Analysing the competitive performance of the South African subtropical fruit industry

by

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Declaration

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Abstract

The main purpose of this study was to investigate the competitive performance of the South African subtropical fruit industry in the global markets in view of recent general findings that the industry showed a declining trend of competitiveness (refer to the Agric-Competitiveness Matrix by Van Rooyen; Boonzaaier, 2017; BFAP, 2018). To determine the competitive performance of the industry and to arrive at the conclusions of the study, a five-step analytical and a systematic framework , applied in agri-business competitiveness studies by Esterhuizen (2006), Van Rooyen, Esterhuizen and Stroebel (2011), Jafta (2014), Boonzaaier (2015), Angala (2015), Boonzaaier and Van Rooyen (2017), Abei (2017) and Dlikilili (2018) was used. This framework was adapted and extended to accommodate the nature of the industry and to introduce Delphi-based consultative processes and statistical methods, such as principal component analysis (PCA) and Cronbach's alpha analysis.

In this study, competitiveness is defined as the: "ability of the South African subtropical fruit industry to trade products in both domestic and international markets on a sustainable basis; and to attract resource investment such as land, labour, technology, management skills and talent, and capital from other competing economic activities while earning at least the opportunity cost of returns on such resources employed" (adapted from Freebairn,1987). This definition, together with the Porter Competitive Diamond of enquiry, shifts the analysis away from a comparative advantage to a competitive advantage focus. Competitive performance of the South African subtropical industry was measured over time, based on its global trade orientation, and compared to the performance of the industry relative to that of its direct major international rivals. To achieve this, the Relative Trade Advantage (RTA) formula, developed by Vollrath (1991), was considered as appropriate to quantitatively measure competitive performance. Trade data from the Food and Agriculture Organization (FAO), available for the period 1961 to 2013, and from the International Trade Centre (ITC) for the period 2001 to 2016, was used.

The results of the FAO RTA analysis show that the industry consistently recorded RTA values below one throughout the studied years (1961 to 2013), i.e. only marginally competitive performance. However, when using the ITC datasets, it showed a stronger marginally competitive trend, with RTA values around 1 in most of the years, and with that in 2010 (RTA of 1.55) being comparatively greater than in the other periods, followed by a decreasing trend over recent years to a RTA of -0.08 in 2016.

The reason for differences in FAO and ITC RTA trends is found in the details of the respective databases used– with the FAO excluding mangos and macadamias. These are two of the most important competitive subtropical product groups for South Africa. The ITC based results, which included these products (i.e. mangos and macadamias), were thus used in the analysis, as confirming a generalised declining trend in competitive performance by the industry since 2011.

As to individual products, great variation was however registered. The macadamia nut industry, with its high competitive performance – RTA >120 in 2014/15, proves to be the top-performing South

African subtropical fruit industry, followed by avocado industry and mangos, all consistently recording RTA values above one. Banana, papayas and kiwi fruit were trading uncompetitive in the global markets.

In relation to the value-adding activities of this industry, only pineapple juice was considered (due to no data being available for other processed subtropical fruit products), and while juice is rated competitively, there is an observable decline for fresh pineapples.

The South African avocado industry, when compared to the other major Southern Hemisphere production regions to which it enjoys similar production seasons, had a relatively low rate of performance and was outperformed by all the competing countries. Chile had the highest RTA value for avocados, of 93.98, in 2003. In comparison to the Northern Hemisphere production regions – where the industry enjoys counter-seasonal production – the South African avocado industry, with RTAs of 3.13, outperformed Spain, with RTAs of 1.32 in 2016.

The macadamia nut industry, which leads the competitive performance stakes in the South African subtropical fruit industry when compared to the other major Southern Hemisphere production regions to which it enjoys similar production seasons. It outperformed Australia and Zimbabwe, with an RTA value of 124.1 in 2014. When South African macadamia nuts are compared to the other major Northern Hemisphere production regions – in relation to which it enjoys counter-seasonal production. The local macadamia nut industry, with a RTA value of 128.3 in 2015, outperformed Hong Kong, China (with a RTA of -3.30 in 2015) and Guatemala (with a RTA of 52.1 in 2015).

The next step in the analysis, involved a survey that was conducted among expert industry-level role players to determine the factors that influence (positively or negatively) the competitive performance of the SA subtropical fruit industry. A two-round Delphi method was introduced, using respondents to the first survey as the focus group. In the first round of the Delphi process, such participants were requested to rate the impact of identified factors on a Likert scale. A total of 101 factors were found to be positively or negatively affecting the competitive success of the industry. The enhancing factors included the use of advanced technologies, the use of labour-saving machines, economies of scale, and the availability of competitive local input suppliers, while constraining factors included the cost of skilled labour, the quality of unskilled labour and the cost of the new, specialised technologies. The role of the political process was viewed as highly constraining, together with administrative “red tape” and administrative/compliance factors impacting on the industry.

The Porter Competitive Diamond model was next applied and fitted the 101 factors into the six Porter Competitive Diamond determinants, again illustrating constraining and enhancing determinants. Principal component analysis (PCA) was performed, showing interesting pointers to differences and consensus in the views of industry participants with regard to the impact of factors identified for each determinant. The results reveal that there was strong consensus (similarity) in opinions regarding 30 factors influencing the industry’s competitive performance. These correlated factors (consensus factors)

were subjected to Cronbach's alpha analysis to assess their levels of internal reliability. From the results, only three of the 30 factors showed no internal consistency reliability and they were removed, leaving 27 final factors. These 27 final factors were subjected to the round two Delphi analysis. In this round, the same participants were then again asked to rate and discuss the long run relevance of these factors as determinants of competitiveness.

The final step in the analysis involved proposing industry-wide strategies to enhance the industry's declining global competitive performance. Based on the X-Y scatterplot of impact rating (from Delphi round 1) and the long run relevance rating (from Delphi round 2), critical factors to be improved and maintained were identified that aided the formulation of strategies. A strategic agenda of 19 actions were proposed. These included, amongst others: innovation through value chain collaboration; the establishment of a Subtropical Fruit Industry Strategy Plan (SFISP), as a basis of collaboration between industry role players; and government; industry-specific human resource development; effective domestic marketing; the further development of foreign markets; improved logistics and efficient distribution infrastructure; and continued engagement with government through strategic planning regarding key industry issues such as labour policy, trade policy, development of new markets, and technological innovation support.

Opsomming

Die hoofdoel van hierdie studie was om die mededingende prestasie van die Suid-Afrikaanse subtropiese vrugtebedryf in die globale mark te ondersoek, gesien teen die agtergronds van waarnemings van verlagende mededingedheid (Agric-Competitiveness Matrix, Van Rooyen & Boonzaaier, 2017). Om die mededingende prestasie van die bedryf te bepaal en om by die gevolgtrekkinge van die studie uit te kom, is ’n vyf-stappe ontledingsraamwerk wat in mededingendheidstudies deur Esterhuizen (2006), Van Rooyen, Esterhuizen en Stroebel (2011), Jafta (2014), Boonzaaier (2015), Angala (2015) en Boonzaaier en Van Rooyen (2017) gebruik is, uitgebrei en aangepas om die aard van die bedryf te akkommodeer en om Delphi-gebaseerde konsultatiewe prosesse en statistiese metodes, soos hoofkomponent-ontleding en Cronbach se alfa-analise, in te sluit.

In hierdie studie is mededingendheid eerstens gedefinieer as die vermoë van die plaaslike subtropiese vrugtebedryf om sy produkte in beide plaaslike en internasionale markte op ’n volhoubare basis te verhandel; en om skaars hulpbronne soos grond, arbeid, tegnologie, bestuursvaardighede en talent as ook kapitaal van ander, mededingende ekonomiese aktiwiteit te lok, terwyl dit ten minste die geleentheidskoste van opbrengste wat op hierdie hulpbronne gebruik is, verdien (Freebairn, 1987). Hierdie definisie, tesame met Porter se mededingende diamant-model, skuif die analise vanaf ’n studie van vergelykende voordeel tot mededingende voordeel.

Die tweede stap in die ontledingsraamwerk was om die mededingende prestasie van die Suid-Afrikaanse subtropiese vrugtebedryf oor tyd op grond van sy handelsoriëntasie te meet, en om die prestasie van die bedryf met dié van sy grootste direkte internasionale mededingers te vergelyk. Om dit te bereik, is ’n omvattende indeks om mededingende voordeel te meet, naamlik die Relatiewe Handelsvoordeel (*Relative Trade Advantage* (RTA)) van Vollrath (1991), beskou as die gepaste indeks om die mededingende prestasie van die plaaslike bedryf kwantitatief te meet. Wêreldhandelsdata vanaf die *Food and Agriculture Organization* (FAO) vir die tydperk vanaf 1961 tot 2013 en vanaf die Internasionale Handelsentrum (*International Trade Centre* (ITC)) vir die tydperk 2001 tot 2016 is gebruik om die bedryf se RTA’s te meet.

Die resultate van die FAO RTA-analise toon dat die bedryf dwarsdeur die studiejare (1961 tot 2013) konsekwent posetiewe maar marginale RTA-waardes (tussen 0 en 1) opgeteken het, m.a.w. marginaal mededingende prestasie. Toe die ITC-datastel gebruik is, het dit egter sterker ’n positiewe tendens getoon, met RTA-waardes in die meeste jare van om en by 1, en met die waarde in 2010 (RTA van 1.55) vergelykenderwys groter as in die ander tydperke en met ’n geleidelik afnemende tendens oor onlangse jare (RTA van -0.08 in 2015).

Die rede vir hierdie verskille in RTA-tendense kan gevind word in die onderskeie databasisse wat gebruik is – met die FAO wat nie veselperskes en makadamianeute insluit nie. Hierdie is twee van die belangrikste mededingende subtropiese vrugtegroepe in Suid-Afrika. Die ITC-gebaseerde resultate, wat hierdie produkte ingesluit het (m.a.w. veselperskes en makadamianeute) is dus in die volgende stappe

van die analise ingesluit en bevestig ook dat die suptropiese bedryf in die algemeen teen n dalende koers meeding sedert 2011.

Groot produk spesifieke variasie word egter gevind ten opsigte van mededingendheid. Die makadamia neut bedryf, met sy hoë mededingende prestasie – RTA waardes >120 in 2014/15 -is die top-presterende Suid-Afrikaanse subtropiese vrugtebedryf, gevolg deur die avokadobedryf en mangos, met RTA waardes van konstant bo een. Piesangs en kiwi vrugte was in die algemeen nie mededingend. Met betrekking tot die waardetoevoegende aktiwiteite van hierdie bedryf is slegs pynappelsap oorweeg, aangesien data nie vir ander verwerkte subtropiese vrugte beskikbaar was nie. Pynappel sap toon n mededingende tendens met ’n waarneembare afname in mededingende prestasie by vars pynappels.

Met betrekking tot die onderskeie produkte: wanneer die avokadobedryf met die vernaamste Suidelike Halfrond produksiestreke vergelyk word wat eenderse produksieseisoene ervaar, het dit relatief laag presteer en het al die mededingende lande beter presteer. Chili het die hoogste RTA-waarde vir avokado gehad, van 93.98 in 2003. In vergelyking met die Noordelike Halfrond produksiestreke – waar die bedryf teen-seisoenale produksie ervaar – het die plaaslike avokadobedryf, met RTA’s van 3.13, beter presteer as Spanje, met ’n RTA van 1.32 in 2016.

In terme van die makadamianeutbedryf, wat die beste presteerder is in die Suid-Afrikaanse subtropiese vrugtebedryf, is dit naasbeste wanneer dit met ander vername Suidelike Halfrond produksiestreke vergelyk word, wat eenderse produksieseisoene het. Dit het beter presteer as Australië en Zimbabwe, met ’n RTA-waarde van 124.1 in 2014. Wanneer Suid-Afrikaanse makadamianeute met produksiestreke in die Noordelike Halfrond vergelyk is – met teen-seisoenale produksie – het die plaaslike makadamianeutbedryf, met ’n RTA-waarde van 128.3 in 2015, beter presteer as dié van Hongkong (China) (met ’n RTA van -3.30 in 2015) en Guatemala (met ’n RTA van 52.1 in 2015).

Stap drie het eerstens ’n bedryfsopname behels wat onder kundige bedryfsvlakrolspelers onderneem is om die faktore te bepaal wat die mededingende prestasie van die SA subtropiese vrugtebedryf beïnvloed (hetsy positief of negatief). ’n Twee-rondte Delphi-metode is gebruik, met respondente van die eerste opname wat as die fokusgroep gebruik is. In die eerste Delphi-rondte is hierdie deelnemers gevra om die impak van geïdentifiseerde faktore op ’n Likert-skaal te bepaal. ’n Totaal van 101 faktore is gevind om die mededingende sukses van die bedryf positief of negatief te beïnvloed. Die versterkende faktore was o.a. die gebruik van gevorderde tegnologieë, die gebruik van arbeidsbesparende masjinerie, ekonomieë van skaal en die beskikbaarheid van plaaslike insetverskaffers, terwyl stremmende faktore die koste van geskoolde arbeid, die gehalte van ongeskoolde arbeid en die koste van die nuwe, gespesialiseerde tegnologieë was.

Die rol van die politieke proses is as hoogs stremmend beskou, tesame met die rompslomp en administratiewe/nakomingsfaktore van die bedryf beïnvloed.

Die vierde stap het Porter se mededingende diamant-model toegepas en die geïdentifiseerde 101 faktore in die ses Porter mededingende diamant-determinante ingepas. Dít het weer die stremmende en

versterkende faktore geïllustreer. Hoofkomponent-ontleding (PCA) is ook uitgevoer, aangesien dit betekenisvolle, interessante wysers verskaf na die verskille en konsensus in die sienings van die kundiges met betrekking tot die impak van die faktore wat vir elke determinant geïdentifiseer is. Die resultate toon dat daar sterk konsensus (eendersheid) was in opinies oor 30 faktore wat die bedryf se mededingende prestasie beïnvloed. Hierdie gekorreleerde faktore (konsensusfaktore) is verder aan Cronbach se alfa-analise onderwerp om hulle vlakke van interne betroubaarheid te assesseer. Die resultate het getoon dat slegs drie van die totaal van 30 faktore geen interne betroubaarheid getoon het nie en hulle is verwyder, wat 27 finale faktore agtergelaat het. Hierdie 27 finale faktore is onderwerp aan die tweede rondte van die Delphi-analise. In hierdie rondte is die kundige deelnemers gevra om die relevansie van hierdie faktore as determinante van mededingendheid te beoordeel en te bespreek. Die resultate toon dat die meeste van hierdie finale faktore relevant was vir die langtermyn mededingende sukses van die bedryf, en daar is in die finale stap van die analise aan hulle aandag geskenk.

Stap vyf van die raamwerk het die voorstel van bedryfswye strategieë behels om die bedryf se delende globale mededingende prestasie teen te werk. Op grond van die X-Y puntediagram van impakbeoordeling (vanuit Delphi rondte 1) en die relevansiebeoordeling (vanuit Delphi rondte 2) is kritiese faktore wat verbeter en onderhou moet word, geïdentifiseer wat die formulering van strategieë gehelp het. Negentien strategiese aksies word voorgestel--dit sluit onder andere in die stigting van ’n Strategiese Plan vir die Subtropiese Vrugtebedryf waar waardeketting rolspelers en ook die regering kan saamwerk; bedryfspesifieke menslike hulpbronontwikkeling; doeltreffende plaaslike bemarking; die verdere ontwikkeling van buitelandse markte; verbeterde logistieke en verspreidingsinfrastruktuur; en voortgesette betrokkenheid by die regering oor sleutel bedryfskwessies, soos arbeidsbeleid, handelsbeleid, ontwikkeling van nuwe markte, ens.

Dedication

This Master's degree is dedicated to my late mother, Zanele "Gutswana" Sibulali, my late sister, Zintle Sibulali, my late grandmother, Emily Sibulali, all those who believed in my academic career and journeyed with me to this far, particularly Ntombifuthi "Antana" Sibulali, Victor Bulelani Sigcau, Ncumisa Sibulali, Nompucuko Sibulali, Mduduzi Petros Sibulali, Vuyisa "Ngwenya" and Liso Ngceni, for their endless love, advice, words of encouragement, patience and willingness to support me to achieve this great goal.

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List of ABBREVIATIONS

AGOA – African Growth and Opportunity Act

ARC – Agricultural Research Council

BFAP – Bureau for Food and Agricultural Policy

DAFF – Department of Agriculture, Food and Fisheries

DRC – Domestic resource cost ratio

EMS – Export market share

EU – European Union

FAO – Food and Agriculture Organization

FPEF – Fresh Produce Exporters Forum

GATT – General Agreement on Trade and Tariffs

GCI- Global Competitiveness Index

GDP – Gross domestic product

HO – Heckscher-Ohlin

HS – Harmonised system

ITC – International Trade Centre

MAP – Marketing of Agricultural Products Act

NAMC – National Agricultural Marketing Council

NDP – National Development Plan

NSP – Net social profitability

NXi – Net Export Index

OECD – Organisation for Economic Co-operation and Development

PAM – Policy analysis matrix

PPECB – Perishable Products Export Control Board

RCA – Revealed comparative advantage

RCR – Resource cost ratio

RMA – Relative import advantage

RTA – Relative trade advantage

RXA – Relative export advantage

SA – South Africa

SAAGA-Southern African Avocado Growers' Association

SADC – Southern African Development Community

SALGA-Southern African Litchi Growers' Association

SAMAC-Southern African Macadamia Growers' Association

SAMGA-South African Mango Growers' Association

SH – Southern Hemisphere

Subtrop- South African Subtropical Growers' Association

TDI – Trade Performance Index

UK – United Kingdom

USA – United States of America

USDA – United States Department of Agriculture

WEF – World Economic Forum

WTO – World Trade Organization

Chapter 1: INTRODUCTION

1.1. Background

The literature generally describes the competitiveness of a nation or economy and its industries by focusing on trade performance through production value added and the level of integration into the global markets and value chains (Montalbano et al., 2015). Agribusiness presents great potential in transforming the agricultural sector of Africa. The growing demands for high-value products the world over yields positive outcomes relating to value-added employment creation and income improvement through production and export activities. The influence of globalisation has affected the agricultural market through encouraging market liberalisation, which in turn enforces the emergence of competitiveness as a key survival factor (Rozana et al., 2017; De Pablo Velenciano et al., 2017).

Webber and Labaste (2011) emphasise that an increase in competitiveness can greatly assist those involved in agriculture, agro-enterprises and agribusiness to improve their income and asset bases as well as alleviating the prevalence of poverty through promotion of an economic development growth trajectory. Thus, such practices need to be at the centre of agricultural policy developments, industry and firm level strategies (Alford et al., 2017). However, for such opportunities to be captured, long-term agricultural growth needs to be competitive (Webber & Labaste, 2011; Van Rooyen, 2014; Babu & Shishodia, 2017). Agricultural competitiveness therefore remains a cornerstone in sustained growth and trade in the agri-food sector (Van Rooyen & Boonzaaier, 2016).

South African agricultural economic development is based on the above assertions as it has undergone a series of structural and policy changes over time, particularly post 1994, to improve the country's economic growth and global market integration (Vink, Tregurtha & Kirsten, 2002; Sinngu & Antwi, 2014; Ntombela et al., 2017). After two decades, the country's agricultural sector had, to some degree, realised the growth ignited by the liberalisation of the agricultural market in 1996 that resulted in increased competitiveness (Van Rooyen & Esterhuizen, 2012), output growth and access to different global markets (BFAP, 2016; BFAP, 2017; Ntombela et al., 2017). Such growth has been significant in the wine, deciduous and citrus fruit industries of South Africa (Van Rooyen & Boonzaaier, 2017). It must be noted that these industries are also labour intensive and must be promoted to support job creation (refer to chapter six of National Development Plan (NDP), 2011). Moreover, for the country to be competitive in the global market depends on its ability to provide the required products opportunely. However, it is important to note that the competitiveness of the industry or country requires more than just an enabling trade environment (Esterhuizen & Van Rooyen, 2006; Van Rooyen & Boonzaair, 2017).

This thesis will complement recent studies by Esterhuizen, 2006; Van Rooyen, Esterhuizen & Stroebel, (2011); Van Rooyen & Esterhuizen (2012); Jafta, (2014); Angala (2015); Boonzaaier (2015); Van Rooyen & Boonzaaier (2017) and Dlikilili (2018) exploring South African agri-competitiveness by

focusing on the subtropical fruit industry. During the 2014/15 season, the subtropical fruit industry accounted for a total gross value of R3.3 billion of the 26.6 % gross value of the horticultural products in South Africa. The subtropical fruit industry creates employment opportunities along the value chain and contributes significantly to total agricultural exports (DAFF, 2016). It is estimated that the banana industry employed 23 000 workers (DAFF, 2016b), while macadamia nut industry employed 12 500 workers (DAFF, 2016c), pineapple industry employed 4 900 workers (DAFF, 2016d), mango industry employed 3 000 (DAFF, 2016e), and the litchi industry employed 2 400 workers (DAFF, 2016f) in 2016, respectively. South Africa, through its subtropical fruit industry, can be seen as a wheel, which can be used to achieve Vision 2030 of the National Development Plan (NDP), which aims to grow the South African gross domestic product at an annual growth rate of 5.4 % and to add 1 million direct jobs in the agricultural and agro-processing sector.

1.2. Problem statement and objectives

The need to support the trade growth of a nation has gone beyond the strategies of trade promotion and market access, as many countries fail to remain competitive in the global markets despite their identified comparative advantages. Market access and positive trade policies to embrace "behind-the-border" issues fail, as many African countries are unable to compete in global markets (Porter, 1990; Esterhuizen, 2006; Webber & Labaste, 2009; Pieterse et al., 2016). The ability to compete in the global markets is determined by a complex set of issues such as demand and supply forces, macroeconomic policies, natural factor endowments, factor conditions, infrastructure and related services, capacity to innovate and in particular strategic choices on the manner of how and what (goods) to compete with (Porter, 1990; Agnihotri & Santhanam, 2002; World Bank, 2013). The importance and selection of sectors/ industries for exports in a country's growth trajectory means that trade competitiveness should receive attention in policy discussions (Webber & Labaste, 2011; Pieterse et al., 2016; Mugabira, 2017). Challenges facing countries include the need to integrate into the international markets and to improve the competitive performance of traded products (Sinngu & Antwi, 2014; Almodarra & Saghaian, 2016; Ughanwa & Baker, 2018). South Africa's subtropical fruit industry is no exception as its export-driven focus means it is affected by market-related globalisation trends, increasing competition, changes in trade policies, trade liberalisation, information advancement and communication technologies with specific emphasis on factors related to environmental, food safety ethics, infrastructure and logistics advancements (Siddiq et al., 2012; Dasgupta, 2015; Rozana et al., 2015; Bureau & Swinnen, 2017; Solberg, 2017; De Pablo Valenciano et al., 2017; Rozana et al., 2017; Boonzaaier & van Rooyen, 2017; Subtrop, 2018). The "playing fields" are in a state of flux. At the farm and agribusiness firm level, challenges that face farmers and related agribusiness include increasing and changing production costs, rapid cost of technology adoption, water shortages and adverse weather conditions such as drought, and changing legal/regulatory compliances, all of which significantly influence optimisation in subtropical fruit production (Siddiq et al., 2012; AgriFood, 2018). On the processing, retailing and consumer side,

there is an increasing change in food composition and preferences that challenges industries to meet international quality standards and regulations. The full value chain is affected by such changes and need to be managed as such (Webber & Labaste, 2011).

Van Rooyen et al., (2011), Van Rooyen and Esterhuizen (2012), Angala (2015), and Boonzaaier & van Rooyen (2017) argue that, being and remaining competitive is critical for future growth of agricultural industries. This requires all players in the value chain to be competitive in the international market (Angala, 2015; Boonzaaier, 2015; Abei, 2017 & Dlikilili, 2018). The most pervasive external factors that influences the competitiveness of the country include the set of policies that regulate the market for agricultural products together with currency value movements and fluctuation and global market trends (Esterhuizen et al., 2011; Jafta, 2014).

From an internal factor perspective, fruit value chains are faced with supply and demand uncertainties, a lack of coordination along the value chain, and fluctuating margins that need significant management efficiency and the adoption of modern decision technologies (Soto-Silva et al., 2016). Bijman and Bitzer (2016), and Antonio and Griffith (2017) assert that an improvement in quality, coordination and innovation in food value chains is paramount in a successful competitive strategy. The presence of risks i.e. input value, production; post-harvest and marketing risks need attention in the value chains of fresh produce farmers (Louw & Jordaan, 2016). Competitiveness is thus related to both firm level (point along the value chain) and industry actions, and this raise questions about the competitive performance of the South African subtropical fruit industry, as such, including points in the value chains and the analysis thereof.

A first component of the problem statement of this study, would thus be formulated as how to constitute a theoretically sound industry wide analysis of competitive performance, with attention to different value-adding activities along the value chain and how to account for changes over time. This will consider the given factors affecting competitive trade listed above. Several studies on South African fruit industry level competitiveness have been conducted, including Esterhuizen et al., (2012) on the wine industry, Jafta (2014) on the apple fruit industry, Boonzaaier (2015) on the stone fruit industry and Dlikilili (2018) on the citrus fruit industry using relative trade advantage (RTA) and the Porter Competitive Diamond in a comprehensive analytical framework. However, none of these listed studies focused on or referenced the competitive performance of the subtropical fruit industry of South Africa, the factors influencing such performance and the way in which this industry responded to the many challenges related to its competitiveness.

Recent studies on measuring competitive performance in the agribusiness sector (Van Rooyen & Boonzaaier, 2017; Van Rooyen et al., 2018), indicated the declining trends for the South African subtropical fruit industry. This finding forms the basis of the problem statement of this study i.e. declining rates of competitiveness in the subtropical fruit industry. The competitive performance of this industry is viewed as important due to its relevance in economic development of South Africa (refer to

chapter six of the National Development Plan, 2011). Such a study will also establish a relevant baseline and feature as "business and strategic intelligence" for industry-wide strategic actions. A second component of the problem statement of this study will be to consider the analytical frameworks previously used for analysing competitiveness in the South African agro-industry context for application to the subtropical fruit industry, given climatic, market, technological and location differences. This will require the construction of a competitiveness definition applicable to the circumstances of the subtropical fruit industry, related measurements and analysis thereof, as well considering the appropriate database and statistical analysis methods for analysing competitiveness of the industry.

Primary and secondary objectives:

This study aims to develop a theoretically sound, systematic and comprehensive analytical framework through measurement and analysis of competitiveness of the subtropical fruit industry of South Africa. Therefore, the overall objective will be structured into the following sub-objectives, namely to:

- Define the term competitiveness in the context of the South African subtropical fruit industry;
- Measure the competitiveness of the South African subtropical fruit industry;
- Determine factors that affect the competitiveness success of the local industry;
- Analyse such factors affecting the competitiveness of the industry to identify major exogenous and endogenous factors enhancing and/or constraining the industry; and
- Lastly, recommend industry-level strategic actions and institutional incentives to support the competitive performance of the subtropical fruit industry of South Africa.

1.3.The research questions

The following research questions guide the study:

- What analytical frameworks of competitiveness will apply to this study and what database will be required?
- How can the term competitiveness be defined in the context of the South African subtropical fruit industry?
- How competitive has the subtropical fruit industry of South Africa performed over time?
- What are the major factors determining the competitive performance trends of the industry?
- How can the industry strategically enhance its competitiveness status?

1.4.Hypotheses of the study

The hypotheses to direct the comprehensive analysis of competitiveness in the light of the outlined problem statement are as follows:

- **H1**: The South African subtropical fruit industry is performing increasingly uncompetitively in the global markets over time.
- **H2**: This declining competitive performance of this industry is determined by a combination of factors; such as global integration; supporting government policy, the lack of innovation and advancements in technology, and complying with market-oriented quality standards and regulations. Competitiveness of the industry is thus not determined by simple comparative advantage related factors such as climate and location; rather a multiple set of factors that impact strategically on competitiveness.

1.5.Analytical framework and research methodology

This study investigated and applied a "step-wise" analytical framework based on that used by ISMEA (1999), Esterhuizen (2006), Esterhuizen and Van Rooyen (2006), Angala (2015), Van Rooyen et al., (2011), Boonzaaier and van Rooyen (2017), and Dlikilili (2018). The study required its extension and adaptation to accommodate the peculiarities of the database and related characteristics of the industry. These steps are as follows:

Step 1: From a theoretical scanning of literature, define competitiveness in context of the subtropical fruit industry of South Africa;

Step 2: Use an appropriate time-series database in measuring the competitiveness of the local subtropical fruit industry over time;

Step 3: Identify all the major factors affecting competitiveness through industry consultations;

Step 4: Establishing and analysing the major factors of competitiveness;

Step 5: Use the latter intelligence to propose industry-wide strategic actions suitable to enhance the competitiveness and performance of the subtropical fruit industry of South Africa.

1.6.The significance of the study

The subtropical fruit industry of South Africa remains an important component of agricultural performance and can also be extended in a developmental context to create employment and income linkages and combat poverty along the lines as described in chapter 6 of the National Development Plan (NDP). Therefore, a comprehensive understanding of the competitive performance of this industry and its various value adding components along the value chain would be relevant to the stated research questions. In the wake of ever-increasing competition, the globalisation of international markets, stringent new labour laws, turmoil from political influence, the land reform question, the quest for a minimum farm wage and changing consumer preferences has established a need to develop a clear framework of analysis to define and measure the competitiveness of the subtropical fruit industry of South Africa. Outcomes can identify a range of potential factors that influence the competitiveness and

offer suitable strategic actions that improve the competitive performance of the industry. Thus, this will support the industry's key role players (stakeholders and executives) to improve their industry and position themselves as capable competitors.

1.7. Delimitation of the study

This study analysed competitiveness trends of the SA subtropical fruit industry. The study is based firstly, on time series secondary data for empirical measurements. Primary data, sourced from the participating actors as to the factors affecting industry's competitiveness, however, only covers the 2016/2017 period, the designated time for the participative research to be accomplished. Future surveys could lead to a more comprehensive view on factors constraining and/or enhancing, and their potential impacts, using this study as a base line.

Furthermore, the analysis was applied on the industry level, with no specific firm-level value-adding applications (i.e. firm-level analysis and strategy development). This study therefore, only makes recommendations on industry-level strategies for the future international competitiveness of the subtropical fruit industry of South Africa – not at firm level. For this typological analysis of different level, firms will be required.

1.8. Outline of the study

This study is organised into six chapters. The first chapter contains the exploratory background: a problem statement, the objectives and research questions, the hypothesis and delimitations to drive the study. The subsequent literature review chapter, gives a concise description of the evolution of competitiveness thinking and trade theories (classical, neoclassical and new trade theories), together with the relevance of such theories to the subtropical fruit industry of South Africa. This chapter also gives a definition of competitiveness, describes measures used to assess competitive trends and an overview of competitiveness studies conducted across the agricultural spectrum. The chapter also includes a discussion of the South African subtropical fruit industry and its trade relative to competitiveness analyses. Chapter 3 presents a comprehensive five-step analytical framework of analysis, as well as a discussion of the measurement tools and analytical methods used. The fourth chapter is an overview of the local subtropical industry in relation to production, export and import data, and information on the structures of the industry. Chapter 5 is the description and interpretation of the results and findings of the study. The last section, Chapter 6, gives conclusions, findings and further studies recommendations on how the local subtropical fruit industry could possibly enhance its competitive performance.

Chapter 2: LITERATURE REVIEW

2.1.Introduction

The term international competitiveness has long been a subject of academic literature in economics and business – from the classical theories of Adam Smith and David Ricardo to Michael Porter and the recent "New Competitive Theory" (Masters, 1995; Smit, 2010; Boonzaaier, 2015). The post-Porter period includes the World Competitiveness Report from the World Economic Forum (2007). According to Esterhuizen (2006) and Van Rooyen et al. (2011), the multidimensional nature of competitiveness makes it difficult to define and measure, as it depends on the level (firm, industry or national) on which it is addressed. Therefore, a better understanding of such levels will allow us to define competitiveness in the context of South African agribusiness, particularly that of the subtropical fruit industry, an internationally tradable commodity group. This chapter focuses on establishing a sound theoretical foundation of analysis for this study, i.e. the definition, techniques and methods to measure and analyse competitiveness, the data required, and the sources. The application of competitiveness analysis in different agricultural studies will also be considered so as to draw guidelines.

2.2. The evolution of competitiveness theory

Competitiveness thinking is rooted in the classical trade theories of economics. However, its significance changes relative to time and the context in which it is applied. Some theories are accommodated, and some are considered as irrelevant when applied to new frameworks and related interdisciplinary fields of strategy, operations and new economies (Cho & Moon, 2000). Moreover, research efforts and practices have given rise to different perspectives and theories to describe competitiveness at different levels – the national, industry and firm levels (Boonzaaier, 2015; Frohberg & Hartmann, 1997; Siudek & Zawojska, 2014). There is thus a growing need to revisit general trade theory for its relevance to competitiveness and strategy formulations (Cho & Moon, 2000). It is therefore crucial for a firm or industry to define competitiveness and also measure it as part of its strategy to compete internationally (Ambastha & Momaya, 2014). This also refers to agribusiness competitiveness (Babu & Shishodia, 2017; Cook & Chadda, 2006; Doyer & Van Rooyen, 2011). The evolution of classical views on competitiveness to the modern-day theory and practice of Cho (1994), Porter (1990) and Rugman & D'Cruz (1993) is illustrated in **Figure 2.1.**

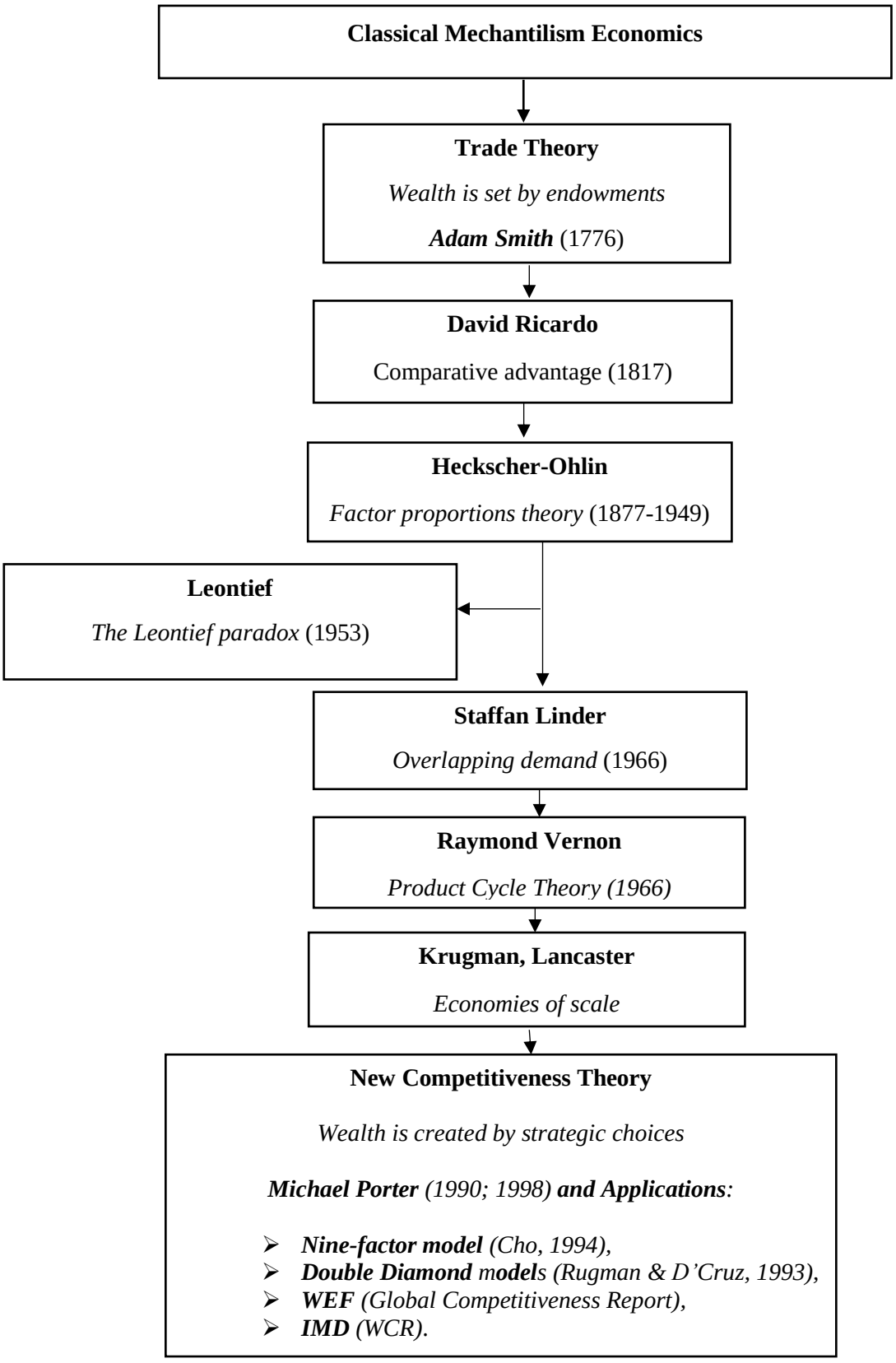


Figure 2.1: Transformation from trade theory to competitiveness theory (from Adam Smith to Michael Porter).

Source: Cho & Moon (2002) and Masters (1995)

2.2.1. Classical Mercantilist Economics

Mercantilism, a trade policy framework, was primarily adopted by Europe's economic powerhouses from the 16th to the 18th centuries (Langdana & Murphy, 2014). Mercantilist principles of trade theory dominated between 1500 and 1750 (Grampp, 1952; Sihlobo, 2016). The mercantilist approach was largely driven by wealth implications associated with the inflow of precious metals – gold and silver traded (Keynes, 1936; Langdana & Murphy, 2014), which strengthened the country's economy. The principle of the mercantilist school of thought was that "a nation's growth pathways were determined by its ability to remain a net exporter" (Sihlobo, 2016:23). Mercantilists viewed trade as a zero-sum game, as they advocated for strict government control, intervention and economic nationalism (Irwin, 1991; Smit, 2010). Under such a state policy regime, markets operated under imperfect conditions, which led to a rise in economic rents whose international distribution could be altered by commercial trade policies (Irwin, 1991).

On reflection, many criticisms of mercantilism followed, with the counter-intuition that the planning and regulation of national economic activity was not enough to achieve the goals of the nation. David Hume (1752) developed a theory of the *quantity of money*, which contrasted with the point of view of the mercantilist approach. Hume's argument was that the greater inflation spikes ravaging mercantilist-aligned countries were simply due to the quantity of specie (money) circulating in the economy. Hume's criticism is simplified by Langdana and Murphy's (2014:8) findings as follows: "[Simply] stated, increasing the amount of money in the economy does nothing to increase real wealth: instead, it just means that more money is required to trade for the same good and services as before."

However, the major opposition to mercantilism as a trade policy came from Adam Smith (1776) and his seminal work, *The Wealth of Nations*. Adam Smith argued that the mercantilist trade principle benefited only a few and weakened the economy of a country in the long run.

2.2.2. Adam Smith: The Theory of Absolute Advantage

Adam Smith's seminal work of 1776, *The Wealth of Nations*, was contrary to the mercantilists' point of view, which perceived international trade as a zero-sum game. Smith's attempt was to justify why countries should engage freely in international trade. Smith's (1776) theory of absolute advantage proves the impossibility for countries to become rich simultaneously. A country's wealth is rather achieved through competition and the identification of factor inputs: land, capital, natural resources and labour. This generally conforms to the notion that the wealth of a nation is not inherited, but rather created through the effective use of resource endowments. Smith (1776) was also of the view that all nations could benefit from trade, but only if the mechanisms of specialisation and free trade were practised properly. The fundamental underlying principle of Adam Smith's theory was that, for two nations to benefit mutually from trade, they must trade voluntarily. Smith strongly believed in *laissez-faire* policy by involving government in trade, and by advocating for free trade that would improve

productivity while enhancing each nation's welfare (Salvator, 2011). Stated otherwise, if one nation benefited and other lost in trade, trade would be refused (Zhang, 2008). Adam Smith's theory can be understood by conceptualising the term *absolute advantage*, which is driven by the rising cost differences between nations. Adam Smith (in Myint, 1977) argues that:

> *[W]hether the advantages which one country has over another, be natural or acquired, is in this respect of no consequence. As long one country has those advantages, and the other wants them, it will always be more advantageous for the latter, rather to buy of the former than to make.*

Generally, this means country (A) holds an absolute advantage over another country (B) if it is able to produce the same quantity of output of good (x) efficiently by using fewer domestic resources relative to country (B). Therefore, it is advisable that country (B) should focus its efforts by specialising on goods in which it has an absolute advantage relative to its counter-trading competitor country (A). The division of labour and specialisation are central to Smith's argument (Smit, 2010). The theory of absolute advantage has been criticised as it is viewed as just a comparison of labour productivity between countries (Darity & Davis 2005). The critics of Adam Smith's work accentuate the omission of an explanation of what happens in the case where a country does not hold absolute advantage in all the goods it produces (the opposite is also true). Adam Smith's neglect does not justify the existence of comparative cost advantage; hence David Ricardo extended the principle of absolute advantage to comparative advantage.

2.2.3. David Ricardo: Theory of Comparative Advantage

Ricardo (1772-1832) extended the work of Adam Smith's principle of specialisation and gains from global trade. Ricardo (1817) explains the downside of the absolute advantage principle that prevails when a particular country (C) holds no absolute advantage in the production of any goods. Ricardo's theory encouraged a country to specialise and produce a product in which it is relatively more efficient than its counterparts (countries) and that achieves mutually beneficial trade (Sihlobo, 2016; Smit, 2010). Despite the existence of absolute cost disadvantages when producing goods and services, a country could export those goods with low absolute cost advantage and import goods with the largest absolute cost advantage. This can be referred to as the self-equilibrating nature of trading partners (Krugman, 1993). The country achieves comparative advantage by producing a good at a lower marginal opportunity cost (Salvator, 2011). The assumptions of Ricardo's theory of comparative advantage include that labour and capital are immobile between countries, and the costs do not change when output increases (Sihlobo, 2016). The latter assumptions are the basis of specialisation in trade (Esterhuizen, Van Rooyen & D'Haese, 2008) and resulted in the consideration of opportunity cost to explain the theory of comparative advantage.

In an extension of Ricardo's theory, John Stuart Mill (1806-1873) concurred with the view of the principle of comparative advantage and established the *law of international trade values*, emphasising that *barter terms of trade* do not depend on domestic cost only, but also on the *pattern of demand* (Esterhuizen, 2006). According to Mill's theory of international trade value, the value of an imported good is equal to the value of the good exported to pay for it (Angala, 2015). Mill's theory established that the terms of global trade depend largely on the elasticity of the demand for each traded product (Cho & Moon, 2013). Subsequently, imports are important to improve the country's economic welfare, although exports are necessary to pay for the value of imports entering the country. The latter proceeding supports free international trade under the condition of the law of comparative costs. The superiority of Ricardo's theory provided a more convincing explanation for why trade should be treated as a positive sum game, in terms of which countries can focus on specialising in what they can produce efficiently.

2.2.4. The neoclassical economic school of thought

The greatest contribution of the neoclassical school of thought is its pursuit to identify sources of comparative advantage with the intent to understand why one industry could profitably expand while others fail. "A neoclassicist, according to Veblen and Lawson, is one who appreciates that the world is more complex, context-sensitive and dynamic than their own modelling strategy would seem to presume, but who persists with the modelling strategy in question anyway" (as cited in Ross, 2016:2). Generally, classical economists outline that nations could improve their welfare levels and increase economic growth through international trade and specialisation. Thus, this principle still holds in today's modern trade agreements, and there is a need to improve competitiveness between firms and industries. From the above argument, classical economists clearly advocated for free trade and believed that governments need to maintain competitive markets through investment in research and education, instead of restricting trade (Angala, 2015; Masters, 1995; Sihlobo, 2016). The neoclassical economic school of thought made an effort to identify the reasons why opportunity costs differ across nations and/or firms.

Since the 1900s, trade theory has been extended through the work of neoclassical economists. According to neoclassical trade theories, the classical economic school of thought failed to explain the difference in productivity between nations. This largely rests on the fact that Ricardo's theory of comparative advantage failed to explain the location or direction of trade advantages between trading countries, and this led to the establishment of the Heckscher-Ohlin (H-O) theory. Eli Heckscher (1919) and Bertil Ohlin (1933) used factor proportion and extended it to a theory. H-O theory explains and explores the difference in opportunity cost and factor intensities (land and capital) between countries.

The H-O theorem provides factor endowments or abundance as the basic determinant of comparative advantage (Smit, 2010). The notion of the H-O theorem argues that trade between countries originates from differences in the factor endowment of nations vis-à-vis a country, so that they will only export goods that are produced by the relatively intensive use of the factor with which the country is relatively well endowed (Angala, 2015; Sihlobo, 2016). The H-O theorem concludes that, the more abundant the factor, the lower the cost of production. Therefore, all nations will benefit mutually and simultaneously from trade gains.

Several studies were conducted to verify the H-O theorem. The first was a study done by Leontief (1953), who found that, irrespective of the general assumption that the United States was expected to supply capital-intensive products and import labour-intensive products, the results were the complete opposite – hence the Leontief paradox (Esterhuizen, 2006; Hough et al., 2003). Consequently, the Leontief paradox led economists to search for alternative explanations for H-O theory, and the difference in human capital was the factor used most to explain the Leontief paradox.

In 1941, Wolfgang Stolper and Paul Samuelson introduced the Stolper-Samuelson theorem (Samuelson, 2005). Their theorem derives its existence from an extension of the H-O framework. It states (in the context of a two-factor, two-goods model) that an exogenous increase in the relative price of a good will initiate an increase in turn to the factor that is used most intensively in the production of the good.

The Stolper-Samuelson theory explains the ratio of international trade that leads to a change in output prices, which changes real factor rewards by creating incentives for countries with abundant input resources, while nations with scarce input resources become reluctant to become involved in free trade. Paul Samuelson further introduced factor price equalisation in the H-O model. The model added that free trade will bring an equalisation in the relative and absolute returns to homogenous factors between countries (Gokcekus & Bengyak, 2013). However, certain assumptions need to hold for factor price equalisation to occur. These include zero transportation cost, no trade barriers, and identical technology.

On the other hand, Rybczynski's (1955) theorem acknowledges the economy of a country that produces two goods by using two factors of production (land and capital). His theorem argues that a growth in the labour of a country implies that the country will produce goods that are labour intensive, while goods that require capital intensity will decline proportionally. As an example, the economic development of Japan and Korea is determined by high savings and investments. Consequently, both countries turned to produce more capital-intensive goods (Esterhuizen, 2006). Conversely, the labour-abundant sectors constricted in both countries, with labour being released into the capital-abundant sectors.

At the same time, Salter (1959) and Swan (1960) introduced the *exchange rate on international trade*, hence the Salt-Swan theorem. They assumed that the economy of a country is divided into tradeable and non-tradeable goods. The notion is that tradeable goods consist of both exportable and importable

goods, hence their prices are determined by foreign trade markets, and non-tradeable goods are those that do not enter the global market and are traded only in the domestic market. The latter situation leads to labour being transferred from the non-tradeable goods to the tradeable goods sector. Generally, these theories explain inter-industry trade efficiently, but fail to account for the intra-industry trade situation.

2.2.5. Challenges to comparative advantage

2.2.5.1 Linder (1961)

Stefan Linder acknowledged the contribution of the Heckscher-Ohlin theorem to elucidate the supply-oriented theory when trading a primary product. Linder developed the Linder theorem, which advocated for a demand-oriented trade situation. Linder's theory highlights the trade patterns derived from "overlapping demand" and refers to countries that produce goods and services only for domestic markets while exporting the surplus (Sihlobo, 2016). Linder's theory contrasted with Heckscher-Ohlin's theorem, which focused only on supply-oriented factor endowments and possible intensities that form the sources of comparative advantage and trade patterns. The demand-orientated theory concluded that customers are largely affected by their income levels, and therefore a country's income per capita determines the types of goods that meet domestic market demand. Linder's view was that countries with similar income per capita are likely to trade with each other, and the goods traded between the countries will be those with characteristics of overlapping demand.

2.2.5.2 Vernon (1966)

Raymond Vernon (1966) proposed the concept of the "product life cycle". According to Vernon (1966), the product life cycle is determined by opportunities and demand levels available in the domestic market. The basic notion of Vernon's principle assumed that commodities produced in developed economies are supplied to less-developed economies. Subsequently, each product has its own product life cycle that passes through different stages: the new product stage, the maturing stage, and the standardised stage (Vernon, 1966). This led Krugman (1979) to develop a theory on economies of scale.

2.2.5.3 Krugman (1976)

Krugman (1979) advocated prominently for economies of scale. Economies of scale can be defined by an increase in output that results in a decrease in the cost of production (Sihlobo, 2016). This suggests that, as firms produce more goods, they search for better alternatives to improve productivity levels while lowering the cost involved in production. The contribution of economies of scale is significant in international trade theory, as it shows that a country can be cost effective in producing a good, but does

not necessarily need to have an abundance in factors of production. The economies of scale explained trade patterns that were not explained by the H-O theorem. The H-O theorem assumes constant returns to scale, whilst the concept of economies of scale outlines that output will be more than double if inputs are doubled (Krugman, 1979).

All the theories discussed above still hold in present-day economies and have relevance in how competitiveness is conceptualised. They paved the way for the guideline for trade analysis and the formulation of trade policies and business analysis in many nations. Changes in global economies and trade require new economic or trade theories to explain current trade patterns and economic scenarios. However, recent research findings and academic developments in competitiveness theory reveal specific limitations of the static concept of comparative advantage explained by classical and neoclassical trade theories. According to Esterhuizen et al. (2008), the new theory of competitiveness outlines the limitations to identify factors such as the wealth of nations, share in global markets or economic growth as the only accepted measures of competitiveness.

Therefore, debates on competitiveness theory should direct our thinking and arguments to define and measure international competitiveness. Competitiveness should be viewed as a complex notion that changes with time (Abei, 2017; Angala, 2015). In response, Michel Porter (1990, 1998), of the Harvard School of Business, introduced a "New Competitive Theory", namely the 'Porter Diamond model' (Cho & Moon, 2013) to explain competitiveness using the current theoretically sound perspective of national comparative economic advantage. He drew a distinction within trade theories by arguing that national worth is not inherited, but rather created through alternative strategic choices.

2.2.6. Porter's Diamond model of competitiveness (new competitive theory)

The present-day global economic village is too sophisticated and complex to be only understood in terms of traditional trade theories, hence the introduction of Michael Porter's new competitiveness theory in 1990. Porter's approach primarily echoes the critical perspective that international competitiveness is defined much more by value adding at a firm/industry level through strategic choices, than by macroeconomic-level activities. According to Porter (1990), firms and industries are capable of creating value added in business in relation to others (rivals). Porter defines the value-adding (productivity) in the presence of competition among business organisation locations across nations (Cho & Moon, 2013). The scope of Porter's critical "Competitive Diamond model" allowed him to explain how some nations and industries are more competitive than others.

Porter's (1990) Competitive Diamond model can be applied as a measure and analytical framework of the international competitiveness of firms. There are several models that have been developed and are widely used in the literature to measure competitiveness, but two of the prioritised methods are Porter's (1990) "Diamond Model" and Balassa's (1977, 1986) RCA model. Porter (1990) asked, "When is an

industry internationally competitive?" To find the answer, Porter (1990) posed another question: "Why does a nation achieve international success in a particular industry?" He further suggested that, if one attempts to answer these questions, one must consider four broad attributes shaping the country's environment under which domestic firms participate to improve their competitive advantage performance. These are: (1) strategic context, (2) basic approach, (3) supporting background, and (4) research scope.

The basic notion of Porter's theory is that nations are likely to achieve competitive status in firms where the national 'Diamond' is most guaranteed. The Competitive Diamond model (see **Figure 2.2**) includes four interrelated components, namely (1) factor conditions, (2) demand factors, (3) relative and supporting industries, and (4) firm strategy, structure and rivalry.

Porter's theory outlines that the possible interaction between these attributes promotes an environment suitable for innovation, productivity and competitiveness (Bakan & Dogan, 2012). Primarily, the principle of the Porter Competitive Diamond model is not very relevant in small economies because of the limited domestic variables (Cho & Moon, 2013; Masters, 1995). This challenges small countries to enhance their global competitiveness position by utilising international variables.

Adam Smith pioneered the trade theory of absolute advantage, whilst Michael Porter pioneered the theory of competitive advantage. This proves that, under changing global economic circumstances, no theory is perfect or remains relevant forever. Rugman and D'Cruz (1993), who developed a Double Diamond model framework for a Canadian background, extended the Porter Competitive Diamond model. Similarly, Moon *et al*. (1998) extended this framework to a Generalised Double Diamond model to fit the context of a small country economic case. Cho (1994) extended Porter's Competitive Diamond model by categorising sources of competitiveness into two, viz. physical and human factors.

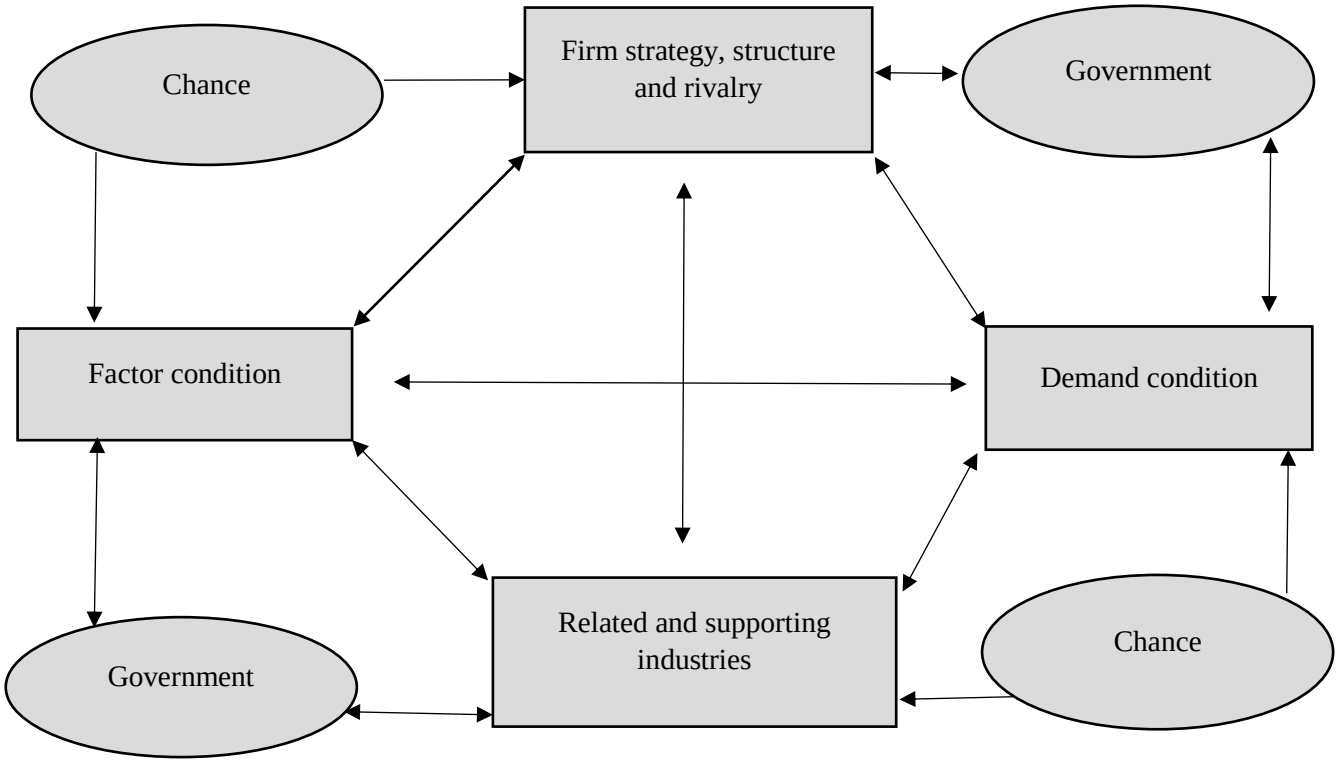


Figure 2.2: Porter Diamond model of competitiveness

Source: Porter (1990, 1998)

The section below extends the explanation of four attributes of Porter's Diamond model (Porter, 1990).

Factor conditions: These refer to a country's position in the factors of production, such as recruiting skilled labour or infrastructure required by the industry to be competitive. A simple definition of factors of production in a large body of literature often takes into consideration factors such as capital, land and labour. According to Porter (1990), the latter was too shallow to explain competitiveness, hence he proposed that factors need be categorised into broad groups, namely human resource development, material resource development, knowledge resource development, and capital resource development. It is important to make a clear distinction between these factors based on whether they are basic or advanced factors, generalised or specialised, and created or inherited factors. The advanced, specialised and created factors are highly recommended to achieve the sophisticated forms of competitive advantage. Therefore, the competitive advantage of a firm or sector depends on the effective and efficient use of the accessible factors.

Demand conditions: These conditions support the nature of home-market demand for the industry's products and services. Thus, this is the broadest determinant of international competitiveness or competitive advantage. The home demand is characterised by the structure of demand, sophisticated and changing demand, and is protective of the buyer's needs (Bakan & Dogan, 2012). This determinant describes the nature of consumers in the home market. The demand condition is driven by the buyers' requirements that exert pressure on product quality, price and services in a particular industry. Porter (1990) argues that the demand conditions have an impetus impact on the formation of factor conditions.

The combination of home demand conditions, demand size and pattern growth of domestic demand are crucial to obtain an international competitive advantage. However, Porter contends that the quality of home demand is more important for an industry to develop and expand. The nature of home demand shapes how firms perceive, interpret and respond to buyers' needs in the market (Smit, 2010). Consequently, this forces countries to continuously innovate and upgrade their international competitive position.

Related and supporting industries: these industries focus on the presence or absence of supplier industries and other related industries of a nation that strives to be internationally competitive. These industries form a basic factor to interact with the target industry (Porter, 1990). Porter argues that it is particularly rare to find a single successful industry (sector) without strong, supportive and related industries. According to Porter (1998), related and supporting industries are those that can organise or allocate activities in the value chain when competing. Moreover, the presence of these industries is often a result of new and competitive industries that provide new opportunities for factors such as information and technological exchange.

Firm strategy, structure and rivalry: this dimension describes the situation in the nation in relation to how new companies are created, organised and managed, given the nature of domestic rivalry. Primarily, this dimension deals with the severity of possible home competition. Whether the firm or sector is competitive in the home market will have an influence on the improvement in productivity necessary to compete internationally. This dimension, from a broader view, measures the situation under which the firm (sector) has originated, is systematised and managed, as well the nature of domestic competition that allows a nation to score a sustainable competitive advantage (Porter, 1990). The manner in which firms are created and managed is influenced by a nation's current conditions. Porter's determinants interact as a system to form a framework in which a nation's firms are created and are able to compete in an international trading environment (Dlamini, 2012).

Apart from the four mentioned determinants of the Porter Diamond model, two extended determinants directly affect the nation or industry's operational systems. The additional two determinants or variables are government and chance events. Although the government and chance events determinants are introduced into the model at the end, they both play a significant, direct role in the competitive performance of industries.

Chance events refer to the occurrence of events other than the nation's circumstances that are beyond the firms' and local government's power and influence. This could mean factors external to the firms or local government. Such events include acts of pure intervention, wars, major technological discontinuities, political decisions by foreign governments, and an increase in demand and shifts in world financial markets and exchange rates. These events are paramount, as they allow shifts in competitive position due to the discontinuities they create. Furthermore, these events can reverse

advantages that were previously created by the firms or other competitors. The nation with a more attractive diamond is likely to translate chance events into competitiveness (Porter, 1998).

The role of government is regarded by Porter (1990) as the most influential factor of the four mentioned attributes, and which could give rise to either a negative or a positive result. A subtle example relates to the factor condition being immensely influenced by subsidies and policies in relation to the capital market; product standards that are regulated by government; and, in some cases, government being the major buyer of goods and services provided by firms (Petit & Gnaegy, 1998; Porter, 1998). According to Dlamini (2012), government can provide and ensure an incentive that stimulates and rewards investments – more specifically in the ancillary industries that provide immense support to the production, transportation, processing and exportation of goods. Generally, government provides infrastructure such as dams, energy, information and communication networks, which by their nature are unlikely to be provided by the private sector due to economies of scale.

The Porter Diamond model, through its attributes, places emphasis on how firms should invest and become innovative; however, nations succeed in a particular industry because they face a diverse domestic environmental pool, and challenge and encourage firms to improve and broaden the scope of their competitive advantages and opportunities over time (Porter, 1998). Furthermore, Porter refers to all the attributes as a 'diamond', a term that emphasises the interdependence of determinants on each other. Porter's (1990) model gives a qualitative description of factors determining the competitive performance success of an industry in a particular country. Additionally, a quantitative description using Porter's (1990) Competitive Diamond model is possible for countries to be compared. According to Esterhuizen and Van Rooyen (1999), the Porter Competitive Diamond model allows for the analysis and identification of the structure of a sector and for pointing out its strengths and weaknesses. The Porter Competitive Diamond model is viewed as less applicable in small economies such as Canada in comparison to the United States of America, due to its limited domestic variables (Rugman, 1991). To address these issues and accommodate the points of critique, Cho (1994) and Moon et al. (1998) proposed a "Double Diamond model" that emphasises the role played by human factors when analysing competitiveness.

2.3. Applying competitiveness analysis: Institute for Management Development: World Competitiveness Yearbook

The World Competitiveness Centre (WCC) has been at the centre of the application in terms of the competitiveness of countries and enterprises since 1989 (WCC, 2011). The World Competitiveness Yearbook report ranks nations primarily according to their capacity to manage their competitiveness in order to achieve increased prosperity and growth (WCC, 2017). The World Competitiveness Yearbook accounts for about 59 industries and developing economies, which are compared on 331 factors. These components of the criteria are grouped into four competitiveness factors (see **Figure 2.3**). Therefore,

the level of accuracy in both the data and measurements that feed the World Competitive Yearbook is maintained and achieved through effective partnership and sustainable collaborative relations with 54 other partner industries across the world, and the data is aggregated over a five-year period.

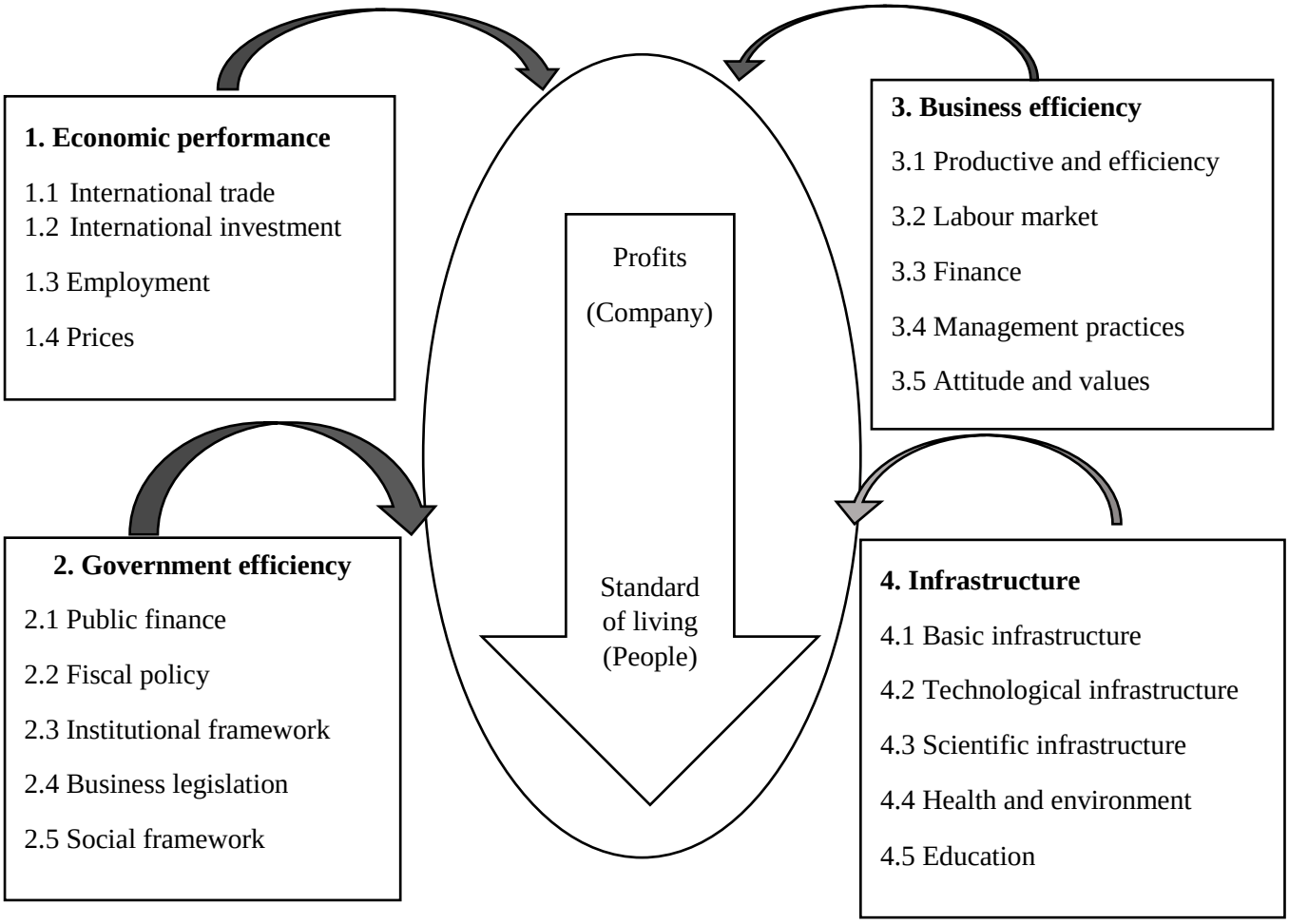


Figure 2.3: World Competitiveness Four-factor grouping

Source: IMD World Competitiveness Yearbook (WCC, 2011).

2.4. World Economic Forum: Global Competitiveness Index (GCI)

World economic growth remains continuously low, and commodity prices are constantly falling, while global trade and external imbalances continue to grow and government finances are stressed (WEF, 2017). Therefore, promoting the environment necessary to identify new factors that reignite national growth should be the priority of any economy. The World Economic Forum (WEF, 2017) is the longstanding cross-country benchmark of the factors and institutions that determine long-term national growth and prosperity through measures of productivity and drivers of growth.

On the other hand, the Global Competitiveness Annual Report serves as a tool for public-private collaboration on long-term competitiveness agendas that aim to build a more prosperous and more

inclusive world for all. The Growth Competitiveness Index (GCI) was established by Jeffrey Sachs and John McArthur in 2001 (Marginean, 2006) to measure microeconomic and macroeconomic fundamentals of national competitiveness, based on the Global Competitiveness Index (GCI). The index shows differences between competing nations and allows the identification of potential innovations and new methods to measure human capital and prioritise policy.

The index consists of 114 confirmed indicators that capture factors that influence the productivity and long-term prosperity of a nation (WEF, 2016). The latter indicators are grouped into 12 pillars (see **Figure 2.4)**, namely Institution, Infrastructure, Macroeconomic environment, Health and primary education, Higher education and training, Goods market efficiency, Labour market efficiency, Financial market development, Technical readiness, Market size, Business sophistication, and Innovation. These pillars are further organised into three ***sub-indexes***, namely basic requirements, efficiency enhancers, and innovation and sophistication factors. Most importantly, the three factors are given different weights when calculating the overall index, depending on the stage of development of an economy.

Figure 2.4 below presents each pillar under consideration. The GCI includes statistical data from organisations, such as the World Bank, the International Monetary Fund (IMF) and the United Nations' specialised agencies like UNESCO. The WEF publishes an annual report on global competitiveness based on the GCI and other indexes.

In the 2015/2016 annual report, South Africa was ranked number 49 out of 102 economies, with a score of 4.39 out of 7, and a previous score ranking of 56 (WEF. 2016). The GCI captures the holistic view of the fundamentals of the economy that include factors such as recent developments, commodity price fluctuations, security-related issues, geopolitical uncertainties, etc.

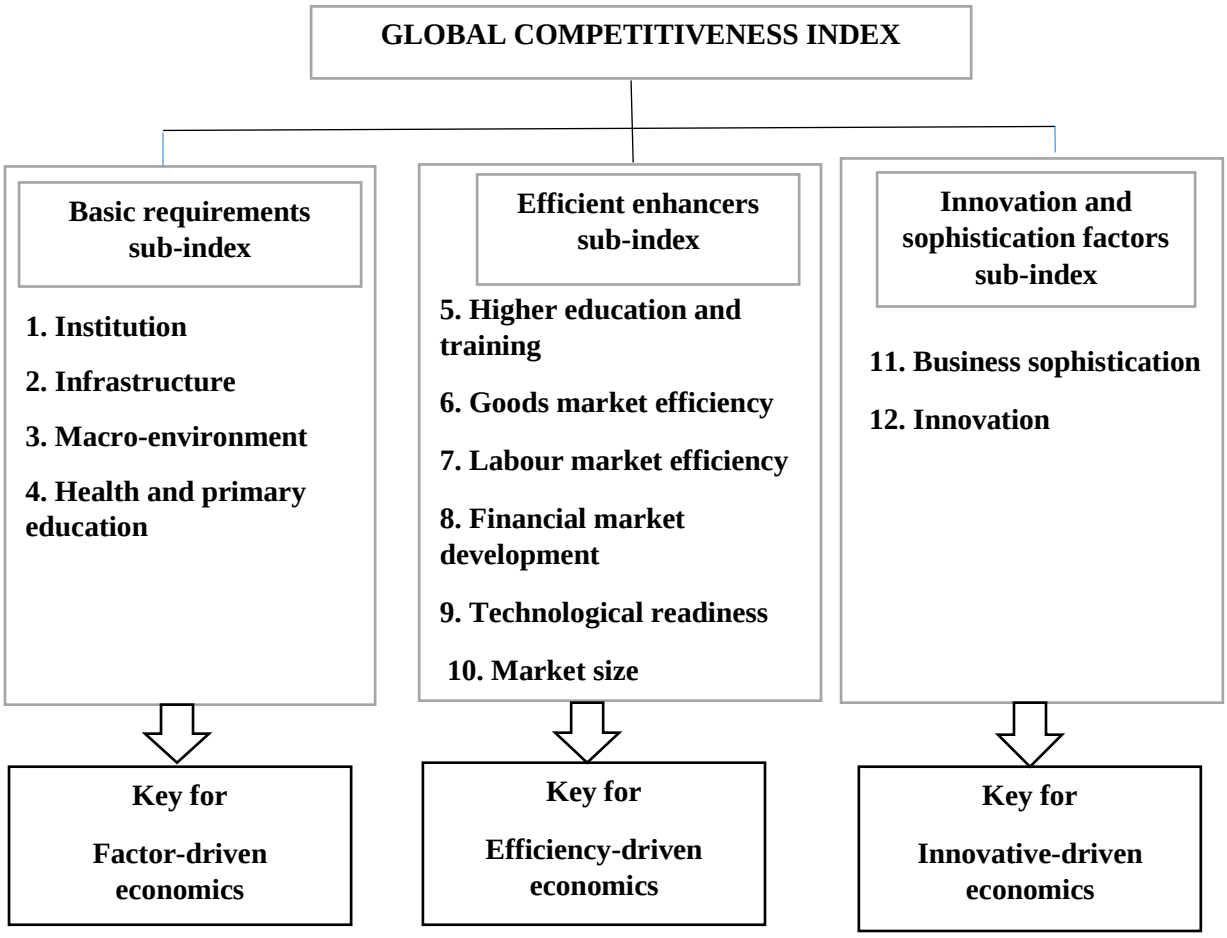


Figure 2.4: The Global Competitiveness Index framework

Source: World Economic Forum (2017)

2.5. Comparative advantage vs competitive advantage

In this context, comparative advantage and competitive advantage are two different, important economic concepts that are used to explain issues related to international trade and competitiveness (Warr, 1994). Both concepts shed light on comprehensively understanding international trade, with a significance of analysing factors underlying international competitiveness and factors that shape current trade patterns, particularly in agriculture (Abei, 2017 & Dlikilili, 2018; Angala, 2015; Boonzaaier, 2015; Esterhuizen, 2006). Frohberg and Hartman (1994) argue that both terms are based on the concept of general economic equilibrium.

The principle of comparative advantage is one of the most important concepts in economic development, as explained in section 2.2.3. The concept of comparative advantage is historically tied to Ricardian theory, which is based on labour theory (Ricardo, 1817). Ricardian theory assumes that labour is homogenous (Salvatore, 2002). Lindert and Pugel (1996) define comparative advantage in relation to the ability of a country to produce a particular good at a lower opportunity cost relatively to the output of the same commodity in another country. Bhattacharyya (2011) concurs that comparative

advantage refers to a situation in which a country exports commodities that cost relatively less to produce than in other countries. Despite the latter, a country can be declared competitive while it does not have a comparative advantage (Dunmore, 1986).

The existing literature points out several approaches developed to measure the degree of specialisation in the export of goods (for example, Balassa, 1965, 1977; Vollrath, 1991). All these approaches focus on the comparative advantages of a nation concerning the trade patterns of a particular product (or group of commodities) compared to other countries or groups of countries (Hadzhiev, 2014). Competitiveness over the past two decades has drawn the attention of economists, researchers and policy makers, inter alia due to the importance of "free trade" and the notion of "tradable products" strategies (Gittinger, 1984). The wide use of the term competitiveness, and the lack of a unanimously accepted definition, have resulted in misunderstandings and contradictions among various actors (Reiljan et al., 2000). Krugman (1994) defines competitive advantage through productivity similarly to Porter (1990).

According to Porter (1990), competitive advantage is significant in modern-day trade and business models, and it is created and maintained through the strategic positioning of localised processes. Competitive advantage can be considered as relative and multidimensional with the meaning and implication of the concept changing constantly over time and context (Abei, 2017). To measure competitive advantage, the RTA indicator is considered the most sophisticated and comprehensive index, as it takes into account imports and exports in view of trade theory and globalisation trends, and also intra-industry trade (Esterhuizen, 2006). It therefore is considered the superior measure of competitiveness when compared to other measures, such as RCA, DRC, RER, etc. Competitiveness can be analysed at the country, industry and firm levels (Ajitabh & Momaya, 2004; Frohberg & Hartmann, 1997). It is for this particular reason that, in the current study, we use the RTA index to measure and analyse the competitiveness of the subtropical fruit industry. Competitive advantage mirrors business opportunities within current policy frameworks and price distortion (Esterhuizen, 2006; Esterhuizen & Van Rooyen. 1998).

Gupta (2009) proposes an appropriate framework that links the two levels of competitiveness, viz. micro and macro, and the two interrelated concepts, viz. comparative and competitive advantage, for a better analysis of competitiveness. Gupta (2009) uses Porter's Diamond model to incorporate factors that influence comparative advantage and competitive advantage, and possible link the two. According to Gupta (2009), factors affecting one side of the diamond of comparative advantage also influence factors that drive competitive advantage.

2.6. Defining the term competitiveness

Several scholars agree that the concept competitiveness is complex and may not have a generic definition applicable to particular economic and business situations (Ahearn et al., 1990; Ceptureanu,

2016; Mashabela, 2007; Masters, 1995; OECD, 2011; Sharples, 1990). The term competitiveness has long been debated and influenced by classical economists, namely Adam Smith (1776) and David Ricardo (1950), and by neo-classical economist such as Heckscher (1919) and Ohlin (1933). In the plethora of existing definitions, competitiveness in economic research is related to growth in the productivity of a nation (Arsalan & Tathdil, 2012), and it therefore is also important to define international competitiveness at the firm and industry level (Bakani, 2012; Masters, 1995; Momaya, 1998; Porter, 1990). Defining competitiveness can be viewed as a multidisciplinary approach of modern economics (Ceptureanu, 2016; Lengyel, 2004; Vukovic *et al*., 2012). In an attempt to define international competitiveness, factors associated with comparative advantage, as well as the competitive advantage of a nation, industry or firm, need to be considered. This has led to unlimited measurements of competitiveness, along with the questions why some firms, industries and nations are more competitive compared to others. Balassa (1965) argues that competitiveness is reflected in the realities of the trade environment, where interventions can skew natural comparative advantage. Esterhuizen (2006) concurs with this and adds that competitiveness is a reflection of the realities that manifest in the economic and business environment.

Barker and Kohler (1998) define competitiveness as the "degree to which a nation can, under free and fair market conditions, produce goods and services that meet the needs of international markets, while simultaneously maintaining and expanding the real income of its people over a long run period". Ajami (1992) and Balassa (1961) criticised such a definition based on free and fair market conditions, arguing that, in the real word, free and fair market conditions do not exist. They added that the comparison of competitiveness at the national level is highly problematic, and that the free and fair market condition is only applicable as a theoretical economic concept. Freebairn (1987:79) defines competitiveness as "the ability of an industry or firm or sector to attract investment and other scarce resources by trading products in the global market, while at least earning the opportunity costs of returns on the resource employed". Scott and Lodge (1985) further define competitiveness as the "country's ability to create, produce, distribute and service products in the international trade while earning rising returns on its resources".

Michael Porter (1990) stresses the importance of creating strategic advantages to complement geographical location and natural/production factor endowments when defining competitiveness. In his Diamond model, it is emphasised that the natural endowments and geographical location of a business are likely to enhance competitiveness through the productivity levels, innovativeness and export position of a country. This provides a strong argument to apply Porter Diamond theory to agricultural competitiveness situations. Similar to Porter's (1992) definition, Krugman (1994) explicitly defines competitiveness as a nation's level of productivity. Warr (1994) defines competitiveness in terms of the ability of a firm, industry or country to compete successfully in trading products in the global market, given the existing policies and economic structures; while Ortmann (2000) and Fafchamps et al. (1995) define competitiveness in relation to the ability of a country or industry to produce a product at an

average variable cost below its price. In contrast, Porter (1990) argues that efficiency in production cost alone does not determine the competitive performance of a country due to changing technologies.

Worley (1996) agrees that competitiveness seeks to explain the existing trade patterns as they function in a real-world environment within the barriers of free trade, product quality and differentiation. Spies (1999) adds that "competitiveness implies superior performance in productivity growth especially in a multi-factor productivity, which is best reflected in the effective rate of technological innovation in an economy". The European Commission (2009) adopted the following definition of competitiveness: "a sustained rise in the standards of living of a nation or region and as low a level of involuntary unemployment as possible." The OECD (2010) defines competitiveness as the "ability of companies, industries, regions, nations and supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis". That said, competitiveness is a relative measure (Maksymets & Lönnstedt, 2016). In the light of all the broad definitions of competitiveness mentioned above, Esterhuizen (2006), Esterhuizen and Van Rooyen (2008) and Esterhuizen *et al*. (2001) conceptualise competitiveness from an agribusiness point of view and orientation by adopting the definition of Freebairn (1987).

Van Rooyen (2008) identifies three stages of competitiveness in agriculture: surviving, competing and winning.

Esterhuizen (2006:74), together with Van Rooyen (2008) and supporting Freebairn (1986), defines competitiveness in relation to tradability, i.e. if a product is internationally traded as the "… ability of the industry to trade products in both domestic and international markets on a sustainable basis; and to attract resource investment such as land, labour, technology, management skills and talent, and capital from other competing economic activities while earning at least the opportunity cost of returns on such resources employed". From this definition, three aspects of competition can be identified, namely international market, domestic market for products, and domestic market for scarce resources. The definition accommodates other economic ideas and has a strong agricultural economics sense (Van Rooyen & Boonzaaier, 2016), as it relates to notions such as opportunity costs, scarcity, intra- and inter-commodity competition for scarce resources, and international and domestic trade. This definition is thus accepted to guide this study (see Step 1, section 3.2.1 in Chapter 3) in selecting appropriate measurement methods and allowing for the identification of the factors that predominantly influence sustained trade as a basis for the competitiveness of the industries.

This study analyses the competitive performance of tradeable subtropical fruit commodities at the international level and, as such, trade volumes and values are recorded over time (see Chapter 4, section 4.5). The South African subtropical fruit industry operates along the value chain – from farm-level growth and production of different subtropical fruit types to processing into various fruit components such as pineapple juice, i.e. the value chain analysis (discussed in Chapter 4). In the context of the

competitiveness of South African subtropical fruit and the availability of data at different value-added levels, the Freebairn definition will consider the analysis at industry level.

2.7. Measurements of competitiveness

As stated earlier, competitiveness is widely used but rather complex – this refers to its definition and the measurement thereof. Competitiveness is measured at different levels of the economy, such as the firm, industrial and international level (Ceptureanu et al., 2016). As such, there is no generally accepted measure of competitiveness. According to the OECD (2010), measurements of competitiveness should be based on two disciplines: (1) neoclassical economics, and (2) the strategic management school, which emphasises the firm's structure and strategy. Master (2005) highlights three distinct, globally recognised measures of competitiveness, namely ***market share***, ***relative prices***, and ***physical productivity***. Abei (2017) adds that some measures of competitiveness include export market shares, balance of trade, percentage share of the world manufacturing output and percentage share of domestic manufacturing output, amongst others. The latter three measures are linked to market adjustments – a higher market share achieved by greater productivity or lower prices. Although there are several theoretical studies on approaches and indicators used to measure competitiveness, three frequently used indicators are the Global Competitiveness Report, published annually by the World Economic Forum (**WEF**), the World Competitiveness Yearbook of the Institute for Management Development (**IDM**), and the Business Competitiveness – Ease of Doing Business Report constructed by the International Finance Corporation (**IFC**). These indices are prominent in analysing international competitiveness. However, there are several popularly used empirically based indicators (indices) of competitiveness applied at different levels (national, regional, industry and firm level) (Esterhuizen, 2006). Esterhuizen and Van Rooyen (1999) thus concur that a number of methods have been developed and used to assess industry-level competitiveness.

2.7.1. Revealed Comparative Advantage (RCA)

Revealed comparative advantage (RCA) has been used globally as an index in the economic and business literature to measure the comparative advantage of a product by country (Hadzhiev, 2014; Maksymets & Lönnstedt, 2016; Sinngu & Antwi, 2014; Webber & Lambaste, 2011). Several studies have applied the revealed comparative advantage (RCA) index, first coined by Balassa (1965), to measure and analyse industry or sectoral comparative advantage. Comparative advantage has been the key economic concept to explain specialisation in the export of goods and services (Esterhuizen & Van Rooyen, 1999). This can be linked to Ricardo's principle of comparative advantaged discussed in section 2.2.3. Balassa's index defines a country's export share of a particular product in the world market. The difficulty of measuring comparative advantage led Balassa to investigate the country's

trade patterns without taking into account underlying resources, subsidy interventions or prices (Esterhuizen & Van Rooyen, 1999; Master, 2005). Abei (2017) adds that the RCA index compares a country's share of the world market relative to its share of all trade goods. The RCA index is used to avoid double counting of both the country and commodity numerator and denominator. The country and commodity under consideration are excluded when total exports are calculated. For the *i*-th country and *j*-th commodity, the original expression of RCA is as follows:

$$RCA_{IJ} = RXA_{IJ} = (X_{IJ}/X_{IK})/ (X_{nj}/X_{nk}) \quad (1)$$

X denotes country *I* exports; *K* is the total exported commodities except *J*; and n stands for all the countries other than country *I*. An RCA value greater than 1 shows a country's comparative advantage in the particular product under question due to its strong export values. The RCA index measures the degree of a country's export specialisation and export of a product in the global trade environment of a country (Hadzhiev, 2014). When the RCA_{ij} value is higher than a unit, a country is considered to have a revealed comparative advantage; in contrast, when the RCA_{ij} value is less than a unit, a country is said to have a comparative disadvantage. The advantage of this index is that, for it to hold, it needs trade data and does not depend on any economic theory with regard to factor endowments and perfect competition, and it measures relative success in exporting (Esterhuizen, 2006).

Several scholars have used this index to determine comparative advantage at different levels (i.e. nations, industries and services), including Bahta and Willemse (2016), Esterhuizen (2006), Kim and Thunt (2017), Porter (1990), Sawyer, Tochkov and Yu (2017), Sihlobo (2016), Van Rooyen *et al*. (1999) and Webber and Lambaste (2009).

Like many other measures of comparative advantage, the RCA index alone is not viewed as sufficient to define whether the comparative advantage of a product exists under the existing policy regime of a country (Norton, 2016). Another weakness of the index, it does not include both exports and imports (see next section, i.e. Vollrath, 1991), when it measures specialisation it is asymmetric and lacks normality because it considers only values between zero and infinity (Dalum et al., 1998). The use of the RCA index as a measure of comparative advantage has its own limitations and implications in application (Ballanca et al., 1986). A basic limitation of the RCA index is that it cannot be used to rank products in order of their competitiveness. Additionally, the RCA index as a measure of comparative advantage does not consider imports. Where markets are distorted, the RCA index can lead to higher or misleading values of competitiveness. Another shortcoming of this model is that the real trend of comparative advantage is determined only from post-trade data (Bender & Li, 2002). A highly protected market, i.e. high import tariffs, export restrictions and other designated protectionist policies, distort RCA and lead to misleading values of RCA (Utkulu & Seymen, 2004). Consequently, this results in the misinterpretation of the factor underlying competitive advantage (Mashabela, 2007). Hence, Vollrath (1991) proposes an extended version of the revealed competitive advantage index, although it does not use net trade.

2.7.2. Relative Trade Advantage (RTA) Index

The Relative Trade Advantage (RTA) index of Vollrath (1991) extends Balassa's index (RCA) to measure competitiveness and avoids double counting when comparing countries (OECD, 2010; Sinngu & Antwi, 2014). This index determines the country's share in the world market of one commodity relative to its share of all traded commodities. Vollrath (1990) proposes three indexes to measures revealed comparative advantage: the Relative Export Advantage (RXA), the Relative Import Advantage (RMA), and the Revealed Trade Advantage (RTA). The RXA and RMA indexes are calculated based on the trade values and weights of the RTA (Esterhuizen & Van Rooyen, 1999). The difference calculated between the revealed export advantage, RXA, and RMA is called the relative trade advantage (RTA). The RTA method is mathematically expressed as follows:

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \ldots\ldots (1)$$

$$RXA\left(X_{ij}/\sum_{i,i\neq j} X_{il}\right)\left(\sum_{k,k\neq i} X_{kj}/\sum_{k,k\neq i}\sum_{i,i\neq j} X_{kl}\right) \ldots\ldots (2)$$

$$RMA_{ij} = \left((M_{ij}/\sum_{i,l=j} M_{il}\right)/\left(\sum_{k,k\neq i} M_{kj}/\sum_{k,k\neq i}\sum_{l,l=j} M_{kl}\right) \ldots\ldots (3)$$

M in this equation denotes imports of a commodity. In this study, *M* is imports of subtropical fruits. An RMA value less than a unit shows a revealed comparative advantage and thus higher competitiveness (Babu & Shishodia, 2017). In the presence of increasing intra-industry trade, RTA is considered to play a significant role (Esterhuizen, 2006; Frohberg & Hartmann, 1997; ISMEA, 1999).

$$RTA = \left[\frac{\left(\frac{X_{ij}}{X_i}\right)}{\left(\frac{X_{refJ}}{X_{ref}}\right)}\right] - \left[\frac{\left(\frac{M_{ij}}{M_i}\right)}{\left(\frac{M_{refJ}}{M_{ref}}\right)}\right] \ldots\ldots (4)$$

The RTA value can be either positive or negative. A positive value of relative trade advantage (RTA) shows a competitive trade advantage, whereas a negative RTA value signifies a competitive disadvantage. Any index value that falls between zero and one reveals the marginal competitive status of a nation's product. Scholars such as Batha and Jooster (2004) and Pitts et al. (1995) argue that taking imports and exports into account when calculating competitive advantage, where only RXA is considered, may lead to high values of competitive advantage that are misleading. Moreover, the use of exports and imports by Vollrath is considered to be a more comprehensive and appropriate measure of competitiveness than RCA (Dlikilili & Van Rooyen, 2018; Frohberg & Hartmann, 1997). The RTA index also allows competitive advantage to be measured under real-world conditions and other trade regimes (Esterhuizen & Van Rooyen, 2006; Van Rooyen, 2011).

From the above indices it is evident that both Balassa (1997) and Vollrath (1991) view trade performance as an indicator of competitiveness. This forms an important part of the stated definition adopted for this study, as explained in Step 1 in section 3.2. Therefore, the RTA reflects competitive

performance under real-world conditions, such as "distorted economies, uneven playing fields and different trade regimes", and can be used to measure competitiveness over a long duration, thereby establishing a trend of the industry's performance (Esterhuizen & Van Rooyen, 2006). This is the reason why, in this study, RTA is used in assessing and analysing the competitiveness of the subtropical fruit industry or commodities. Several researchers who have carried out analyses of competitiveness have used this method (Abei, 2017; Angala, 2015; Boonzaaier, 2015; Dlikilili, 2018; Esterhuizen, 2006; Esterhuizen et al., 2011; Jafta, 2015; Ferto & Hubbard, 2001; Pitts & Lagnevik, 1997; Valentine & Krasnik, 2000; Van Rooyen, 1998; Van Rooyen et al., 2000).

Given the latter discussion, when comparing the cross-section of RTA, different factors of the method may change, leading to changes in the interpretation of the RTA indexes. Therefore, interpreting the RTA index results should be treated with care (Dlikilili & Van Rooyen, 2018). Table **2.1** below shows how to interpret several cases of the RTA index. There are three aspects that change and that need to be considered when calculating the RTA index. Case 1 is a comparison of differences in the RTA indices for different products traded by the same country with the same reference countries, the country can make use of the real value of the RTA indicator. The higher RTA value reveals the greater competitiveness of that particular product over other products. In Case 2, a country's competitiveness in a specific product is compared with that of different reference countries. Such comparisons of the RTA values determine the relative importance of the traded products relative to those of different trading countries (i.e. major competitors). In Case 3, care needs to be applied, as economies of different sizes affect the absolute value of the RTA. By using the RTA trend analysis, it is possible to compare the competitiveness of different economies, i.e. countries.

Table 2.1: Interpretation of different trade advantage indexes

Case	Country or group of countries to be analysed	Commodity, product or commodity group	Group of reference countries	Interpretation
1	Same	Different	Same	RTA indicators for different commodities or products traded by the same country with the same reference countries can make use of the real value of the RTA indicator.
2	Same	Same	Different	A specific country's competitiveness in a specific product or commodity is compared to different reference countries. A comparison of the RTA indicator enables one to determine the relative importance of the trading partners.

3	Different	`Same	Same	Special care need to be paid in this case. The index is affected by the size of the economy. The trend should be used to compare competitiveness between countries.

Source: Valentine and Krasnik (2002)

Some of the limitations of the RTA index are that it does not reveal how the nation or industry obtains its competitiveness, or how competitive advantage can be maintained over time. However, several scholars of competitiveness, including Abei (2017), Angala (2015), Boonzaaier (2015), Boonzaaier and Van Rooyen (2016), Dlikilili (2018), Esterhuizen (2006), Jafta (2014), Sinngu and Antwi (2014) and Van Rooyen et al. (1999) have argued that such limitations of the index can be dealt with by incorporating a Porter Diamond model through the identification of factors enhancing or constraining the competitive performance of a nation or industry.

Some other methods used in measuring competitiveness include: the real exchange rate (RER), the net export index (NXi), export market share (EMS), foreign direct investment (FDI), unit labour cost, the Grubel-Lloyd (GL) measure, domestic resource cost ratio (DRC), social cost and benefit (SCB) measures, and Porter's Competitive Diamond model (Porter, 1990), amongst others. All the measures of competitiveness can be categorised under three main headings: measures of competitive performance, measures of competitive potential, and the management process, otherwise known as the 3Ps

2.8. Applications of competitiveness analysis in agriculture

There is a considerable amount of literature on agricultural competitiveness analyses (see Table **2.2**). The analysis of competitiveness of European agriculture, done by the Institut de Science Mathematiques et Economicques Appliquees (ISMEA) (1999), must be viewed as a benchmark study that focuses on the development of the RTA method and Porter's diamond model. The different methods and frameworks used in these studies serve as a justification for measuring competitiveness that will be applied to measure the competitiveness of South African subtropical fruit industry. Table **2.2** illustrates competitiveness studies conducted in the field of different agricultural sectors.

Table 2.2: Overview of studies on competitiveness in agriculture

Authors or researchers	Proxies and/or models/frameworks for competitiveness applied	National industry or sector evaluated/analysed	Verdict or conclusions drawn
1. Overview of international studies on competitiveness			
ISMEA (1999)	RTA and Porter Competitive Diamond model	The European agro-food system	Scope for European Union integration
Ferto and Hubbard (2002)	RCA and RTA	Hungarian agricultural food sector	Hungary had a comparative advantage in 11 of the 22 aggregated agricultural products
Thomas (2007)	Porter Diamond model	Namibian table grapes	The Namibian table grape chain is relatively competitive in the international market. Primary production becoming more competitive
Aktha, Sharif and Shas (2009)	RTA	Competitiveness of Pakistan's fruit exports	Pakistan has a comparative advantage in fruit export (mangos, dates and oranges). It has a relative high comparative and competitive advantage in date and mango production
Ruma (2011)	RTA and CEP	Vegetables, fruit and flowers in India	India has a competitive advantage relative to its major rivals
Tuna, Goerigiev and Nacka (2012)	RCA and Porter Diamond model	Tobacco sub-sector in the Republic of Macedonia	The Republic of Macedonia has favourable conditions and a competitive advantage for producing tobacco
Adegbite, Oni and Adeoye (2014)	Private cost ratio (PCR), DCR and PAM	Pineapple production in Osun State, Nigeria	The pineapple production system using the sucker method is more competitive and has a higher comparative advantage than the crown production system.
Eskandari et al. (2015)	Michael Porter's five forces model	Food industry in Hamadan Province, Iran	Competition among competitors is important to determine the competitiveness of the food industry

Khai, Ismail and Sidique (2016)	RCA and RTA	Shrimp products in Malaysia	Malaysian shrimp exports were not competitive internationally. RCA and RXA indexes showed some competitiveness of non-frozen shrimp products
2. South African applications of competitiveness			
Kalaba and Hanneberry (2001)	Import demand models - Source-differentiated AIDS model - Restricted SDAIDS models	The effects of a free-trade agreement on South African agriculture: Competitiveness of fruits in the EU market	Chile and the USA showed a strong competitive advantage over SA in some fruits. There is a complementary relationships between SA and USA apples
Van Rooyen, Kirsten and Collins (2001)	Domestic resources cost (DRC) RCA private cost ratio (PRC) Policy analysis matrix (PAM) Porter Diamond	The competitiveness of the South African and Australian flower industries	When all the methods were applied, the results revealed that SA has a competitive advantage in the production of flowers. The Porter diamond shows a more competitive advantage for Australian flowers. Both SA and Australia have a revealed comparative advantage for Australian flowers
Esterhuizen, Van Rooyen and Van Zyl (2001)	RTA	The competitiveness of the agricultural input industry in South Africa	The fertiliser industry was viewed as competitive, while the pesticide industry had decreasing competitive performance. The machinery industry was uncompetitive. The agro-food and fibre industry showed an increasing trend of competitiveness
Mahlanza, Mendes and Vink (2003)	Social cost benefits (SCB) DRC Policy analysis matrix (PAM)	Comparative advantage of organic wheat production in the Western Cape	The results showed a comparative advantage for wheat grown under organic practices. The findings further show the existence of distortions in the market, even under organic wheat production practices
Mosona (2004)	RTA	Agricultural competitiveness and supply chain integration: South Africa, Argentina and Australia	SA agricultural commodity chains are marginally competitive

Esterhuizen and Van Rooyen (2006)	RTA	An inquiry into factors impacting on the competitiveness of the South African wine industry	The SA wine industry has improving competitiveness. This competitiveness is constrained by the size of the domestic market, the strong rand and crime, among other identified impacting factors. Efficient supporting system and intense competition in the market are among the enhancing factors
Mashabela and Vink (2008)	RTA	Competitive performance of global deciduous fruit supply chains: South Africa	Results show that SA deciduous fruit supply chains are internationally competitive. Chile supply chains for deciduous fruit are internationally more competitive. The SA supply chain loses its competitiveness status as one moves from primary to processed products
Van Rooyen et al. (2011)	RTA Porter Competitive Diamond	Analysing the competitive performance of the South African wine industry	SA wines are internationally competitive, with an increasing trend. Fluctuating exchange rate and changing market trends play a significant role in the competitive performance of the industry
Van Rooyen and Esterhuizen (2012)	RTA Porter Diamond	Measuring and analysing trends in competitive performance: South African agribusiness during the 2000s	The results showed that agribusiness is marginally competitive. The results also reveal that the business is constrained
3. Recent competitive performance of the South African agricultural sector			
Sinngu and Antwi (2014)	RCA, RTA, NXi, Porter Diamond	Competitiveness of the South African citrus fruit industry relative to its Southern Hemisphere competitors	SA citrus industry is globally more competitive than its Southern Hemisphere (SH) rivals. However, its competitiveness declines as one moves down the value chain. The BEE policy, labour policy and tax system were found to be some of constraining factors of the industry

Jafta (2014)	RTA and Porter Diamond Model	An analysis of the competitiveness of the South African apple industry	SA apple industry achieved sustained competitive performance in the reviewed period. However, when the industry was compared to major rivals, it was outperformed by Chile and New Zealand in the Southern Hemisphere
Boonzaaier (2015)	RTA, Porter Competitive Diamond	An inquiry into the competitiveness of the South African stone fruit industry	SA stone fruit industry's competitiveness is outperformed by Chile in the SH, whereas in the Northern Hemisphere (NH) the local industry is outperformed by France. Strategy, structure and rivalry were viewed as the most enhancing determinants
Sihlobo (2016)	RCA, agri-benchmark production model, growth share matrix, indicative trade potential index, market attractiveness index (MAI), and relative indicative trade potential index	An evaluation of the competitiveness of the South African wheat industry: A hedonic price model	SA maize exports are competitive. Competitive advantage falls below that of Brazil, Argentina and the USA in the production cost analysis. The United Arab Emirates, Japan and Mexico were identified as high-potential export markets for SA maize
Van der Merwe et al. (2016)	Hedonic price model	Factors influencing the competitiveness of the South African wheat industry: A hedonic price model	The findings show that changes in prices are mainly a function of colour, P/L, defects and fall
Davids and Meyer (2017)	Univariate time series analysis qualitative approach	Price formation and competitiveness of the South African broiler industry in the global context	Technical efficiency of South African producers is on par with international standards. Domestic chicken price is more elastic to variations in the import parity price than changes in feed costs

Valenciano et al. (2017)	Constant market share	South Africa's competitiveness against its main competitors in the market of pears imported by EU28	SA pears were competitive in the EU market before the global financial crisis. After the meltdown, exports of pears from SA to EU rose by a low margin at a slow rate
Dlikilili (2018)	RTA, Porter Diamond Model and two-step Delphi	Measuring competitive performance of the South African citrus industry	SA citrus industry is competitive and has maintained positive figures since early 1960s. When compared with global competitors, it is being challenged by the most powerful nations in both the Southern and Northern Hemisphere
Dlikilili and Van Rooyen (2018)	RTA	Measuring the competitive trends of the South African citrus industry	SA citrus industry is competitive and has maintained positive figures since early 1960s. When compared with global competitors, it is being challenged by the most powerful nations in both the Southern and Northern Hemisphere.

From a discussion of the different studies above, it is evident that a number of studies have been conducted to measure the competitiveness of world and South African agricultural commodities in the last decade. Most studies have used trade-based measures of competitiveness; – the RTA, with the Porter Diamond model.

2.9. Conclusions

The evolution of the concept and theory of competitiveness was reviewed with reference to trade theories from the classical economists – Adam Smith (1779), David Ricardo (1817) and J.S. Mills (1848-1873), to the neoclassical economic models (H-O-S). This contributed greatly to the identification of the sources of comparative advantage, free trade and specialisation in the new competitiveness theories, such as Porter's Competitive Diamond model and the extended models. What stands out in the literature review of trade theories is the question why countries open their markets and why some nations are competitive while others are not. New competitiveness theories, such as that of Porter, differ from the traditional/classical theories by arguing that national prosperity is not inherited (a set of natural endowments), but rather created by strategic choices made by a particular firm or nation. In this study, competitiveness is defined in the context of the South African subtropical fruit industry as "the ability of the South African subtropical fruit industry to trade successfully and on sustainable bases; and being able to attract resource investment such as land, labour, technology, management skills and talents, and capital from other competing economic activities while earning at least opportunity cost of returns on resource employed" (adopted from Freebairn, 1986). Several methods that are used to measure relative competitiveness are outlined in this chapter, including the relative comparative advantage (RCA) of Balassa, extended by Vollrath to relative trade advantage (RTA). The application of these theories and methods to measure and analyse competitiveness was finally used to establish a base for developing an analytical framework for this study. According to Abei (2017) and Dlikilili (2018), a competitive advantage can be indicated by the trade performance of a particular traded commodity and its value chains, competing with other, competing commodities and countries. This shows that the commodity's trade pattern reflects relative market costs, as well as differences in non-price competitive factors.

Chapter 3: ANALYTICAL FRAMEWORK

3.1. Introduction

This chapter provides the analytical framework and methods to measure, analyse and identify factors affecting the competitive performance of the subtropical fruit industry of South Africa.

3.2. A step-wise analytical process

Based on the international trade orientation of the subtropical fruit industry, the current study utilised the widely used Vollrath-Porter's method, viz, the RTA indices of Vollrath (1991) for the measurement of competitive performance and the Porter Competitive Diamond model to analyse the factors that direct such performance. This analytical framework was initially applied by ISMEA (1999) to analyse the competitiveness in the extended European Union group and was referenced by numerous authors in the international environment.

In the South African agribusiness context (Esterhuizen, 2006; Van Rooyen et al., 2011; Van Rooyen & Esterhuizen, 2012; Jafta, 2014; Boonzaaier, 2015; Boonzaaier & Van Rooyen, 2017; Dlikilili, 2018; Dlikilili & Van Rooyen, 2018b; Abei & Van Rooyen, 2018 ; Angala & Van Rooyen, 2018) referenced and adapted variations of this method (refer to Table **2-2**).

Industry participation in this study was structured through a "two round" Delphi method to gather opinions and views from the relevant industry role players. Data analysis was conducted through a set of appropriate statistical methods including Principal Component Analysis (PCA) and Cronbach Alpha that will be discussed fully later in section 3.2.4.

Each step of the framework is the sequential cognisance of the information gathered in the previous steps and gives feedback on the gathered information; hence, the process is interactive from data collection to data analysis. The five-step analytical framework is shown in **Figure 3.1**:

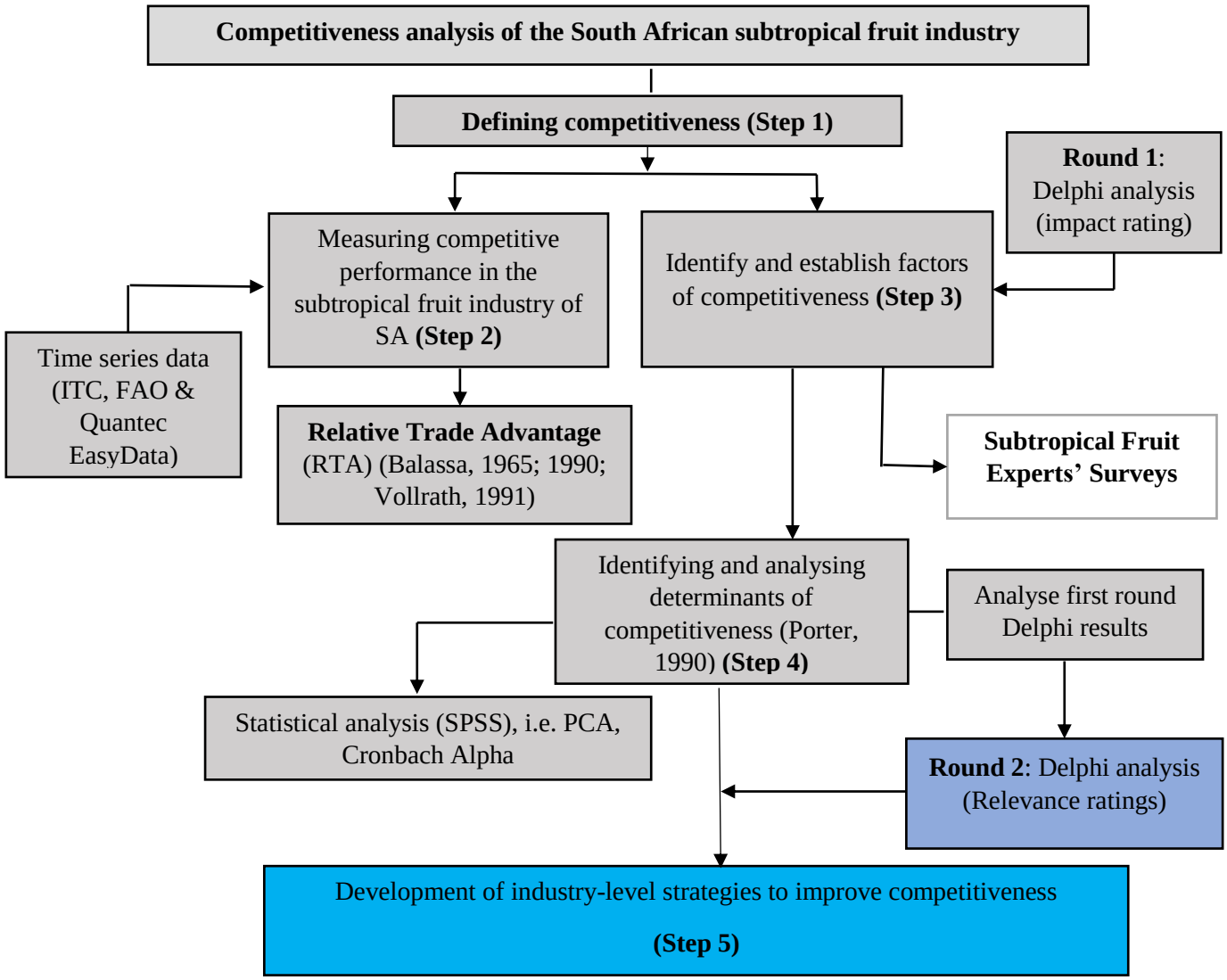


Figure 3.1: Analytical framework

Source: Adapted from Esterhuizen (2006), Van Rooyen et al. (2011), Van Rooyen and Esterhuizen (2012), Jafta (2014), Angala (2015), Boonzaaier (2015), Boonzaaier & Van Rooyen (2017), Abei (2017) and Dlikilili (2018).

3.2.1. Step 1 – Defining competitiveness in the context of the South African subtropical fruit industry

As it stated in the preceding chapter (see section 2.6), competitiveness in the context of this study is defined as the "…ability of the South African subtropical fruit industry to trade successfully and on sustainable bases; and being able to attract resource investment such as land, labour, technology, management skills and talents, and capital from other competing economic activities while earning at least opportunity cost of returns on resource employed" (Freebairn, 1986). Boonzaaier and Van Rooyen (2015) argue that it is crucial that an appropriate and unequivocal definition of competitiveness to be adopted within an agricultural trade framework, to apply an applicable and valid measure i.e. RTA, to be utilised as a proxy for the industry evaluation of competitiveness. The definition mentioned above

gives effect to competing in a highly contested global trade environment, focusing on "competitiveness advantage" rather than "comparative advantage" analytical viewpoints (Porter, 1998; Esterhuizen, 2006; Boonzaaier, 2015; Boonzaaier, 2015; Boonzaaier & Van Rooyen, 2015). Given the later discussion, the mentioned definition was therefore, adopted for the purpose of this study. Refer to chapter two section 2.6 for evolution of the competitiveness.

3.2.2. Step 2 – Measuring the competitive performance of South African subtropical fruit industry

The second step of the analytical framework sought to measure the competitiveness of the subtropical fruit industry of South Africa over time -using trade data (FAO and ITC). In Chapter 2 (see sections 2.7.2 to 2.7.9), different methods and approaches to measure competitiveness were discussed. The relative trade advantage (RTA) method of Vollrath (1991), thoroughly explained in section 2.7.2, was adopted in this study to measure, quantitatively the competitiveness of the local subtropical fruit industry in the international market. Vollrath (1991) adds that the RTA may be more preferable to other methods such as RCA and NEI because it is less susceptible to policy-induced distortions, which tend to be more pronounced on the import side. It for this particular reason that the RTA, which include exports and imports was used for this study.

The RTA use trade data (e.g. FAO or ITC); a true reflection of global trade dynamics (Abei, 2017). Thus, the RTA is a suitable method to measure competitive performance over time (see section 2.7.2). The RTA method also allows the analysis and measurement of competitiveness under real world conditions such as distorted economies and different trade regimes, and is one of the most widely used and comprehensive methods. Boonzaaier & van Rooyen (2017), Freebairn (1986) & Esterhuizen (2006) concur with the latter by stating that RTA is the most comprehensive and sophisticated method, and it captures the real world conditions of competitiveness. As market prices are used, and not "resource cost calculations" the RTA give a better indication of "competitive performance" than the RCA index (Boonzaaier & Van Rooyen, 2017), and is thus preferred in this study.

As discusses earlier, the RTA indexes has some limitation and might also be biased to the size of economies—when comparing countries, some undisclosed market distortion in the form of tariffs, subsidies and government interventions forms of protectionism. This is also true in agriculture and food sector, where government interventions are seen as a common feature (Mashabela & Vink, 2008). Therefore, caution stance is advised when reading the RTA results in Chapter 5. The above stated conditions, directly influences global trade, hence the more useful to agribusiness concept of "competitive advantage" rather than the academic/policy analysis view of "comparative advantage".

Data used to measure competitive performance

Competitiveness is a relative measurement, which depends greatly on the type and quality of data available (Esterhuizen, 2006). This study used time series secondary trade data—imports and exports values to measure the competitiveness trend of the SA's subtropical fruit industry relative to its international rivals. Data was sourced from internationally recognised data sources, namely the Food and Agricultural Organization (FAO), accessed at http://www.fao.org/faostat/en/#home, for the period 1961 to 2013 and from the International Trade Centre (ITC), which can accessed at http://www.trademap.org/Index.aspx, for the period from 2001. The ITC database provides trade statistics for all products, for most countries registered with the World Trade Organisation. While on the other hand, the FAO is a United Nations linked organisation that provides trade data of only all agricultural related commodities for over 245 countries and territories. According to Dlikilili (2018) and Abei (2017), the latter time-series datasets provide important trade data necessary to measure and compare the competitive performance of a particular commodity over the time. It should be noted that the FAO database includes only agricultural-related trade data and the agricultural industries not only compete within the agricultural sector but also compete in the entire economy for scarce resources such as land, capital, water and credit. Therefore, using both datasets will be advantageous to capture the competitive performance in the agricultural sector and competitiveness trends at the macroeconomic level.

3.2.3. Step 3 – Establishing factors determining competitiveness of South African subtropical fruit industry (through a first-round Delphi).

Evaluating industry's competitive performance and identifying the major factors influencing the industry's international competitiveness are crucial for understanding and for formulating effective policies or strategies intended to maintain or enhance the industry's market position (Maksymets & Lönnstedt, 2016). According to Abdikoğlu and Unakitan (2016), factors affecting the competitiveness of a country's industries are either economic or non-economic in nature. This step was intended to identify and determine factors constraining or enhancing the competitiveness of the South African subtropical fruit industry. This step involved participative methods by obtaining views and opinions from leading experts in the subtropical fruit industry. To achieve this, the Delphi technique used the Subtropical Fruit Executive Survey as a method to gather views and opinions from industry key stakeholders who hold different positions along the subtropical fruit value chain. The Delphi method of gathering and analysing such information will be discussed below -in sections 3.2.3.1 to 3.2.

3.2.3.1 Delphi method

The Delphi technique allows prospective researchers to obtain highly reliable and quality data from selected groups of experts by means of strategically designed and controlled questionnaire surveys (Okoli & Pawlowski, 2004; Hsu & Sandford, 2007; Hallowell & Gambatese, 2010; Dlikilili, 2018). This technique is useful when empirical data is not sufficiently available and extrapolation from past observations is insufficient for valid forecasts, therefore alternative research techniques are considered in participatory research (Marchau & Van de Linge, 2016).

The objective of its use is to achieve consensus of valued opinions on specific real-world issues. The Delphi technique is well suited as a research method for consensus building as it uses a series of questionnaires delivered using multiple iterations to collect opinions from experts. The Delphi technique allows experts to reassess or rate their initial opinions (Ludwig, 1997; De Vet et al., 2004; Kearney et al., 2017). The judgement of opinions by experts could lead to an acceptable consensus of dealing with conflicting scientific evidence (Jones & Hunter, 1995). The key components of the Delphi technique include anonymity – by means of questionnaires; iterations– presenting questions over a number of rounds, allowing participants to judge their opinions; controlled feedback – sharing ideas through a formal input process; and a statistical group response expressed as a consensus (Joblonski *et al*., 2016).

The Delphi technique has been used on various topics in food systems research, including assessing market access and competitiveness issues (Henchion & McIntyre, 2005), strategic planning for agriculture (Rikkonen et al., 2006), identifying emerging food market risks (Wentholt et al., 2010), and examining the changes in rural wealth impacts on intellectual capital (Jablonski *et al*., 2016).

For the Delphi process to hold, two or more iterations are sufficient for most academic research and the process only ends when the research question has been answered (Mamaqi et al., 2010). Thangamaratinam and Redman (2005) argue that Delphi method requires at least a minimum of two rounds, beyond that the results are likely to be disputed for scientific merit. In this study, a two-round Delphi method was applied. This included the impact rating i.e. first round of Delphi and long-term relevance, i.e. second round of the Delphi method to analyse factors affecting the competitive performance of the industry. Both steps of the Delphi technique are fully discussed below in relation to the objective to identify factors affecting the competitive performance of the industry.

Delphi round one: procedures followed- in step 3

The first round of the Delphi process as used in step 3 of the analytical framework include the composition of potential experts that represent the industry to address particular issues of concern namely; identification and rate factors affecting the competitiveness of the industry. In this study, the target group comprised industry experts (i.e. input providers, producers, packers, exporters, processors and/or marketers) as advised by the management of the Subtropical Fruit Growers' Association (Subtrop), together with expert volunteers who indicated their interest to participate in the study. There

are no specific guidelines or techniques to be followed when one selects the sample (experts) for Delphi studies (Hsu & Sandford, 2007). Generally, the selection of potential experts to participate in the Delphi process is determined by the availability of funds, logistics and exclusion criteria. Contrary, the number and constitution of experts depends on the nature of the research questions (Okoli & Pawlowski, 2004).

Regarding the number of experts, Ludwig (1995) stated, that the majority of Delphi studies have used between 15 and 20 respondents. With the help of the Subtrop, in this study a total panel of 50 experts was drawn. Their selection was determined by their experience and knowledge in their unique field of expertise along the subtropical-based value chain. This was followed by the draft of an explanatory recruitment letter sent via email to the selected experts, accompanied by a questionnaire on the factors affecting the competitive performance.

The questionnaire survey (the Subtropical Fruit Executive Survey) served as the cornerstone of soliciting specific information about the content of the factors influencing competitiveness of the industry. A total of 14 questionnaires were returned, representing a relatively low response rate of 28%. The low response rate was not left unattended and was viewed within the context of scientific research method. The response rate of the e-mailed questionnaires is often low when the selected respondents do not personally know the researcher (Patten, 2016). The questions in the questionnaire were purposely addressed and deliberately assessed with the intention to identify possible weakness and non-credibility that could have reflected an unclear framework for the questionnaire, however, in this study that was confirmed not to be the case.

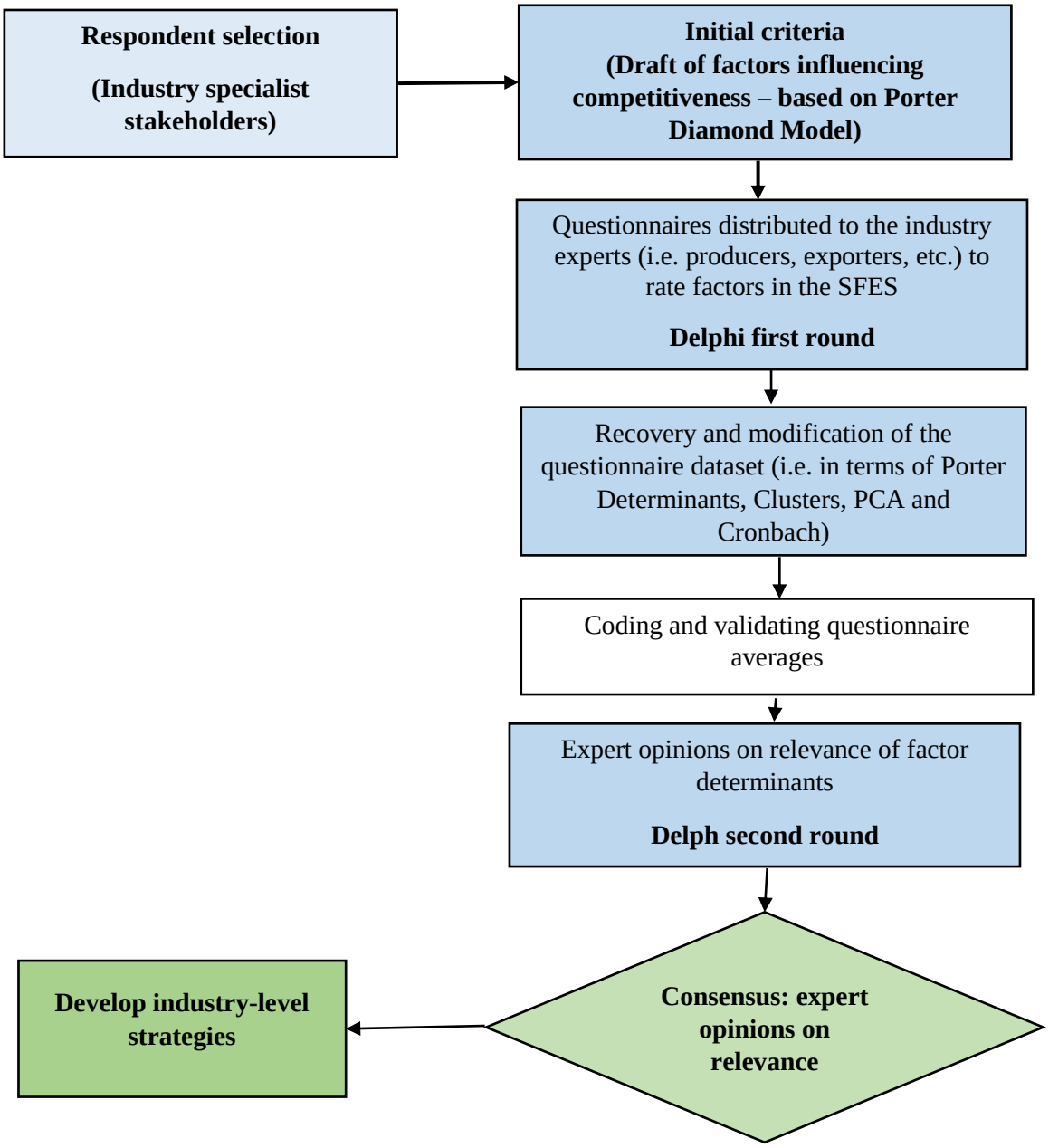


Figure 3.2: Delphi analytical framework

Source: Adopted from: https://www.google.co.za/search?q=Delphi+process&rlz=1C1GGRV_enZA782ZA784&source=lnms&tbm=isch&sa=X&ved=0ahUKEwivg4ytjbTZAhUGvBQKHTDkAEwQ_AUICigB&biw=1920&bih=974#imgrc=dnYRwafqs0ZyGM:

Figure 3.2 represents the sequential steps of the Delphi method to arrive at the expert consensus on the factors and determinants of competitiveness in order to derive relevant proposals for local industry strategies. After receiving the Subtropical Fruit Executive Survey (SFES) feedback from the respondents, the researcher converted the information into a well-structured questionnaire using Porter Competitive Diamond determinants and the PCA statistical mechanism to identify highly correlated factors in each determinant. Subtrop was the main channel to engage with experts who would like to

participate in such deeper information gathering process for impact and relevance i.e. Delphi round two (in step 4).

3.2.3.2 Questionnaire design and data collection

Questionnaires were designed and piloted in collaboration with Subtrop and structured based on factors derived from the Porter Diamond model were e-mailed to the selected experts to give opinions by means of rating factors that influence the competitiveness success of the industry in step 3. The experts were asked to express their opinion by scoring each factor on a Likert scale of 1 to 5, with 1 being highly constraining, 3 being neutral and 5 being highly enhancing (see **APPENDIX A**). There are several different scale of formats that can be used, including semantic differential, Stapel scale, Likert scale, Thurstone differential scale, and direct rating scales (Albaum, 1997). The most used scale format is the Likert scale (Gerland, 1991). Moreover, Likert scales are commonly used to measure attitude, providing " a range of responses to a given question or statement " (Jamieson, 2004).

3.2.3.3 Delphi round two technique in step 4

The second round of the Delphi process invited the experts who previously participated in the first round to rate the level of long run relevance of the highly correlated factors identified in the Cronbach's alpha analysis. Understanding factors impacting on the competitive performance of the industry, and whether these factors need to be improved for the long run success of the industry's competitiveness (i.e. round 2-long run relevance) is important. This helped us toward the development of strategic action proposals in step 5 of the analytical framework. Furthermore, in analysing the most critical factors affecting competitiveness and their long run relevance for the industries, an X-Y scatterplot (or a two-dimensional impact and relevance analysis) was undertaken for the 'current impact' rating (X-axis) plotted against the 'long run relevance' rating (Y-axis) (see **Figure 3.3**).

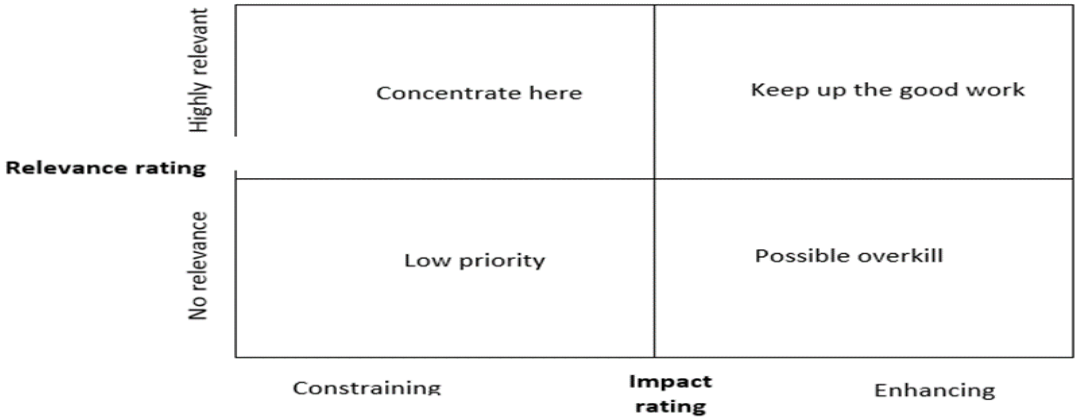


Figure 3.3: X-Y scatterplot impact and relevance rating

The round two Delphi analysis allows the identification of the performance gap between 'what is' the current impact status of performance and 'what ought to' to be – long-run relevance, using the X-Y scatterplots. In the second round of the Delphi technique, the response rate was 64%. From this, the industry expert-level input must be viewed as constrained. Conclusions of this section are the impact of factors influencing the competitive performance of the industry and must thus at best be treated as 'setting the scene' for proposing strategies to improve competitive performance (refer to strategic action recommendations in Chapter 6).

3.2.4. Step 4: data analysis (as used in steps 3 and 4)

This step complements the previous/former steps (1, 2 and 3 of the framework) in which the data gathered using the subtropical fruit expert survey (SFES) is analysed and discussed through the application of the Porter Diamond model. In this step, factors that affect (constrain or enhance) competitiveness of South African subtropical fruit industry are clustered and categorized according to Porter's theory of competitiveness (1990) in to the Porter Diamond model. The Porter Diamond model groups the competitiveness factors into the six determinants, namely; factor conditions; demand and market conditions; related and supporting industries; firm strategy and structure and rivalry, the role of government and the role of chance. These determinants were discussed in Chapter 2 (see section 2.2.6). The results from this will be presented using radar plots constructed using Microsoft Excel.

Statistical analysis (Applied in step 3 and 4)

3.2.4.1 Principle component analysis (PCA)

The Principal Component Analysis (PCA) was applied in this study to reduce the data achieved through the SFES by identifying the highly correlated variables – determinants for which the experts' views on ratings were similar, and the uncorrelated variables – determinants for which the experts' views on ratings were more variable. PCA is used in the dimensionality reduction (Yi et al., 2016). The responses to the statements within the six determinants of Porter's Diamond model in round one of the Delphi method results were subjected to principle component analysis (PCA) with the use of one (1) as prior communality estimate; the principle axis method was used to extract the components, followed by *varimax* rotation. The aim of using a PCA was to extract meaningful (significant) information from the data that could be presented as the new set of variables to show the pattern of similarity in the observations (Abdi & Williams, 2010).

PCA is a multivariate statistical technique, with the following goals:

- ✓ Extract the most important information from the data table;

- ✓ Compress the size of the dataset by keeping only the important information;
- ✓ Simplify the description of the dataset; and lastly,
- ✓ Analyse the structure of the observations and the variables.

3.2.4.2 Cronbach's alpha method

Cronbach's alpha is a crucial instrument that measures how closely related the set of items are, as a group developed by Lee Cronbach in 1951. Cronbach's alpha evaluates assessments and questionnaires (Tovakol & Dennick, 2011). This statistical method is used to measure reliability and internal consistency (Vaske, Beaman & Sponarski, 2016). Cronbach's Alpha is expressed as a number between 0 and 1. Alpha is connected to the interrelatedness of the all the items within the test. Additionally, Cronbach's Alpha estimates show the amount of measurement error in a test. Thus, the index's interpretation of reliability is the correlation of the test with itself. A 'high' value of alpha does not imply that the measure is unidimensional.

Simply put, if the test, for example, has a reliability of 0.7, there is 0.34 error (random error). An increase in the estimate of reliability, the fraction of a test score that is attributable to error, will decrease. Therefore, if the items in a test are correlated with each other, the value of alpha increases as well. The questionnaire used in this study was designed within the scope of the Porter Diamond framework, and was organised and restructured to best fit the PCA and was substantiated by Cronbach's alpha. The Cronbach's alpha reliability coefficient was used to determine the extent to which the questions asked were properly grouped together into the six determinants of Porter, and was used to evaluate the internal reliability of the factors identified to be highly correlated in the PCA analysis.

3.2.5. Step 5: Propose strategies to enhance the competitiveness of the South African subtropical fruit industry

The previous steps paved a way to the arrival of step 5. Based on the data analysis in the previous steps (i.e. PCA, Cronbach's alpha, Porter Diamond analysis, and scatterplots) this step proposes industry-level strategic actions suitable to enhance the competitiveness of the South African subtropical fruit industry. Findings were organised into useable, reliable knowledge and intelligence to guide the desired strategic actions to enhance the future global competitive performance of the subtropical fruit industry. These strategies should be formulated based on the findings in steps 3 and 4, and possible with relevant industry role players where necessary. However, in this study, focus group participation was not conducted and the proposed industry-level strategies must be viewed at best as "first round" recommendations by the industry.

3.3.Conclusions

The aim of this chapter was to describe the analytical framework designed to answer the research questions and objectives stated in Chapter 1. The analytical framework defined competitiveness in the context of South Africa's subtropical fruit industry situation. This then served as a guide in selecting methods and data to measure and evaluate the competitiveness of South African subtropical fruit industry, viz the relative trade advantage (RTA) index of Vollrath (1991), trade data (FAOSTAT and ITC). The Porter Diamond model of competitiveness – was selected to identify and analyse factors affecting the competitive performance of South Africa's subtropical fruit industry, and a two- round Delphi analysis were proposed to obtain opinions from the South African subtropical fruit industry experts. In the first round of Delphi technique, a questionnaire designed in the form of Porter Diamond model and piloted in collaboration with the Subtrop was e-mailed to selected subtropical fruit industry experts to capture determinants of competitiveness trends. Principal Component Analysis (PCA), Cronbach's alpha and interesting pointers from cluster analysis were considered as methods to use in chapter five for a detailed statistical analysis. Such statistical analysis methods will assist us to systemise the collected information meant to develop a base to propose actions to enhance future the industry level competitive performance. Chapter 4 gives an overview of the industry in relation to its competitive performance in the international stage. Chapter five gives the empirical results and findings achieved using the methods discussed above.

Chapter 4: OVERVIEW OF THE SOUTH AFRICAN SUBTROPICAL FRUIT INDUSTRY

4.1. Introduction

The subtropical fruit industry in South Africa operates in a market-driven, highly deregulated and dynamic business environment and faces the challenge to integrate into a highly competitive global market. In attempting to analyse the competitiveness of subtropical fruit in the global environment, a descriptive overview and understanding of the South African fruit industry is required. The ability to compete in the global markets is determined by factors such as demand and supply, factor conditions, infrastructure and related services, as mentioned in section 1.2 in chapter 1. In this chapter, the global production and market trends of subtropical fruits are discussed. This is followed by an overview of South Africa's fruit industry, with a particular focus on the structure, production, distribution, institutions and marketing trends.

4.2. Global overview of the subtropical fruit industry

4.2.1. Global subtropical fruit production and patterns of production

The subtropical fruit industry forms part of the world fruit sector, known for income generation and job creation while earning foreign exchange, and forms a source of nutrition and dietary requirements for the world's growing population, particularly from low-income countries. In terms of production, mangos, pineapples, papayas and avocados are considered the major subtropical fruits (Evans *et al*., 2017), hence, the study reviews these fruit types. It is worth noting that the data of the world's subtropical fruit remains scarce and limited, and this makes it difficult to give a full picture of world production and distribution. The growth in world subtropical fruit production over the past 50 years has been the result of higher yield per unit of land, and crop intensification (FAO Statistical pocket report, 2015).

The growing global demand for subtropical fruits is driven by local consumption and world exports. World subtropical fruit production increased by more than 5% between 1991 and 2000, reaching more than 60 million tons in 2000. In the 2009 production season, world subtropical fruit production was estimated at more than 82.2 million tons, slightly less than the 82.5 million tons produced in the previous production season. In 2010, global subtropical fruit production was expected to drop to 62 million tons after the 2007/2008 financial crisis (see **Figure 4.1**). Developing countries account for 98% of the total world subtropical fruit production, with 80% being imported by developed countries.

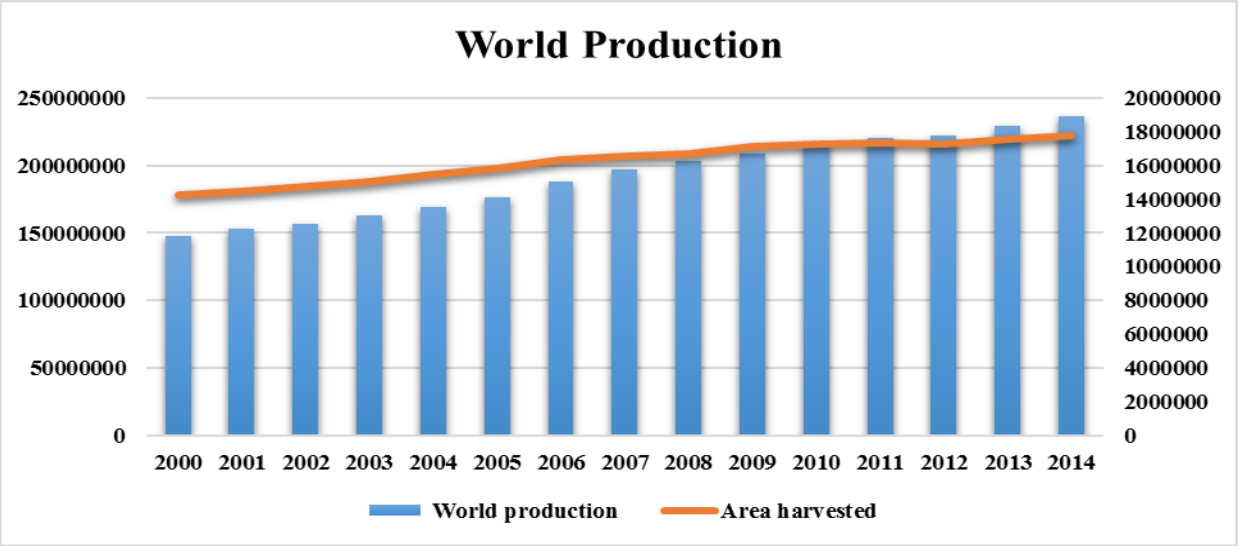


Figure 4.1: World subtropical fruit production ('1000 tons)

Source: FAO (2017)

From **Figure 4.2**, it is clear that banana is the most popular subtropical fruit produced globally, followed by mangos, pineapple, papaya and the minor tropical fruits (Evan, 2008). Between the 2000 and 2004 production seasons, the global production of subtropical fruits showed an annual growth rate of 3.5% (Ahmad & Chwee, 2007). A significant increase in production volumes and annual growth in world subtropical fruit production were recorded for bananas, mangos, pineapples and papayas. World subtropical fruit area under production has constantly been increasing and is expected to expand over the next decade (see **Figure 4.1**).

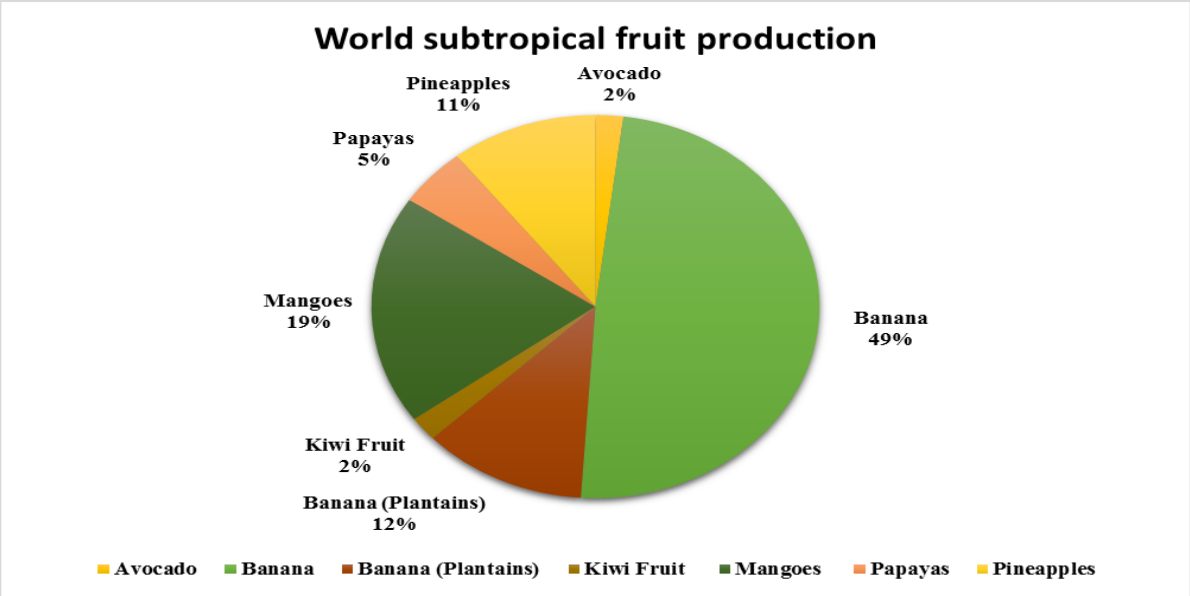


Figure 4.2: World subtropical fruit production for the 2014 production season (FAO, 2017)

Source: Author's own calculation from FAO (2017)

Table 4.1: World subtropical fruit production

World major subtropical fruits	World production (million tons)	Largest	%	2nd largest	%	SA	%
Avocado	5 028 756	Mexico	30	Dominican Republic	8.5	1 077 173	2.13
Bananas	114 130 151	India	26.0	China	10.6	456 803	0.40
Banana (plantains)	30 667 662	Uganda	14.7	Cameroon	12.7	-	-
Kiwi fruit	52 876 05	China	53.4	Italy	14.7	-	-
Mango	49 900 161	India	40.8	China	10.3	44 986	0.10
Papayas	12 822 014	India	44.5	Brazil	12.65	14 602	0.12
Pineapples	27 328 308	Costa Rica	11.5	Brazil	10.4	91 304	0.36

Source: FAO (2004)

Asia remains the largest subtropical fruit-producing region in the world, with approximately 178 million tons produced in 2004, accounting for 66% of the world total production (NAMC, 2007). Other regions include the Americas, with 53 million tons, and Africa, with 25 million tons (FAO, 2004). In terms of avocado fruit, Mexico remained the largest producer in 2014, accounting for five million tons. On the other hand, India was responsible for 44.5% of global papaya production in the 2015 production season. From **Figure 4.2** it is clear that banana remained the world's most produced subtropical fruit in 2014, accounting for 49% of total world subtropical fruit production (FAOSTAT, 2017). Of the total world banana production, 26% comes from India, followed by China, with 10.6% of world banana production.

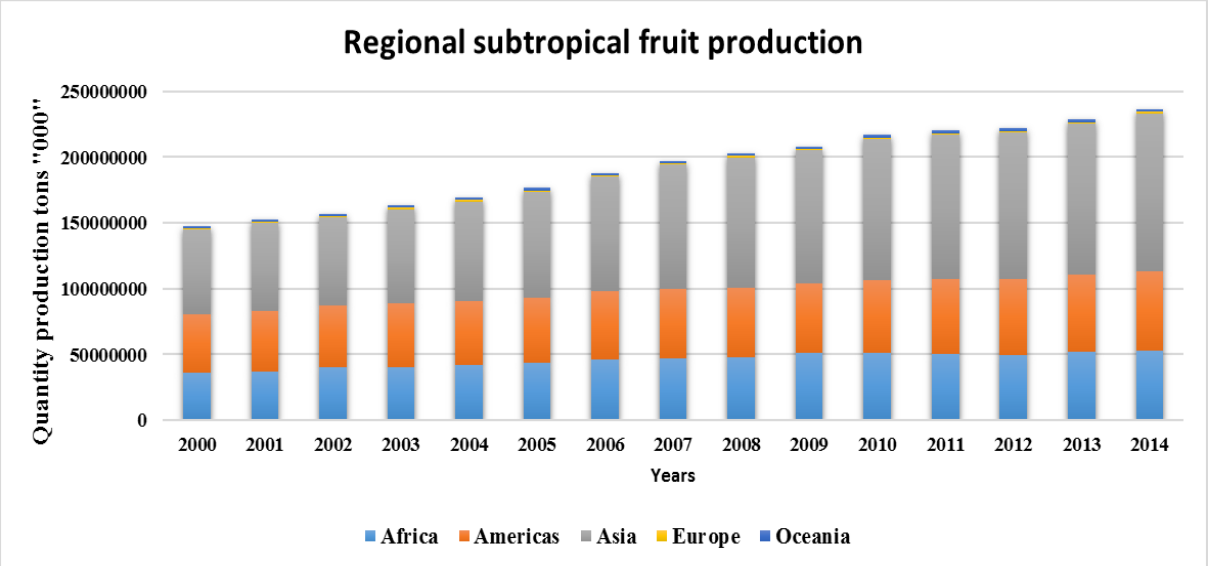


Figure 4.3: Total regional subtropical production (2000 to 2014)

Source: Own calculation and FAO (2017)

Globally, Asia accounts for more than 70% of the tropical fruit produced, followed by Latin America and the Caribbean, at 15% and 9% respectively. Africa, Oceania, the United States and Europe account for the balance (see **Figure 4.3**). Furthermore, unfavourable climatic and weather conditions have had a significant impact on the production and storage losses of subtropical fruits. The world's production of subtropical fruit has shown a remarkable increase in quantity over the past decades, with a significant increase from 2000 to the recent the 2014 production season (FAO, 2017).

4.2.2. Global trade in subtropical fruit

Trade in fruit products has been among the most dynamic areas of international agricultural trade, driven by increased consumer incomes and diversity in consumer and market needs for product variety, freshness, convenience, and year-round availability (Diop & Jaffee, 2005). This requires an increase in production, and efficiency in postharvest handling, processing and recommended logistical technologies that are largely dependent on investment in the fruit industry. About 90% of the subtropical fruit produced in the world passes through formal and informal markets. The remaining 10% is traded, and of this total (10%), 50% is traded as fresh fruit and 50% is traded as processed products. In 2009, the total value of globally traded fresh tropical fruit was US$ 5.4 billion, and traded processed tropical fruits amounted to US$ 6.5 billion (FAO, 2017). Global markets for subtropical fruits are gradually growing, and exporting countries are striving to expand their production in response to meet the ever-growing demand. On overage, 11,9 million tons of subtropical fruit were exported annually from 1961 to 2013 (FAO, 2017). This represents a value of approximately US$ 4.7 million per annum.

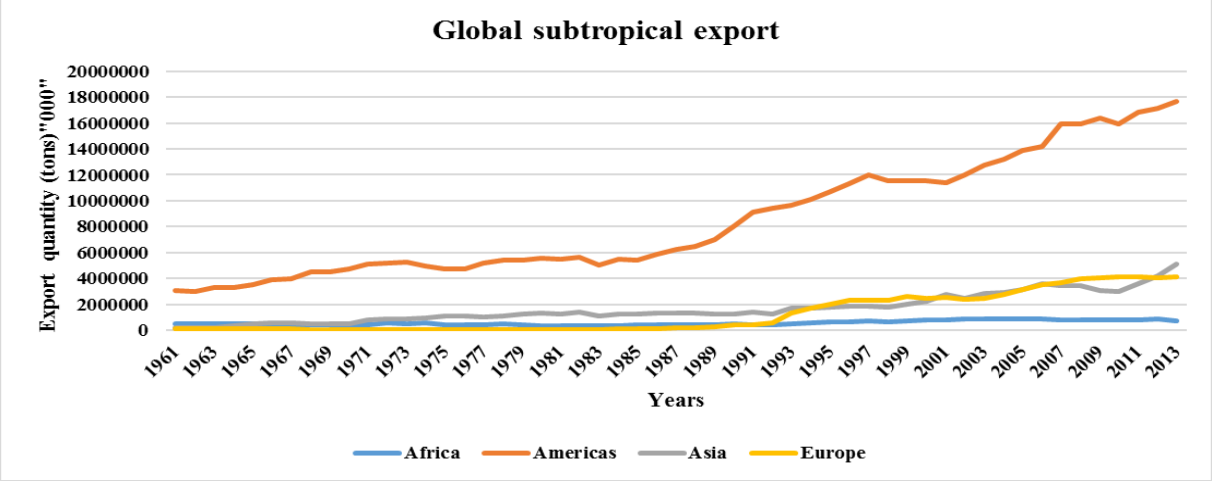


Figure 4.4: World exports of subtropical fruit

Source: Author's own calculation based on FAO (2017)

Globally, the export of subtropical fruit has increased over the past two decades, showing a significant increase (see **Figure 4.4**) from 16 million tons in 2000 to 26 million tons in 2013 (FAO, 2017; Ahmad & Chwee, 2004). The Americas export the largest quantity of subtropical fruit, followed by Asia and Europe (**Figure 4.4**). The export value from the Americas accounted for 46% of total global exports in

2004. In the same marketing year, the export value of subtropical fruit from the Americas was estimated at $ 6.5 billion compared to Asia's export, which valued at $ 2.5 billion. The major fruit exported by the American region is banana.

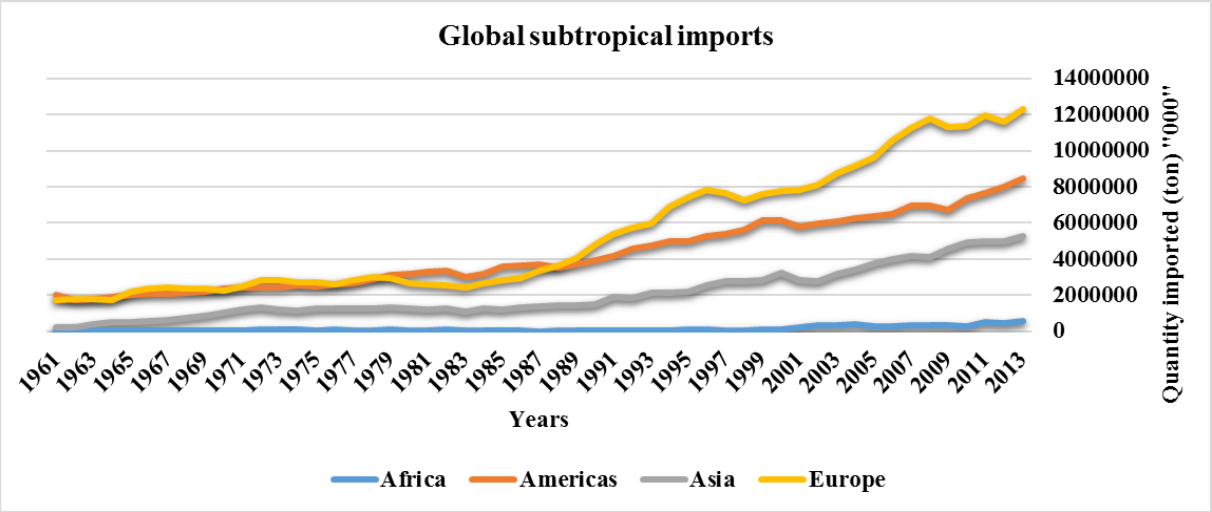


Figure 4.5: Quantity (tons) of subtropical fruit imported to different regions
Source: FAO (2017)

Europe accounts for 50% of the world's subtropical imports, followed by the Americas (Canada and the United States of America) and Asia (FAO, 2017) (see **Figure 4.5**). Africa imports the least of the world's subtropical fruit, and this can be attributed to the fact that Africa is a net exporter of subtropical fruit. Europe and the Americas together account for more than 70% of world import demand (FAO, 2017). In 2010, world import volumes for the major subtropical fruits (banana, avocado, mango, papaya and pineapples) indicated an increase of 4.2 million tonnes, with the largest increase for mango, at 9%. To close the trade balance is important for subtropical products; however, a significant growth in subtropical exports has been recorded in the minor subtropical fruits as well.

4.3. Historical overview of the South African subtropical fruit industry

According to Du Toit (1981), the deciduous fruit industry was established as an organised entity during the settlement of the Dutch at the Cape of Good Hope in 1652 to supply trade ships with fresh produce. The industry thereafter expanded to the northern parts of South Africa and became established in the warmer subtropical climate and summer rainfall regions of the country. Little is known about the initial varieties that were planted. During this period, there were many limiting and constraining factors that hindered the development of the country's fruit industry. Such factors included the lack of a well-established marketing system, and institutional and market infrastructure that slowed the development of the industry sub-optimally. The birth of the commercial South African fruit industry came into existence as the result of international exchange and interaction, driven by globalisation and the openness of international markets since the 1990s (Boonzaaier, 2015). Since the inception of the South African deciduous fruit industry, there has been an increase in volumes, and new cultivars of other

fruits, e.g. subtropical fruit, are associated with good horticultural management and new investments (NAMC, 2006). Of the 4.7 million tons (valued at more than R30 billion) of South African fruit produced annually, 5% come from the subtropical fruit industry (Fruit SA, 2015). Approximately 90% of South Africa's fruit is exported to the international market, with the remaining proportion being absorbed by domestic markets (NAMC, 2016). South African subtropical fruit is an export-oriented industry today, with volumes supplied to domestic markets and exported into international markets every year.

4.3.1. The industry's institutional structures today

4.3.1.1 Fruit South Africa (FSA)

Fruit South Africa (FSA) is a non-profit organisation established in the early 2000s as an umbrella organisation for the different fruit sectors of South Africa. In 2013, the fruit industry of South Africa was formally re-established. On its establishment, the South African fruit industry appointed a board of directors that are responsible for continuous growth (market shares, exports) and development (i.e. production, technological advancement, etc.). Fruit South Africa comprises the Citrus Growers' Association of Southern Africa (CGA); HORTGRO (pome and stone fruit); the South African Table Grape Industry (SATI); Subtrop (avocado, litchi, mango, pineapple and macadamia industries); and the Fresh Produce Exporters' Forum (FPEF), and addresses issues related to the fruit industry.

Figure 4.6: Fruit industry of South Africa

FSA is characterised and driven by its vision and mission. The vison and mission statements of the industry are as follows:

- Vision: To be "**a competitive, equitable and sustainable S.A. fruit industry**".

- Mission statement: "**FSA creates and facilitates a competitive, equitable and sustainable environment for its members**."

The fruit industry of South Africa has the following strategic objectives:

- To establish FSA as the collective platform for the fruit industry of South Africa
- To engage constructively and subjectively with government and other public institutions on policy, legislation and other related fruit industry matters
- To engage constructively with other strategic stakeholders
- To promote and coordinate socio-economic issues (broad-based BEE, transformation, and skills development)
- To gather and disseminate key industry-related information
- To communicate industry information to the broader public and industry stakeholders

This set of strategic objectives is set to encourage the achievement of long-lasting sustainability, competitiveness, and equity in the industry.

4.3.1.2 Fresh Produce Exporters' Forum (FPEF)

This is a voluntary, non-profit organisation with 34 affiliated members and accounts for about 90% of fresh fruit export from South Africa to the world markets. It was initially registered in 1998. The FPEF primarily provides leadership and services to its affiliated members, the international buying community and the fresh fruit export industry. Members of the FPEF are divided into exporters, producers-exporters, export and marketing agents, pack houses, and logistics and other related services. The FPEF raises funds to promote exports of fresh fruit with the help of its members or directly from the Department of Trade and Industry (dti). Such contribution is made on an annual basis and is not necessarily guaranteed income. This refers to the fact that the planning and funding of the outlined events are usually limited to one budgetary year. However, the statutory levies imposed are for a period of four years, which makes it easier to plan, particularly for longer term projects.

4.3.1.3 Subtropical fruit-related associations

The subtropical fruit industry of South Africa has different sub-sectors that work collectively to promote the fruit industry of South Africa. Subtropical fruits are mainly categorised into different fruit types, including avocados, bananas, litchis, kiwi fruit, mangos, guavas, pineapples, papayas, granadillas and nuts (cashew, pecan, almonds and walnuts). Each fruit type has various cultivars, which have different seasons and different harvesting periods (dates).

4.3.1.4 Horticultural Growers (HORTGRO)

The existence of HORTGRO arose from the establishment of the Deciduous Fruit Producers' Trust (DFPT) in 1997 through the introduction of the three primary fresh producer organisations, namely the South African Stone Fruit Producers' Association (SASPA), the South African Apple and Pear Producers' Association (SAAPA), and the South African Table Grape Industry (SATI). In 2009, a new HORTGRO entity was established to facilitate all the operations, services and functions of the deciduous fruit industry of South Africa. With a broader scope, the DFPT still retains its statutory duties to ensure that contracts and agreements are upheld and met. In contrast, SATI has been considered as a parallel industry relative to the deciduous fruit industry.

4.3.1.5 South African Subtropical Growers' Association (Subtrop)

The Subtropical Growers' Association (Subtrop) is an association comprising associations (affiliated members) that manage the affairs of the South Africa Avocado (SAAGA), Mango (SAMGA), Macadamia (SAMAC) and Litchi (SALGA) Growers' Associations. The association's main purpose is to promote the production and export of subtropical fruit in the internal market through defined industry lines. The membership of the association varies from smallholders to large corporate operations. Moreover, the activities performed by Subtrop and its affiliated associations are funded by its members. A full picture of the subtropical fruit industry of South Africa in terms of production, exports and sales on markets is discussed in sections 4.4 and 4.5 below.

4.4. Subtropical fruit production in South Africa

As stated in chapter 1, the subtropical fruit industry contributes significantly in the country's GDP. South Africa is well known for its diverse climatic and weather conditions that favour the production of subtropical fruit (DAFF, 2017). The climatic condition requirements determine which subtropical fruit cultivars can grow in which regions. These regions are Limpopo, Mpumalanga and KwaZulu-Natal. However, fruit like granadillas and guavas grow in the Western Cape, while pineapple production is largely in the Eastern Cape and KwaZulu-Natal provinces. In 2015/2016, the area under production of avocadoes was estimated at 16 000 ha, mangos at 7 000 ha and litchis at 1 700 ha (DAFF, 2016a, 2016b, 2016c).

Figure 4.7: Geographical distribution of fruit production in South Africa

Source: (FRUIT SA, 2015)

The value of South African subtropical fruit production was R3 500 million in 2015/2016, a significant decrease of 6.4% from the 2014/2015 season, which was valued at R3 742 million (DAFF, 2016b).

Table 4.2: Availability and harvesting periods of subtropical fruit

Month/ fruit type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avocado												
Banana												
Kiwi												
Mango												
Macadamia												
Litchi												
Pineapple												
Papaya												
Guavas												
Pecan nut												

Source: DAFF (2017)

Table **4.2** indicates the availability of subtropical fruit in South Africa. The seasonality of South Africa's subtropical fruit allows producers to access Northern Hemisphere (NH) markets when other exporters of the same fruits are off-season (Absa, 2017). The three major regions – the European Union, the North American Free Trade Agreement (NAFTA) area and Asia – largely depend on Southern Hemisphere country imports for juice and off-season fresh fruit such as banana (Wu Haung, 2004). SH fruit exporters have a crop production cycle opposite to that of the NH, with summers during the Northern Hemisphere winter, and play a significant role in ensuring a year-round supply of fresh fruit (USDA, 2004). Therefore, SH countries (including Argentina, Australia, Brazil, Chile, New Zealand and South Africa) take advantage of the seasonality difference to expand production and their exports. The

expansion of export market shares of South African subtropical fruit are important for the relative trade advantage calculation for this study.

4.4.1. South African subtropical fruit production

Figure 4.8 illustrates the production of individual South African subtropical fruit on the basis of the datasets of Quantec (2017) and the FAO (2017) for the period from 1961 to 2016. The dataset obtained from the DAFF (2016) includes only avocados, banana, kiwi fruit, mangos, litchis, papayas, pineapples and macadamia nuts due to limitations on data availability. Since 1961, subtropical fruit production in South Africa has increased; however, some periods are marked by variations, such as in the mid-1990s, when South Africa's fruit industry faced international sanctions (Vink, 2008).

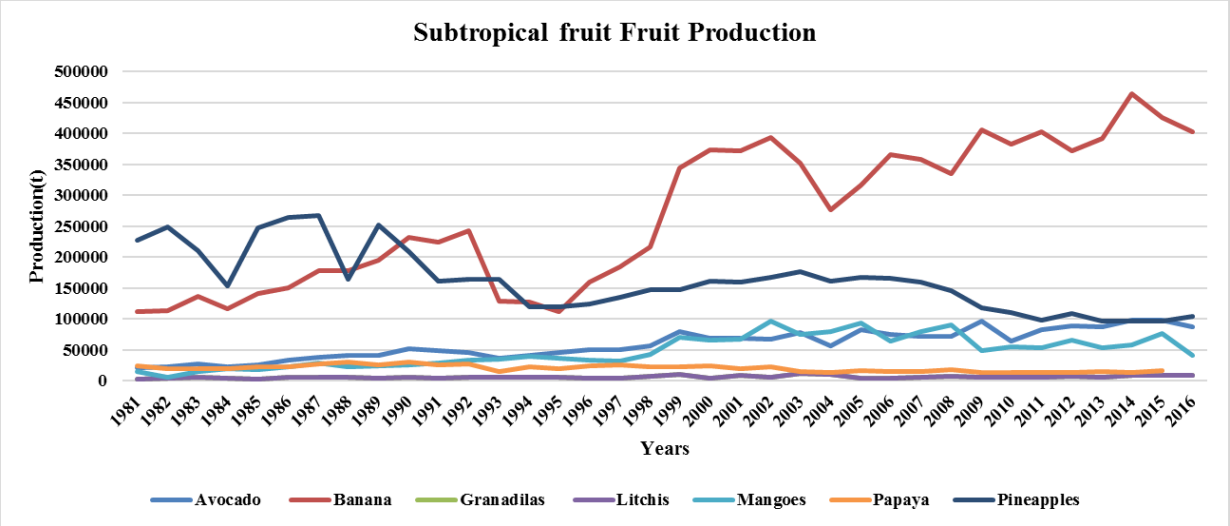


Figure 4.8: South African subtropical fruit production: 1981-2016
Source: FAO (2017), Quantec (2017)

Figure 4.8 shows that banana production increased significantly – by 463 344 tons – relative to other South African subtropical fruits over the studied period. Mango and avocado fruit production followed the same trend of increase, while pineapple production declined sharply, from 247 623 tons in the 1980s to 104 379 tons in 2016. This could be attributed to changing climatic conditions, low investment, poor farming techniques and a decline in area under production of pineapple in South Africa. On the other hand, papaya and litchi production has been constant, with no significant changes over the studied years.

Table 4.3: Recent production seasons of subtropical fruit: 2011/2012 to 2015/2016

Fruit type	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
			'000 tons			
Avocados	88.1	87.0	97.7	98.2	82.8	77.9
Bananas	371.3	392.3	463.4	462.4	401.4	287.9
Pineapples	108.7	96.8	96.7	95.8	98.9	88.7
Mangos	65.1	52.6	57.6	75.7	41.0	60.5
Papayas	12.7	14.9	13.7	15.9	11.1	15.2

Granadillas	**0.5**	**0.8**	**0.7**	**0.7**	**0.7**	**0.8**
Litchis	**7.8**	**5.6**	**8.3**	**8.3**	**7.5**	**10.4**
Guavas	**23.7**	**33.6**	**31.6**	**31.9**	**30.2**	**28.1**
Total	**677.9**	**683.6**	**769.7**	**788.9**	**673.6**	**569.5**

Source: DAFF (2017)

Table **4.3** presents recent SA subtropical fruit production – from the 2011/2012 to the 2016/2017 season. As can be seen, the production of subtropical fruit in the 2011/2012 season was at 677 400 tons, and this decreased by 10.3%, from 788 836 tons in 2013/2014 to 673 537 tons in the 2015/2016 season (DAFF, 2017b; Subtrop, 2017a). Pineapple production, on the other hand, rose by 3.2% in the 2015/2016 production season, while granadilla and litchi production remained constant. Mango production decreased by the largest share, of 45.8%, followed by papaya at 30.2%, avocados at 15.7%, litchis at 9.6%, bananas at 5.4%, and guavas at 5.3% in the 2015/2016 production season. This can be attributed to the drought experienced by South Africa in the 2015/2016 production season (Absa, 2017). In the 2016/2017 production season, mango production showed a significant increase of 47.6%, while litchis rose by 23.8%, papayas by 8.6% and guava by 5.6%. Thus, this increase can be attributed to a combination of factors, such as good-quality inputs, innovation, good technology, reliability and good relationships between active stakeholders. South African subtropical competitors are fast at improving in these areas, so the industry had to work hard to remain in the international market. Competing on the global stage requires the local subtropical fruit industry to improve its production, which contributes significantly to its trade performance – a requirement of the RTA method, as explained in section 3.2.2.

4.4.2. Production and market prices of individual subtropical fruit in South Africa

4.4.2.1 Avocado

The subtropical fruit industry is export oriented; there are several reasons for this, chief amongst them the returns per ton received from sales on the international market. Avocado is regarded as an elite fruit group because of its bountiful health benefits (high levels of vitamins, minerals, antioxidants and other recommended photochemicals) (Agri Handbook, 2016). Avocado production in South Africa is concentrated in the warm sub-tropical regions, namely the Limpopo and Mpumalanga provinces and some parts of KwaZulu-Natal (SAAGA, 2017; Agri Handbook, 2016; DAFF, 2016). Due to the climatic variability between the avocado-growing regions, most of the major cultivars are available only in a specific period (see **Table 4.1**). The area under avocado production in South Africa has expanded steadily in the past 30 years, from ± 2 000 ha in 1970 to ± 16 000 ha in 2016 (DAFF, 2016; SAAGA, 2016). Two major cultivars are grown in South Africa: *Fuerte* and *Hass* (DAFF, 2016; SAAGA, 2016). In the eight latest years, new plantings of Hass have accounted for 70% of production.

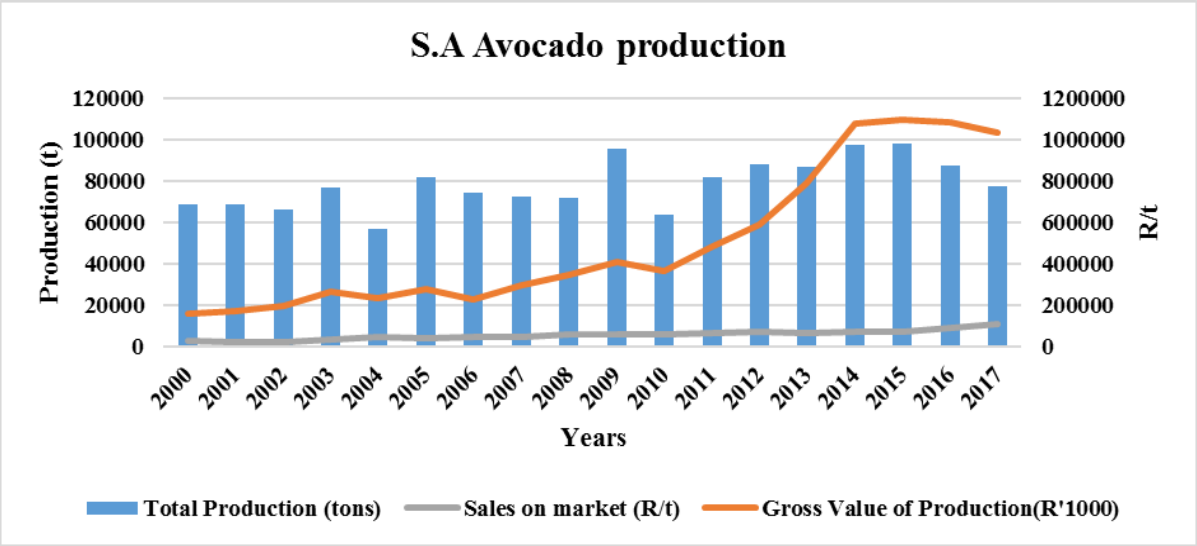


Figure 4.9*:* South Africa's avocado production, sales in markets (tons) and gross value of production (R'1 000) of avocado.

Sources: Author's own calculations from DAFF (2017) and FAO (2017)

South Africa produces approximately 90 000 tons of avocado annually (Agri Handbook, 2016). In 2013/201 production season, South Africa produced approximately 97 675 tons of avocado (FAO, 2017; DAFF, 2017). The total production of the South African avocado industry showed gradual growth from 2000 to 2014 (FAO, 2017). **Figure 4.9** shows that the gross value of avocado production recorded the highest value of R1.9 million in 2014/2015, marketing season compared to other studied years. South Africa is ranked the fifth producer of avocado in the Southern Hemisphere (SH), after Peru, Chile, Brazil and Venezuela (DAFF, 2016a). The local avocado industry need to improve its global production position relative to the competitors in the SH. In 2016/2017 production season, the price per ton of avocado in the local market averaged at R10 578.00. This was 1.16 times more than the 2015/2016 figures. The market price per ton exported in the 2016/2017 season was 17 050.06, this was the highest export market price since 2000/2001 marketing season.

4.4.2.2 Banana

The banana fruit industry of South Africa is export oriented, with a large amount of production meant for the local market (DAFF, 2016b). However, this does not suggest that the economic contribution of SA's banana industry in terms of trade revenues is insignificant and should not be included in the competitiveness analysis of the subtropical fruit industry. This, however, challenges banana producers to expand their plantation and as well their export share to compete on the global stage. Banana production is concentrated in Mpumalanga (Onderberg and Kiepersol), Limpopo (Levuba and Letaba) and KwaZulu-Natal (North and South coasts).

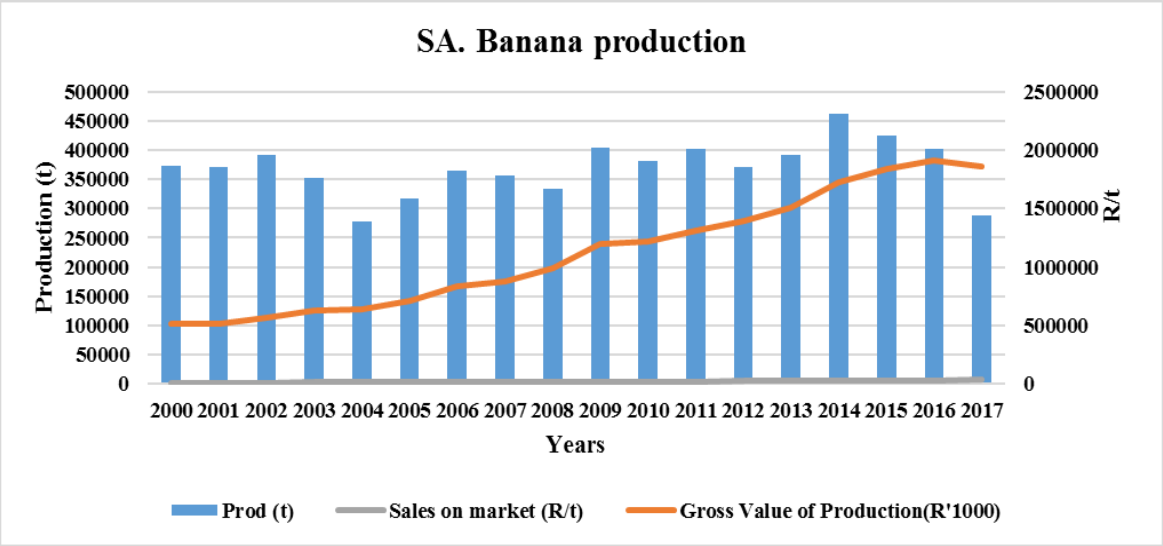


Figure 4.10: Banana production (tons), sales in markets (tons) and gross value of production (R'1 000).

Source: Author's own calculations from DAFF (2017) and FAOSTAT (2017)

The total area under banana plantation in 2011 was estimated at 11 360 ha, with the Onderberg area in Mpumalanga recording the largest (36%) area under production. The Kiepersol region was the second largest banana-producing region in South Africa. Banana fruit production over the past 17 years has shown slight growth, with a highest total production of 45 6803 tons produced in the 2014 season (FAO, 2017). This shows a significant improvement compared to the previous production seasons (2004, 2008 and 2013). The gross value of the production of bananas in South Africa increased significantly – from R510 849 in 2000/2001 to R1.87 million in 2016/2017 production season. This could be associated with the increase in banana production due to improved cultivars and the adoption of effective production practices. The slight growth observed in banana production in South Africa is directly associated with the suitable area under production. Generally, banana production is largely dependent on rainfall availability. The average price per ton of banana sold in the local market was R7 445 in the 2016/2017, which was 1.36 times more than the 2015/2016 figures.

4.4.2.3 Kiwi

Kiwi is defined as an edible fruit berry of a woody vine of the genus Actinidia (NAMC, 2014). The South African kiwi industry is relatively small, with an estimated 200 ha of green-fleshed varieties under production. The South African kiwi industry has not kept up with the global pace in production practices. South African kiwi production per hectare is relatively low when compared to New Zealand and Australia, estimated at between 10 and 12 tons/ha (NAMC, 2016). In South Africa, the kiwi crop is produced in three major provinces, namely Limpopo, KwaZulu-Natal and the Eastern Cape (DAFF, 2016). South Africa's kiwi growers produce the yellow kiwi cultivar, and their growing season runs from January/February to mid-March/April. The most commonly grown cultivar of kiwi fruit in South

Africa is oval. Globally, China and New Zealand are the leading producers of kiwi fruit – New Zealand with about 2 700 kiwi farmers.

4.4.2.4 Mango production

The mango cultivars grown in South Africa are Tommy Atkins, Sensation, Kent, Heidi, Keitt and Zill (SAMGA, 2017). Mango production remains highly concentrated in the North-Eastern regions of South Africa (Agri handbook, 2016; DAFF, 2016c). The major mango-producing regions in South Africa are the Mpumalanga, Limpopo and KwaZulu-Natal provinces, with Mpumalanga remaining the largest producer of mangos.

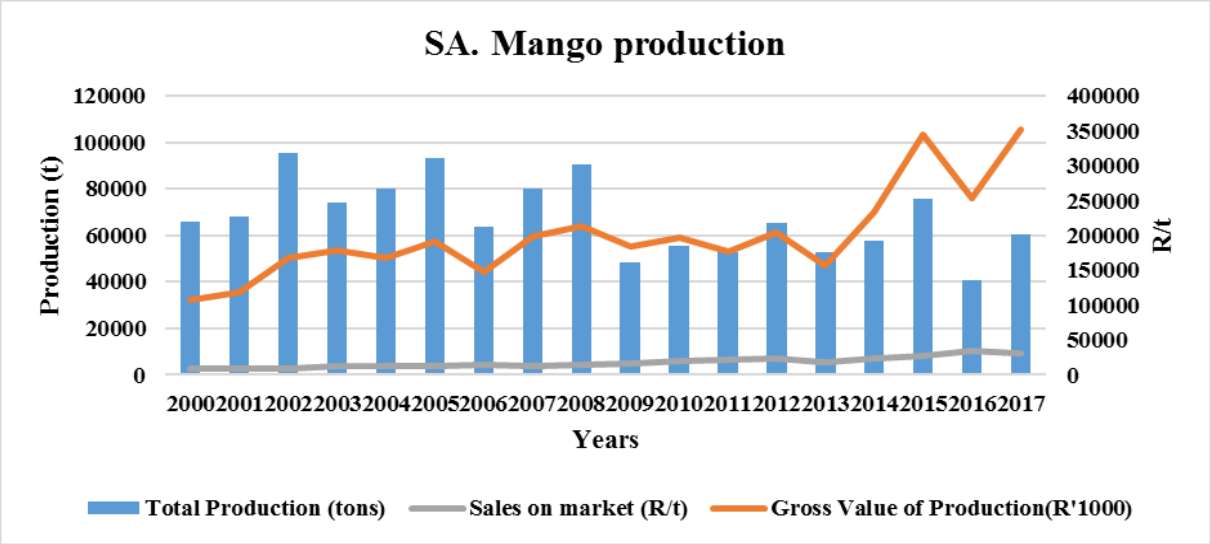


Figure 4.11: Total production (tons), sales in market (tons) and yield of mangos

Sources: Author's own calculations from DAFF (2017) and FAOSTAT (2017)

In the past ten years, mango production has been unstable and relatively declining, as shown in **Figure 4.11.** In the 2015/2016 production season, a total volume of 61 895 tons of mangos was produced. This showed an increase of 7.4% (57 582 tons) on the previous production season. From **Figure 4.11** above, it can be seen that the 2007/2008 production season in South Africa had the highest volume of mangoes produced. However, between the 2005/2006 and 2013/2014 production seasons, a 41% drop in quantity was experienced. This decline can be attributed to no increase in area under mango production, which had an impact on the export share. The gross value of mango production increased gradually over the studied period, with a significant increase of R157 090 from the 2012/2013 production season to R352 760 in the 2016/2017 production season. The average price of mango sold in the local market per ton was R9 009 in the 2016/2017 season, which was 0.89 times less than the 2015/2016 figures. The lowest average price of R3 779 per ton sold in the local market was recorded in the 2003/2004 season.

4.4.2.5 Papaya

The South African pawpaw (papaya_ industry is export-oriented. Pawpaw is estimated to be produced in 60 countries across the world, and large quantities are concentrated in developing countries (NAMC, 2013). Asia is the leading producer of pawpaw, followed by South America, Africa, Central America, North America and Oceania.

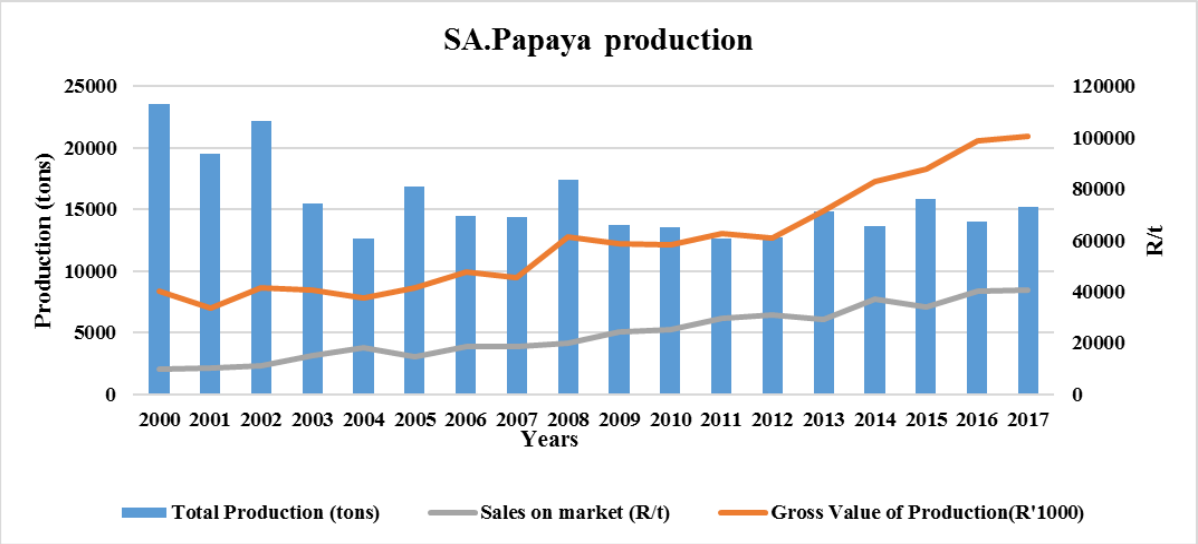


Figure 4.12: Total papaya production (tons), sales in markets (tons) and gross value of production (R'1 000)
Source: Author's own calculation from FAOSTAT (2014) and Quantec (2017)

Pawpaw is a minor subtropical crop in South Africa (Connolly, 2010). However, its trade data is considered when analysing the competitiveness of the South African subtropical fruit industry. South African pawpaw production declined – from 23 550 tons in 2001/2002 to 15 212 in the 2016/2017 production season (Quantec, 2017). Although the South African pawpaw industry remains remarkably small in terms of production, the industry showed slight growth of 2% in quantity exported from 2015 to 2016 (ITC, 2017). From **Figure 4.12** it can be seen that the gross value of pawpaw production has experienced a positive increase over the entire reviewed period, reaching a peak of R100 531 in the 2016/2017 marketing year. The domestic market price for papaya per ton in the 2000/2001 marketing season was R2 148 and increased to R8 470 in the 2016/2017 marketing season. The 2016/2017 papaya average price per ton in the local market was 3.94 times than the 2000/2001 figures.

4.4.2.6 Pineapple production

The pineapple industry of South Africa is export and market oriented (DAFF, 2017). About 80% of the pineapples produced are absorbed by the processing industry annually. Pineapple production in South Africa is concentrated in two regions: Eastern Cape and Northern KwaZulu-Natal (Hluhluwe district) (DAFF, 2017). Two commercial pineapple cultivars are planted in South Africa – the smooth-leaf Cayenne, produced in the Eastern Cape, and the Queen variety (DAFF, 2016d).

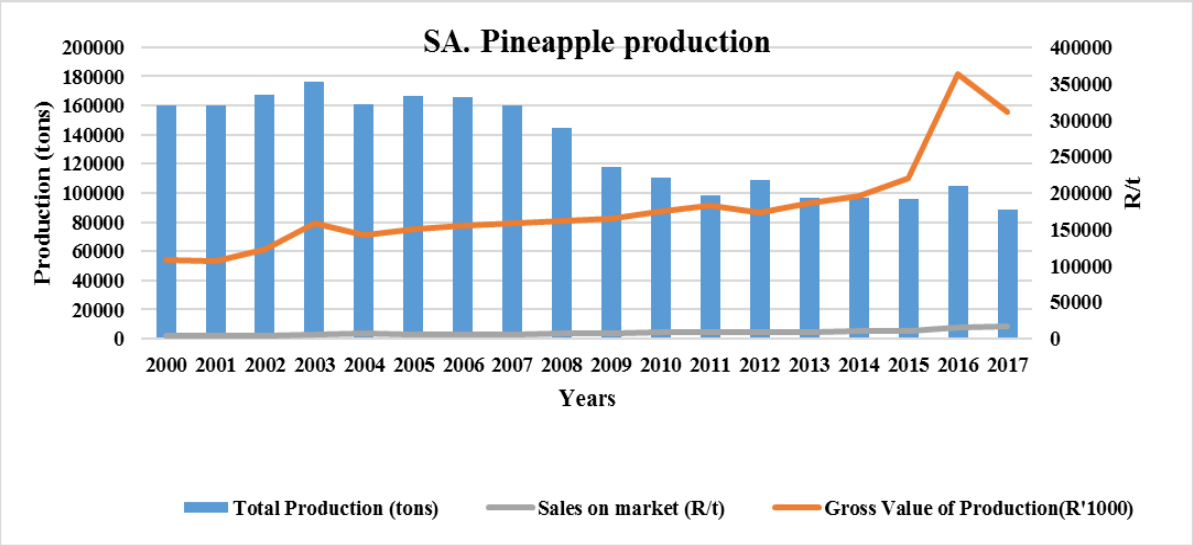


Figure 4.13: Total pineapple production (tons), sales in markets (tons) and gross value of production (R'1 000)
Source: Author's own calculation from DAFF (2017) (statistics and economic analysis) and FAO (2017) (yield)

Figure 4.13 shows that the gross value of production by the South African pineapple industry was approximately R219 million in the 2014/2015 season. The 2016 production season represented a 12.3% increase in gross value of production when compared to the previous seasons. Generally, the total pineapple production in tonnage declined from 166 463 in the 2004/2005 season to 88 763 in the 2016/2017 season, when the industry picked up. The possible reasons for this decline could be attributed to contaminated zinc sulphate, increased fertiliser demand, exchange rate fluctuations, and improved market prices leading to low production volumes, amongst other things. In the 2014/2015 production season, a total of 95 799 tons of pineapples were produced in South Africa. About 20 396 tons of pineapple were sold in the local market at an average price of R64 115 per tonnage in 2016/2017 season.

4.4.2.7 Macadamia nuts

Amongst the subtropical fruit products in South Africa, macadamias are the fastest growing tree crop (DAFF, 2016e; SAMAC, 2017). There are two macadamia cultivars or species that are commercially produced in South Africa, namely *M. integrifolia* and *M. tetraphylla* (DAFF, 2017). The major macadamia production regions in South Africa are coastal KwaZulu-Natal, Mpumalanga and Limpopo (DAFF, 2016e; SAMAC, 2017). A total of 700 farmers are estimated to grow macadamia nuts in South Africa (Absa 2018). The growth in macadamia production is attributed to the exponential increase in new plantings of macadamia trees yearly (SAMAC, 2017). The number of macadamia nut trees under plantation has increased from one million in 1996 to eight million in 2016, on a total area of 28 000 ha (SAMAC, 2017). In 2016, the macadamia industry of South Africa planted approximately 3 870 ha and producing 46 000 tons (SAMAC, 2017). In the past 20 years, the macadamia production of South Africa has increased more than 20-fold (SAMAC, 2017). A low macadamia nut production output of 18 718

tons was recorded in 2007. In 2008, South African macadamia nuts eased higher, by 13.4%. South Africa produced 23 507 tons of *dry in shell* (DIS) macadamia nuts in 2009, and this was a 13.9% increase compared to the previous season. The production growth is a factor of tree age, climate, and production practices, amongst other factors. The total South African macadamia crop (i.e. Karnel and NIS) production declined significantly, from 46 000 tons in 2015 to 37 910 tons in 2016 (SAMAC, 2017). This decline is associated with the severe drought cycle in 2015/2016 (DAFF, 2017). The gross value of macadamia nuts declined by 20% compared to the gross value of production in 2009. In 2013, the gross value surged by 62% compared to the gross value in 2012, and this can be ascribed to the high producer price that prevailed in the same year. Additionally, the market prices for macadamia are determined by market forces of demand and supply. The weighted average export price for macadamia kernels in 2017 was R224.15 per kilogram and R75.58 per kilogram for macadamia in shell (SAMAC,2017).

From a social/ethical point of view, the subtropical fruit industry employs, trade its produce internationally and most of the economic activities kick-start at the primary production at farm level of subtropical fruit industry, but also right up the value chain and down the supply chains. Hence, it is important to provide an overview of subtropical fruit industry production and situate this in the context of analysing competitiveness, as the objective of this study.

4.5. Market structure of subtropical fruit in South Africa

The focus of this section is on the subtropical fruit export segment, which grew significantly post-deregulation in 1997, as this segment fundamentally affects the competitiveness in the milieu of the key measurement applied – the RTA index – to assess the competitiveness of this related area and industry of interest. The market structure of subtropical fruits emphasises the importance and contribution of exports to this industry in relation to the possible shifts in international trade. This entails a review of production distribution, export market (international) and the contribution of the industry to the country's economy.

Figure 4.14 bellow presents the distribution of the selected subtropical fruit types, including avocado, banana, mango, litchi, papaya and pineapple. It is worth noting that most of South Africa's subtropical fruit go to the local market (fresh perishable produce market, informal markets, etc.) and to the processing industry (Quantec, 2017).

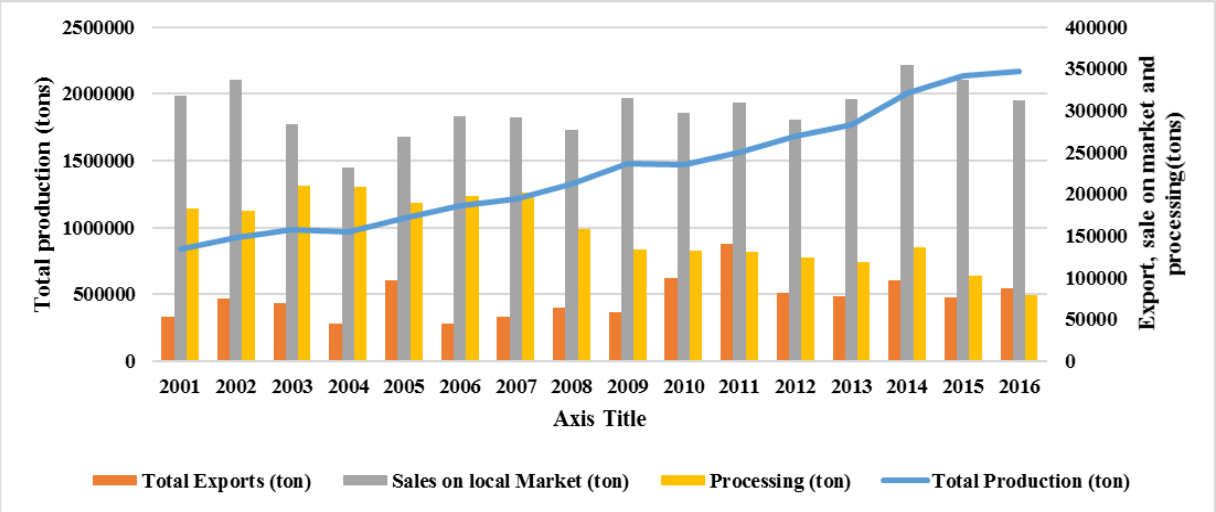


Figure 4.14: Distribution of the subtropical fruit industry from 2001 to 2016

Source: Author's own calculation based on DAFF (2017), ITC (2017) and Quantec (2017)

The industry is export-oriented and some of its fruit do not feature the most on the global stage. This, amongst other reasons, could be attributed to low production and the scale of operation of the other fruit types such as kiwi fruit. It might also be the reason why the competitiveness of the subtropical fruit industry of South Africa has never been studied before. The current trade performance of the industry has been declining challenges the producers to improve their production practices and production to trade successfully globally and to compete with major producers of subtropical fruits on the global stage. An overview of the export performance of the South African subtropical fruit industry would also allow a detailed competitive advantage analysis of each individual fruit type and comparison thereof. The 2013/2014 production season in South Africa recorded an increase in both the intake for processing and local sales of subtropical fruit.

Table 4.4: Distribution of selected South African subtropical fruit (2016/2017 season)

Fruit type	Total production (ton)	Local market (ton)	Exports (ton)	Processed (ton)
Avocado	87 584	27 431	49 850	4 127
Banana	402 053	240 444	8 123	648
Kiwi fruit	Not available	Not available	584	Not available
Litchi	8 411	1 473	4155	1 026
Mango	41 030	13 306	2 132	22 248
Macadamia nuts	38 500	Not available	14 811	Not available
Papaya	11 375	7 545	1 353	1 043
Pineapple	104 379	21 328	1 605	78 844

Source: DAFF (2017) & NAMC (2017).

Table **4.4** shows the distribution of subtropical fruit in the recent (2016/2017) marketing year. From the table above it is evident that macadamia nuts and avocados were the largest exports of South African

subtropical fruit, accounting for 49 850 and 14 811 tons respectively. About more than 95% of South African macadamia produce is exported, and the industry received an export value of R3.2 billion in 2017 (SAMAC, 2017). On the other hand, 45% of South Africa's avocados were exported in 2017 (SAAGA, 2017). This concurs with the fact that avocados and macadamia nuts are major exports of the subtropical fruit industry of South Africa (Absa, 2017). The South African subtropical fruit industry need to sustain the production growth and trade performance of these two "winner" fruit types, as they make up an important export market share in the European market and other markets (Absa, 2017). For the other fruit types, the industry needs improved practices to expand the scope of production to enhance the country's export trade performance, which is crucial for measuring the competitiveness of the industry using the RTA index.

4.5.1. Exports of South African subtropical fruit from 1961 to the 2013 season

This section outlines the export environment of subtropical fruit. A short synopsis of trade profile trends over the reviewed period is provided, both by source of imports and destination of subtropical exports. South Africa is situated at the southern tip of Africa and is a member of the Southern African Customs Union (SACU). According to Lewis (2001), South African trade historically was driven by three predominant interrelated strategies, namely import-substituting industrialisation, the development of strategic industries, and the development of minerals-related exports. The accession to the WTO increased the pace of trade policy reforms in South Africa, where key aspects of liberalising and tariff-reduction measures were at the centre of negotiations.

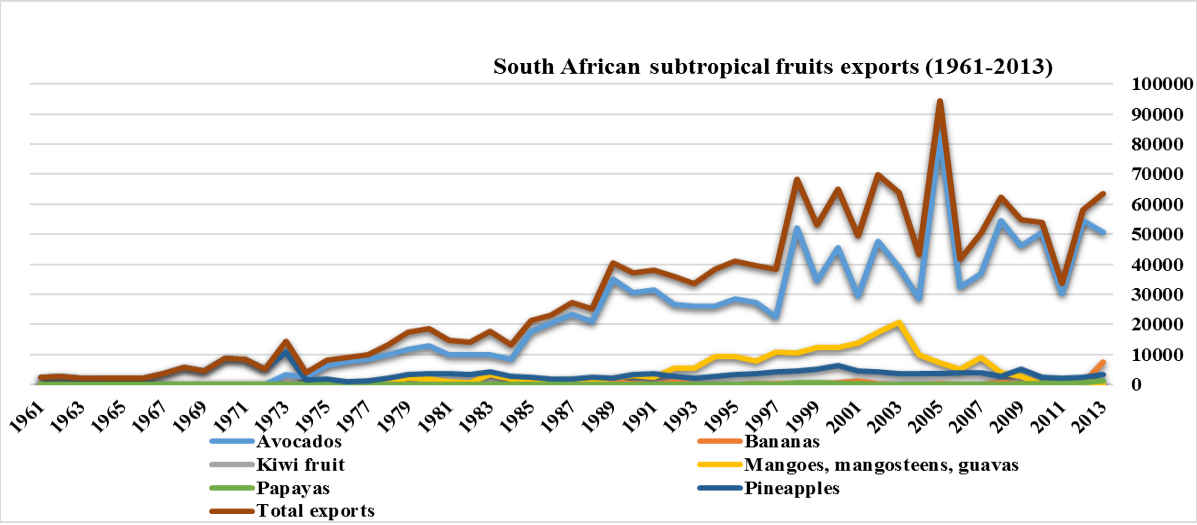
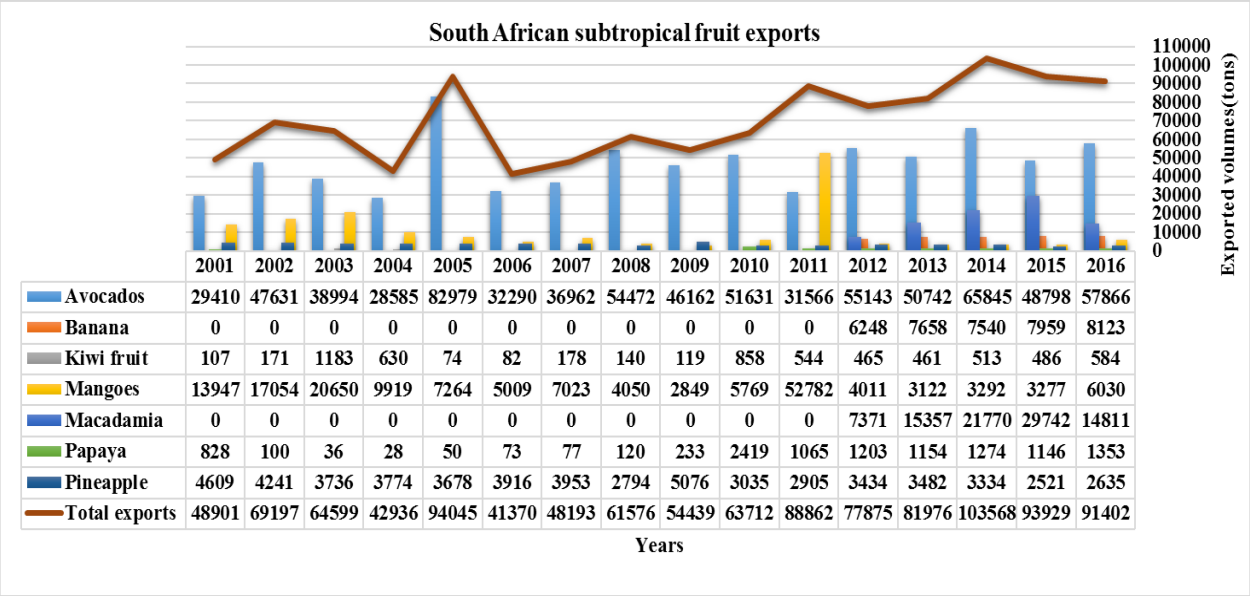


Figure 4.15: Export volumes of subtropical fruits (1961 to 2013*)*
Source: Author's own calculations from FAO (2017)



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Avocados	29410	47631	38994	28585	82979	32290	36962	54472	46162	51631	31566	55143	50742	65845	48798	57866
Banana	0	0	0	0	0	0	0	0	0	0	0	6248	7658	7540	7959	8123
Kiwi fruit	107	171	1183	630	74	82	178	140	119	858	544	465	461	513	486	584
Mangoes	13947	17054	20650	9919	7264	5009	7023	4050	2849	5769	52782	4011	3122	3292	3277	6030
Macadamia	0	0	0	0	0	0	0	0	0	0	0	7371	15357	21770	29742	14811
Papaya	828	100	36	28	50	73	77	120	233	2419	1065	1203	1154	1274	1146	1353
Pineapple	4609	4241	3736	3774	3678	3916	3953	2794	5076	3035	2905	3434	3482	3334	2521	2635
Total exports	48901	69197	64599	42936	94045	41370	48193	61576	54439	63712	88862	77875	81976	103568	93929	91402

Figure 4.16: Subtropical fruit export volumes (2001 to 2016)

Source: Author's own calculations from ITC (2017)

Figures 4.15 and **4.16** above show an increasing trend in subtropical fruit exports from South Africa for the period 1961 to 2016(FAO, 2017). South Africa is a relatively small grower of subtropical fruits in terms of global trajectories, except for avocado and macadamia nuts, which have shown rapid production growth over the past number of years. Amongst the selected subtropical fruit exports, avocados recorded the largest export volume, of 57 866 tons, in the 2016 production season (ITC, 2017), surpassing all other fruit types. A decline in mango exports was recorded – from 13 947 tons in 2001 to 6 030 tons in 2016. On the other hand, banana fruit have recently shown a marginal increase, from 6 248 tons in 2012 to 8 123 tons in 2016. The value for South African avocado exported in 2017 was at $64 million (ITC, 2018).The annual growth for avocado exported by South Africa between 2013 and 2017 was 9 % (ITC, 2018). The macadamia nut industry's growth is driven by growing markets in Hong Kong, China and Vietnam (Absa, 2017). The South African macadamia nut exports in 2017 was valued at $316 million. The annual export growth rate in value for South African macadamia nuts between 2016 and 2017 was 65 % (ITC, 2017).

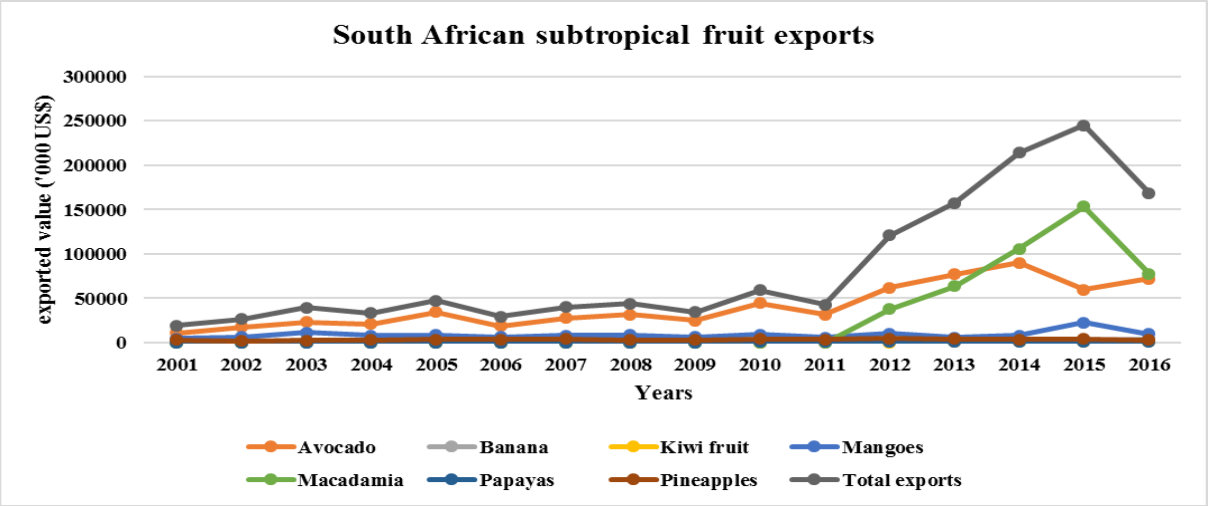


Figure 4.17: Value of subtropical fruit exports (2001 to 2016)

Source: Own calculations from ITC (2017)

Figure 4.17 shows the value of South Africa's subtropical fruit exports from 2001 to 2016.In nominal value terms, South Africa's combined exports for avocados, mangos, macadamia nuts and litchis grew up by 16 fold, from $ 54 million in 2005 to $ 324 million in 2015. The volume distribution of each subtropical fruit to marketable segments (local market, export market and intake for processing) in different production seasons is associated with net realisation in monetary value per ton. The figure above shows that the value of subtropical fruit exports has been increasing from the 2011 season to 2016. South Africa is a net exporter of macadamia nut crops, with the biggest markets in Hong Kong, China and Vietnam. Avocado exports have been significant in value; this can be attributed to the increase in production and the quality of the fruit, which meets international market standards.

Due to limited and unavailable data showing the export quantities of processed subtropical fruit products over a period of 18 years, this study did not conduct a detailed value chain analysis of competitiveness for all the subtropical fruits. In this study, only the pineapple industry has data of the processed fruit, unlike the other fruit types like mangos, macadamia nuts, avocado, etc. According to Angala (2015) in order to provide a thorough analysis of any industry, it is crucial to have a better understanding of its value chain, hence the provision of the following section in this chapter.

4.6.The South African subtropical fruit value chains

To have a better understanding of the function of the subtropical fruit industry, it is essential to consider and describe the value chains of this industry (Dlikilili, 2018). Jafta (2014) and Esterhuizen (2006) describes a value chain as the institutional arrangements that link all the stakeholders (i.e. producers, processors, marketers and distributors) in the supply chain that add value to the products as they move along the chain. Global value chains allow farmers, workers and consumers to integrate with and participate in the global economy. The prominent objective of value chain analysis is to enhance the

operation efficiency, profitability and competitive position of a firm and its supply chain partner (Min & Zhou, 2002; Angala, 2015).

The competitive performance of industries cannot only be explained and understood by assessing the industry, as the competitive performance of the industry stems from many value-adding chain activities(Min and Zhou, 2002), such as production, picking, producing juice, drying and cracking, and marketing, delivering and supporting the product until it reaches the end user. Each of the aforementioned activities contributes to a firm's relative total costs, and certainly creates a base for differentiation. **Figure 4.18** is an example of the subtropical fruit value chain, in this case the value chain of the pineapple juice industry. The value chain activities of the pineapple juice industry include activities such as research, breeding, production, marketing, storing, distribution and the effective support to the final consumer.

An industry can gain a competitive advantage by effectively performing value-adding chain activities more cheaply or better relative to others. Value-adding chain activities affect the competitive performance of industries (Ortmann, 2001). Value chain analysis is important in South African agriculture (Esterhuizen & Van Rooyen, 1999). Certain activities in the value chain can be competitive, while others are less so, or non-tradeable. Generally, agricultural value chains in South Africa are marginally competitive (Esterhuizen, 2006; Esterhuizen et al., 2011; Sinngu, 2014; AgBiz, 2015; Van der Merwe et al., 2017).

The competitive performance of South African agricultural value chains is declining, and this is caused by several factors (Jafta, 2014; Sinngu, 2014; and Dlikilili, 2018). Therefore, recent studies indicate the need to differentiate between industries, with the grain value chain generally highly competitive, while some livestock value chains are uncompetitive. The deciduous fruit and citrus value chains are generally competitive (Van Rooyen and Boonzaaier, 2017; Boonzaaier and van Rooyen, 2017). This underscores the need for a more comprehensive statement on the competitiveness of industry-specific value chains. Value chains are a complex linkage of various production and operational activities of stakeholders in the subtropical fruit industry. Value chain coordination is needed in agriculture to improve competence when introducing new products. In essence, value chain activities are discrete building elements of the competitive advantage of an industry or firm. Value adding highlights the linkages that exist between a firm and its prominent suppliers that may reduce costs or enhance differentiation (Porter, 1990).

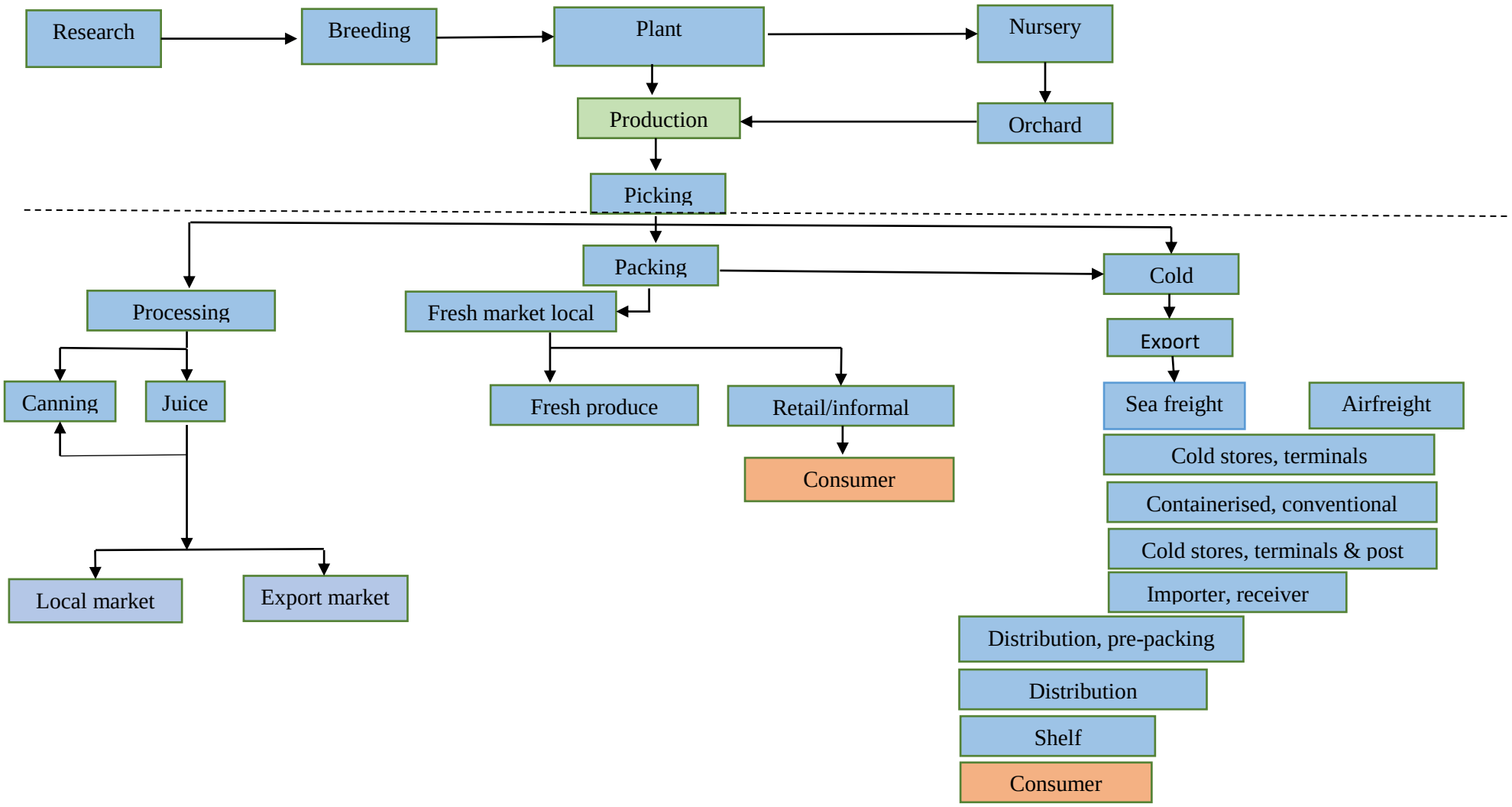


Figure 4.18: The subtropical fruit value chain: pineapple industry

The South African subtropical fruit industry's contribution to the economy

The role of the agricultural sector in the South African economy has been topical in several studies since the mid-1950s. The methods used to measure the sector's role include the following five themes: the role of the sector in providing food, in earning foreign exchange, in employment creation, as a source of capital, and as a buyer of goods or provider of inputs to manufacturing (i.e. market linkages). Similarly, the role of the subtropical fruit industry goes beyond the surface of economic analysis in its contribution to the economy. Although land reform programmes are expected to drive the expansion of South African subtropical fruit production, the area under subtropical fruit production has declined from 18 000 to 12 000 hectares in the past decade (NDP, 2011).

The subtropical fruit industry of South Africa collects foreign revenue through trading its produce globally. The total subtropical fruit export value in the 2015/2016 marketing season – avocadoes, bananas, kiwi fruit, mangos, macadamia nuts, papayas, pineapples and litchis collectively – amounted to US$ 168.4 million. This is driven by the fact that the agricultural industry of the country has to maintain a positive trade balance for both primary and processed agricultural products (NDP, 2011).

Amongst the outlined objectives of SA's National Development Plan for an inclusive rural economy, agriculture, agro-processing and related sectors have to create 326 000 indirect jobs, as unemployment has to fall from 24.9% in 2012 to 6% (13 million jobs) by 2030 (NDP, 2011). The South African subtropical fruit industry has released a labour force for the rest of the economy and has a potential to create a significant number of jobs in the underused area. The subtropical fruit industry has a labour multiplier of two labourers per hectare, with the upstream and downstream linkages at around 1.3 jobs per hectare, hence approximately 30 000 jobs can be created by the industry over the 10 years from 2014 (NDP, 2011).

Full-time and seasonal labour is employed in the subtropical fruit industry of South Africa to do several specialist tasks – harvesting, supervision and operational duties in the pack house, irrigation management, and tractor forklift driving. Job opportunities in the subtropical fruit industry are not only created in primary production, but right along the value chains and industry linkages (backward and forward linkages). The macadamia nut industry in South Africa has created 3 500 new jobs in the past decade, while it is estimated that the avocado, mango and pineapple industries created 23 000, 3 000 and 1 400 permanent jobs respectively in the peak period of the 2014/2015 season. This has provided a rise in employment opportunities and several business ventures, consequently adding stability to local economies. The subtropical fruit industry has the potential, given the required policies, to create employment, promote export competitiveness and create a conducive business environment.

4.7. Conclusions

The structure of the subtropical fruit industry must be viewed as an important aspect that determines its ability to face ever-increasing competition (one of the Porter Diamond determinants). Therefore, considering the competitiveness of the South African subtropical fruit industry, it is important to understand the evolution of the industry, the context in which the industry operates and the direction it is expected to take. This chapter has focused on providing a descriptive overview of the subtropical fruit industry by looking at its historical background, production trends and information on the distribution of the produce. The local subtropical fruit industry exports a fraction of its produce, as the larger amount of its production is absorbed by local market sales and processing industries (i.e. avocado for oil, pineapple for pineapple juice). When the South African fruit industry was deregulated in the mid-1990s, this allowed the development of the separate industries (including subtropical fruit), and an increase in production. Farmers had the freedom to integrate into the international market, which required producers to be productive and competitive; hence product quality, agro-processing and trade have become the top priorities in the country's fruit industry. In general, the export of subtropical fruits increased after the industry was exposed to international markets, with avocado and macadamia nuts taking the lead in exports. This suggests that subtropical fruit need to extend and maintain production over the years. South African macadamia nuts rank high in the world in terms of export value, with the biggest markets in Northern Hemisphere countries. Continued investment in new varieties, research and infrastructure will have a significant impact on the subtropical fruit industry, and hence on the economy of the country due to the industry's employment, food security effect and foreign exchange earnings.

Chapter 5: ANALYSIS, FINDINGS AND RESULTS

5.1.Introduction

This chapter discusses the research findings and draws conclusions on the competitive status, trends and real-world factors affecting the competitiveness of the subtropical fruit industry in South Africa as the clustering of the main factors within determinants of the Porter Diamond model.

5.2.Measuring competitiveness status and performance (Step 2)

In this study, the relative trade advantage (RTA) method of Vollrath (1991), trade datasets from FAOSTAT (2017) and Trade Map data (ITC) from 2001 to 2016 (all discussed in Chapter 3) were used to quantitatively measure and trace the trends in the competitive performance of the subtropical fruit industry of South Africa over time and to compare such performance with that of its major international competitors. The purpose of this section was to answer the questions, "how competitive is the subtropical fruit industry over time?" and "which factors impacted on this performance?" with reference to the problem statement. Generally, both datasets record the trade performance (see section 4.5, Chapter 4) of subtropical fresh or dried produce. The exception in this study is pineapples, for which processed juice is considered (see **Figure 5.15**).

The FAO dataset, however, was found to be less applicable in calculating the RTA values of the subtropical fruit industry due to its exclusion of trade data for mango fruit imports and for macadamia nuts – both highly competitive products in South Africa (see **Figure 5.3**).

The ITC dataset, on the other hand, includes all subtropical fruit types (including avocado, banana, banana-plantains, kiwi fruit, mango, macadamia, papaya and pineapple) (Subtrop, 2017), with macadamia nuts and mangos specifically identified as important commodities. The ITC dataset also includes a broader economy-wide reference, giving a better indication of opportunity costs in the selected definition of competitiveness for this study than the agriculture-based FAO dataset. According to Abei (2017), Dlikilili (2018) and Boonzaaier and Van Rooyen (2017), the ITC dataset provides a more comprehensive view of global competitiveness, as non-agricultural commodities are also included when calculating the RTA values.

The ITC dataset was thus preferred as the appropriate dataset for step two of this study – measuring competitiveness. In terms of the interpretation of the RTA: any RTA value between zero and one indicates the industry's marginally competitive status, and an RTA value of less than zero indicates a competitive disadvantage – meaning it is largely dependent on imports of the particular commodity.

When using the FAO trade dataset for South Africa, the RTA for subtropical fruit remained below one from 1961 to 2013, indicating only marginal competitiveness (refer to **Figure 5.1**). The ITC data revealed some higher ratings, encompassing fluctuations and a recent drop to a non-competitive rating for 2015 and 2016. The FAO and ITC datasets also differ in their product compositions for subtropical fruit; ITC contains a more comprehensive dataset (Abei, 2017; Dlikilili, 2018; Dlikilili & Van Rooyen, 2018), with mango imports and disaggregated macadamia nuts excluded in the FAO dataset.

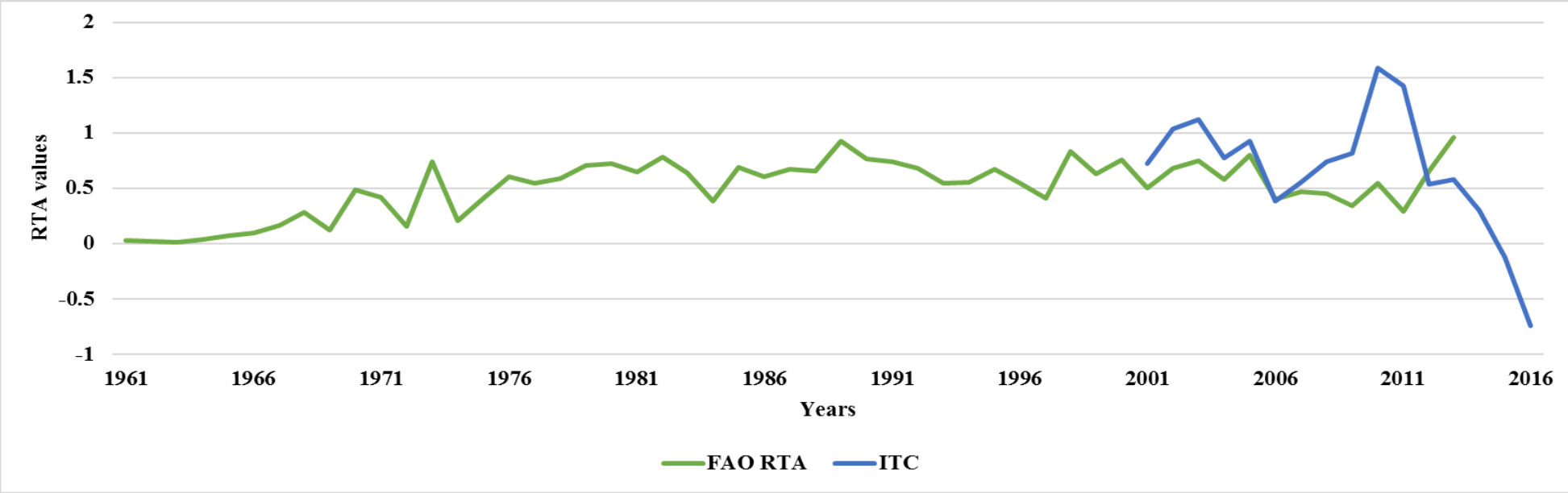


Figure 5.1: RTA values for SA subtropical fruit industry using both FAO and ITC datasets

Source: Author's own calculation based on the ITC (2017) and FAO (2017) datasets.

As for an explanation of the differences in RTA values, the FAO and ITC datasets were found to differ in their product compositions for subtropical fruit; ITC contains a more comprehensive dataset, with mango imports and macadamia nuts excluded from the FAO dataset. The ITC data also constitutes a broader economy-wide trade base, where the FAO only uses agricultural data. The ITC data thus reflect a better "opportunity cost" status in the measurements of competitiveness. The study thus considers only the more comprehensive ITC dataset for the analysis of the competitive performance of the South African subtropical fruit industry, dividing the performance trends into different phases, as shown in **Figure 5.2.**

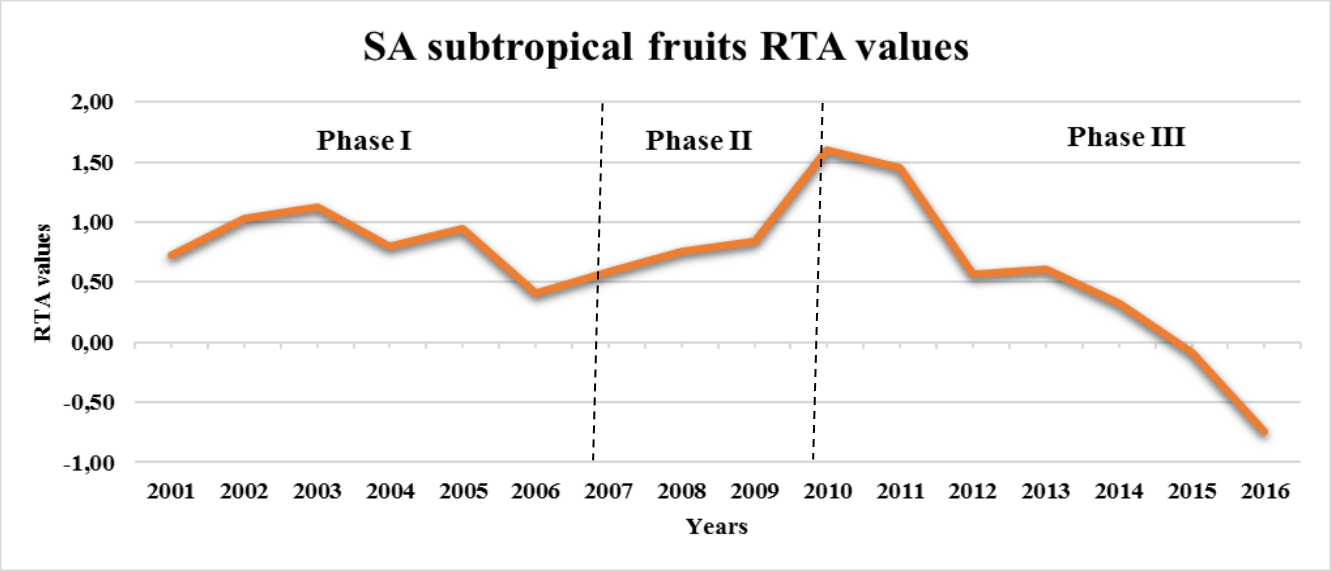


Figure 5.2: RTA values of the South African subtropical fruit industry (2001 to 2016)

Source: Author's own calculation based on ITC (2017).

The results of the ITC-based RTA values in **Figure 5.2** show a generally positive but declining trend in RTA values,[1] ranging between 1.55 in 2010 and -0.74 in 2015. Some years recorded a significant decline or rise in RTA value. The South African subtropical fruit industry averaged a marginally competitive advantage, with the magnitude varying from 2001 to 2016. The competitive performance status of the industry is explored in the next steps (i.e. Porter Competitive Diamond model and Delphi process).

The highest RTA values of 1.55 and 1.45 were recorded in 2010 and 2011 respectively. In recent years, the local industry has realised a significant decline in competitive advantage, recording negative RTA values from 2015 to 2016. Before we proceed with an assessment of the competitiveness of the local industry, it will be helpfully to place the industry in the recent economic development of South Africa, for which three different phases are considered. These phases are explained in detail below:

Phase 1: (2001 to 2007): "A tough ride in the global market" – positive but decreasing trend in competitive performance.

The RTA values in this phase showed a positive but decreasing and fluctuating competitive trend. The phase started competitively in 2001, with a positive RTA value above one – perhaps as a positive response to the deregulation of the South African fruit industry in the mid-1990s (Kruger, 2000; Vink & Sandrey, 2008) – and peaked in 2003 before a sharp decline in the following years. This was driven by persistent drought and the strengthening of the rand (Vink & Van Rooyen, 2009), indicating a "tough ride" in the international market for South African subtropical fruits. During this period, the South African fruit industry increasingly improved its know-how to do business in the international playing

[1] The higher the value, the more efficient South Africa is in the exportation of selected subtropical fruits.

field – in ways to find markets for products and understanding how markets work in terms of standard requirements and consistency (Boonzaaier, 2015).

The competitive performance of the industry achieved in this phase can also be attributed to the continuous increase in the export of subtropical fruit (including avocado and macadamia nuts in particular) as a result of the production, marketing and management of technical skills introduced by the Subtropical Fruit Farmers' Association (Subtrop) (Subtrop, 2017; SAMAC, 2017). This can also be attributed to the growing world demand for avocados and macadamia nuts that kept the price at attractive levels over the past decade. Another reason for the positive competitive advantage of the local industry can be linked to the industry's ability to utilise the seasonality advantage of entering global markets. It could also be associated with the 20% decline in Mexico's avocado production and the limited Chilean avocado production in previous years due to unfavourable weather conditions. Thus, this presented temporary opportunities for South African avocado producers to gain more ground in the European markets.

During this phase, it can be said that the rand (ZAR) gained strength that inhibited international trade in South African subtropical fruit. According to Boonzaaier (2015), the fluctuations in exchange rate can account for the decline and fluctuations in the RTA values. The industry experienced a marginal decline in competitiveness in 2003 and 2004 due to persistent summer drought in the northern parts of South Africa (Reason & Phaladi, 2005; Vink & Van Rooyen, 2009) that affected total South African agricultural production. This may have led to a reduction in export volumes of subtropical fruit compared to previous years.

Phase 2: (2007 to 2010): "Climbing the ladder of competitiveness" – positive and increasing trend.

This phase lasted from 2007 to 2010, when the industry gained momentum to fit a better export drive to a rapid growth in production, and increased its competitive advantage. It is apparent from **Figure 5.3** that the industry's competitive performance gained control in this phase. Sandrey and Vink (2008) assert that this phase was marked by increasing global trade, driven by broader based deregulation and increasing freedom to trade, with less policy and support distortions. Additionally, the positive outlook for the South African economy experienced in 2006, and the higher commodity prices in 2008, renewed investor confidence in the agricultural sector (Vink & Van Rooyen, 2009).

The industry's competitiveness continued to increase, with the RTA value reaching its highest (1.55) in the 2009/2010 production season. This phase was marked by the positive and increasingly competitive performance of the industry, i.e. gradually moving up the ladder of competitiveness. The increase experienced in 2009 can be attributed to the recovery of the South African economy after the 2008 financial crisis (Van Rooyen & Esterhuizen, 2012).

The decline in exchange rate during the economic meltdown in 2008/2009 (see **Figure 5.3**) allowed an increase in South African trade; generally, the country's fruit products could be traded at better prices. The local avocado industry has experienced an increase in prices in the past six years, and it is considered profitable (Absa, 2017). The exchange rate and continuous increase in global demand and supply affect export prices (Absa, 2018). Similar findings were recorded by Jafta (2014), Boonzaaier (2015) and Dlikilili (2018) for the other South African fruit groups that are traded internationally.

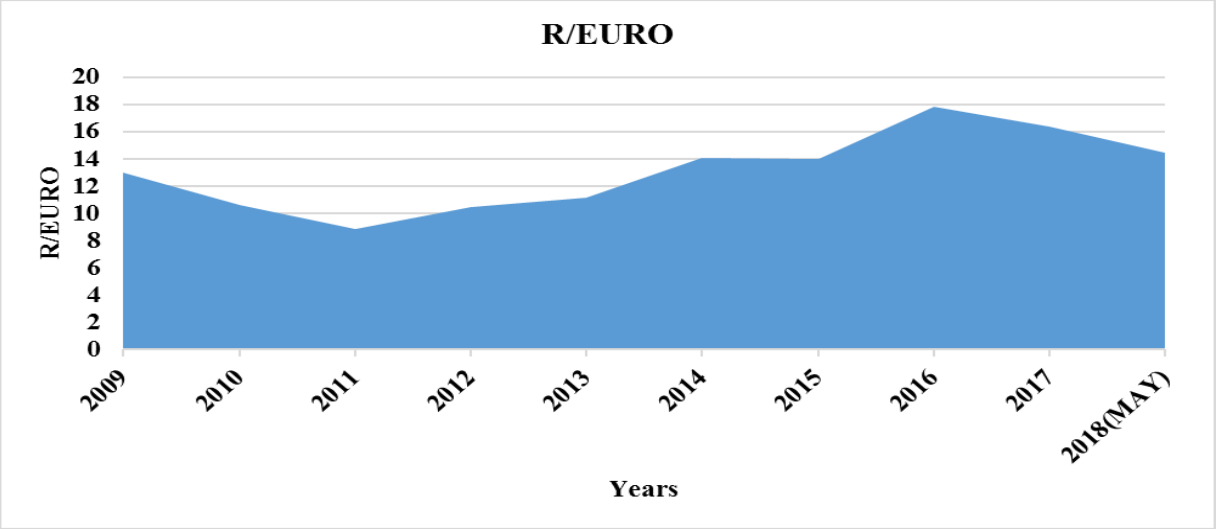


Figure 5.3: The exchange rate – rand to euro

Source: Author's own calculation based on data from SARB (2018)

The exchange rate, however, is not the only factor affecting competitive advantage (Boonzaaier, 2015). During this period, global market requirements, together with climatic conditions, led to a reduction in export volumes of subtropical fruit and other fruit varieties (Angala, 2015). The upward trend in this phase can also be related to the marginal decline in Peru's avocado export volumes, from 51 million tonnes in 2008/2009 to 48 million tons in 2009/2010 (ITC, 2017; Absa, 2018). This presented South African avocado producers and exporters a temporary opportunity to gain market share where it competes directly with Chile in terms of avocado exports. Lastly, the demand for locally produced macadamia nuts has increased by 40%, largely attributed to Chinese demand, the fastest growing market destination (Subtrop, 2017; Absa, 2017; AgriObit, 2018), and this contributed towards the increasing competitive performance of the industry. This can be linked to the Salt-Swan theorem discussed in section 2.2.4.

Phase 3: (2011 to date): "Moving towards hard times" – competitive but decreasing trend.

Phase 3 is from 2011 to the present day, showing a pronounced gradual decline in the competitive performance of the South African subtropical fruit industry and, according to the ITC RTA trends, indicative of "moving towards hard times". This period is marked by increased regulations in the international market (Dlikilili, 2018), in particular in the EU market – the largest market for South African avocado and macadamia crops. Exporters exporting to the EU are forced to meet the increasingly

stringent technical and environmental standards, as these require compliance with external certification of standards (Dlikilili, 2018). With the support of the South African Subtropical Growers' Association, the industry has managed to overcome some of these challenges (Subtrop, 2017). The RTA values of the South African subtropical fruit industry have declined significantly, from 0.32 in 2014 to -0.08 in 2015. A reason for the pronounced declining competitiveness status of the local subtropical fruit industry in 2015 and 2016 is the negative impact of the 2015/2016 drought, which resulted in a reduction in the production of subtropical fruit such as avocado and macadamia nuts, and resulting in no further growth in exports. For example, macadamia nut production declined significantly in 2016 due to a severe drought and unfavourable growing conditions, dropping from 24 743 metric tons (NIS) to 13 680 metric tons in 2016 (SAMAC, 2017).

Given the preceding discussions (on the phases), the growth prospects for the future of the industry will be achieved by producers, input suppliers and processors. etc. who can actively position themselves and improve their business activities to enhance the industry's declining global competitiveness status. This will be done through export strategies that are adopted and implemented in line with those that are being developed to project the future. Moving forward, clear industry strategies that effectively engage with the relevant personnel, aiming at maintaining existing markets and negotiating better trade deals, and with innovative ideas in terms of production, will be of importance to maintain and enhance the competitiveness status of the industry (BFAP, 2016).

5.3. Comparison of competitive performance between South African subtropical fruits

This section starts by comparing individual subtropical fruit types, followed by a comparison with other major trading countries. The RTA trends in individual subtropical fruit types (e.g. avocado, banana, kiwi fruit, mango, macadamia nuts, papaya and pineapple) are given and analysed in this section. From **Figure 5.4** and Table **5.1** below, it is revealed that the macadamia fruit crop outpaced all other selected South African subtropical fruit types from the 2006 to 2016 production seasons, recording the highest RTA value of 128.30 in 2014, followed by the avocado crop reaching 12.84 in 2002. The macadamia nut industry of South Africa has shown rapid growth in production over the past 10 years, before the significant decline caused by the severe drought in 2015/2016 production season (Absa, 2017; ITC, 2017; SAMAC, 2017).

On average, the competitive performance of the avocado industry fluctuated over the studied years, although it presents an overall declining trend. The comparison of RTA values in this section make sit possible to determine the relative importance of the trade commodity (subtropical fruit) relative to different trading competitors. Therefore, the RTA values calculated in this section provide a relative measure rather than an absolute competitiveness measure.

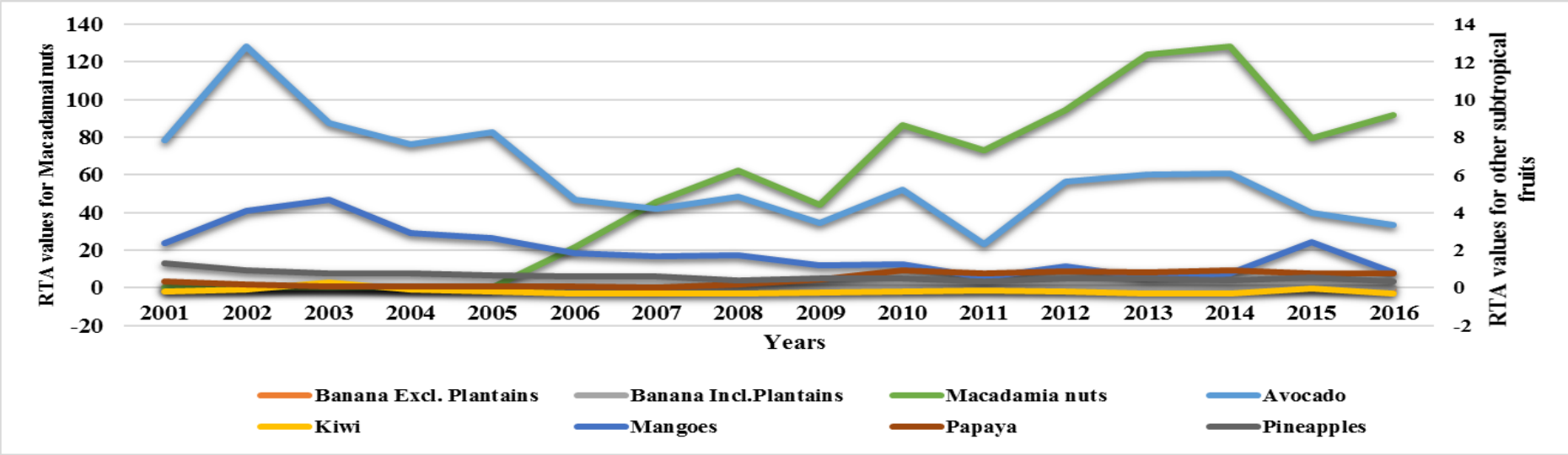


Figure 5.4: Trends in the ITC RTA values of individual South African subtropical fruit (2001 to 2016).

Source: Author's own RTA calculations, based on ITC (2017) data

Table 5.1: Trends in the ITC RTA values of individual South African subtropical fruit (2001 to 2016)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Avocado	7.84	12.84	8.75	7.64	8.25	4.67	4.18	4.86	3.46	5.23	2.30	5.67	6.05	6.09	3.99	3.36
Banana excl. plantains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.09	0.06	0.02	-0.29
Banana incl. plantains	0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.06	-0.06	-0.05	0.05	0.02	0.00	0.00	0.00	0.00	0.00
Kiwi	-0.18	-0.10	0.28	-0.06	-0.21	-0.33	-0.31	-0.31	-0.27	-0.19	-0.15	-0.19	-0.30	-0.29	-0.06	-0.28
Mango	2.38	4.08	4.70	2.94	2.64	1.82	1.67	1.72	1.21	1.25	0.57	1.17	0.56	0.78	2.45	0.85
Macadamia nuts	0.00	0.00	0.00	0.00	0.00	21.46	45.99	62.31	44.29	86.25	72.93	94.59	124.1	128.3	79.31	92.08
Papaya	0.35	0.18	0.05	0.05	0.06	0.07	0.01	0.20	0.42	0.94	0.78	0.89	0.82	0.93	0.79	0.75
Pineapple	1.29	0.95	0.78	0.75	0.65	0.59	0.59	0.39	0.49	0.48	0.36	0.49	0.48	0.41	0.55	0.35

Most of the other individual subtropical fruit had a positive RTA value of above one, except for kiwi fruit, which recorded an average RTA value of -0.184, implying no relative competitiveness. The kiwi industry is relatively small in its scope of operation, with an estimated 200 ha under production, and the industry's production has not kept pace with current world best practices (NAMC, 2014). In the 2014/2015 marketing season, the mango crop showed a significant increase from 0.78 to 2.45 in 2015 when considering its RTA values. This is attributed to the 15% increase in South African mango production in the 2014/2015 production season compared to the previous season (NAMC, 2016; SAMGA, 2017). In the preceding ten years, mango production had been fluctuating, caused by unfavourable weather conditions and the outbreak of disease. Mango exports declined faster than world imports in France, Australia, Singapore and Swaziland (Bulagi, 2014). Generally, most of the individual South African subtropical fruits are marginally competitive, except for avocado and macadamia nuts, which are highly competitive.

5.4. Focusing on the winners: Global comparison of the competitive performance of avocado and macadamia nuts in comparison to other countries

This section provides the relative competitive position of the SA avocado and macadamia nut industries in the context of the total SA trade situation, compared to the major competing nations of these subtropical fruit crops, each in the context of their particular trade situation. Avocado and macadamia nuts are viewed as the "winners", i.e. the most competitive of South Africa's subtropical fruit crops (see **Figure 5.4**). According to the Absa (2017) outlook, these crops are indeed the major traded subtropical fruit in South Africa, driven by the effective supply to the increasing world demand, with the biggest export markets in Europe (e.g. the United Kingdom). These are two important subtropical fruit crops, and the FAO data does not provide aggregated macadamia nut data and, as the results, this section of the chapter will be based on the ITC trade map dataset.

Measuring international competitiveness using the RTA method allows for comparisons (see section 2.7.2, Chapter 2), provided RTAs are viewed as a comparison in relation to competitiveness in a particular country economy (Esterhuizen, 2006; Dlikilili, 2018). The competitive performance of avocados, for example in Chile, can be compared with South Africa's avocados – not directly, but in the context of the competitiveness of this commodity in the economy of its own country. The rating of the "top performer" must thus be viewed relative to the performance of that commodity in a country context, such as Chilean avocados vs SA avocadoes – not directly, but both in the context of their particular economies (Esterhuizen, 2006; Dlikilili, 2018; Dlikilili & Van Rooyen, 2018).

Avocado industry of South Africa compared to major competitors: South Africa is a net exporter of fresh and dried avocados (NAMC, 2017). In the 2017 marketing season, South Africa exported 49 850

tons avocados; of the total exported, a 22% share went to the United Kingdom (UK), and an 18% market share went to France (Absa, 2017). Major competitors of South Africa's avocado industry in the Southern Hemisphere include Chile, Kenya and Peru. The selection of competitors is based on their size of production and the amount of global market share of the selected product – in this case, avocado.

From **Figure 5.5** it is clear that Kenya's avocado industry had an RTA value of 99.74 in 2001, higher than that of other competing nations, revealing a relative competitive advantage and making it – relatively speaking – the strongest and most globally competitive. In Africa, Kenya is a direct competitor of the South African avocado industry, and it is ranked 8th in the world, with a market share of 1.87% of world exports in 2017 (ITC, 2017). Kenya's avocado export value increased by 100% between 2012 and 2015. Avocado is among the major export crops of Kenya, constituting about 17% of the total horticultural products of the country, and it is mostly absorbed by European markets such France (21.8%), the Netherlands (21.8%) and Germany (8.85%) (Wasilwa et al., 2017).

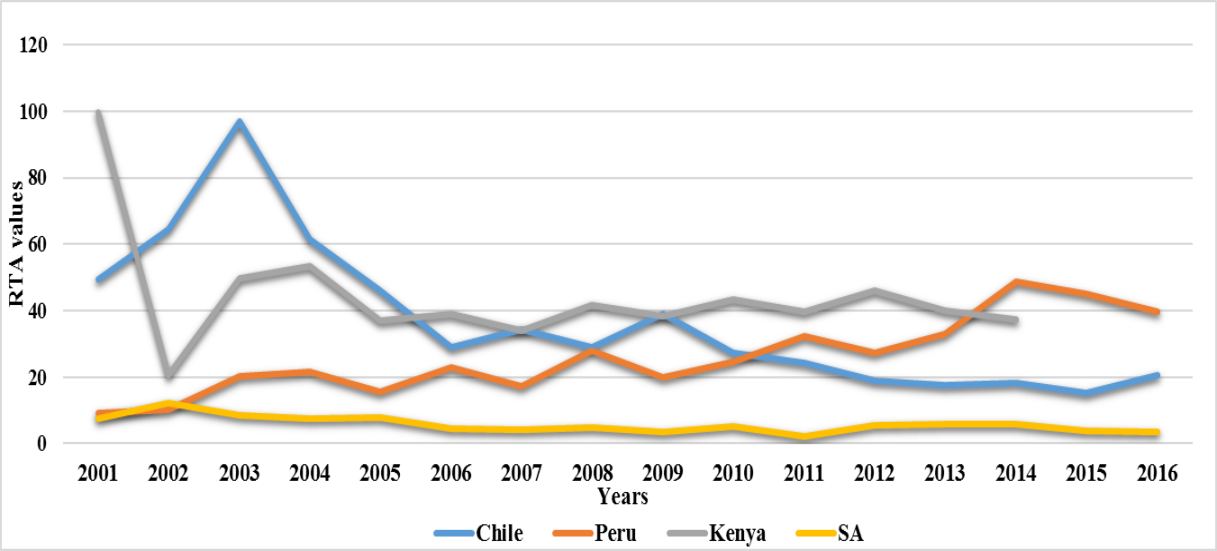


Figure 5.5: SA avocado industry compared with SH producing countries (2001 to 2016).

Source: Author's own calculations based on data from the ITC (2017)

From the 2013 to 2016 production seasons, Peru's RTA value outperformed all its rivals, and its relative competitive advantage has been increasing since 2000. This must be viewed in the context of the Peruvian economy, and can be attributed to the country's increasing number of new avocado plantations coming into production, which led to a 20% increase in avocado production in 2017 (FAS & Eyob, 2017). About 67% of Peru's avocado exports are destined for European markets and they compete with South Africa for market share.

The avocado industry in South Africa is relatively outperformed by the selected nations from the Southern Hemisphere (Chile, Kenya and Peru, all with higher RTA values), with a highest RTA value of 12.30 in 2002 over the studied years. This warrants a study to identify the causes of such performance, lessons that can be drawn from other competitive nations, and realistic options to increase the competitive

advantage of the avocado crop. Nevertheless, when analysing the avocado fruit industry (see **Figure 5.5**), South Africa can be regarded as either the "runner-up" or fourth most competitive country in the "first league", or the *de facto* leader in the second league of global competitors when compared with Peru and Chile in the Southern Hemisphere. In the world, Chile is the leading producer and exporter of avocado to the European market. Overall, the Kenyan avocado industry has performed interestingly – it must be rated as consistently highly competitive in comparison with the performance of competing countries.

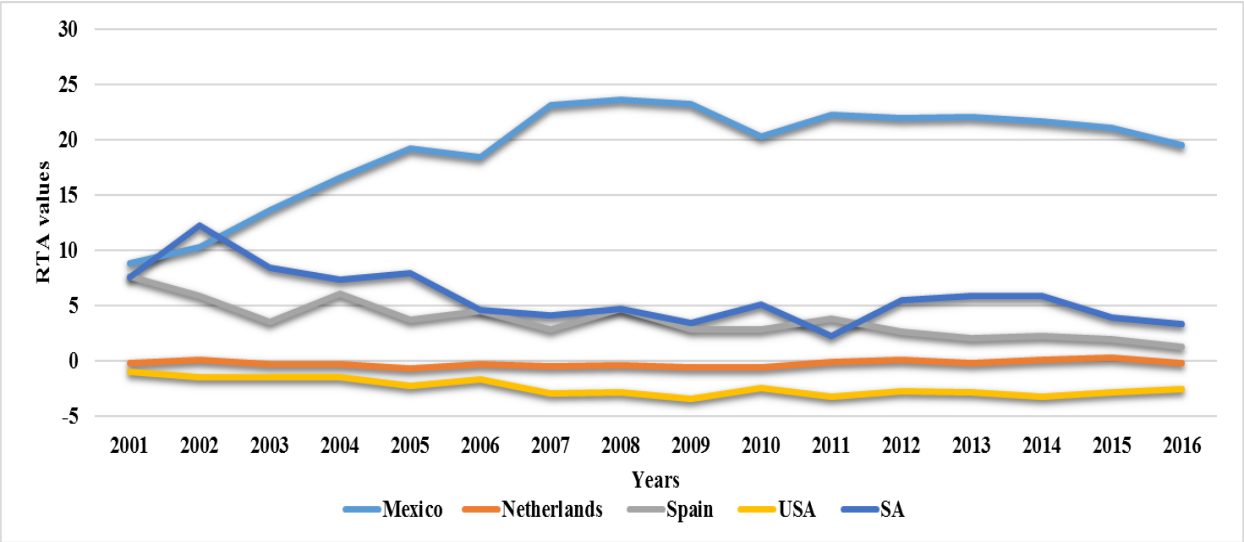


Figure 5.6: Fresh or dried avocado ITC RTA trends: SA compared with NH countries (2001 to 2016).

Source: Author's own calculations based on data from the ITC (2017)

Mexico has shown an increasing revealed competitive performance in the avocado industry in the Northern Hemisphere since 2000, and has by far the strongest and most globally competitive status (see **Figure 5.6**). Mexico's avocado RTA values were consistent, with the highest value of 23.7 in 2003 compared to that of other countries. Spain and the Netherlands are marginally competitive, while the avocado industry of the United States of America is internationally uncompetitive. The avocado industry of South Africa features prominently in comparison with the Northern Hemisphere (NH) countries. In the NH, South Africa outperformed the USA, Spain and the Netherlands – these countries mostly recorded negative RTA values below one and are globally uncompetitive (see **Figure 5.6**). South Africa had the highest RTA value of 12.30 in 2002, but this trend has since been decreasing. The expansion of avocado fruit remains constrained by water requirements for irrigation, land availability, varying climatic conditions and the uncertain business environment in South Africa (Subtrop, 2017; SAAGA, 2016).

The macadamia nut industry of South Africa compared to major competitors

The world's macadamia nut industry is growing rapidly, driven by global market demand. South Africa, Australia and Kenya are the key producers in the Southern Hemisphere region, contributing 70% of the global supply (Duncan, 2018). Malawi, Kenya and Australia are South Africa's main competitors in the

Southern Hemisphere (Van Rooyen, 2014b). The RTA values for macadamia nut calculated from the ITC datasets are presented in Table **5-2, Figure 5.7** and **Figure 5.8**.

When analysing the relative competitive performance of SA in Table **5.2** and **Figure 5.7**, it can be observed that, in the SH, South Africa was outperformed by major competitors such as Malawi and Kenya in terms of macadamia nuts, with RTA values of 466.2 and 261.6 respectively in 2014. Malawian macadamia nut production accounted for 3% of global production, and 5% of global market exports in 2015 (Du Toit et al., 2017).

Malawi's highest RTA value for the macadamia nut industry can be attributed to its developed processing capacity and growing access to high-quality export markets through its Strategic Plan from 2012 to 2020 (Fernandez, 2012). On the other hand, Kenya produces about 10% of the world's total production (Gitonga *et al*., 2017). However, the Kenyan macadamia nut industry needs to regain its global export market position to improve its competitive performance (Murioga et al., 2016).

The SA macadamia nut industry only outperformed Australia (with a highest RTA value of 76 in 2007) in the 2009 to 2016 production seasons, and Malawi in the 2007 to 2014 production seasons. In the 2016 production season, SA's RTA trend declined to 79.3 from 128.3 in 2015. This could be associated with a decline in macadamia nut production due to climate variation, i.e. the drought in the 2015/2016 production season (Absa, 2018; SAMAC, 2017; Subtrop, 2018).

When analysing the relative competitive performance of the SA macadamia nut industry compared to that of its major trading rivals in the Northern Hemisphere (see Table **5.2** and **Figure 5.8**), with which it enjoys counter-seasonal production, the industry outperformed most of its competitors (i.e. Hong Kong, Germany and the USA), with a highest RTA value of 128.3 in 2015. South Africa was outperformed by Guatemala in the 2007 to 2012 production seasons.

South Africa exports 95% of its macadamia crop, with the export value totalling R3.3 billion in 2018 (Duncan, 2018). It has regained its crown as the world's largest producer and exporter of macadamia nuts, contributing 25% (54 000 tons) to the global crop production in 2017, followed by Australia and Kenya (Bizcommunity, 2018; Sutton, 2018). Macadamia nuts are a growing market in South Africa (Van Rooyen, 2014b). These results reveal that SA is the leader in terms of the relative competitive performance of macadamia nuts in the Northern Hemisphere region, while facing strong competition in the Southern Hemisphere.

Table 5.2: RTA values for major macadamia nut-trading nations

Southern Hemisphere																
Competitors	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Australia	0.0	0.0	0.0	0.0	0.0	0.0	76.8	58.9	40.0	20.8	11.7	23.8	24.9	13.4	29.1	36.4
Kenya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.6	73.2	197.4	207.2	262.9	205.4	261.6	191.3	264.7
Malawi	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.6	6.3	466.2	454.3	348.7
Zimbabwe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	4.2	29.6	65.2	41.5	23.4	59.8	81.7	101.4
South Africa	0.0	0.0	0.0	0.0	0.0	0.0	21.5	46.0	62.3	44.3	86.3	72.9	94.6	124.1	128.3	79.3
Northern Hemisphere																
Competitors	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012.**	**2013**	**2014**	**2015**	**2016**
Hong Kong (China)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.3	-1.4	-2.0	-2.6	-1.9	-3.3	-2.2	-2.7
Germany	0.0	0.0	0.0	0.0	0.0	0.0	-0.8	-1.3	-1.3	-1.2	-1.0	-0.6	-0.9	-0.8	-0.7	-0.9
Guatemala	0.0	0.0	0.0	0.0	0.0	0.0	145.5	121.4	119.1	68.8	83.9	98.0	88.7	63.8	52.1	72.2
USA	0.0	0.0	0.0	0.0	0.0	0.0	-1.5	-1.6	-1.5	-1.6	-1.4	-1.6	-1.4	-1.4	-1.0	-0.7
South Africa	0.0	0.0	0.0	0.0	0.0	0.0	21.5	46.0	62.3	44.3	86.3	72.9	94.6	124.1	128.3	79.3

Source: Author's own calculation base on ITC (2017)

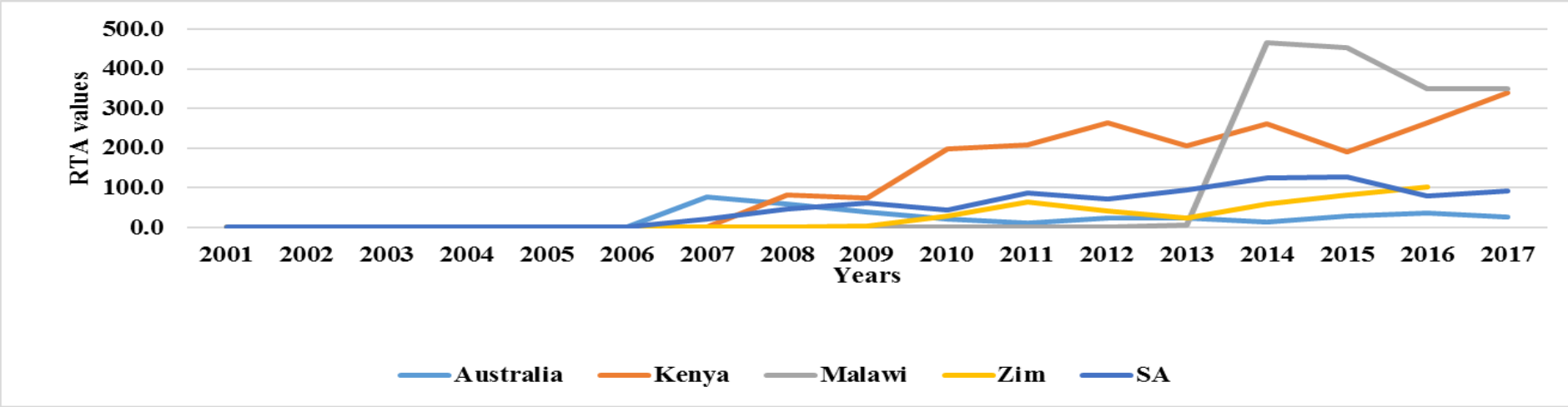


Figure 5.7: SA macadamia nut industry compared with SH production regions

Source: Author's own calculations based on data from the ITC (2017)

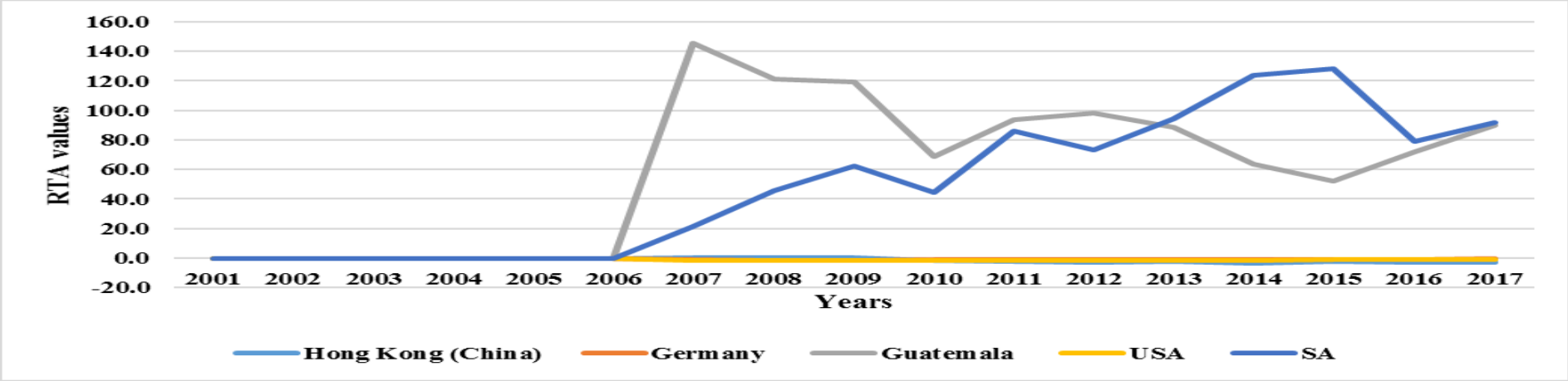


Figure 5.8: SA macadamia nut industry compared with NH production countries

Source: Author's own calculations based on data from the ITC (2017)

5.5. Value chain comparisons – fresh pineapples and pineapple juice from South Africa

The horticultural value chains in South Africa are undergoing a process of rapid transformation (Barrientos & Visser, 2012). Globally and locally, these value chains are swiftly moving towards an internationally interconnected and integrated system with complex relationships, due to year-round supply, product differentiation and technology advancement, with a primary objective to enhance competitiveness (Fundira, 2004). Boonzaaier (2015) argued that the South African fruit industries along the value chain are highly dependent on sustained exports to take full advantage and determine profit margins. Sustained trade performance forms component of the selected definition of competitiveness in this study. Subsequently, value chain analysis form a fundamental component of developing economies' growth potential which may lead to income improvement and poverty reduction- a notional mentioned in the definition of competitiveness in section 2.6, chapter 6. Therefore, attention given to supply chain management analysis is to improve marketing performance, production levels and value chain systems through effective producer response to changing consumer and market demands, which lead to cost reduction (Ortmann, 2001). According to Esterhuizen et al. (2008), the value chains of South African agribusiness have varying rates of competitiveness. This is confirmed by the recent work by Van Rooyen and Boonzaaier (2016).

Angala (2015) states that in order provide a detailed analysis of any industry, it is crucial to understand each stakeholder along the value chain of the industry. Therefore, to shape an improved understanding of the Subtropical fruit industry' challenges and opportunities, value chain guides the inclusion of key decision makers' opinions across various disciplines of issues relating to competitiveness to be included in the Subtropical Fruit Executive Survey (SFES).

Due to limited data available in the ITC database for processed subtropical fruit commodities exported, the industry could only calculate the RTA values of pineapple juice. The pineapple industry of South Africa on average is marginally competitive; with RTA value above one only recorded in 2001 (see **Figure 5.9**). On the other hand, the pineapple juice industry of South Africa is more competitive than the fresh pineapple industry, with RTA value above one of the studied years.

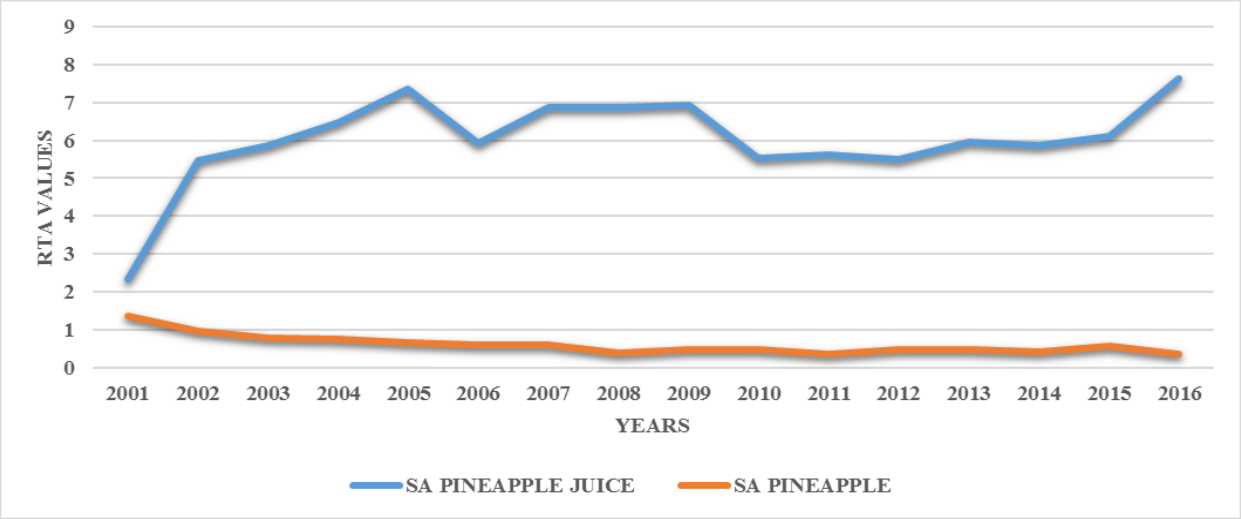


Figure 5.9: Value chain comparisons – fresh pineapples and pineapple juice value chain of South Africa

Source: Author's own calculations based on the data from the ITC (2017).

5.1.1 International comparisons of pineapple value adding

Findings on the competitive performance of the SA pineapple-based value chain are presented in this section, along with the same guidelines as referred to above in section 5.2, a comparison relative to the economy-wide performance of a particular competing country. The processing of pineapple has made the fruit known throughout the developed world (Rohrbach et al., 2002). The value added to pineapple relative to its competitiveness evaluated in this section is based on the two Harmonised System (HS) codes for pineapple juice, namely HS 0200941 (*Pineapple juice, unfermented, Brix value*) and HS 0200949 (*Pineapple juice, unfermented, Brix value>20 at 20 ℃)* from the ITC (2017) data. The pineapple industry value chain shows varying competitive performances between countries, with the Philippines maintaining high competitive performance until 2007, compared to Costa Rica, Netherlands, South Africa and Madagascar (see **Figure 5.10**).

From **Figure 5.10** below it can be seen that South Africa showed a constant RTA value above one in terms of pineapple juice (unfermented). From 2001 to 2016, the RTA values of Costa Rica's pineapple juice (HS 0200941) have been increasingly higher by far compared to its major competitors. Costa Rica and the Philippines are among the leading pineapple producers in the world and have shown a constant increase in production since 2000 (UNCTAD, 2016). Costa Rica stood out by virtue of its specialisation in the production and export of value-added pineapple in the 2016 marketing year.

On the other hand, the Philippines had a negative RTA value from 2001 to 2007, and is considered to have an uncompetitive status in the value chain of pineapple juice (unfermented, Brix value ≤ 20 at 20°C). Moreover, Madagascar and the Netherlands had low RTA values in pineapple juice (unfermented, Brix value ≤ 20 at 20°C).

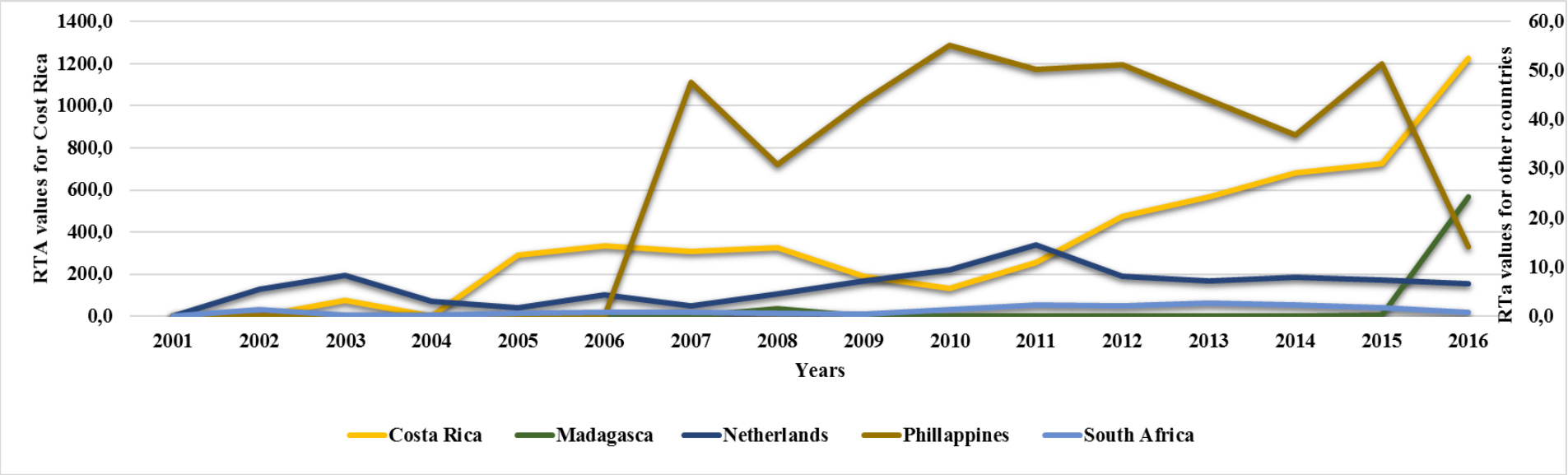


Figure 5.10: Pineapple juice, unfermented, Brix value (HS0200941) – RTA ITC trends (2001 to 2016)

Source: Author's own calculation based on the data from ITC (2017).

Table 5.3: Pineapple juice, unfermented, Brix value (HS 0200941) – RTA ITC trends (from 2001 to 2016)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Costa Rica	0.0	0.0	75.5	0.0	292.3	333.6	308.7	324.2	189.8	133.3	253.6	475.2	566.5	679.7	727.0	1225.5
Madagascar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.2	24.3
Netherlands	0.0	5.4	8.3	2.9	1.8	4.3	2.1	4.5	7.2	9.5	14.6	8.1	7.2	7.9	7.4	6.7
Philippines	0.0	0.0	0.0	0.0	0.0	0.0	47.7	30.9	43.8	55.2	50.3	51.3	44.1	36.9	51.4	14.1
South Africa	0.0	1.4	0.2	0.1	0.6	0.7	0.7	0.5	0.5	1.3	2.2	2.2	2.6	2.3	1.7	0.8

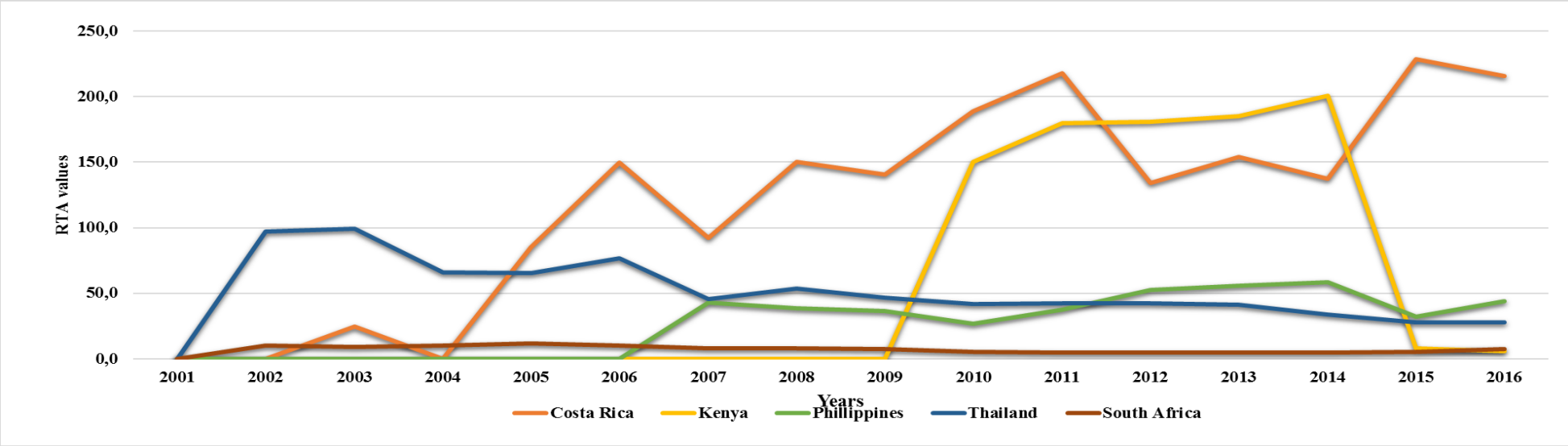


Figure 5.11: Pineapple juice, unfermented, Brix value (HS 0200949) – RTA ITC trends (2001 to 2016)

Source: Author's own calculation based on the data from ITC (2017).

Table 5.4: Pineapple juice, unfermented, Brix value (HS0200949) – RTA ITC trends (from 2001 to 2016)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Costa Rica	0.0	0.0	24.8	0.0	85.1	149.5	92.4	150.1	140.5	188.9	217.7	133.9	153.9	137.4	228.6	215.7
Kenya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	150.0	180.0	180.6	185.2	200.6	7.8	6.0
Philippines	0.0	0.0	0.0	0.0	0.0	0.0	42.9	38.6	36.6	26.8	37.4	52.5	56.0	58.6	31.9	44.1
Thailand	0.0	97.2	99.2	65.7	65.2	76.5	45.3	53.4	46.6	41.5	42.1	42.2	41.1	33.5	28.0	27.8
South Africa	0.0	10.3	9.3	10.1	11.8	9.9	7.7	8.1	7.6	5.3	4.9	4.6	4.8	5.0	5.6	7.3

From **Figure 5.11** and Table **5.4** it is clear that Costa Rica recorded a higher RTA value of 228.6 compared to its rivals in 2015. It relatively outperformed other countries in terms of pineapple juice (unfermented, Brix value > 20 at 20°C) in the Southern Hemisphere. The trend in Kenya's RTA value showed a relative increase, surpassing all other countries between 2011 and 2014. Kenya is rated amongst the main exporters of canned pineapple in the international trade market (FAO, 2016). Foreign investment and partners played a critical role in the dramatic growth of the Kenyan industry's competitive performance after 2009. This emanates from the private sector's capacity to adapt to changing industry circumstances and government commitment to promote the participation of pineapple smallholder farmers in the industry through awareness of export standards, certification compliance, and the importance of support to producer associations.

The trend in Kenya's relative RTA value declined significantly, from 200.6 in 2014 to 7.80 in 2015. This could be attributed to the lack of processing facilities close to the sources of the produce and post-harvest losses in the horticultural industry of Kenya. On the other hand, the trend in the relative RTA value for Thailand started off as highly competitive in 2001, outperforming all other countries. Thailand ranks first in terms of pineapple production and exports, with 50% being absorbed by the global market.

It is worth noting that canned pineapples are the domain of Asian countries. SA's pineapple juice (HS 0200949) was marginally competitive from 2001 to 2016, although showing a decreasing RTA trend. Amongst other reasons, this could be related to limited processing opportunities in the South African fruit industry. In the pineapple juice commodity (HS 0200949), South Africa is not in the major league of competitors. This could suggest limited value-adding opportunities in the pineapple supply chain of South Africa, therefore presenting opportunities for the SA pineapple industry to focus on more value-adding activities.

5.6. Factors influencing the competitive performance of the subtropical fruit industry (Step 3): First-round Delphi analysis

This section discusses factors affecting the competitive performance of the subtropical fruit industry of South Africa. In order to achieve this, a Delphi process was applied, with the use of a questionnaire based on the Porter Competitive Diamond Model to gather information (views and opinions) from local subtropical fruit experts on factors that enhance or constrain the competitive performance of the industry. In this study the purposive sampling—a non-probability method of sampling, was applied to distribute the questionnaires, where selected participants could fully comprehend and answer the questions asked in the questionnaire survey (SFES).

5.6.1. The Subtropical Fruit Expert Survey (SFES)

Table **5.5** provides a description of the SFES respondents, differentiated according to fruit types, value chain positions, functional role players and sizes. Within the Delphi approach followed (explained in section 3.2.3 in Chapter 3), the views of a small group of experts, selected in collaboration with Subtrop, a representative industry body, can be considered and interrogated (Thangaratinam & Redman, 2005).

Table 5.5: Demographics of SFES sample

VALUE CHAIN POSITION	**% SHARE OF THE RESPONDENTS' POSITIONS IN THE VALUE CHAIN (n = 14)**
Producer/processor/marketer	2 (7.6)
Producer only	4 (28.6)
Exporter or marketer	1 (7.2)
Pack house and processors/advisor	1 (7.2)
Input/service provider	4 (28.6)
Producer or pack house	2 (7.6)

Source: SFES (2017)

Some respondents held more than one position along the value chain. Table **5.5** also presents the percentage share of the respondents' positions in the value chain. Producers and input/service providers had the highest percentage share of 28.6 % of the total sample size.

5.6.2. Identifying the factors affecting the competitiveness of subtropical fruit industry

A total of 101 factors were identified and rated in the SFES (refer to **Appendix A**) in the first-round Delphi process. Technological innovation and advancement was the most enhancing factor, with a rating of 4.67 out of 5. The most constraining factor was expectations of South African land expropriation without compensation, which was rated at 1.08 out of 5.

Validating the questionnaire survey

This section refers to the applicability of the questions incorporated in the SFES (see **Figure 5.12**). Of the 101 factors identified, 93% were found to have a positive or negative impact on the competitive performance of the industry. From the ratings, 51% of the factors were found to be constraining the performance of the industry, while 42% were enhancing competitive performance, with 7% being neutral, measuring 3 out of 5, starting at one (1). The 7% neutral factors, however, does not mean the factors were irrelevant; rather, selected experts viewed no current relevance. The questionnaire can thus be viewed as relevant based on its current impact on the competitive performance of the subtropical fruit industry.

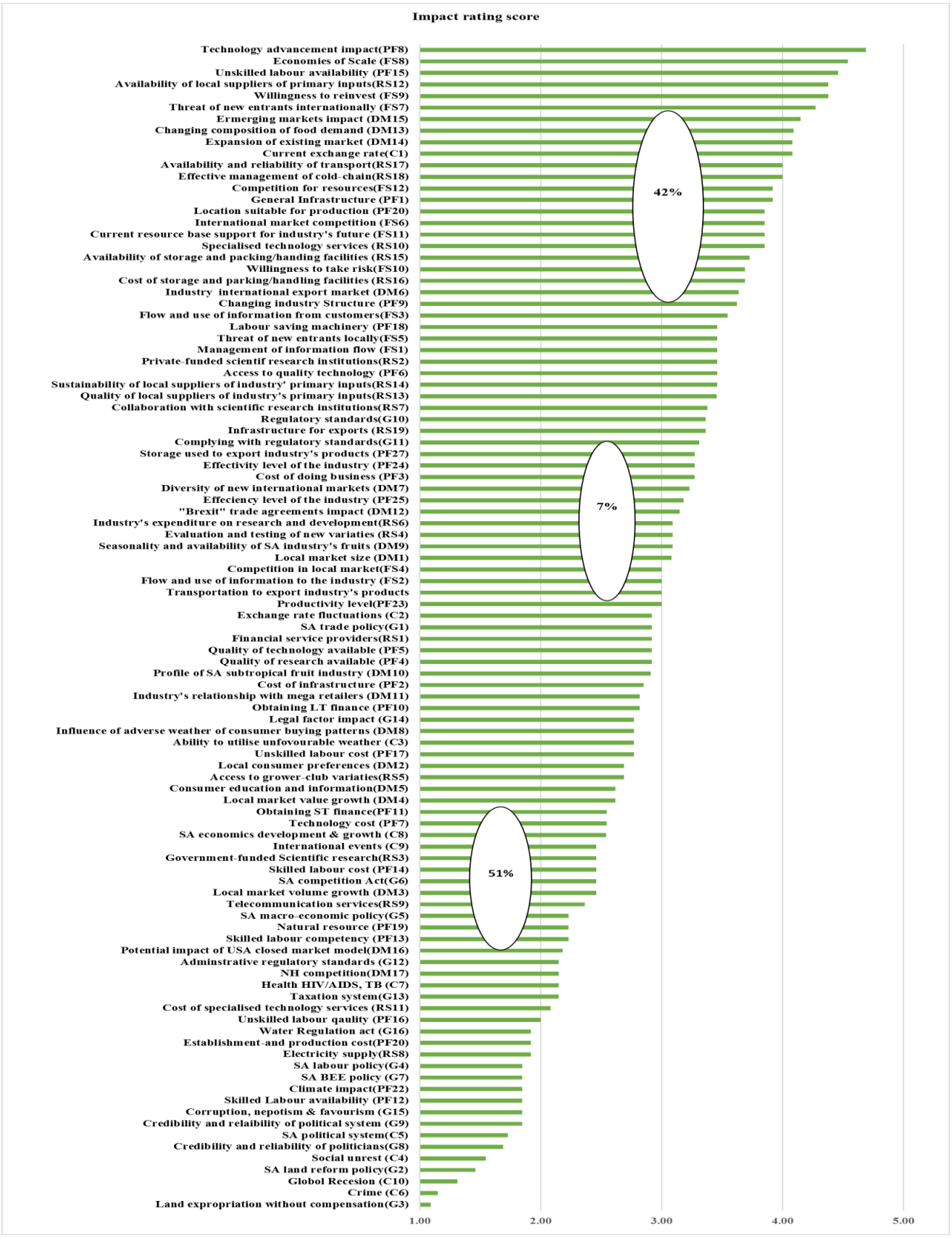


Figure 5.12: Impact rating of factors influencing the competitive performance of the SA subtropical fruit industry

Source: Author's own calculation based on SFES (2017)

Ratings: 1 = Most constraining; … Neutral = 3…; 5 = Most enhancing.

5.1.2 Top ten most constraining and most enhancing factors of competitive performance

The ten top factors' impact ratings, including the most enhancing and most constraining factors, are listed in Table **5.6**, and are further grouped into the Porter Competitive Diamond six determinants. A rating closer to 5 indicates a stronger enhancing impact, whereas a rating closer to 1 indicates a highly constraining impact on competitive performance.

Table 5.6: Major factors constraining and enhancing the competitiveness of the South African subtropical fruit industry

Major constraining factors	Impact rating*	**Major enhancing factors**	Impact rating*
South African land expropriation expectations (without compensation	**1.08**	Innovation and advancements in technology	**4.67**
Crime	**1.16**	Impact of economies of scale	**4.5**
Global recession prospects	**1.33**	Willingness to reinvest	**4.33**
Social unrest	**1.54**	Changing demand composition	**4.08**
Availability of skilled labour	**1.83**	Exchange rate	**4.08**
Impact of climate change	**1.83**	General infrastructure	**3.92**
Corruption, nepotism and opportunism	**1.83**	Availability of specialised technological services	**3.83**
Credibility and reliability of current government systems	**1.91**	Size of export market	**3.83**
Water regulations	**2.00**	Use of labour-saving machinery	**3.50**

Rating scores out of 5

* Impact rating (1 = Most constraining; …; 3 = Neutral; …; 5 = Most enhancing)

Table **5-6** shows that the most constraining factors relate to policy, social stability, political and administrative uncertainties and include the cost implications of crime; these were viewed by the industry experts to have a significant constraining impact rating of close to 1 out of 5. On the other hand, technological innovation and economies of scale were viewed as the most enhancing factors, with both factors having a current impact rating of close to 5 out 5. It is also interesting to note that the most constraining factors are external to the control of the industry or firms; most related to political factors, climate and social factors. These constraining factors will be addressed in Chapter 6, under industry-level strategy development (see section 6.3).

5.7. The Porter Competitiveness Diamond framework: analysing the determinants of competitiveness (Step 4)

This section takes a closer look at the 101 impact factors identified in round one of the Delphi analysis, and clusters them, on an averaged score basis, into the major determinants of competitiveness of the industry (see **Appendix B** for factors under each determinant), applying the Porter Competitive Diamond framework. The six Porter's determinants of competitiveness are production factor conditions (PF); demand/market conditions (DF); related and supporting industries (RS); firm strategy, structure and rivalry (FS); government support and policies (G); and chance factors (C) (see section 2.2.6). The average impact rating score of each determinant was calculated based on the responses in the Subtropical Fruit Expert Surveys (SFES) of the relevant factors per determinant. The current impact rating score for each Porter determinant is illustrated in Table **5.7**.

Table 5.7: Impact rating* of the all the Porter Competitive Diamond framework determinants

Porter's diamond determinants	***Impact rating scores* (Out of 5)***
Firm strategy, structure and rivalry (FS)	3.72
Related or supporting industries (RS)	3.11
Demand and market factor conditions (DM)	3.07
Production factor conditions (PF)	2.88
Chance factors (C)	2.27
Government support and policies (G)	2.26

Impact rating score out of 5

*Impact rating: 1 = Most constraining; …; 3 = Neutral; …; 5 = Most enhancing

Source: Subtropical Fruit Expert Survey (2017)

The determinants that have an enhancing impact on the current industry's competitiveness were the firm strategy, structure and rivalry (rating 3.74 out of 5), related or supporting industries (rating 3.11 out of 5) and demand and market factor conditions (rating 3.07 out of 5).

Production factor conditions (PD), rated around 2.89 out of 5, were close to neutral. The role of chance factors (C), i.e. the industry's flexibility to capture chance occurrences, was rated 2.27 out of 5, and government support and policies (G) were rated 2.26 out of 5 and had the most constraining impact on competitive performance.

5.7.1. Principal component analysis (PCA)

Principal component analysis (PCA) was used in this study to identify factors that are highly correlated(redundant), that is, factors that individual industry experts viewed as similar, and uncorrelated factors, that is, factors that the experts viewed with varying opinions. This method was explained in detail in section 3.2.4.1 in the data analysis in Chapter 3. Factors that were identified as

highly correlated were further analysed with the Cronbach's alpha method (discussed in section 3.2.4.2) to assess the internal consistency of these factors. Factors that were identified as uncorrelated, i.e. as varying in opinion, were discussed and recommended to be considered for further research analysis to obtain greater clarity on the distribution of opinions and to further determine possible consensus. The PCA results are discussed for each Porter determinant from section 5.7.1 to section 5.7.6 below.

5.7.2. Firm strategy, structure and rivalry (FS, rated 3.72 out of 5)

This determinant of competitiveness deals with the conditions that determine how companies are created, organised and managed (explained in section 2.4, Chapter 2). This determinant is rated at an average impact score of 3.72 out of 5 – the highest and the most enhancing factor of the Porter Competitive Diamond determinants (see Table **5.7**). The 12 factors identified within this determinant scored high impact rating values (see Table **5-8** and **Figure. 5.13**). This was also found by other recent studies on SA's fruit industry (Abei, 2017; Angala, 2015; Boonzaaier, 2015; Boonzaaier & Van Rooyen, 2017; Dlikilili, 2018; Esterhuizen, 2006; Jafta, 2014; Van Rooyen & Stroebel, 2011). Generally, all the factors in this determinant scored impact ratings of above 3 out of 5. Porter further outlines that no managerial methodology can be considered as perfect for the development of an industry or nation, but that it rather depends on how efficiently an industry's practice matches the competitive advantage of that particular industry.

Table 5.8: The impact of firm strategy, structure and rivalry (Determinant FS) factors on the competitiveness of the SA subtropical fruit industry.

Firm strategy, structure and rivalry	Firm strategy, structure and rivalry	Standard deviation
Impact of economies of scale (FS8)	4.54	0.519
Impact of willingness to reinvest (FS9)	4.38	0.768
Entry of new entrants into local market (FS7)	4.00	1.08
Competition for resources (FS12)	3.92	1.19
International market competition (FS6)	3.92	0.862
Current resource support for future (FS11)	3.85	0.689
Willingness to take risks (FS10)	3.69	1.109
Management of market intelligence (FS3)	3.54	0.877
Information flow management (FS1)	3.46	0.776
Threat of new entrants in local market (FS5)	3.46	1.391
Local market competition (FS4)	3.17	1.467
Flow and use of information from customers (FS2)	3.00	1

Source: Subtropical Fruit Expert Survey (2017)

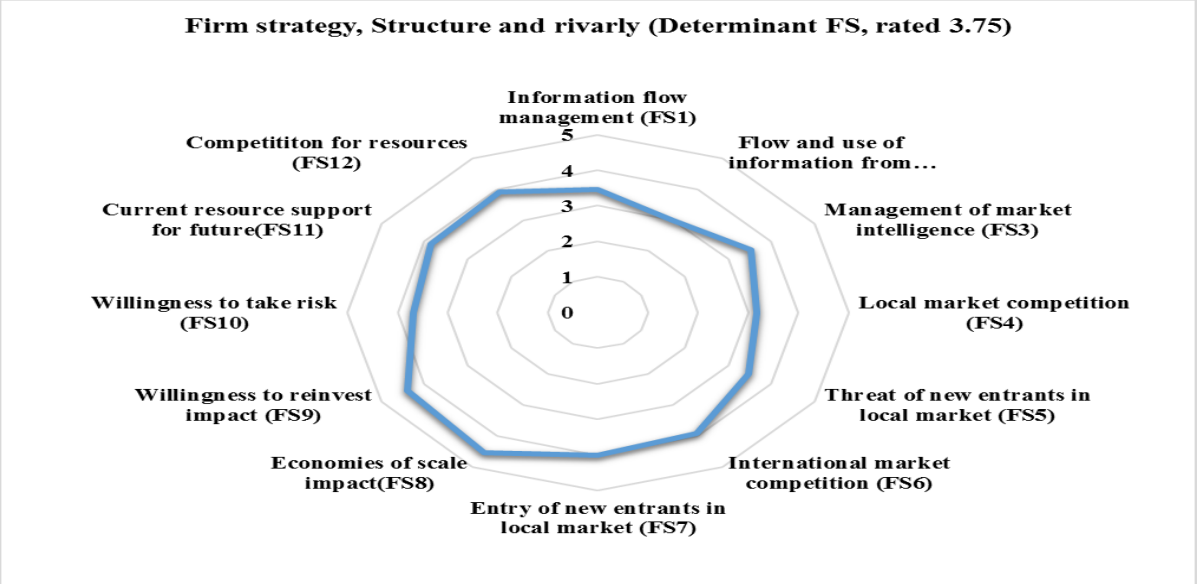


Figure 5.13: The impact of the firm strategy, structure and rivalry (Determinant FS) factors on the competitiveness of the South African subtropical fruit industry.

Source: SFES (2017)

*Notes: 1 = most constraining; 3 = neutral; 5 = most enhancing

From **Figure 5.13**, the prospects of economies of scale (FR8) was rated as the most enhancing factor of the industry's competitiveness (4.54 out of 5). This could be explained by the favourable prospects and the industry's readiness to expand its size through the availability of high quality land, the development of new plantations and the adoption of advanced technologies. The role of economies of scale was discussed by Krugman (1979) in chapter 2. The flow and use of quality information from customers (FR2) showed a moderate but enhancing status on the competitiveness of the industry, scoring an impact rating of 3 out of 5. With regard to this determinant to enhance the competitiveness of the industries, it is imperative that the flow and use of information (FR2) is adequate and timeously available to stakeholders, not ignoring other enhancing factors that need improvement. Such information includes better understanding of various aspects, including latest technology developments, new fruit cultivars and reliable market information that responds to the consumers' needs, changing preferences and expectations.

Dlikilili (2018) notes that knowledgeable strategy developments and fruit product development processes are based on the effective flow of information from the end user back to the producer. Therefore, improvements need to be considered in this regard. The competition in the international market (RS6) was considered enhancing the competitiveness of this determinant, with an impact score rating of 3.92 out 5. This concurs with the results obtained by Abei (2017), Angala (2015), Boonzaaier (2015), Dlikilili (2018) and Jafta (2014) with regard to the value of strong international competition as an enhancer of the international competitiveness of the fruit industry. Competition in economics is the theoretical construct with great historical link to Adam Smith (see section 2.2.2). Competition is always encountered in international markets, and consequently firms/industries are under pressure to devise

more efficient production methods, marketing techniques and quality improvement in their products to survive the competition in these markets (Monti, 2003).

Principal component analysis: Firm structure, strategy and rivalry (Determinant FS)

Principle component analysis (PCA) was carried out (explained in section 5.4.5.1) to explore the degree to which the respondents' responses to the questions in the SFES related to the factors under the firm strategy, structure and rivalry determinant that reflect consensus or variation in opinion and views.

Uncorrelated factors identified under this determinant included aspects such as information flow management (FS1), flow and use of information from customers (FS2), local market competition (FS4), international market competition (FS6), entry of new entrants into the local market (FS7), economies of scale (FS8), willingness to take risks (FS10), and current resource support for future (FS11). Therefore, a detailed analysis that addresses these differences was necessary to determine what can be collectively achieved concerning the management of market intelligence and flow of information between various key clusters in the subtropical fruit value chain. These include factors such as taking into consideration the case of the large sample size and inclusively clustering the experts (respondents) based on their size and the activities they perform in the value chain

Factors on which respondents had mutual agreement on the rankings of their impact on the competitive performance of the industry include management of marketing intelligence (FS3), willingness to reinvest (FS9), and current resource support (FS11). The threat of new entrants into the local market (FS5) was considered as not relevant, with a score of 3 out 5. With the entry of new domestic competitors, existing ones are forced to improve their game in the market in order to keep their competitive position. This consequently leads to an increased volume of subtropical fruit production, improved quality and eventually increased competitiveness in the local market. This confirms Porter's (1990) views that the higher the competition the better. These are factors that the industry needs to maintain in practice and to manage properly, as they enhance the competitive performanc

5.7.3. Related and supporting industries (Determinant RS, rated 3.11 out of 5)

Related and supporting industries are the industries, organisations, institutions and agencies that provide indirect or direct support to the subtropical fruit industry. The impact of the related and supporting industries determinant was rated at an average score of 3.11 out of 5 – the second highest and the most enhancing factor of the Porter Competitive Diamond determinants (see table **5.7**). This determinant involves the extent to which firms are provided with competitive services, can coordinate or share certain activities within the value chain when competing, or those activities that are complementary (Porter, 1990). The presence or absence in a nation of internationally competitive industries (e.g. input providers, research institutes and financial institutions) play a crucial role on the competitiveness of its industries (Mashabela, 2007). The small dataset limited the responses from different functions to be

clustered in the value chain (as was done by Abei, 2017, Angala, 2015 and Boonzaaier, 2015), and as such 'a detailed value chain analysis' could not be conducted. Fifteen factors were determined under this factor; seven were enhancing while the rest were constraining to the competitiveness of the industry.

The enhancing factors under this determinant are the availability of local suppliers of primary inputs (RS12), and the sustainability of local suppliers of primary inputs (RS14), which received an impact rating score of 4.38 and 3.31 out of 5 respectively. This enables competitiveness in planting and productivity in the industry. The major components of the efficient production and improved competitive performance largely rely in the accessibility of local supply of more competitive inputs and adoption of improved production technology (Porter, 1990). Therefore, accession to innovative agricultural research, training and extension, and affordable financial institutions are therefore significant for the competitive performance South African subtropical fruit industry.

Effective management of the cold chain (RS18) was also viewed as enhancing, with an impact rating of 4.00 out 5. The respondents (see Table **5.9** and **Figure 5.14**) also viewed specialised technology services (RS10) available to the industry as an enhancing factor, with an impact rating score of 4 out of 5. Specialised technologies involve economy-enriching technology spill-overs and improved productivity from an ecosystem of advanced and related industries. Good-quality storage, packing and product-handling services (FS16) were rated as relatively positive, with an impact rating of 3.69 out of 5. In this regard, post-harvest management especially is crucial, as it ensures that subtropical fruit reach the shelf or end users in a good quality and nutritious state. Available and reliable transport (RS17), rating 3.8 out of 5, and cold storage/cooling facilities (RS18), rating 4 out 5, for moving subtropical fruit to maintain quality local and international market supply were rated as enhancing competitive performances.

Table 5.9: The impact of related and supporting industries (Determinant RS) on the competitiveness of the South African subtropical fruit industry.

Related and other supporting industries (SR)	**Mean**	**Std. deviation**
Availability of local suppliers of primary inputs (RS12)	4.38	.768
Effective management of cold-chain (RS18)	4.00	.577
Specialised technology services (RS10)	3.85	.801
Cost of storage and packing/handling facilities (RS16)	3.69	.855
Sustainability of local suppliers of primary inputs (RS14)	3.46	1.050
Private-funded scientific research (RS2)	3.46	.967
Collaboration with scientific research institutions (RS7)	3.38	.870
Storage and packing/handling facilities (RS15)	3.31	1.032
Availability and reliability of transport (RS17)	3.08	1.188
Financial services providers (RS1)	2.92	.760
Access to grower-club varieties (RS5)	2.69	1.182
Government-funded scientific research (RS3)	2.46	.660
Telecommunication services (RS9)	2.38	.870
Cost of specialised technology services (RS11)	2.08	.760

Electricity supply (RS8)	1.92	.760

Source: SFES (2017)

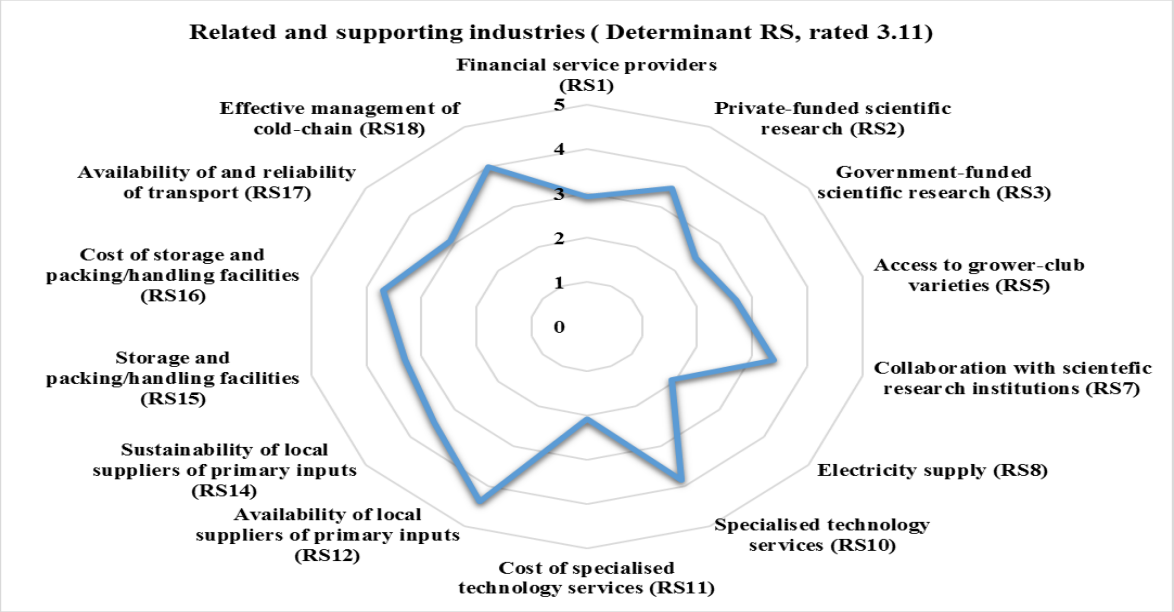


Figure 5.14: The impact of the related and supporting industries on the competitiveness of the South African subtropical fruit industry.

Source: SFES (2017)
Notes: 1 = most constraining; 3 = neutral; 5 = most enhancing

On the other side of constraining competitiveness factors in this determinant, the cost of specialised technology services (RS11) was considered to have a negative impact on the competitiveness of the industry, with an impact rating score of 2.07 out of 5. The maintenance of specialised machinery and technologies, with a relatively weak skilled labour force (see Determinant PF), is costly. Electricity supply (RS8) was viewed as the most constraining factor by the experts, with an impact rating score of 1.92 out of 5. An increase in electricity cost increases the total cost of production and affects the cost of doing business.

The South African electricity industry has experienced a dramatic increase in its basic tariff over recent years, and this increase has been transferred to all sectors of the economy. In 2008/2009, the basic electricity tariff was R0.25 per kwh, and the proposed potential electricity tariff increase for 2018/2019 would translate into a tariff of R1.06 per kwh (AGRISA, 2017). This threatens the sustainability of agriculture, considering the crucial role of electricity in irrigation to stabilise fruit production. The increase in electricity tariff is transferred to the costs of the local agricultural activity (AGRISA, 2017), along with schedule stoppages and power outages. Engaging in research will allow the development of new strategies to deal with all challenges faced by the industry, such as cost of specialised technology services, and electricity supply to improve production of the subtropical fruit industry. The electricity supply factor needs to be critically addressed in collaboration with government, as the industry as the industry is limited in the extent to which it can facilitate this factor.

Principal component analysis: *Related and supporting industries (Determinant RS)*

The related and supporting industries determinant (RS) was subjected to PCA, and the results revealed that, irrespective of the respondents' position in the value chain, they perceived a few highly correlated variables, while several other variables were uncorrelated. Under this determinant, the uncorrelated factors include financial support services (FS1), electricity supply (FS8), government-funded scientific research (FS3), effective management of the cold-chain (FS18) and specialised technology services (FS10), among other factors. The variation in opinions when rating electricity supply might be explained by the fact that municipalities (electricity suppliers) have different population densities and size, and provide different services to different mixes of low, medium, and high income and usage domestic customers (Yelland, 2015). Consequently, different electricity tariff rates and structures between municipal electricity distributors, and with Eskom Distribution (Yelland, 2015). Therefore, the geographical location of each of these experts might have had the influence in rating of this factor.

The variation in opinions expressed by the respondents in rating the specialised technology services can be explained as a reflection of differences in the relevance of such services to different groups and countries (WEF, 2016). Today's agricultural practices are faced by a wide range of technology services that are either unavailable or underdeveloped. On the other hand, three factors that were determined as highly correlated include the cost of specialised technologies (FS11), storage, packing/handling facilities (FS15), and the cost of storage and packing/handling facilities (FS16).

5.7.4. Demand and market conditions (Determinant DM, rated 3.07 out 5)

Table **5.10** and **Figure 5.15** shows the enhancing factors of demand/market conditions (determinant DM) as discussed in a declining order, i.e. 4.15, then 4.08, etc. The demand and market conditions determinant was rated 3.07 out of 5 by the industry respondents (see Table 5-7). The most enhancing factor is the chance of expansion in existing markets (DM14), with an impact rating score of 4.15 out of 5. Therefore, through the development of market strategies, the existing markets must be served better as a priority. Another strongly enhancing factor of the industry's competitiveness is the emerging market impacts (DM15), with an impact rating score of 4.08 out of 5. Emerging market impacting factors include, amongst others, measures of profitability, productivity levels, export performance and market share (Akben-Selcuk, 2016). The growth of the macadamia nut market in China and Brazil positively influences the industry's competitive performance (Absa, 2017; SAMC, 2017). Therefore, tapping into new and other potential emerging markets would improve the competitiveness of the industry. Whilst it is argued that existing markets remain the most important, the industry should also not lose sight of emerging markets or non-traditional export markets. Therefore, a balanced marketing strategy is required.

The international export market size (DM6) also received positive feedback from the experts, obtaining an impact rating score of 3.85 out of 5, and this confirms that the industry is export driven (Subtrop, 2017). This means the local industry is internationally inclined and has steadily increasing access to

international markets, particularly for avocado and macadamia nut markets, given the fact that both these industries produce high-quality products that meet international quality and safety standards (Absa, 2018; NAMC, 2017; SAMC, 2017; SUBTROP, 2017).

Table 5.10: The impact of market/demand factor conditions (Determinant MD) on the competitiveness of the South African subtropical fruit industry.

Demand functions (DM)	**Mean**	**Std. deviation**
Emerging markets impact (DM15)	4.15	.801
Chance of expansion in existing markets (DM14)	4.08	.641
USA closed market economic model (DM16)	4.08	.760
International export market size (DM6)	3.85	1.214
Diversity of new international markets (DM7)	3.23	.927
Seasonality and availability (DM9)	3.15	1.144
Brexit trade negotiation agreements (DM12)	3.15	.899
Local market size (DM1)	3.08	1.553
Adverse weather impact on consumer buying patterns (DM8)	2.77	1.423
Local consumer preferences (DM2)	2.69	1.109
Local market value growth (DM4)	2.62	1.193
Consumer education and information availability (DM5)	2.62	1.121
Local market volume growth (DM3)	2.46	1.198
NH competition (DM17)	2.15	.987

Source: Subtropical Fruit Expert Survey

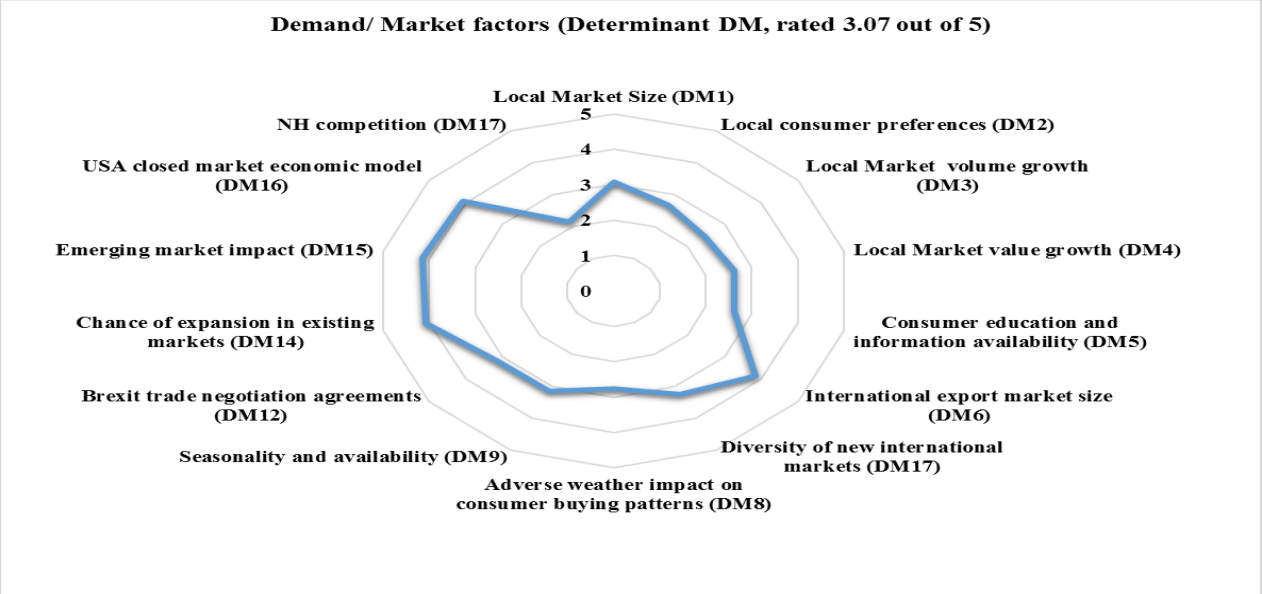


Figure 5.15: The impact of the demand/market factors on the competitiveness of the South African subtropical fruit industry.

Source: SFES (2017)

On the other hand, regarding constraining factors, the industry experts were concerned about the prospects of local market volume growth (DM03) for subtropical fruit, which received an impact rating score of 2.46 out of 5. This can be attributed to the low and poor demand for avocados and macadamia nuts in the local markets (Absa, 2017). The reason for this is that avocado and macadamia nuts are

determined by high prices and are considered as 'food for elites' in South Africa (Absa, 2018; SAMAC, 2017). Moreover, the steady growth in the subtropical formal market may partly be due to the continuous growth of direct sales from established pack houses to the informal sector and retailers (DAFF, 2017). Sustainable marketing strategies are required to ensure lucrative sales of subtropical fruit in the local markets. There could also be renewed access to the markets in the Northern Hemisphere countries (DM17), as the products of South Africa's subtropical industry have different seasonality compared to countries in the Northern Hemisphere. The country's strongest markets in the Northern Hemisphere needs to be maintained.

Principal component analysis (PCA) results: Demand and market factor conditions (Determinant DM)

Uncorrelated or 'variation-in-opinions' factors identified under the demand and market conditions determinant were: local consumer preferences (DM2), international market size (DM6), seasonality and availability of fruit (DM9), 'Brexit' trade negotiations (DM12), chance of expansion in existing markets (DM14), and increase of emerging markets (DM15) (see Appendix B2). These factors, however, may reflect the respondents' different experiences of the market.

Additionally, formulating intervention strategies to enhance the performance of the industry will require the employment of different approaches suitable for different role players involved in the subtropical fruit industry. Such detailed analysis would require a large sample size and the clustering of respondents (Abei, 2017), based on their scope of operations and positions they occupy in the value chain, in order to determine what is achievable in a collective effort. Of the nineteen factors, only four (21%) were identified as being highly correlated. These were termed as 'consensus' factors and comprised the importance of the subtropical fruit industry's relationship with mega retailers (DM1), i.e. a strong value chain relationship, the diversity of international markets (DM7), competing at the same time with NH countries (DM17), and the local market size (DM1).

5.7.5. Production factor conditions (Determinant PF, rated 2.88 out of 5)

The SFES showed that there are several factors affecting the production factor conditions (Determinant FP) of competitiveness (see Table **5.11** and **Figure 5.16**). According to Abei (2017), production factor conditions relate to primary production processes along the value chain. Furthermore, production factors are divided into basic factors and advanced factors by Porter, as referenced by Dlikilili (2018). This is also illustrated in the 'radar' format in **Figure 5.16** below. The results under this determinant revealed that seven of 20 factors of the production factor determinant were viewed enhancing the competitiveness of the industry, with values above 3 (see Table **5.11**), while the rest were considered as constraining factors.

Table 5.11: The impact of production factor conditions (PF) on competitiveness in the South African subtropical fruit industry.

Production factor conditions (PF)	Mean	Std. deviation
Technology advancement (PF8)	4.69	1.316
Unskilled labour availability (PF15)	4.46	1.330
General infrastructure (PF1)	3.92	.954
Location suitable for production (PF20)	3.85	.987
Changing industry structure (PF9)	3.62	.870
Labour saving machinery use (PF18)	3.46	1.266
Access to quality technology (PF6)	3.46	1.266
Quality research available (PF4)	2.92	1.115
Technology quality (PF5)	2.92	.862
Cost of infrastructure (PF2)	2.85	1.144
Unskilled labour cost (PF17)	2.77	1.013
Obtaining LT credit (PF10)	2.77	1.166
Technology cost (PF7)	2.54	.877
Skilled labour cost (PF14)	2.46	1.198
Skilled labour competence (PF13)	2.23	1.092
Unskilled labour quality (PF16)	2.00	.913
Natural resource access (PF19)	2.23	1.166
Establishment and production cost (PF21)	1.92	.760
Skilled labour availability (PF12)	1.85	.899
Climate impact (PF22)	1.85	.555

Source: SFES (2017)

Notes: 1 = most constraining; 3 = neutral; 5 = most enhancing

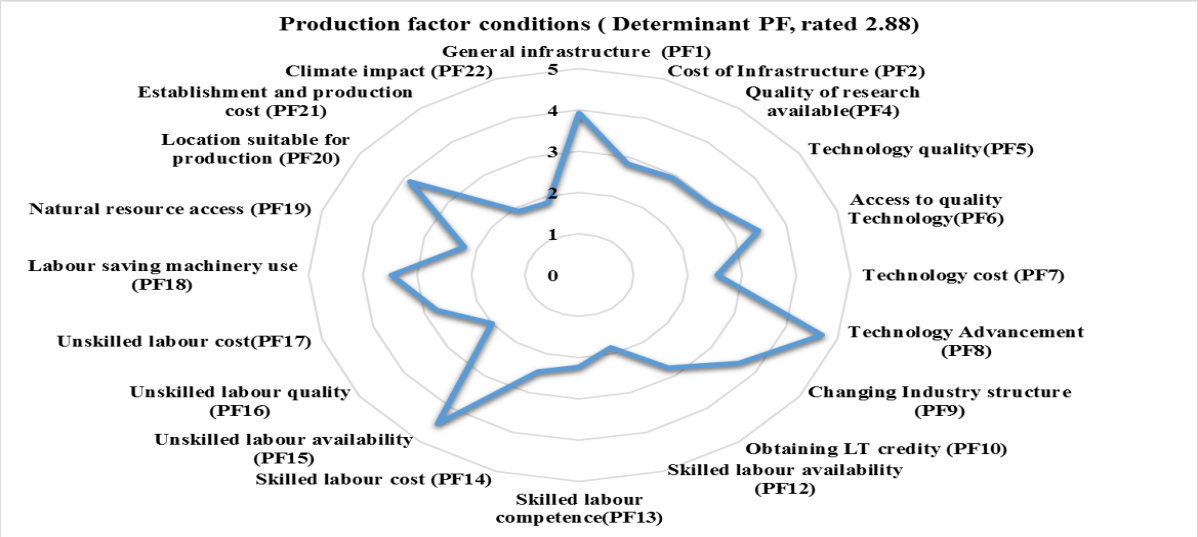


Figure 5.16: The impact of production factor conditions (PF) on the competitiveness of the South African subtropical fruit industry

Source: SFES (2017)

As reflected in Table **5.11** and **Figure 5.16**, the experts viewed advancements in technology and innovation factors as the most enhancing factor of the industry's competitive performance, with an

impact rating score of 4.89 out of 5. This corresponds with Porter's statement that industries achieve a competitive advantage through the adoption of technology and innovation (Porter, 1990). For example, in 2017, the Global Competitive Report of the World Economic Forum (2017) ranked South African technological readiness and innovation 49th out of 139 countries, with an average impact score of 4.7 out of 7.

The results also show that the ability of the industry to attract an unskilled labour force (FP15) was the second most enhancing factor, with an impact rating score of 4.46 out of 5. The Global Competitive Report of the World Economic Forum (2018) ranked South African labour market 55th out of 140 countries. The experts also viewed labour-saving machines (PF18) as an enhancing factor, which received an impact rating score of 4 out of 5. This supports the notion of the adoption of new labour-saving machinery in certain jobs as a mechanism to improve both the efficiency and productivity levels of the industry (Kramer & McMillan, 2006). Technological advancement (PF8) and labour-saving machines (PF18) also have made a crucial contribution to increasing agricultural (i.e. subtropical fruit) productivity and promoting agricultural development in all OECD countries (OECD, 2011). The fourth enhancing factor under this determinant is general infrastructure (PF1), with an impact rating score of 3.92 out of 5. This concurs with the results obtained by Angala (2015), Boonzaaier (2015) and Dlikilili (2018), who found that general infrastructure allows network development and logistical efficiency. These are necessary factors for producers to be linked to the available local and international markets. According to Abei (2017), to improve the industry's competitive performance, government should develop and effectively maintain the road links.

Among the constraining factors of the production condition determinant was the high establishment and production costs (FP21) – on-farm infrastructure and farm production-related activities. Such costs take five to ten years of farm operations before reaching the break-even point (Angala, 2015). The cost of imported machinery and inputs related to technology is relatively important (Abei, 2018). Some of these costs are related to 'administered' costs, such as energy, minimum wage labour regulations, high inputs of production, etc. The second factor constraining the industry's competitive performance was the availability of skilled labour (PF12), with an impact rating score of 1.85 out of 5. This is in contrast to the availability of the unskilled labour workforce in agriculture to carry out manual labour. Generally, there is not an abundant trained labour workforce for employment in the farming sector due to high opportunity cost and lucrative opportunities elsewhere in the economy (BFAP, 2012). This clearly threatens the production and productivity growth of this industry. Improved training programmes with incentives structured to encourage trained personnel to remain in the industry must be considered.

Among the strongly constraining factors in the industry's competitive performance identified by the respondents was climate change (PF22), with an impact rating score of 1.85 out of 5. Climate change should reflect a long-term view, and not that of seasonal variation. A collaborative effort between the industry and government is needed to address climate variation (discussed in Chapter 6 under strategies). The severe drought experienced recently in the subtropical production areas may thus have

biased this viewpoint, rather reflecting climatic variation. Climate change, however, is expected to have an impact on agricultural productivity, crop choice and food security around the world (Alam et al., 2017). In South Africa, the impact of climate variation varies by province, with the Northern Cape, North West and Limpopo provinces being worse off (Tibesigwa et al., 2017). Notably, most subtropical fruit crops are grown in Limpopo, including macadamia nuts, mango, avocado etc. This issue thus needs to be subjected to continued investigation and observation. The low quality of unskilled labour (PF16) in this determinant was also highlighted to be constraining the competitive performance of the industry, with an impact rate score of 2 out of 5. This concurs with the fact that the farming industry in South Africa sources unskilled labour either to perform permanent, seasonal or contract activities as a means of cutting labour costs. This concurs with the results of the study conducted by Dlikilili (2018), namely that, at the entry level, the country has an abundance of unskilled labour due to high levels of unemployment. The importance of labour in production dates back to the seminal work of David Ricardo, as discussed in section 2.2.3, Chapter 2.

Principle component analysis (PCA) results: Production factor conditions (Determinant PF)

The uncorrelated factors of the production factor conditions determinant obtained using PCA include cost of infrastructure (PF2), cost of doing business (PF3), quality of technology (PF5), competency levels between skilled labour (PF13), obtaining skilled labour (PF15), etc. It is worth noting that 'variation' does not really imply that such factors are invalid, but rather that there was variation in opinions and views on them and that they may require further industry-level deliberations and analysis to formulate consensus explanations and proposals (Abei, 2017; Angala, 2015; Boonzaaier, 2015; Boonzaaier & Van Rooyen, 2017; Dlikilili, 2018). This was not attempted in this study, but may warrant further research to achieve a greater level of industry consensus for the way forward. This is listed as a focus area for further research in Chapter 6. The production factor conditions determinant (PF) had 27 factors. Of all the factors, only eight (29%) were highly correlated as 'consensus' factors. These factors included: the storage used for export (PF27), local climate impact (PF22), cost of establishment and production (PF21), use of labour-saving machines (PF18), quality of research (PF4) and obtaining skilled labour (PF12). The highly correlated factors achieved through PCA indicate that the respondents agree on the rating, and they would give a comprehensive basis for immediate collective industry actions.

5.7.6. Chance or opportunity factors (Determinant C, rated 2.27 out of 5)

This determinant received the lowest average rating impact of 2.27 out 5 among the Porter Diamond determinants (see Table **5.7**), showing a constraining impact on industry competitiveness. These are all competitiveness factors that fall outside the direct control of the industry and of firm-level actions (Porter, 1998). These factors influence the competitiveness of the industry (Mashabela, 2007). All these events may create forces that reshape the industry's structure, allowing the industry to improve its

competitiveness or allow new industry players to take advantage of opportunities created by a reshaped industry structure. Ten chance factors influence the competitiveness of the subtropical fruit industry. These factors include exchange rate fluctuations (C2), with an impact rating score of 2.92 out of 5, global recession (C10), rated 1.02 out of 5, cost implications of crime (C6), rated 1.15 out of 5, social unrest (C4), with an impact rating score of 1.43 out of 5, etc. (see Table **5.12** and **Figure 5.17**).

Table 5.12: The impact of chance or opportunity factors (Determinant C) on the competitiveness of the South African subtropical fruit industry.

Chance or opportunity factor (C)	Mean	Std. deviation
Current exchange rate (C1)	4.08	.641
Exchange rate fluctuation (C2)	2.92	.862
Ability to utilise unfavourable weather conditions (C3)	2.77	.927
SA economic development and growth (C8)	2.54	1.266
International events (C9)	2.38	1.121
Health-HIV/AIDS, TB, etc. (C7)	2.15	1.214
South African political system (C5)	1.69	.630
Social unrest (C4)	1.54	.877
Global recession (C10)	1.31	.480
Crime (C6)	1.15	.376

Source: SFES (2017)

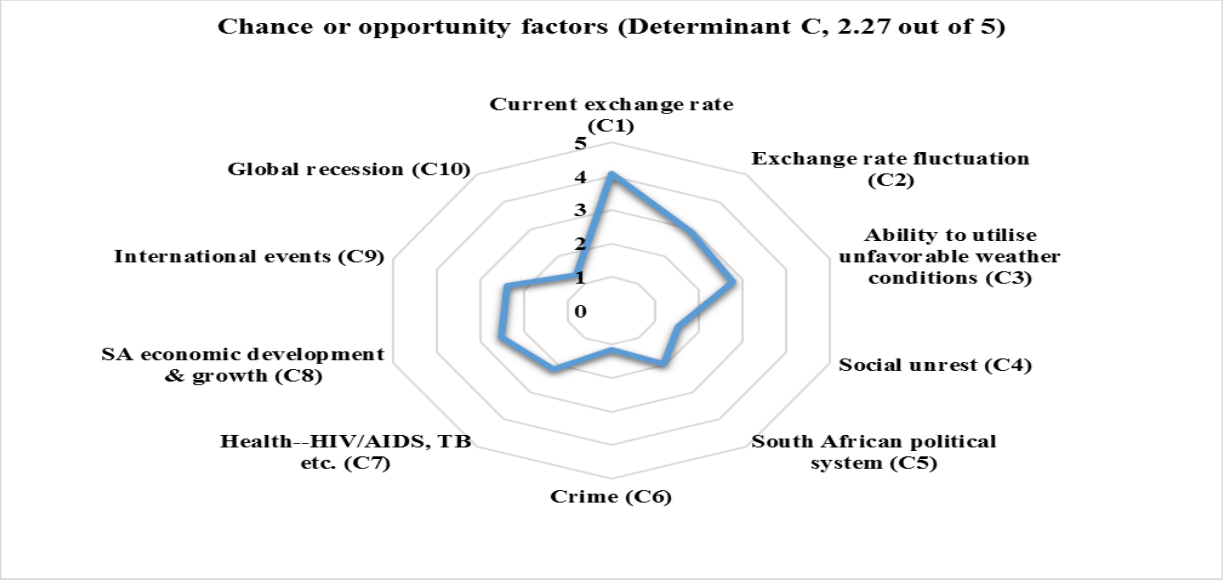


Figure 5.17: The impact of chance or opportunity factors (Determinant C) on the competitiveness of the South African subtropical fruit industry

Notes: 1 = most constraining; ... 3 = neutral … 5 = most enhancing
Source: SFES (2017)

From Table **5.12** and **Figure 5.17**, it is clear that the exchange rate, i.e. decreasing value of the ZAR (C1), was viewed by the respondents as a highly enhancing factor in relation to the competitiveness of the industry, with an impact rating score of 4.08 out of 5. The ZAR has decreased gradually, from a rate of R 6.94 to the euro, R 9.12 to the pound sterling (GPB) and R5.49 to the US dollar ($) in 1998, to 2017 levels (when the opinions were gathered) of R16.77 to the euro, R18.90 to the pound sterling

(GPB) and R14.40 to the US dollar ($). Currency levels did recover and some negative views can be expected to emerge. The fluctuation in exchange rate can account for the decline and fluctuations in the RTA values. The declining value of the ZAR, however, does not only improve trade by South African firms, but also increases imported capital and production requisites (Boonzaaier, 2015). This exchange rate effect on trade performance of the subtropical fruit industry complements the Salt-Swan theorem discussed in chapter (see section 2.2.4). The theorem states that prices of a nation's tradeable goods are determined by foreign trade markets.

On the other hand, exchange fluctuation (C2) was viewed by the experts to have a negative impact on the competitive performance of the industries, with an impact rating of 2.92 out of 5. This indicates a certain degree of instability that complicates decision making in the industry (**Figure 5.3**). The global recession (C10) was viewed as potentially the most constraining factor of this determinant, scoring an impact rating of 1 out of 5. The 2008 financial crisis and its aftermath set the platform for this assessment. At a country level, policy uncertainty could threaten investment in the industry and industry planning.

Principle component analysis(PCA) results: The chance factor determinant (Determinant C)

The non-correlated variables (least correlated) identified by the PCA for this determinant are: ability to utilise unfavourable weather conditions (C3), social unrest (C4), South African political system (C5), crime (C6), health – HIV/Aids (C7), SA economic development and growth (C8), international events (C9) and global recession (C10). Social unrest, for example, is ongoing and affects the stakeholders differently. The existing 'variations' in eight factors can be attributed to the fact that different role players in the industry react differently/independently to world events. An example includes the growing global demand for South African macadamia nuts – particularly in the China and India markets (SAMC, 2017). This may give rise to challenges for local macadamia nuts producers in the long run. Generally, this determinant negatively influences the industry competitiveness. This arises from the fact that the occurrences of these factors cannot be predicted (Abei, 2017). It is important to note that the 'variation' in opinions of the respondents in this study does not mean the "uncorrelated factors" are not valid; however, there are differences in views on them and this may require further analysis – the factoring in of clusters in the presence of a larger sample size. Two of the original ten variables derived from PCA to be highly correlated were views on the impact of the exchange rate, viz, current exchange rate (C1) and fluctuation of exchange rate (C2). This determinant is generally negative in its nature and this might stem from the fact that the occurrence of the events cannot be predicted. Developing instant strategies may also be challenging, because one strategy can work perfectly in a particular year and fail the following year.

5.7.7. Government support and policies (Determinant G, rated 2.26 out of 5)

Government support and policies (Determinant G) are shown in Table **5.13** and Figure **5.18**. Government actions, through support systems, legislation and policies, play a direct role in creating the economic system in which industries and firms do business and compete (Boonzaaier & Van Rooyen, 2017; Porter, 1990). The views on competitiveness expressed in the SFES under government support and polices were listed as a major negative factor affecting the competitive performance of the subtropical fruit industry.

Complying with regulatory standards (G11) and regulatory standards stringency (G10) were rated by the experts as having a positive current impact on the competitive performance of the subtropical fruit industry, with impact rating scores of 3.61 and 3.31 out of 5 respectively. Most of the following factors under this determinant scored relatively low, viz uncertainty about South African land reform policy (G2), with impact rating score of 1.46 out of 5, especially the inconsistent and unclear application and provisions.

The lack of capacity to implement South African labour law (G4), with an impact rating score of 1.85 out of 5, refers to the high rigidity of labour markets and administration of legal provisions. The credibility of politicians (G8), referring to unclarified and unreliable political opinions, and Agri-BEE (G7), with an impact rating of 1.85 out of 5, include unclarified specifics on the transformation programme, and corruption and nepotism (G15), to name some constraining government actions.

Table 5.13: The impact of government support and policies (Determinant G) on the competitiveness of the South African subtropical fruit industry.

Government support and policies	**Impact rating**	**Std deviation**
Complying with regulatory standards (G11)	3.62	0.961
Regulatory standards stringency(G10)	3.31	0.93
South African trade policy(G1)	2.92	0.954
Legal factor impact (G14)	2.77	0.832
South African competition (G15)	2.46	1.127
South African macro-economic policy (G4)	2.23	0.832
Administrative regulations (G12)	2.15	1.291
Taxation system (G13)	2.15	0.987
Water Regulation Act (16)	1.92	1.115
South African labour policy (G3)	185	0.899
South African BEE policy (G7)	1.85	1.068
Corruption, nepotism and opportunism(G15)	1.85	0.801
Credibility and reliability of political system(G8)	1.85	0.987
Credibility and reliability of current politicians (G7)	1.69	1.109
South Africa land reform (G2)	1.46	0.967

Source: Subtropical Fruit Expert Survey (2017)

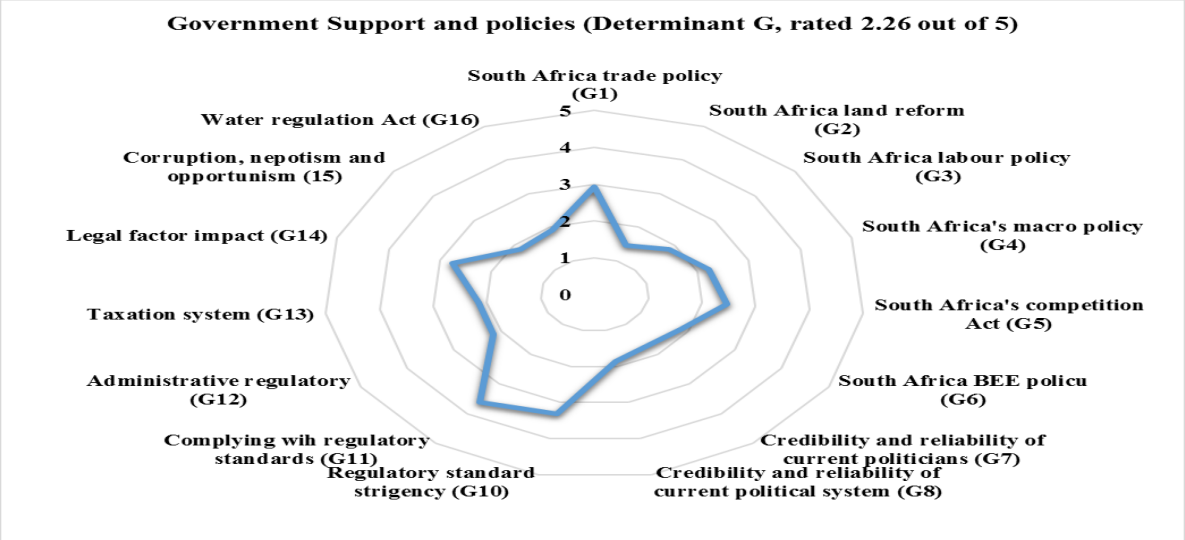


Figure 5.18: The impact of government support and policies (Determinant G) on the competitiveness of the South African subtropical fruit industry

Notes: 1 = most constraining; 3 = neutral; 5 = most enhancing
Source: SFES (2017)

South Africa is a water-scarce country and its water resources are unevenly distributed (Goldin, 2010). In the past few years, South Africa has suffered from extreme weather conditions, such as the 2015 drought, and unpredictable rainfall. The fruit industry of South Africa faces the challenge of water restrictions and high temperatures (BFAP, 2017). The water shortage in South Africa has a significant impact on agricultural products, and this may be associated with the reduction in production of macadamia nuts in 2015/2016 and other issues such as the colouring of the fruit of subtropical crops. Therefore, the Water Regulation Act (G16) was viewed by the respondents as constraining the competitive performance of the industry, with an impact rating score of 1.92 out of 5.

Principal component analysis (PCA) results: Government support and policies (Determinant G)

The detailed statistical results of the PCA are discussed below. Eight of the original 16 variables in the PCA were indicated as being highly correlated, and these factors include SA macro-policy (G4), SA competition (G5), SA BEE policy (G6), creditability and reliability of the current politicians (G7), creditability and reliability of the current political system (G8), complying with the regulatory standards (G11), taxation system (G13), and corruption, nepotism and opportunism (G15). Concerning the incidence of corruption, South Africa was ranked 61 out 140 countries by Word Economic Forum (WEF, 2018) in the global competitiveness report. The following factors were identified by PCA as non-redundant (least correlated variables) for the entire sample: SA trade policy (G1), SA land reform (G2), SA labour policy (G3), regulatory standard stringency (G10), legal factor impact (G14) and Water Regulation Act (G16). This also requires a further detailed analysis using a larger sample size and a detailed cluster analysis. A better understanding of these policies with a large degree of consensus will improve agreement on measures and actions directed at improving the industry's performance levels.

5.8.Cronbach's alpha reliability test (internal consistency)

Cronbach's alpha is expressed as a numerical number between 0 and 1 (Reynaldo & Santos, 1999; Tavakol & Dennick, 2011) and is aimed at analysing the internal consistency of the primary data collected during the first round of Delphi.

Table 5.14: Cronbach's internal consistency results of the Porter Diamond determinants

Determinants of competitiveness model	Cronbach's alpha (α) value	Comment on the level of internal consistency
Production factor conditions	0.71	Good
Demand/market factors	0.71	Good
Related and supporting industries	0.82	Excellent
Firm strategy, structure and rivalry	0.63	Acceptable
Government support and policies	0.76	Good
Chance or opportunity factors	0.65	Good

Source: Author's own calculation based on SFES (2017)

This analysis was based on Porter's six determinants of competitiveness to test the internal consistency in the experts' opinions using Cronbach's alpha. The results of the internal consistency reliability scores indicate that the responses from the subtropical fruit survey have a high level of internal consistency. This means that the set of questions asked in the first round of the Delphi analysis shows the interrelatedness of the items asked about in the questionnaire regarding factors affecting the competitiveness of avocadoes and macadamia nuts. Moreover, a high coefficient of alpha does not necessarily always mean a high degree of internal consistency (Tavakol & Dennick, 2011).

Cronbach's alpha of the correlated factors affecting industry competitiveness

The correlated factors from the PCA results relating to the impact on competitiveness were further used to analyse the internal consistency reliability of the questions in the questionnaire, using the Cronbach's alpha coefficient. The Cronbach's alpha analysis of reliability is a step toward the development of industry operational strategies (Step 5 in Chapter 3), since it measures the interrelatedness of factors. Applying an iterative process on the 30 correlated factors (consensus factors in PCA results) was assessed and factors that would improve the reliability of the strategic framework through their omission were deleted from the group of factors.

Three factors, namely; general infrastructure (PF1), competition for resources (FS12) and credibility and reliability of current political system (G8) were removed from the strategic framework to give 27 factors in the final correlated factors (refer to Table **5.15**). The three factors were rejected based on their low level of internal consistency reliability. When the alpha is low due to a poor level of interconnectedness between the samples, some of the test items should be revised or deleted (Tavakol & Dennick, 2011).

In the final set of factors, a Cronbach's alpha coefficient value of 0.745 was achieved, and this indicates a higher level of internal consistency. In other words, factors asked about in the questionnaire are correlated with each other. This was done to achieve trustworthy results that can be used in formulating industry-level strategies to improve factors constraining competitiveness.

Table 5.15: Cronbach's alpha of the correlated factors affecting industry competitiveness

Reliability statistics

Cronbach's alpha	Cronbach's alpha based on standardised items	Number of items
.745	.752	27

Item-total statistics

	Scale mean if item deleted	**Scale variance if item deleted**	**Corrected item-total correlation**	**Cronbach's alpha if item deleted**
Cost of technology	76.31	92.897	-.002	.752
Unskilled labour quality	76.85	86.641	.363	.732
Use of labour-saving machinery	75.38	88.423	.152	.747
Local climate impact	77.00	94.500	-.108	.752
Industry productivity levels	75.77	87.026	.426	.731
Industry efficiency	75.62	80.423	.671	.711
Transport for export	76.08	91.910	.049	.750
Local market size	75.77	84.026	.253	.742
Consumer education and availability of information	76.23	87.359	.240	.740
Effect of adverse weather on consumer buying patterns	76.08	88.077	.132	.751
Seasonality and availability	75.69	85.564	.320	.734
Brexit trade negotiations agreement	75.69	87.731	.303	.736
Chance of expansion in the existing market	74.69	89.564	.227	.740
Competition with NH countries	76.77	83.526	.595	.720
Evaluation and testing of new science	75.85	81.308	.490	.721
Cost of specialised technology services	76.77	85.526	.537	.725

Storage, packing, product-handling facilities availability	75.15	89.641	.202	.741
Management of market intelligence	75.31	94.231	-.080	.756
Economies of scale	74.31	95.564	-.216	.755
South African trade policy	75.92	86.744	.337	.734
South African labour policy	77.00	85.500	.441	.728
South African macro-economic policy	76.62	82.090	.720	.713
Regulatory standards	75.54	88.436	.405	.733
Administrative regulations	75.85	86.474	.229	.742
Taxation system	76.69	82.731	.553	.719
Current exchange rate	74.77	90.192	.250	.739
South African economic development and growth	76.31	91.397	.026	.757

Source: Author's own calculation based on SFES (2017)

Table **5.15** shows the 27 final factors that have an impact on the competitiveness of the industry that were sent back to the experts in the second round of the Delphi analysis. This was done primarily to assess the long-term relevance of impacting factors on the current performance of the industry. Consequently, some of these results of the second round were then used to design and construct an industry-level strategic framework to improve the competitive performance of the industry by focusing on those factors that constrain the industry's competitiveness.

5.9.Delphi analysis round two: rating the relevance of factors

The second round of Delphi analysis invited the same respondents who participated in the first round to rate the long-term and sustained relevance of the highly correlated factors identified in the Cronbach's analysis. The second round of Delphi analysis divided the Cronbach's alpha results into correlated factors based on the Porter Diamond determinants. These factors were then rated by the experts on the level of long-term relevance, using a Likert scale of 1 to 5, with 1 representing no long-term and sustained relevance of the factor and 5 representing a high level of long-term relevance of the factor for the industries. Ten experts participated in the second round, representing a response rate of 71%. This section signifies the possible tensions that exist between what is expected to sustain the competitiveness of the industry (relevant) and what is currently happening and affecting the industry (i.e. current impact factors). Angala (2015) recommends that such a "performance gap" needs to be explored further to prevent current factors from only determining strategic directions. As an extension of the conventional Porter Competitive Diamond analysis, this

section explores the 'performance gap' using the Delphi analysis results on an X-Y scatterplot for each Porter determinant (refer to **Figure 5.19** to **Figure 5.24**). The X-Y scatterplot provides visual identification of determinants that are critical to the industry based on their current impact and their relevance to the industry's competitiveness (Dlikilili, 2018).

The factors in the top left corner of the quadrant show the determinants that are highly relevant for sustained development and that are currently constraining competitive performance, and these need to be restructured through several strategies to close the performance gap in order to increase their impact and to be sustained as such. The critical determinants in the top right corner of the quadrant are currently and in the long term contributing to the successful competitive performance of the industry, i.e. relevant and currently enhancing competitive performance. Such determinants need to be managed efficiently to remain in the positive space, i.e. 'maintenance determinants'. The factors in the bottom left corner of the quadrant show the determinants that are least relevant from a long-term viewpoint but currently are the constraining the competitive performance of the industry the most. These determinants will need a serious and immediate focus and could be costing the industry to a certain degree. On the bottom right of the quadrant are determinants that enhance the industry's current competitiveness but are not relevant in the long term. Immediate, short-run solutions may be required here. In general, the focus should be on the top half of the matrix – solving immediate and relevant problems if a sustained competitiveness development path is being sought.

5.9.1. Firm strategy, structure and rivalry (Determinant E)

This determinant of the Porter Diamond model deals directly with the environment in which firms operate and make decisions, viz. firm strategy, structure and rivalry.

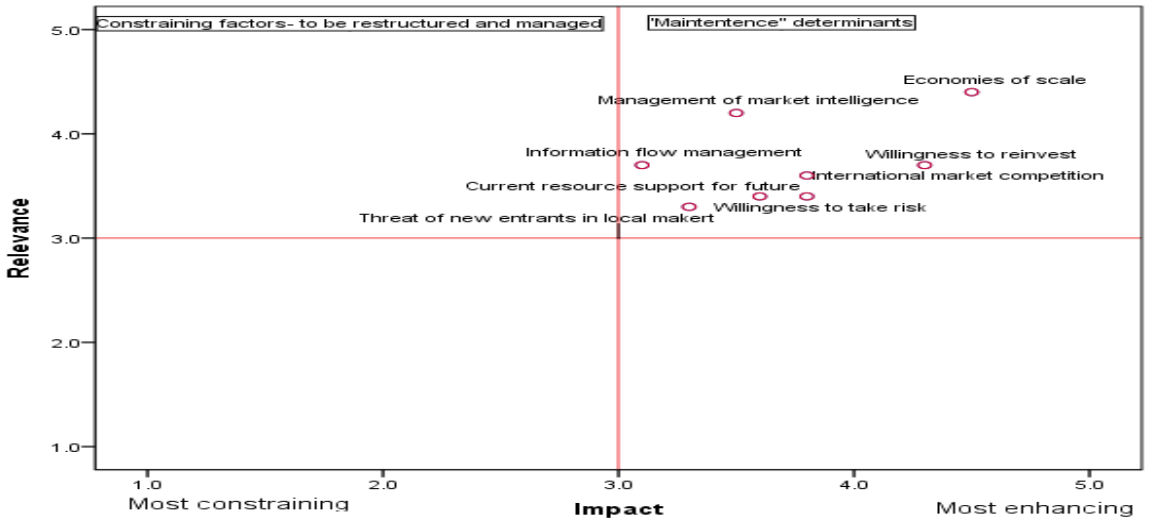


Figure 5.19: Scatterplot of firm strategy, structure and rivalry (Determinant FS)

Source: SFES (2017)

Figure 5.19 above shows variables that are relevant and currently enhancing the competitive performance of the industry. These factors include the management of market intelligence (FS3),

economies of scale (FS8), information flow management (FS1), international market competition (FS5), willingness to take risk (FS10), current resource support for the future (FS), and the threat of new entrants to the local market (FS5). All these factors need to be managed and maintained to sustain their impact.

5.9.2. Related and supporting industries (Determinant RS)

These factors include the effective support services environment – electricity supply, effectiveness of cold-chain management, transport, etc. The most relevant, highly constraining factors under this determinant, as shown in the top left corner of the quadrant in Figure **5.20**, include electricity supply (RS8), effectiveness of cold-chain management (RS18), cost of specialised technology (RS11), and financial service providers (RS1).

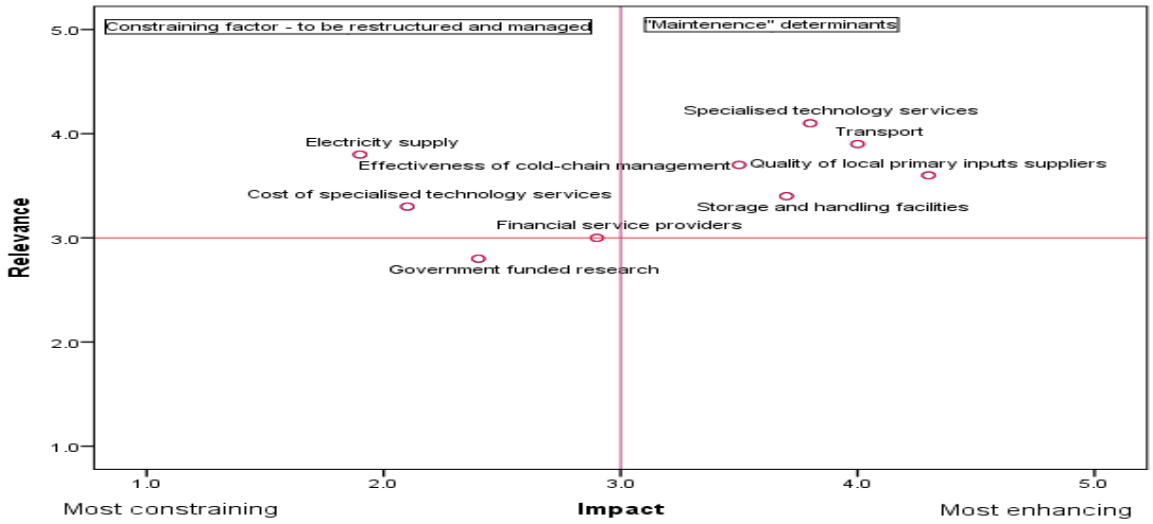


Figure 5.20: Scatterplot of related and supporting industries (Determinant RS)

Source: SFES (2017)

The experience of electricity cuts and 'time-outs' that were experienced in South Africa in early 2008 will not disappear soon. South Africa's economy remains vulnerable to a shortage of power supply. Electricity supply is imperative in agriculture, and a shortage in supply has negative implications for the industry. Therefore, producers are always concerned about the current and future supply of electricity during critical times such as harvesting, when there is a need for packing and cooling facilities.

The cost associated with specialised technology (RS11) has a direct impact on the industry. The effectiveness of cold-chain management (RS18) is crucial in promoting coordination along the supply chain. These factors need to be taken into consideration when planning and strategizing in order to improve the competitive performance of the industry. On the top right corner of the quadrant are currently enhancing and relevant factors in the industry's competitive performance, which include

specialised technology services (RS10), quality of local primary input suppliers (RS13), transport, and storage and handling facilities (RS15). All these factors should be managed at least to improve the current competitive performance of the industry.

5.9.3. Demand/market factor conditions (Determinant DM)

Figure 5.21 below illustrates the relevant factors that influence the competitiveness of the demand/market factor conditions of the Porter Diamond model.

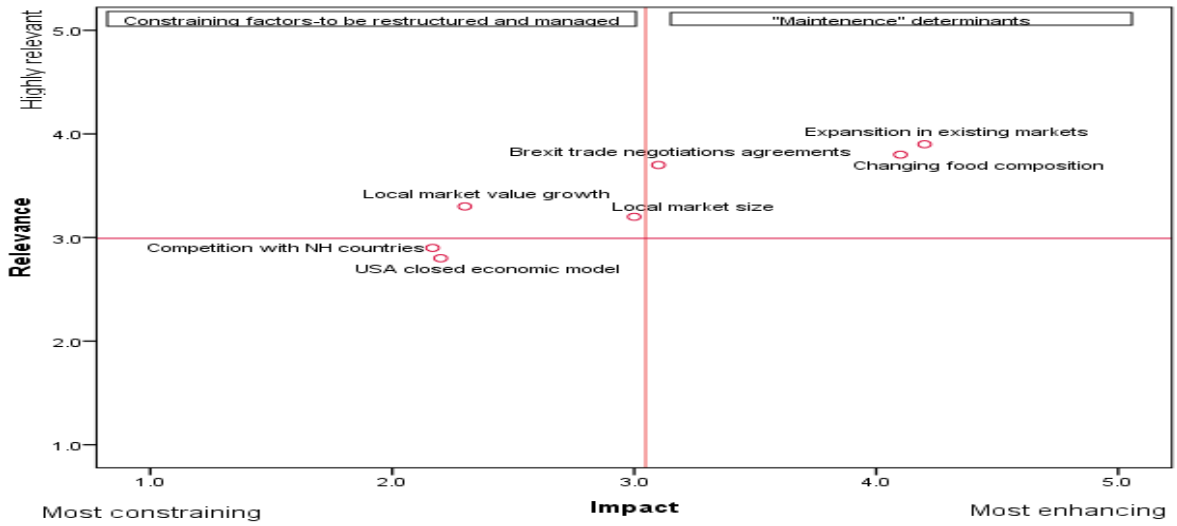


Figure 5.21: Scatterplot of demand factor conditions (Determinant DM)

Source: SFES (2017)

Constraining factors: Figure **5.21** shows the demand and market factors that are constraining the industry's competitive performance (see top left corner of the quadrant). These include the growth of local market value (DM4), local market size (DM1), and the expectations related to the Brexit trade deal (DM17). The expert participants also viewed these factors as highly relevant. There is thus a generally felt need for improvement in the growth of the local market to complement the export drive in the industry. On the top right corner of the quadrant are factors that are the most enhancing and currently relevant to the industry. These factors include the expansion of the existing market (DM), the Brexit trade negotiation agreement (DM) and changing food composition (DM). Such factors need at least to be maintained to remain enhancing to the competitiveness of the industry.

5.9.4. Production factor determinants (Determinant PF)

Figure **5.22** below provides a visual representation of production determinants that are identified as critical to the industry. Looking at the top left quadrant, the production factors (PF) that have a negative impact on the industry's competitiveness are: the cost of technology (PF7), establishment and farm production costs (PF21), high cost of skilled labour (PF14), and limited access to natural resources

(PF19). These are viewed as the main constraining factors driving the identified performance gap, and they will need an improvement in the industry's strategic planning.

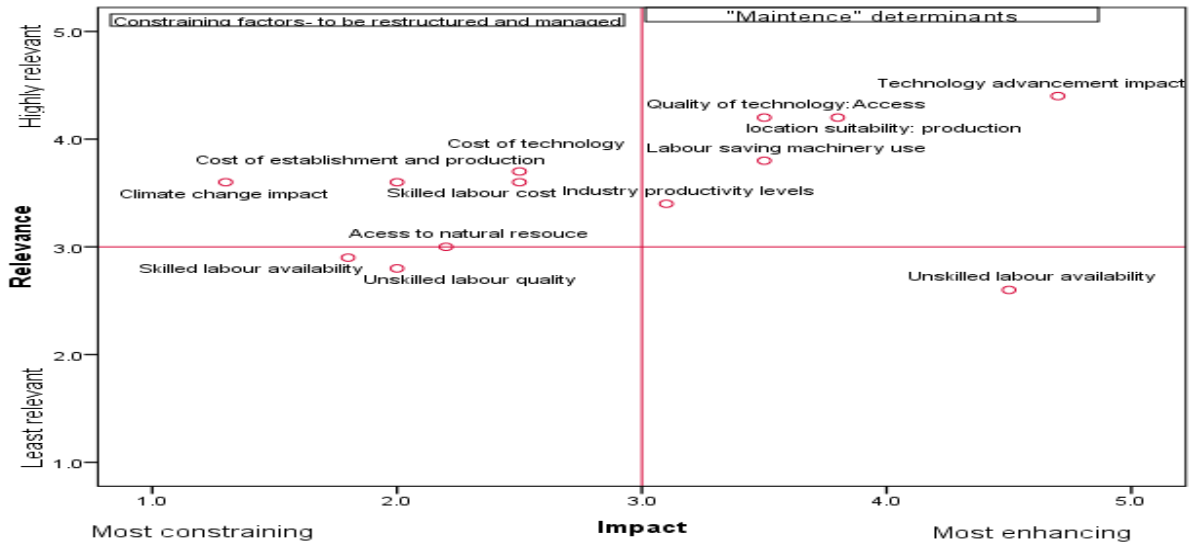


Figure 5.22: Scatterplot of production factor conditions (Determinant PF)

Source: SFES (2017)

Obtaining skilled labour (PF12) in agriculture is a problem that needs attention. The availability of high-quality land and water resources in climatically suitable regions for subtropical fruits is limited. Factors that are relevant and are currently enhancing competitive performance (on the top right corner in **Figure 5.22**) are: advancements in technology – innovation (PF8); access to quality technology (PF6); suitability of location for production (PF20); use of labour-saving machinery (PF18); and industry's productivity levels (PF23). These factors needs to be maintained.

5.9.5. Chance factor determinant (Determinant C)

To analyse the observed 'performance gap' in the chance factor determinant, **Figure 5.23** shows the X-Y scatterplot (quadrants) with the critical factors affecting the competitive performance of the industry (i.e. subtropical fruit and macadamia nuts). This figure signifies that most of the factors in this determinant constrain the competitive performance of the industry, and only one factor was determined as enhancing the industry's competitive performance.

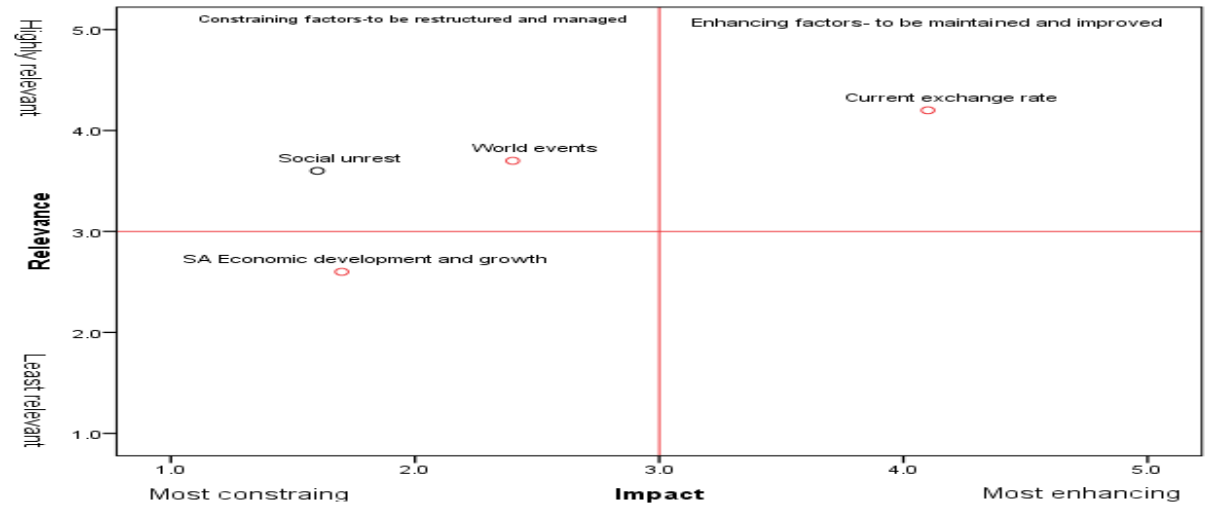


Figure 5.23: Scatterplot for the chance factors (Determinant C)

Source: SFES (2017)

The constraining factors are: social unrest (C4) and world events (C8). Although these factors fall outside the scope of the industry's control, the subtropical fruit industry needs to take them into account in its planning and management. The factor that was identified as relevant, with a positive influence on the subtropical fruit and macadamia nut industry, is the current exchange rate. The industry needs be cautious about the exchange rate, more especially relative to subtropical fruit export growth, resource allocation, the change in consumer spending patterns, private investments and employment. Social unrest, such as the 2012 farm workers' strike, requires the industry to be prepared for such interruptions.

5.9.6. Government support and policies (Determinant G)

In analysing the 'performance gap' in the government support and policies factor condition, **Figure 5.24** shows the X-Y scatterplot (quadrants) of relevance versus current impact ratings.

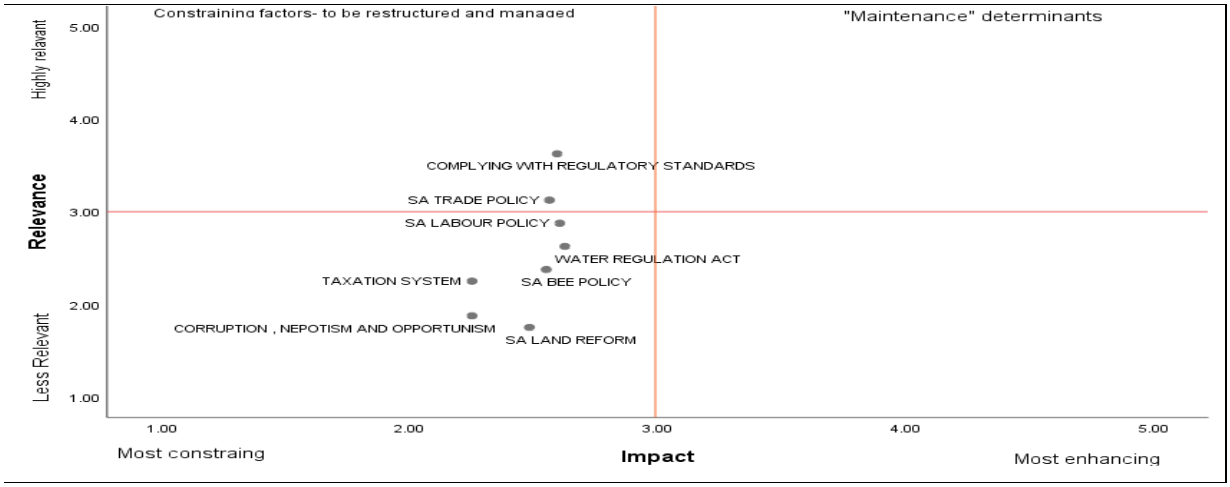


Figure 5.24: Scatterplot of government support and policies (Determinant G).

Source: SFES (2017)

From Figure **5. 24** it can be seen that the majority of the factors under this determinant have a negative impact on the industry's competitive performance and are located in the bottom left corner of the quadrant.

The constraining and less relevant factors are: the Water Regulation Act (G16), corruption, nepotism and opportunism (G15), the taxation system (13), the SA BEE policy (G6), SA land reform (G2) and SA labour policy (G3). These were identified as concerning factors and are perceived to undermine the strategic positioning of the local subtropical fruit industry. The constraining and less relevant factors include complying with regulatory standards (G11) and SA's trade policy (G1) maintenance factors (see the top-right corner of the quadrant in **Figure 5.24**). These two factors are relevant and need industry-based decision to be taken in consideration.

5.10. Conclusion

The focus of this chapter was to assess the competitive performance of the South African subtropical fruit industry, making use of all the information gathered and analysed previously. Following the proposed analytical framework, the chapter started by measuring the competitive performance of the industry through the RTA formula (Step 2 of the analytical framework explained in Chapter 3). The results of the ITC data RTA index revealed that the subtropical fruit industry of South Africa was competitive globally from 2001 to 2014, becoming less competitive since then. This means the industry's export market has been losing its international competitive status during recent years. The industry statistics, however, are somewhat misleading, as individual groupings show very different performance levels. When comparing individual SA subtropical fruit types, macadamias outperformed all other selected subtropical fruit types, recording a high RTA value – even above 120 in the 2014/2015 marketing years. Avocados also consistently performed competitively, albeit lower than macadamia nuts, together with mangos. Bananas and kiwi fruit did not compete successfully.

Generally, it was also established that the subtropical fruit industry is losing its competitive performance status, including that of macadamia nuts. Strategic changes may thus be required. It was also noted that South African subtropical products compete with countries in the NH and need to consider the counter-seasonal production of countries in the SH – where they enjoy the same production season. In the SH region, the country was outperformed only by Australia in terms of macadamia nuts when considering RTA values. In terms of avocado, Peru outperformed the world's major exporters from the 2013 to 2016 marketing years. This could be attributed to the growing avocado plantations in Peru, amongst other things. On the other hand, Mexico has shown an increasing competitive advantage in terms of avocado in the NH. Since 2000, the Mexican avocado industry has been by far the strongest and the most globally competitive.

Trends in the RTA values of the primary and processed subtropical fruit (pineapple juice) industries of South Africa differ to certain degree from those of the country's major trading competitors. Moreover, an increase in the competitive performance of pineapple juice was observed as one moves along the value chain from primary pineapple to pineapple juice.

Step 3 of the analysis entailed the identification of factors affecting the competitiveness of the industry and the extension of the conventional approach of previous studies of competitiveness; hence, the two-step Delphi analysis was added. A total of 101 factors were identified and grouped into the six Porter determinants. In Step 4, the Delphi analysis was introduced to achieve a more eligible and comprehensive analysis of expert opinions and views. Principal component analysis (PCA) was conducted to give interesting pointers as part of the analytical framework to determine whether the questions in the SFES represented a correlation or variation in the views or opinions of the respondents. This was done to aid the second step of the Delphi analysis. The results of the Cronbach's analysis showed that 48 factors were highly correlated.

Steps 4 was the second round of the Delphi analysis, and the questionnaire survey that was drafted on the basis of the results of the Cronbach's alpha was sent back to the group of experts who participated in the first round to rate the relevance of factors that were described as highly correlated. Key enhancing factors with a high level of internal consistence were identified, as they need to be maintained. The constraining factors with relevance included factors such as quality of unskilled labour (PF), cost of skilled labour (PF), cost of specialised technology (FS10), land reform policies (G), AgriBEE policy (G), etc. Most of the constraining factors fall outside the industry's scope of control. The findings of this chapter are not in consonance with the results of the available studies (Boonzaaier, 2015; Dlikilili, 2018; Jafta, 2014) on the competitive performance of the South African fruit industry. The following chapter gives an in-depth analysis of the key findings, and makes recommendations and proposals (see Step 5 of the analytical framework) for strategies to enhance the competitive performance of the subtropical fruit industry in the global market environment.

Chapter 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

To manage the competitiveness of an agricultural industry, one firstly needs to define the concept of competitiveness in the context of the situation at hand, and then measure, analyse and understand such performance in order to identify factors and determinants of the performance so as to design and implement suitable improvements. This was the focus of this study on the competitiveness of the South Africa's subtropical fruit industry. In this chapter, conclusions are drawn from the findings in the previous chapters to propose strategic actions aimed at improving and maintaining the competitive performance of the industry (Step 5). Declarations on the outlined research questions and stated hypotheses will also be made, as well as recommendations for further research.

6.2. Summary of major findings

The problem statement of the study was to formulate a theoretically sound industry-wide analysis of competitive performance. The overall objective of this study was to qualitatively and quantitatively assess the competitive performance of the South African subtropical fruit industry in the global market. Chapter 1 focused on the identification of the research problem, outlining the objectives and the research questions, and formulating the hypotheses along with the delimitations of the study.

Chapter 2 is the literature review on the theoretical evolution of the term competitiveness. A definition of competitiveness applicable to and adapted in this study was drawn from this chapter. For the current study, competitiveness is defined as "the ability of the South African subtropical fruit industry to trade its products in both domestic and international market on a sustainable basis, while earning at least the opportunity cost of returns on the resources engaged" (adapted from Freebairn, 1986). Thus, this encourages the ability to attract scarce resources such as land, human capital, labour and capital from other economic activities. This definition was chosen on the basis that it is inclusive of opportunity cost, which allows the consideration of other alternatives competing for scarce resources. This definition, together with the Porter Competitive Diamond model of enquiry, shifts the analysis away from a study of comparative advantage to a study of competitive advantage.

Various methods and indices used to measure competitiveness in agricultural industries and in related disciplines are mentioned in this chapter. This was followed by the selection of suitable methods to measure and analyse the local industry's competitiveness. The RTA of Vollrath (1991) was selected to measure competitiveness of the local industry over time in step 2 of the analytical framework. The RTA is not the only measure of competitiveness, this was discussed in Chapter 2, however it captures the broader scope of competitiveness relative to free trade environment in which competitive advantage drives the growth and to some extent survival of the industry, and it takes into account total trade-imports and exports— in order to trace competitiveness over time. A brief overview of previous studies

conducted locally and abroad on the competitiveness of several agricultural industries was also provided to support the appropriate selections.

Chapter 3 gave a detailed overview and description of the selected analytical methodological processes and data used in the assessment of competitive performance in this study. To achieve the objectives of the study, a five-step analytical framework was followed. In this chapter, this framework was discussed in detail while referencing various methods applicable to each step. Certain changes from the "conventional framework" used in these types of studies were also introduced to accommodate the nature of the subtropical fruit industry in South Africa.

Chapter 4 provided an overview of the South African subtropical fruit industry. This entailed a global overview of subtropical fruit, including production and marketing distribution. At a country level, a historical background of subtropical fruit production, current subtropical fruit plantations, their location, size, quantity and the value of the fruit produced and exported were provided. This chapter further discussed the distribution and value chain of SA subtropical fruit. Some strategic issues relating to the subtropical fruit industry were also described in Chapter 4.

The results and findings were discussed in Chapter 5. The ITC (whole economy) dataset was preferred over the FAO (agricultural commodities) dataset because of its more comprehensive nature. The ITC dataset include economy wide thus, a better inclusion of opportunity cost consideration as required by the selected definition of the study. The results from ITC RTAs showed on average the South African subtropical fruit industry had positive figures over the studied years and maintained such positive figures since 2001, with decreasing trend over the recent years. The RTA trend line of the period 2001 to 2016 was subjected to an in-depth trend analysis and three phases were identified and discussed. These are **Phase 1** (2001 to 2007): "A tough ride in global markets" – positive but fluctuating trends in competitive performance; **Phase 2** (2007 to 2010): "Climbing up the ladder" – showing a positive and increasing trend and; **Phase 3** (2011 to 2016): "Moving towards hard times" – still a competitive but a decreasing trend.

When South African individual subtropical fruit groups were analysed and compared on an annual basis, most ITC RTA values were positive in most of the studied years, indicating competitive performance, although characterised by some variations in the level of competitive performance and negative values from 2015 to 2016 – due to a decline in production as a result of drought. The avocado and macadamia RTA values were much higher than those of the other local subtropical fruit from 2001 to 2016 (with an average RTA value of 5.96 and 50.10 respectively), followed by the pineapple industry (the third highest average RTA value of 1.93). The kiwi fruit, papaya and banana fruit groups were identified as losers, as they averaged negative RTA values for the studied years.

It is important to highlight that the selection of the database and the selection of commodities for relative comparison play a significant role in measuring the competitiveness of the industry. In the subtropical value-add analysis, the observation was made only for pineapple juice due to limited trade data available

for the other locally processed subtropical fruits. The results showed a pronounced decline in the competitive performance as one moves down the pineapple value chain. In the Southern Hemisphere, the Philippines outperformed South Africa in the pineapple juice trade.

The analysis then focused on the identification and analysis of the factors that have an impact on the competitive performance of the industry. To identify these factors, the study made use of a two-round Delphi analysis to gather expert opinions and views from people who hold different positions in the subtropical fruit value-add chains. The two-round Delphi technique presented the extension of the conventional framework as applied by ISMEA (1999), Van Rooyen *et al*., (2011), Jafta (2014), Angala (2015), Boonzaaier (2015), Boonzaaier and Van Rooyen (2017) and Abei (2017).

The first round of Delphi analysis selected industry experts based on their experience in their particular field of expertise (viz. input provider, producer, packer, exporter, processor and marketer). The questionnaire was grouped into Porter Diamond six determinants, namely production factor conditions(PF), demand conditions(DM), related and supporting industries(RS), firm strategy, structure and rivalry(FS), government support and policies(G), and chance factors(C). This was followed by an explanatory recruitment letter, accompanied by a questionnaire (Subtropical Fruit Expert Survey) and were issued via email to the selected experts.

The factors identified by the Subtropical Fruit Expert Survey (SFES) were used in the first-round Delphi, in which experts identified 101 factors relating to constraints or enhancers of the competitive performance of the industry. Of all the factors rated, 93% were considered to have an impact (positively or negatively) on the competitiveness of the industry. Enhancing factors included innovation and advancement in technology, impact of economies of scale, willingness to reinvest, changing demand composition and exchange. On the other hand, factors such as South African land expropriation without compensation expectations, crime, global recession prospects, and social unrest were viewed by experts to have a negative impact on the competitive performance of the industry.

In step 4 of the analytical framework, the aim was to analyse the factors rated by the SFES to obtain the major constrainers and enhancers of the competitive success of this industry. sssSimilarities and variations in these factors were also considered by using principle component analysis (PCA), and factors (variables) that were identified to be highly correlated (i.e. individual ratings viewed as very similar) and uncorrelated (that is, factors that were rated by respondents more varyingly) were identified.

Applying this iterative process, of the 101 total factors, 30 were found to be highly correlated in consensus when using the PCA analysis. The highly correlated factors included economies of scale opportunities, growth in value of the local market, complying with regulatory standards, availability of skilled labour, quality of unskilled labour, and costs of specialised technology services. These 30 factors were further analysed using Cronbach's alpha to test the level of internal consistency reliability. These

are factors that would improve the reliability of the strategic framework (step 5). The Cronbach's alpha coefficient was 0.761 across all the tested factors, showing a high level of internal consistency.

Three factors, namely general infrastructure (PF1), competition for resources (FS12) and credibility and reliability of current political system (G8), were rejected from the strategic framework, leaving only 27 factors to be included in the final strategic framework. The remaining 27 factors were then included in and subjected to the respective Porter Diamond determinants, viz. Firm strategy, structure and rivalry (FM), Related and supporting industries (RS), Demand/marketing factor conditions (DM), Production factor conditions (FP), Chance opportunity factors (C) and Government support and policies (G).

In the second round of the Delphi analysis, the 27 identified factors were rated in terms of long-run relevance to the current industry's competitive performance using the X-Y scatterplot. This process was carried out to permit possible strategic planning that would combat the constraining factors and improve or maintain the competitive performance of the industry. This final step in the analytical framework is described (see section 6.3) in this chapter.

6.3. Setting a strategic planning framework for the global competitive performance of the South African subtropical fruit industry

Based on the findings of a declining trend in competitiveness in the industry, the purpose of this section is to derive and formulate an industry-wide strategic agenda and actions suitable to enhance the competitiveness of the subtropical fruit industry's position in the global market. It is worth noting that these strategy proposals are derived from the findings and results of this study, most of which were guided by experts participating in the two-round Delphi analysis. As mentioned in Chapter 1, there is no existing Subtropical Fruit Industry Strategic Plan (SFISP),together with a lack of research and popular literature that directly addresses the competitive performance of the industry and trade data discrepancies. Consequently, this study and the proposed strategic recommendations may give rise to new agenda items and ways to enhance the competitive performance of the industry.

These proposed strategies were not, however, tried and tested through broad participative industry sessions – at best, they must be viewed in the context of the current study as strategic advice and intelligence for the industry to consider, perhaps through an extended Delphi analysis process. Therefore, the proposals should only be viewed as an effort to focus the agenda on some priority areas gained from the analysis. It is also important to note that no firm-level strategies are proposed in this section, as the study did not go into that level of detailed analysis.

The industry-level strategic actions and recommendations were derived in terms of the Porter Competitive Diamond model from the findings of round two of the Delphi analysis (see **Figures 5.19** to **5.24**), using the X-Y scatterplot results of 'impact rating – based on first-round results' and 'relevance score – based on the second-round results'. These findings provided a visual identification of critical

determinants of the industry, based on their immediate impact and long-term relevance to the South African subtropical fruit industry's competitive performance.

6.3.1. Focus points for industry-level strategic actions

The Porter Competitive Diamond model is used in this section to structure 19 relevant proposals in order to provide a consistent framework of reference.

Proposals for production factors determinant as per the scatterplot "to be constructed and maintained":

- Human resource development along the value chain*:* A joint effort by the industry and government is required to upgrade and transfer skills and to improve training and sustainable employment. Particular focus must be placed on farmworkers' performance of specialised activities (i.e. irrigation, harvesting, sorting and cracking in the local industry), farm-level management, technical and professional services, etc. Constant re-skilling will be required to accommodate technical innovation and job changes related to such innovations It is also important that a skilled labour force is drawn to the subtropical fruit industry, and that productive labourers are retained through regular and progressive vocational training, awards and remuneration of recognition. Workers can also be awarded business shares as a mechanism to retain them after skills upgrading.
- Reduction in overall and per unit cost of establishment and production: This requires the adoption of effective cost-saving and yield-increasing production innovations, and improved business management efficiency in the industry. Establish public-private collaboration to strengthen innovation and technological renewal to develop and apply innovations in the industry, such as smart water technologies in irrigation techniques and water recycling to sustain the industry (Dlikilili, 2018). There is also a need to identify critical points in the industry's value chain through improved coordination so that transaction costs can be kept to a minimum level to improve the industry's international competitive performance.
- 'Smart fresh' innovations: A focus on new cooling and temperature-control technology, climate and moisture-management tools, fruit-handling systems, fruit thinning and harvesting platforms, chemical and fertiliser application equipment, etc. is also required (BFAP, 2018).
- Climate change impacts and related variations: The industry, in collaboration with government agencies, needs to expand research to track and project possible climate variation, and its possible impacts, such as frost damage during the flowering of fruit.

Proposals for demand and market determinant as per scatterplot "to be constructed and managed":

- Improve growth in local market value: Macadamia nuts and avocados are perceived as luxury foods that are expensive (ABSA, 2018a) and, as such, low-income customers are not viewed as potential focus groups to market such products. This would require several industry initiatives to expose these groups (e.g. a large potential market) to such products. In addition, expanding the "Healthy Food Options" to promote clean and healthy eating must be extended by all subtropical fruits to cover all components of the market.
- Reaching the end consumer: Existing literature outlines that consumers spend more time on mobile and social media platforms than before (EU COMMISSION, 2017; Rodgers & Tharson, 2018). Therefore, using mobile apps such as QR, fruit blogs, etc. will not only educate consumers about subtropical fruit, but also guide them in purchasing decisions toward healthy, fresh subtropical fruit.
- Collaborative marketing: A funding contribution for sales promotions and generic marketing strategies from all components in the value chain should be considered to make subtropical fruit more visible and attractive to different groups of customers.
- Diversifying the global subtropical fruit market: More attention being paid to emerging markets and growing markets like China and India for avocados would play a significant role in the future of the industry's competitiveness (Absa, 2018b; Rozana et al., 2015; Subtrop, 2017). Also, search for reliable, new foreign marketing environments and forms of marketing, and aim to increase the value of subtropical fruits exported.

Proposals for related and supporting industries as per the X-Y scatterplot "to be constructed and managed":

Porter (1990) postulated that the presence of competitive suppliers or other supporting industries plays an important role on the industry's competitive performance.

- Effectiveness of cold-chain management: This effectiveness, from the time of packaging in South Africa to delivery in the international market, is critically important to prolong the shelf-life and quality of subtropical fruit. To keep trend with global market preferences, the industry needs to evolve appropriate standards and certifications for aspects such as the correct temperatures for the produce, equipment (cold storage facilities, refrigerated road motor transport, temperature dataloggers, well-suited containers and vessels, etc.), and monitor shipments until the final destination/market. Kaplinsky and Morris (2018) add that market regulations and standards along the value-add chains have become a crucial factor affecting the capacity of producers or farmers to participate in competitive global markets.
- Cost-sharing models: Consider specialised investments in innovation and technology services through open and cost-sharing innovation models (Van Rooyen et al., 2018)
- Consistency and improved electricity supply (including renewable energy and fossil fuels): to maintain consistency in power supply by economising and investing in additional electricity supply through green energy development and other environmentally friendly energy-supply

initiatives (Angala, 2015). Inconsistent electricity supply in the subtropical fruit industry has to be attended to in an effective manner by area/time targeting and early warning in collaboration with government departments (Energy, Trade and Industry, Science and Technology). The creation and expansion of more low-cost and affordable generating points is necessary for the industry's competitive performance (Abei, 2017; Van Rooyen, 2017; Van Rooyen et al., 2018). This can be promoted by government by supporting private power-generating initiatives.

- Improved and efficient logistics and distribution infrastructure – effective infrastructure together with constant maintenance and conservation of distribution infrastructure: Logistics connect every link in the value chain and are a critical driver of competitiveness and sustainable development. Efficiency in transport and logistics is a critical determinant of the competitiveness of a country's producers and exports (Pieterse et al., 2016). This initiative can be launched in collaboration with other fruit-exporting industries and the public sector (as a component of the National Development Plan).

Proposals on firm strategy, structure and rivalry as per the X-Y scatterplot results "to be constructed and managed":

- Improved business intelligence: Enhance the 'business decision making' database and capacity building of the industry to make improved business decisions by improving industry-based 'business intelligence', for example by adding competitiveness analysis reporting by all in the value chain. Such intelligence could also be used to support and streamline industry participation and value chain efficiency. The current 'wine industry value chain round table' conducted by Vinpro sets an organisational model for such actions. This focus should include improved communication channels of information between the key industry players (i.e. marketers, traders, producers, etc.) in the value chain by promoting better and reliable knowledge of the market and appropriate planning to promote innovation and to build trust between participating individuals.
- Value chain analysis: Performing benchmarking among value chain functions to achieve better information flows, efficient cost controls and improved governance and coordination should also be considered.
- Industry strategy: Establish a Subtropical Fruit Industry Strategy Plan (SFISP) between industry and government to build/restore mutual trust and to create a "shared mission, joint vision and strategy plan". This will allow for improved, coherent and systematic strategic planning and management by the industry.

Proposals on government support and policies as per the X-Y scatterplot "to be constructed and managed":

The role of government in agriculture is viewed as essential to regulate and to support a business-enabling environment within a sustainable social structure, which drives the development of industry to improve its overall contribution to the nation's economic, social and environmental objectives (Porter, 1990). In this context, the following can be considered:

- New markets: It is essential to find new markets for local subtropical fruit (Absa, 2018). Trade policies and regulation developed should largely promote and support trade in value-added subtropical fruit products and agro-industrial products. This will sustain the integration of the industry into the global economy in order to encourage internal and external competition and allow greater access by the industry to technology and capital.
- Request a clear government support strategy: Government should also be willing to play a central, active role in providing financial support for industry initiatives, i.e. trade promotions data, research, and improving market access through good, mutual collaboration with the industry. Most importantly here will be timeous reactions to international regulations and the signing by government of such agreements. Historically, many opportunities were lost by administrative red tape and non-performance at government level. It will be necessary to consistently engage with ministers and government personnel on key industry challenges such as trade regulations, certifications, farm theft, water shortages, drought, minimum wage, land reform programmes, etc. (BFAP, 2017) to reduce the level of failure in the production line with the development of or investment in the industry. Through this platform, the industry should provide critical input to government policies, strategies and legislation, and should participate in trade missions and agribusiness developments.
- An effective Subtropical Fruit Industry Strategy and Plan (SFISP) and appropriate structures to deal with matters as mentioned above will be an important component of government strategy in relation to the industry. The creation of confidence in the country and industry should also be highly prioritised on the agenda.

The chance or opportunity factor as per the X-Y scatterplot results "to be constructed and managed:

These events are virtually uncontrollable by industry action alone and require broader society inputs to use opportunities in a constructive manner.

- Social unrest, strikes and protests: Such actions on subtropical fruit farms and along the value chain need more attention, as they hinder production and the productivity of farm activities. To overcome any acts of violence and protests on subtropical fruit farms, farm worker representation is paramount in farm management structures for communication and engagement on burning issues, such as minimum wage proposals, working conditions, and new

developments and innovations in farming. This builds honesty and trust while strengthening employee-employer relationships. External parties along the value chain and government must also play a meaningful role in bringing together all the interest groups to engage with one another, thereby avoiding protests and violence. Such an agenda could be incorporated into the SFIP. The use of the SFIP could be structured in a manner to attend to such matters.

- Megatrends and economy-wide intelligence: World events influence the performance of the industry, and such events require farmers, producers, promoters and marketers to integrate into the global economy by improving technical skills and knowledge of doing farm business in the subtropical fruit industry. Access to and interpretation of megatrends, strategic information and business intelligence should be highly rated in such actions and be conducted along the full value chain.

6.4.Reporting on the validity of the stated hypotheses

The first hypothesis stated "The South African subtropical fruit industry is viewed as performing increasingly uncompetitively in the global markets over time". This was based on the recent generalised measurements and had to be tested in this study through a comprehensive analysis. A 'five-step' analytical approach was followed in which the empirical measurement of competitive performance anchored the analysis. After measuring the global competitive performance of the local industry through trade-based RTA values, using the ITC dataset and the FAOSTAT dataset, a discrepancy was found between the respective trends. The industry performed only (marginally) competitively when using the FAO dataset, but showed competitive trends when using the ITC dataset. The chosen dataset therefore has a significant impact on the assessment of the validity of the first hypothesis. When considering the ITC data, the RTA values declined sharply from 2016, while the FAO-based RTAs increased marginally in 2013.

Further investigating this discrepancy, it was found that the FAO data does not include macadamia nuts and mango import values – both among the major exports by the SA subtropical fruit industry. ITC data included both these products, i.e. providing a better base for assessing the competitiveness of the industry. In general, the hypothesis stating that South African subtropical fruit performed in an increasingly uncompetitive manner does hold, particularly over the more recent years. However, it must be noted that, when particular products/commodities were measured, viz. macadamias, mangos and avocados (refer to **Figure 5.4**), they were found to be highly competitive, especially macadamia nuts, which had high RTA values. Bananas, papayas and kiwi fruit, on the other hand, were measured as performing uncompetitively. From this it can be concluded that a more refined, less generalised formulation of the hypothesis is needed, as "the devil is found in the details" – in this case the highly differing performance of particular commodities within the subtropical fruit industry.

The second hypothesis stated "This declining competitive performance of this industry is determined by a combination of factors such as global integration, supporting government policy, the lack of

innovation and advancements in technology, and complying with market-oriented quality standards". The findings derived from the subtropical fruit expert survey, analysed in section 5.4, show a number of factors affecting the competitive performance of the industry on the global stage. The extended analysis through PCA and the Cronbach's alpha statistical measurement confirm such differences and allow factors to be placed in the Porter Competitive Diamond, together with rating them in terms of their long-term relevance and immediate impact on competitive performance. From this, 19 strategic actions were outlined for consideration by the industry. These findings clearly support this second hypothesis, as stated.

6.5.Recommendations for further studies

From this study, a number of future research topics can be proposed:

- Improving the participative analysis: The Porter Competitive Diamond analysis requires comprehensive participative inputs to ensure a well-informed analysis. The low rate of initial responses required the implementation of expert-led Delphi procedures to give reliable evidence and inputs for strategy proposals and priority actions required. Future studies should aim to expand the participation in the first round of the analysis, allowing more intensive statistical analysis procedures.
- To have a better in-depth understanding of the industry's competitive performance, this study recommends that any future studies on the competitiveness of the subtropical fruit industry should also consider analysing particular products at firm-level competitiveness, expanding the five-step analytical framework adapted in this study to include a firm-level case study (applying a 'Triple Porter Diamond' model dealing with national, industry and firm-level analysis).
- A detailed competitive performance inquiry into the secondary/value-adding local subtropical fruit industry (i.e. avocado oil, processed macadamia nuts and mango juice) should be conducted. The framework proposed by Webber and Lambaste (2007), dealing with various considerations listed in this study, could be activated for such an extended enquiry.
- Enhance the consumer research focus and growth in the value of the local market: considering subtropical fruit consumer preferences and trends will enhance strategic action – at both the industry and firm level. Consumer education and research will help to determine the underlying reasons for the limited demand for subtropical fruit, reveal consumers' preferences (in terms of varieties and forms) in various segments (locally and globally), and help key industry players to prioritise fulfilling the needs of various market segments. Thus, a study could be conducted to analyse the needs of the subtropical fruit customer and methods to reach different target groups.
- The Delphi analyses applied in this study can be performed for an in-depth analysis to understand factors that affect each stakeholder grouping (e.g. input provider, producer,

processor, exporter, etc.) in the subtropical fruit value chain. This study has used a relatively small expert-based sample size and recent trade data (ITC). Therefore, further research is recommended using a larger sample and a more representative sample to allow the classification of respondents into clusters of the value chain (as was done by Abei (2017), Angala (2015) and Boonzaaier (2015)).

6.6.Concluding remarks

Is the South African subtropical fruit industry operating at declining levels of competitiveness? This focused the analysis of the study and it was found to be generally true. However, this finding needs to be treated with care and qualification. The South African subtropical fruit industry is export-oriented and integrated into the highly globalised international market. This orientation also affects its structure and strategy in the local market. In this study, analysing the competitive performance of the industry was therefore directly linked to the nation's trade performance – capturing both imports and exports according to Relative Trade Advantage theory (Volrath, 1998) and measurements. The problem analysed was related to generalised observations that the industry operates at a declining competitive trend. To analyse competitiveness, one needs to be able to define, measure and consider factors affecting competitiveness at different levels. This study focused on the industry level, with only some references to firm-level strategy according to the Porter Competitive Diamond model (1990, 1998).

The competitive performance of the South African subtropical fruit industry was defined for this study (see section 2.5, Chapter 2). The applied definition highlighted crucial notions relevant to the analytical approach and framework followed for trade-oriented competitiveness, i.e. the Vollrath-Porter model. It is widely accepted that competitiveness does not have a single definition, and this makes it difficult to apply and measure, hence the study developed a comprehensive analytical framework to analyse competitiveness in an economic environment influenced by trade and exports. Particularly, the notions 'sustained trade' and 'continuously' in the adopted definition require a consideration of competitive performance over a certain period, as reflected in trends. The notion of 'opportunity costs' speaks to the alternatives available across a wide range of products, industries, sectors, countries, etc., – all the possible activities that compete for scarce/limited resources, and the notion of comprehensiveness refers to the identification and inclusion of all such competing factors that have an impact on industry competitiveness.

The major finding of this study was that the South African subtropical fruit industry is marginally competitive in the global trading environment, albeit to some extent fluctuating and, indeed, as was referenced in the problem statement of this study, trending towards being uncompetitive in recent years. However, if the different subtropical products are analysed, different pictures emerge – avocado and macadamia nuts are highly competitive, followed by pineapples and mangos. Papayas, bananas and kiwi fruit are generally trading uncompetitively in global markets. In a global comparison, avocado and macadamia nuts are highly competitive when compared with the Southern Hemisphere subtropical fruit-

producing regions, which enjoy similar production seasons, although the avocado industry was outperformed by Peru.

The study identified and analysed 101 factors affecting the competitiveness of the industry on the basis of the responses of industry experts using a two-round Delphi technique. From this analysis, matrices depicting relevant and high-impact factors in the context of the Porter Competitive Diamond were drawn and resulted in 27 factors with high internal consistency reliability to give direction in strategic actions. From this analysis, a strategic agenda containing 19 points for consideration by the industry was developed. These included: improved electricity supply, effectiveness of cold-chain management, cost of specialised technology services, growth in the value of the local market, local market size, innovation to reduce the per-unit cost of technology, cost of establishment and production, impact of climate change, skilled labour cost and the improved retention of skilled labour, dealing with factors such as social unrest and world events, complying with regulatory standards, and SA trade policy. The development of a Subtropical Fruit Industry Strategy Plan (SFISP) was proposed to deal with these factors in a consistent and aligned manner, promoting collaboration between the various stakeholders in the industry value chain and with the relevant government agencies.

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APPENDIX A

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

RESPONDENT INFORMATION	
Name of Respondent:	
Contact number:	
E-mail address:	
Geographical Area: (District/Municipality)	

Subtropical Fruit varieties addressed (Mark with "x" where applicable)	Avocados	Macadamia nuts	other

Avocados: Crop Distribution (Mark with "x" where applicable)	Fresh	Dried	Processed

Macadamias: Crop Distribution (Mark with "x" where applicable)	Fresh	Dried	Shelled	Not-Shelled

Processed products type (if applicable mark with "x")	Macadamia Oil	Avo:Oil & Puree	Pineapple juice	Mango: Acher,Dried and juice

Position in the value chain: Mark with "x" where applicable * More than one position is possible	Input or Service Provider	Producer	Pack house or Processor	Exporter or Marketer	Adivisor/Informant/Consultant

If an Input or Service Provider, indicate with an "x" applicable % of resources (land, human, capital) spent on Subtropical Fruit	<10%	11%-25%	26%-50%	51%-75%	>75%
If a Producer, indicate with an "x", the applicable area (ha) under Subtropical Fruit Production	<5 ha	6 ha-15 ha	15ha-25ha	25 ha-45 ha	>45 ha
If a Pack house or Processor, indicate with an "x", the applicable volume of Subtropical Fruit (ton) handled by your business	<50 t	50 t-100 t	100 t - 500 t		>500 t
If an Exporter or Marketer, indicate with an "x", the applicable volume (ton)	<100 t	100 - 300 t	300 t - 600 t		>1000 t
If an Advisor/informant/consultant, indicate with an "X" the % of resources (Human capital e.g. time) spent on Subtropical fruit industry	<10%	11%-25%	26%-50%	51%-75%	>75%

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

PRODUCTION FACTOR CONDITIONS						
1) The general infrastructure used by the industry:						
Poorly developed and insufficient	1	2	3	4	5	Well developed and sufficient
Comment:						
2) The cost of industry infrastructure is:						
Extremely high	1	2	3	4	5	Very affordable
Comment:						
3) The cost of doing business in your industry is: (i.e. transaction costs).						
Extremely high	1	2	3	4	5	Very affordable
Comment:						
4) The quality of research available to your industry:						
Generally lags behind other industries	1	2	3	4	5	Is outstanding
Comment:						
5) The quality of technology available to your industry:						
Generally lags behind other industries	1	2	3	4	5	Is current and outstanding
Comment:						
6) Access to quality technology for your industry is:						
Difficult to obtain	1	2	3	4	5	Easy to obtain
Comment:						
7) The cost of technology is:						
Extremely high	1	2	3	4	5	Very affordable
Comment:						

8) Would technology advancement impact on the competitiveness of your business?

Marginally improve	1	2	3	5	Enhance bussiness' competitiveness

Comment; Specify the technology

9) Does the changing structure of subtropical fruit (Concentration, regulations, new markets):

Negatively influnce in the industry	1	2	3	4	5	Positively influence in the industry

Comment:

10) Obtaining long-term finance for your industry is: (e.g. loan)

Extremely difficult and too costly	1	2	3	4	5	Easy and very affordable

Comment:

11) Obtaining short-term finance of your industry is:

Extremely difficult and too costly	1	2	3	4	5	Easy and very affordable

Comment:

12) Skilled labour is:

Difficult to obtain	1	2	3		5	Easliy accessible

Comment:

13) Competency levels amongst skilled labour is:

Not very high	1	2	3		5	Is outstanding

Comment:

Comment

14) Cost of hiring skilled labour is:

Too costly	1	2	3	4	5	Very affordable

Comment:

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

15) Obtaining unskilled/Entry-level labour is:

Difficult	1	2	3	4	5	Easy

Comment:

16) The quality of Unskilled/Entry-level labour is:

Not very high quality	1	2	3	4	5	very high quality

Comment:

17) Cost of hiring of Unskilled/Entry-level labour is:

Too costly	1	2	3	4	5	Very affordable

Comment:

18) Extent of using labour saving machinery :

Currently used	1	2	3	4	5	Will be used in the future

Comment:

19) Access to natural resources (land and water) is:

Limited	1	2	3	4	5	Readily available

Comment:

20) Your location's suitability for Subtropical Fruit production is:

Not suitable	1	2	3	4	5	Appropriate

Comment:

21) Establishment-and production costs are:

Too costly	1	2	3	4	5	Very affordable

Comment:

22) The impact of local climate/weather variation (unpredicted conditions) affects your industry:

Negatively | 1 | 2 | 3 | 4 | 5 | Positively

Comment: _____

23) The productivity level of your industry is:

Very low | 1 | 2 | 3 | 4 | 5 | Very high

Comment: _____

24) The effectivity (successful in achieving a desired result) level of your industry is:

Very low | 1 | 2 | 3 | 4 | 5 | Very high

Comment: _____

25) The efficiency (input : output relation) level of your industry is:

Very low | 1 | 2 | 3 | 4 | 5 | Very high

Comment: _____

26) The transportation to export your products:

Constraints your industry's competitiveness | 1 | 2 | 3 | 4 | 5 | Enhances your industry's competitiveness

Comment: _____

27) The storage (containers) used to export your products:

Constraints your industry's competitiveness | 1 | 2 | 3 | 5 | Enhances your industry's competitiveness

Comment _____

DEMAND/MARKET FACTORS

1) The local(SA) market size is:

Unable to handle large volumes (of your produce) | 1 | 2 | 3 | 4 | 5 | Large enough and growing in demand

Comment: _____

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

2) Local consumers preference of Subtropical Fruits are:

Slow to adopt new products and processes | 1 | 2 | 3 | 4 | 5 | Actively seeking out new products and processes

Comment: _____

3) The growth in volume of the local market is: (Capacity to handle increasing volumes):

Too slow | 1 | 2 | 3 | 4 | 5 | Large enough and fast enough

Comment: _____

4) The growth in value of the local market is:

Too slow with decreasing trends | 1 | 2 | 3 | 4 | 5 | Large enough and show increasing trends

Comment: _____

5) Consumer education and availability of information, to base marketing decisions on, is:

Insufficient | 1 | 2 | 3 | 4 | 5 | Adequate

Comment: _____

6) The international Subtropical Fruit export market is:

Too small | 1 | 2 | 3 | 4 | 5 | Large enough

Comment: _____

7) The diversity (based on volume, value and variety) of new (more lucrative) international markets is:

Similar | 1 | 2 | 3 | 4 | 5 | Varied

Comment: _____

8) The influence of adverse weather conditions on buying patterns of consumers in export markets:

Dependent/ has impact | 1 | 2 | 3 | 4 | 5 | Sovereign/Independent/ no impact

Comment: _____

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

9) Seasonality and availability of the SA Subtropical Fruit Industry's competitiveness:

Negatively	1	2	3	4	5	Positively

Comment: _____

10) The availability and characteristics (profile and product) of the SA Subtropical Fruit on offer, in line with market demand:

Insufficient	1	2	3	4	5	Sufficient

Comment: _____

11) The South African Subtropical Fruit Industry's relationship with mega retailers (Shoprite, Pick n Pay,M&S, Tesco etc.)

Very Poor	1	2	3	4	5	Very good

Comment: _____

12)How will the proposed 'Brexit' trade negotitiations agreements influence your industry's competitiveness

Big impact	1	2	3	4	5	Less impact

Comment: _____

13)Changing composition of food demand (food preference):

Constraints competitiveness	1	2	3	4	5	Enhance competitiveness

Comment: _____

14)The chance of expansion in the exting market is:

Less likely	1	2	3	4	5	Very likely

Comment: _____

15) The chance of emerging markets to increase industry's level of competitiveness :

Less likely	1	2	3	4	5	Very likely

Comment: _____

16) The potential impact of "USA closed market economic model"(Trump's America first) in your industry's competitiveness :

Will constraints your industry's competitiveness	1	2	3	4	5	Will enhance your industry's competitiveness

Comment: _____

17) Being in the market at the same time with Northen Hemisphere competitors affects your industry's level of competitiveness: _____

Negatively	**1**	**2**	**3**	**5**	Positively

Comment _____

RELATED AND SUPPORTING INDUSTRIES

1) Financial service providers generally:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

2) Private-funded scientific research institutions are:

None-existent	1	2	3	4	5	The best in their fields

Comment: _____

3) Government-funded scientific research institutions(ARC , NRF etc.) are:

Do not contribute	1	2	3	4	5	They are best in their fields

Comment: _____

4) Evaluation and testing of new varieties according to industry's best practices:

Improper	1	2	3	4	5	Properly evaluated and tested

Comment: _____

5) Access to grower-club varieties:

Access to no programs	1	2	3	4	5	Access to all the programs

Comment: _____

6) Subtropical fruit Industry`s expenditure on Research & Development is :

Insufficient	1	2	3	4	5	Sufficient

Comment: _____

7) Collaboration with scientific research institutions is:

17) Being in the market at the same time with Northen Hemisphere competitors affects your industry's level of competitiveness:

Negatively	1	2	3	5	Positively

Comment

RELATED AND SUPPORTING INDUSTRIES

1) Financial service providers generally:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment:

2) Private-funded scientific research institutions are:

None-existent	1	2	3	4	5	The best in their fields

Comment:

3) Government-funded scientific research institutions(ARC , NRF etc.) are:

Do not contribute	1	2	3	4	5	They are best in their fields

Comment:

4) Evaluation and testing of new varieties according to industry's best practices:

Improper	1	2	3	4	5	Properly evaluated and tested

Comment:

5) Access to grower-club varieties:

Access to no programs	1	2	3	4	5	Access to all the programs

Comment:

6) Subtropical fruit Industry`s expenditure on Research & Development is :

Insufficient	1	2	3	4	5	Sufficient

Comment:

7) Collaboration with scientific research institutions is:

Non-existent	1	2	3	4	5	Intensive and continuing

Comment:

8) Electricity supply (including renewable energy and fossil fuels):

Constraints competitiveness	1	2	3	4	5	Enhances competitiveness

Comment:

9) Telecommunication services:

Constraints competitiveness	1	2	3	4	5	Enhance competitiveness

Comment:

10) Specialised technology services are: (E.g. computerised irrigation systems/services, smart fresh, consultants etc.)

Not available	1	2	3	4	5	Available from outstanding local institutions/firms

Comment:

11) The cost of specialised or hired technology services is:

Too expensive	1	2	3	4	5	Very affordable

Comment:

12) Availability of local suppliers of primary inputs(Fertilisers,pesticides etc.):

Largely non-existing and limited supply	1	2	3		5	Numerous and provides all necessary input components
					x	

Comment:

13) The quality of local suppliers for your industry's primary inputs is:

Inefficient and have little technological capability	1	2	3	4	5	Internationally competitive, innovative and reliable

Comment:

14) The sustainability of local suppliers of your industry's primary inputs:

Problematic	1	2	3	4	5	No problem at all

Problematic						No problem at all

Comment: _____

15) Availability of storage and packing/product handling facilities:

Not available	1	2	3	4	5	Readily available

Comment: _____

16) The cost of storage and packing/product handling facilities:

Extremely high	1	2	3	4	5	Affordable

Comment: _____

17) Availability and reliability of transport:

Unavailable and unreliable	1	2	3	4	5	Readily available and trustworthy

Comment: _____

18) Effective management of cold-chain:

Ineffective and inefficient	1	2	3	4	5	Effective and efficient

Comment: _____

19) Necessary infrastructure requirements for export purposes: (e.g. port facilities at Cape town , Port Elizabeth, Durban Harbour)

Insufficient and hinders competitiveness	1	2	3	4	5	Sufficient and improves competitiveness

Comment: _____

60% of the Questionnaire Completed

FIRM STRATEGY, STRUCTURE AND RIVALRY

1) The management of information flow from primary suppliers to your industry is:

Inadequate	1	2	3	4	5	Excellent

Comment: _____

2) The flow and use of information from customers to your industry to inform strategy is:

Inadequate	1	2	3	4	5	Excellent

Comment: _____

3) The management of market intelligence for the Subtropical Fruit industry is:

Inadequate	1	2	3	4	5	Excellent

Comment: _____

4) Competition in the local(SA) market is:

Very limited	1	2	3	4	5	Very intense

Comment: _____

5) Threath of new entrants locally (new subtropical fruit farmers) is:

Less likely	1	2	3	4	5	Highly likely

Comment: _____

6) Competition in international market is:

Very limited	1	2	3		5	Very intense

Comment: _____

7) Threaths of new entrants internationally is:

Less likely	1	2	3	4	5	Very likely

Comment: _____

8) To what extent does economies of scale(i.e extra saving in costs gained by increased production) influence your competitiveness?

Minor influence	1	2	3		5	Major influence

Comment: _____

9) Your willingness to reinvest in Subtropical Fruit operations:

Reluctant	1	2	3	4	5	Keen

Comment: _____

10) Your willingness to take risk:

Risk arverse	1	2	3	4	5	Risk taker

Comment: _____

11) Does your current resource base (in terms of land, human and capital) support future subtropical fruit operations?

Insufficient	1	2	3	4	5	Sufficient

Comment: _____

12) Competition for resources (land, information, human and capital) used by the industry vs other agricultural related activities:

Not competitive at all	1	2	3	4	5	Very competitive

Comment: _____

GOVERNMENT SUPPORT AND POLICIES

1) South Africa's trade policy:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

2) South Africa's land reform policy:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

3) The call for land expropriation without compensation will :

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

4) South Africa's labour policy(e.g minimum wage):

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

5) South Africa's macro-economic policy:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

6) South Africa's Competition Act:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

7) South Africa's BEE(transformation) policy:

Constraints your industry's competitiveness	1	2	3	4	5	Is an opportunity to increase your industry's competitiveness

Comment: _____

8) The credibility and reliability of the politicians concerning industry related matters is:

Very low	1	2	3		5	Very high

Comment: _____

9) The credibility and reliability of the current political system(i.e accountability, elections, constititutional and Parliamentary actions etc.):

Very low	1	2	3	4	5	Very high

Comment: _____

10) Regulatory standards (e.g. Products standards, energy, safety, and environment) in your opinion are:

Lax or non-existent	1	2	3	4	5	Among the world's most stringent

Comment: _____

11) Complying with regulatory standards:

Obstructs competitiveness	1	2	3	4	5	Increases competitiveness by promoting improvement

Comment: _____

12) Administrative regulations are:

Burdensome	1	2	3	4	5	Routine with minor effort

Comment: _____

13) The taxation system:

Impedes business investment	1	2	3	4	5	Promotes business investment

Comment: _____

14) Have Legal factors, over the past five years, undermined your industry's strategic positioning?

Have severely undermined strategic planning	1	2	3	4	5	Have had no effect on strategic planning

Comment: _____

15) The effect of corruption, nepotism and opportunism on your industry' competitiveness:

Impedes business investment	1	2	3	4	5	Promotes business investment

Comment: _____

16) The Water Regulation Act:

Hinges level of competitiveness	1	2	3	4	5	Does not have an impact

Comment: _____

CHANCE OF OPPORTUNITY FACTORS(factors over which your firm has no control and are external in nature)

1) The current exchange rate :

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

2) The exchange rate fluctuations:

Constraints your industry's competitiveness	1	2	3	4	5	Enhances your industry's competitiveness

Comment: _____

The Competitiveneess status of the South African Subtropical fruit Industry- Survey-2017

3) The ability of the Sutropical Fruit industry to fully utilise the effects of unfavourable weather conditions on competitors:

Incapable	1	2	3	4	5	Capable

Comment: _____

4) Social unrest (such as Xenophobia, political motivated land grabs, theft, labours strikes, etc.)

Imposes significant costs to your industry	1	2	3	4	5	Does not impose significant costs to your industry

Comment: _____

5) The South African political system in general:

Hinders competitiveness	1	2	3	4	5	Promotes competitiveness

Comment: _____

6) Crime in general

Imposes significant threath to your industry	1	2	3	4	5	Does not impose significant threath to your industry

Comment: _____

7) Health -HIV/AIDS, TB, etc. :

Imposes significant costs to your industry	1	2	3	4	5	Does not impose significant costs to your industry

Comment: _____

8)Economic development and growth in South Africa:

Constraints your industry's competitiveness	E	2	3	4	5	Is a opportunity to increase your industry's competitiveness

Comment: _____

9) To what extent does international/world events impact on your industry's competitiveness? (E.g. warfare/conflicts, international boycotts, exchange rate fluc

Big impact	1	2	3	4	5	No impact

Comment: _____

APPENDIX B

PCA results for Firm strategy, structure and rivalry determinant (FS)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.328	27.732	27.732	3.328	27.732	27.732	2.510	20.914	20.914
2	2.641	22.009	49.741	2.641	22.009	49.741	2.398	19.987	40.902
3	1.958	16.317	66.058	1.958	16.317	66.058	2.019	16.822	57.724
4	1.296	10.800	76.859	1.296	10.800	76.859	1.707	14.228	71.952
5	1.053	8.778	85.637	1.053	8.778	85.637	1.642	13.685	85.637
6	.780	6.504	92.140						
7	.414	3.454	95.594						
8	.264	2.201	97.795						
9	.147	1.227	99.022						
10	.089	.745	99.767						
11	.022	.181	99.948						
12	.006	.052	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
E12	.914	.084	.085	-.169	-.143
E10	.846	.145	-.046	.058	.257
E2	.587	.375	.047	-.358	-.021
E7	.012	.907	-.087	-.133	-.134
E8	.143	.791	.168	.184	.427
E4	.380	.755	-.020	.253	.297
E11	-.015	-.118	.946	.027	-.034
E3	.110	.143	.937	.083	.213
E5	-.048	-.036	-.013	.953	.081
E6	-.371	.357	.304	.703	-.158
E9	.130	.070	.232	-.058	.906
E1	.528	-.205	.228	-.137	-.606

All other Porter Diamond determinants were analysed using the same analysis under the PCA.