An application of a two-step Delphi model in identification of factors affecting the competitive performance of the South African citrus industry.

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Abstract:

This paper seeks to understand the underlying factors driving the success or failure of the competitive performance of the South African citrus industry. In order to do this, a two-step Delphi technique was employed to capture the opinions from selected citrus industry experts. These views were obtained using a questionnaire designed in the form of Porter Diamond model. Results reveal that a range of endogenous and exogenous factors affects positively and/or negatively the competitive success of industry. The enhancing factors include the both the quality and availability of local input suppliers, economies of scale, diversity in foreign markets and quality of private funded research. Those negatively affecting the industry include both availability and quality of skilled citrus labour, current tax system, consumer education, labour policy, administrative regulations and quality of government-funded research. From these factors, displayed in a X-Y scatterplot of "impact ratings"—based on first-step Delphi results and "relevance scores" —based on the second step Delphi results, strategies were drawn to improve the competitive success of the industry, for all determinants that were highly correlated.

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JEL CLASSIFICATION: Q17, P32

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1. Introduction

Today's global markets are gradually undergoing significant changes, such as the political changes in the United Kingdom (UK), facing Brexit, the proposed potential "closed economy" in the USA market and the African Continental Free Trade area recently signed by forty four African countries. These global changes are accompanied by an increase in world trade, which subsequently increases the level of competition the level of competition faced by domestic exporters in global markets.

It is reasons like these that have makes the matter of competitiveness vital for export-orientated agricultural industries such as the South African citrus industry. According to O'Rourke (2011), these industries cannot maintain their financial relevancy and development without harvesting and promoting competitive products. In the words of Van Rooyen, Esterhuizen and Stroebel (2011), remaining competitive is essential for the future growth of the agricultural industries. This means that firms or producers in the value chain have to place themselves in a position where they can be competitive in the global markets.

Various forms of restrictions, policies and trade negotiations between countries affect the competitive strength of a particular industry. At farm level, producers are faced with uncertain weather conditions (particularly the recent drought that has hit hard certain citrus-producing provinces) rising input costs, tough water restrictions, changing technology, and rising labour costs, etc. Others in the value chain have to contend with the stringent administrative and compliance regulations related to safety, ethical, environmental and financial requirements, increasing transportation costs (i.e. shipping), packaging and labelling regulations, etc. On the demand side, consumers are also concerned about food safety standards and health (in reference to citrus black spot), and this requires an active, efficient, competitive and sustainable economy.

With this background, the aim of this paper is to examine the underlying factors directing the competitive success or failure of the South African citrus industry. This is to be attended in terms of firstly measuring its competitive performance over time; secondly, identify and analyse the factors influencing the competitive performance of the industry; and thirdly propose new strategies that can be used by the industry as to improve its level of competitiveness.

1.1 Outline of this paper:

This paper is categorised into five sections. This section described the main objectives and research questions directing this paper. The next section provides a brief overview of the South African citrus industry and highlights key challenges currently facing the industry. The third section describes the analytical technique used to measure competitive performance over time, and it describes the Delphi method used to identify the key enhancing and constraining factors to the competitive success of the industry. The fourth and fifth sections provides key findings and conclusions, respectively.

2. Overview of the South African citrus industry

The South African citrus industry is characterised by a diversity of growers, fluctuating from large and highly profitable commercial producers to small-scale emerging black producers who mostly sell their products in local markets. The industry supplies numerous varieties of citrus, such as soft citrus, lemons, limes, orange and grapefruit. These citrus fruit are grown in fifteen regions across the country, with Gauteng and Free State province being the provinces not producing citrus. Orange is by far the most produced citrus fruit in the country and is produced in the Eastern province (produces about 41% of Navels) and Limpopo province (produces about 51% of Valencia oranges) (CGA, 2016a). Overall, the industry harvests more than two million tonnes of fresh citrus each year, of which about 70% is distributed in

numerous foreign markets, 24% is supplied to the domestic market and the outstanding quantities are sold to processing industries (CGA, 2016a).

South Africa is amongst the top three exporting countries (by value) of citrus and has shown impressive and positive trends over the last decade. European market is an extremely important market for most of SA citrus exports, absorbing a share of than 10% of each of the citrus varieties. Other important export markets include the Middle East, particularly in the absorption of lemons and limes, growing from 34% exported in 2015 to 40% exported in 2016. The Russian Federation and the Far East are also important markets for lemons and limes.

The citrus industry contributes approximately R13.2 billion to the total fruit export value in South Africa; employs more than 125 000 workers (roughly about 14% of agricultural labour) and contributes approximately 27% of the total agricultural exports (CGA, 2016b; Uys, 2016). Driving the success and development of the citrus sector is the Citrus Growers' Association (CGA), which protects the interests of stakeholders (growers) among exporters, suppliers, research institutions and government. Despite its continued success in the recent past, the domestic citrus fruit industry still faces challenges with a complexity and intensity that cannot be separated from the ever-changing business environment. The identified general challenges, from recent data sources, include, but are not limited to, the following (CGA, 2007, CGA, 2016b; DAFF, 2016);

- Operating against tariffs and non-tariffs barriers
- Labour policy uncertainties in the South African context- hidden costs, high administration and red tape compliance.
- Trade policy changes – Brexit for example.
- Climate change implications.
- Transportation (cold storage, issues related to costs and capacities costs).
- Market access and changes regarding policy changes.

- Market development – opportunities, new markets, declining traditional markets.

- Capital investment requirements in an uncertain environment.

- Government policies (land redistribution, trade, tax system, social compliance).

- Post-harvest treatment and labelling –increasing compliance and costs.

- High input costs (e.g. fuel)—due to a weakening currency and increasing administrative prices – electricity, labour, etc.

- Transformation uncertainties and changing legislation and scorecards.

From reviewing the industry it was evident that there is no lack of statistical information on the subjects of areas under production, geographical production zones, cultivars planted and production costs for the local citrus industry. However, aspects surrounding strategic planning and strategic intelligence for the industry are not widely published (you have to be a member of certain websites) and available to be applied by all the relevant people in functional value chain positions in the formation of industry strategies. The strategic plans for the industry are not easily accessible. There are strategic plans by Fruit SA, such as "getting fruit back to the rail" and the Agricultural Policy Action Plan. However, such strategic plans seem not to directly address the individual competitive performance factors, as specified by Porter (1990;98). Therefore, there is a need to draw up a clear strategic plan that will specifically target the citrus industry in the midst of its own unique challenges. However, such strategic ideas and proposals will only be derived based on the findings of this paper and not through participative industry sessions.

3. Analytical framework

This paper make use of the analytical framework adapted (from Esterhuizen 2006, van Rooyen, Stroebel, and Esterhuizen 2012; Jafta, 2014; Angala, 2015; Boonzaier 2015, Boonzaier and van Rooyen, 2017; Dlikilili, 2018), modified to meet the needs of interactive analytical procedures such as the Delphi analysis.

3.1 Measuring competitiveness

The first step is to measure competitive performance over time of the South African citrus industry. The Revealed Comparative Advantage model as developed by Balassa (1977, 1989) and extended by Volrath (1991) to the Relative Trade Advantage (RTA) method, was used. Vollrath (1991) modified the original version of Balassa's revealed comparative advantage by proposing a method that will reflect both imports and exports as a better manifestation of global trade. The RTA method allows for the measurement of competitiveness under real world conditions such as uneven economic "playing fields", distorted economies and different trade regimes and is therefore the most suited for measuring competitiveness status (van Rooyen, Esterhuizen and Stroebel, 2011).

3.2 Determining key factors driving competitiveness.

The second step examines which key factors play an enhancing and/or constraining role in the competitive success of this industry. In order to extend the conventional framework of earlier competitiveness scholars, whereby information was gathered along the lines of the Porter Competitive Diamond model and through an extensive industry survey only, a two-step Delphi technique was applied. The sample group selected were experts in the citrus value chain, whether they be input producers, packers, processors, exporters and/or marketers.

The Porter Competitive Diamond model: The methodology developed by Porter (1990;98) to analyse competitiveness is adapted and used to derive the determinants of competitiveness status in the South African citrus industry. Accordingly, the six characteristics that shape the environment in which producers or service producers compete are analysed, namely: *Factor conditions; Demand condition*; *Related and supporting industries*; *Firm strategy, structure and rivalry*; *Role of government*; and the *Role of chance.* (refer to Esterhuizen 2006, van Rooyen, Stroebel, and Esterhuizen 2012; Jafta, 2014; Angala, 2015; Boonzaier 2015; and Dlikilili, 2018)

Applying the Delphi technique: the Delphi technique (Dalkey and Helmer, 1963), is a commonly used and globally accepted method for achieving convergence of opinion relating to real-world knowledge sought from experts relating to a certain topic (Hsu & Sandford, 2007). Ludwig (1997) notes that, this method, by design, is an iterative multistage communication process that intends to conduct detailed examinations and discussions of a specific issue for the purpose of goal setting (strategies), policy effect investigation, or predicting the occurrence of future events. It involves the use of techniques that intend to develop, from a group of informants, an agreed view or shared interpretation of an emerging topic (i.e. factors affecting the competitive success of the citrus industry) (Day & Bobeva, 2005). This Delphi technique is also utilised in order to aid the enhancement of effective decision-making in various industries (Mkhabela, 2013).

Generally, the key features of the Delphi technique include the use of experts, different rounds, controlled opinion feedback and giving participants the chance to change their opinions (De Vet *et al.,* 2005). In the light of this feedback, individuals are then permitted to amend their judgements until an acceptable measure of consensus is reached (Jones *et al.,* 2017). This technique has become a well-accepted means of using expert opinions, and has been used to explore a wide range of issues in the realm of food and agriculture, such as food supply chain management Kenyon *et al*. (2008); water resource management De Lange and Kleynhans, (2007); and pricing policy option (Mkhabela, 2013), to mention a few.

In the case of this paper, the Delphi method was applied with a view of generating consensus amongst different experts in the citrus industry value chain on factors that influence (positively or negatively) the competitive performance of this industry. Mamaqi, Miguel and Olave (2010) suggest that two or three iterations of the Delphi method are sufficient for most research. They argue that the process only ends if the research question has been answered,

e.g. when consensus is reached. In this study, a two-round Delphi analysis was deemed sufficient to achieve the results.

The first step in Delphi studied involved the identification of experts to act as representatives of the industry. In this paper, this was done with the support of the Citrus Growers Association executives and a focus group gathered in Citrusdal. A list of 60 experts was drawn up and they were selected based on their experience in their particular fields of expertise. The selection of experts was "custom-made" to ensure representation across the typical citrus-based value chain and to represent diverse geographical regions. After the selection process, questionnaires—designed in the form of Porter diamond model, were sent out to the selected experts to give their views in terms of rating the impact of the identified factors as determinants of competitive performance of the industry. A total of 13 questionnaires were returned, representing a relatively low response rate of 22%. The list of experts who participated in the first round of the analysis is highlighted in the table 1[Table 1 near here].

This relatively low response rate was not left unattended and was viewed from within a scientific research approach. The questions were addressed and assessed by envisioning the identification of possible weaknesses that could have reflected an unclear framework for the questionnaire. This was however determined not to be the case, again in collaboration with the Citrus Growers Association. It was thus decided that the obtained response rate would be enough to draw meaningful first round consensus on the expressed opinions i.e. factors impacting on competitive performance.

In the second round of the Delphi analysis the experts were shown the results from the first round of the Delphi and were asked to rate their 'relevance' as determinants of the competitiveness of the industry. This round gave a future view of these determinants, since

the first round gave ratings based on their current impact. This is because one needs to know and understand how the specific factors are currently performing (i.e. round 1 –impacting), and whether it is important that these factors perform well towards the success of the industry's competitiveness (i.e. round 2 – relevance in general), hence aiding the formulation of strategies.

This analysis enables one to identify the performance gap between 'what is' the status of performance now and 'what ought' to be the status – hence fitting the requirements of a Delphi study.

3.2.1   Principal Component Analysis:

Principal Component Analysis (PCA) is a type of factor analysis that reduces dimensions within data by extracting linear combinations that best describe the co-variance among all elements (Vyas and Kumaramayake, 2005). It analyses a data table representing observations described by several dependent variables, which are, in general, intercorrelated (Abdi and Williams, 2010). This method was applied for data-reduction purposes in order to distinguish between highly correlated variables—that is determinants for which the experts' views on ratings were very similar, and uncorrelated variables—that is the determinants for which the experts' responses on ratings were more varying. In statistical analysis, the uncorrelated variables could undergo further analyses, such as detailed cluster analysis, to identify groups within the dataset with similar opinions. However, such analysis can also be limited by the size of the available data.

This PCA analysis was used to pinpoint highly correlated variables in the dataset in terms of factors related to the six main Porter Competitive Diamond determinants. Responses to the impact of the determinants within the various sets were subjected to PCA using 1 as prior communality estimates.

The principal axis method was used to extract the components, and this was followed by a varimax rotation. Meaningful components had Eigen values larger than 1 and were retained for rotation. Following the approach of Angala (2015), an item was interpreted as loading on a given component if the factor loading was 0.40 or greater for that component, and less than 0.40 for the other.

4. Findings

4.1 How competitive is the South African citrus industry in global markets?

The competitive trend of the South African citrus industry was calculated using the RTA method for the period from 1961 to 2013 using data obtained from the Food and Agriculture Organisation (FAO) and from the International Trade Centre (ITC) for the period from 2001 to 2016. The local citrus industry is relatively marginally less competitive using the more focused agriculture-based dataset (FAO- takes into account agricultural products only) than the broader multi-sector-based (i.e. takes into account all industries and commodities of a nation) dataset (ITC). [figure 1 near here].

A closer inspection of both these competitive performance lines reveals that the industry had high positive figures throughout the studied years. This implies that the industry performed competitively, maintaining positive but constant between 1961 (RTA 4.6) and the early 1990's; with a consistent increase from the years in which South Africa became democratic and when the industry was deregulated- mid nineties; with the period from 2005 (RTA 15.2- ITC) a strong and gradually increasing trend (RTA 18.6 in 2016). The figure also reveals considerable variations in the competitiveness performance. These variations were grouped into four periods showing trends in the local industry's competitive performance. These phases are thoroughly explained in another article published by Dlikilili and Van Rooyen (2018) and are:

 Phase 1: Competitiveness in a highly regulated agricultural economy, 1961 to 1990

The industry's competitiveness status during this period can be viewed as somewhat 'artificial', due to subsidised support and regulated prices. It was marked by political and economic trade sanctions imposed on the country by the international community, which resulted in political and economic instability (Kirsten *et al.* 1994).

Phase 2: Democracy and economic deregulation- access to global trade, 1990 to 2000

This phase included first democratic elections, deregulation of the South African fruit industry (Vink, 2004), and the lifting of international sanctions on the country, giving unrestricted access to lucrative export markets, exposure to profitable international business, and increased investment.

Phase 3: Becoming a global player in an increasingly deregulated environment, 2000 to 2009

During this period, global trade increasingly moved towards broader-based deregulation and increasing freedom to trade, with fewer policy and support distortions (Sandrey and Vink 2008). With increased experience and better understanding of business strategies mandatory to compete globally, the industry's competitive performance continued to rise, reaching its highest in 2006.

Phase 4: Towards sustaining competitive performance, from 2010 onwards

The instabilities in competitive performance during this period were due to increased regulations in the international markets, particularly in the Europe, where citrus originating locally was restricted during the 2012/13 harvest season because of the threat of Citrus Black Sport. Growth prospects for the future will be attained by producers, input suppliers and processors who can position themselves correctly in a position from which they can be truly globally competitive.

4.2 Ranking the actors affecting industry competitiveness (Delphi 1)

The above RTA analysis confirms that the industry is performing at high and sustained competitive levels. However, the RTA method does measure the competitive performance, but does not point out why the industry is competitive and it fails to propose new solutions on how the industry can gain, maintain and/or improve its global competitiveness status—it only measures and point to trends; both useful in strategic assessments. In order to extend the analysis to accommodate such strategic dimensions, a two-step Delphi technique was applied in which a questionnaire– designed in the form of a Porter Competitive Diamond Model was used to gather key information through the Citrus Experts Survey (CES).

4.2.1   The production factor determinant

The competitive status of an industry is determined by the availability and status of factors of production within the industry or nation (Porter, 1990). Porter categorises these production factors required by industry in order to compete into two types. These are basic factors and advanced factors. Basic factors include, *inter alia*, the state of national resources, endowments and their location, capital, availability of raw material and labour—generally referred to as 'comparative advantage factors'. Advanced factors include innovative infrastructure (including advancement in technology, pesticides, etc.) and the presence of highly educated personnel within the industry. Both these factors, rated by the citrus experts on the basis of their influence on competitiveness performance, are highlighted in table 2 [Table 2 near here].

The results reveal that the availability and quality of skilled labour are key challenges facing the citrus fruit industry, while unskilled labour is available in abundance. It is not surprising to notice that entry-level labour (3.92) is not constraining, since the country is faced with an abundance of surplus labour due to the high levels of unemployment, which stands around 27.7%. The CES results also indicated that the cost and quality of low-skilled labour are constraining the industry's global competitiveness status. This finding contradicts

what one would expect from economic theory, which is that a high supply of low-skilled labour would make low-skilled labour cheap. The reason for this contradiction lies in the minimum wage bill set by the department of labour for farm workers.

PCA was used to identify highly "correlated variables"—that is factor ratings in the dataset (under production factors) for which individual views were very similar, as well as "uncorrelated variables"—that is factors on which experts' ratings varied more. The uncorrelated variables – those with 'variation in opinion' – could be considered in further analyses (clustering) to reach greater clarity on the distribution of opinions and to further determine possible consensus clusters. However, in the case of this paper, the low response rate eliminated such detailed cluster analysis from a statistical point of view. It is important to also highlight that 'variation' in the case of this paper does not imply that these 'uncorrelated factors' are not valid, but rather that there are differences in views on them and they may require further analysis i.e. through the application of cluster analysis using a larger sample size.

The highly correlated variables indicate that the respondents mainly agree on the rating of these factors, and they would provide a sound basis for immediate collective industry action. These correlated factors included factors such as cost infrastructure, obtaining skilled labour, general infrastructure, and the cost of entry-level labour. The uncorrelated factors included factors such as access to quality technology, obtaining long-term finance, etc.

4.2.2   Demand factors

Demand conditions refer to the nature of demand for an industry or nation's products and services and the ability to capture this demand through marketing and sales. The most essential component that determines these demand conditions are the composition of the demand, its size and patterns of growth, and the internalisation of domestic demand (Porter,

1990). The local market size, together with its growth in volume, was found to be negatively affecting the competitive status of the local citrus industry, see table 3[Table 3 near here]. This is concurrent with the available literature, because the local market consumes less than 30% of local citrus production. The slow growth in volume locally requires the industry to educate local consumers in terms of taste, quality and health benefits associated with citrus fruit in order to fuel local demand for citrus and expand local consumption.

On the other hand, new markets (rating of 4.33 out of 5), together with global market size (rating of 4.0 out of 5), were highlighted as factors enhancing the competitive status of the industry. This is also not surprising, because more than 60% of local citrus exports are absorbed by foreign markets and the diversity in foreign markets plays a helping hand in this regard. This also reflects that the industry easily accesses lucrative foreign markets, aided by its ability to produce quality citrus fruit that are demanded in these external markets.

Through the application of PCA, the uncorrelated factors identified included growth in value in local market, expansion in existing markets, changing food demand, seasonality and international citrus markets, and local market size. Only few factors were indicated as highly correlated 'consensus factors' under this determinant, namely growth in volume in the local market, consumer education and availability of information, relationship with local retailers, and local consumer preference for citrus fruits.

4.2.3 Related and supporting industries

The robust related and supporting industries play a crucial role in the competitiveness performance of a firm or nation (Porter, 1990). According to Mashabela (2007), the presence or absence in the nation of internationally competitive industries (e.g. input providers, research institutions and financial institutions) has an impact on the competitive performance of its industries.

Privately funded research, with an average score of 3.83 out of 5, was viewed as more enhancing to the competitive performance of this industry, whilst an area in which government is involved, viz. government-funded research (average of 2.15), was viewed as more constraining [Table 4 near here].

Only two constraining factors were found under this determinant, namely electricity supply and government-funded research, and these will have to be addressed in collaboration with government, as the industry is limited in the extent to which it can facilitate these two factors.

The identified uncorrelated factors include, amongst other factors, electricity supply, testing of new varieties, expenditure on research and development, quality of local input suppliers, and availability of storage. The variation in opinion expressed towards the rating of electricity supply might be explained by the fact that municipalities (electricity suppliers) have varying population densities and size, and provide different services to different mixes of low, medium, and high income and usage domestic customers (Yelland, 2016). Furthermore, municipalities have diverse combinations of domestic, commercial, and industrial customers embedded within their geographic areas of supply. This results in a wide variance of 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 played a part towards the rating of this factor.

On the other hand, factors commonly agreed upon (correlated) include quality of privately funded research, availability and reliability of transport, effective management in cold chain, and availability of local input suppliers (e.g. fertilisers, pesticides).

4.2.4 Firm structure, strategy and rivalry

The fourth determinant of competitiveness deals with the conditions that determine how companies are created, organised and managed, as well as the nature and extent of domestic rivalry. Economies of scale with a rating score of 4.38 and global competition with a rating score of 4.31 were rated as the top two enhancing factors in this determinant. Global citrus competition considered to be among the enhancing factors correlates well with the mind-set of competitive attitude conveyed by the experts [Table 5 near here]. The good management of information (rating score of 3.62) between various points in the value chain was considered to be an enhancing factor to the competitive status of the industry. Knowledgeable strategy developments and product development processes are based, *inter alia*, on the flow of information from the end user back to the producer.

The results also confirm that domestic rivalry enhances the competitive status of the industry. Porter explains that there is a strong association between vigorous domestic rivalry and the development and persistence of competitiveness in any industry. He highlighted that vigorous domestic rivalry creates pressure on sectors (producers, processors, input providers etc.) to improve quality and service, to innovate (i.e. create new cultivars) and to create new processes that are necessary to gain and improve competitive status. Therefore, the pressure from different citrus industries in the value chain provides inspiration to the others to search for innovation, efficiency and new markets and, in turn, to improve their competitiveness.

The uncorrelated factors were identified as aspects such as current resource base, competition in global markets, threat of new entrants – both locally and globally, willingness to take risks, management of market intelligence, management of flow of information, flow of information from customers to industry, and competition in the local market.

Those with mutual agreement on the ranking of their influence on competitive performance of the industry were factors such as willingness to reinvest in citrus operations, economies of scale and competition for resources (e.g. land, capital).

4.2.5 *Government support and policies*

Macro-economic environment conditions, sometimes the result of government policies, may put an industry or nation in an unfavourable competitive position (Porter, 1998). The WEF global competitiveness report of 2016 places the South African macro-economic environment at number 97 out of 138 nations, signifying a slight deterioration when compared to the 2015/16 global competitiveness report, which ranked the local macro-economic environment 85th out of 140 countries. This implies that the current macro-economic environment plays a hindering role in the competitive performance of this country. The results from the CES are in line with this report [Table 6 near here].

Results reveals that the current local macro-economic policies with a rating score of 2.08, are hindering the competitive position of the citrus industry. Most of the factors under this category were rated as having a negative impact on the competitive status of the industry. The threat of land expropriation (score of 1.46 out of 5) for local citrus producers, exporters and processors in South Africa (the majority of whom are white) is reported as one of the factors that hinders the competitiveness performance of the sector going forward. According to Chadwick (as cited by Partida, 2011), some farmers have developed a short-term outlook on their farms since land reform policies were introduced – shorter term than farming should be.

The factors with varying opinions in their ranking were current political system, land reform policy, complying with regulatory standards, macro-economic policy, regulatory standards, Water Regulations Act, land expropriation, AgriBEE policy, and the Local

Competition Act. The correlated factors under this determinant include the local trade policy, labour policy, taxation system, and corruption and opportunism.

4.2.6   Role of chance

Porter (1998) defined chance factors as happenings that are beyond the control of industries or governments. These events may create forces that reshape the structure of an industry, allowing it to improve its competitive position and/or allow in new players who exploit the opportunities arising from a reshaped industry structure. The experts highlighted the exchange rate with rating of 4.23 (the current low value of the Rand against major currencies such as the US Dollar, the EURO and the British Pound) as the most enhancing factor under this determinant [Table 7 near here]. It is important to highlight that Esterhuizen and Van Rooyen (2008) found that a strong Rand was one of the factors constraining the competitiveness success of agribusinesses in South Africa.

The current political system (in general) with rating score of 1.69 and the cost of crime with rating score of 1.54 were amongst the factors that negatively influence the competitive status of the local citrus industry.

The uncorrelated factors include factors such as the impact of the global recession, social unrest (strikes, land grabs), as well as the political system. The only correlated factor identified under this determinant was the impact of global conflicts on the industry's competitive success.

4.3 Rating the relevance of factors -Delphi 2 analysis

After the analysis of the first round results, the task now was to send these results (correlated factors under PCA) back to the experts to rate the degree of relevance of these factors as determinants of competitiveness in the local citrus industry. A Likert scale of 1 to 5 was again used, with 1 signifying no relevance of the factor and 5 representing high relevance of the factors to the competitive status of the sector. While more than two iterative discussion

rounds are allowed in the Delphi approach, a third estimation round was not considered useful in this study because, the standard deviation scores associated with the experts' rating means did not change significantly between rounds one and two, suggesting that further significant reductions in the heterogeneity of the estimates would be very unlikely. Displayed in Figure 2 is a X-Y scatterplot of 'impact ratings—based on first-round results' and 'relevance scores—based on the second-round results', for all determinants that were highly correlated under PCA analysis[Figure 2 near here].

This figure provides a visual identification of determinants that are critical to the industry based on their current impact and their relevance to the industry's competitive performance. The quadrant in the top left corner shows determinants that are relevant to the industry but that are currently constraining its global competitive performance. This means that these are the determinants that the industry should focus on more, referred to in this paper as 'new focus area' and in this paper more emphasis was put to them in terms of drawing up strategic approaches. These factors include administrative regulations, consumer education, trade policy and quality of both skilled and unskilled labour.

The top right quadrant highlights the determinants that are currently contributing positively to the competitive performance of the citrus industry, i.e. currently being enhancing and relevant and being in the 'keep up the good work zone'. These determinants need to be managed in order to maintain and expand them in that 'positive space', i.e. 'maintenance determinants'. These variables include the development of foreign markets, general infrastructure and quality of local input suppliers. . The variable "global events" (e.g. wars) was found to be constraining the industry, but had no current relevance in the competitive status of the industry. This can be associated with the stable economies in the industry's major export markets, particularly in the EU.

4.4 Key strategies proposed to improve the industry's competitive performance

The purpose of this section is to formulate industry wide strategies that can be used to maintain and improve the industry's competitive position in global markets. These strategies are derived from the findings of this paper, most of which were directed by the results obtained from the two-round Delphi analysis. These proposals and recommendations may provide new angles and contribute to a more competitive citrus industry. It must however be noted that these proposals were not tested through participative industry sessions where findings from this paper and proposed strategies were discussed –a three type Delphi process. These strategies could be introduced to the industry as "business intelligence" for further interrogation and consideration.

- Development and testing of innovative yield increasing and cost saving technology (fruit handling systems, harvesting platforms, fertiliser application equipment, moisture management tools, storage, packaging materials etc.) throughout the value chain. This may require an audit to assess what is currently going on; a bench marking of global best practise technology; and implementation strategies.

- Continued training of labourers (in all parts of value chain) is recommended in order for the required skills to be obtained in the industry. Apart from the ongoing collaboration with government, such training could be held with participating farmers and other interested personnel's in the value chain. The risk of course is that qualified labourers might seek better fortune elsewhere, in order to avoid this, industries in the value chain could provide such labours with shares ownership in the business (determined by owners).

- With regards to climate change, there should be continued collaboration with government, to support research institutions (such as the CRI, ARC etc.) and weather

stations to continue developing new citrus varieties (specifically developed for local conditions) and making quality climate data accessible to all citrus farming regions.

- Growing domestic consumption of citrus fruits could require participation in various initiatives, such as the "Healthy Food Options", which aim to reduce physical inactivity and promote healthy eating. The health benefits associated with consuming citrus, particularly 100% citrus juices, can be marketed in these initiatives. Also, supply citrus juices and citrus fruits to selected schools to increase awareness.

- The industry could also study the cost and benefits of using social media-apps as a way of marketing tool. These apps can be used to disseminate citrus related information (i.e. health benefits, history of citrus, their time of availability etc.). These apps provide a platform whereby consumers can engage directly with suppliers.

5 Conclusion

This paper concentrated on assessing the factors driving the success or failure of the South African citrus industry. A three-step analytical framework was adapted and applied to analyse the competitive performance of the industry and to understand the underlying factors driving the competitive success of the industry. The main conclusion is that the industry is increasingly globally competitive, with strong notable increasing trends after the deregulation period. The determinants to this increasing trend were also determined and analysed. The availability of local input suppliers together with their quality, global citrus market size and economies of scale were some factors found to be highly relevant to the increasing competitive success of the industry. However, factors such as cost of entry labour, unclear policies (i.e. land expropriation) and access to natural resources (e,g. land, water) were factors which are relevant to the future success of the industry but are currently negatively affecting the competitive performance of this industry. This paper provided some strategies or

"business intelligence" that can be used to improve the future competitive performance of the citrus industry.

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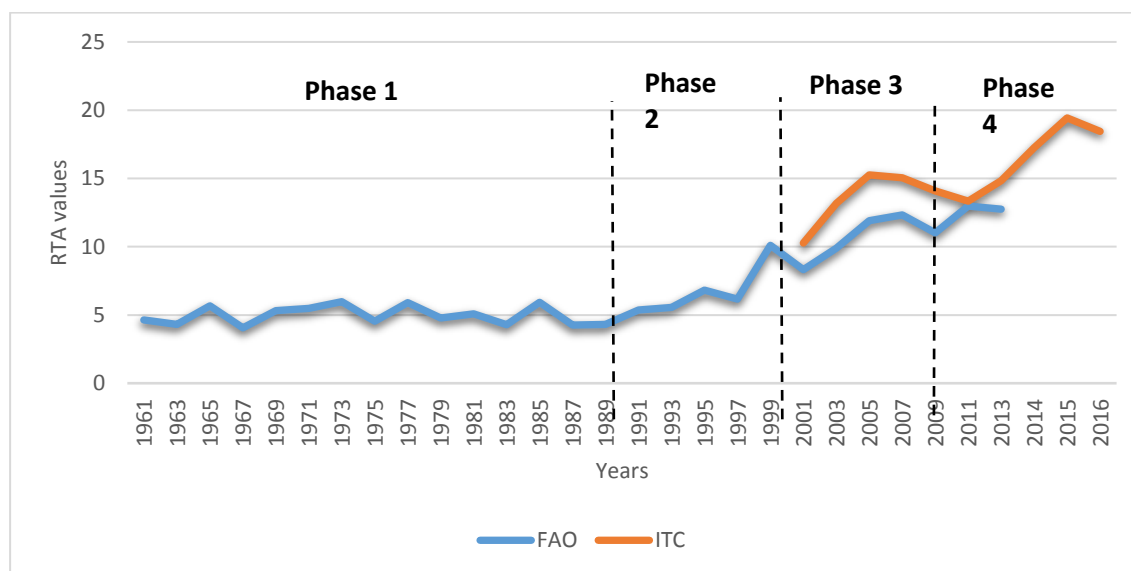
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Figure 1: RTA values for the South African citrus industry

Source: Dlikilili (2018).

Figure 2: *X-Y scatter plot for impact and relevance ratings*

Source: Dlikilili (2018).

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Table 1: Citrus experts who participated in the survey and their positions in value chain

Location	Position in the value chain	Citrus fruit type produced	Distribution type	Exported quantity (cartoons)
Kirkwood Sundays river	Producer, Processor, Exporter, input provider	All	Fresh and processed	>1000 000
Umtshezi	Producer, packer	Oranges, lemons	Fresh	
Warrenton	Producer, packer, exporter	Oranges, lemons, soft citrus	Fresh	100 000-500 000
Berg river	Producer	Oranges, lemons, soft citrus	Fresh	
Kirkwood	Producer	All	Fresh	
Grblersdal	Producer, packer, exporter	Oranges, lemons, soft citrus	Fresh and processed	100 000-500 000
Gamtoos vallei	Producer	Lemons, soft citrus	Fresh	
Paarl	Input provider			
Clanwilliam	Producer	Oranges	Fresh and	<100 000

			processed	
Western cape	Input provider, Exporter	All	Fresh	>1000 000
Stellenbosch	Producer, packer, exporter	All	Fresh and processed	>1000 000
Swellendam	Producer, packer,	Lemons, soft citrus	Fresh	100 000-5000
Stellenbosch	Producer, packer, exporter	All	Fresh	>1 000 000

Source: Dlikilili (2018).

Table 2: Determinant Production factors affecting the industry, ratings out of 5.

Factors	Mean	Std. deviation
Quality of technology	4.15	.899
General infrastructure	4.08	.641
Technology advancement	4.00	.816
Location	4.00	.913
Obtaining unskilled labour	3.92	.954
Access to technology	3.85	1.144
Storage	3.38	1.387
Cost of technology	2.46	.967
Transportation	2.92	1.441
Access to natural resources	2.38	1.325
Competency skilled labour	2.31	.855
Cost of infrastructure	2.23	.725
Cost of entry unskilled labour	2.14	1.127
Establishment cost	2.08	.760
Cost of hiring skilled labour	2.00	.913
Local climate	1.75	.866
Obtain skill labour	1.69	1.109
Quality unskilled labour	1.50	.792

Source: Dlikilili (2018).
Notes: 1= most constraining; 3= neutral; 5=most enhancing

Table 3: Determinant demand conditions affecting the industry.

Factors	Ratings out of 5
Emerging markets	4.33
International market size	4.00
Diversity in foreign markets	3.85
Food preference	3.77
Seasonality	3.58
Likelihhod of Brexit impact	3.42
Consumer education	2.45
Relationship with major retailers	2.45
Foreign politics (USA)	2.42
Growth in volume locally	2.25
Local market size	2.08
Adverse weather	1.85
NH competition	1.85

Source: Dlikilili (2018).
Notes: 1= most constraining; 3= neutral; 5=most enhancing

Table 4: Determinant related and supporting industries affecting the industry.

Factors	Mean	Standard deviation
Availability of input suppliers	4.69	.480
Specialised technology innovation	4.31	.630
Quality of input suppliers	4.08	.760
Testing of new varieties	4.00	.913
Packing and product handling	3.85	.987
Privately funded research	3.83	1.536
Sustainability of input suppliers	3.77	.927
Cold chain management	3.77	1.013
Collaboration with research institutions	3.54	1.198
Export facilities	3.18	1.537
Cost of storage	3.00	1.279
Government-funded research	2.15	1.144
Electricity supply	2.32	1.387

Source: Dlikilili (2018).

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

Table 5: Determinant firm structure, strategy and rivalry affecting the competitive success of the industry

Factors	Mean	Std. deviation
Economies of scale	4.38	.650
Global competition	4.31	.751
Willingness to reinvest	4.23	1.013
Current resource base	4.08	.760
Willingness to take risk	4.00	.816
Competition for resources	4.00	.913
Flow and use of info	3.62	1.136
Local competition	3.45	1.036
Threat of new entrants locally	3.36	1.629
Market intelligence	3.00	1.279

Source: Dlikilili (2018).

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

Table 6: Determinant government support and policies affecting the industry.

Factors	Mean	Std. deviation
Competition Act	3.38	.650
Regulatory standards	3.23	1.235
Water Regulation Act	2.23	1.092
Tax system	2.23	.725
Admin regulations	2.23	0.738
Macro-economic policy	2.08	.954
AgriBEE	2.08	.996
Labour policy	2.00	1.080

Trade policy	1.92	.954
Legal and political factors	1.75	1.055
Corruption and opportunism	1.69	.947
Land reform policies	1.50	.798
Reliability of current political system	1.46	.967
Land expropriation	1.46	1.198
Credibility of politicians	1.08	.277

Source: Dlikilili (2018).
Notes: 1= most constraining; 3= neutral; 5=most enhancing

Table 7: Determinant chance factors affecting the competitive performance of the industry.

Factors	Mean	Std. deviation
Current exchange rate	4.23	.725
Exchange rate fluctuations	2.85	1.463
Unfavourable weather conditions	2.67	1.435
Economic growth and development	2.42	1.505
Global events	1.85	.899
Social unrest (strikes)	1.75	.866
SA political system	1.69	.751
Cost of crime	1.54	.776
Global recession	1.38	.650

Source: Dlikilili (2018).
Notes: 1= most constraining; 3= neutral; 5=most enhancing