

**A competitive advantage analysis of South African vegetable
sector: tomatoes, carrots and onions.**

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Thesis submitted in partial fulfilment of the requirements for the degree of
Master of Science in Agriculture (Agricultural Economics) in the faculty of
AgriSciences at Stellenbosch University



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March 2021

Declaration

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Abstract

The purpose of this study is to measure and analyze the competitive performance of South African vegetable sector; specifically, tomatoes, carrots and onions, in the African market, with emphasis on the recent years (2001 - 2018).

A comprehensive approach is applied using an analytical framework that analyses the sector both quantitatively and qualitatively in order to highlight factors that enhance and constraint the sectors' competitive advantage.

Quantitatively, the study measured the competitive advantage of the South African vegetable sector using three indexes: relative trade advantage (RTA), relative comparative advantage (RCA), and net export index (NXi). The results show that South African vegetables (collectively) did not have a comparative advantage, neither are they competitive in the African market, however NXi values are quite high, showing that the vegetable sector is a net exporter. Individually, carrots and onions are found to be comparative and competitive in the African market, whereas tomatoes are neither comparative nor competitive. All three vegetables have high NXi values reflecting that the individual vegetables are net exporters. Main competitors in the African market for these three vegetables included Egypt, Morocco, Belgium and Netherlands.

Qualitatively, a Vegetable Executive Survey (VES) of sector role players was conducted using a two rounds Delphi technique in order to identify factors that are enhancing and constraining the vegetable sector. A total of 48 factors are identified and they are rated on a five-point Likert - scale, with 5 being the most enhancing and 1 being the most constraining. Among other factors these are the most constraining factors, input cost, credibility of political system, land reform policy, social unrest and crime. Enhancing factors of South African vegetable sector includes expenditure on research and development, size of local and international market, consumer information of vegetables and economies of scale. The rated factors are grouped/clustered into the six determinants of Porter's diamond model. The results showed that demand conditions, firm strategy, structure and rivalry, and related and supporting industries factors are the

vegetables sector's enhancing determinants. Government support and policy, factor conditions and chance factors are South African vegetable sector's constraining determinants.

Opsomming

Die doelwit van hierdie studie was om die mededingende prestasie van die Suid-Afrikaanse groentesektor te meet en te analiseer; spesifiek tamaties, wortels en uie, in die Afrika-mark, met die klem op die afgelope jare (2001 - 2018).

'n Omvattende benadering was toegepas met behulp van 'n analitiese raamwerk wat die sektor sowel kwantitatief asook kwalitatief analiseer om faktore wat die sektore se mededingende voordeel versterk en beperk, uit te lig.

Kwantitatief het die studie die mededingende voordeel van die Suid-Afrikaanse groentesektor gemeet aan die hand van drie indekse: onthulde vergelykende voordeel (RCA), relatiewe handelsvoordeel (RTA) en netto uitvoerindeks (NXi). Die resultate toon dat Suid-Afrikaanse groente (gesamentlik) nie 'n vergelykende voordeel gehad het nie, en ook nie mededingend op die Afrika-mark is nie, maar die NXi-waardes is redelik hoog, wat toon dat die groentesektor die netto uitvoerder is. Wortels en uie individueel word vergelykend en kompetend gevind in die Afrika-mark, terwyl tamaties nie vergelykend of kompetend is nie. Al drie die groente tipes het hoë NXi-waardes wat weerspieël dat die individuele groente netto-uitvoerders is. Die belangrikste mededingers op die Afrika-mark vir hierdie drie groente tipes was Egipte, Marokko, België en Nederland.

Daar was kwalitatief 'n groente-uitvoerende opname (VES) gedoen van sektorrolspelers met behulp van die Delphi-tegniek van twee rondes om faktore te identifiseer wat die groentesektor verbeter en beperk. 'n Totaal van 48 faktore word geïdentifiseer en word op 'n vyfpunt Likertskaal geëvalueer waarvan 5 die mees versterkend en 1 as die mees stremmend identifiseer word. Onder meer is die mees stremmende faktore insetkoste, geloofwaardigheid van die politieke stelsel, grondhervormingsbeleid, sosiale onrus en misdaad. Versterkingsfaktore van die Suid-Afrikaanse groentesektor sluit in besteding aan navorsing en ontwikkeling, grootte van plaaslike en internasionale mark, verbruikers kennis van groente en ekonomie van skaal. Die gegradeerde faktore word gegroepeer in ses determinante van Porter se diamantmodel. Die resultate toon dat die

vraagstoestand, sakestrategie, struktuur en mededinging, en verwante en ondersteunende bedrywe die groentesektor se versterkende determinate is. Die regeringsondersteuning en -belied, faktortoestand en toevallige faktore is die stremmende determinate van die Suid-Afrikaanse groentesektor.

Dedication

This thesis is dedicated to my late mother, Viola Sanganza; my siblings Chris and Patience, your support and love have made me reach this milestone. Finally, to my soul mate Alice, thank you for your unselfish devotion and support.

Acknowledgements

I wish to express my sincere gratitude to the following people and institutions that assisted me in different ways to make this study a success, without them this task would have been impossible:

Ms Lulama Ndobongo-Traub, for her valuable guidance and leadership throughout this research.

I would also like to thank the following institutions for providing relevant information and personnel that is vital for this study: Korkom, Fresh Produce Exporters' Forum (FPEF), Fresh Produce Importers Association (FPIA), Produce Market Association (PMA) and Fresh Produce Market (FPM) –Tshwane.

Vegetable Executive Survey (VES) participants that took part in the survey, your expert opinions and contributions are vital for the completion of this study.

My friends and family, especially my fellow postgraduates students, Dr Shepherd Mudavanhu, Johann Boonzaaier, Ayabonga Sibulali and Thabile Nkunjana for your constant guidance and support throughout this research.

Finally, to God almighty – for giving me the ability, strengths, wisdom and perseverance to finish this research.

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List of Abbreviations

AfCFTA	African Continental Free Trade Area
ARC	Agriculture Research Council
DAFF	Department of Agriculture Forest and fisheries
DDM	Double diamond model
GCI	Global Competitiveness Index
GDDM	Generalized double diamond model
GDP	Gross Domestic Product
FAO	Food and Agricultural Organization of the United Nations
FPEF	Fresh Produce Exporters' Forum
FPIA	Fresh Produce Importers Association
FPM	Fresh Produce Market
ITC	International Trade Centre
NXi	Net Exporter's index
PMA	Produce Market Association
PPECB	Perishable Products Exporters Control Board
R&D	Research and Development
RCA	Revealed comparative advantage
RMA	Relative Import advantage
RTA	Relative Trade Advantage
RXA	Relative Export Advantage
SA	South Africa
SACU	Southern African Customs Union
SADC	Southern African Development Community
SANSOR	South African National Seed Organization
SSA	Statistics South Africa
TPO	Tomato Producers' Organization
USD	United States Dollar
VES	Vegetable Executive Survey

Chapter 1: Introduction

1.1 Background

Trade liberalization, and the attending globalization, has led to governments and firms evaluating their competitive advantage in global markets. Competitive advantage is a necessity for long-term sustainability of the agricultural sector, therefore businesses along a value chain must position themselves to be competitive in the world market, Van Rooyen *et al*, (2011). South Africa is part of the global economy following deregulation in the mid-1990s, which implies that the economy faces fierce competition in global markets (Chitiga *et al*, 2008; Ortman, 2000).

The agricultural sector contribution to the South African economy has always been vital both direct and indirect. Greyling, (2012) states that the role that agriculture plays was, and will always be, increasing food supply for domestic consumption, releasing labor for industrial employment, enlarging the market for industrial output, increasing the supply of domestic savings and earning foreign exchange through agricultural exports, as a result of these reasons, the sector needs to be kept updated and competitive.

According to Kirsten, (1999) the future of the agricultural sector depends largely on its ability to compete effectively and efficiently in the world market, this can be achieved by trading more efficiently and effectively with high quality products and high technological ways of producing products.

The theory of competitive advantage has been applied to many sectors in South Africa. It builds on the theory of absolute and comparative advantage that was introduced by classical economist Adam Smith and David Ricardo however it dates to the mercantile system in the 1500s. The theory of competitive advantage provides a better analysis for modern day trade in combination with Porter's diamond framework. It provides information to nations in terms of how to create an environment that will encourage birth of new firms, as well as an environment that encourages or motivates firms to be competitive and sustainable. One of the reasons why Porter's diamond framework is so useful is because older economic trade theories like absolute and comparative advantage

of the classical economist does not adequately explain the modern trade patterns, (Feesta, 2015). The theory has been applied in a wide range of studies in agriculture, ranging from dairy farming, sheep farming, stone fruit, apples, potatoes, subtropical fruits, wheat, value chains of different commodities examples of these studies includes, (Vink *et al*, 1998, Esterhuizen, 2006, Stroebel and Jooste, 2010, Ntombela and Khlenhans, 2011, Jafta, 2014, Boonzaaier, 2015, Reynolds, 2017, Dlikilili, 2018). However, there has not been many competitive advantage studies for South African vegetables.¹

In the budget speech of Trade, Industry and Economic Development by Minister Ebrahim Patel (2019), he stated that African countries were in negotiations to finalize the African Continental Free Trade Area (AfCFTA), with 54 countries already signed the agreement and 27 countries already ratified it (which was intended to come into effect in July 2020, but due to the COVID-19 pandemic it was delayed to January 2021). In his address he also highlighted that about 250 000 South African jobs are supported by exports to Africa. Given these statistics, this makes the African market particularly important, hence this study is going to put much emphasis on the competitive advantage of South African vegetables (tomatoes, carrots and onions) in the African market.

A total approximate production for all three vegetables of 3 630 189 tones, and a collective export income of approximately \$52.6 million US dollars (USD) in year 2018 (FAO, 2019; ITC, 2019), It is of no doubt that these three vegetables are valuable to the agricultural sector.

One of the reasons that the vegetable sector has not received much attention on the topic of competitive advantage is that majority of vegetables in general are regarded as low value products. However, in 2018, Netherlands exported approximately \$676 million US dollars' worth of onions, Morocco exported approximately \$687 million US dollars' worth of tomatoes in 2018 and China exported approximately \$397 million US dollars' worth of carrots in the same year, (ITC, 2019). Therefore, exporting of vegetables is a lucrative business, the questions to be answered are how and where tomatoes, carrots and onions of South Africa should be exported. Using secondary data (FAO stats and ITC trade data), and primary data (vegetable executive survey) this study seeks to provide trends, factors

¹ South African potatoes are the only vegetable that has had a competitive advantage study done on, by Stroebel and Jooste, (2010).

affecting the industries' competitive advantage and then propose strategies and ideas that decision makers in the vegetable (tomatoes, carrots and onions) sector could consider in their decision making.

This study focuses on the competitive advantage of South African vegetable sector (tomatoes, carrots and onions) in the African market. The study will put much emphasis on the past two decades. The vegetables sector's contribution to the economy, ranges from employment, food security, foreign currency, medicinal, region development, etc, hence competitiveness of this sector becomes very vital to continue supporting the economy and ultimately survival of the fierce global competition.

1.2 Problem statement, Study Objectives, Research Question and Hypothesis

The South African vegetables sector is currently not as export oriented as compared to the fruit industry, with majority of the vegetable products being sold in the local market through both formal and informal channels. The exports of these vegetables are mainly into the SADC and SACU region, with a small percentage being exported to Europe and United Kingdom. Over the past two decades the collective trading of the three vegetables are showing an increase in exports, an increase from value of \$4.8² million US dollars in 2001 to 52.6 million US dollars in 2018 and quantity moved from 31 600 tones in 2001 to 148 300 tones, (ITC, 2019). Given the potential export earning of these vegetables a competitive study measuring the competitiveness of South African exports into the African market had to be done, in order to determine the trend over time and factors influencing this sector's competitive advantage and long-term sustainability.

The challenge of this study is to develop strategies and interventions that would address the constraining factors and promote enhancing factors of tomatoes, carrots and onions. Identification and analyzing of these factors therefore become important components in the research problem of this study.

² Take note that ITC did not include SACU data from 2001 – 2009.

1.2.2. Study Objectives

The objective of this study is to look at the competitive advantage of the South African vegetables, (tomatoes, carrots and onions) in the African market where majority of these vegetables are exported to, however a global overview will be briefly highlighted in the study. The competitive advantage of South African vegetable sector is not determined by one factor. Factors to look at includes, the value of the Rand, productivity, market strategy, advances in information and technology, trade, local sales, consumer preferences, research and development, firm strategy and government support.

The primary objective of this study is to design and conduct a systematic description and comprehensive analysis of the competitive advantage of the South African vegetable sector (tomatoes, carrots and onions) in the African market to address this objective, the study will analyze the competitive performance of South African vegetable sector by identifying key attributes that affect competitive advantage and propose possible strategies to enhance competitive advantage of the sector.

1.2.3. Research questions

It is evident that the South African vegetables exports (tomatoes, carrots and onions) has been increasing in volume and value for the past two decades, hence there is need to look at the competitive advantage of the sector and how the sector can be both internationally and locally competitive, as a result the research questions to be answered include:

- ❖ How competitive is the South African vegetable sector relative to competitors in the African market?
- ❖ What are the factors that affect or drive competitive advantage of this sector?

1.2.4 Hypothesis

The following hypothesis are designed to guide the analyses and interpretation of the outcomes of this study:

- ❖ South African tomatoes, carrots and onions are competitive relative to the leading exporters in the African market.
- ❖ Competitive advantage of the vegetable sector (tomatoes, carrots and onions) is determined by multiple factors. The range of these factors includes government policies, productivity, exchange rate, trade, skilled labor and firm strategies, etc.
- ❖ The South African vegetable sector has to invest more into technology, new markets and skilled labor for long term sustainability of the sector.

1.3. Analytical framework and research methodology

Guided by the research questions, hypothesis and objectives, the research makes use of the quantitative and qualitative analysis to identify key components that constraints or enhances the competitive advantage of South Africa vegetable sector (tomatoes, carrots and onions). To reach this goal the research made use of the following framework³:

- ❖ Define competitive advantage as it applies to South African vegetable sector.
- ❖ Measure the competitiveness and status of South African vegetable sector using RTA, RCA and NXi.
- ❖ Identify factors that affect the competitiveness of South African vegetable sector using a two rounds Delphi technique.
- ❖ Establish and analyze the major determinants of the sector, using the Porter diamond model.
- ❖ Propose strategies to enhance the competitive advantage of South African vegetable sector.

³ Refer to Appendix C for the detailed framework process.

1. 4. Delimitations and thesis outline of the study

This study analyzed the competitive advantage of the South African tomatoes, carrots and onions, not all the vegetables, although vegetable products are similar in terms of value chain, production, markets, transportation and to a lesser extent shelf life. The focus of this study is mainly on fresh tomatoes, carrots and onions, from the period of 2001 to 2018 in the African market, although a global perspective and trends of these vegetables are also briefly highlighted.

The study dealt with mainly historical analysis and it did not attempt to predict the future, but rather used the relevant historical data to suggest recommendations to enhance the competitive advantage of the South African vegetable sector.

The thesis is structured into six chapters. Chapter 1 presents an introduction of the study, and this includes the study research objective and questions, hypothesis, importance of the study and delimitations, respectively. Chapter 2 provides a descriptive overview of the South African vegetable sector, (tomatoes, onions and carrots), its importance to the South African economy and contribution to the gross domestic product (GDP). Relevant industry statistics and trends are also outlined. It also provides vegetable sector (tomatoes, carrots and onions) sector structure and value chains. Chapter 3 reviews the theory relevant to competitive advantage and its application to South African agriculture. The chapter also established a definition that will be applied to this study.

Chapter 4 presents the analytical framework of this study, outlining the methodology and data that is used. Chapter 5 presents the results of study: description, findings and interpretation of data. Chapter 6 provides conclusions and recommendations on how competitive advantage of the South African vegetable sector (tomatoes, carrots and onions) can be enhanced and sustained in the long run.

Chapter 2: Overview of the South African vegetable sector

2.1 Introduction

The main purpose of this chapter is to provide an overview of South African vegetable (tomatoes, carrots and onions) sector. The focus is to establish an understanding of the trends of tomatoes, carrots and onions in the African market, value chains and flow of product in different value chain channels of these vegetables are also discussed. The chapter begins with an overview of South African agriculture in general and its contribution to the economy.

2.2 Overview of South African agriculture sector

The importance of the agricultural sector in South Africa is often not given the credibility that it deserves, over 2.9 million individuals in South Africa are depended on the agriculture sector as stated by the Statistics South Africa (SSA), (2018), with 847 000 workers being recorded in the fourth quarter of 2017 and 843 000 workers in the first quarter of 2018 (SSA, 2018). Table below shows the employment distribution per province of workers in commercial agriculture. The Western Cape Province represents almost a quarter (22%) of the workers employed in commercial agriculture, with Limpopo province showing positive trend.

Table 2.1: Distribution of commercial agriculture workers by province.

Province	2017 (4 th Quarter)		2018 (1 st Quarter)	
Western Cape	193 000	23%	181 000	22%
Eastern Cape	94 000	11%	97 000	12%
Northern Cape	55 000	6%	44 000	5%
Free State	77 000	9%	71 000	8%
KwaZulu-Natal	106 000	13%	122 000	14%
North West	47 000	6%	43 000	5%
Gauteng	36 000	4%	32 000	4%
Mpumalanga	104 000	12%	94 000	11%
Limpopo	136 000	16%	158 000	19%
Total	847 000	100%	843 000	100%

Source: SSA, 2018

An estimation of 2.4% contribution to the GDP of South Africa from agriculture for year end 2018 season is noted DAFF, (2018). There is also a decline in the percentage contribution of agriculture to the South African GDP from 4.6% in 1994 to 2.4% in 2018, (DAFF, 2018). One of the many reasons being South African economy pie has become more diverse and agriculture now represents a smaller percentage of the pie. Despite the decline in percentage contribution to GDP, agriculture remains a significant employer and mostly in the rural areas of South Africa. It is also a major earner of foreign currency into the South African economy. Agricultural exports in season 2017 were estimated to be R126.82 billion, (DAFF, 2018). Fig 2.1 below shows the major entities of agriculture, in terms of value contribution. Take note that the horticulture sector represents approximately a quarter of the agriculture sector.

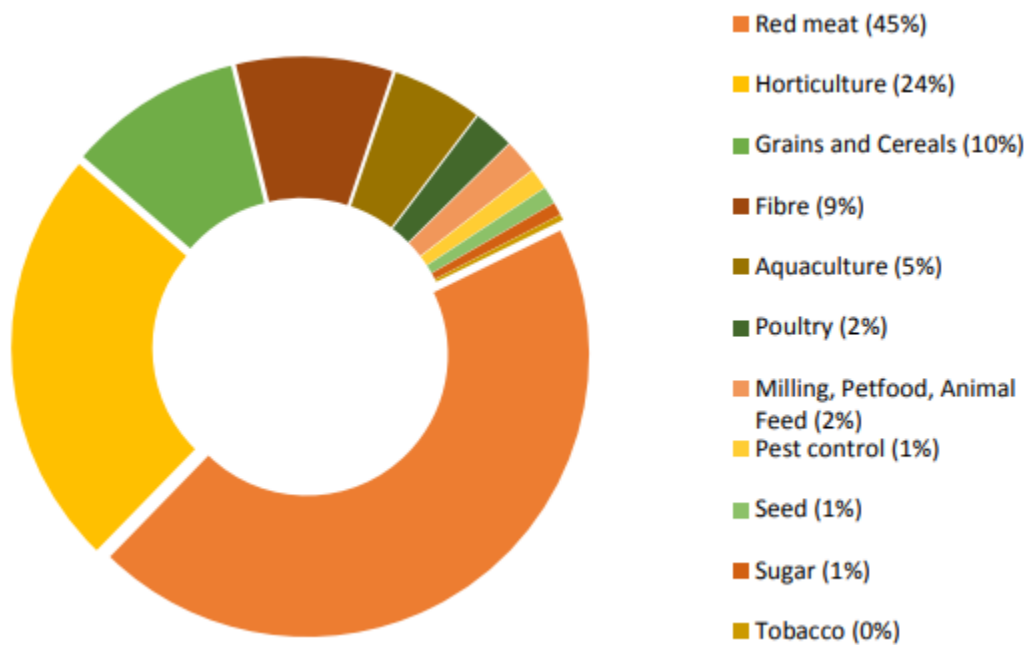


Fig 2.1 Major agriculture entities in South Africa (2016)
Adapted from AgriSETA, 2016

2.3 Global overview of vegetables (tomatoes, carrots and onions)

The future of the vegetable sector shows a positive trend, this is resulting from gradual shift from meat diets to more vegetable diet across the globe, health benefits associated with eating vegetables, low levels of cholesterol in vegetables and on average vegetables contains low calories. Tomatoes, onions and carrots have shown an increase in production over the last two decades (FAO, 2018), which can also be noticed by the tones of exports of these vegetables. Approximately a value of \$14.6 billion US dollar of these three vegetables were exported globally in the year 2018 an increase from approximately \$13.5 billion US dollar in 2017 and tomatoes accounted for more than 65% of the total value ITC, (2018), with the majority of trading happening in the European and Chinese market. Fig 2.2 below shows a gentle upward trend of the global three vegetables exports and imports.

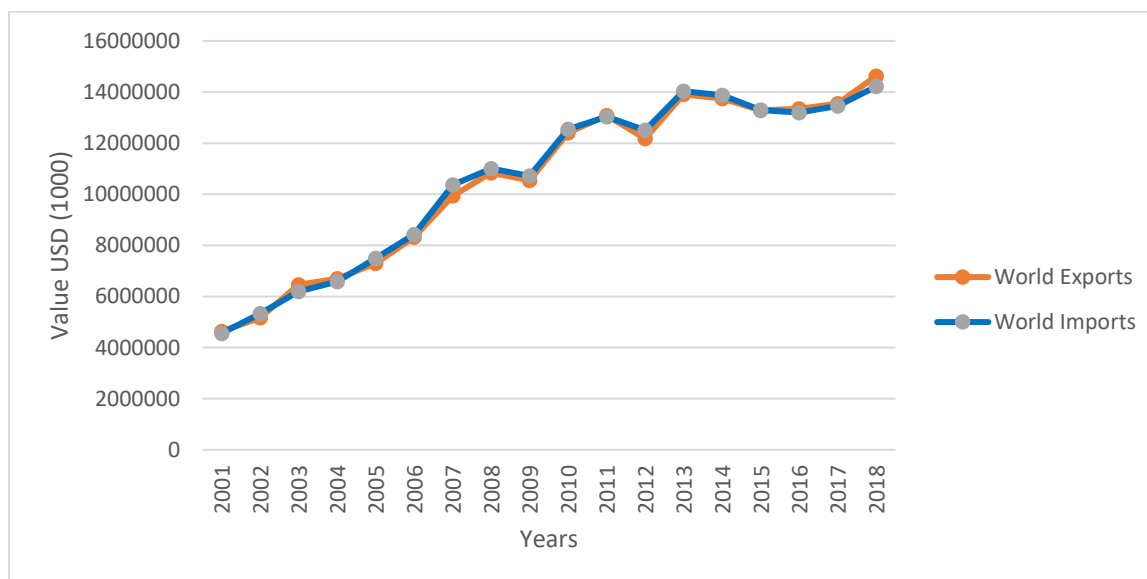


Fig 2.2 World imports and exports of the aggregated three vegetables (2001- 2018)
Source: Own calculations – ITC, 2019

In year 2017, the total production of these three vegetables amounted to approximately 300 million tones (tomatoes: 242 million tones; carrots: 64 million tones; onions: 6 million tones) and the area harvested was approximately 11 million ha globally, with onions area

harvested accounting for more than 48% of the area harvested for these three vegetables, (FAO, 2018).

In the African context, there was approximately \$ 266.4 million US dollars of these three vegetables that was imported in the year 2018, a decrease from \$279.6 million US dollars in year 2017, with Egypt, South Africa and Netherlands being the top exporters of these vegetables into the African market ITC, (2018). The total African production of these three vegetables for year 2017 was approximately 37.4 million tones and the area harvested was approximately 2.6 million ha (FAO, 2018). It can be concluded that the quantity of these three vegetables being traded globally has increased in the past two decades and it can also be concluded that global production of tomatoes, carrots and onions has also increased, this can be attributed to technology, growing demand – due to increasing population and also changing costumers taste and preferences, with increasing consumers moving away from animal-based diets.

Fig 2.3 below shows a comparison of South Africa and to the rest of world, in terms of production of tomatoes, carrots and onions from 2001 to 2017. South African tomatoes, carrots and onions makes a small share of production compared to the rest of world, according to the FAO, (2019) stats data.

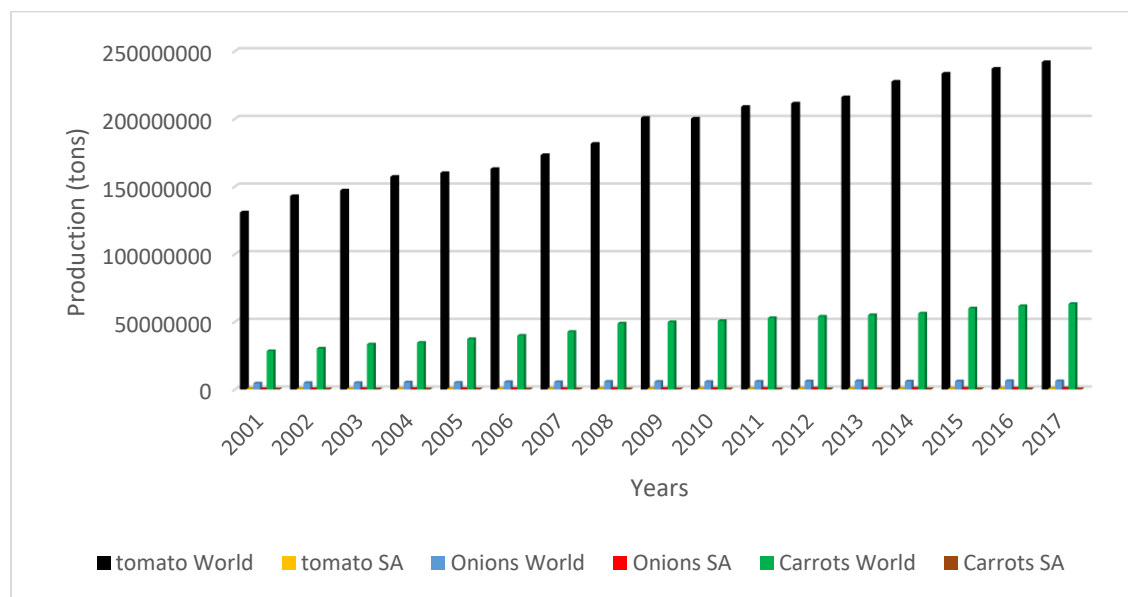


Fig 2.3 Total world vs South Africa production for the three vegetables
Source: Own calculation – FAO, 2019

2.4 Overview of the South Africa Vegetable Sector

The South African vegetable sector is quite big and diverse, it comprises of different products ranging from potatoes, sweet potatoes, tomatoes, Lettuce, Onions, cucumber, garlic, beetroot, cabbage, carrots (DAFF, 2018). Majority of these vegetables are sold locally through the Fresh Produce Markets (FPM) that are in all major cities of South Africa, retailers, processors and exports, respectively. Fig 2.4 below shows the share of different vegetables in the South African vegetable sector.

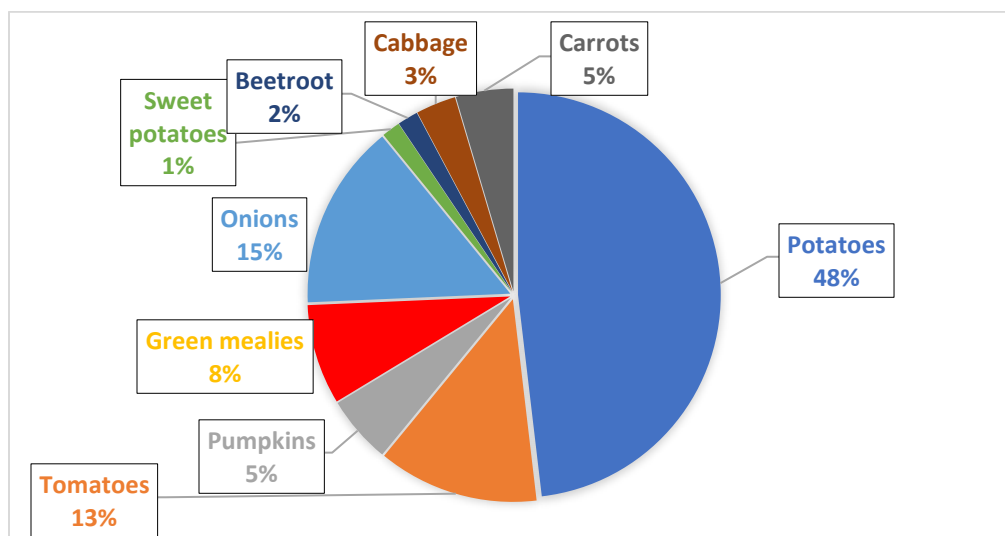


Fig 2.4 The share of different major vegetables of South Africa (DAFF, 2018)

2.4.1 South African vegetables export market and competitor's overview

It is evident in vast empirical literature that exporting economies are growing economies and that diversifying exports leads to better economic growth, Mathee *et al*, (2016) states that diversifying exports is beneficial especially for developing countries. Majority of the quantity of vegetables being studied are exported in the African market and specifically Southern African Development Community (SADC) and Southern African Customs Union (SACU), to a lesser extent these vegetables are exported to European and Asian market, highlighted by ITC and FAOSTATS data. Major competitors of South African vegetables (tomatoes, carrots and onions) in the African market includes Egypt, Morocco, Netherlands, Namibia and to a lesser extent Mozambique, Zimbabwe and Zambia. Fig

2.5 below shows a general overview of exports for Netherlands, Egypt, Morocco and SA into the African market for the three vegetables. It can be concluded that there is a gentle upward trend for all exporters of these vegetables into the African market, with Netherlands showing a much steeper upward graph.

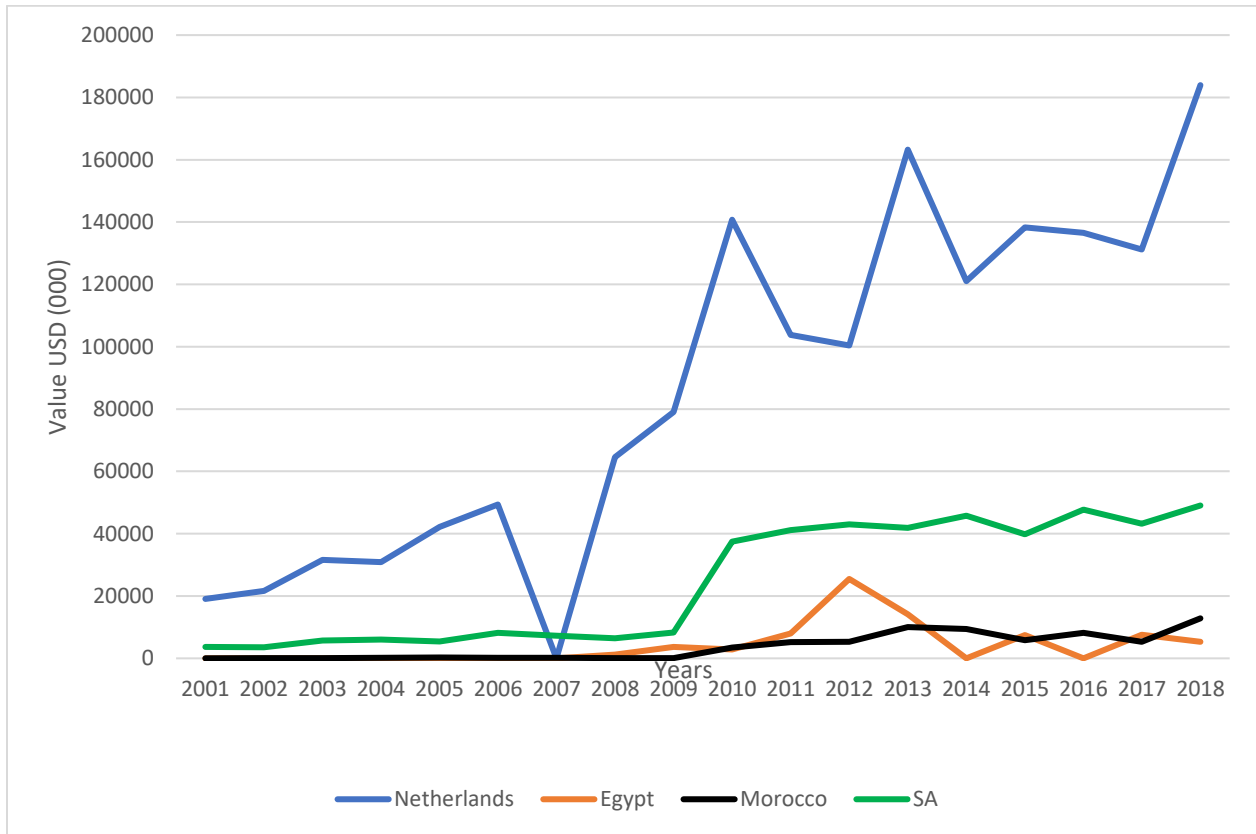


Fig 2.5 Aggregated tomatoes, carrots and onions exporters into the African market.

2.4.2 South African tomatoes overview

Scientifically known as *Solanum lycopersicum* tomatoes are the second most important vegetable by value in South Africa, according to DAFF, (2017a). The vegetable has been contributing more than approximately 15% to the total gross value of vegetables, and from year 2007 to 2016 the contribution of tomatoes to total gross value of vegetables has been increasing.

Tomatoes in South Africa are produced in all nine provinces, with Limpopo province producing more than the other eight provinces. Limpopo accounts for more than 75% of total area planted in South Africa.

Tomatoes in South Africa are marketed using four channels namely FPMs, exports, processing and direct marketing. South Africa is not a major exporter of tomatoes, it represents only 0.1% of world tomato exports, and it is ranked number 40 (ITC, 2019). The major exporters of tomatoes are Mexico (with 25% of total world export), Netherlands (18.9%), Spain (12.6%) and Morocco (6.1%). South Africa exports most of its tomatoes to African countries and especially Southern African countries like Botswana, Lesotho, Mozambique and Namibia. In terms of imports South Africa is a self-sufficient country in tomatoes. In 2016 majority of tomato imports came from Namibia.

The processing Industry for tomatoes includes canning, freezing, dehydration and juice production. Due to demand for convenience by customers, the canning industry of tomatoes has been increasing drastically, 112 998 tons of tomatoes were reported to be canned in year 2015, DAFF, (2017a). There was also a significant increase in frozen tomatoes (23.7% in 2016), also attributed to customer's needs for convenience.

The world biggest producer of tomatoes is China, followed by India, United States, Turkey, Egypt, Iran and Italy respectively. These countries produce more than 80% of world's tomatoes (FAO, 2019).

Fig 2.6 below shows South African tomato production and exports relative to the African production and exports. African production and exports exclude South African production and exports. It is evident from the figure below that South African tomato production and exports have a small market share in the Africa market. It is also evident that African

production has been increasing over the past two decades and that African exports are showing a steep upward trend.

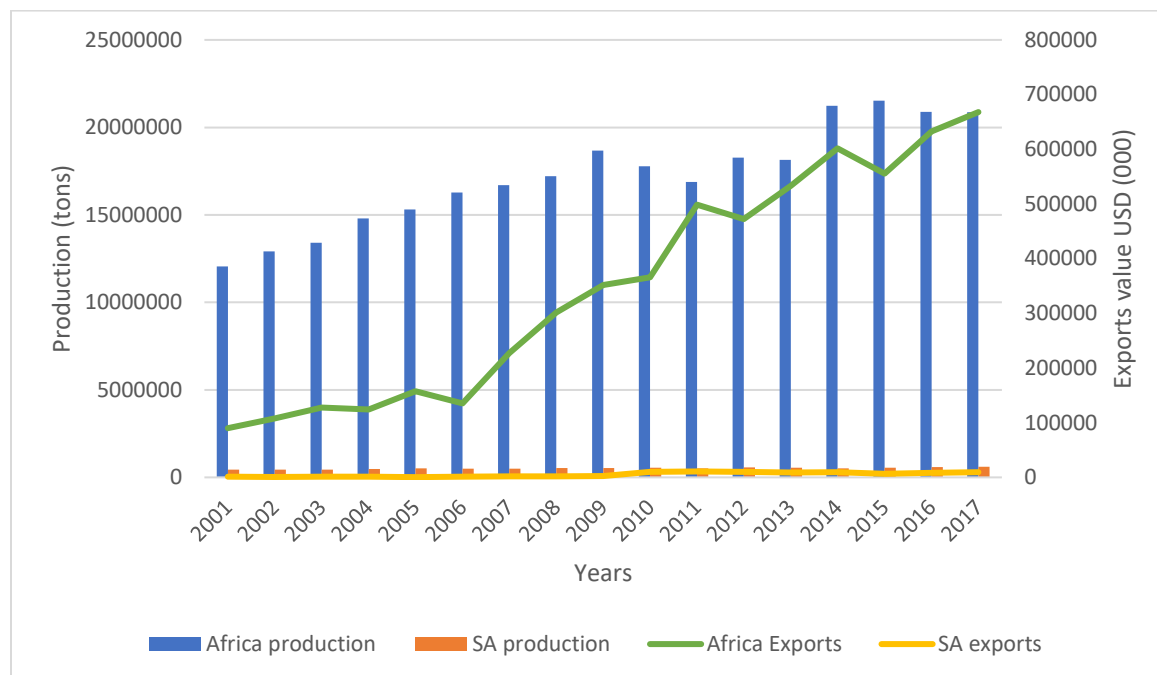


Fig 2.6 South Africa vs Africa tomatoes production (LHS) and South Africa vs Africa tomatoes exports (RHS).
Source: Own calculations (data - ITC, 2018; FAO, 2018)

2.4.2.1 South African tomatoes value chain season 2016/17

The tomato value chain comprises of seed producers, traders, packers and processors. In the season 2016/17 primary producers of tomatoes produced approximately 610 000 tons of tomatoes, of these 610 000 tones approximately 45% is distributed via the FPM, with quantity of 278 900 tones in that season. Processors which form a huge part of the tomato value chain recorded a quantity of 137 701 tones in the same season. Quantity of approximately 31 326 tons of tomatoes were exported in season 2016/17, which showed an increase from the previous season of 2015/16 (29 074 tones, ITC 2018). 7 317 tons of tomato imports were recorded in the same season, which was an increase from 5 491 tons of season 2015/16. There was a balance of 154 756 tones that was unaccounted, this was distributed though packers and retailers (informal and formal). Fig 2.7 below shows the simplified value chain and major linkages between the role players of the tomato sector of South Africa.

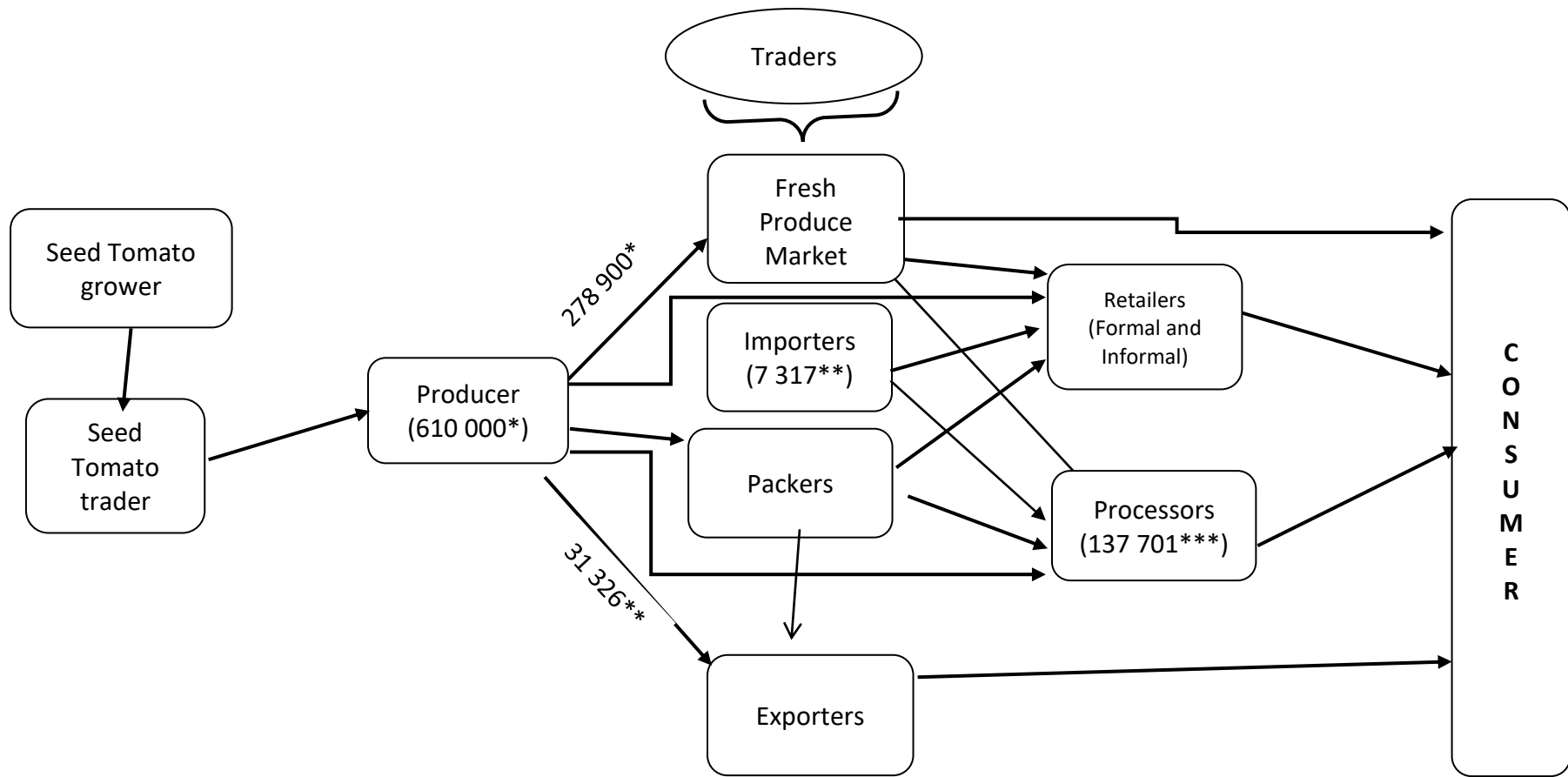


Fig 2.7 Tomatoes Value Chain Season 2016/17

source:

* --- DAFF, 2017

** --- ITC, 2017

*** --- DAFF, 2017

Balance 154 756 tones

2.4.3 South African carrots overview

Well known to be rich in Vitamin C, B1, B2 and carotene, carrots are one of the most valuable vegetables in South Africa. They are well known to be orange in color, but carrots can be white, red or white blend.

In South Africa carrots are grown in Western Cape, Gauteng, Free State, Kwazulu Natal and Mpumalanga. The biggest producers of carrots in the world are China, followed by Russia, United States of America, Poland, Ukraine and Morocco (DAFF, 2017b).

There has been an increase in both consumption and production of carrots in South Africa for the past decade. The sector makes use of the FPMs, formal and informal retails, processors and direct sells, with FPMs being the main channel of carrot marketing in South Africa (DAFF, 2017b). South Africa is not a major carrot exporter, in 2016 it represented only 0.7% of world exports, (ITC, 2019). Most of South African carrots exports are destined for Botswana, Mozambique, Angola, Namibia, United Kingdom, Lesotho and Swaziland. Globally major exporters are China, United States, Netherlands, Spain, Australia, Israel, Belgium and Mexico respectively. South Africa is also not a major importer of carrots. It imports majority of its imports from Belgium, United Kingdom and Zambia, (ITC, 2019).

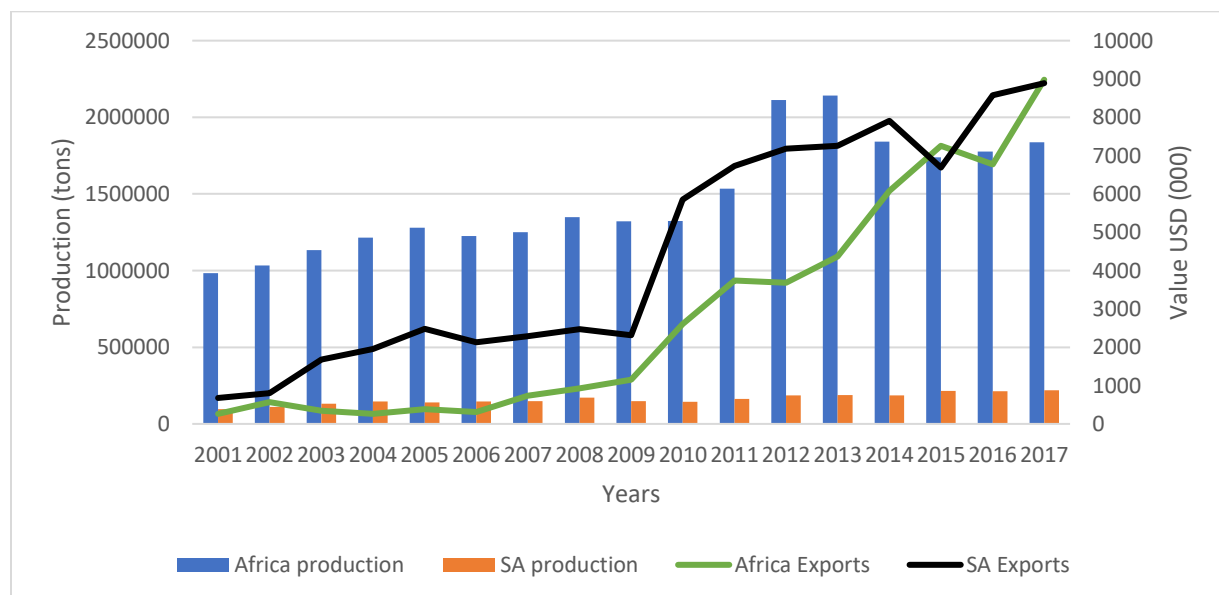


Fig 2.8 South Africa vs Africa carrots production (LHS) and South Africa vs Africa carrots exports (RHS). Source: Own calculations (data - ITC, 2018; FAO, 2018).

2.4.3.1 South African carrots value chain season 2016/17

With an increase in exports value from USD 677 000 and quantity of 2 105 tones in 2001 to USD 9 166 000 and quantity of 16 639 tones in 2018 ITC, (2019), carrots are showing positive export growth. The quantity produced by South African farmers was 218 000 tones in season 2016/17, of this quantity, majority of the product was distributed through FPMs. FPM recorded 131 500 tones for the season 2016/17, this is approximately 60% of the carrots produced. The quantity of 21 951 tons of carrots was processed, with 16 639 tons of carrots being exported in season 2016/2017, which showed a decrease from 20 114 tones in season 2015/16. Importers only imported 4 tons in season 2016/17, which also showed a decrease from 34 tons of season 2015/16. 47 906 tons of carrots was the balance that was distributed via retailers, both formal and informal, in the season 2016/17. Fig 2.9 below shows the simplified value chain and major linkages between the role players of the carrots sector of South Africa.

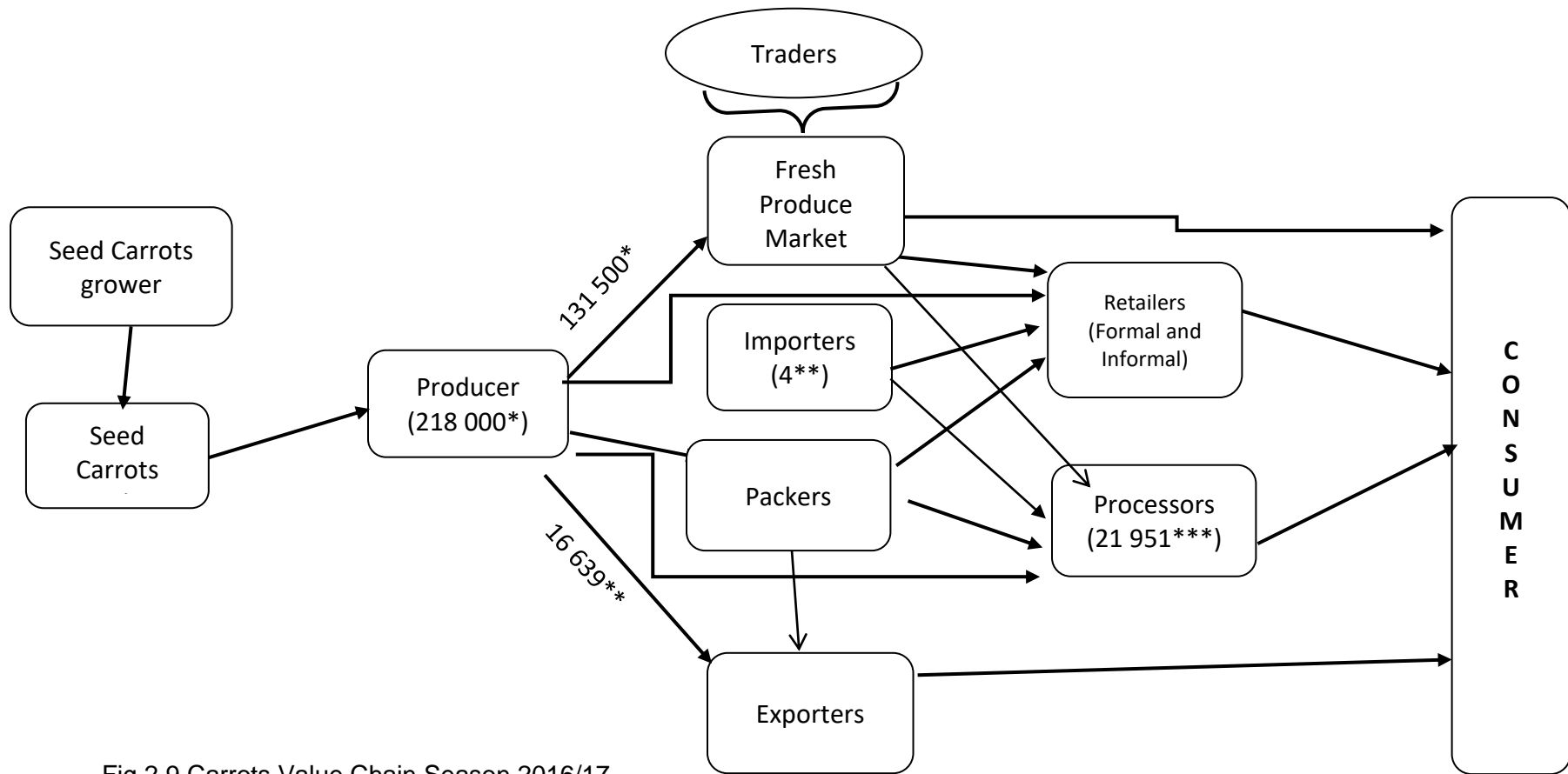


Fig 2.9 Carrots Value Chain Season 2016/17

source:

* --- DAFF, 2017

** --- ITC, 2017

*** --- DAFF, 2017

Balance 47 906 tones

2.4.4 South African onions overview

Onions are third most valuable vegetables in South Africa after potato and tomatoes respectively, (DAFF, 2017c). They are a good source of vitamin C, an antioxidant and are essential for uptake of iron. Another good thing about onions are the presents of phenolics, flavonoids that are anti-cancer and anti-cholesterol. Onions are produced in almost all the provinces of South Africa, but the major producers are Western Cape, Northern Cape, North West and Limpopo province. The major world producers are China, India, United States, Egypt, Iran and Turkey respectively. South Africa is also self-sufficient in onions, and it exports the rest. Onions just like tomatoes and carrots, majority of it are sold through the FPMs, other channels include informal market, processors and direct sells to wholesalers and retailers. South African onion exports contributes about 1.1% of the total world onion exports. Majority of the exports are destined in Africa and to a lesser extent Europe, and countries like Mozambique, Angola, Botswana and Namibia are the major importers. Major world exporters include Netherlands, China, Mexico, India, United States, Egypt and Spain. On imports, South Africa only import 0.01% of world imports, with most of the imports coming from Namibia.

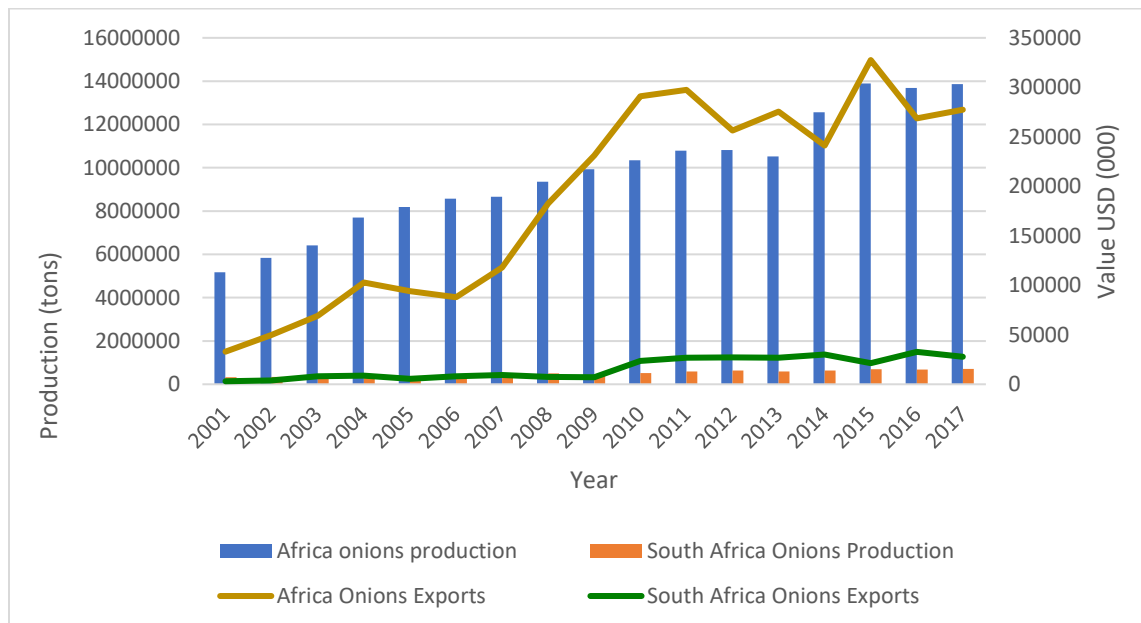


Fig 2.10: South Africa vs Africa onions production (LHS) and South Africa vs Africa onions exports (RHS). Source: Own calculations (data - ITC, 2018; FAO, 2018)

2.4.4.1 Onions value chain season 2016/17

Recording an export value of USD 33.2 million in 2018 season, onions are considered the third most important vegetable in terms of value contribution to the vegetable gross value in South Africa, (ITC, 2019; DAFF, 2017). South African onion primary producers managed to produce 704 000 tons of onions in season 2016/17, with imports being 6 349 tones in the same season as shown in Fig 2.11 below. Majority of the product produced, approximately 50% was distributed through the tradition route of vegetables FPM, with quantity of 395 900 tones in the season 2016/17 sold using through FPM. ITC, 2018 recorded a quantity of 106 064 tons of onions exported, that was a slight increase from the previous season, which recorded 104 172 tones. The onion processing industry of South African is still small, with only 5 524 tons of onions being distributed through this route. Retailers (informal and formal) had approximately 190 163 tons of onions distributed using this channel. Fig 2.11 below shows the simplified value chain and major linkages between the role players of the onions sector of South Africa.

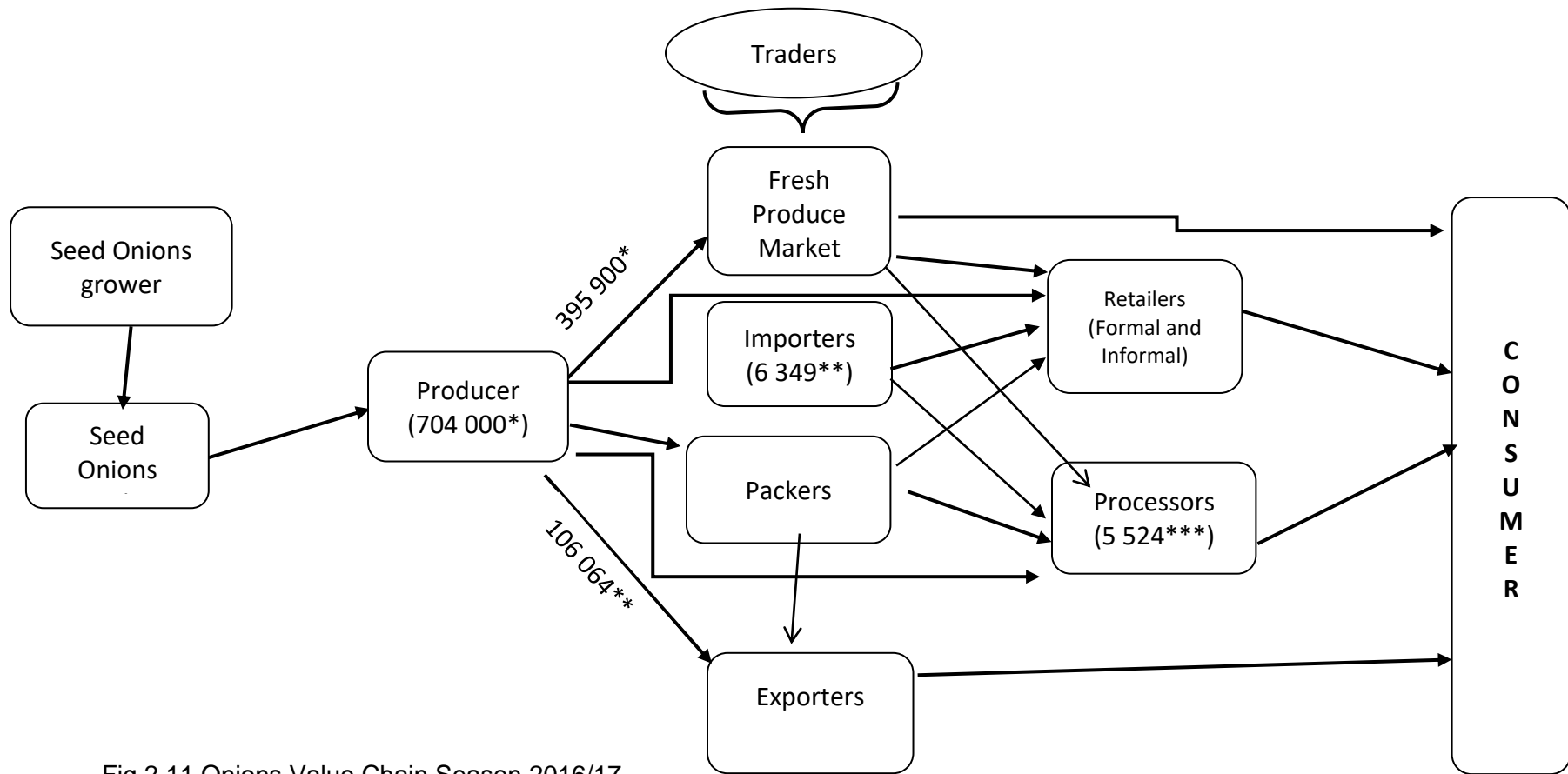


Fig 2.11 Onions Value Chain Season 2016/17

source:

* --- DAFF, 2017

** --- ITC, 2017

*** --- DAFF, 2017

Balance 190 163 tones

2.5 Sector Institutional structures

The agricultural sector went through a lot of changes after the deregulation process in the mid – 1990s. As a result of the deregulation, there were formations of industry organizations and associations. The main reasons for formations of organizations and associations were to provide information to industry's decision makers. As new markets started to open and increasing exposure to global competitors, resulting from deregulation, information about these new markets became vital. Below is a discussion of organizations applicable to vegetable sector:

2.5.1 Tomato Producers' Organization (TPO)

TPO is an organization that aspires to be a mouthpiece for fresh tomato producers in South Africa. The organization has several objectives, and these include being a national representative body that allows tomato producers and stakeholders to participate. To allow affiliation and cooperation of tomato producers with other agricultural organizations. TPO aspires to be an organization that helps producers to be more efficient in production and marketing of tomatoes.

2.5.2 Korkom

Established in 1981, Korkom is an organization that gathers information for its potato and onions growers. The organization has approximately 40 members. The mission of Korkom is to provide information that helps members make decisions that are informed and sustainable in production and marketing. The organization hopes to give its members a competitive advantage by providing timely and correct information.

2.5.3 Fresh Producers Exporter's Forum (FPEF)

FPEF have approximately 130 members and accounting for over 90% of fresh produce exported from South Africa. This is a voluntary, non-profit organization that has an objective to provide leadership and service to its members with regards to the international market. The organization intends to create value for its members by means of ensuring profitability, sustainability and global competitiveness. The organization also provides a pivotal link between government and sector regarding market access and related issues. The FPEF is a member of Fruit South Africa (FSA), a bigger organization comprising of FPEF, Citrus Growers' Association (CGA), South Africa Subtropical Growers' Association (SUBTROP) and South Africa Table Grape Industry (SATI).

2.5.4 Fresh Produce Importers Association (FPIA)

Established in 2010, FPIA aims to improve the efficiency and competitiveness of the South African import sector. FPIA provides services to fruit and vegetable importers with regards to sanitary, phytosanitary compliance and capacity development. The association also provides information on how to engage with regulatory authorities.

2.5.5 Perishable Products Exporters Control Board (PPECB)

Established in 1926, PPECB is an independent service provider of quality certification and cold management services for producers and exporters of perishable products. PPECB also provides inspection and food safety services assigned by DAFF. The European Commission also recognizes PPECB. This allows PPECB to be regarded the same way as European Union (EU) inspection bodies. This ultimately improves easiness of South African products into the EU market and all the other markets (US, Russia, China, Middle East, etc).

2.6 Conclusion

The purpose of this chapter was to provide an overview of the South African vegetable sector (tomatoes, carrots and onions). The chapter begins with a brief overview of the South African agriculture and a global overview of vegetable production and trade. Comparison between South African vegetable sector and the African market is also conducted.

Special emphasis is later given to the individual vegetables (tomatoes, carrots and onions). Outlines of individual value chain of these vegetables are provided. It is established that most South African vegetables are consumed locally and are distributed through the fresh produce market (FPM). The exports for South African vegetables are currently limited, however quantities exported are increasing every year. Competitive advantage and sustainability of the vegetable sector is important, not only for the stakeholders but for the number of South African families that the sector supports. Chapter 5 and 6 will give factors that are affecting the vegetable sector and propose possible strategies to sector stakeholders.

Chapter 3: Literature Review: Theory of competitive advantage

3.1 Introduction.

The theory of competitive advantage builds on the theory of absolute and comparative advantage that was introduced by the classical economists Adam Smith and further refined by David Ricardo. Although Smith was the predecessor of the classical economist, the foundation of his theory was laid by the Physiocrats in the 18th century, (Boonzaaier, 2015). Back in history, the theory of absolute advantage and comparative advantage were the corner stone of theories to explain trade. These theories started to face criticism from economist like Leontief, Vernon, Paul Kruger and Michael Porter. The theory of competitive advantage gives a better understanding of modern-day trade and the Porter's framework provides information to industries or nations in terms of how to create an environment that will encourage birth of new companies and as well as environment that encourages or motivates firms to be competitive.

The theory has been applied in a wide range of studies, ranging from dairy farming, sheep meat, bananas, wheat, value chains of different commodities to mention but a few, (Ntombela and Khlenhans, 2011; Reynolds, 2017, Vink *et al*, 1998). The theory of competitive advantage stems from Paul Kruger and then Michael Porter. Porter in his famous framework called the Porter diamond framework, which provides firms with the right environment for innovation and improved competitive advantage. This theory of competitive advantage had to be developed due to the reason that old theories (absolute and comparative advantage) could not adequately explain the modern patterns of trade, (Feesta, 2015). On the other hand, measures of competitive advantage had to be developed, these measures will be discussed in chapter 4. However, the arguably most frequently used measures of competitive advantage are RCA and RTA. Relative Comparative Advantage (RCA) originated from Balassa in 1965, and Volrath further developed it to Relative Trade Advantage (RTA). Van Rooyen *et al*, (2011) states that combining Porters' framework and RTA/ RCA, gives a comprehensive assessment of competitive advantage.

3.2 Absolute advantage to Competitive Advantage: Evolution of thought

This section of the study outlines the origin and history of trade theories, how they have evolved, and emphasis is mainly from the classical economist to the new trade theory. The table 3.1 below shows the evolution of the trade theory from Classical economist to the diamond framework model by Porter.

Table 3.1. The evolution of thought.

Theorist	Key Concepts
Adam Smith (1723–1790)	Theory of Absolute advantage: Notion of gains from trade – a nation is better off with trade than without.
David Ricardo (1772–1823)	Theory of Comparative advantage, which underlines how countries gained from trade through specialization.
Max Weber (1864–1920)	Relationship between values, religious beliefs and the economic performance of nations.
Joseph Schumpeter (1883-1950)	Emphasis on the role of the entrepreneur as competitive factor, underlining that progress is the result of disequilibria, which favor innovation and technological improvement
Heckscher-Ohlin (1919, 1933)	Factor endowment- Countries exports products with factors that they are well endowed in. The more abundant the factor, the lower the cost.
Stolper-Samuelson (1941)	Stolper- Samuelson theory, showed the relationship between output price and factor prices within a single economy.
Wassily Leontief (1953)	The Leontief Paradox.
Stefan Linder (1961)	Demand-oriented theory states that customer's taste is strongly affected by income levels.
Raymond Vernon (1966)	The Product Cycle: The role of information knowledge. Stimulus to innovation is typically provided by a promise or threat in the market.
Paul Krugman (1979)	Economies of Scale – Explains intra-industry trade.
Michael Porter (1990)	Porter's Diamond framework – Identification of six determinants that influences an environment where companies can be born and learn to compete. Each determinant is an essential ingredients to achieve international competitive success.

3.2.2 Classical Trade Theorists: Absolute and Comparative advantage

Mercantilism was the dominating thought between the 15th and 17th century. Mercantilist assumed that a nation's economic wealth and political influence emanated from its stocks of valuable metals (gold and silver) and as such a nation's growth pathways was determined by its ability to remain a net exporter, (Keynes, 1936). In order to maintain this position, policies, such as quotas and import tariffs were utilized. This resulted to a zero-sum game, where the winners (King and export traders) gained at the expense of the losers (households).

Adam Smith, in his seminal work "*An Inquiry into the Nature and causes of the Wealth of Nations*" (1776), challenged Mercantilist thinking. He proposed that a country's prosperity is enhanced through specialization and trade. He reasoned if a country employed its productive resources (land, Capital, natural resources and labor) in producing goods and services in which they have absolute advantage⁴ ; then through trade there would be net welfare gains.

David Ricardo, in 1817, further refined this thinking to incorporate of the notion of comparative advantage. The Ricardian model is the simplest and most basic general equilibrium model of international trade. If a country or individual firm is relatively the lowest opportunity cost in production of a good than another country or individual firm then we say that it has comparative advantage in production of that good, and countries should concentrate on those goods that they have comparative advantage in and then trade.

Since countries have limited resources and level of technology, they tend to produce goods or services in which they have a comparative advantage, (meaning an opportunity cost associated with the production of one good compared to another). That is why countries tend to specialize in production of certain products. Nakhumwa *et al*, (1999) states that this theory is important for developing countries for it aids in economic growth.

⁴ In other words, they can produce the good more "efficiently" than any other country, using fewer resources, or the same amount of resources but with less time.

Another factor of determination in the Ricardian model is the use of labor cost. A country should trade in a product that they have lowest factor of production cost, (in this case where they pay the lowest wages). Costinot *et al*, (2015) states that specialization should then be in the product that they use lowest factor cost and trade with the product that requires high factor cost.

3.2.3 Neoclassical Trade Theorist: Heckscher – Ohlin (H-O)

H-O theory states that the relative comparative advantage of a country is determined by relative factor abundance across countries. Therefore, countries differ from each other according to the factors of production that they possess – it also assumes that technology is the same for all countries. Countries will have a comparative advantage in a good that they have abundant factor of production in and therefore export that good, (Esterhuizen, 2006). This school of thought (neoclassical) tried to explain the reasons why opportunity cost differs across nations or firms. Heckscher – Ohlin theory assumes that technology is identical across all countries, but production methods differ from country to country.

The H-O theory faced critics from a number of economist, further studies were done to try and address its shortcomings on manufactured goods and economist that stood out are Leontief, (1953) - (Leontief Paradox), Linder, (1961) and Vernon, (1966) – The product cycle.

The Leontief Paradox came about when Leontief, (1953) did a study on USA trade. Leontief expected the USA (most capital abundant country in the world) to export capital-intensive goods and import labor intensive goods but however found out the opposite. USA import-competing goods required 30% more capital than its exports. This was the opposite of what H-O theory suggested, and this is known as the Leontief Paradox.

Stefan Linder, (1961) a Swedish economist stated that although the H-O theory was adequate to explain international trade of primary products, another explanation was needed for trade in manufactured goods. Linder, (1961) demand-oriented theory states that customer's taste is strongly affected by income levels and therefore a nation's income per capita level determines kinds of goods they will demand. As a result of this demand,

industry will produce goods according to this local demand and these goods produced for domestic demands will eventually be exported. Linder stated that international trade in manufactured goods will be greater between nations with similar levels of per capita income than those with dissimilar per capita income.

The Product Cycle by Raymond Vernon, (1966) – Vernon begins with an assumption that the stimulus to innovation is typically by some threat or promise in the market. What is more striking about Vernon was the appreciation of the role of information and knowledge. According to Vernon, (1966) the product cycle is determined by the opportunities and demand levels in the domestic market. Vernon also highlighted a product goes through the following stages: new product stage, maturing stage and standardized stage, it was essential to match the product on its maturity stage with its production location. Therefore, Vernon's focus was more on the product and not its factor endowments to explain international trade.

It is quite evident that the H-O theory was inadequate in explaining manufactured products but good on primary products. As a result of the inadequacy of the classical and neoclassical economist theories to explain modern day trade this gave birth to the new trade theory.

3.3 New trade theory: Competitive Advantage.

The main thinkers of new trade theory believed that old trade theory failed to adequately explain observed trade patterns. One of the important contributors to new trade theory was Paul Krugman. In 1979, Krugman advocated the idea of economies of scale. Old trade theory like the Heckscher-ohlin theory assumed that there are constant returns to scale. This means, if input were to be double, output will be doubled. Whereas if economies of scale exist, if input were to be doubled, then output will become more than double. Krugman argued that as output is increased, cost (average total cost – ATC) declines (economies of scale). Reduction in ATC could be as a result of fixed cost associated with starting a firm or it could attribute to efficiency, as firms produce more

output they learn better ways of improving efficiency. As a result of economies of scale, Krugman noticed intra-industry trade, countries trading goods in similar industries, on the other hand the H-O theory could only explain inter-industry trade. Krugman highlighted that trade is possible and mutually beneficial to identical countries (intra-industry trade). Economies of scale make it possible to produce goods efficiently without sacrificing the variety of goods and is particularly useful in explaining trade of manufactured goods in developed countries. Among other new trade theory thinkers is Michael Porter, who introduced the Porter's diamond framework.

3.3.1 Porters' Diamond Framework.

Porter's diamond framework was designed by Michael Porter, in order to try and explain why different companies differ in their competitive advantage in the international market. In his introduction of the diamond framework he said, "Companies achieve competitive advantage through acts of innovation, not only innovation but its broader sense, which include both technology and also new ways of doing things" (innovation and creativity), (Porter, 1990). He also states that innovation can be seen in form of new product design, a new process of production, a new marketing approach and also new ways of conducting training, Porter, (1990). These are determinants that create an environment in which companies are born and learn how to compete and each point is essential for international competitiveness, Porter, (1990). In his research in 1990, he then proposed what is now well known as the Porter's diamond framework. Fig 3.1 shows the Porter's diamond framework.

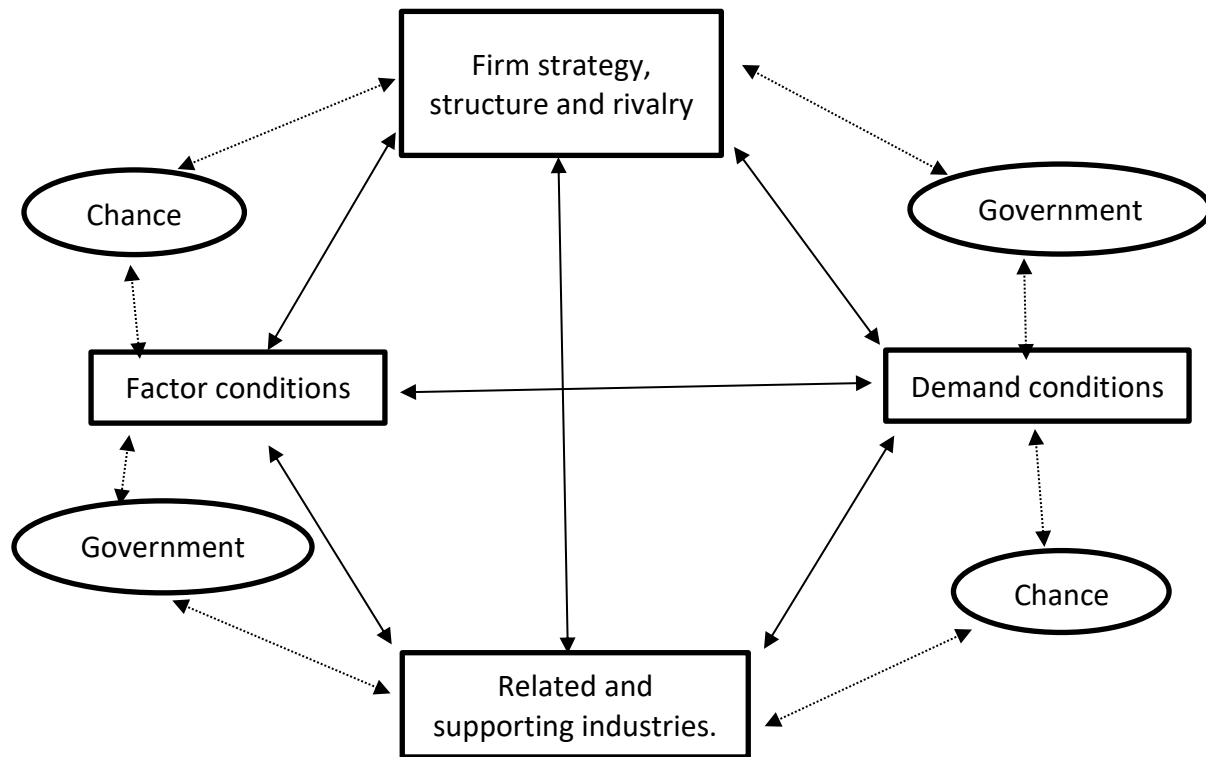


Fig 3.1 Porter's Diamond framework
Source: Porter, (1990)

3.3.1.1 Factor Conditions.

The nation's position in factor of production is necessary or an indicator of how it will compete in a given industry, examples of these are skilled labor and infrastructure. These factors determine the flow of trade, a company will export only goods that make use of the resources which are relatively well endowed, (this builds up from the classical economist). He also then says that nations do not inherit but instead creates the most important factors of production, example - skilled human resources. Porter then also said unskilled labor, high school or even college education do not really give a company or industry competitive advantage but rather highly specialized individuals that suits an industry's needs. These types of factors are scarce, and they are more difficult for foreign competitors to imitate. Therefore, to remain competitive nations should not only create specialized factors but should continuously work to upgrade them.

3.3.1.2 Demand Conditions

This factor of competitive advantage looks at the nature of home market demand for the industry's product or service. The importance of home demand is not diminished by globalization, as suggested by Michael Porter. Nations gain competitive advantage in industries where home demand gives their companies a clearer or earlier picture of emerging buyer needs. Buyers' demands or pressure companies to innovate faster and achieve more sophisticated competitive advantage than their foreign rivals. Porter also states that the size of the foreign demand proves to be far less significant than the character of the home demand.

3.3.1.3 Related and Supporting Industries

This factor of competitive advantage looks at the presence or absence in a nation of supplying industries and other related industries that are internationally competitive. The presence of such industries creates advantage in downstream industries in several ways. Most of the time these companies they deliver cost effective inputs in an efficient, rapid and sometimes preferential way. Home-based competitiveness in related industries provides the similar benefits like information flow and technical interchange and this speed the rate of innovation (Porter, 1990).

3.3.1.4 Firm strategy, structure and rivalry

These are conditions that govern how companies are created, organized and managed. Firm strategy, structure and rivalry determines the nature of domestic rivalry.

It is evident that no one managerial system is universally appropriate. One management skill can work in certain environment and never work in another. Competitive advantage in a specific industry results from convergence of the management practices and organizational modes favored in the country and the source of competitive advantage in the industry. Another important aspect is that individual motivation to work and expand skills is also important for competitive advantage. It must be noted that some skills are

scarce, for example outstanding talent, a nation's success largely depend on the type of education, the industry where these talented individuals choose. This is important because other competitors cannot imitate this factor.

3.3.1.5 Government support and policy

The classical economist suggested two options when it comes to government intervention, firstly, support of some industries and producers or employing policies to contribute directly to the competitive advantage of targeted industries, or a view that government should not interact with the market, notion of 'Free market'. Porter, (1990) states that these are both wrong. Porter argues that advocates of government might implement policies that will sometimes hurt companies in the long run. He then proposed that government proper role is to act as a catalyst and challenger; it is to encourage or even push companies to raise their aspirations and move to higher levels of competitive performance. Some simple basic principles that government should embrace to play the proper supportive role for national competitive advantage, and these are: encourage change, promote domestic rivalry, and stimulate innovation. Porter also gave a list of policies that should be implemented for nations that seek competitive advantage, these are: focus on specialization of factors of production, enforce strict product safety, environmental standards, sharply limit cooperation among industry rivals, promote goals that lead to sustained investment, reject managed trade. Government cannot create competitive industries, only companies can do that, and its role should only be as a challenger or catalyst.

3.3.1.6 The role of chance

Chance by Porters' definition are occurrence that have little to do with circumstances in a nation and are often largely outside the power of firms and or industry. These events include wars, political conflicts, large increases in demand, shifts in world financial markets, pandemic disease, exchange rates etc, (Zereyesus, 2003). Such events can nullify sources of competitive advantage and create new ones, (Esterhuizen, 2006). A

practical example will be of Namibia and South Africa, in terms of the three vegetables (tomatoes, carrots and onions). If Namibia faces unfavorable weather this will affect supply of the product into the African market and this will consequently affect the prices paid to producers.

3.3.2 Extending Porter's diamond model

Many scholars have extended and adapted the Porter diamond model over the years. The first challenge came from Rugman and D'Cruz, (1993) on their study, *The Double Diamond Model of International Competitiveness: The Canadian Experience*. Rugman and D'Cruz developed a double diamond model (DDM), they developed this model because they argued that Porter's diamond model was lacking in countries with small, open, trading economies. Rugman and D'Cruz questioned the definition of Foreign Direct investment (FDI) by Porter, calling it narrow and questionable. Second criticism was the viewpoint of Porter on the role of natural resources, they called it old fashion and misguided, arguing that Canada has developed successful megafirms which have turned Canada's comparative advantage in natural resources into proprietary firm specific advantages in resource processing. The difference then between Porter's diamond model and DDM is that DDM considers the activities of multinational enterprises, which have to rely on both home based and foreign determinants to sustain their competitive advantage. Rugman and D'Cruz, (1993) argues that competitive advantage should build upon domestic and foreign determinants in order to be globally competitive.

Moon *et al*, (1998) argue that the Porter diamond model was incomplete, mainly because it does not incorporate multinational activities. Therefore, they developed the generalized double diamond model (GDDM), that was applied in Korea and Singapore. Moon *et al*, (1998) criticized the exclusive focus of Porter on home base concept as the only source of competitive advantage, Porter model fails to incorporate effects of multination activities in his model. They argued that Porter's narrow view on multinational activities led him to underestimate the potential of Singapore's economy. The GDDM on the other hand has

the domestic diamond model and an international diamond model, with the domestic diamond being similar to the Porter's diamond model.

The Porter's diamond model also faced critic from Cho, (1994), arguing that the model should accommodate human influence on the rapid growth that happened in Korea. Son and Kenji, (2013) also criticized the Porter's diamond model, arguing that it fails to explain the small, open economies like Korea and Singapore. However, the Porter diamond model has been the building block to most competitive advantage studies done. The model is used by the World Economic Forum in its annual World Competitiveness Report, it is also used by Webber and Lambatse, (2011) in the value-chain analysis of African countries. In South African agriculture the model has been used in a variety of studies, ranging from dairy farming, sheep farming, stone fruit, apples, potatoes, subtropical fruits, wheat, value chains of different commodities examples of these studies includes, (Vink *et al*, 1998, Esterhuizen, 2006, Stroebel and Jooste, 2010, Ntombela and Khlenhans, 2011, Jafta, 2014, Boonzaaier, 2015, Reynolds, 2017, Dlikilili, 2018).

3.4 Defining Competitive Advantage

Competitive advantage originated from a Latin word *petere*, which means to seek, attack or aim at, (Boonzaaier, 2015). The theory of competitive advantage has received many different definitions in economics and business studies but there is little agreement on what the term means.⁵

However, for the purpose of this study the definition of competitive advantage that is going to be used is adapted from Freebain, (1986) and Esterhuizen, (2006):

“The ability of a sector, industry, firm or farm to compete by trading their products at the time, place and form within the global environment while earning at least the opportunity cost of returns on resources employed”

⁵ More definitions of competitive advantage can be accessed in Appendix D

3.5 Conclusion

The purpose of this chapter was to provide a foundation of the theory of competitive advantage, from the mercantilist to the new trade theory (with more emphasis on the Porter's diamond framework). The chapter looked at the major trade theories, providing both their strength and weakness. Economies and industries have become more complex due to globalization and trade liberalization hence it is hard to be competitive in business, industries and sectors applying only the classical and neoclassical models. Due to the variety and disagreements on the term competitive advantage, this chapter concluded with a definition which is going to be applied in this study of South African vegetable sector (tomatoes, carrots and onions).

Chapter 4: Empirical Framework and Methodology

4.1 Introduction

The objective of this chapter is to provide a framework of analysis in order to determine the competitive advantage of South African vegetable (tomatoes, carrots and onions) sector. This analytical framework includes both quantitative (RTA, RCA and NXi) and qualitative measure (Porter diamond framework) of the sector's competitive advantage.

Drawing from Freebain, (1986) and Esterhuizen, (2006) this study defines competitive advantage as:

“The ability of a sector, industry, firm or farm to compete by trading their products at the time, place and form within the global environment while earning at least the opportunity cost of returns on resources employed”

4.2 Quantitative Analysis: Measuring the Competitive Advantage in Agriculture

Competitive advantage studies have gained momentum in the recent years (both local and international). Table 4.1 below shows studies that have used the competitive advantage proxies that this study used (RCA, RTA and NXi). The general consensus that these proxies show throughout the studies below is, they highlight whether a firm, industry or sector have a competitive advantage over competitors they are measured against. These proxies also show a trend that the firm, industry or sector followed over a given number of years.

Table 4.1 Summary of studies that used RTA, RCA and NXi to quantitatively measure competitive advantage

Title of Research	Authors	Measurements	Findings/ Conclusions
Competitiveness and agri-food trade: An empirical analysis in the European Union	Banterle, 2005	EMS, RCA, NXi	Businesses and companies are more competitive than co-operatives. The better the soil quality, the more competitive these businesses.
China's agricultural products	Qiang, Yong-Sheng and Xiao-uan (2011)	RCA and trade coefficient specialization (TCS)	Ability of direct factors is strong in terms of transformation from cost advantage and price advantage into competition advantage.
Global Pear Market	Valenciano, Giacinti and Uribe (2012)	RCA	Geography plays a main role in competitiveness with nearby markets, as happens in markets with free trade.
Competitiveness analysis of the tobacco sub-sector in the Republic of Macedonia	Tuna <i>et al</i> , 2013	RCA, Porter Diamond	The sub-sector has favorable conditions and a competitive advantage for producing tobacco.
An analysis of the competitive performance of the Namibian date industry - 2001 to 2013	Angala, 2015	RTA, Porter Diamond.	The Namibian date industry is generally competitive.
How competitive is agribusiness in the South African food commodity chain?	Esterhuizen & Van Rooyen, 1999	RTA	The selected food chains are marginally competitive except pineapple, maize, apple and wheat. Competitiveness index decreases as one moves down the value chain.
The competitiveness of the agricultural input industry in South Africa	Esterhuizen, Van Rooyen & Van Zyl, 2001	RTA	The fertilizer industry is competitive. Pesticide industry has a decreasing competitive performance. Machinery industry is not competitive. Agro-food and fiber industry have shown increasing trends of competitiveness.

Agricultural competitiveness and supply chain integration: South Africa, Argentina and Australia	Mosoma, 2004	RTA	SA agricultural commodity chains are marginally competitive. Argentinean and Australian food chains are internationally competitive. Competitiveness index decreases in all countries as one moves down the value chain.
Relative competitiveness of the South African oilseed industry	Hallat, 2005	RCA, RTA, net index exports (NXi)	SA primary industry is more competitive compared to that of Argentina. In the secondary industry, Argentina enjoys competitive advantage over South Africa.
An inquiry into factors impacting on the competitiveness of the South African wine industry	Esterhuizen & Van Rooyen, 2006	RTA	SA wine has improving competitiveness. Size of domestic market, strong Rand, crime are some of the factors identified to be constraining the industry. Efficient supporting system and intense competition in the market are some of the identified enhancing factors.
Competitive performance of global deciduous fruit supply chains: South Africa versus Chile	Mashabela & Vink, 2008	RTA	Findings show that SA deciduous fruit supply chains are internationally competitive. Chile supply chains for deciduous fruit are strongly competitive internationally. SA deciduous supply chain loses its competitiveness status as one moves from primary to processed products
An evaluation of the competitiveness of the agribusiness sector in South Africa	Esterhuizen, Van Rooyen & D'Haese, 2008	RTA, Porter Diamond	SA business sector is marginally competitive, but with an increasing trend. Crime and labor policy are some of the factors identified to be constraining the industry, whereas for high-quality products, continuous innovation was found to be enhancing the industry.
Competitiveness of the South African deciduous fruit canning industry	Madima, 2009	RTA, Porter Diamond	EU subsidies negatively affect competitiveness of the SA fruit canning industry in that market.

			The industry is globally competitive in product quality and labor costs.
Analyzing the competitive performance of the South African wine industry	Van Rooyen <i>et al.</i> , 2011	RTA, Porter Diamond	SA wines are internationally competitive (with increasing trend). Fluctuating exchange rate and changing market trends play a negative role in the competitive performance of the industry.
An inquiry into the competitiveness of the South African stone fruit industry	Boonzaaier, 2015	RTA, Porter Diamond	The industry's competitiveness falls behind Chile in the SH, whilst in the Northern Hemisphere it is more competitive than France. Strategy, structure and rivalry factors were identified as enhancing factors.
An evaluation of competitiveness of South African maize exports	Sihlobo, 2016	RCA, Agri-benchmark production model, growth share matrix, indicative trade potential index, market attractiveness index (MAI), and relative indicative trade potential index.	SA maize exports are competitive. Competitive advantage falls behind Brazil, Argentina and the USA in the production costs analysis. United Arab Emirates, Japan and Mexico were identified as high-potential export markets for SA maize.
An analysis of the competitive performance of the South African citrus industry.	Dlikilili, 2018	RTA, Porter diamond model	The citrus industry as a whole was found to very competitive, and the citrus industry of South African can be view as global leader in comparison to other Southern hemisphere competitors.
Analyzing the competitive performance of the South African subtropical fruit industry	Sibulali, 2018	RTA, Porter diamond model.	The subtropical industry was found to be marginally competitive, trending towards being uncompetitive in recent years. However, avocados and macadamia nuts were found to be highly competitive in the global market than the other subtropical fruits.

In section 4.2.1 below various methods of measuring competitive advantage are outlined and after reviewing literature, Relative Comparative Advantage (RCA), Relative Trade Advantage (RTA) and Net Export index (NXi) are chosen to be the competitive advantage measuring proxies to be used in this study. These proxies are chosen for two main reasons, firstly they provide a trend of competitive advantage that a firm, industry or sector have over a given period. Secondly, these proxies provide a comprehensive analysis of competitive advantage by taking into account both imports and exports of the product traded to measure competitive advantage⁶.

The RTA is going to be the main proxy for this study because it describes the share of a country's commodity in relation to a specific market relative to all traded goods. The method considers both exports and imports. The main reason for choosing RTA is, the proxy allows for measurement of competitive advantage under real world trade circumstances, (distorted economic policies and uneven playing grounds) and it provides analyses based on recorded data over an extend period of time, that enables identification of possible trends.

4.2.1. Relative Comparative Advantage (RCA)

Revealed comparative advantage (RCA), was first introduced by Balassa in 1965, and he further expanded it in 1977, this provided a stage approach to industrialization as major innovation. Edwards and Volker, (2002) states that this is the most common measure used to analyze competitive advantage. The definition used for relative comparative advantage is, it is the ratio of the share of product exports in world trade. Edwards and Schoer, (2002) states that it is a measure used to show share of a commodity in a country's total exports as compared to the share of the commodity in world exports. Balassa, (1965) states that RCA could be used as an indicator of trade performance of individual commodities. RCA also shows that commodity trade pattern reflects relative market costs as well as differences in non-price competitive factors.

⁶ Appendix C provides alternative proxies that can be used to measure competitive advantage.

$$RCA_{Aj} = (X_{Aj}/X_A)/(X_{refj}/X_{ref}) \quad (1)$$

if X_{Aj} is country A's export value of commodity j, X_{refj} is commodity j's export value for the group of reference countries other than A. X_{ref} is the total exports of a set of nations other than j.

The RCA therefore can point out the sectors for which an individual country has a comparative advantage or disadvantage on. The RCA above 1 shows a revealed comparative advantage and less than 1 shows comparative disadvantage.

4.2.2 Relative Trade Advantage (RTA)

Vollrath, (1991) then introduced the relative trade advantage (RTA). RTA method allows for the measurement of competitive advantage under real world conditions with its uneven playing fields, distorted economies and varying trade regimes. RTA takes into account both imports and exports, and it is calculated as the difference between relative export advantage (which equates to the Balassa index) and its counterpart, relative import advantage.

$$RTA_{iv} = RXA_{iv} - RMA_{iv} \quad (2)$$

RXA is calculated the same as Balassa RCA discussed on section 4.2.1.

$$RMA_{iv} = \frac{\left(\frac{M_{iv}}{M_i}\right)}{\left(\frac{M_{refv}}{M_{ref}}\right)} \quad (3)$$

Where, X and M refer to exports and imports, respectively. The numerator in equations is equal to a country's export (imports) of a specific product category relative to the exports (imports) of this product from all countries except for the country in consideration.

The denominator reveals the exports (imports) of all products except for the commodity in consideration from the respective country as a percentage of all other countries' exports (imports) of all other products.

Again, a value greater than 1 shows competitive advantage, less than 1 shows competitive disadvantage.

4.2.3 Net Export index (NXi)

The Net Export index (NXi) is basically exports of a country's product minus imports of that product, divided by the total value of trade (Carraresi and Banterle, 2008). The NXi is advantageous over proxies like RCA because it takes into account both exports and imports. However, the weakness of this measurement is that a country with low exports and no imports results to value closer to 100 (competitive), though it might have a small share of global trade, (Sihlobo, 2016).

Formula:

$$NXi = [(X_i - M_i) / (X_i + M_i)] * 100 \quad (4)$$

Where X_i and M_i represents exports and imports of a particular product respectively (numerator). X_i and M_i represent total exports and imports traded by the country (denominator). A country that has an index of 100 indicates that the country has no imports, and on the other hand a country with negative 100 shows zero exports. If the value of NXi is zero, that means exports and imports are equal.

4.2.4 Data used

The secondary data used to calculate RTA, RCA and NXi values are sourced from International Trade Centre (ITC) and Food and Agricultural Organization (FAO), can be accessed on: www.trademap.org and www.fao.org respectively. ITC provides trade data for all products and for 220 countries, their trade data begins from 2001. On the other hand, FAO provides trade data for only agricultural products and for over 245 countries,

their trade data goes back from 1961. Both organizations provide trade data for both exports and imports, which made the databases perfect for RTA calculations. However, for the purpose of this study ITC is the most preferred database to calculate RTA, RCA and NXi of South African vegetables. ITC is the most preferred database because it provides trade data for current years (2020), whereas FAO provide trade data to year 2016 and also ITC provides trade data for all products traded by a country and whereas FAO only has Agriculture trade data.

4.3. Qualitative analysis: Identifying determinants of competitive advantage (Application of Porter's diamond model)

The previous section (4.2) focused on quantitative measure of South African vegetable sector, this section will focus on qualitative measure of competitive advantage of South African vegetable sector.

Table 4.3 below shows studies that have used the Porter's diamond model to determine factors that enhance or constrict competitive advantage of firm, industry, or sector that they were studying.

Table 4.2 Review of studies that used Porter diamond model to qualitatively measure competitive advantage

Title of Research	Authors	Sampling Methodology	Findings/ Conclusions
Namibian table grape production	Thomas (2007)	Executive Survey	The Namibian table grape chain is relatively competitive in the international arena. Primary production in becoming more competitive.
Analyzing the competitiveness performance of the South African apple industry	Jafta, 2014	Executive Survey	The apple industry has competitive advantage over its competitors, except for Chile and New Zealand. Main factors that enhance the industry's competitive advantage were industry research and development, quality of infrastructure. Main constraining factors were quality of low skilled labor, crime and trust in the political system.
An analysis of the competitive performance of the Namibian date industry - 2001 to 2013	Angala, 2015	Purposeful sampling method	The Namibian date industry is generally competitive.
An evaluation of the competitiveness of the agribusiness sector in South Africa	Esterhuizen, Van Rooyen & D'Haese, 2006	Executive Survey	SA business sector is marginally competitive, but with an increasing trend. Crime and labor policy are some of the factors identified to be constraining the industry, whereas for high-quality products, continuous innovation was found to be enhancing the industry.
Competitiveness of the South African deciduous fruit canning industry	Madima, 2009	Executive Survey	EU subsidies negatively affect competitiveness of the SA fruit canning industry in that market. The industry is globally competitive in product quality and labor costs.
Analyzing the competitive performance of the South African wine industry	Van Rooyen <i>et al.</i> , 2011	Executive Survey	SA wines are internationally competitive (with increasing trend). Fluctuating exchange rate and changing market trends play a negative role in the competitive performance of the industry.

Competitiveness of the South African citrus fruit industry relative to its southern hemisphere competitors	Sinngu, 2014	Executive Survey	SA citrus is globally more competitive than its SH rivals. However, its competitiveness decreases as one moves down the value chain. BEE policy, labor policy and tax system were found to be some of the factors constraining the industry.
An inquiry into the competitiveness of the South African stone fruit industry	Boonzaaier, 2015	Executive Survey	The industry's competitiveness falls behind Chile in the SH, whilst in the Northern Hemisphere it is more competitive than France. Strategy, structure and rivalry factors were identified as enhancing factors.
An analysis of the competitive performance of the South African citrus industry.	Dlikilili, 2018	Delphi Method (two rounds)	The citrus industry as a whole was found to be competitive, and the citrus industry of South African can be view as global leader in comparison to other Southern hemisphere competitors.
Analyzing the competitive performance of the South African subtropical fruit industry	Sibulali, 2018	Delphi Method (two rounds)	The subtropical industry was found to be marginally competitive, trending towards being uncompetitive in recent years. However, avocados and macadamia nuts were found to be highly competitive in the global market than the other subtropical fruits.

This section of the study involves the Application of Porter's diamond framework, which involves determining enhancing or constraining factors that affects competitive advantage of South African vegetable (tomatoes, carrots and onions) sector. This involves recruiting of sector experts and getting their opinions on the key factors that affects competitive advantage using two rounds Delphi technique. After two rounds of Delphi technique, the responses from the survey are grouped into Porter's determinants of competitive advantage, that is demand factors, factor condition, related and supporting industries, firm strategy, structure and rivalry, government policies and chance factors ⁷

4.3.1 The Delphi Technique

Delphi technique is a survey method that is "intended" for systematic, organizing and structuring judgments and opinions on a particular subject from a panel of anonymous experts until a consensus is reached on a topic using series of learning rounds, (Worrell *et al*, 2013). The method originated in the early 1950s with the RAND Corporation. Briedenhann and Butts (2006) argue that panel of experts is necessary for a collective judgment, for a group of experts far outweighs that of a single expert. Selection of expert panel needs to be deliberate and well-conceived in order to ensure sufficient variation of value chain opinions, quality of data and credibility (Briedenhann and Butts, 2006; Kezar and Maxey, 2016). The basic rule of thumb for a Delphi technique is the group of experts should be composed of knowledgeable experts, secondly all members of the panel should remain anonymous. Thirdly, group communication should be utilized to develop consensus building and there should be controlled feedback and iteration. Two rounds of the Delphi technique are considered to be enough for this study⁸. The Delphi technique made use of the Vegetable executive survey (VES) discussed in section 4.3.2 below.

⁷ Refer to section 3.3.2.

⁸ Mamaqi *et al*, (2010) states that two or three rounds of the Delphi technique should provide sufficient analysis of results for a research.

Advantages of using Delphi technique

The collective judgment of experts is more reliable than an individual statement, though it is made up of subjective opinions, (Briedenhann and Butts, 2006). Secondly, anonymity of respondents and controlled feedback are some of the strengths of this technique, they reduce the role of dominant personalities, and permits the opinions of each respondent to be incorporated equally in the projection, (Farkas and Wheeler, 1980). The technique also fosters consensus building.

Disadvantages of using Delphi technique

It is difficult to assess the reliability and accuracy, since Delphi uses judgment and opinion as its basis, (Briedenhann and Butts, 2006). The other disadvantage is that the process is time consuming and there is a high likelihood of a low response rate, especially starting from the second round. There is also the possibility of getting different results from a different group of experts, (Briedenhann and Butts, 2006). It has been considered by many authors as unscientific, (Kezar and Maxey, 2016).

4.3.1.2 Studies that used the Delphi technique

Briedenhann and Butts, (2006): Application of the Delphi technique to rural tourism project evaluation.

This article used the Delphi technique to evaluate the development and management of rural tourism. The experts' panel was from South Africa and Britain. Three rounds of the Delphi technique were considered to be enough for this study. Panel of experts were selected from academics, consultants in the field of tourism, public sector officials, non – governmental organizations (NGOs), rural tourism project managers and private sector tourism operators.

Bailey *et al*, (2012): Exploring a city's potential low carbon futures using the Delphi methods: some preliminary findings.

This article applied the Delphi technique to generate several broadly consensual low carbon scenarios for 2050. Three rounds of the Delphi technique were deemed enough for this study. Panel of experts were selected using a partial Political, Economic, Socio-cultural and Technology (PEST/PESTLE), in order to cover all the representatives that emits carbon.

Mullins, 2006: Exploring change in the Housing Association sector in England using the Delphi method.

The article applied Delphi method to study organizational and sector change in the housing association sector in England. Two rounds Delphi technique was used for this study. Leaders of associations, executive staff in a range of organizations were chosen as the panel of experts.

Dlikilili 2008: An analysis of the competitive performance of the South African citrus industry.

The article applied the Delphi technique to analyze the competitiveness of the South African Citrus Industry. The author used two rounds of Delphi technique. The researcher used the South African Citrus Growers Association (CGA) to select a panel of experts that comprised of input providers, producers, packers, traders (exporters and importers) and processors.

4.3.1.3 Vegetable executive survey

The vegetable executive survey (VES) of tomatoes, carrots and onions was constructed to capture the salient elements of the Porter's (1990) diamond model of competitive advantage, see Appendix A.

Identification of the panel of experts to be part of the VES involved three steps. First step, value-chain mapping for each commodity was conducted. The output is a clear distinction of the various stages along each commodity's value chain, (see Chapter2).

Second step, at each distinct stage of the value-chain facilitative organizations were approached in order to generate a sample population of sector experts. These included:

1. Industry Associations are approached to develop a sample of potential experts from the Input suppliers (seed producers), primary producers, processors and pack houses levels of the value-chains. These organizations and associations included: Tomato Producers' Organization (TPO), Korkom and Produce Marketing Association (PMA).

2. Trade Associations are approached to develop a sample of potential experts for exporters and Importers stages of the value chains. These organizations included Fresh Produce Exporters' Forum (FPEF), Fresh Produce Importers' Association (FPIA) and Produce Market Association (PMA).

3. Fresh Produce Markets (FPM) are approached to develop a sample of potential experts from the FPM stage of the value chains. These FPMs included: the FPM Capetown and FPM Johannesburg.

Criteria for selection:

Once sample population of sector experts was identified (as described above) a single expert for each stage of the value chain and for each vegetable was selected using the following criteria shown in table 4.4 below:

Table 4.3 Selection criteria of VES expert panel

Vegetables Value Chain Stakeholders	Experts panel selection criteria
Input Supplier (only seed suppliers) (An average annual sale of no less than ⁹)	Tomatoes: R300 000 (USD 20 519.84) ¹⁰
	Carrots: R200 000 (USD 13 679.89)
	Onions: R500 000 (USD 34 199.73)
Primary producers (farmers) (An average minimum yield: ¹¹)	Tomatoes: 75 387 kg/ha
	Carrots: 29 421 kg/ha
	Onions: 24 270 kg/ha
Traders: Pack houses (A minimum capacity of: ¹²)	Tomatoes: 10 000 tones/ month
	Carrots: 1 000 tones/month
	Onions: 4 500tones/month
Traders: FPM (Average quantity of: ¹³)	Tomatoes: 30 000 tones
	Carrots: 15 000 tones
	Onions: 40 000 tones
Traders: Exporters (Average quantity exported: ¹⁴)	Tomatoes: 15 000 tones
	Carrots: 6 000 tones
	Onions: 21 000 tones
Traders: Importers (Average quantity imported: ¹⁵)	Tomatoes: 150 tones
	Carrots: 80 tones
	Onions: 300 tones
Processors (Minimum sales per annum: ¹⁶)	Tomatoes: R200 000 (USD 13 679.89)
	Carrots: R100 000 (USD 6 839.94)
	Onions: R30 000 (USD 2 051.98)

⁹ Average annual sales calculated using South African National Seed Organization (SANSOR) 2019

¹⁰ Exchange rate Rand to USD is 1USD: R14.62, United Nations June 2019.

¹¹ Minimum average annual yields were calculated from 2000 to 2016 were calculated using FAOSTATS data (FAO, 2018).

¹² Pack houses minimum average is estimated by taking an average of 3 pack houses of the same vegetable in South Africa.

¹³ Average output of producers to the FPM is obtained from Agriculture Abstract 2018

¹⁴ Average exported quantity is estimated by taking total exported quantity divided by total exporters. (ITC, 2018 & FPEF, 2018)

¹⁵ Average imported quantity is estimated by taking total imported quantity divided by total importers. (ITC, 2018 & FPIA, 2018)

¹⁶ Minimum sales are estimated by using the Statistics and Economic analysis, (DAFF 2018)

Selection of experts from the sector required different criteria due to their position within the value chain. A minimum of 10 years of experience was the main benchmark for all the experts selected, the reason is that experts with more experience usually provides better expertise than those with less experience and also due to their ability to be sustainable over a considerably long period (10 years). Average yield, quantity and capacity are calculated over a period of 16 years, this is because droughts experienced in South Africa over the current years needed to be into account. The targeted sample population of this study are mainly managers and chief executive officers (CEOs).

4.3.1.4 Establishing major determinants of South African vegetable sector (Application of Porter's diamond model)

Establishing major determinants of competitive advantage compliments the vegetable executive survey (VES). This section involves categorizing the factors identified by sector experts into groups or clusters of Porter's determinants. The methodology developed by Porter, (1990) collaborating it with VES is applied in this study in order to derive these major determinants that either enhance or constrain the competitive advantage of the South African vegetable sector. The two rounds Delphi technique facilitated the derivation of these major determines through consensus building of sector expert's panel. The determinants of competitive advantage according to the Porter, (1990) methodology are fully discussed in section 3.3.2 of chapter 3. Table 4.5 below shows examples of questions asked for each Porter diamond model determinants¹⁷.

¹⁷ All questions can be accessed in Appendix A.

Table 4.4 Porter's diamond model determinants example questions

Factor conditions	How is the availability of skilled Labour?
	Are Input cost expensive?
Demand conditions	Has growth in demand of local market for vegs positive?
	Is the size of international market enough?
Related and supporting industries	How do rate Sector expenditure on research and development?
	Finance is easily accessible?
Firm strategy, structure and rivalry	Management of market Intelligence for the vegetable sector is excellent?
	Does economies of scale have a positive effect on your company?
Government support and policy	South Africa's trade policies enhance competitive advantage?
	Does South Africa's land reform policy enhance competitive advantage?
Chance factors	Has crime significantly affected your company?
	Does the exchange rate enhance your company's competitive advantage?

4.3.2 Data analysis

To analyze the Delphi response from the VES, this study chose to use these descriptive statistical measures: mean, standard deviation and frequency. Most Delphi studies used statistics measures that show central tendency (means, median and mode) and statistics measures that show level of dispersion (standard deviation) (Berman *et al*, 2017; Sourani and Sohail, 2015; Melanda *et al*, 2019; Worrell *et al*, 2019).

One of the assumptions for Delphi is that all participants (experts) opinions are regarded equal, to avoid a particular vocal or dominant individual to influence the outcome (Worrell *et al*, 2012), hence all participants are assigned the same probability on every question of this VES for the calculation of mean. Standard deviation is calculated to show how accurate are the values of every question from the mean. Frequency, mean and standard deviation are calculated after every Delphi round, this aids on the consensus building during the vegetable executive survey (VES).

4.4 Conclusion

The Purpose of this chapter was to describe the Empirical framework and methodology used in this study. The chapter outlined the techniques to be used in this study in order to measure quantitatively and qualitatively the competitive performance of South African vegetable sector (tomatoes, carrots and onions). RTA, RCA and NXi are chosen to be the quantitative measure of competitive advantage of South African vegetable sector. The Porter diamond framework in conjunction with two round Delphi technique are chosen to be the qualitative measure of this study. A two round Delphi analysis was deemed enough for this study and the results of every round are analyzed using statistical mean, standard deviation and frequency. The proposed methodology was developed to examine and evaluate the vegetable sector's competitive advantage in order to shape and direct possible strategies to enhance competitive performance of the sector in the long run.

Chapter 5: Results and Discussion

5.1 Introduction

This chapter is going to provide results/ findings and draw conclusions on the measurements of competitive advantage of the South African vegetable sector, highlighting the competitive trend over time. The chapter also then provides an analysis of factors enhancing or constricting the competitive advantage of the sector and then clustering the main determinants according to the Porter diamond model. The following chapter will then provide strategies and recommendations for the sector's decision makers.

5.2 Measuring competitive advantage

The sustainability of the vegetable sector requires the sector to be able to cope with the global economy's competition and pressure. The various competitive advantage measuring techniques are highlighted in Chapter 4 and after careful consideration this study will make use of the three measuring techniques, which are, RTA, RCA and NXi. One of the reasons behind measuring competitive advantage of South African vegetable sector is the trading potential under the AfCFTA¹⁸. Therefore, the South African vegetable sector needs to be assessed using trade based measurement and the three measurement techniques (RTA, RCA and NXi) perfectly provides enough analysis, as argued in Chapter 4.

Competitive advantage is measured by application of trade-based measures like RTA, RCA and NXi as highlighted by many authors, (Esterhuizen, 2006; Jafta, 2014; Boonzaaier, 2015). It is argued that competitive advantage could be indicated by the trends of the traded commodity and value chains. A commodity's trade pattern reflects relative costs as well as differences in non-price factors such as government policies,

¹⁸ Trading was set to commence on July 2020: however, due to the COVID-19 pandemic trade was pushed forward to January 2021.

subsidies, taxes etc, the bottom line being that these measures provides true cost of doing business. Therefore, the measures selected for this study allows measurement of competitive advantage under real world trade circumstances, (distorted economic policies and uneven playing grounds).

It is therefore a necessity to determine how the sector has successfully traded its products over time relative to its competitors. As highlighted in Chapter 4, RTA, RCA and NXi measurements are going to be calculated using data from FAOSTAT and ITC trade data. It is vital to note that FAO data only includes agricultural products and on the other hand ITC includes all the data of products traded by a country. Boonzaaier, (2015) regarded the ITC RTA values to be multi-sector based competitive advantage index, whereas FAO RTA values are agriculture based competitive advantage index. For the purpose of this study more emphasis is going to be on RTA, RCA and NXi values calculated using ITC data. In the sections to follow, RTA, RCA and NXi values for both the African and World market for all three vegetables (tomatoes, carrots and onions) will be presented.

5.2.1 RTA and NXi of SA vegetable sector (tomatoes, carrots and onions) in Global and African market

Fig 5.1¹⁹ below shows RTA and NXi calculations for global and African market, the RTA and NXi values are calculated using FAO data (1961 – 2016) and ITC data (2001-2018). RTA values are on the primary axis and the NXi values on the secondary axis. It is evident from the graph below that RTA of the South African vegetable sector for both global and African market are below 1 (except for 2006 African market with RTA value of 1.28). Bearing in mind that for any sector or firm to be considered competitive RTA values must be above 1. Therefore, the South African vegetable sector is not competitive in both the global and African market, however African RTA values are higher than global market, indicating good opportunity that can be exploited. The NXi graph shows a very unstable trend from 1961 to 1995, and after 1996 the trend stabilizes generally above 80%. Bearing

¹⁹ Table B.1 and B.2 shows the RTA & NXi calculations for global and African market (Appendix B).

in mind that NXi values close to 100 shows that the sector is a net export and negative 100, shows that the sector is a net importer. It can be concluded that the South African vegetable sector (tomatoes, carrots and onions) is currently a net exporter of vegetables, however the volumes exported are not large enough for the sector to have a competitive advantage in the global and African market, as shown by the RTA and NXi graphs below.

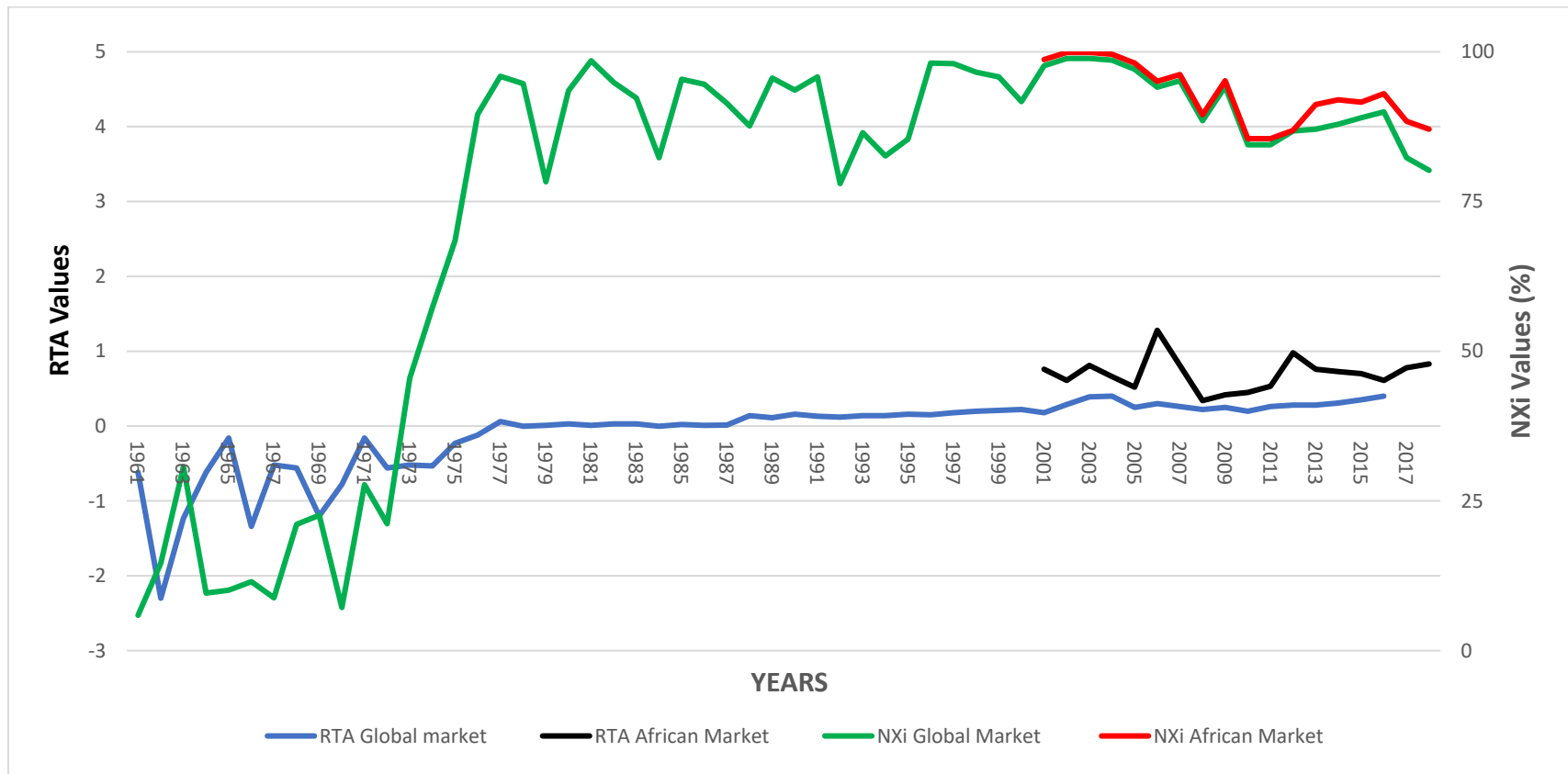


Fig 5.1 RTA and NXi for South African tomatoes, onions and carrots in the global and African Market.
 Source: Food and Agriculture Organization data (FAO, 2019) & International Trade Centre (ITC, 2019)

5.2.2 RTA of individual vegetables in the African market

The graphs of RTA and NXi of vegetables in global and African market above (fig 5.1) has clearly shown that the South African vegetable sector is not competitive in the African market and globally, however the question that needs to be addressed is, which of the three vegetables is competitive and which ones are not? Fig 5.2²⁰ below shows individual RTA values of each vegetable. It is evident that carrots are the most competitive vegetable of the three vegetables in the African market, followed by onions and tomatoes, respectively. South African tomatoes have a competitive disadvantage in the African market with RTA values of less than 1. Conclusions can be assumed that, higher RTA values of South African vegetable sector in Fig 5.1, where a contribution of mostly carrots and to some extent onions and low values are predominantly a contribution of tomatoes.²¹

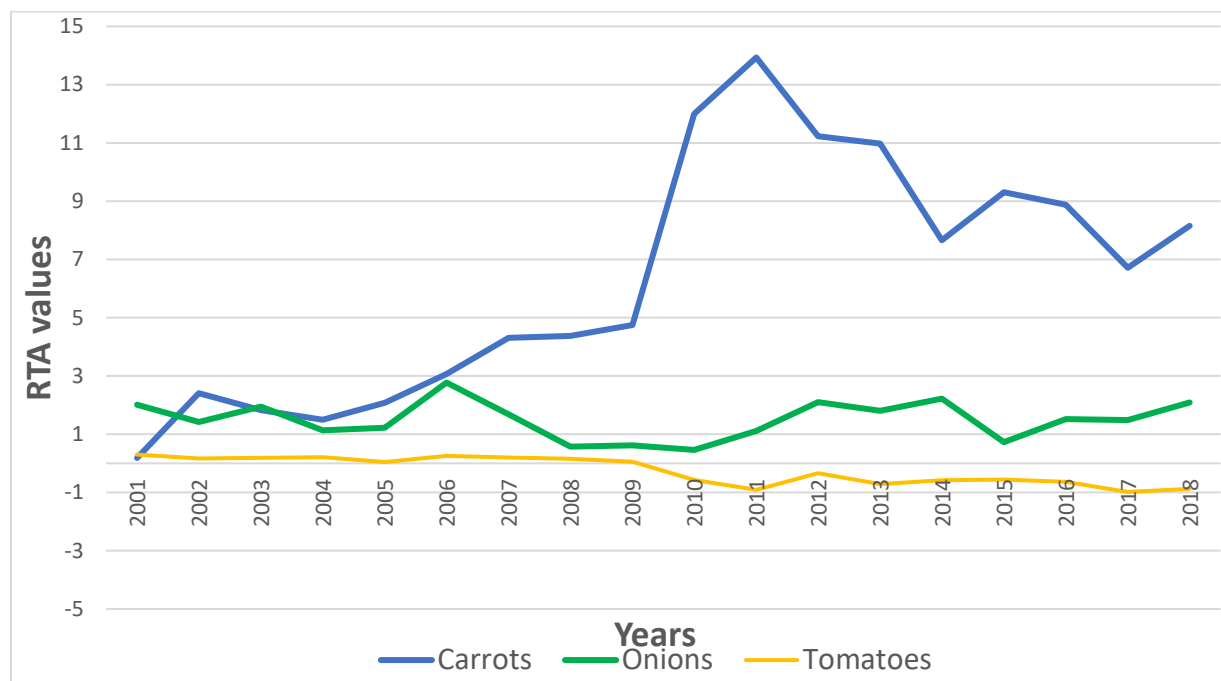


Fig 5.2 RTA calculations for individual South African vegetables in the African market
Source: International Trade Centre data (ITC, 2019)

²⁰ Table B.3 shows RTA calculations for South African tomatoes, carrots and onions in the African Market (Appendix B).

²¹ Fig B.1 and Table B.4 shows RCA of individual South Africa vegetables (tomatoes, carrots and onions) in the African market (Appendix B).

5.2.3 NXi of individual South African vegetables (tomatoes, carrots and onions) in the African market

Fig 5.3²² below shows individual vegetables Net Export index (NXi) values. As discussed in Chapter 4, NXi shows net exports of a commodity. High NXi values show that there are higher exports than imports. According to the NXi values in Fig 5.3, Carrots, onions and tomatoes shows high NXi values (with a lowest being 79% for tomatoes). This shows that the South African vegetable sector exports more than it imports (net exporter). However as mentioned in Chapter 4, the weakness of this proxy is that a commodity that has low quantities exported and zero or low imports will also show high NXi values. Therefore, the NXi proxy should not be used in isolation of other competitive advantage measures.

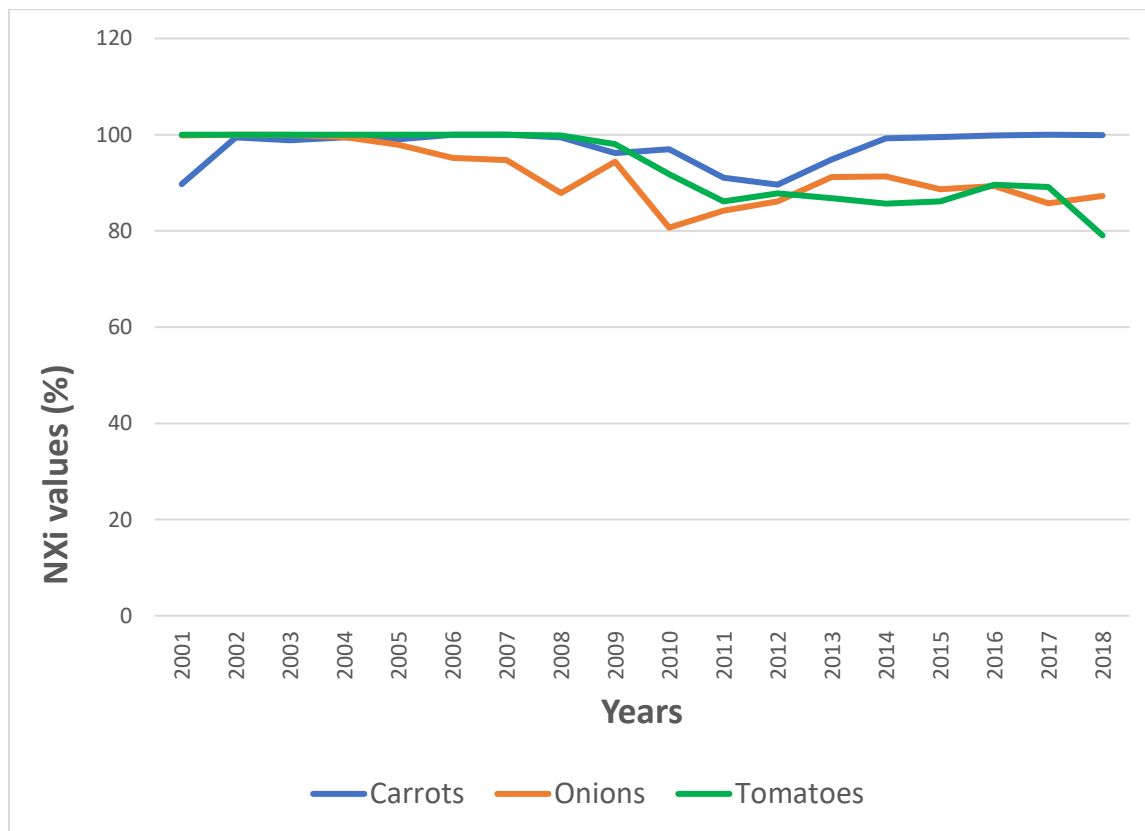


Fig 5.3 NXi calculations for individual South African vegetables in the African Market
Source: International Trade Centre data (ITC, 2019)

²² Table B.5 shows NXi calculations for South African tomatoes, carrots and onions (Appendix B)

5.2.4 RTA of South African tomatoes in all five regions of Africa.

Section 5.2.2 above showed the competitive advantage of the three vegetables in Africa as a whole, the following section will discuss competitive advantage of individual vegetables in the five regions of Africa.

Fig 5.4²³ below shows that South African tomatoes have a competitive advantage only in Southern Africa, with only 2005 being the only year that has RTA value below 1. Across the other four regions (East, West, Central and North Africa), the regions had RTA values below 1, indicating that South African tomatoes have a competitive disadvantage, except for 2006 for East Africa and West Africa that had RTA values above 1. One of the many reasons to explain the competitive advantage of South African tomatoes in Southern Africa is that Southern Africa is the closest of the five region. Therefore, exporting to this region reduces transport cost massively, which is a huge cost for exports and given the nature of the product the closer the market is, the more profitable the exports will be.

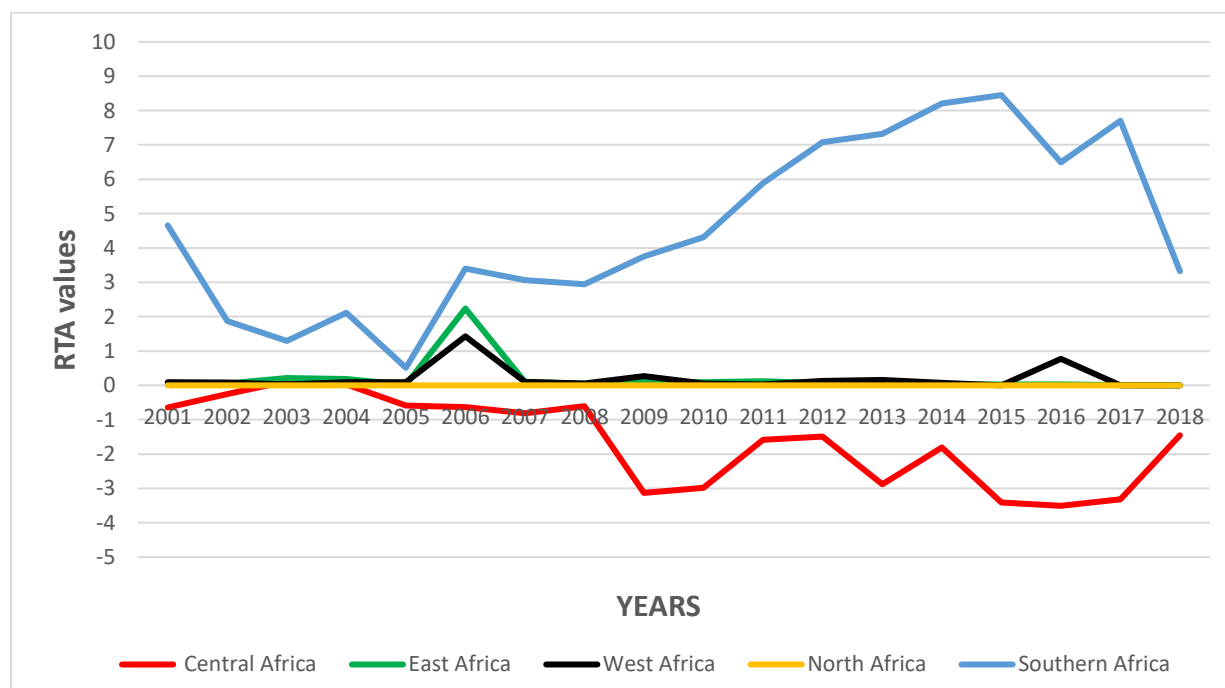


Fig 5.4 RTA of South African tomatoes in all five regions of Africa.
Source: International Trade Centre data (ITC, 2019)

²³ Table B.4 shows RTA calculations for South African tomatoes in the five regions of Africa (Appendix B).

5.2.5 RTA of South African carrots in all five regions of Africa.

South African carrots RTA values are shown in Fig 5.5²⁴ below. South African carrots are not competitive in Central, East, West and North Africa, with West Africa being the least of the four regions. On the other hand South African carrots, just like tomatoes, also have a competitive advantage in Southern Africa, as shown by RTA values above 1. Most of the RTA values of South African carrots are above 5 in Southern Africa, showing a strong competitive advantage. The cause for concern, however, is that the RTA values for South African carrots have been on decline since 2012 in the Southern Africa market, moving from RTA values above 8 to RTA values below 3.

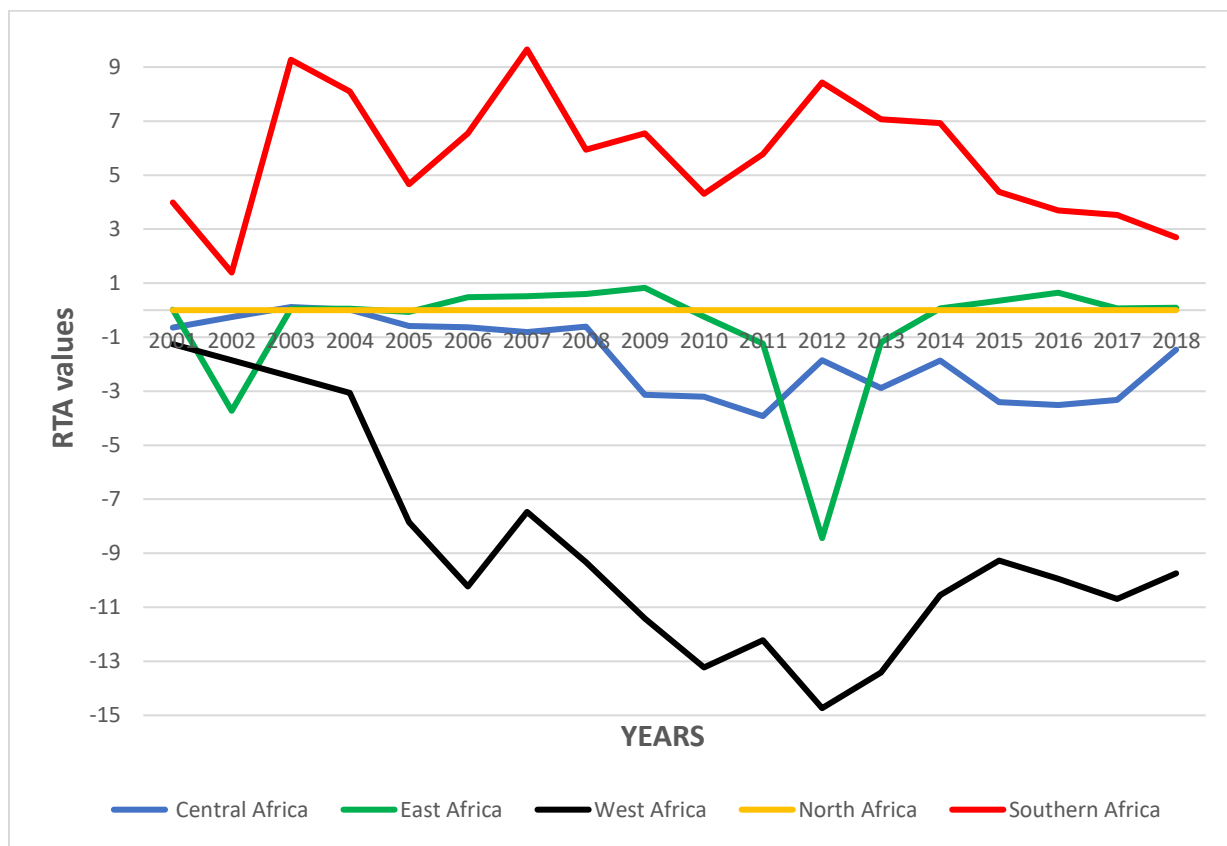


Fig 5.5 RTA of South African carrots in all five regions of Africa.
Source: International Trade Centre data (ITC, 2019)

²⁴ Table B.5 shows RTA calculations for South African carrots in the five regions of Africa (Appendix B).

5.2.6 RTA of South African onions in all five regions of Africa.

Fig 5.6²⁵ below shows RTA values for the South African onions in five regions of Africa. The Fig shows that the onions are not competitive in Central, East, North and West Africa. However, Fig 5.8 also shows that the South African onions sector is competitive in Southern Africa. The RTA values in Southern Africa are mostly above 2, apart from the period of 2007 to 2010, where RTA values were below 2 (with 2009 and 2010 having RTA values below 1). Similar to tomatoes and carrots, the onions sector is also only competitive in the Southern Africa, this could be as a result of the distance to the market -ultimately transport cost, nature of product (short shelf life) and also the nature of infrastructure, keeping in mind that most of the African transport infrastructure are underdeveloped.

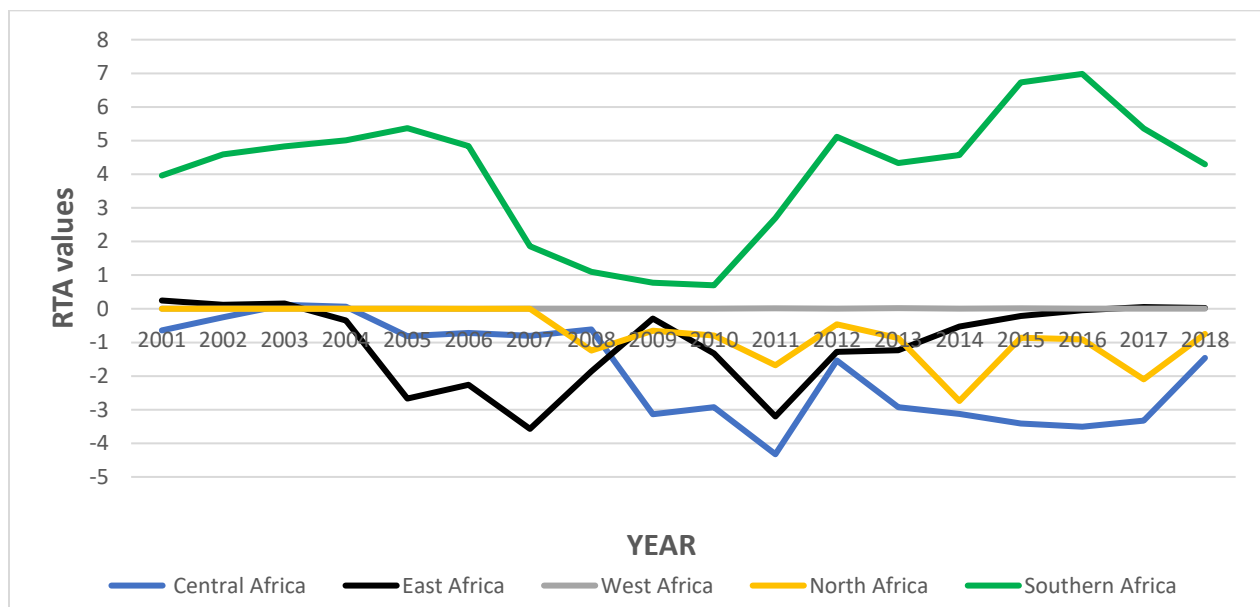


Fig 5.6 RTA of South African onions in all five regions of Africa.
Source: International Trade Centre data (ITC, 2019)

²⁵ Table B.6 shows RTA calculations for South African onions in the five regions of Africa (Appendix B).

5.3 Comparison of South African vegetable sector with other countries

The main objective of the previous sections is to establish the competitive performance/ trend of the South African vegetable sector (tomatoes, carrots and onions) in the African market. Therefore, it is vital to have a comparison of the South African vegetable sector, with major vegetable exporters into the African market. Bearing in mind that RTA methodology allows for comparison of countries, one of the many reasons why this methodology is chosen in this study. Jafta, (2014) states that RTA considers market distortions and the size of the economy into consideration that is why it is acceptable to be used as a comparison of competitive advantage between countries.

5.3.1 South African tomatoes comparison with other countries

Fig 5.7²⁶ below shows RTA values of major tomato exporters into the African market. It is quite evident, that the South African tomato sector is not competitive. Morocco and Uganda are competitive in the African market, Uganda being more competitive in the current years (2011 – 2018). On the other hand, just like South Africa, Namibia recorded negative RTA values. The graph below does not only show how uncompetitive South African tomato sector is, but it also shows an opportunity in the African market for South African tomato sector, because they are no dominant countries exporting tomatoes into the African market (highlighted by low RTA values), *ceteris paribus*.

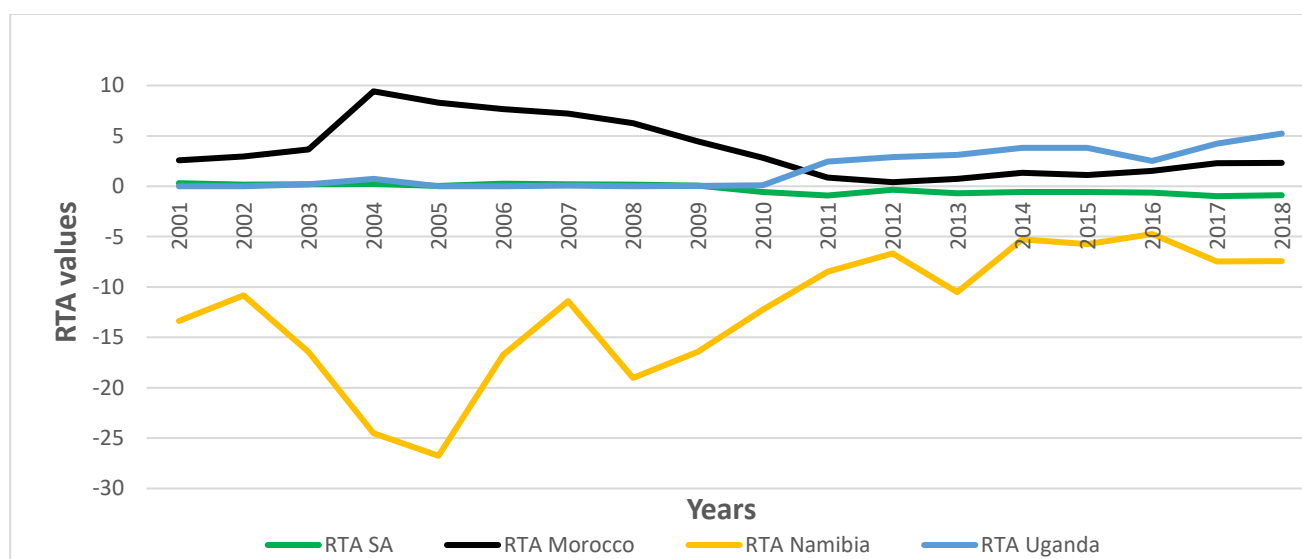


Fig 5.7 South African tomatoes comparison to other competitors in the African market
Source: International Trade Centre data (ITC, 2019)

²⁶ Table B.9 shows South African tomatoes comparison to other countries into the African market (Appendix B)

5.3.2 South African carrots comparison with other countries

Fig 5.8²⁷ below shows RTA values for major carrots exporters into the African market. South African carrots are showing a strong competitive edge over the other competitors, Belgium, France and Netherlands. However, the only major competitor according to the RTA calculations in Fig 5.8 is Belgium that has high values of RTA, but in recent years (from 2010), the South African carrots sector is more competitive with RTA value averaging above 6.

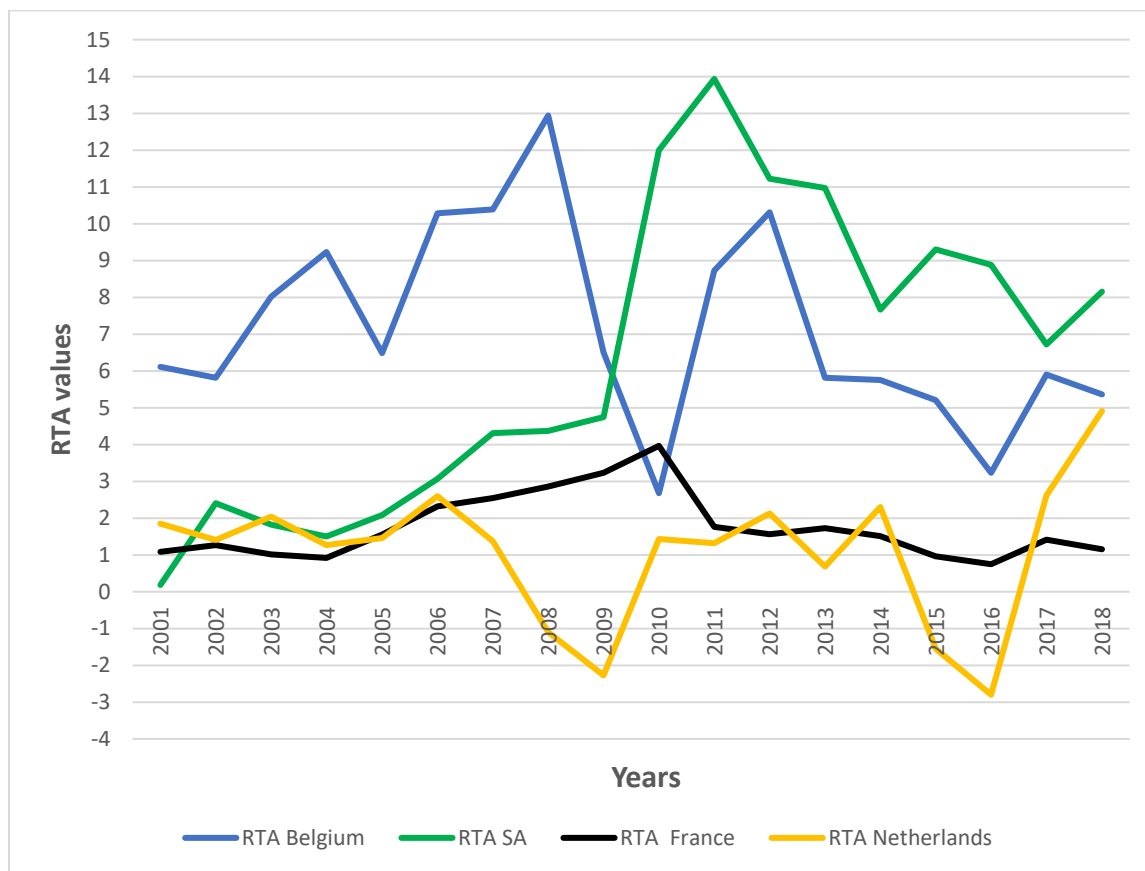


Fig 5.8 South African carrots comparison to other competitors in the African market
Source: International Trade Centre data (ITC, 2019)

²⁷ Table B.10 shows South African carrots comparison to other countries into the African market (Appendix B)

5.3.3 South African onions comparison with other countries

Onions RTA values for major exporters of onions into the African market are shown in Fig 5.9²⁸ below. It was previously established that the South African onion sector is competitive, However Netherlands has a competitive edge over South African onions. Another country of concern is Egypt that is also showing higher RTA values than South Africa, especially in the recent years (from 2011). Tanzania on the other hand years that they are competitive (even more than South Africa), but majority of the years Tanzanian onions were uncompetitive. South African onions face intense competition from all four of the competitors, especially Netherlands. Therefore, decisions makers in this sector needs to be more innovative and creative to ensure the sector is competitive and sustainable in the long run.

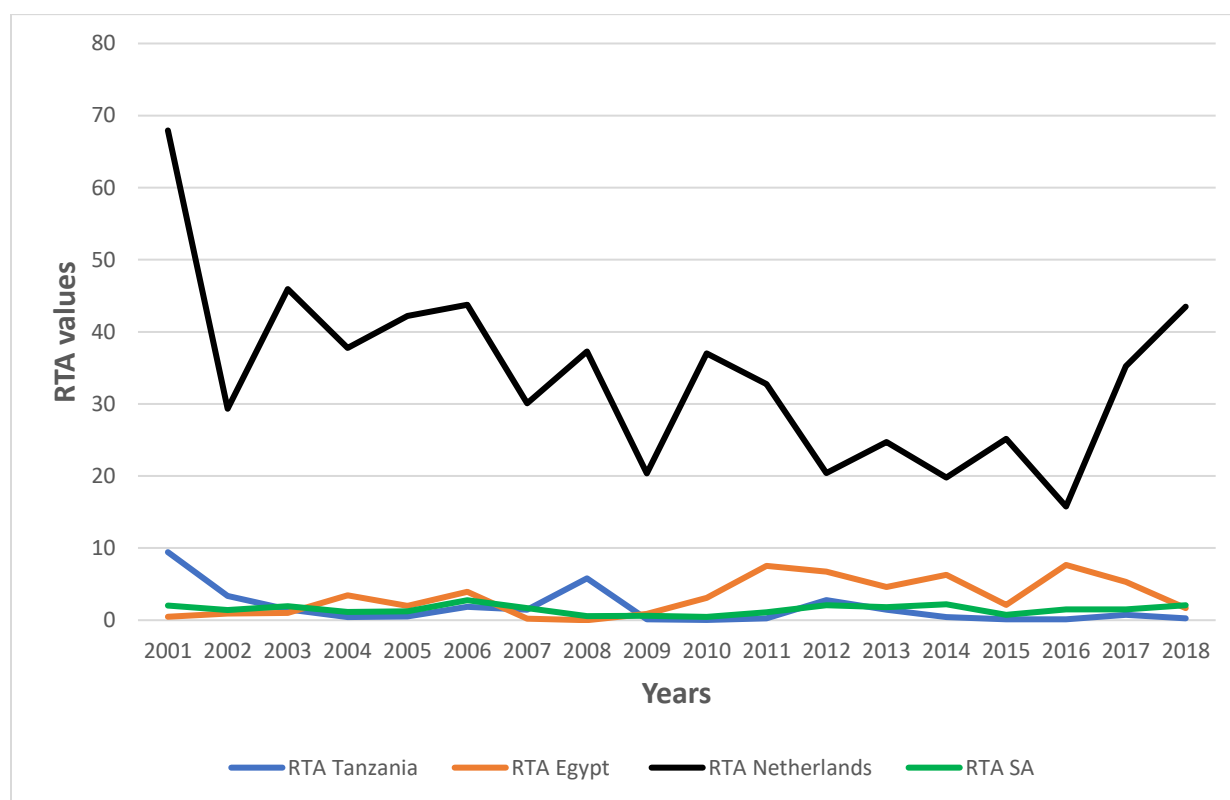


Fig 5.9 South African onions comparison to other competitors in the African market
Source: International Trade Centre data (ITC, 2019)

²⁸ Table B.11 shows South African onions comparison to other countries into the African market (Appendix B)

5.4 Identifying factors of competitive advantage of the South African Vegetable sector (Tomatoes, Carrots and Onions)

The previous section measured the competitive advantage of the South African vegetable sector (tomato, carrots and onions) in global and African market using RTA, RCA and NXi. The section seeks to establish factors that determine the competitive advantage of the South African vegetable sector. An online Vegetable Executive Survey (VES) together with personal interviews are used to get views from vegetable sector role players. Identifying and rating the factors of competitive advantage will assist the sector to better understand its position in the African market and make informed decisions going forward. The focus group for the VES are the experts (decision makers) in the vegetable value chain – input producers, producers, packers, processors, exporters, importers and fresh produce market agencies.

The study used a two rounds Delphi technique that is send out to participants using an online survey platform (Survey Gizmo). The VES contained 46 questions and the targeted audience for the two rounds Delphi are 25 vegetable sector experts selected by the sector's boards as described in Chapter 4.3.2.

First round Delphi had a response of 18 participants of the 25 intended, representing 72% response rate. The responses are analyzed and results are sent back for Delphi round two, however only 8 response of the 25 intended are received, representing 32% response rate. The relatively low response in round two is not left unattended and is viewed from within a scientific research approach. This study used a Likert scale, with a rating from 1 – 5. A rating of above 3 highlighted that the factor had an enhancing impact (rating closer to 5, highly enhancing) and a rating below 3 indicated constraining factors, (rating closer to 1, highly constraining), with a rating of 3 being neutral. This section of the study also provides grouping/clustering of the VES factors into major determinants of Porter diamond model.

Fig 5.10 below shows the factors²⁹ that are identified and rated by vegetable sector experts in the vegetable executive survey (VES).

²⁹ Important to note, beyond these factors, Delphi participants in an open-ended question indicated that SA vegetable sector global footprint, marketing strategies and new relevant products development in the processing industry are also enhancing factors. Political instability, poor economic policies, environmental issues and crop disease are some of the constraining factors.

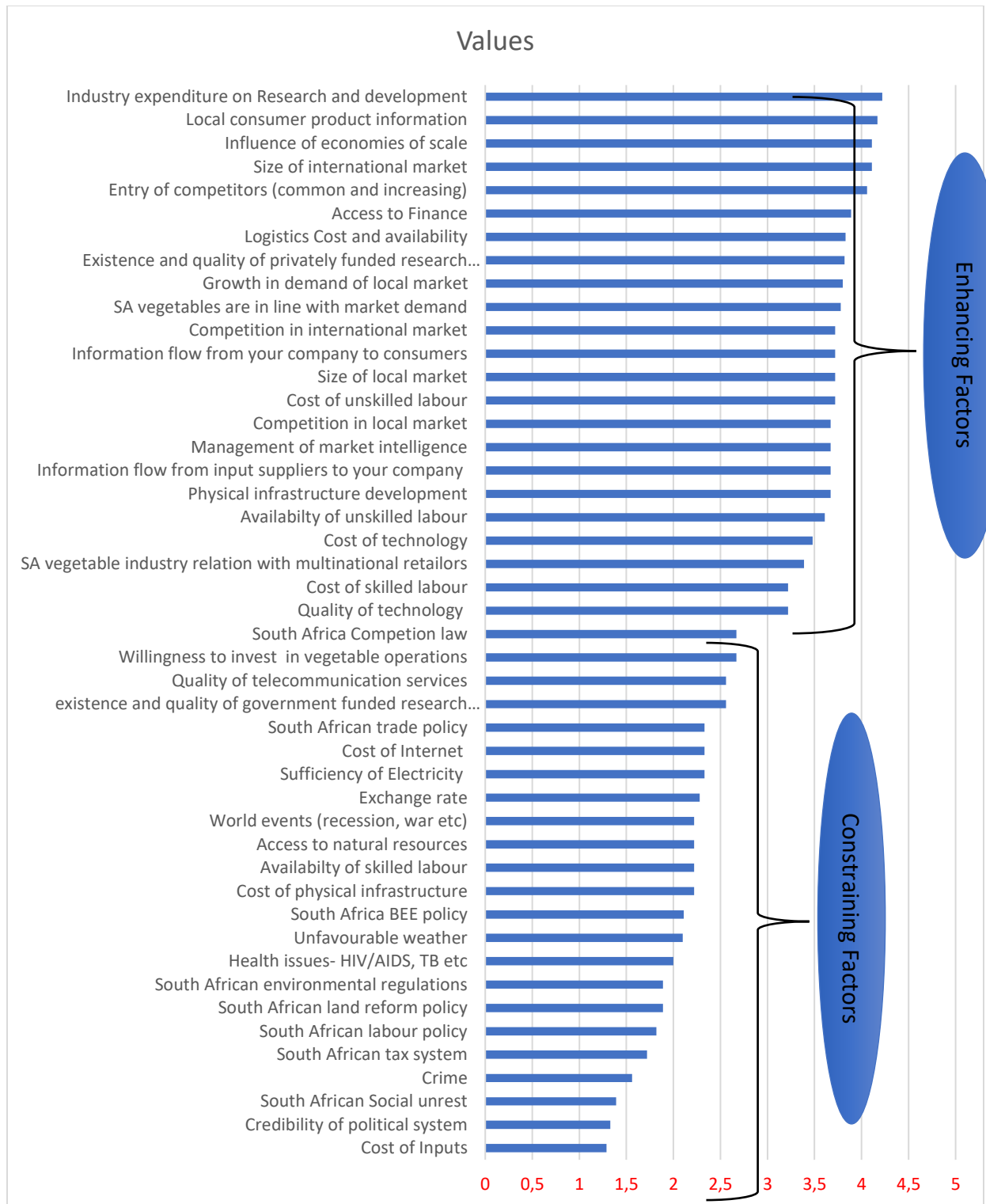


Fig 5.10 South African vegetables competitive advantage factors
 Source: vegetable executive survey

5.4.1 Most enhancing and constraining factors

Table 5.1 below shows the top ten enhancing and constraining factors of the South African vegetable sector, according to the responses of the sector experts. Sector's expenditure on research and development and local consumers product information availability are the top enhancing factors, whereas cost of inputs, credibility of the political system and crime topped the constraining factors. It should be noted that many of the constraining factors are government related factors.

Table 5.1: Top ten enhancing and constraining factors of the South African vegetable sector

Constraining Factors	Mean	Enhancing Factors	Mean
Cost of Inputs	1.29	Sector's expenditure on Research and development	4.22
Credibility of political system	1.33	Local consumer product information	4.17
South African Social unrest	1.39	Influence of economies of scale	4.11
Crime	1.56	Size of international market	4.11
South African tax system	1.72	Entry of competitors (common and increasing)	4.06
South African labor policy	1.82	Access to Finance	3.89
South African land reform policy	1.89	Logistics Cost and availability	3.83
South African environmental regulations	1.89	Existence and quality of privately funded research institutions	3.82
Health issues- HIV/AIDS, TB etc	2.00	Growth in demand of local market	3.80
Unfavorable weather	2.10	SA vegetables are in line with market demand	3.78

5.5 Porter's Determinants of competitive advantage in the South African Vegetable sector

The following section is going to focus on application of the Porter's diamond model. The factors identified and rated in the VES will be grouped into Porter's determinants. The Porter's six major determinants of competitive advantage as mentioned in Chapter 3 are factor conditions, demand conditions factors, related and supporting industries, firm strategy, structure and rivalry, government support and policy and chance factors.

5.5.1 Factor conditions

Porter, (1990) states that competitive advantage of industries is determined by availability of factors of production. He also highlighted two types of factor conditions: Basic factors-state of natural resources, endowments and their location. The second grouped he called them advanced factors – these include innovative infrastructure and skilled personnel.

The factor conditions are deemed generally constraining by South African vegetable sector decision makers, with an average rating of 2.64. Majority of the factors are regarded as constraining, with the most constraining being Input cost. Input cost has always been regarded as a constraining factor in most agricultural studies done in South African agriculture, examples being, Jafta, (2014) in Apple sector, Dlikilili, (2018) in Citrus sector and Stroebel and Jooste, (2010) in potato sector. The main reason is most inputs used in South African agriculture are imported, and due to a weak Rand value, input cost become awfully expensive. Other constraining factors includes, cost of infrastructure, access to natural resources – due to droughts, natural resource like water have become constraining in recent years. Cost of skilled and unskilled labor are deemed constraining – due to minimum wages set by the government (minimum wage for farm workers is R18.69/hour (USD 1.28/hour)³⁰, which equates to approximately R3362.40 (USD 229.99) per month (45-hour week). However, quality of infrastructure, quality of technology and availability of unskilled labor are considered enhancing factors of the South African vegetable sector.

³⁰ Exchange rate Rand to USD is 1USD: R14.62, United Nations June 2019.

Fig 5.11³¹ below shows the VES factor conditions rated by sector experts in a two round Delphi method.

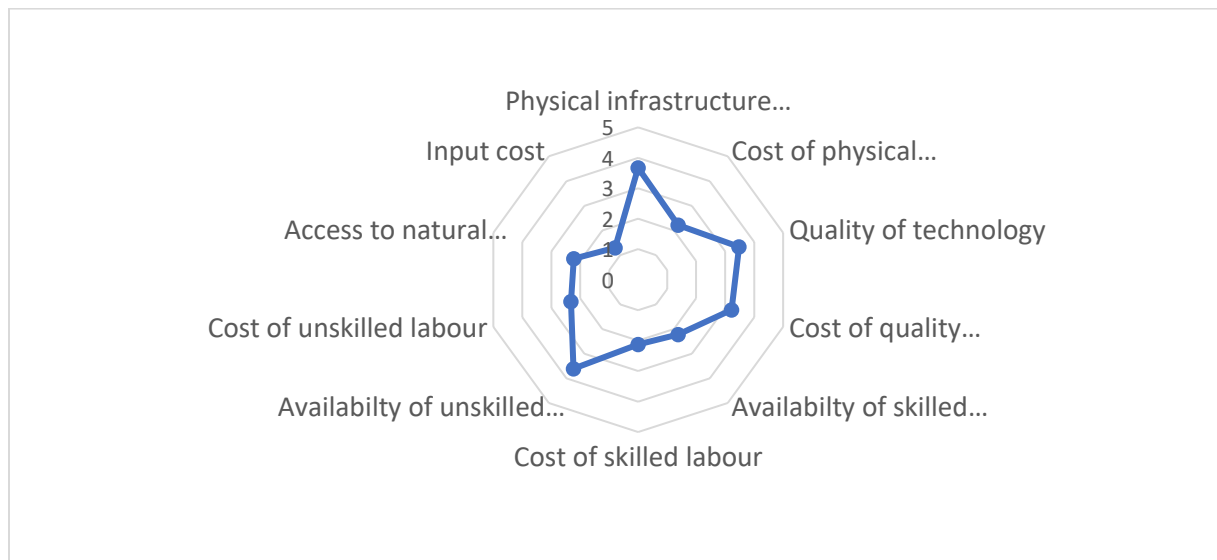


Fig 5.11: South African vegetable sector factor conditions
 Source: Vegetable executive survey (2019)
 Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

5.5.2 Demand conditions

The tomato, carrots and onions sector experts generally regarded the South African vegetable demand conditions as enhancing factor, with mean rating of 3.83. All factors of demand conditions are considered enhancing factors. Due to healthy benefits that are related to vegetables, there is no surprise that demand conditions are considered enhancing. The size of the market, both local and international for South African tomatoes, carrots and onions are considered large enough to accommodate the sector's production.

Relationship between the sector and multinational retailers and the availability of product information to consumers are all considered enhancing by VES participants. Fig 5.12³²

³¹ Table B.12 shows South African vegetable sector Factor Conditions (Appendix B).

³² Table B.13 shows South African vegetable sector Demand Conditions (Appendix B)

below shows sector experts rating of the demand conditions of the Porter's diamond model.

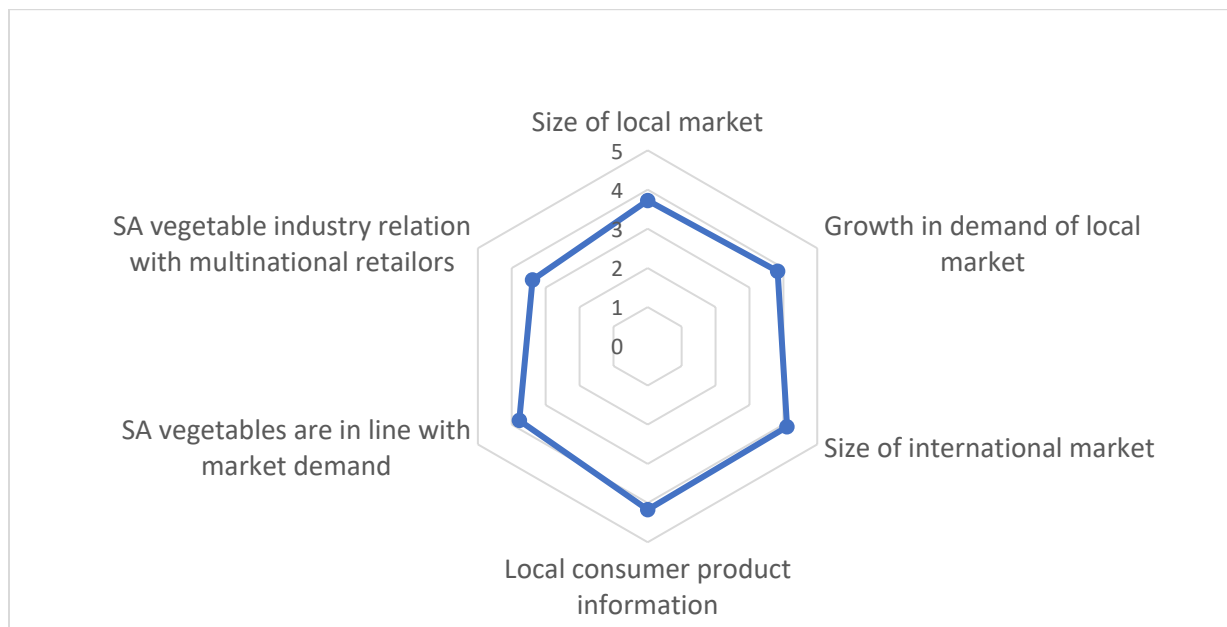


Fig 5.12 South African vegetable sector demand conditions
 Source: Vegetable executive survey (2019)
 Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

5.5.3 Related and supporting industries.

Porter argues that, presence of internationally competitive related or supporting industries, increase a sector's competitive advantage, in the sense that these companies provide products or services in an efficient and effective way, and in most cases- they provide these products or service cost-effectively.

Related and Supporting industries factors are considered generally enhancing, with an average rating of 3.19. Most enhancing factors includes quality of research and development funded by the sector, accessibility of finance, availability and cost of logistics.

However, there are also constraining factors highlighted by experts, these included quality of research institutions funded by the government, electricity supply, quality of telecommunication. The recently most worrying factor is electricity supply, not only is supply not enough, but the cost of electricity has also been increasing since 2008 (Ndou, 2012). Currently, taxes on electricity keeps on increasing with power cuts also included into the Eskom electricity supply woes.

Below is Fig 5.13³³ showing the VES experts rating of the related and supporting industries factors of the Porter's diamond model.

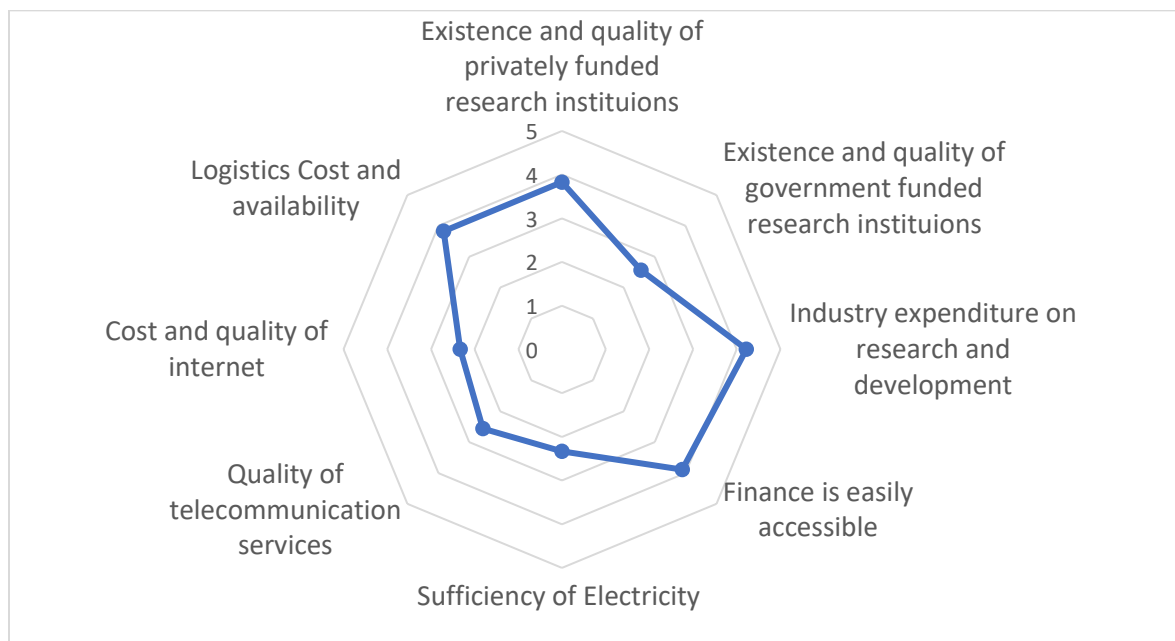


Fig 5.13: South African vegetable sector related and supporting industries.

Source: Vegetable executive survey (2019)

Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

5.5.4 Firm strategy, structure and rivalry

These are factors that highlights managerial systems to a larger extent. Porter, (1990) indicates that no one managerial system is universally appropriate for all firms, but rather competitive advantage of industries is as a result of management practices and

³³ Table B.14 shows South African vegetable sector Related and Supporting industries factors (Appendix B).

organizational modes that are unique to increase a company or sector's competitive advantage.

Firm strategy, structure and rivalry factors for tomatoes, carrots and onions are considered enhancing my VES participants, with an average rating of 3.66.

Management of competition in the international market, management of competition in local market, management of market intelligence, are all considered to be enhancing by tomatoes, carrots and onions experts.

However, there are some setbacks on willingness to invest in vegetable operations. The factor is highlighted as one of the most constraining factors, with a rating of only 2.67. This is highly linked to the land reform debate in South Africa, therefore confidence of investing in agriculture generally is currently low.

Fig 5.14³⁴ below shows firm strategy, structure and rivalry rating from VES participants.

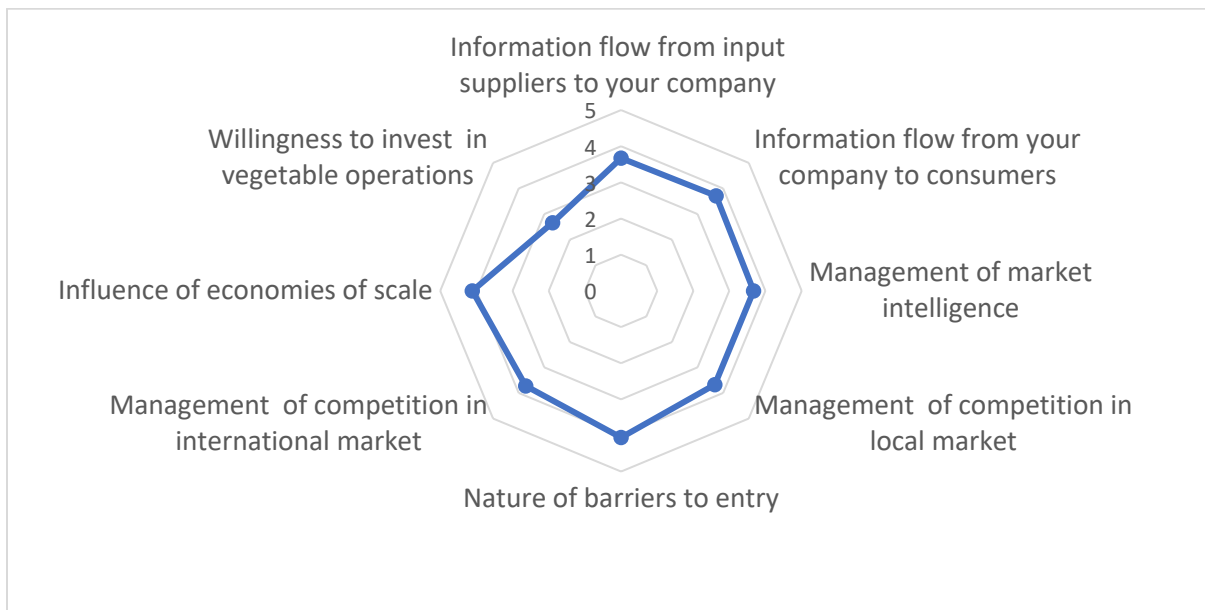


Fig 5.14 South African vegetable sector firm strategy, structure and rivalry

Source: Vegetable executive survey (2019)

Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

³⁴ Table B.15 shows South African vegetable sector Firm Strategy, structure and Rivalry factors (Appendix B)

5.5.5 Government support and policy

Porter noted that there are two opposing views on the role of government in improving competitive advantage. On the one hand some economists argue that government should support the marketplace through targeted policies such as subsidies, price support, etc (Porter, 1990). While classical and neoclassical theorist would argue for limited government involvement (Porter, 1990). Porter, (1990) however, argue that both these notions for government involvement are wrong and states that role of government should be to act as a catalyst to push companies to higher levels of competition.

Fig 5.15³⁵ below shows the rated government support and policy factors rated by vegetable sector role players. It can be concluded that the influence of South African government policies constraints vegetable competitive advantage, with an average rating of 2.1 – the most constraining Porter’s determinant factor. All factors related to government support and policy are considered constraining, with credibility of political system, labor policy and land reform policy considered the most constricting.

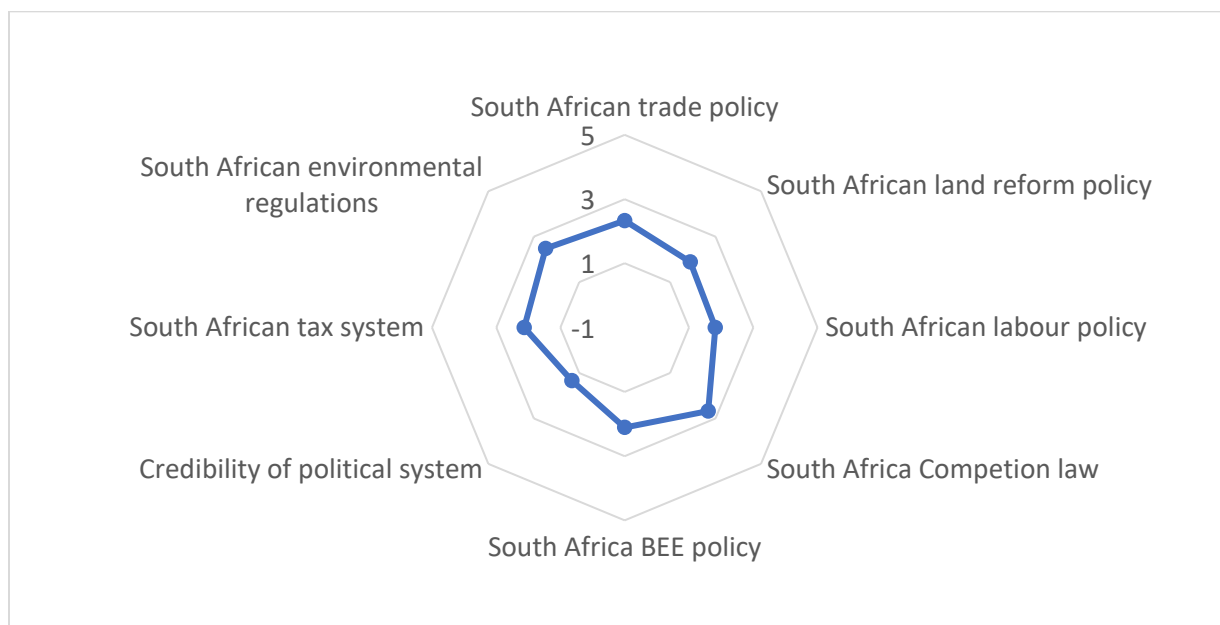


Fig 5.15 South African vegetable sector government support and policy

Source: Vegetable executive survey (2019)

Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

³⁵ Table B.16 shows South African vegetable sector Government policy and support factors (Appendix B)

5.5.6 The role of chance

Chance factors are described by Porter as factors that companies or sector have no control over, sector decision makers can only try to manage the factors in order to enhance their competitive advantage.

Fig 5.16³⁶ below shows chance factors rated by vegetable role players. Chance factors have an average of 2.19, indicating that they have a constraining effect on vegetable sector's competitive advantage. Cost associated with social unrest and crime are highlighted as the most constraining by vegetable sector's role players.

Health issues, specifically HIV and AIDS is also a constraining factor in South Africa, this factor has huge effect in sectors like the vegetable sector- due to the labor-intensive nature of the sector. Exchange rate factor received mixed feelings from sector role players depending on where they are on the value chain. Majority of role players considered exchange rate to be constraining because they import inputs (e.g machinery), however for exporters, exchange rate is deemed enhancing.

Unfavorable weather has played a crucial role in South African agricultural sector in past few years, with droughts being the main topic, therefore unfavorable weather is rated as a constraining factor by vegetable sector's role players

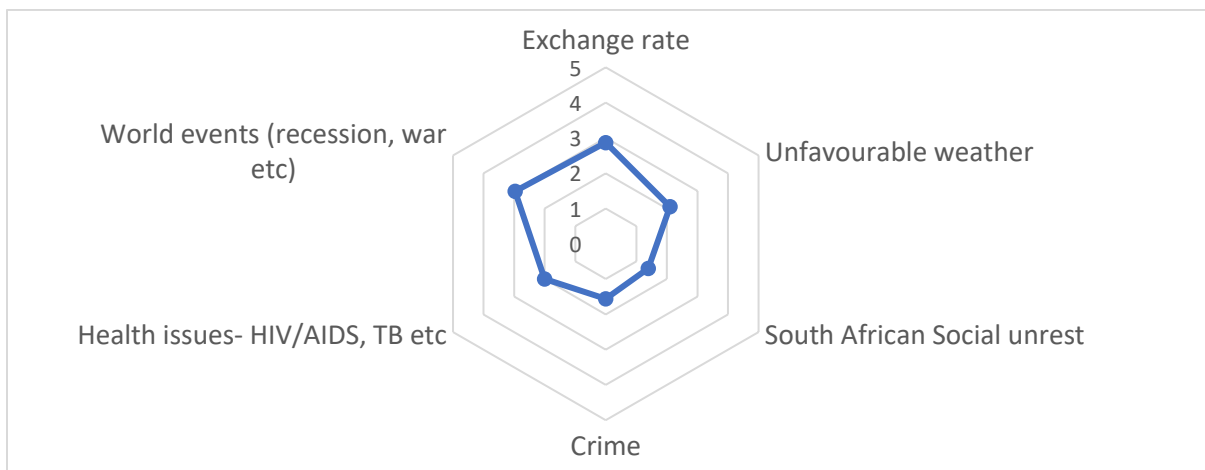


Fig 5.16 South African vegetable sector chance factors.

Source: Vegetable executive survey (2019)

Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

³⁶ Table B.17 shows South African vegetable sector Chance factors (Appendix B)

5.5.7 Summary of Porter's determinants of competitive advantage

Fig 5.17 below illustrate a summary of Porter's determinants of competitive advantage for the South African vegetable sector, as rated by the vegetable sector role players in two rounds Delphi method.

The enhancing factors for the vegetable sector (tomatoes, carrots and onions) are demand conditions, firm strategy and rivalry and related and supporting sector, respectively.

However, government support and policy, chance and factor conditions are highlighted as constraining factors by vegetable sector's role players, respectively.

The sustainability of the vegetable sector lies in the ability of the sector to manage the highlighted constraining Porter's determinants and maintain or improve the enhancing determinants.

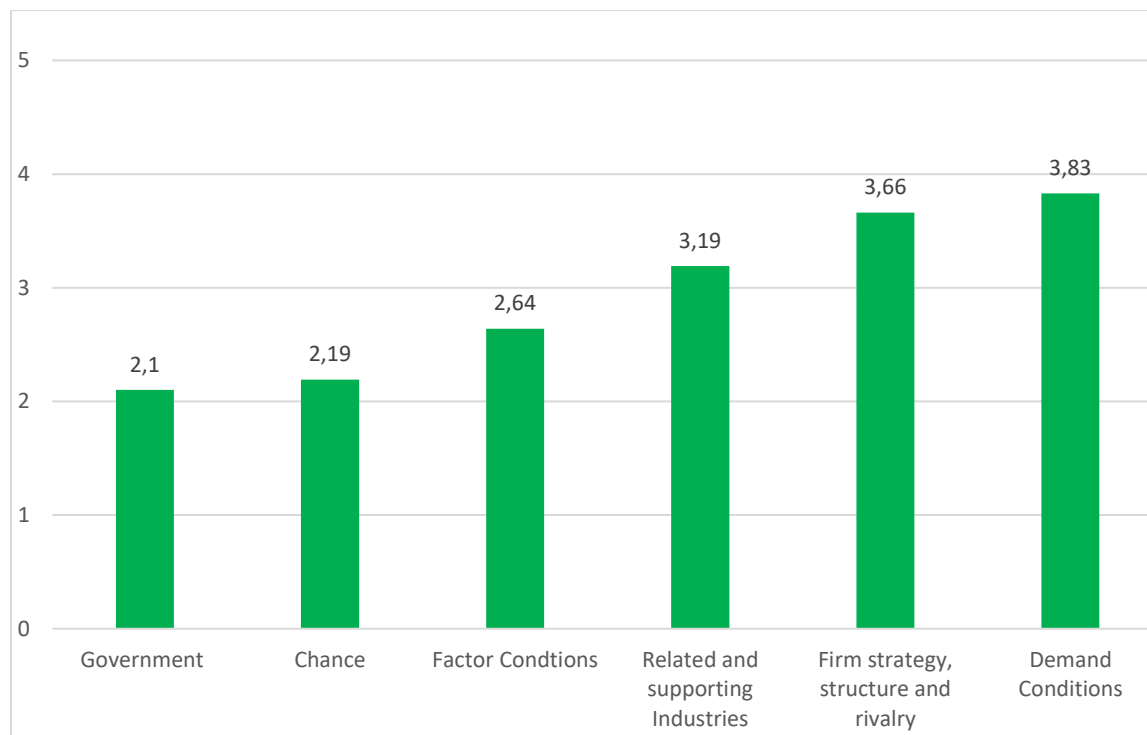


Fig 5.17 South African vegetable sector Porter Diamond model summary

Source: Vegetable executive survey (2019)

Rating: 1 - highly constraining, 3 – Neutral, 5 – highly enhancing

5.6 Conclusion

The South African vegetable sector (tomato, carrots and onions) is uncompetitive in both global and African market. In the last decade, the South African vegetable sector is a net exporter of vegetables (tomatoes, carrots and onions) however the quantities exported are not high enough for the sector to be considered competitive. Individually in the African market, carrots are highly competitive, followed by onions that are also competitive however, tomatoes are uncompetitive in the African market. It is also established that all three vegetables are competitive only in Southern Africa market and uncompetitive in the rest of the four regions of Africa. Morocco, Belgium, Netherlands and Egypt are the main competitors of the three South African vegetables.

In the Porter's model analysis, the most important factors that are found to have enhancing factor are sector's expenditure on research and development, size of international and local market, access to finance, logistics cost, consumer product information.

Main factors that constrict competitive advantage are cost of inputs, credibility of political system, crime, labor and land policy. Therefore, the sector needs to capitalize on enhancing factors and manage constricting factors in order to improve its competitive advantage in the African market and be sustainable in the long run.

Chapter 6: Summary, Recommendations and Conclusions

6.1. Introduction

The main focus of this study is to measure and analyze the competitive advantage of South African vegetable sector (tomatoes, carrots and onions) in the African market. Competitive advantage of the vegetable sector was measured using RTA, RCA and NXi. Factors enhancing and constraining competitive advantage of the vegetable sector were identified and analyzed. The objective of this chapter is to provide a summary of the main findings of this study, provide strategic insights/ recommendations that sector decision makers can consider improving the sector's competitive advantage and ultimately sustainability of the sector in the long run.

6.2. Summary of the research

- Chapter 1 served as an introduction to the study. This chapter provided the background of the study, objectives, research questions and the importance of the study.
- Chapter 2 contained an overview of the vegetable sector (tomato, carrots and onions). Global overview of vegetables and competitors of South African vegetable sector are also discussed. Value chains for tomatoes, carrots and onions are constructed in this chapter.
- Chapter 3 reviewed the relevant literature of competitive advantage. Porter diamond model is discussed in detail.
- Chapter 4 contained the empirical framework, which clearly outlined the research methodology used in this study.
- Chapter 5 presents results and findings of this research. This chapter provides results of measuring competitive advantage and factors affecting competitive advantage of the South African vegetable sector.
- Chapter 6 is the chapter for strategic proposal, recommendations and conclusion for the South African vegetable sector in order for the sector to be sustainable in the long run. Strategies proposed in this chapter serves as indicators or pointers

that provides intelligence to strategic planning, they should not be viewed as full-fledged strategies.

6.2.1 Summary of major findings

The quantitative analysis done in this study using RTA, RCA and NXi showed that the South African vegetable sector is neither competitive nor comparative in the global and African market. However, in the last decade the vegetable sector is a net exporter, shown by high NXi values. Tomatoes, carrots and onions RTA, RCA and NXi values were calculated individually for the African market, the results showed that carrots and onions are competitive, however tomatoes are uncompetitive in the African market. RTA for tomatoes, carrots and onions in five regions of Africa were also calculated. Tomatoes, carrots and onions were found to have a competitive advantage only in Southern Africa as compared to the other four regions of Africa. RTA values of competitors for tomatoes, carrots and onions in the African market are also calculated. South African carrots dominated the African market, with main competitor being only Belgium. Onions faced fierce competition from Netherlands and Egypt in the African market. South African tomatoes faces competition from Morocco and Uganda.

Qualitatively, the VES was constructed and send to sector's role players using a two rounds Delphi technique. After first round the results were analyzed using statistical mean, frequency and standard deviation and results were send back to participants, in order to reach a consensus.

Porter's major determinants of competitive advantage were established after the two rounds Delphi technique. Government support and policy, chance factors and factor conditions are generally constraining the South African vegetable sector. On the other hand, related and supporting sector, firm strategy, structure and rivalry and demand conditions are generally enhancing the South African vegetable sector.

6.3 Revisiting research questions and hypothesis

Chapter 1 of this study presented the research questions and hypothesis, the stated research questions are "How competitive is the South African vegetable sector relative to

competitors in the African market?” and “What factors drives the competitive advantage of the sector?”.

The hypothesis highlighted that “South African tomatoes, carrots and onions are competitive relative to the leading exporters in the African market. Competitive advantage of the vegetable sector (tomatoes, carrots and onions) is determined by multiple factors. The range of these factors includes government policies, productivity, exchange rate, trade, skilled labor and firm strategies.”

The ultimate reason for the empirical framework (described in chapter 4) is to lay a foundation for this chapter, which is strategies to enhance the sustainable competitive advantage of South African tomatoes, carrots and onions.

6.4 Strategic proposals for the South African vegetable sector (tomatoes, carrots and onions)

The purpose of this section is to provide strategies for the vegetable sector (tomatoes, carrots and onions) that can be used to maintain and improve the sector’s long-term success. There are six determinants of competitive advantage as proposed by Porter, (1990), and he argues that a sector or firm can make itself competitive through the strategic management of these six determinants. It is also particularly important to note that, although nations gain competitive edge over others in certain sectors, it is individual firms that compete against each other not nations (Porter, 1990).

The strategies proposed below stemmed from the response obtained from the VES discussed in chapter 5. These strategies should not be viewed as fully-fledged strategic planning, rather they should be viewed as recommendations resulting from intelligence of the survey taken by sector role players.

6.4.1 Factor conditions

Factor condition is overall rated as a constraining determinant, with a rating of 2.64. Below are suggestions on strategies:

Technological innovation – Innovation according to Porter, (1990) includes improvements/new technology and new ways of doing things. Technological

improvements that should be considered include, yields increasing mechanism, new markets, new ways of conducting training for workers and drought resistant crops etc. Usage of biotechnology is also advised. Technological innovation for in transit vegetable preservation is also advised, shelf-life extension, packaging and new varieties that are pest and drought resistant.

Smart ways of conserving water – Majority of South African fruit industries have switched to drip irrigation in orchards, however that is not necessarily the case with the vegetable sector, which still relies heavily on sprinkler irrigation. Smarter ways of conserving water in the sector should be considered, bearing in mind the droughts that we have been experiencing in South Africa in recent years. Government support to research institutions (e.g Agricultural Research Council (ARC)) regarding such topic would improve availability of information to farmers and all decision makers in the vegetable value chain, which then lead to better informed decisions.

Labor skills training – Availability and cost of skilled labor is highlighted as a concerning issue by tomatoes, carrots and onions role players. Agriculture profession has had this problem especially in the last decade, being labeled by many young people as “*not sexy profession*” to be part off. However, for any sector to be competitive it needs specialized skilled individual – this provides a competitive edge that other competitors will find difficult to replicate Porter, (1990). Therefore, skills training for workers already in the sector is essential for the sector’s future sustainability and competitive advantage.

Cost of production - cost of production is considered highly constraining by VES participants, input cost being the main contributor. This mainly results from cost associated with importing inputs, given that the Rand is weak compared to a US dollar or Euro. Exchange rate is something no one can control, however taxes imposed on imported agricultural inputs could be revised in order to address high cost involved in importing inputs.

6.4.2 Demand conditions

VES participants rated demand conditions as the most enhancing factor for tomatoes, carrots and onions. However, approximately more than 70% of these vegetables are

consumed locally (as raw or processed). The main two reasons for this as highlighted by VES participants are: vegetables are low value product and poor infrastructure to transport the vegetables into the African market. It is well documented how poor the infrastructure is across Africa generally, hence there is need for infrastructure development in order to shorten in transit time for vegetables. In fruit sector, introduction of waxing and colder temperature while transporting exports have massively improved product shelf life, therefore innovation on vegetable preservation should be considered in order to increase vegetables shelf life.

In 2018, Netherlands exported approximately USD 676 million US dollars' worth of onions, Morocco exported approximately USD 687 million US dollars' worth of tomatoes in 2018 and China exported approximately USD 397 million US dollars' worth of carrots in 2018 (ITC, 2019). Therefore, it is evident that exporting these vegetables in question is profitable, it is then important for South African vegetable sector to export its products to high paying markets like Europe and US, bearing in mind innovation on how to preserve these vegetables during transportation is also vital.

6.4.3 Firm Strategy, structure and rivalry

Supply chain management/coordination – Supply chain management cannot be stressed enough as a measure of improving competitive advantage of the vegetable sector. It is not good enough if parts of the supply chain perform efficiently and the rest of the supply chain is not efficient, then the full potential of value adding will not be realized (Jafta, 2014). Porter, (1990) states that the competitive advantage of a firm or sector is developed through the way firms or industries organizes and performs discrete activities in the value chain. The South African vegetable sector needs to focus more on supply chain management, in order to address the inherent weakness associated with primary agriculture, that is lack of capital investment, lack of information flow and advanced technology. Therefore, efficiency in supply chain management results to a more competitive sector.

6.4.4 Related and supporting industries

Related and supporting industries is overall rated as an enhancing determinant, with a rating of 3.19 below are a few suggestions on strategies:

Monopoly – monopolies are well known for their weakness in producing products or services inefficiently and charging high prices. This has been the case with Electricity Supply Commission of South Africa (ESCOM). More and more power cuts are experienced in the country and sector role players highlighted electricity supply as constraining factor. Investment in the provision supply of additional electricity supply should be considered. Other renewable sources should be investigated, examples being hydro-electric power, solar power or wind power.

Research and Development – More collaboration between public and private sector research institutions should be encouraged. Government funding on these collaborations is also highly advised. The research institutions need to be well structured, goal driven and cost effective. Bearing in mind that availability of information directly affects competitive advantage of a sector.

Sustainable logistics – Dlikilili, (2018) in his research on competitive advantage of citrus – he advised getting rail back on track for transportation of citrus. This research also shares the same sentiments, due to the bulkiness of vegetables and the bad state of African roads. Rail is the first step in the right direction for vegetable exports.

6.4.5 Government support and policy

Currently, confidence in government is incredibly low from sector role players point of view. This is shown by the overall rating of the determinant government policy and support of 2.1, the most constraining determinant.

Promote Investment – government policy shapes the environment which directly influences investors' confidence in any industry, sector, or country. Porter, (1990) argues that government should act as a catalyst or challenger in an economy, however sector role players indicates that their willingness to invest in the vegetable sector is currently negative. To increase investors' confidence, South African government needs to fight

corruption (any form of corruption). The government needs to review and address burning issues like the land reform program and transformation initiatives like BEE, without clear outline of policies, investors' confidence in an economy drops.

Research and Developments (R&D) – research and development is one of the most crucial factor of competitive advantage. However, government funded R&D centers are rated as constraining factor by sector stakeholders. Collaboration of government funded research institutes with privately funded institutes should be considered, (as mentioned above). Appointment of individuals that are effective and efficient (competent) is of utmost important – bearing in mind that having individuals with specialized skills is a competitive advantage that cannot be replicated as argued by Porter, (1990). If there are no readily available individuals with specialized skills, government might need to consider skills training, in the form of internships or make provision for more tertiary education funding initiatives.

6.4.6 The role of chance

Chance factors are considered constraining by sector stakeholders, with crime, social unrest and health (HIV and AIDS) issues topping the list of constraining factors. The challenge with these factors is, there is little that sector role players can do because there are external factors.

Crime – vegetable sector stakeholders have raised serious concern about crime. Crime in South Africa spreads from farm murders, looting of shops and recently attacks on Logistics companies (mainly trucks). The entire value chain is under threat from crime, therefore there is urgent need for means to fight crime. Government should consider stricter measures in tackling crime – introduction of harsher punishment for those that are found on the wrong side of the law should be implemented. There is a direct relationship between crime and investors' confidence. If an investor feels that their investment is not safe due to high crime rate, there is a high probability that they will not invest in that economy, (Jafta, 2014).

6.5 Recommendation for further research

After the application of the chosen methodology and findings reached in this study, a couple of issues can be recommended for further research and as highlighted below:

New markets – It is established in this study that most of the South African tomatoes, carrots and onions end up in the African market (mainly SADC and SACU), on the other hand most of the countries like Morocco, Mexico, Netherlands and China send their vegetables to high paying markets like Europe, UK and USA. Therefore, a study applying the Market Attractive Index (MAI) to determine other attractive markets, identifying new and lucrative markets for these vegetables can be beneficial for the sector in the long run.

Non-trade base measurements – This study made use of Relative Trade Advantage (RTA), Relative Comparative advantage (RCA) and Net Exporters index (NXI). A study applying non-trade base measurements to measure competitive advantage of South African tomatoes, carrots and onions is highly advisable, given that majority of the vegetables are sold in the local market, although it might be difficult to have comparison between industries in different countries.

Value Chain competitiveness – This study focused on competitive advantage of fresh tomatoes, carrots and onions. However, expanding the competitive analysis into value chains will give a clearer understanding of the sector. This is found in chapter 5 when different role players representing different stages on the value chain gave different views and ratings on the factors impacting competitive performance of vegetables. Such investigation can broaden and deepen the understanding as to where exactly intervention or proposed strategies should be applied.

Application of competitive advantage theory on other vegetables – The vegetable sector contains a lot of products in their basket, therefore, apart from tomatoes, carrots and onions that are investigated in this study and potatoes that are analyzed by Stroebel *et al*, (2010) similar studies should be done to vegetables like green, yellow or red pepper, sweet corn, green beans and lettuce. There are less studies that have been done in the South African vegetable sector.

6.6 Concluding remarks

The South African vegetable (tomatoes, carrots and onions) sector has been analyzed using RTA, RCA and NXi, in conjunction with Porter's diamond framework. It can be concluded that globally the South African tomatoes, carrots and onions are uncompetitive, and neither are they comparative (1961 -2016), However in the last decade the sector showed high NXi values, showing increased exports than imports.

In the African market carrots are highly competitive, followed by onions that are competitive and tomatoes – that are uncompetitive. South African vegetables main competitors in the African market include Morocco, Egypt, Netherlands and Belgium.

It is also determined that the competitive performance of the South African vegetable sector is not determined by one factor but rather by a range of factors and these factors includes among other things input cost, exchange rate, productivity, local and international demand of vegetables, firm strategy, government support and policy, related and supporting industries and crime.

In conclusion, there is a brighter future for South African tomatoes, carrots and onions in the African market (especially Southern Africa), more so for carrots – which had high RTA values than its competitors. Sector decision makers needs to prioritize management of constraining factors as highlighted in chapter 5 of this study and maintain or continue to improve enhancing factors in order to be sustainable in the long run given the AfCFTA.

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Appendix A

- i) Job title:
- ii) Geographic location (province):
- iii) Vegetable commodity Produced, Processed and or Traded:
- iv) Position along the Value Chain:

Factor Conditions

General physical infrastructure used by your company is well developed and sufficient?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The cost of physical infrastructure is affordable?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Quality of technology available to your company is outstanding and advanced?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Cost of technology is affordable compared to other industries?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Skilled Labour is easy to obtain?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Cost of skilled labour is affordable?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Unskilled labour availability is easy to obtain?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Unskilled labour cost is affordable?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Input cost (in general) is expensive?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Access to natural resources (land and water) is readily available?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Demand Conditions

Local market size is large enough and growing in demand?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The growth in demand (over time) of the local market is fast enough?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Consumer education and availability of information regarding your product is sufficient?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The international vegetable export market is large enough?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The availability and characteristics of SA vegetables, are in line with market demand (local and international)?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The South African vegetable industry's relation with multinational retailers is good?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Related and supporting industries

Privately Funded scientific research institutions are existent and are the best?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Government Funded scientific research institutions are exist and are the best?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Industry's expenditure on Research and development (R&D) is sufficient?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Financial Service providers generally enhance your business's competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Electricity supply is sufficient?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Telecommunication services are well developed and sufficient?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Internet is affordable and easily accessible?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Logistics cost is affordable?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Availability of local primary input suppliers are numerous and provide all necessary inputs?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Firm strategy, structure and rivalry

The management of information flow from primary suppliers to your company is excellent?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Flow of information from costumers to your company to inform strategy are excellent?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Management of market Intelligence for the vegetable Industry is excellent?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Competition in the local market is Intense?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Entry of new competitors is common and is increasing?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Competition in the International market is intense?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Economies of scale have a positive effect on your company?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Your willingness to invest in vegetable operations, keen?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Government policy and support

South Africa's trade policies enhance competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

South Africa's land reform policy enhances competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

South Africa's Labour policy enhance competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

South Africa's Competition law enhance competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

South Africa's BEE policy enhances competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

The credibility of the political system is very high?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Have legal or political changes over the past five years changed your company's planning?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Taxation system positively affects business investment?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Environmental regulations negatively affect your company's investment?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Chance factors

The exchange rate enhances your company's competitiveness?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Are you satisfied by utilization and management of unfavourable weather by the Industry?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Social unrest significantly affects your company?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Crime significantly affects your company?

Strongly Agree	1	2	3	4	5	Strongly Disagree

Health issues - HIV/AIDS, TB, etc significantly affects your company?

Strongly Agree	1	2	3	4	5	Strongly Disagree

World events affects your company competitiveness (-warfare, recessions, etc ...)?

Strongly Agree	1	2	3	4	5	Strongly Disagree

General questions

- v) What are the MAIN factors (not mentioned in the survey) enhancing the competitive performance of your industry?
- vi) What are the MAIN factors (not mentioned in the survey) constraining the competitive performance of your industry?
- vii) Who are the most threatening competitors? local and International

Appendix B

Table B.1: South Africa's RTA and NXi calculation in the Global market using FAO trade data

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	
RTA	-0.62	-2.30	-1.23	-0.62	-0.16	-1.34	-0.52	-0.56	-1.20	-0.78	-0.16	
NXi	5.90	14.6	30.7	9.6	-10.1	-36.4	8.80	21.1	22.6	-7.2	27.7	
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	
RTA	-0.56	-0.52	-0.53	-0.23	-0.12	0.06	0.00	0.01	0.03	0.01	0.03	
NXi	21.2	45.5	57.3	68.5	89.6	95.9	94.7	78.3	93.5	98.5	94.9	
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	
RTA	0.03	0.00	0.02	0.01	0.12	0.14	0.11	0.16	0.13	0.12	0.14	
NXi	92.3	82.3	95.4	94.6	91.4	87.6	95.6	93.6	95.8	78.0	86.5	
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
RTA	0.14	0.16	0.15	0.18	0.20	0.21	0.22	0.18	0.29	0.39	0.40	
NXi	82.6	85.4	98.1	98.0	96.6	95.8	91.7	97.7	98.9	98.9	98.6	
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
RTA	0.25	0.30	0.26	0.22	0.25	0.20	0.26	0.28	0.28	0.31	0.35	0.40
NXi	97.1	94.1	95.2	88.5	94.2	84.5	84.5	86.8	90.1	90.8	90.0	90.5

Table B.2: South Africa's RTA and NXi calculation in the African market

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
RTA	0.76	0.61	0.81	0.66	0.52	1.28	0.81	0.34	0.42	0.45	0.53
NXi	98.7	99.9	99.9	99.6	98.1	95.1	96.2	89.5	95.2	85.5	85.5
	2012	2013	2014	2015	2016	2017	2018				
RTA	0.98	0.76	0.73	0.70	0.61	0.78	0.83				
NXi	86.8	90.1	90.8	90.0	90.5	88.4	87.1				

Table B.3: RTA calculations for South African tomatoes, carrots and onions in the African Market.

Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
RTA Tomatoes	0.30	0.17	0.18	0.22	0.04	0.26	0.20	0.16	0.06	-0.57
RTA Carrots	0.18	2.41	1.82	1.50	2.08	3.07	4.31	4.37	4.75	12.0
RTA Onions	2.02	1.42	1.95	1.14	1.22	2.77	1.68	0.57	0.62	0.46
Product	2011	2012	2013	2014	2015	2016	2017	2018		
RTA Tomatoes	-0.91	-0.33	-0.71	-0.58	-0.56	-0.63	-0.98	-0.88		
RTA Carrots	13.9	11.2	10.9	7.7	9.3	8.9	6.7	8.15		
RTA Onions	1.11	2.10	1.80	2.22	0.73	1.52	1.49	2.08		

Table B.4: RTA calculations for South African tomatoes in the five regions of Africa.

Five regions of Africa	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Africa	-0,65	-0,25	0,12	0,02	-0,59	-0,63	-0,81	-0,61	-3,13	-2,98	-1,59	-1,50	-2,88	-1,81	-3,41	-3,51	-3,32	-1,46
East Africa	0,03	0,06	0,22	0,19	0,02	2,24	0,10	0,05	0,11	0,09	0,12	0,06	0,04	0,02	0,02	0,03	0,01	0,00
West Africa	0,09	0,08	0,03	0,09	0,09	1,43	0,10	0,06	0,27	0,05	0,03	0,13	0,16	0,07	0,00	0,78	0,00	0,00
North Africa	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Southern Africa	4,66	1,87	1,30	2,12	0,51	3,40	3,06	2,94	3,76	4,31	5,88	7,08	7,32	8,20	8,45	6,50	7,71	3,33

Table B.5: RTA calculations for South African carrots in the five regions of Africa.

Five regions of Africa	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Africa	-0,65	-0,25	0,12	0,02	-0,59	-0,63	-0,81	-0,61	-3,13	-3,20	-3,92	-1,85	-2,88	-1,86	-3,41	-3,51	-3,32	-1,46
East Africa	0,02	-3,73	0,06	0,06	-0,06	0,48	0,51	0,60	0,83	-0,24	-1,24	-8,44	-1,19	0,06	0,35	0,64	0,07	0,09
West Africa	-1,26	-1,86	-2,46	-3,06	-7,85	-10,2	-7,47	-9,33	-11,4	-13,2	-12,2	-14,7	-13,4	-10,5	-9,26	-9,94	-10,7	-9,75
North Africa	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Southern Africa	3,99	1,39	9,27	8,10	4,66	6,55	9,65	5,94	6,55	4,31	5,78	8,43	7,06	6,92	4,38	3,69	3,53	2,69

Table B.6: RTA calculations for South African onions in the five regions of Africa.

Five regions of Africa	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Central Africa	-0,65	-0,25	0,12	0,06	-0,81	-0,72	-0,81	-0,61	-3,13	-2,92	-4,33	-1,54	-2,92	-3,13	-3,41	-3,51	-3,33	-1,46
East Africa	0,25	0,12	0,16	-0,35	-2,67	-2,26	-3,57	-1,86	-0,29	-1,33	-3,20	-1,28	-1,23	-0,53	-0,22	-0,04	0,05	0,02
West Africa	0,00	0,00	0,01	0,00	0,01	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,02	0,01	0,01	0,00	0,01	0,01
North Africa	0,00	0,00	0,00	0,00	0,00	0,00	0,00	-1,24	-0,65	-0,80	-1,68	-0,47	-0,88	-2,74	-0,86	-0,91	-2,10	-0,75
Southern Africa	3,96	4,59	4,82	5,01	5,37	4,84	1,86	1,10	0,77	0,70	2,70	5,11	4,33	4,57	6,73	6,98	5,36	4,30

Fig B.1: RCA of individual South Africa vegetables (tomatoes, carrots and onions) in the African market

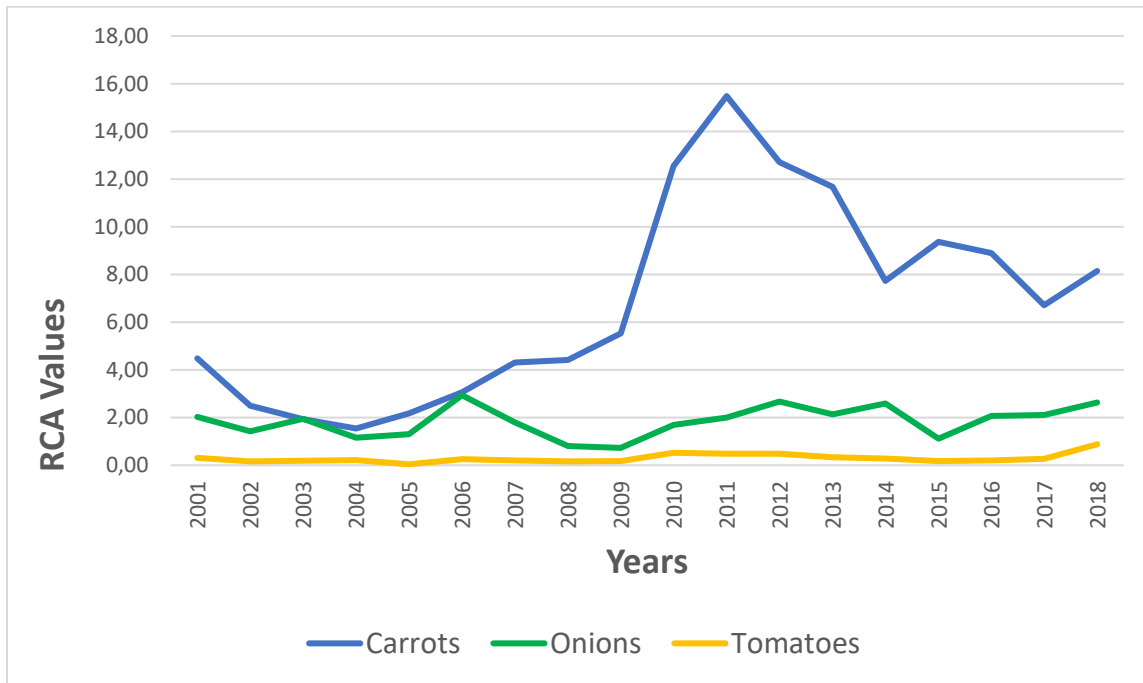


Fig 5.4 RCA calculations for individual South African vegetables
Source: International Trade Centre data (ITC, 2019)

Table B.7: RCA calculations for South African tomatoes, carrots and onions

Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
RCA Tomatoes	0.3	0.17	0.18	0.22	0.04	0.26	0.20	0.16	0.17	0.53
RCA Carrots	4.49	2.50	1.94	1.54	2.17	3.07	4.31	4.42	5.53	12.6
RCA Onions	2.03	1.42	1.95	1.16	1.30	2.94	1.80	0.81	0.73	1.69
Product	2011	2012	2013	2014	2015	2016	2017	2018		
RCA Tomatoes	0.48	0.49	0.34	0.28	0.18	0.20	0.27	0.88		
RCA Carrots	15.5	12.7	11.7	7.7	9.4	8.9	6.7	8.2		
RCA Onions	2.00	2.67	2.14	2.59	1.11	2.07	2.11	2.63		

Table B.8: NXi calculations for South African tomatoes, carrots and onions

Product	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NXi Tomatoes	100	100	100	100	100	100	100	99.9	98.0	91.8
NXi Carrots	89.7	99.5	98.8	99.5	99.1	100	100	99.5	96.2	97.0
NXi Onions	99.8	100	99.9	99.5	97.9	95.2	94.7	87.8	94.4	80.7
Product	2011	2012	2013	2014	2015	2016	2017	2018		
NXi Tomatoes	86.1	87.8	86.8	85.7	86.2	89.6	89.1	79.1		
NXi Carrots	91.0	89.6	94.9	99.3	99.5	99.8	100	99.9		
NXi Onions	84.2	86.1	91.1	91.2	88.7	89.3	85.7	87.3		

Table B.9: South African tomatoes comparison to other countries into the African market

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
South Africa	0.30	0.17	0.18	0.22	0.04	0.26	0.20	0.16	0.06	-0.57
Morocco	2.58	2.97	3.65	9.42	8.30	7.65	7.22	6.25	4.44	2.83
Namibia	-13.3	-10.8	-16.4	-24.5	-26.8	-16.8	-11.4	-19.0	-16.4	-12.3
Uganda	0.00	0.00	0.19	0.74	0.00	0.06	0.01	0.03	0.11	2.45
Country	2011	2012	2013	2014	2015	2016	2017	2018		
South Africa	-0.91	-0.33	-0.71	-0.58	-0.56	-0.63	-0.98	-0.88		
Morocco	0.85	0.40	0.73	1.34	1.13	1.52	2.27	2.31		
Namibia	-8.47	-6.67	-10.5	-5.28	-5.74	-4.74	-7.48	-7.43		
Uganda	2.45	2.88	3.12	3.82	3.83	2.50	4.23	5.23		

Table B.10: South African carrots comparison to other countries into the African market

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
South Africa	0.18	2.41	1.82	1.50	2.08	3.07	4.31	4.37	4.75	12.0
Belgium	6.11	5.82	8.01	9.23	6.49	10.3	12.9	6.50	2.68	8.73
France	1.09	1.26	1.01	0.92	1.56	2.31	2.55	2.86	3.23	3.96
Netherlands	1.85	1.40	2.04	1.26	1.45	2.60	1.37	-1.10	-2.27	1.43
Country	2011	2012	2013	2014	2015	2016	2017	2018		
South Africa	13.9	11.2	10.9	7.7	9.3	8.9	6.7	8.15		
Belgium	8.73	10.3	5.81	5.75	5.21	3.23	5.90	5.36		
France	1.77	1.56	1.73	1.51	0.96	0.75	1.41	1.15		
Netherlands	1.32	2.13	0.69	2.31	-1.55	-2.80	2.61	4.91		

Table B.11: South African onions comparison to other countries into the African market

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
South Africa	2.02	1.42	1.95	1.14	1.22	2.77	1.68	0.57	0.62	0.46
Egypt	0.48	0.90	1.02	3.47	2.00	3.92	0.21	0.00	0.90	3.11
Tanzania	9.44	3.34	1.52	0.43	0.51	1.86	1.44	5.79	0.13	0.03
Netherlands	67.9	29.3	45.9	37.8	42.2	43.7	30.1	37.3	20.4	37
Country	2011	2012	2013	2014	2015	2016	2017	2018		
South Africa	1.11	2.10	1.80	2.22	0.73	1.52	1.49	2.08		
Egypt	7.52	6.73	4.60	6.30	2.12	7.67	5.33	1.68		
Tanzania	0.26	2.80	1.46	0.42	0.11	0.12	0.73	0.26		
Netherlands	32.8	20.4	24.7	19.8	25.2	15.8	35.2	43.5		

Table B.12: South African vegetable sector Factor Conditions.

Factor Condition.	Mean	S. Dev	Frequency
Physical infrastructure development	3.67	0.49	4
Cost of physical infrastructure	2.22	0.43	2
Quality of technology	3.48	0.43	3
Cost of quality technology	3.22	0.43	3
Availability of skilled labor	2.22	0.43	2
Cost of skilled labor	2.12	0.43	2
Availability of unskilled labor	3.61	0.5	4
Cost of unskilled labor	2.32	0.57	2
Access to natural resources	2.22	0.43	2
Input cost	1.29	0.48	1

Table B.13: South African vegetable sector Demand Conditions

Demand Conditions	Mean	S. Dev	Frequency
Size of local market	3.72	0.46	4
Growth in demand of local market	3.83	0.32	4
Size of international market	4.11	0.51	4
Local consumer product information	4.17	0.32	4
SA vegetables are in line with market demand	3.78	0.43	4
SA vegetable sector relation with multinational retailers	3.39	0.51	3

Table B.14: South African vegetable sector Related and Supporting industries factors.

Related and supporting Industries:	Mean	S.Dev	Frequency
Existence and quality of privately funded research institutions	3.83	0.43	4
Existence and quality of government funded research institutions	2.56	0.51	3
Sector expenditure on research and development	4.22	0.54	4
Finance is easily accessible	3.89	0.61	4
Sufficiency of Electricity	2.33	0.49	2
Quality of telecommunication services	2.56	0.38	3
Cost and quality of internet	2.33	0.68	2
Logistics Cost and availability	3.83	0.65	4

Table B.15: South African vegetable sector Firm Strategy, structure and Rivalry factors

Firm Strategy, Structure and Rivalry	Mean	S. Dev	Frequency
Information flow from input suppliers to your company	3.67	0.49	4
Information flow from your company to consumers	3.72	0.46	4
Management of market intelligence	3.67	0.49	4
Management of competition in local market	3.67	0.49	4
Nature of barriers to entry	4.06	0.53	4
Management of competition in international market	3.72	0.46	4
Influence of economies of scale	4.11	0.68	4
Willingness to invest in vegetable operations	2.67	0.5	3

Table B.16: South African vegetable sector Government policy and support factors

Government support and policy	Mean	S. Dev	Frequency
South African trade policy	2.33	0.48	2
South African land reform policy	1.89	0.71	2
South African labor policy	1.82	0.51	2
South Africa Competition law	2.67	0.49	3
South Africa BEE policy	2.11	0.68	2
Credibility of political system	1.33	0.48	1
South African tax system	2.13	0.67	2
South African environmental regulations	2.48	0.58	3

Table B.17: South African vegetable sector Chance factors

Chance	Mean	S. Dev	Frequency
Exchange rate	2.87	0.46	3
Unfavorable weather	2.1	0.44	2
South African Social unrest	1.39	0.59	1
Crime	1.56	0.5	2
Health issues- HIV/AIDS, TB etc	2	0.7	2
World events (recession, war etc)	2.97	0.77	3

Appendix C

The proposed process to measure South African vegetable sector's competitiveness is schematically outlined in Fig 4.1 below:

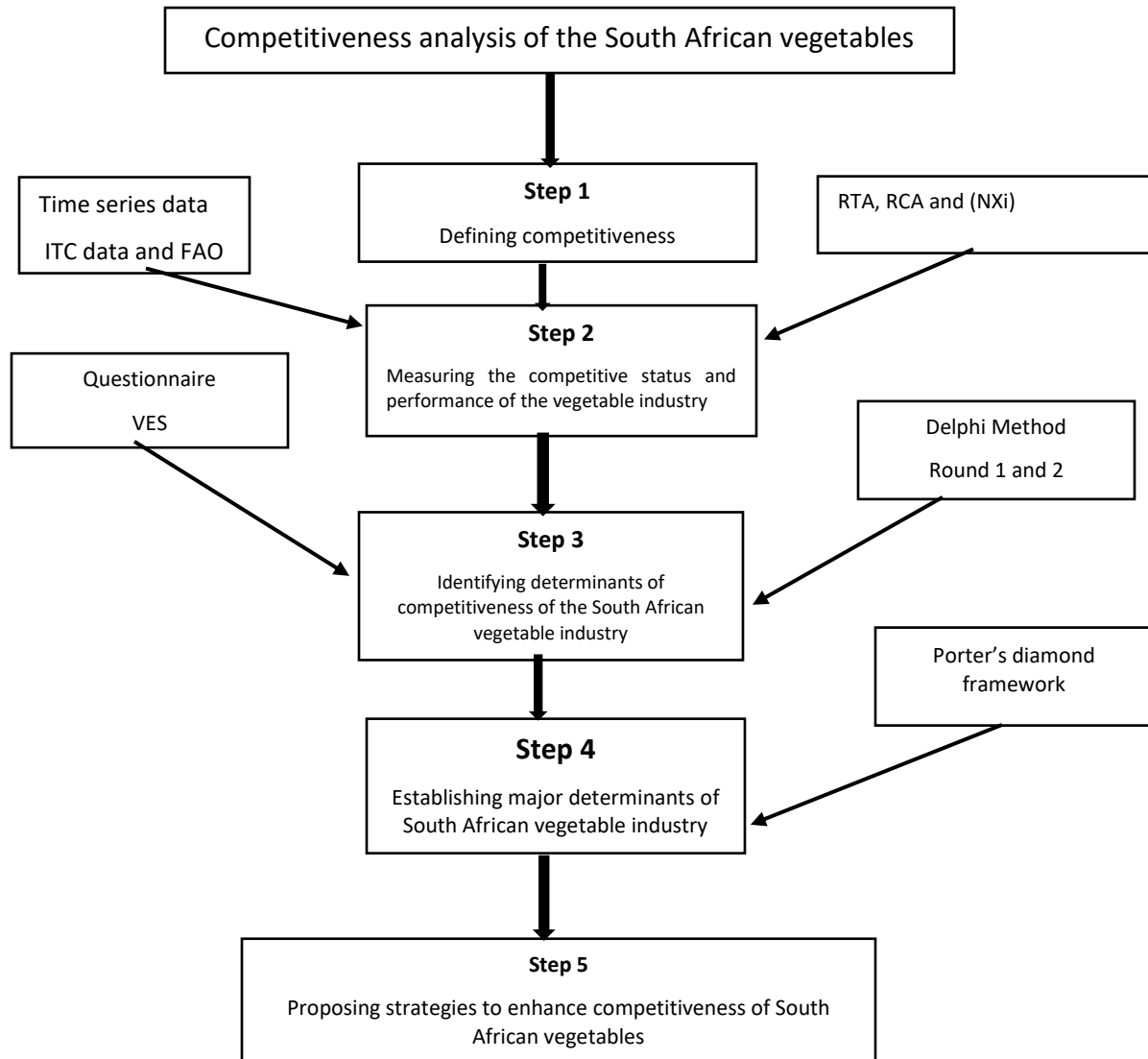


Fig C.1 Adapted from Esterhuizen, (2006), Jafta, (2014) and Boonzaaier, (2015)

Table C.1 Summary of other measurements of competitive advantage.

Measuring Technique	Description	Authors
Domestic Resource Cost ratio (DRC)	It's defined as shadow value of non-tradable factor inputs utilized in the production per unit of tradable value added.	Krugger (1966) and Bruno (1972)
Real Exchange rate (RER)	It is the ratio of the price index of tradable commodities to that of non – tradable inputs. Where the demand for currency of a competitive nation's exchange rate is strengthened and <i>vice versa</i> .	Brinkman (1987) and Frohberg and Hartmann (1997)
Export Market share (EMS)	It is an index that measures the export share of a nation in percentage in relation to the exports of a set of nations for a certain industry. This can be either quantity or value.	Dosi, Grazi and Moschella, (2013)

Appendix D

Definitions of competitive advantage

Competitive advantage is the ability of a sector, sector, firm to compete by trading their products at the time, place and form within the global environment while earning at least the opportunity cost of returns on resources employed, Freebairn, (1986)

Competitive advantage is defined as the effort of a firm to sustain or increase its market share, through appropriate pricing strategies, product quality improvements, the use of adaptable marketing strategies, (Zereyesus, 2003).

Venter and Horsthemke, (1999) defines competitive advantage as the ability of a sector to outperform rivals with a primary goal of profitability.

Balyte and Tvaronaviciene, (2010); Enisiu, (2007)., states that competitive advantage is not only economic performance, but it also includes 'soft factors', which are environment, information, technology and the ultimate goal should be to better the standards of living for all.

OECD, (1992) defines competitive advantage as, assuming free trade, the ability of a country to produce goods and services that meet the test of foreign competition while simultaneously maintaining and expanding domestic real income.

Feurer and Chaharbaghi, (1994) states that when defining competitive advantage, it is important to question something or someone's existence or existence of an organization and key players that determine its survival. The ultimate goal of an organization is to make profit, satisfy its shareholders and achieve sustainable growth and be able to satisfy the demand that a firm is competing for.

Competitive advantage should be considered as a means to an end not an end in itself, it is a dynamic process, not an absolute state of affairs, (Esterhuizen *et al*, 2001).

Competitive advantage incorporates efficiency and effectiveness. Efficiency - which implies that goals should be met at the lowest possible cost, and effectiveness - having the right goals, and the most crucial thing is the choice of these goals, (Symington, 2008).