, the secondary data sources also included Internet databases of published statistics (such as Statistics South Africa), Internet articles from magazines, journals, and newspaper articles reporting on the event, and history textbooks.

Typically, data and information used in the study consisted of the annual citrus industry data as published by the Department of Agriculture in collaboration with the Fresh Produce Exporters Forum and the Citrus Growers Association of South Africa. The researcher collected secondary data from various sources related to the same topic to cross-reference and ensure validity. These sources include but are not limited to International statistics published on volumes and values of international trade, PPECB, CGA, FPEF, DALRRD, DAFF, CRI, and Statistics SA. The relevant acts were also consulted.

The data collection methodology followed is explained in five steps below:

Step 1: Although it is not usually necessary to seek consent to use published data in research, permission was sought in writing and in principle from the various institutions mentioned above. The study was also cleared by the North-West University's Scientific Committee and after that the Faculty of Economic and Management Science's Ethics Committee. A formal ethics number was used (NWU-00582-22-A4).

Step 2: Internet-based data sources do not require consent because they are published on the Internet. These sources are used when comparing data with data from other countries.

Step 3: Citrus performance reports and other information was requested by email from the above institutions.

Step 4: The reports were used after verification, and the researcher used the information.

Step 5: The researcher interpreted the results (with guidance from the study director and a statistician) and wrote the report.

All the data used are publicly available, and observations date back to 1995.

4.4 TECHNIQUES AND INDEXES TO MEASURE COMPETITIVENESS AND RISK CRITIQUE

The trade advantage, net export index and constant market share are calculated to determine the competitiveness of South African citrus relative to other countries and confirm that it is worth actively addressing the risks posed by the industry.

This research is used to measure risk criticality and prevent disaster. The Swiss cheese model of accident causation is used in risk analysis and risk management, including in aviation safety, engineering, healthcare, and emergency services, and as a principle behind layered security as used in computer security and defence. In the Swiss cheese model, an organisation's defences against failure are modelled as a series of barriers represented as cheese slices. The holes in the cheese slices represent individual vulnerabilities in individual parts of the system and constantly vary in size and position across all slices (Skybrary, 2022).

All indicators and indices can be used to calculate the risk index. The risk index is the overall result of a risk assessment. It is composed of the probability index and the impact index. The probability index shows the likelihood of a risk event occurring. A straight line measures this through the risk holes in the Swiss cheese. If the holes in the cheese line up, a failure is predicted.

It was noted that the South African citrus industry is a significant player in the global market. Still, it is vital to establish whether it has a competitive advantage when operating at the international level.

4.5 RELATIVE REVEALED COMPARATIVE TRADE ADVANTAGE (RCA) INDEX

Relative revealed comparative advantage is an index used in international economics to calculate the relative advantage or disadvantage of a particular commodity of a particular country resulting from trade flows. It is based on the Ricardian concept of comparative advantage.

The index of revealed comparative advantage of product j exported from country i (RCA_{ji}) can be formulated as follows:

$$RCA_{ji} = (X_{ji}/X_{jw}) / (X_i/X_w)$$

where

X_{ji} = exports of product j from country i

X_{jw} = world exports of the product j

X_i = exports of country i

X_w = world exports

4.6 RELATIVE TRADE ADVANTAGE (RTA)

The Relative Trade Advantage (RTA) considers both imports and exports and is calculated as the difference between the relative export advantage (which corresponds to the Balassa Index) and its counterpart, the relative import advantage.

$$RTA_{iv} = RXA_{iv} - RMA_{iv}$$

RXA is calculated in the same way as Balassa RCA, as described in section 4.7.

$$RMA_{iv} = \frac{\left(\frac{M_{iv}}{M_i}\right)}{\left(\frac{M_{refv}}{M_{ref}}\right)}$$

Where:

X represents exports

M represents imports

The equation numerator is equal to a country's exports (imports) for a given commodity relative to the exports (imports) of that commodity from all countries except the country measured.

The denominator indicates the exports (imports) of all products (fruits) except the commodity under consideration from the respective country as a percentage of the exports (imports) of all other countries for all other products (fruits). Again, a value greater than 1 indicates a competitive advantage, and a value less than 1 indicates a competitive disadvantage.

4.7 NET EXPORT INDEX (NXI)

The net export index measures the value of exports of a given commodity compared to imports of the same commodity. Table 6-1 in chapter 6 shows the results of these calculations. Formula:

$$NXi = [(Xi - Mi / (Xi + Mi))] * 100$$

Here X_i and M_i represent exports and imports, respectively, of a particular asset (numerator). X_i and M_i represent the total exports and imports traded by the country (denominator). A country with an index of 100 has no imports, and a country with a negative value of 100 has no exports. If the value of NX_i is zero, exports and imports are equal.

4.8 PORTER'S COMPETITIVE DIAMOND MODEL

4.8.1 The competitive advantage of the South African citrus industry in terms of Porter's diamond model

The risks affecting the competitive advantage of citrus in South Africa were isolated and classified using Michael Porter's diamond model. According to Porter's diamond model, the six main determinants of competitiveness are demand factors, related and supporting industries, industry structure, strategy and competition, government support and policy, and the role of chance (Investopedia team, 2022).

4.8.2 Industry strategy, structure, and rivalry

The country's internal framework determines how enterprises are established, organised, and supervised. The nature and intensity of domestic competition are part of the factors known as industry strategy, structure, and rivalry. Economies of scale and global competition are important factors enhancing industry competitiveness. Rivalry among global citrus producers and a competitive attitude make this industry internationally competitive.

There is intense competition in the South African citrus industry, which strengthens the industry's competitiveness. The intense pressure on companies to improve and innovate, created by strong national competition, drives companies to reduce operational inefficiencies, improve quality and service, reduce costs and introduce new products to remain competitive.

An industry's competitiveness is influenced by the efficient and effective transfer of information from the consumer back to the producer organisation, including how producers respond to it. Informed strategy development and product development require proper management of the distribution of information from the manufacturer to the customer and back. This makes it possible to gather knowledge about technological breakthroughs, new breeds and market information and respond to end users' demands and expectations.

The citrus sector requires a significant capital investment to participate. Given the low availability of credit in South Africa, the struggle for finance remains a major barrier to entry and is the reason why new competitors rarely enter the industry. The high entry barriers make the industry ideal for existing companies within the industry, giving them leverage to negotiate higher prices and better terms.

4.8.3 The role of chance

Random events are not related to a country's conditions and are often beyond the ability of industry or the national government to control. These events can create pressures that change the structure of an industry, improve or worsen the industry's competitive position, and allow new entrants to benefit from the opportunities created by a reshaped industry structure. Wars, foreign policy decisions, significant surges in demand for manufactured goods and commodities, movements in global markets and exchange rates, and technological discontinuity are all examples of random events.

The current political system, the cost of crime, the impact on workers' health (HIV/AIDS), economic instability, the impact of the exchange rate, social unrest (strikes) and global events such as the Covid-19 pandemic and the Russian-Ukrainian war are just some of the random events that negatively impact the competitive performance of the citrus industry in South Africa.

4.9 FACTOR CONDITIONS

Factor conditions refer to the predominance and availability of factors that affect production and the level of output required to be competitive in a particular industry. Typical examples are natural resources, labour conditions, real estate, facilities, equipment and infrastructure requirements, fuels, and agrochemicals.

- *Labour conditions* - Access to skilled labour is a major problem for the South African citrus sector, although unskilled labour is plentiful. The supply of blue collar labour in South Africa and the citrus industry can be considered one of the best in the world, contributing to the industry's competitiveness. The oversupply of unskilled labour is reflected in the high unemployment rate in South Africa, which stood at 33.9% in July 2022 (Trading Economics, n.d.). Despite the abundance of unskilled labour, this labour resource remains expensive, largely due to the introduction of increases in minimum wages mandated by South African labour laws.
- *Cost of doing business* - This is an essential part of the factors determining an industry's competitiveness, as they are directly related to its financial feasibility and profitability. Countries with lower operating costs are more conducive to business and are more likely to be profitable, competitive and attract investors. South Africa was once considered one of the easiest countries to do business with but has since deteriorated, ranking 84th out of 190 economies in 2022 (Trading Economics, n.d.). Due to rapidly rising input costs, the cost of doing business in the South African citrus industry is considered high, severely affecting its competitiveness.
- *Technology* - As one of the most critical components affecting competitiveness, technological advancement can reduce manufacturing costs and increase product quality, yield and innovation. In 2016, South Africa ranked 49 out of 138 in terms of its technological readiness, according to the Global Competitiveness Report (World Economic Forum, 2016). Industry experts maintain that local technological advancement and the availability and access to this technology play an important role in strengthening the competitiveness of the local citrus industry. These experts also believe that the local citrus industry has access to state-of-the-art technology that makes it globally competitive (Chadwick, 2022).

- *Natural resources* – Access to and availability of natural resources such as soil, rainfall, and water are crucial for the agricultural sector's competitiveness. The cultivation of citrus fruits is directly influenced by water availability, quality, and climate. Climatic conditions are a significant production factor, while water is essential. South Africa is considered a water-scarce country, and if current water use continues, it is predicted that demand will soon exceed supply (van der Rheede, 2022). The local agricultural industry is facing a new challenge: water quality is declining rapidly, threatening the sector's competitiveness.

4.10 DEMAND CONDITIONS

Demand factors refer to the extent to which an industry's products and services are in demand and the ability and willingness to tap into demand through sales and marketing channels. Demand factors play an essential role in the competitive success of the industry. Market size, growth expectations and the structure of the local market all contribute to the industry's competitiveness. The local citrus market in South Africa is considered too small to achieve economies of scale, so local growers turn mainly to export markets to remain profitable. The local market also suffers from a low volume growth rate. To address this, the industry needs to educate local customers about citrus's taste, quality, and health benefits to increase local demand for citrus.

The size of the global market as a demand driver strengthens the competitive status of the industry, especially as South Africa is considered the second largest exporter of citrus, making it a major player in the global industry. About 60% of domestic citrus products are exported, and the diversity of these markets contributes to the industry's competitive advantages. The ability of South African citrus producers to produce quality fruit has given them access to lucrative foreign markets, which are in demand in various markets. Another reason for South African citrus' popularity, especially in the Northern Hemisphere, is the timing of their supply when some of their competitors in the Northern Hemisphere are out of season.

4.11 RELATING AND SUPPORTING INDUSTRIES

The existence of internationally competitive suppliers and industries that support and promote primary industries is associated with and supporting industries. Examples include suppliers of intermediate inputs, financial institutions, service providers such as energy, internet services and telecommunications, and public and private research institutes. The presence of such industries can potentially lead to competitive pricing and improved quality of products and services. The absence of these industries can lead to the need for costly imports, which reduces the industry's competitiveness.

Like all other industries in South Africa, the citrus industry is primarily dependent on electricity supply from Eskom, the public power utility. Recent exorbitant electricity price increases and regular power outages have harmed the industry's competitiveness.

Another important industry is telecommunications. South African access to telecommunications networks is costly but of comparable quality to some developed countries.

Further related and supportive industries are the providers of debt. The ability to obtain funding for capital-intensive businesses remains one of the most critical factors for survival and growth. Although South Africa has a well-developed and sophisticated banking system of international standards, access to debt capital remains a constraint for businesses, especially start-ups and entrepreneurial ventures.

Supportive industries on harbours are critical to citrus production. Citrus fruits have a limited shelf life and rely on cold storage and fast transportation. Effective cold chain management contributes to the competitive advantage of the industry. Given the high road transport cost due to increased fuel costs and deterioration of local road infrastructure, citrus is not transported efficiently to the market. Two privately funded research organisations in South Africa, the Citrus Growers Association (CGA) and Citrus Research International (CRI), play a critical role in improving the industry's performance.

4.12 GOVERNMENT SUPPORT AND POLICY

Government attitudes and policies are critical to the competitive performance of an industry. Depending on policies, programmes and operational structure, national governments have the potential to influence an industry's competitiveness positively or negatively. A stable and predictable macroeconomic environment, especially one that favours export-oriented sectors such as citrus, is seen as a fundamental element for the growth of a sustainable competitive industry.

While a government is not responsible for an industry's competitiveness, it is responsible for creating a climate conducive to economic activity. When macroeconomic policies are considered sound, they contribute positively to the competitive performance of an industry. However, government intervention can have a detrimental effect on export performance. Despite the South African government's efforts to liberalise trade and formalise trade agreements, the country's existing trade policies may prevent the industry from competing. South Africa's macroeconomic environment was ranked 97 out of 138 countries in 2016 (World Economic Forum, 2016), which means that the current macroeconomic climate hinders the country's competitive performance.

Labour and land reform policies negatively impact the competitiveness of the South African citrus industry. Land reform has been a topical issue in the recent past as the government has been criticised for its slow progress in achieving land reform goals. The pace at which land claims are settled is detrimental to capital investment in land improvement and development. The political uncertainty associated with land redistribution discourages agricultural investment. Regarding labour legislation, businesses feel it is too rigid and provides too much protection to workers while providing too little protection to businesses (Chadwick, 2022). Therefore, South African labour legislation can be seen as an obstacle for the local citrus industry.

4.13 CONSTANT MARKET SHARE (CMS)

Constant market share analysis (CMS) is often used in practical studies of export development. This method is important because citrus in South Africa is largely exported,

and the local market for fresh, frozen, dried, or juiced citrus is very limited. CMS is a method of examining trade patterns and trends to determine policy and shed light on the fundamental aspects of a country's comparative export performance.

As mentioned above, CMS analysis involves the decomposition of an identity. To measure a country's comparative export performance, take the ratio of its exports to those of a standard:

$$S \equiv \frac{x}{X}$$

where S is the ratio of exports of a 'focus country', x to X , the exports of one or more countries serve as a standard of comparison. To gain insight into the factors underlying a country's competitive performance, the (proportional) change in exports, q , is decomposed into three terms: a scale effect, Q , a competitive effect, s , and a second-order effect, sQ :

$$q \equiv Q + s + sQ$$

where:

q , Q and s are the proportional changes of x , X and S , respectively, over a discrete period.

Under 6.1, table 6-1 shows the results of these calculations.

4.14 SUMMARY

The measurements are used to determine whether the citrus industry in South Africa has a competitive advantage compared to other countries. It is pointless to analyse and justify the existence of an industry if it is not competitive and, therefore, will not survive anyway. Therefore, various scientific calculations and proven models have been used to establish this. The indices and models seem applicable to the industry and give the best results.

CHAPTER 5 PRESENTATION AND INTERPRETATION OF RESULTS

5.1 INTRODUCTION

The industry's competitiveness must be intense to ensure the sustainability of citrus in South Africa. As a result, it must be determined whether the factors threatening sustainability are manageable. And only then can the industry be saved. This chapter discusses the factors and the damage resulting from the risks. Risks and conditions are highlighted, and challenges and trends are analysed to find better ways to manage risk and make the industry sustainable and safe.

5.2 WHAT CITRUS FARMERS HAVE CONTROL OVER

Citrus producers need to innovate, and great ideas should come from new perspectives driven by the fear of failure. Citrus producers have control over hiring. People trained by experience are as valuable as those trained by theory. Still, their training only goes so far in terms of the actual scenarios they have experienced in their careers. People with formal training and experience know better how to solve new problems they have not yet experienced because they have book knowledge to overcome challenges in uncertain times. Commercial farms are more likely to employ people with formal qualifications than smaller farm owners (Kahan, 2008). For example, the information needed for decision-making must be accurate and timely which makes the appointment of a well-trained accountant worthwhile. The flip side of the coin is that citrus farmers employ skilled labour, and then the farmers tie the hands of employed talent so that they cannot improve processes and innovate. This is the control default of farmers.

Producers have how they deal with technology and new ideas in their own hands. Solar, hydro and wind power generation can compensate for Eskom's inability to supply electricity and excessive tariff increases. Renewable energy systems will also prevent farms from paying a higher unit tariff than other industries. Turbines can be connected to pipeline systems to generate energy where gravity causes water pressure to be high.

Fuel independence is fast becoming a new buzz word. High-torque tractors are not needed in citrus farming, as they mostly pull sprayer trucks or large-bin trailers. Packing houses already use electric forklifts. In the case of citrus farming, the availability and cost of electric tractors are worth exploring, especially if farms can generate their own electricity for charging stations (Gaines, 2021). Biofuel production is another option, but it is not straightforward as feedstocks vary, and the output may not be as pure as desired and could damage engines and machinery. Tractors and machinery can be converted to run on natural gas instead of fuel, and then cow dung can be used to produce the gas (de Visser, 2021). If converting vehicles is too expensive, the biogas can be converted into fuel. The gas in the gas conversion digester contains about 50% methane and 50% CO². To be able to use it as fuel, the CO² must be separated from the methane.

Exchange rate hedges and forward contracts provide a buffer against exchange rate fluctuations but can lead to financial losses if producers cannot predict the markets. Many competent and trustworthy agencies can help you with this.

Automation, mechanisation, and technology are abundant for farms, and early adopters have benefited greatly. They are expensive but could eliminate other problems such as high labour costs, industrial action, union interference and productivity problems.

Farmers can control the quality of the product produced for access to niche markets, the percentage of exportable quality pack-outs and the yield of crops to the extent that they can afford the input costs.

5.2.1 Contractual damages

Eskom fails to provide predictable and sustainable energy solutions. The South African government manages the water supply, while it can barely manage its own enterprises. Water quality in South Africa is severely affected by poor sanitation management, which is the responsibility of the Department of Water affairs. The condition of roads deteriorates daily, and train services are not readily available in all areas where citrus is grown and

are often affected by strikes and looting. South African ports are managed by Transnet, as are the trains, which is a state-owned enterprise where inefficiencies are apparent. It is difficult, if not impossible, to get compensation for this inefficiency from the responsible bodies.

5.2.2 Delictual damages

The risks identified above in 5.2.1, which are attributed to one responsible party, namely the government in South Africa, will cause, and unfortunately continue to cause, harm to another party, namely agricultural producers. It is therefore important that the government becomes aware of the damage it causes itself, as well as the damage caused by others but under its control, in order to sustain the citrus industry, which is a major player in the South African economy. Raising awareness in government should be done through AgriSA, CGA and other bodies established for this purpose. So far, these institutions have not been very successful with this and should increase their efforts.

5.2.3 Damages causing pure economic losses

Land claims and land grabbing result in farmers losing access to land used for income generation. This means a financial loss to the farmer and, in many cases where farms cease production, a loss to the supply chain and a disruption of the constant flow of foreign exchange into the country, as described under Net imports and the citrus contribution to the South African economy. These losses often have an impact on communities as jobs are lost. Foreign investors, therefore, become nervous about investing in South African agriculture. Only the land grabbers or claimants benefit from this initiative, and only for a short time, when the crops on the land are depleted and not replaced, they again become a burden on the government. It is also not sustainable for the small group of beneficiaries.

5.2.4 Statutory damages

While farmers in the past received pre-determined compensation for their claimed land, the government now wants to redistribute land without compensating the losing owner. Statutory damages are different from compensatory or actual damages, which seek to compensate a party for a breach or violation of the law. A farmer must be able to prove lost income to secure actual damages. The amount a farmer can claim as statutory damages may be higher than the substantial financial loss.

5.3 SUSTAINABILITY RISK OF SOUTH AFRICA'S CITRUS FRUIT RELATIVE TO ITS COMPETITORS IN THE SOUTHERN HEMISPHERE

South Africa produces the most citrus fruit in the southern hemisphere, but despite this, the sustainability of its cultivation is in question and this is the reason: the country is so busy with crisis management that it overlooks some important details. Compared to its competitors in the Southern Hemisphere, South Africa faces the same impacts of climate change. It is lagging somewhat behind in controlling climate change due to the burning of fossil fuels for energy production. The ongoing forest fires in the Cape Province also threaten climate change patterns.

The environment is somewhat different because of the government's control in South Africa over natural resources and the management of some inputs that could easily be deregulated, such as distribution channels. This poses less risk for competing countries. The South African population is brainwashed by political influence, and health care is almost non-existent and controlled by the government. At the same time, other countries employ healthy people, resulting in higher productivity.

Ethics in South Africa is a major threat to business and foreign investment as the country has a culture of fraud and unethical behaviour, as seen in the credit ratings published by S&P, etc. Innovative automation technologies are as available in South Africa as to its competitors. Still, because upgrading is expensive, it is usually financed, and it is

sometimes more challenging to obtain funding because of a perceived lack of ethics. Financing in South Africa is expensive due to rising interest rates, and foreign investment is rare due to the lack of confidence. South Africa also has a poor culture of pollution and no significant record of recycling. Most of these threats are inevitably caused by bad human behaviour, and a culture change could improve long-term perceptions.

Climate change can be slowed down by relying on renewable energy or deregulating Eskom's energy supply, making it more efficient and reliable. Further reducing pollution of all kinds, deregulating distribution channels such as trains and ports, improving medical care for workers through better recruitment of hospital staff, and prosecuting fraudsters, could significantly improve South Africa's competitiveness with other Southern hemisphere countries.

5.4 POLITICAL RISKS

A common example of political risk is countries undergoing political turmoil. Many countries are experiencing recent changes in social attitudes and outlooks, leading to unrest, political change and political movements that disrupt the economy. Relatively new on the stage of political risk is technology. The increasing ownership of mobile phones enables anyone with a phone to be a photographer, journalist, or information source. Trust in investments, companies, and countries can be shaken in seconds if a video is posted online. It is important to note that political risks are not always clearly defined - in many cases, they are rumours with little or no substance. International investors, therefore, need to keep an eye on the official news and not just rely on performance data to manage these risks (Christy, 2021). Especially in South Africa, many uneducated people have become a source of information. These people can not be silenced in a democracy such as South Africa. Therefore the reader or recipient of such uninformed information must judge its validity and source before making conclusions from it. These publishers of exaggerated information are allowed and sometimes even encouraged to destroy the infrastructure to achieve their personal goals. However uneducated and biased this information may be, many readers could perceive South Africa to be extremely

unstable. South African farmers suffer immensely from political incitement by irresponsible political parties and other motivations to undermine agriculture. Citrus farming in South Africa is no exception. There is no one-size-fits-all solution to this problem, but unfortunately, little is being done to improve the political situation in this beautiful country. Apart from packing their bags and moving to another country, farmers and the public have little influence in solving political problems. The government needs better control over the irresponsible behaviour of political parties, riots and a more effective and visible law enforcement system. Achieving better political conditions depends entirely on the ruling government.

5.5 B-BBEE AND MINIMUM WAGES VS PRODUCTIVITY TRENDS AND LABOUR CONDITIONS

The importance of monitoring productivity is not yet widely recognised and applied by farmers because monitoring takes time and leads to difficult conversations that are sometimes disturbing. Most farm workers are unskilled and have basic needs in Maslow's hierarchy. The agricultural workers are often not completely healthy, burdened with HIV and receive poor care in the state hospitals and clinics. Their productivity can be much better if they can feel healthy and strong.

By driving up the wages of low-wage earners, the minimum wage also helps to raise the relative wages of weaker or disadvantaged workers, such as young, less educated, or migrant workers. In practise, minimum wages can benefit two categories of workers. First, they should benefit those who previously earned less than the newly introduced or newly increased minimum wage. This is usually the target group of the policy.

Second, minimum wages can have "ripple" or "spill over" effects further up the wage distribution chain by increasing the wages of those above the minimum wage. Spillover effects are indirect wage increases caused by employers or employees (or both) wanting to maintain differences in job status or higher wages for workers with higher seniority or qualifications. Spill over effects is usually stronger for wages close to the minimum wage

and gradually disappear as workers earn higher wages. It is a noble gesture to reward employees for their hard work, which is not disputed. Every employee must earn a living wage. However, this gesture could be much more effective if education was of high quality and school discipline was better.

At present, school education in rural areas lacks substance. Children are poorly educated and not motivated to complete school. Those who do are not taught adequately because the quality of basic education in South Africa is not good. It is reported that 85% of school facilities students attend in South Africa are poorly funded, dysfunctional schools (Sterne, 2021). Like health care, basic education is the government's responsibility, and it is extremely important to improve its quality.

Citrus farmers can provide scholarships to their employees and children who want to study horticulture in tertiary institutions. Still, basic education fees have no benefit to farmers regarding tax deductions or BBBEE ratings. The government can offer a tax incentive to farmers willing to pay school fees to send their employees' children to better schools, but these are overcrowded and are not a good solution. The best solution is to improve public and rural schools and enforce discipline.

5.6 MACROECONOMIC CHALLENGES TRENDS

Developments in the macroeconomy can have a significant impact on agriculture. Key factors linking agriculture to the South African and global macroeconomy are exchange rates, international trade, shipping rates, foreign and domestic income, unemployment, interest rates and energy costs. Economists are increasingly worried about South Africa's economy (Roodt, 2022). This is because the country's three major macroeconomic problems - weak economic growth, rising inflation and very high unemployment - have been exacerbated by a series of significant disturbances.

Since Covid-19, shipping costs have skyrocketed uncontrollably, and this is truly predatory, as Figure 5-1 and Figure 5-2 from the freight forwarder GoGlobal show.



Figure 5-1 Freight rate increases since Covid-19

Source: GoGlobal freight forwarders.

Figure 5-1 looks at freight rates over the last three years, and there seem to be unrealistic but acceptable increases. But if the time frame is extended, a different picture emerges.

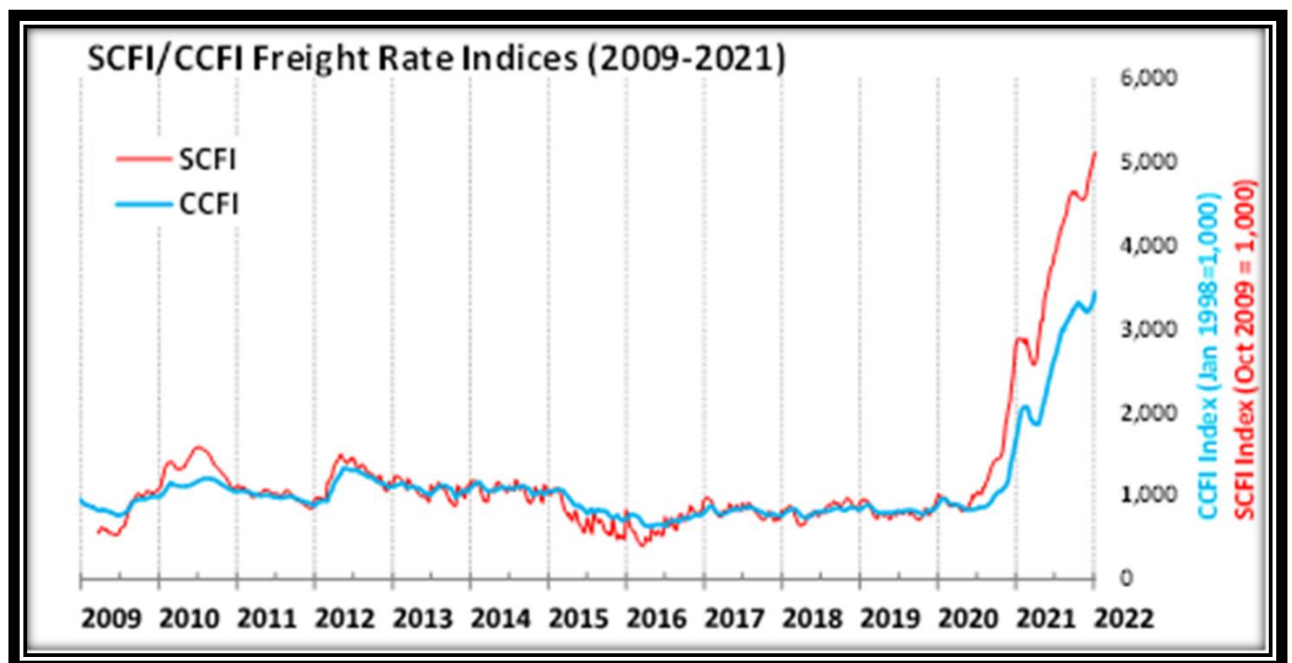


Figure 5-2 Sea freight rates 2009-2022

Source: GoGlobal freight forwarders.

Global freight forwarders play an important role in exporting citrus fruits, as they handle many of the exports. They work with all the shipping companies and have the most comprehensive information on sea freight costs. Figures 5-1 and 5-2 are in USD, so the exchange rate effect is not yet considered.

With few exceptions, growing citrus is only profitable if most of the fruit produced on the farm is sold in the overseas market, where farmers can sell citrus for more money than in the local market (Citrus resource warehouse, 2022). Exchange rates thus influence a substantial part of the income and a less substantial part of the expenditure on citrus. Because most citrus is exported, even fruit juice can be exported, revenue of all varieties is exchange rate sensitive. It is estimated that if the exchange rate ZAR /USD falls below approximately R15/USD, the farmer will no longer be able to afford the inputs for the next harvest. Rates above R15/USD are sustainable rates, and above R17/USD farmers can expand, improve their methods, and innovate. Input costs that depend on the exchange rate include sea freight costs (about 18.5% of costs), diesel (about 14.5% of costs), and a significant portion of fertilisers and agrochemicals. Operating inputs not dependent on exchange rates include fertilisers and agrochemicals to a limited extent, packaging materials (about 13 % of costs including packaging labour), labour costs and electricity (Citrus Resource Warehouse, 2022). Citrus producers must hedge exchange rates for imports and exports to manage the risk of fluctuations because the ZAR is a free-floating currency and is considered to be one of the most volatile in the world (Mohr, 2021).

The recent rate hikes and difficult citrus season experienced by citrus farmers over the past few years are worrying. Some growers have borrowed money for working capital, and automation is usually financed. Foreign funds are attractive financing options for citrus farmers, as they are less expensive. But the attractiveness for foreign investment in South Africa has deteriorated due to laws such as BBBEE, minimum wages and land reforms, poorer credit ratings and perceptions of lawlessness. Therefore, investor confidence is lower, making these loans scarce. But for those who have relationships with foreign companies, and in South Africa these are mostly export agents, financing is available and, if properly managed, can be more rewarding in times of poorer exchange rates. The risk of such loans through export agents is that the farmers have little control over the management of such transactions, and the agents can easily exploit the farmers.

5.7 WATER AND ELECTRICITY CRISIS TRENDS

South Africa is a water-scarce country with a significant risk of imbalance between resource demand and availability. Only 2% of South Africans are water conscious, and the majority are under the mistaken impression that the country is well endowed with natural water (Adetoro, 2021). Therefore, the country needs to manage its limited water resources carefully and prudently to ensure sustainable water security for the future.

Farmers are reporting losses as processing machinery, irrigation equipment and other machinery have been damaged and brought to a standstill by the power outages. Farm workers must work after hours with vital systems unavailable during the day. Such overtime wages increase production costs, which have already risen because of various reasons. The power outages also lead to wastage and financial losses due to the impact on food storage. The shelf life of citrus decreases because of delivery delays and disruptions in the cold chain. Buyers adjust prices accordingly, which causes a decrease in farm income. This challenge increases exponentially in summer, which is luckily not the citrus season. It also reduces the quantity of food available and increases costs for the consumer (Agri SA, 2022).

5.8 MAJOR TRADING COUNTRIES AND FAIRTRADE

The fruit price impact depends to some extent on the time of year in which it is delivered to the consumer. Citrus fruits are known to affect people's immune systems positively. Therefore, it is more important for consumers to consume citrus fruits when the risk of infection is higher, such as during the winter months. The demand for citrus fruits will therefore be higher in the recipient country in winter than in summer and lower in summer. When the demand is higher, the price will also be higher and vice versa. The central trading countries that contrast with South Africa are Northern Hemisphere countries, meaning they deliver citrus to markets in a different season than South Africa. It is not advisable to compare the prices obtained for citrus from South Africa with the analogue countries of the five major suppliers because four are in the northern hemisphere.

Compared to the other less material citrus suppliers in the Southern Hemisphere, South Africa obtains a fair price for its products (UN Comtrade statistics, 2022).

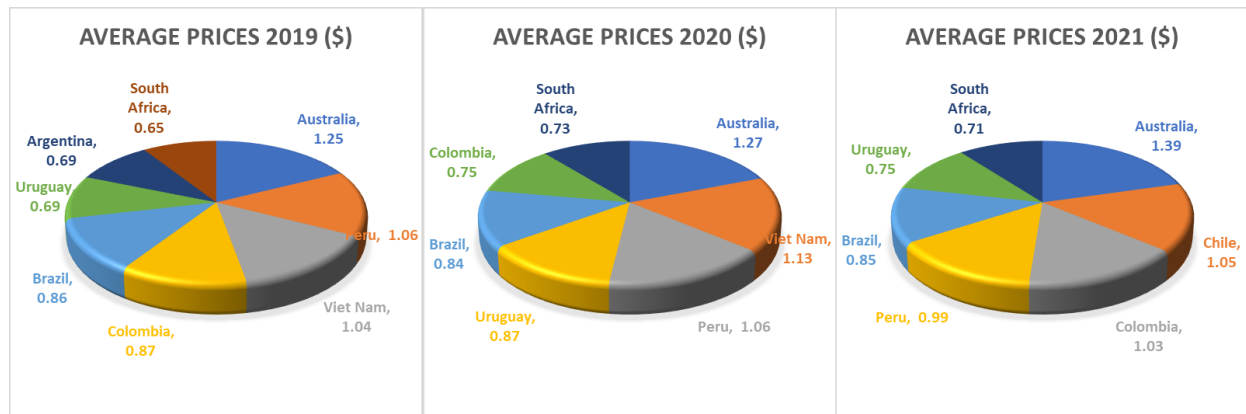


Figure 5-3 Prices compared between southern hemisphere countries

Source: UN Comtrade Database, 2022

Many things can affect the prices obtained, including the share of fruit in certain markets, the quality of the fruit and the packaging. If all these factors cannot be considered equally for all countries, it is impossible to assess the prices' fairness. Compared to Australia, South Africa achieves a 95% lower price than that developed country. South Africa is the 7th best-priced country in the Southern Hemisphere.

The most startling comparison is between South Africa as the largest exporter in the Southern Hemisphere and the major exporters in the Northern Hemisphere, which is depicted in Figure 5-4:

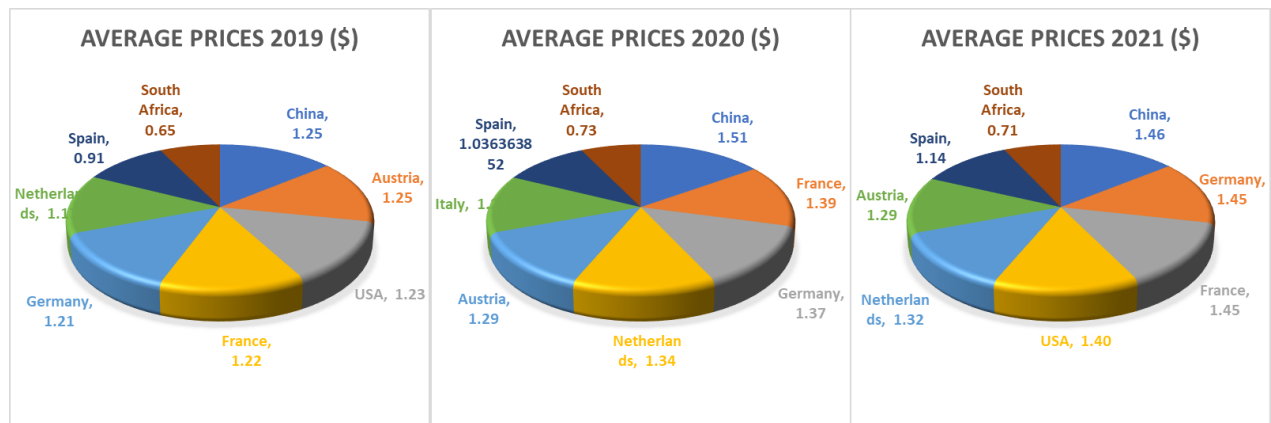


Figure 5-4 Price comparison between South Africa and major citrus exporters in the northern hemisphere

Source: UN Comtrade Database, 2022

South Africa earns, on average, 61% less on the USD price per kilogramme than Spain, which is not the largest price exporter. Compared to the largest reported exporter, China, South Africa earns 105% less on price. This contrasts directly with statement 3.1 about perfectly competitive markets where the market demand determines the price of products. If demand exceeds the quantity available, the price will be higher. If the supply is greater than the demand in the market, the price will be lower. Since Spain and the Northern Hemisphere produce excessively more than the Southern Hemisphere countries, the supply on the same markets should be excessively large and the price lower, but this is not the case. This could be due to the fact that the Southern Hemisphere supplies the Northern Hemisphere in its summer season. Citrus producers in South Africa and other Southern Hemisphere countries could face a Fairtrade crisis, and this is because South Africa is a developing country, which in accordance with Fairtrade, is a third world country and should be compensated fairly for its produce. First world countries in the southern hemisphere achieve higher prices on the same markets in the same period of time.

5.9 EMPIRICAL DETERMINATION OF FACTORS AFFECTING THE RISKS OF THE INDUSTRY IN SOUTH AFRICA: AN APPLICATION OF THE PORTER METHODOLOGY

An empirical statement is a statement that can be verified or disproved by observation or experiment.

Table 5-1 Table of evaluations of the South African citrus industry as per Porter 5 forces.

#	Force	Description of force	Risk to the citrus industry	Rating
1	Competition in the industry	The number of competitors and their ability to undercut a business. The greater the number of competitors and the more equivalent products and services they offer, the less power a company has.	SA is by far the largest supplier (> 50%) of citrus fruits in the southern hemisphere. The runner-up supplies > 10%, which is no threat to SA.	Competitive
2	Potential of new entrants into the industry	The threat that new competitors pose to existing competitors in an industry. Therefore, a profitable industry will attract more competitors who also want to make profits.	The global market for citrus is not yet saturated, so new entrants pose little threat at this stage. New entrants are hindered by the lack of availability of vacant land to expand or enter into citrus industry. Vacant land is limited to mainly Africa.	Competitive
3	Power of suppliers	Suppliers have the power to influence price as well as the availability of resources/inputs. Suppliers are most powerful when companies are dependent on them and cannot switch to other suppliers due to higher costs or lack of alternative sources.	Suppliers of ships, diesel, fertilisers and chemicals have far too much power to drive prices beyond what producers can afford. All these factors are also influenced by the exchange rate, which makes them a double threat.	Not competitive
4	Power of customers	The pressure consumers can put on companies to offer higher quality products, better customer service and lower prices.	SA is known for delivering products of excellent quality, sometimes hampered by shipping problems, which hinders customer service, but at very attractive prices - which unfortunately are exchange rate dependent.	Somewhat competitive
5	Threat of substitute products	The availability of a product that the consumer can buy instead of this industry's product. A substitute product is a product from another industry that provides a similar benefit to the consumer as the product produced by the industry's companies.	Substitutes for citrus are available, but still more expensive and with a shorter shelf life, and due to the unsaturated market this is a minor threat to competitiveness.	Competitive

Table 5-1 clearly confirms the fact that South African citrus is very competitive in global markets and that competitiveness does not have a negative impact on sustainability. This statement is further supported by the results of constant market share, comparative trade advantage, relative trade advantage and net export indexes.

5.10 FACTOR CONDITIONS

The most critical factor in citrus farming is skilled labour. Of all the factors that influence production, labour is one that the farmer can control relatively well. A lack of highly skilled workers is the biggest constraint for the industry. Due to the deterioration of basic education and the promotion of bad behaviour through the payment of excessive unemployment benefits, farmers are trying to replace workers through automation. In addition to the work that farmers do for their labour force, it is necessary to audit the Sustainability Initiative of South Africa (SIZA) to prove that they are fair to their employees. The objectives of SIZA are: To implement a locally relevant and managed ethical trade and environmental programme aligned professionally with local and international standards. To support the continuous improvement of working conditions and environmental practises on farms, packing houses and processing plants. This is a noble and necessary gesture, but it does not address the issue of skills and abilities.

Changing rainfall patterns and the availability, quality and distribution of water currently do not pose a threat to the citrus industry in South Africa (but may soon do so). Measures to delay global warming by reducing carbon emissions and other techniques will take a long time to affect climate change. These attempts should have started ten years ago, but the water was abundant then, and people did not heed the warnings. This does not mean that current efforts are moot. There is still a need to do something, but there may come a time when water is actively scarce, and unlike mangoes, citrus orchards cannot survive in drought conditions. Global Gap has added another condition to its audit that citrus producers must meet to export: Water quality for irrigation must be proven free of human faeces (Citrus, 2022). Water quality is also an issue and can be improved by

improving sanitation, which is the government's responsibility. This problem is easier to solve and is not as long-term as the problem of water scarcity.

5.11 COST OF DOING BUSINESS

The costs of doing business are measured using different standards. This includes money, time, effort, and capital requirements. The World Bank publishes a rating of the ease of doing business in South Africa, ranking 84th out of 190 countries.

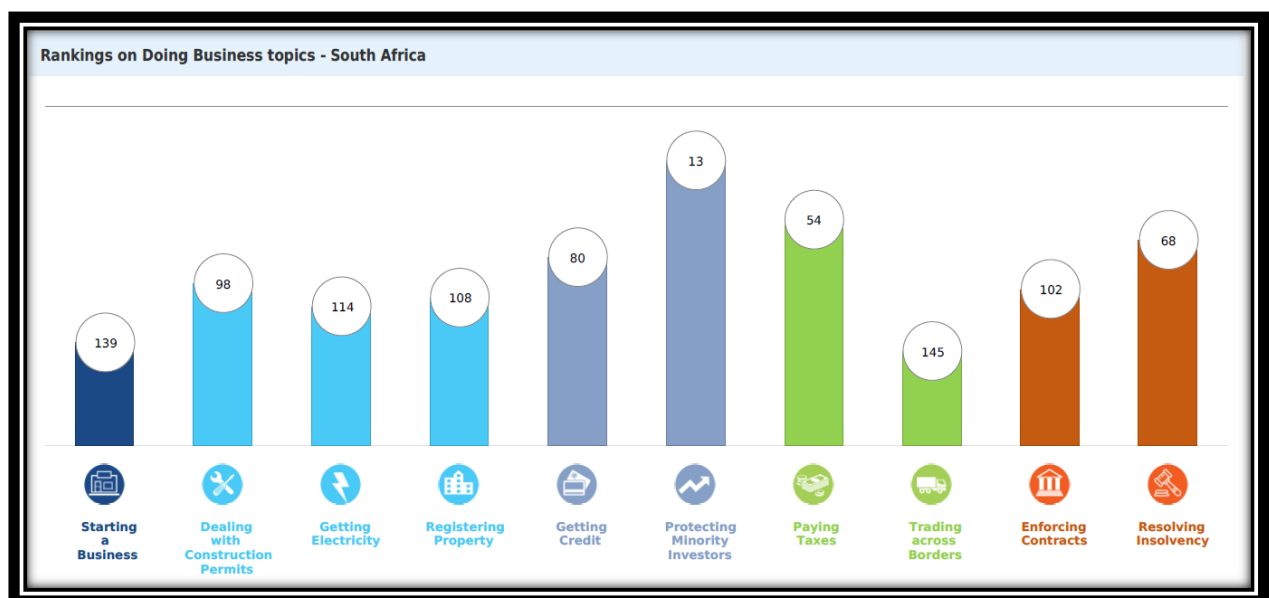


Figure 5-5 Rankings on doing business in South Africa.

Source: World bank, Cost to do business, 2020

Citrus in South Africa would consider, amongst other standards, the ease of international trade as ranked below in comparison to other countries.

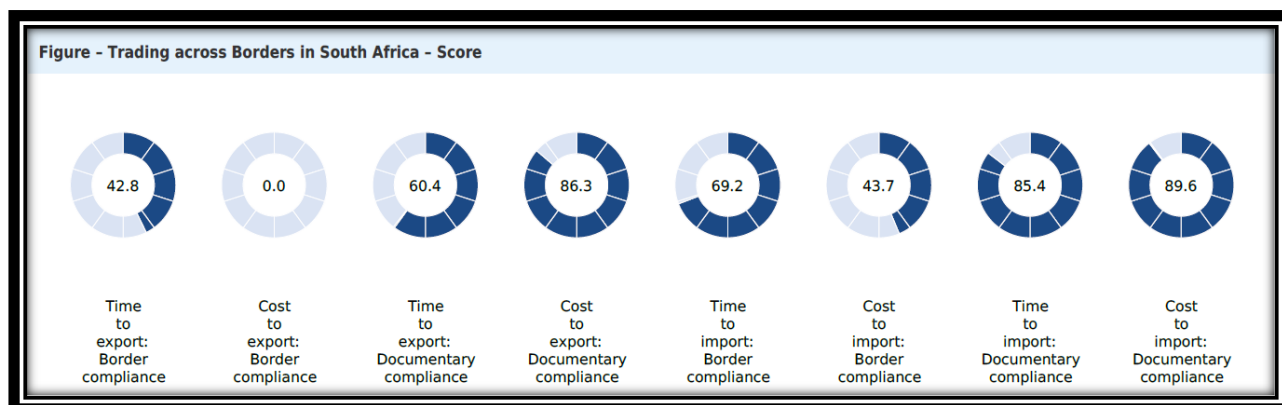


Figure 5-6 Trading across borders from South Africa.

Source: World bank, Cost to do business, 2020

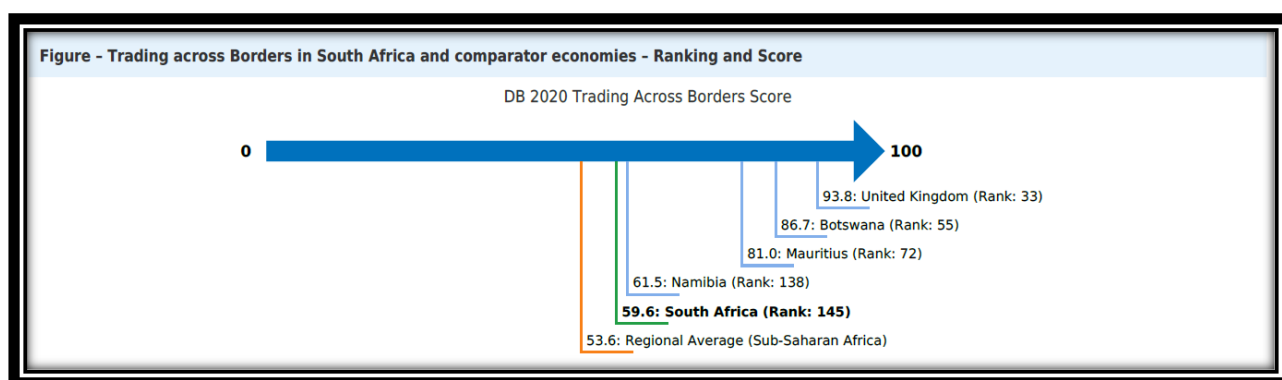


Figure 5-7 Trading across borders, South Africa, compared to other economies.

Source: World bank, Cost to do business, 2020

As citrus fruits are dependent on international trade, cross-border trade is fraught with discomfort due to the time and cost involved in complying with border and documentation requirements.

Another alarming statistic published by the World Bank in the same research is the access to electricity and credit.

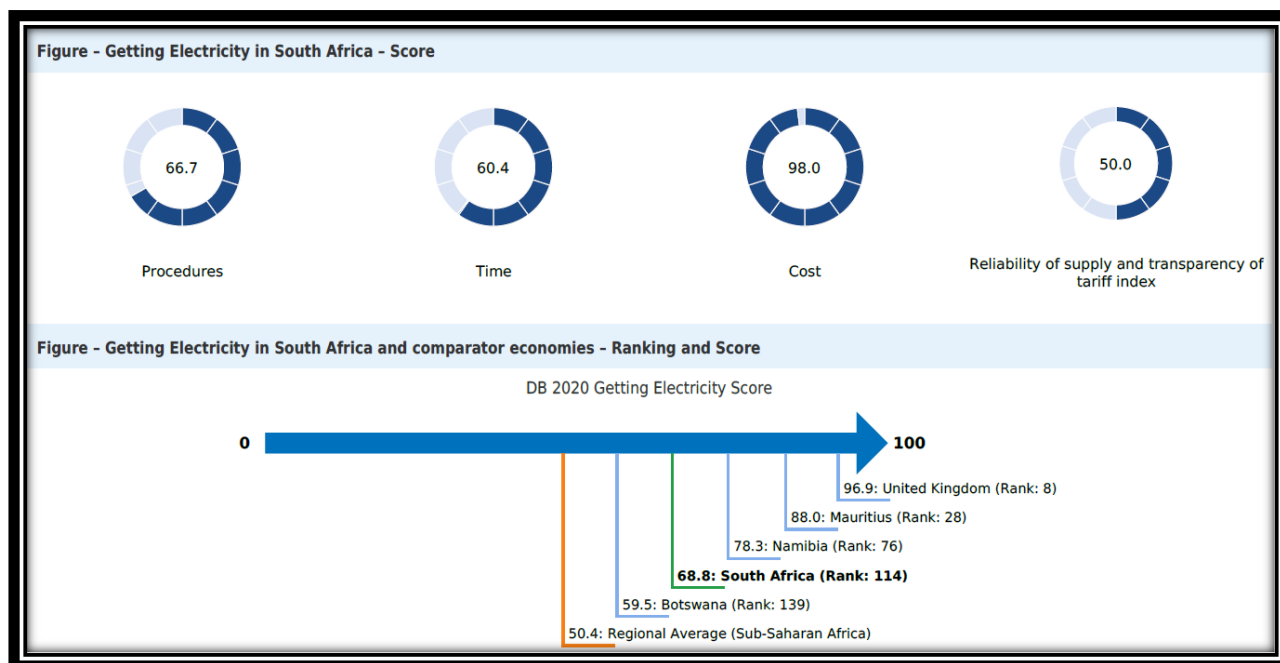


Figure 5-8 Cost of doing business: getting electricity.

Source: World bank, Cost to do business, 2020

Getting credit to bridge financial lows is more complex than in other countries.

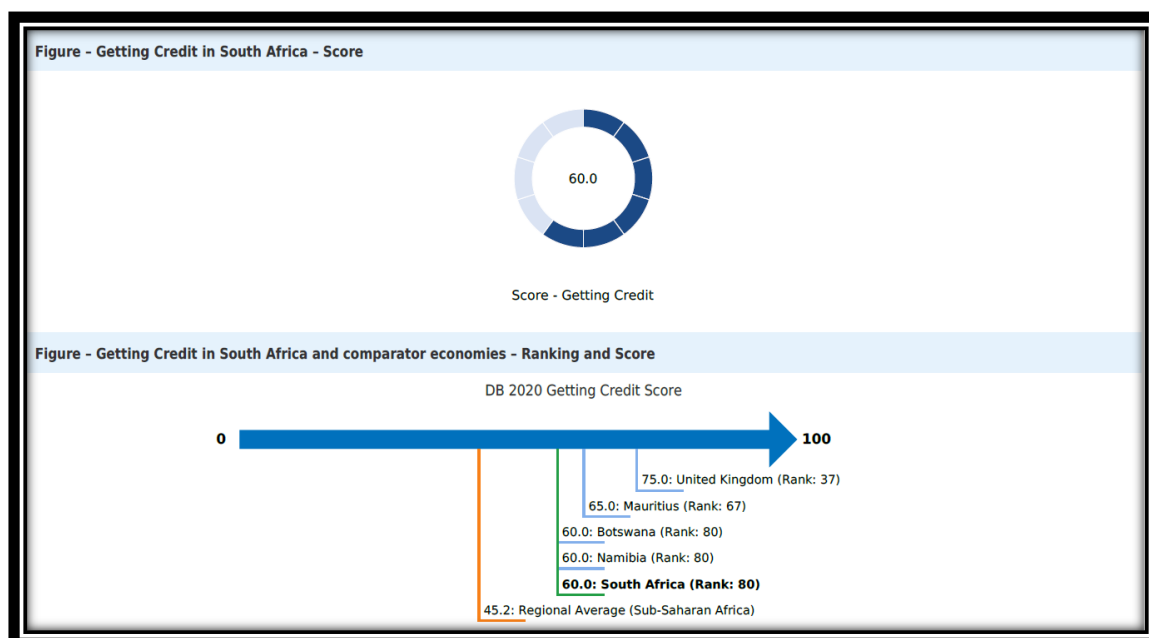


Figure 5-9 Getting credit as a cost of doing business.

Source: World bank, Cost to do business, 2020

According to the World Bank, South Africa is not the cheapest country to do business in, but it is not the most expensive either. Given the diversity of resources and climate in South Africa, it is worth braving the storms that occur in other challenges, as described above, to grow citrus in this country.

5.12 TECHNOLOGY

Technological progress was concentrated largely in agriculture as an area of development, as seen from the trends below. The main reason is that the industry offers so much potential in this respect.

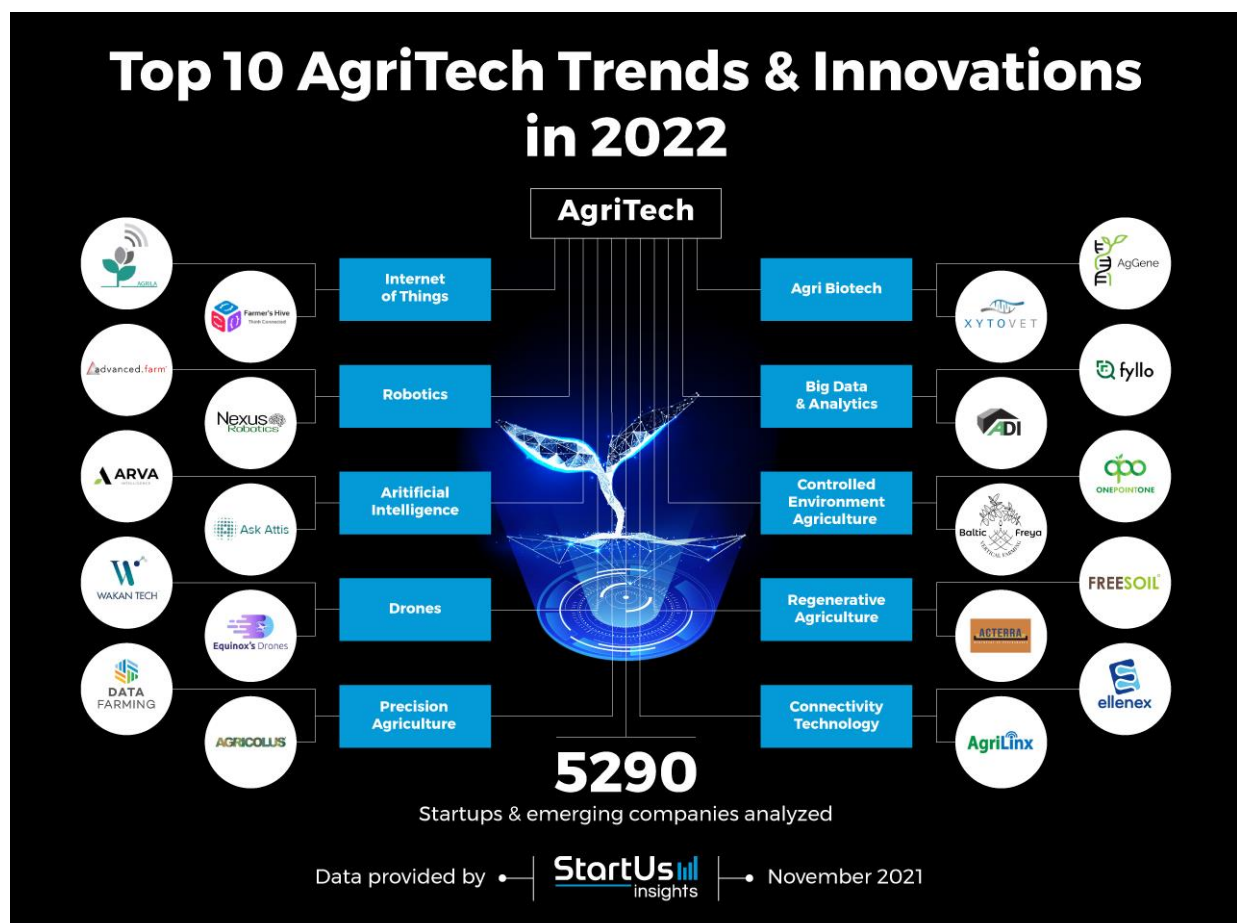


Figure 5-10 Top 10 agritech trends & innovations in 2022.

Source: Startus insights, 2022

Agricultural technology innovations are booming as farmers look for ways to improve efficiency while reducing costs. This is not a new phenomenon in agriculture, as can be deduced from the fact that agriculturalists have formulated their own term for it, which only applies to agriculture. It is a necessary precaution because of the pincer effect in agriculture, where costs are rising faster than income.

Table 5-2 shows a list of current innovation projects for the specific challenges of agriculture.

Table 5-2 Agricultural technology advancements in 2022.

Internet of things (IoT)	
Agrila	Is developing a modular IoT-based sensor station that allows you to measure important parameters such as soil moisture and temperature, wind speed and direction, rain, humidity, solar radiation and much more. The station is solar-powered and provides real-time alerts via mobile or web apps. In addition, the solution provides detailed graphs, reports and analysis of sensor data, enabling farmers to gain insights in an economical and efficient way
Farmer's hive	Addresses the need for instant remote monitoring of agricultural equipment, crops and microclimates. The startup develops sensors based on IoT technology for greenhouses, family farms and fruit growers. It offers cloud services that directly shop the data and detailed metrics measured by these sensors.
Agricultural robotics	
Advanced farm	It uses robotics technology to develop solutions for autonomous harvesting and navigation in the fields. They use robots equipped with stereo cameras to detect and pick fresh fruits and vegetables based on size and ripeness. They are also developing food-safe grippers to separate fruit from plants. They are also developing autonomous tractors and hybrid electric drive systems that allow farmers to automate extensive work with less time and effort
Nexus robotics	Le Chevre, a robot that detects and removes weeds from fields. The robot uses deep learning algorithms and cameras to distinguish between weeds and crops. In this way, the robot can correctly identify the weeds and then remove them without damaging the crops. It also collects data on the growing conditions of the crops and allows farmers to use this data to make informed decisions
Artificial intelligence	
Arwa Intelligence	Uses artificial intelligence to provide tailored crop planning recommendations. The startup is developing a software interface that brings together all agricultural data to perform detailed analyses on genetics, soil fertility, climate, harvest and yield. They offer intelligent soil and climate classification solutions that are specifically tailored to the crops grown in the field. They also facilitate crop analysis by creating farm-level report cards that allow farmers to identify limiting factors and analyse the performance of field inputs for crops
Ask attis	Offers plant disease detection through its app Planticus. Using artificial intelligence, the mobile app identifies diseases and detects pests in plants. The start-up company ensures food safety by developing identification technologies and plant monitoring solutions that enable farmers to secure their harvests before potential damage occurs
Drones	
Wakan Tech	Innovative drone solutions for aerial pollination of date palms. They are developing drones for plant health monitoring and targeted spraying of pesticides and pollen. Their drones pollinate the trees with liquid or dry pollen and are much faster than traditional pollination methods. These drones are equipped with AI and computer vision technology to detect pests and diseased date palms. This allows for faster and more accurate targeting and spraying, especially on large farms.
Equinox's drones	Uses drone technology to provide numerous services such as crop monitoring, aerial inspection, data processing and data analytics. The company offers aerial mapping solutions using ortho-mosaic maps, 3D point clouds, digital models, contour maps and more. The startup processes images and videos from drones to facilitate aerial crop inspection and data analysis. It also offers crop yield estimates based on data collected by drones.
Precision agriculture	
Data farming	Offers digital solutions in precision agriculture through paid cloud services. Their cloud-based platform, The Digital Agronomist, includes tools such as satellite imagery, soil mapping, auto-zone and more that provide farmers with actionable field insights. The solution offers free soil mapping with NDVI, high-resolution satellite imagery and variable rate technology. The variable rate application ensures that the application rate of agricultural inputs is based on the exact location, enabling precise farming.
Agricolus	Is developing many tools for precision agriculture to improve farm management. They use satellites and drones to calculate parameters related to vigour, water stress and chlorophyll quantity. They also develop maps that allow variable application of fertilisers and other inputs. In addition, the startup provides traceability of farming operations and performance analysis through its hardware, AgriPlug. Overall, the solutions optimise production with the right treatment and inputs while reducing the administrative costs incurred.

Agricultural biotechnology

AgGene	Uses plant breeding techniques to develop seeds and tissues with increased protein content. They specialise in manipulating genes for protein enrichment. The start-up company is responding to the increasing global demand for plant proteins. It also uses genetic editing platforms, including CRISPR and MAD7, to introduce desired traits into commercial crops.
XytoVet	Breeding techniques for sheep, cattle and aquaculture. Their DNA technology assigns the correct parentage to sheep and cattle, helping farmers quickly identify the good herd. The startup also works to improve aquaculture by selecting genes with higher growth rates and disease resistance. The company offers a range of genetic analyses to help farmers make better livestock decisions.

Big data & analytics

Fyllo	Uses cloud services to analyse farm data. Devices are installed across the farm to collect data and generate reports. The startup creates models with real-time farm data to help farmers understand their crops' needs, irrigation requirements, pests and diseases. They also provide a personalised fertilisation plan for crops based on soil data analysis.
AgriData innovations	Facilitates the collection, analysis and visualisation of operational data, especially from greenhouses. ADI develops embedded data transmission and control software. The company specialises in subdividing from an image to a specific leaf of the plant, enabling farmers to make accurate decisions. In addition, the startup uses neural networks and image processing to measure crop health, leaf size and more. The insights from the data analysis and visualisation improve the overall productivity and operation of greenhouses.

Controlled environment agriculture

OnePointOne	Builds a vertical aeroponic cultivation space. They use vertical farming techniques to find space-saving, water-saving and labour-saving solutions. They also use hyperspectral, high-resolution imagery to analyse the crops on the farm. The startup also offers farmers personalised farming and nutrition services.
Baltic Freya	Identifies existing problems in the field of hydroponics and aeroponics in order to develop a new and improved technique of misting. Plants grown hydroponically are at risk of root diseases, while aeroponics often involves the use of multiple nozzles. Existing fogponics techniques can overheat the nutrient solution or break the piezoceramic discs. Therefore, the start-up company has developed Fogponics 2.0, which ensures optimal fog formation so that the solution does not overheat and the discs do not break. This maintains and improves the care and functionality of the environment in which the plants grow.

Regenerative agriculture

Freesoil	Develops a high-quality plant-based compost extract for the soil. Once applied to the soil, the compost extract is naturally selected by the plants, ensuring its applicability to multiple crops. They also regularly add microorganisms to the soil. This promotes symbiosis between plants and microbes and ultimately leads to nutrient-rich soil. Their solution therefore allows plants to grow in healthier soil, making them more resistant to disease.
Acterra	Fermentation technology for composting, seed, soil, and residue treatments. They develop a compost additive that accelerates matter breakdown, reduces the need for chemical fertilizers, and also enriches the existing manure with nutrients. Moreover, their method sequesters carbon into the soil making it a sustainable solution.

Connectivity technologies

Ellenex	A wide range of agricultural sensor products powered by connectivity technologies such as LoRaWAN, low-power satellite, Sigfox and low-power WiFi, to name a few. These network technologies support battery-powered devices that are used to measure pressure, flow, level, water quality and temperature. This helps in timely monitoring of the farm as farmers can easily access accurate data.
AgriLinx	Developing its FLEX network, a LoRaWAN network that provides up to 5 miles of low-bandwidth data coverage. It helps farmers access agricultural data on their mobile devices and track irrigation, farm equipment and more. The startup also offers wireless backhubs to connect remote farming locations to internet services. This ensures full connectivity in the fields for proper farm management.

Source: Startus insights, Top 10 agriculture trends for 2022

There seems to be a whole range of technological developments that enable farmers to achieve better quality, higher yields, and lower costs. The only two current obstacles are the willingness to use and trust the technology and the financial means to acquire it. All the innovative companies mentioned above are based abroad and would welcome the opportunity to test their technology on South African citrus farms. Therefore, this option should be explored.

5.13 RESOURCES, NATURAL AND OTHER

Resources are used to produce food, fuel, and raw materials to manufacture goods. Citrus farmers in South Africa should master the skill of using resources even when they are abundant.

- *Natural resources* such as water should be carefully managed and conserved as much as possible. Automation of irrigation saves water by irrigating just the right amount of water without wasting it. Environmental resources include the right amount of sunshine, cold weather when citrus needs colour, and insects that help pollinate flowers. Other insects, in turn, are natural predators and limit the occurrence of pests.
- *Human resources*, like natural resources, are commodities that citrus growers cannot do without. External people as resources can be beneficial to citrus growers. Consultants or outsourcing give growers access to specialised skills and expertise they may not be able to afford or lack in-house due to shortages in the employment market. Citrus farmers should encourage their staff to broaden their horizons and invest in continuous learning to empower their people.
- *Assets* as a resource include the land to be farmed, buildings, implements, tractors, packing machines and computers. The riskiest asset in South Africa is land, even if you own it. Due to land claims, the land is no longer safe, even if the farmer paid for it with his hard-earned money. There is no viable plan to secure land, at least not without government involvement, and so this remains a critical risk. A crucial difference in land security will be achieved when the government

stops implementing land reform for political reasons and starts changing the approach to business principles and the goal of food security. Movable assets and computers are essential for agriculture, and automation requires their modernisation and replacement. The availability of financial resources is important, as this type of upgrading is usually financed because of the high capital outlay. Funding is limited due to uncertainty over land claims.

- *Mineral resources* are also important to farming. A total of 41 mineral raw materials are used in agriculture to produce fertilisers, pesticides, soil improvers and animal feed, as well as for food storage and processing (Wolfbauer, 1977). Agriculture use three major nutrients Nitrogen (N), Phosphorous (P), and Potassium (K) to manufacture fertilisers. Organic fertilisers with a high nitrogen content include urea, which is obtained from urine, feathers, dried blood, and blood meal. Most of these are mined and converted into fertilisers to improve soil and grow food. South Africa imports large volumes of Urea that cannot be supplied locally from Eastern Europe, which is exchange rate sensitive. Farmers have enough leftover materials to make compost, which is much better for soil quality than artificial fertilisers. It supplies fertilising, improves the soil structure, and reduce compacting of the soil.
- *Financial resources* are the funds and assets used to finance an organisation's activities and investments, such as upgrading and renewing equipment. Simply put, financial resources are the funds that keep an organisation running, and there are various ways in which an organisation can raise and use its financial resources. Financial resources can be obtained by making and retaining profits. This is the ideal way of funding, but as citrus is a seasonal product, this is not always possible. Farmers can borrow money from financial institutions and other financiers such as venture capitalists, trade credit from suppliers, government grants and subsidies, and family and friends when retained profits are unavailable. Money is an indispensable and rare resource in citrus or any other agriculture, especially because of rising costs.
- The *resources information/knowledge/core competences* could be the least considered resources as far as could be determined. This research could not find published information on the ideal exchange rate for an industry heavily dependent on exports. It is easy to advise farmers to hedge their currencies, but it is not so easy to suggest a minimum exchange rate required because the industry has no

such information. These calculations are done on farms where the financial staff are suitably qualified, and these are the larger farms where these jobs are justified and can be afforded. Many smaller citrus operations employ "experience-trained" finance and other staff, which prevents them from having quality information if they cannot get it from the industry. Trained staff are often found among accountants, farm managers and HR, and bona fide business is common in agriculture. Perhaps it is because of the succession of children taking over the farm from their parents or what the farm can afford. Whatever the case, education is a big gap, and the quality and availability of information prevent farmers on smaller farms from making sound decisions.

5.14 RELATED AND SUPPORTING INDUSTRIES

The following citrus value chain provides a complete overview of the industries that support citrus production. Associated industry means the same general industry or sector as the citrus grower or a company that contracts with other companies in the citrus grower's industry or sector. To make a comparison: Plumbing would be an industry associated with general construction. Other industries are linked to the individual clusters and serve as supporting industries. These supporting industries include real estate, construction, banking, education, and maintenance services.

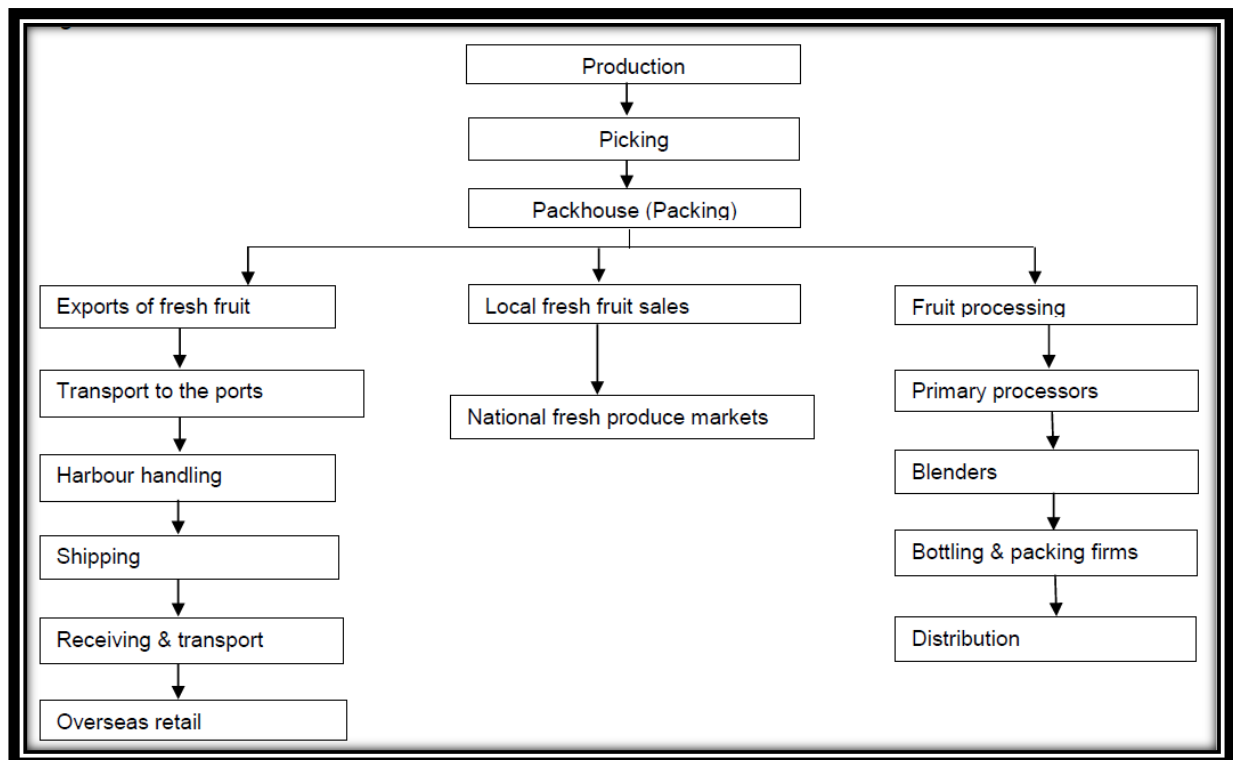


Figure 5-11 Overview of the citrus fruit production value chain.

Source: Innovation and inclusion in agro-processing. Citrus in South Africa. 2020

5.14.1 Related industries in citrus fruit production are the following:

- Packhouses* are crucial to citrus production in South Africa, as the majority of citrus is exported, and for this, the products need to be packed to certain specifications for certain markets. Numerous quality checks are carried out in the packhouses. In the packhouses, the fruit is chemically treated to make it shiny and preserve it, and it is sorted according to size, packed in boxes and stacked on pallets. Packing used to be very labour-intensive, but the equipment in the packing houses can now be largely automated, as handling the fruit could affect the quality. This specific automation entails machines to vacuum suck the fruit in layers and pack it into boxes. Automation is expensive, and the remaining employees need to understand the equipment's programmes and workings. Therefore, the remaining staff will be employed at a higher level with higher salaries. It is advantageous because there are fewer staffing problems but it is not necessarily cheaper. The sorting machines

in older packing houses are already very advanced, using cameras that can measure size, colour and defects and send goods to a specific line accordingly.

- The distribution channels, for example, road transport, rail transport and shipping, unfortunately, also play a decisive role in citrus cultivation. Currently, Transnet manages both train services and ports poorly. This has already been discussed in detail earlier in this document, and the inefficiency of this service is damaging the industry. Not much more can be said about this than that the condition of the roads during road transport has an impact on the condition of the pallets and boxes and even the fruit inside. Dawie Roodt, chief economist of the Efficient Group, has recommended that the government privatise Transnet to solve the service quality problems and make the company profitable again (Roodt, 2022). This research sides with Mr Roodt in this regard.
- The *sales channels* for citrus fruits are somewhat limited. The export of Class I, Class II, and processing and processed fruits are the main channels. The local market for citrus is very limited due to a large amount of citrus produced. Juice factories buy the fruits that cannot be exported or sold locally and are sorted out in packing houses. The best part of each season's harvest is exchange rate dependent, and in a country like South Africa with an extremely volatile currency, it is best to hedge the exchange rate. It is also not advisable to hedge because, being a developing country with a high political risk, it is more likely that the exchange rate will deteriorate, which is beneficial for exporters. The decision to hedge or not, is dependent on the risk profile, risk appetite and other factors. It is advisable to hedge only a part of the projected revenue. At least, it creates predictability and helps with management planning and decision-making. The citrus industry should also explore diversifying sales channels by creating more outlets and options, such as canning or drying, to extend shelf life and reduce the risk of having only channels that could destroy the industry.
- *Processing factories* produce citrus juices that are sold locally and, in many cases, exported. Processing factories consume the rest of the harvest that cannot be sold overseas and is not needed in local and informal markets. This is an important function because it involves little to no risk, apart from oversupply in some seasons. There are also processing factories in Middle Eastern countries to which these culling fruits can be sold, but these carry the same risks and costs as the

class I and II fruits, and the returns often do not justify the additional risk. Nonetheless, they play an important role because local processing factories cannot process all the fruits in the processing class and these overseas factories also often share their profit with farmers through the South African export agents. The latter, in turn, includes it in return for the farmer. This return is less problematic as the performance of the export agents is measured by the return, and they have this profit to improve the return.

5.14.2 The production of citrus fruits is supported by the following industries:

- *Research and development* are extremely important and grossly underestimated in the citrus industry. In South Africa, the Citrus Growers Association (CGA) and the Citrus Research International (CRI) are institutions to which citrus growers pay levies to fund research on behalf of growers. To ensure the sustainability of the commodity, it is increasingly important to develop varieties that have a longer shelf life, are less susceptible to pests and diseases and produce higher yields. In addition, automation will eliminate other problems in the industry and independence from water and electricity will be very important.
- *Repair and maintenance* of equipment and vehicles, as well as packaging machinery, is an important support activity, and training and development of personnel in automation and mechanisation should not be ignored. People providing repair and maintenance services need to keep up with new technologies and not resist modernisation, improvement, and innovation as this hinders progress. Maintenance of automated and mechanised processes and equipment should be done locally, as international travel for imported services makes automation and mechanisation unaffordable.
- *Cold stores* in ports are very efficient, but the general management of the ports themselves hinders the service they can provide. Usually, port workers' strikes result in trucks not being able to enter and leave the ports, causing cold storage facilities to consume electricity even though they are half full, negatively affecting their profitability and, indirectly, that of the farmers. These private companies tend to pass on a part of their profits to the citrus export agents, who often share it with the farmers. Some agents do not share these rebates with their producers. This

type of profit sharing should be legally enforceable under the Agricultural Produce Agents Council Act (SA, 1992). Currently, some export agents share these rebates with their growers, while others keep the money in addition to the commission they charge, as this is not detailed in the law regulating agents. Since the fruits never become the property of an agent and agents only process/handle the fruits on behalf of the producers, the rebate should remain the property of the producer and not the agent. This should be clearly described in the APAC law and enforced.

- *Freight forwarding* companies are private companies familiar with the different entry requirements of the various countries where South Africa exports its fruit. They also have relationships with shipping companies and can organise loading space on ships and containers. Very few export agents handle these logistics in-house, as it is a specialised service that depends a lot on relationships. Freight forwarding companies also share their profits with export companies, which should be subject to the same laws as refrigerated warehouses/cold stores.

5.15 GOVERNMENT ATTITUDE AND POLICIES

The South African government is overwhelmed with its inherited problems from its predecessor as it was stressed in many news broadcasts. The Covid-19 outbreak exacerbated this in 2020, and additional resources were deployed to contain the virus. The government seems to have a positive attitude towards the citrus industry, as evidenced by the president's willingness to travel at relatively short notice to negotiate with the European president when citrus containers were stopped at EU ports due to new entry regulations. The president and his government seem to understand the contribution of citrus to the country's economy and support it. However, the government could do more to help with the risks to the citrus industry's sustainability. Still, the government is not doing so because the industry is supported by strong private bodies such as AgriSA, CGA, FPEF, and DALLRD did not act decisively. The unfortunate thing about the government is that it runs companies with politics, as seen in SAA, Transnet, Eskom, and other state-owned companies. Policies are formulated to gain political favour rather than to grow the economy and create sustainable jobs. Apart from the need to relax policies

and regulations so that farmers can continue to create jobs and to consider actual business principles when formulating laws, the government should also support the citrus industry and not be a burden that complicates business. Interventions should make business easier for citrus growers, not more complicated. The modernisation and improvement of infrastructure under the control of the government should take priority over all other expenditures. More than that, protecting infrastructure from vandalism and privatisation should be an active issue in parliament.

5.16 SUMMARY

Now that it has been established that South Africa has a strong competitive advantage in the citrus industry globally and is the largest competitor in the Southern Hemisphere, the risks threatening the sustainability thereof, will be illustrated using the Swiss Cheese disaster prediction model. This model was first formulated by James Reason and subsequently adapted by the researcher.

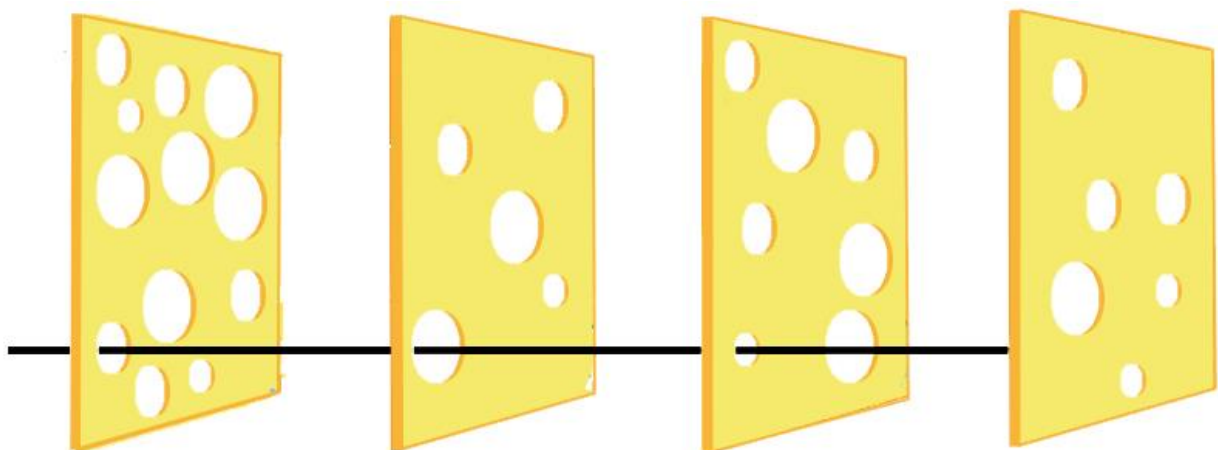


Figure 5-12 Swiss cheese illustration reflecting South African citrus industry

The model illustrates that there are different levels of defence against disasters, and each level has holes representing the defence's weaknesses. The significance of the hole size

is the problem's size within the level of defence. Larger holes represent larger inefficiencies, and smaller holes represent smaller, insignificant inefficiencies that have been ignored. When four holes line up in the four defence cheeses, there is a probability that a disaster will occur. The disaster referred to in this context is the partial or complete collapse of the industry due to sustainability risks.

The model illustrates that the first level of defence against the disaster of industry failure is South African government intervention, legislation, service delivery and administrative failures, such as port congestion, looting and road conditions. This daunting defence will not be improved overnight. The forecasts predict the situation will improve in the long term, but possibly not under the ANC government. Therefore the government cannot at this time provide disaster protection for the citrus industry, which is not an essential service to them.

The second level of defence is macroeconomic and, like the first level, cannot be controlled by the farmer. These are exchange rates, the availability of imported agricultural inputs and transport, and interest rates.

The third defence depends on the farmer's willingness to innovate and keep up with technology, for example biofuel, solar energy, automation, and modern technology. This stage is better adopted by commercial farmers and used as a defence. Here the farmer can turn the cheese so that the holes do not line up and prevent a disaster, but only if the farmer is willing to adapt. The farmer himself can control the third level of defence, but there are some obstacles.

The last level of defence is under the farmer's control. This includes activities the farmer usually does well anyway, such as quality, quantity, compliance with treatment regulations, and labour laws. At this level, the cheese is most easily turned, but sometimes it is too late when the conscious admission of approaching disaster is ignored. Most commercial farmers have turned this cheese and are still sustainable, but smaller farmers have not and have failed.

CHAPTER 6 SUMMARY OF FINDINGS AND RECOMMENDATIONS

6.1 INTRODUCTION

During the research, all possible excuses that the responsible bodies could use were eliminated before the main research question was answered. One possible excuse could be competitiveness, comparativeness, and contribution to the economy. It has been proven that South African citrus has a good competitive and comparative advantage in international markets. It contributes significantly to the South African economy by creating jobs, supporting related industries and having a big positive net export that leads to an inflow of foreign exchange and a positive impact on the country's trade balance. So, it is confirmed that citrus is important to the country, materially and strategically, and is an industry worth supporting.

The results of the calculations from chapter 4 reflected in Table 6-1 below demonstrate a significant competitive and comparative advantage and a positive trade balance:

Table 6-1 Results of comparative and competitive advantage calculations

		2019	2020	2021	Indication
RCA	Relative revealed comparative trade advantage index	3.58	3.52	3.44	>1 competitive advantage
RTAij	Relative Trade Advantage	1 363 362	1 701 484	1 833 662	>1 competitive advantage
RTAiW	Relative Trade Advantage-World	-930 792	-943 416	-1 434 899	>1 competitive advantage
NXI	Net export index	99%	99%	99%	100% = 0 import
CMS	Constant Market share	10.8%	11.7%	12.9%	Growth in constant market share over 3 years

A value greater than 1 under RCA and RTA indicates a comparative advantage, and a value less than 1 indicates a comparative disadvantage. The net export index shows that South Africa exports far more citrus than it imports. And the constant market share grows from year to year.

South Africa has an absolute trade advantage over the citrus-producing countries of the Northern Hemisphere because it can produce citrus more efficiently and cheaply than these countries (Figure 5-4). South Africa can produce citrus at a lower opportunity cost than Northern Hemisphere countries so that trade can benefit both countries. If these two

countries have different relative efficiencies, they can benefit from trading with each other. Considering this argument minimises the risk of global citrus overproduction.

6.2 ANSWERING THE RESEARCH OBJECTIVES AND RESEARCH QUESTIONS

6.2.1 General research question:

Citrus production in South Africa is sustainable overall but is largely affected by risks and inefficiencies beyond the producer's control. It has an excellent competitive and comparative advantage and great opportunities for expansion and collaboration with countries in the Northern Hemisphere. The industry is a boon to the South African economy and to public health and food security. So, the general answer to the research question is yes. Some adjustments from the South African government are needed to overcome the difficulties. However, the South African government is constantly constrained by crisis management in other industries, and because the citrus industry is functioning without their intervention, not much is done. By not proactively mitigating the risks of the citrus industry, the government is preparing for more crisis management in the future. In the absence of the government itself, sub-committees can be set up to deal with non-critical industry problems. Still, they are often unqualified, sometimes corrupt, and ineffective, and only cost the government money unnecessarily, cause frustration in the industry and do not bring solutions to the table. Such committees also do not have enough influence in government to address and actively change things that pose a risk to the citrus industry. However, such committees are usually less politically driven. Be that as it may, there is currently no capacity in government for improvement. It's all about repair and recovery. According to the Swiss cheese model, the South African government does not offer citrus farmers protection from risks. Instead, the government actually increases some of the existing risks.

6.2.2 Specific research questions:

Political risks are material and critical to the continuation of citrus production in South Africa. The risk is that business sectors are affected by decisions that are driven by popularity and political gain. When it comes to business decisions, the principles applied must be business principles and nothing else. Industries become consumables for the government if profitable businesses with excellent prospects are allowed to be used for any other purpose by people who have no consequences to fear if they make mistakes. Therefore, land reform must be suspended until proper information on the original objective of land claims and progress to date is available and verified. In addition, farms with profitable operations must be excluded from the reform, and empty land can be distributed and developed. It is essential to do this publicly and visibly as this will restore investor confidence in South Africa's agriculture and open many doors for financing of innovative and expansive technologies.

BBBEE and minimum wages, compared to productivity, are less critical to the sustainability of citrus farming in South Africa. While it is true that minimum wages have increased more than productivity, this increase is not nearly as significant as the increases in other inputs, and farmers can optimise their operations to increase labour efficiency. Since this is within the farmer's control, the risk is not critical. Citrus farmers in South Africa should empower themselves to optimise their operations by being less negative about innovation and technology. #In the absence or failure of school education in South Africa, some farms build schools for the children of their employees, but this is a high cost for the farms, which only the commercial farmers can afford. However, this is only one solution to the education problem in South Africa, while the real solution lies again with the government. Higher-quality schools are the first step to improving the workforce. This will also happen in the longer term, and there is a void in the immediate vicinity. Citrus farmers can also provide scholarships for their workers' children to study horticulture after school, thus creating a generation of BBBEE managers for the farms. The current training through the SETA is showing good results, and many small and medium citrus farmers are participating. Still, the learning material is limited and only delivers up to a certain level of worker.

The *macroeconomic challenges* are broken down into smaller units due to the different intensities of the risks of the individual elements. Key factors considered in agriculture in the South African and global macroeconomy are exchange rates, international trade, foreign and domestic income, unemployment, interest rates, shipping rates and energy costs. Interest rates are currently not harmful to citrus farmers unless they are already over-indebted. The study indicated that citrus farming is a high-risk business. These risks are also prevalent in other agricultural industries in South Africa. The risks are mainly a result of land claims, multiple farm attacks, and murders, the risk in lending to farmers is high (and, therefore the lender takes a higher rate of return), climate change and labour. On the other hand, the weak Rand exchange rates favour the citrus industry which is very dependent on exports; therefore, this risk is lower. Moreover, there are opportunities for farmers to insure or hedge themselves against the exchange rate risk. The sea freight and its associated costs (as discussed in Section 5.5) remain a major risk, and significant cost increases over a short time have been introduced. This risk is inevitable as there are no alternatives to shipping produce abroad. A manageable macroeconomic is the high energy cost to the agricultural sector compared to other sectors (such as mining, for example). This is under government control, and tariffs should be negotiated between the AgriSA, CGA and Eskom. Farmers also have the option of installing solar systems or other renewable energy. As a result, the energy risks are declining and are no longer regarded to be a critical risk.

South Africa is still in the fortunate position that the *water crisis* relates more to the quality of water due to inadequate sanitation than to water availability. This does not mean that water availability will not become a critical issue soon. However, at present, water is not critical in the citrus industry. Water must still be bootstrapped, used sparingly, and treated as a scarce resource, even though it is not classified as a critical risk. Wastewater disposal is under the control of the government and needs to be improved, and with it, the reuse of wastewater needs to become a common practice. Wastewater treatment plants must stop using chemicals and switch to natural wastewater systems by providing land for natural wastewater treatment plants. These are called wetlands and are much healthier for the environment, and water can be reused after treatment (Koottatep, 2004).

The electricity crisis highlighted the risk of dependency on Eskom and its inability to supply sufficient electricity to the country. This is detrimental to irrigation schedules and can result in production losses. There is also the danger of exponential price increases that could realise in the foreseeable future. The recommendation is that individual farmers install solar or other renewable energy sources to limit their dependency on Eskom and rather use the money previously paid for electricity to make down payments on capital installations of renewable energy. This solution is also within reach of the citrus farmers and would not be considered a critical risk.

Some farmers regard fair trade as problematic, while others see it as an opportunity. Fairtrade aims to pay developing countries a fair price for their products, but a fair price is a relative principle. As discussed in Section 5.3, it became clear that South Africa receives a lower price for its products compared to other countries in the Southern Hemisphere. This is also true for some European competitors. South Africa receives a lower price for citrus than Spain, mainly because Spain can produce citrus at a different time of year and in larger quantities. If a farm competes in a market with perfect competition, prices should theoretically be higher if demand exceeds supply. Likewise, when supply exceeds demand, prices will be lower. It then stands to reason that given the larger quantities produced by the Northern Hemisphere countries, which they sell in the same market that South Africa does, these countries should realise lower prices. However, this scenario poses an opportunity. For example, if Spain can produce a different commodity at a lower price while South Africa can take some of Spain's citrus production, this trade will benefit both countries. This is an avenue to explore through research to develop methods to store citrus for longer, methods to extend the citrus season in South Africa, and perhaps also varieties that bear fruit in the Spanish season. If such an agreement could be negotiated, South Africa would automatically receive a higher price for its products. Spain would benefit from the other produce (of higher value) they replace citrus with. Such partnerships could be considered and negotiated by the CGA but require the trust of both parties. In such a long-term strategy, the government, land reform and the country's security will play an important role.

6.3 SUMMARY OF THE RESEARCH FINDINGS

The summary of findings in Table 6-2 explains how the finding is important or relevant to the aim and focus of this study. It is a simple summary illustrating which of the identified risks are high. High risks can potentially destroy the citrus industry and cannot be mitigated or influenced by the farmer. Medium risks are still severe but can be somewhat controlled or influenced by the farmer. Low risks can be controlled by the farmer and must not be used as an excuse for failure.

Table 6-2 Summary of the research findings

RISK	RATING
Political risks	
Land claims	High
BBBEE and minimum wages	
Enforcement of BBBEE	Medium
Minimum wages	Low
School education system	High
Macro-economic challenges	
Exchange rate	Low
Interest rates	Low with potential to become medium
Shipping cost and availability	High
Water crisis	
Availability	Low with potential to become medium
Quality	High
Electricity crisis	
Availability	Low
Cost	Low
Fairtrade	
Threat of low prices	Medium
Fertiliser availability & cost	High

Fuel availability & cost	High
Harbours inefficiency	High
Trains inefficiency	Low

6.4 CONCLUSION

Citrus in South Africa has a global advantage but is threatened by land claims, poor schooling, and water quality as major risks under the control of the South African government. Sea freight costs are a more difficult problem, and apart from buying their own ships, there will be little relief in this area. BBBEE enforcement is driven by the same government that provides poor schooling and is a medium risk to the continuation of citrus farming. Low prices are a medium risk that can be negotiated with the customer abroad but cannot be controlled by South African farmers or the controlling bodies on the ground, so international partnerships will be very important. Interest rates and the availability of water are low risks, but they can become significant risks soon if they are not controlled actively. Cheap finance is hard to find due to the lack of confidence in South African agriculture, and this is part of the risk of land claims and security. Water resources need to be conserved and proactively protected. Exchange rates, minimum wages, electricity shortages and prices can be managed successfully by farmers, and these are not significant risks.

6.5 RECOMMENDATIONS AND STRATEGIES TO DIMINISH THE RISK OF THE SOUTH AFRICAN CITRUS INDUSTRY

Land claims, poor schooling and water quality, are problems controlled by the government, and solutions should be relatively easy to formulate through a cooperative agreement between the citrus industry and the Ministry of Agriculture. Land claims, as mentioned earlier, should be dealt with publicly and with business principles by the South African government to build investor confidence. Politicians should find another way to gain support and exploit land claims because that is outdated and destructive to the economy.

The enforcement of BBBEE should be made conditional on the improvement of school education, as this is the government's biggest failure that is hindering change. This must be made public because BBBEE is another law that hinders foreign investment in South Africa, preventing innovation and expansion. This changed approach to BBBEE enforcement will benefit the citrus industry in South Africa, all other businesses, and the country's economy. Another risk that goes hand in hand with this is the lack of discipline in South African harbours. State-owned enterprises should not allow their employees to hold various industries hostage, as with the strikes at Eskom and Transnet. These, like the emergency services, should not be allowed to strike.

The CGA should address the threat of unfairly low prices, fair trade with the countries concerned, and possible cooperation agreements between South Africa and Northern Hemisphere producers, which could bring funding opportunities.

Water availability can be secured by investing in natural sanitation plants and reusing water. Fertilisers and fuel can be locally produced depending on the availability of funding and ease of regulations by the government.

The risk of minimum wages can be minimised by optimising processes on farms and through automation. Although automation is associated with unemployment, it does not have to be because the funds can be used for expansion, and there is more than enough scope for this in South Africa. This is also related to the problem of schooling, as higher-skilled personnel will be needed to ensure employment in an automated environment. It is further related to the problem of investor confidence since expansion requires finance, and expansion creates jobs.

Exchange rates could be hedged. Power generation and clean renewables are linked to investor confidence risk as these projects are usually financed.

It seems that the solutions to most of the critical problems in the citrus industry boil down to investor confidence, heavily influenced by land claims, BBBEE and poor schooling, all controlled by the South African government. The good thing is that the government is also the government of the citrus industry in South Africa; therefore, the problems are solvable.

6.6 AREAS FOR FUTURE RESEARCH

An important area for further research is another channel for export. Although all other risk factors are manageable for citrus in South Africa, the constant and escalating conditions at the ports can nullify them. There needs to be a strong competitor to ocean freight suppliers for citrus exports that limit price increases and improve availability of loading space. The current sea freight suppliers have unlimited power to increase prices, and this was not healthy in the past two years.

Further research can be conducted to find more effective and efficient methods and practises of land reform, improving the management of export agents and renewable energy, sanitation, and reuse of water resources for agriculture, and more durable solutions for road infrastructure.

These items on the agenda of citrus industry improvements should be a top priority.

6.7 SUMMARY

This study examined the risks of citrus farming in South Africa. The study consists of six chapters.

Chapter one provides a comprehensive overview of the citrus industry in South Africa, articulates the problem, justifies the study, and sets out the objectives that the researcher hopes to achieve through this study. Chapter two consists of the literature review of this industry, the conceptualisation of the framework and the definition of the risks affecting sustainability in the industry by establishing dependent and independent risk variables. It also describes the review of the risk analysis. Chapter three provides a global perspective on citrus worldwide. It describes all the trends of all the factors affecting the industry. It discusses everything mentioned under the research questions, as well as the market share and contribution of the industry to the South African economy. Chapter four gives the methodology and model specifications that isolate the study areas and discusses the methodology. The models used to measure the comparability of the South African citrus

industry with its competitors are various trade advantage models, the net export index, Porter's competitive diamond model and constant market share. Chapter five looks at the damage caused to the industry and various related industries by the different risks and discusses the interpretation of the results. Chapter six explains the results and recommends solutions to mitigate the risks studied.

The conclusion would be that the industry is strong and has a competitive and comparative advantage in international markets. However, its sustainability is at risk due to various challenges, but it seems to be able to mitigate these and thereby increase the industry's value.

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ANNEXURE

Annexure A



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To whom it may concern

Re: Confirmation of language edit, typography and technical precision

The MBA dissertation "**An evaluation of the risks in South African citrus farming**" by **A de Bruin (32021844)** was edited for language and technical precision. The referencing and sources were checked, and it complies with the Harvard guidelines specified by the 2020 NWU Reference guide.

Final, last-minute corrections remain the responsibility of the author.

Antoinette Bisschoff

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Precision ... to the last letter