



# Business opportunities for protected horticulture in South Africa

An overview and developments in South African protected horticulture

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## **Samenvatting**

Dit rapport beschrijft de huidige status van de tuinbouwsector in Zuid Afrika en de opties voor verdere ontwikkeling en expansie. De studie richt zich met name op de kansen voor de Nederlandse toeleverende industrie om deze ontwikkelingen in de tuinbouw te faciliteren. De tuinbouwsector in Zuid Afrika is klein, en is vooral gesitueerd in de regio's rond Johannesburg, Kaapstad en Durban. Ondanks de grote hoeveelheid zon zijn de geregistreerde productieniveaus laag door een aantal ongunstige teeltcondities. Deze condities zijn goed te verbeteren door beter teeltmanagement, onder andere door minder buiten te telen. De bedekte teelt vindt meestal plaats in plastic tunnels met gebruik van een middelmatig, niet up-to-date technologieniveau. Met nieuwe Westerse technologie die aangepast is aan de lokale condities is er een forse toename in productiviteit en duurzaamheid te verwachten.

Er worden een aantal transitiepaden en hun vereisten gerapporteerd voor de verschillende bedrijfstypen. De groenteteelt heeft naar inschatting veel groeipotentieel vanwege de sterke economische groei en door de koopkrachtontwikkeling van met name de zwarte middenklasse. Daarnaast bieden de economische ontwikkelingen in de buurlanden kansen voor een grotere afzetmarkt. Door internationale concurrentie wordt samenwerking binnen de tuinbouwsector in toenemende mate belangrijk. Dit geldt met name voor de sierteelt ondanks dat deze branche een gematigd door hoog technologieniveau kent. Een juiste samenwerking tussen ondernemers kan leiden tot een competitievere sector. De telers kunnen zich daarbij richten op een gerichte verbetering van apparatuur en infrastructuur, alsmede het ontsluiten van praktische kennis. Hierin kunnen experts afkomstig uit de Nederlandse tuinbouw en kennisinstellingen van waarde zijn. Zij kunnen ondersteuning bieden in het innoveren van de sector ter bevordering van werkgelegenheid, inkomsten en duurzaamheid.

## **Abstract**

This report describes the current status of the horticultural sector in South Africa and its options for further development and expansion. The study specially focuses on the possibilities of the Dutch supplier industry to facilitate these horticultural developments. The horticultural sector of South Africa is small, and is mainly located in the regions around Johannesburg, Cape Town and Durban. Although radiation levels are more than sufficient for crop growth, the recorded productivity levels are low as a result of a range of unfavourable conditions that may be avoided if managed well. Moreover, the vegetable production is largely outdoors. The protected cultivation is often done in plastic tunnels using a medium level of technology. With new technologies adapted to the local conditions a vast increase in productivity and sustainability can be expected. A number of transition pathways and associated requirements are suggested for the different grower types. The vegetable sector has large growth potential given the economic growth in SA and the increase in purchase power of the black middle class. Also the economic developments in neighbouring countries provide good opportunities. Cooperation in the sector will be increasingly important in the future to become more competitive. The growers of ornamentals in general have a medium to high technology level, yet face the challenge to compete internationally. These growers need improved hardware, knowledge, infrastructure, and a better cooperation within the sector. The horticultural experts from industry and knowledge organizations in The Netherlands can assist in many of these issues and may help in creating tailor-made innovations that increase profit and sustainability.

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# Table of Contents

	Foreword	7
	Samenvatting	9
	Summary	11
1	Introduction	13
	1.1 Background	13
	1.2 Objective	13
	1.3 Method	13
	1.4 Acknowledgements	13
2	General information	15
	2.1 Introduction	15
	2.2 Demography	15
	2.3 Economy	15
	2.3.1 Macro-economic developments	15
	2.3.2 External position	16
	2.3.3 The Netherlands	18
	2.3.4 Agriculture	19
	2.4 Ecology	20
	2.4.1 Vegetation	20
	2.4.2 Climate	20
	2.5 Technology and infrastructure	21
	2.5.1 Electricity	21
	2.5.2 Roads	22
	2.5.3 Air- and seaports	22
	2.5.4 ICT	22
	2.6 Political situation	22
	2.6.1 New Growth Path framework	22
	2.6.2 Crime and corruption	23
	2.6.3 Black Economic Empowerment	23
	2.6.4 Land reform	23
	2.6.4.1 Land Restitution	23
	2.6.4.2 Land Redistribution	24
	2.6.4.3 Tenure Reform	24
3	The South African Horticulture sector	25
	3.1 Scale of horticulture	25
	3.1.1 Horticulture in South Africa	25
	3.1.2 Type of farmers	26
	3.2 Description of main horticulture regions	26
	3.2.1 Cape Town	26
	3.2.2 Durban	27
	3.2.3 Johannesburg	28

3.3	Production and productivity	30
3.3.1	Vegetables	30
3.3.2	Flowers	31
3.3.3	Seedlings	31
3.4	Level of technology	31
3.4.1	Country wide	31
3.4.2	Adaptations per region	33
3.5	Profitability	34
3.5.1	Electricity and heating	34
3.5.2	Labour	35
3.5.3	Water	35
3.6	Government and horticulture policies	36
3.6.1	Horticulture policies	36
3.6.2	Empowerment of smallholders and land allocation	36
3.7	Knowledge organisations	37
3.7.1	The Agricultural Research Council (ARC)	37
3.7.2	Universities and Agricultural Colleges	37
3.8	Financial institutions	37
3.9	Professional organisations	37
3.9.1	The South African Flower Export Council (SAFEC)	38
3.9.2	The South African Flower Growers Association (SAFGA)	38
3.9.3	The South African Protea Producers and Exporters Association (SAPPEX)	38
3.9.4	The Seedling Growers Association of SA (SGASA)	38
3.9.5	The South African Nursery Association (SANA)	38
3.9.6	AGRI SA	38
3.9.7	Agriculture in Sustainable Natural African Plant Products (ASNAPP)	39
3.9.8	Intensive Agriculture South Africa (IASA)	39
3.9.9	Private companies	39
3.10	Conclusion	39
4	The Market	41
4.1	The value chain	41
4.1.1	Vegetables	41
4.1.1.1	Wholesales	41
4.1.1.2	Retailers	41
4.1.1.3	Informal retail	42
4.1.1.4	Processors	42
4.1.1.5	Intermediaries	42
4.1.2	Flowers	43
4.1.2.1	Direct sales	43
4.1.2.2	Wholesale	43
4.1.2.3	Retail	43
4.1.2.4	Processors	44
4.2	The domestic market	44
4.2.1	Vegetables	44
4.2.2	Flowers	45
4.2.3	Consumer trends	46
4.3	Export market	46
4.3.1	Vegetables	46
4.3.2	Flowers and cuttings	48
4.4	Conclusion	49

5	Supply industry	51
5.1	Introduction	51
5.2	Current situation	51
5.2.1	Research & development	51
5.2.2	Suppliers of production equipment	51
5.2.3	Suppliers of seeds and planting material	52
5.2.4	Distribution and presence	53
5.3	Conclusion	53
6	Forecast and developments	55
6.1	Possibilities for expansion	55
6.1.1	The basis: increase of profit	55
6.1.2	Possible transition trajectories	56
6.2	Technology required	58
6.2.1	Stepwise increase in production by technology	58
6.2.2	Towards environmental sustainability	59
6.2.3	Feasibility of transitions	60
7	Discussion and conclusions	61
7.1	Discussion	61
7.2	Conclusions	62
7.2.1	Data quality	62
7.2.2	Regions and crops	62
7.2.3	The international market	62
7.2.4	Technology levels and transition processes	63
7.2.5	Recommendations for Dutch suppliers	63
7.2.5.1	Substitute “High-Tech” by “Best Fit”	63
7.2.5.2	ADAPT, not ADOPT	63
7.2.5.3	Keep on improving ‘High-tech’	63
7.2.5.4	Incorporate “high-tech elements” in mid-tech greenhouses	64
	References	65
Appendix A	List with interviewed stakeholders	67
Appendix B	Description of some High Tech greenhouse systems in South Africa	69
Appendix C	SWOT Horticulture SA	73
Appendix D	Procedures to be followed when importing plants and plant products into SA	75



# Foreword

This report was written to give an overview of the South African Horticulture Industry as a general resource.

The South African Horticulture industry, unlike the Dutch, is relatively small and – other than as potential growth sector for employment – is not given the same importance that the national government gives to other better established agricultural industries. This, and the fact that South African farmers in this sector are not (well) organized and individually less forthcoming with statistics of their own production, makes it difficult to get a good picture of what is happening on the ground. Therefore although a number of key respondents were interviewed, in addition to desktop research done in compiling the report, availability of some more detailed information would have improved our insight in the current situation.

It should be noted that horticulture in South Africa is not limited to undercover/protected farming. In fact the majority of vegetable production and a portion of flower production happens in the open field. However, in search of longer seasons and better quality, to protect from the harsh elements and in search of more sustainable production, horticulture is increasingly looking for protected production options.

This report not only identifies partners but also opportunities presented by the South African horticulture sector for Dutch businesses.

Prof Nico Visser – Agricultural Counsellor  
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# Samenvatting

Dit rapport bevat een inventarisatie van de Zuid-Afrikaanse tuinbouw en zijn vooruitzichten ten aanzien van ontwikkeling en uitbreiding. Deze studie is geïnitieerd door het Ministerie van Economische zaken, Landbouw en Innovatie (EL&I). De volgende aspecten zijn bestudeerd:

## Grootte en regio

Het areaal glastuinbouw is in Zuid Afrika relatief klein. Tuinbouwproducten worden in alle streken verbouwd, maar relatief het meest in de gebieden rond Kaapstad, Johannesburg en Durban. Deze drie regio's onderscheiden zich qua klimaat en type product. Kaapstad kent een mediterraan klimaat en produceert vooral groenten en inheemse bloemen (zoals Protea). In de regio Johannesburg heerst een continentaal klimaat, er is groententeelt en hier is het grootste binnenlandse areaal aan geavanceerde bloementeelt gevestigd, gesitueerd rond een bloemenveiling Nederlandse stijl. Vanuit Kaapstad en Johannesburg is er een beperkte export van bloemen en groenten. Het klimaat bij Durban is jaarrond vochtig en warm, en kent een bloemen- en groenteteelt die zich vooral op de binnenlandse markt richt.

## Technologie

Er zijn globaal drie typen bedrijfstypen in de bedekte tuinbouw in Zuid Afrika te onderscheiden: (1) commerciële bedrijven met grootschalige productie en hoog technologisch niveau, (2) opkomende boeren, met gebrek aan ervaring in de glastuinbouw, met weinig middelen, en (3) arme boeren die vooral voor eigen gebruik telen. Het huidige technologische niveau varieert aanzienlijk binnen de regio en tussen bedrijfstypen. De arme boeren telen alleen in het open veld, terwijl de opkomende boeren laagwaardige tot gemiddelde technologie gebruiken met behulp van een tunnelkas maar zonder actieve koeling of verwarming. Het bevoeiingssysteem is basaal en niet geautomatiseerd. Zowel in open veld als in kas worden vaak schaduwnetten gebruikt, echter van lage kwaliteit zodat onnodig lichtverlies optreedt en de luchtuitwisseling erg beperkt is. De commerciële bedrijven bezitten een gemiddeld tot hoog technologieniveau waarbij het groeiklimaat redelijk tot goed beheerst kan worden. De gebruikte systemen gebruiken veel elektriciteit.

## Markt

Er zijn slechts een paar tuinbouwbedrijven die zich op de export richten. De huidige economische crisis. De ongunstige wisselkoers van de Zuid-Afrikaanse munt, verhoogde productiekosten door hoge elektriciteitsprijzen en een toename in arbeidskosten hebben veel bedrijven in financiële problemen gebracht. Vooral de sierteeltbedrijven zijn deze problemen het grootst en kende enkele bedrijfssluitingen. Over het algemeen hebben de bedrijven slechts een beperkte financiële reserve. Het is moeilijk om financiële steun te krijgen van de bank. De tuinbouwproducten worden grotendeels verkocht op de lokale markt. Voor tomaat was in 2009 de export naar schatting slechts 2% van de totale productie. De omringende landen zijn de belangrijkste buitenlandse afzetmarkt, waarbij het transport over de weg overheerst. Snijbloemen worden meestal naar Nederland geëxporteerd, maar de ongunstige wisselkoers en de gestegen prijzen voor luchtvracht is de export naar Europa teruggelopen. Er zijn een reeks exportbureaus actief, maar daarnaast wordt ook direct door de bedrijven geëxporteerd. Voor bloemen is er wel een groei van het aantal exportlanden, er wordt sinds kort ook naar Australië geëxporteerd. De sierteelt ondervindt bij de export veel concurrentie, vooral van Kenia en Ethiopië. Potplanten worden direct door de bedrijven verkocht omdat de veiling geen geschikte infrastructuur biedt. De grote telers leveren direct aan de retail of aan exporteurs. De retail is in toenemende mate dominant binnen de afzetmarkt en vereisen garandeerde levering en kwaliteit gedurende het hele jaar. Deze markteisen kan telers er toe aanzetten om relatief meer van hun gewas in de kas, bij beter beheersbare klimaatcondities, te telen. De invloed van de Zuid-Afrikaanse retail industrie is ook groot, gelet op het feit dat het de grootste is van de Sub Sahara regio en daarbij ook naar buurlanden expandeert.

## Politiek

Zuid Afrika kent geen specifieke politiek ten aanzien van de tuinbouwsector. De sector is relatief klein en de rol van de sector als bron van buitenlandse deviezen is beperkt ten opzichte van sterke sectoren als appels en wijn.

De invloed van de landhervormingen is aanzienlijk en de onderzoek agenda van de overheid is sterk gericht op de ondersteuning van opkomende boeren. Zonder twijfel is er een potentieel aan productie en banen bij economische ontwikkeling van de opkomende boeren. Realisatie van deze ontwikkeling verloopt momenteel echter moeizaam door hun beperkte vaardigheden als ondernemer en gebrek aan inhoudelijke en technische kennis van de moderne tuinbouw. Vooral het telen in kassen is nieuw en enkele recente, gesubsidieerde projecten met tunnels zijn mislukt vanwege het tekort aan kennis en begeleiding. De vooruitzichten zijn dat de opkomende boeren zich in commerciële richting zullen ontwikkelen.

#### **Mogelijkheden voor toeleveranciers uit de Nederlandse glastuinbouw**

De Nederlandse glastuinbouw heeft reeds sinds lange tijd een sterke positie in Zuid Afrika, dankzij historische relaties en de Zuid-Afrikaanse waardering voor het hoge kennis- en technologieniveau. Nederlandse inbreng zou zinvol kunnen zijn in de groenteteelt, waar behoefte is aan verbeterde klimaatbeheersing, geschikt plantenmateriaal en marktsegmentatie en differentiatie. Op opkomende boeren kunnen ondersteund worden in kennisontwikkeling en begeleiding, waarna een passende technologische verbetering realiseerbaar is. De commerciële sierteeltbedrijven kunnen op hun bedrijfssituatie toegesneden energiezuinige, kosten reducerende technologie inzetten om een sterkere concurrentiepositie te verwerven op niet-Afrikaanse markten.

# Summary

This study consists of an inventory of the South African horticulture and its prospects for further development and expansion. The study was initiated by the Dutch Ministry of EL&I. The following issues have been studied:

## Size and region

Protected horticulture in South Africa is relatively small in size. Horticulture products are produced throughout the entire country, however the three main regions are around Cape Town, Johannesburg and Durban. Each of these areas have their own characteristics related to climate and type of products. Cape Town has a Mediterranean climate and produces many vegetables and indigenous flowers (such as protea). Johannesburg has a continental climate. Vegetable cultivation and the biggest share of modern cut flowers production is centred around a Dutch style auction. From Cape Town and Johannesburg limited amounts of flowers / vegetables are exported. Durban is characterized by year-round high temperatures and high humidity levels. Farmers in this region mainly produce flowers and vegetables for the national market, partly under covered systems.

## Technology

There are basically three type of farmers in South Africa: 1) commercial farmers that have large scale modern farms, 2) emerging famers who are usually inexperienced, resource poor and with limited scale of operations, and 3) subsistence farmers that focus on growing enough food for home consumption. The current level of technology varies considerably within each region and among the type of farmers. The subsistence farmers grow vegetables in the open field. The emerging farmers grow in low to medium-tech production systems that have a (multi-)tunnel but without active cooling or heating system. The fertigation system is very basic and manually operated. Shadow nets are frequently used, in the open field and in tunnels, but the quality is poor thereby depressing light levels reaching the crop and limiting air ventilation. The commercial farmers grow in medium to high-tech systems that control most indoor growth conditions. These systems are electricity intensive.

## Market

In general there are only a few companies in the industry that are export orientated. The current economic crisis, the negative exchange rate of the ZAR, the increase in costs due to higher electricity prices and an increase in labour costs brought many farmers in financial problems. Especially flowers farms have great difficulty sustaining their business and some even have been forced to shut down operations. In general the capital reserve of the farmers is limited. For farmers it is very difficult to rely on banks for finance of investments. Horticulture products are mostly sold on the domestic market. For tomato the exported quantity in tonnes was less than 2% of the total production (2009). The main export destinations for flowers and vegetables are the neighbouring countries, to which products are often being transported by road. Cut flowers were often exported to The Netherlands but, due to the unfavourable exchange rate of the ZAR and the price for air transport, exports to Europe have reduced. There are various export agents in the industry, however some farmers export directly. New export markets for flowers are being developed in Australia. However competition with other African countries such as Ethiopia and Kenya has to be considered. Potted planted are sold directly by the farmers, since the auction in Johannesburg does not have the proper infrastructure to handle these. The larger farmers supply retailers and exporting agents directly. Retailers are increasingly dominant in the market and have supply conditions related to quantity and quality throughout the year. These requirements might force farmers to produce in protected circumstances to produce a stable quality and quantity throughout the year. Furthermore, the retail industry in South Africa is regarded the largest in the Sub Sahara region and several retailers are expanding to neighbouring countries.

## Policy

There is no specific governmental policy for the horticulture sector in South Africa. The size of the sector is relatively small and the role of the sector as a foreign currency earner is limited relative to strong sectors like wine and apples. The impact of land reform in horticulture is significant and the governmental policies and research agendas have a strong focus on supporting the emerging farmers. Without doubt, there is a lot of potential for the

economic development of emerging farmers, however their current entrepreneurial skills and technical knowledge of producing horticulture products is limited. Especially growing under protected circumstances is something new for emerging farmers and in the past several projects with donated tunnels have failed due to a lack of support and guidance. In the long term the emerging farmers may develop themselves to commercial farmers.

### **Opportunities for Dutch horticultural industry**

The Dutch industry has a strong position in South Africa, being present since long, and having a high level of know-how and technology. Dutch support to the growing market of vegetables may focus on improved indoor climate, better cultivars and market segmentation. With regard to the emerging farmers the Dutch could first give basic knowledge and training, followed by the necessary technologies to improve horticultural production and quality. The help to commercial ornamental growers may consist of tailor-made techniques on energy saving, reducing costs and making the sector more competitive in its export to non-African countries.

# **1 Introduction**

## **1.1 Background**

Horticulture has a lot of potential in South Africa (SA) and can contribute to food security. The Dutch supply industry is interested in cooperation with South African protected horticultural industry. The sector can be further developed with Dutch know-how and technology. However currently there is limited knowledge on the sector. Therefore there is a need for an accurate description of the actual situation, and assessment of possible development trends. Specific needs related to technology and knowhow of local growers have to be identified. Dutch suppliers can fulfil those needs and can contribute to a further development of (protected) horticulture in South Africa. This line is supported by The Netherlands Ministry of Economic affairs, Agriculture and Innovation (EL&I) , who commissioned this study.

## **1.2 Objective**

The objective of this study is to:

1. Give a quantitative overview of the protected horticulture related to areas of production, area, crops and productions volumes.
2. Give a macro-economic overview of the sector.
3. Identify opportunities for the Dutch greenhouse supply industry.

## **1.3 Method**

By means of a literature review basic information on horticulture in SA has been collected. In addition various sources have been consulted in order to get a broad overview of the countries characteristics and economic performance (e.g. general macro-economic indicators from the World Bank, trade information from the UNcomtrade database and crop production statistics from FAO.

In addition a mission to SA was organised to interview growers and stakeholders within the sector. During these in depth interviews information was gathered, validated and valued. Appendix 1 gives an overview of the interviewed stakeholders. Unfortunately no publications or databases were available on horticulture produce. Therefor no data could be presented on area of cultivation under protected circumstances. Therefore we made estimates on basis of the generally qualitative information collected in the interviews.

## **1.4 Acknowledgements**

This study would not have been possible without the help and assistance of Nico Visser, Fan Hsueh and Wilson Mgwambe from the Dutch embassy in Pretoria. Thanks to all. We also thank Craig and Graham Taylor, PhD student at Wageningen University, who helped supplying data on Durban. We acknowledge the help of Paddy de Vries after we interviewed him. We want to thank Johan Swiegers for supplying some data of Under Cover farming in SA. Special thanks to Athanasios Sapounas at WUR for retrieving climate data from the three airports, and to Jouke Campen for help on some company information. Thanks to Anne Elings (WUR) for his acquisition and support, and Ingrid Korving (EL&I) and Leo Marcelis (WUR) for reviewing the report.



## 2 General information

### 2.1 Introduction

The Republic of South Africa (SA) is a country in southern Africa and is divided into nine provinces, with 2,798 kilometres of coastline on the Atlantic and Indian oceans (CIA, 2011). To the north of the country lie the neighbouring territories of Namibia, Botswana and Zimbabwe. To the east are Mozambique and Swaziland. Lesotho is an enclave surrounded by South African territory (Figure 2.1.).

*Figure 2.1. The Nine provinces of South Africa.*



### 2.2 Demography

SA is multi-ethnic and has diverse cultures and languages. The population is comprised out of 79% black, 9.6% white, 8.9% coloured and 2.5% Indians and Asians (Census, 2001). Eleven official languages are recognised in the constitution. Two of these languages are of European origin: Afrikaans, a language which originated mainly from Dutch that is spoken by the majority of whites and Coloured South Africans. English is commonly used in public and commercial life. The total population is estimated to be circa 50 million. The agriculture populations has decreased the last decade and consisted of 4.76 million people in 2011 (FAOstat, 2012). This a clear sign of on-going urbanisation.

### 2.3 Economy

#### 2.3.1 Macro-economic developments

SA has a dual economy. One comparable to industrialized nations and another comparable to developing countries. SA achieved democracy in 1994, but in the decades before democracy, the apartheid government systematically excluded African, Indian and coloured people from meaningful participation in the country's economy. Apartheid caused much poverty and a profoundly sick economy. The impact of economic sanctions, capital controls and political isolation from overseas had essentially cut the economy off from the rest of the world. The economy was suffering from falling investment and growth, persistently high inflation and interest rates, and weak public finances (Nowak and Ricci, 2005). After apartheid SA has made major strides in raising economic growth and the living standards of its population. Between

1995 and 2003, real GDP grew at an average of nearly 3%, which was double the growth rate recorded between 1980 and 1994 (Nowak and Ricci, 2005). Growth was robust from 2004 to 2007 as SA reaped the benefits of macroeconomic stability and a global commodities boom, but began to slow in the second half of 2007 due to an electricity crisis and the subsequent global financial. However South Africa's economic performance since the mid-2000s has been impressive and the OECD (2011) is expecting a further GDP growth for the upcoming years. Inflation has decreased over the years (Table 2.1.), however the OECD (2010) is expecting an increase in inflation in since food prices have been rising. Food prices account for more than 14% of the basket of goods and services. The poor majority spend most of their income on food.

The total employment within SA is 18.51 million individuals in 2011. According to official data, unemployment is very high, especially for the black majority. Unofficial estimates are even higher and range up to 50%. Despite this the GDP per capita has increased significant. In economics, Purchasing Power Parity (PPP) asks how much money would be needed to purchase the same goods and services in different countries, and uses that to calculate an implicit foreign exchange rate. Using that PPP rate, an amount of money thus has the same purchasing power in different countries, PPP rates facilitate international comparisons of income, as market exchange rates are often volatile and tend to understate the standard of living in poor countries. In 2002 this still was 7,060 USD and in 2010 this was increased with 47% to 10,360 USD. In Kenya it is 1,640 USD and Ethiopia the PPP is 1,040 USD. The increase in PPP in SA was far higher compared to Kenya and Ethiopia. The black South Africans middle class is sharing in the country's economic successes. The so-called black diamonds have worked their way up and have created a considerable amount of wealth. They form around 10% of the 22 million over-18-year old black South Africans and contribute up to 40% of the spending in this group. In terms of earnings, 61% of the black diamond's earn at least 800 USD a month, but households have often more than one wage earner. The category has seen a steady growth in recent years with a 15% rise to reach 3 million black diamonds in 2008 (ULC, 2008).

*Table 2.1. Economic indicators South Africa.*

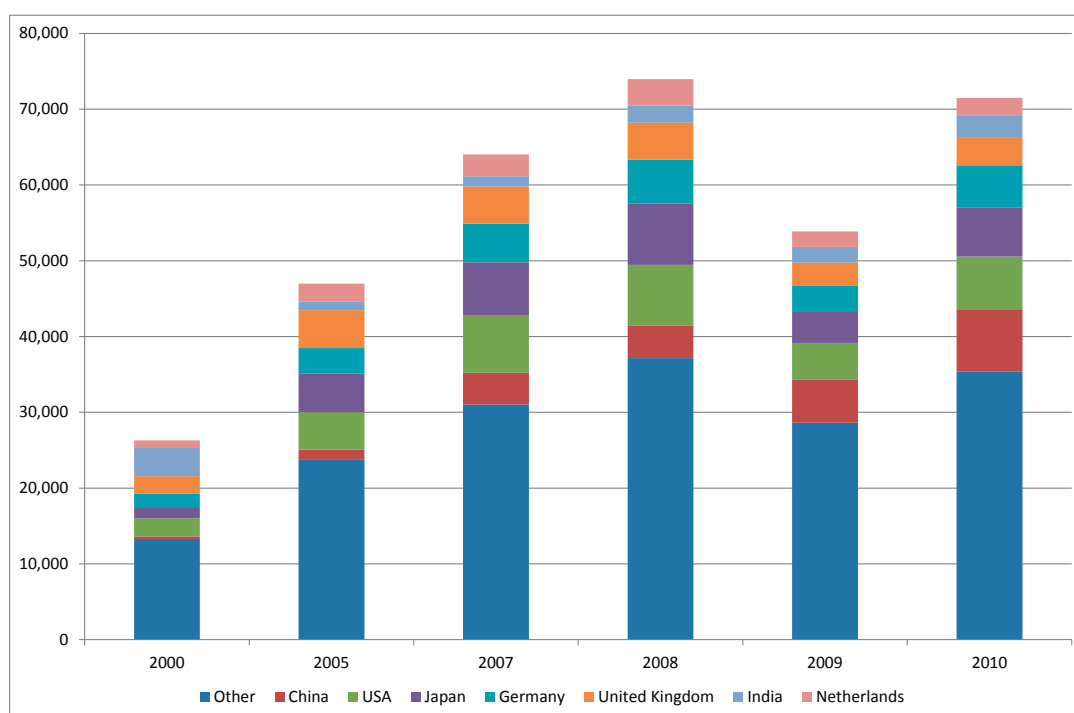
	<b>2008</b>	<b>2009</b>	<b>2010</b>
GDP (ZAR)	2,274 billion	2,395 billion	2,644 billion
Unemployment	22.9%	23.8%	24.9%
Inflation	11.5%	7.1%	4.3%

*Source: World Bank, 2011*

## 2.3.2 External position

China became the most important destination for South Africa's exports in mid-2009 and is also South Africa's leading source of imports. China, and to a lesser extent India, have become dominant trading partners. China's 11.4% share of South Africa's exports surpasses the 9.9% and 9.0% claimed by the US and Japan, respectively. The Netherlands is ranked the 7<sup>th</sup> export destination for South African products (Figure 2.2.).

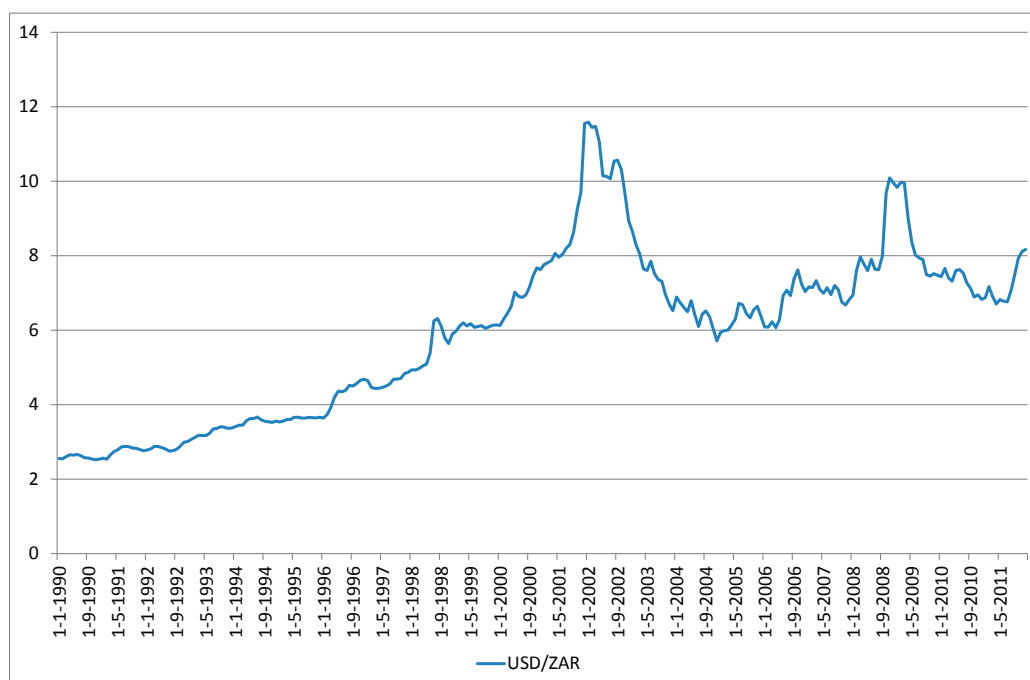




Furthermore China is the dominant investment partner among emerging partners with its foreign direct investment (FDI) ranked 5<sup>th</sup> in terms of value in 2010, at 33 billion ZAR (AEO, 2011). South Africa's foreign direct investment (FDI) inflows has dropped by 70% in 2010 compared with 2009. SA had been placed tenth of Africa's FDI inflows in 2010, compared with the fourth place in 2009. In total, SA received only 2.8% of Africa's FDI. The top-ranked countries in terms of FDI in 2010 were Angola (20% of Africa's total FDI), Egypt, Nigeria and Libya (UNCTAD, 2011).

Many emerging partners use SA as a gateway to other African countries. In December 2010, SA became an official member of the BRICS (Brazil-Russia-India-China-South Africa) group. The challenge for the government is to show that it has a purposeful plan to engage with BRIC countries, to prioritise its productive capacity, and to maximise its contribution to the national economy (AEO, 2011).

The value of the South African Rand (ZAR) has increased significantly and has been very variable the last 10 years (Figure 2.2.). By the end of 2002, the currency was trading at R9 to the dollar, and by the end of 2004 was trading at R5.70 to the dollar. The currency softened somewhat in 2005, and was trading at R6.35 to the dollar at the end of the year. At the start of 2006 however, the currency resumed its rally, and, as of 19 January 2006, was trading at R6 to the dollar. However, the rand weakened significantly in 2006. The downfall of the ZAR could be attributed to various factors like South Africa's worsening current account deficit of 7.3% of the GDP in 2007, inflation at a five-year high, escalating global risk aversion and a general flight to "safe havens", away from the perceived risks of emerging markets. The rand depreciation was worsened by an electricity crisis, which arose from the utility being unable to meet the country's rapidly growing energy demands. Currently the ZAR has an exchange value of R8 to the USD in January 2012 which makes products for export relative expensive.



Source: OANDA.

### 2.3.3 The Netherlands

According to the South African Yearbook (2011), the Netherlands is an important trade and investment partner of SA, and major provider of tourism. South Africa has close political relations with the Netherlands, and engages in substantial cooperation partnerships, contributing significantly to South Africa's national priorities. The Dutch Government has consistently supported South Africa in terms of bilateral and multilateral relations. A large number of bilateral agreements have been signed and high-level bilateral ministerial meetings are held frequently to discuss bilateral relations, economic development and areas of cooperation.

The Netherlands is among the top 10 trade partners of the SA. The total value of the imports from SA was 2.47 billion USD in 2010. Edible fruit and nuts have the largest share, accounting for more than 850 million USD. Also a large part of the import is dominated by various metals, iron and steel (Figure 2.3.).

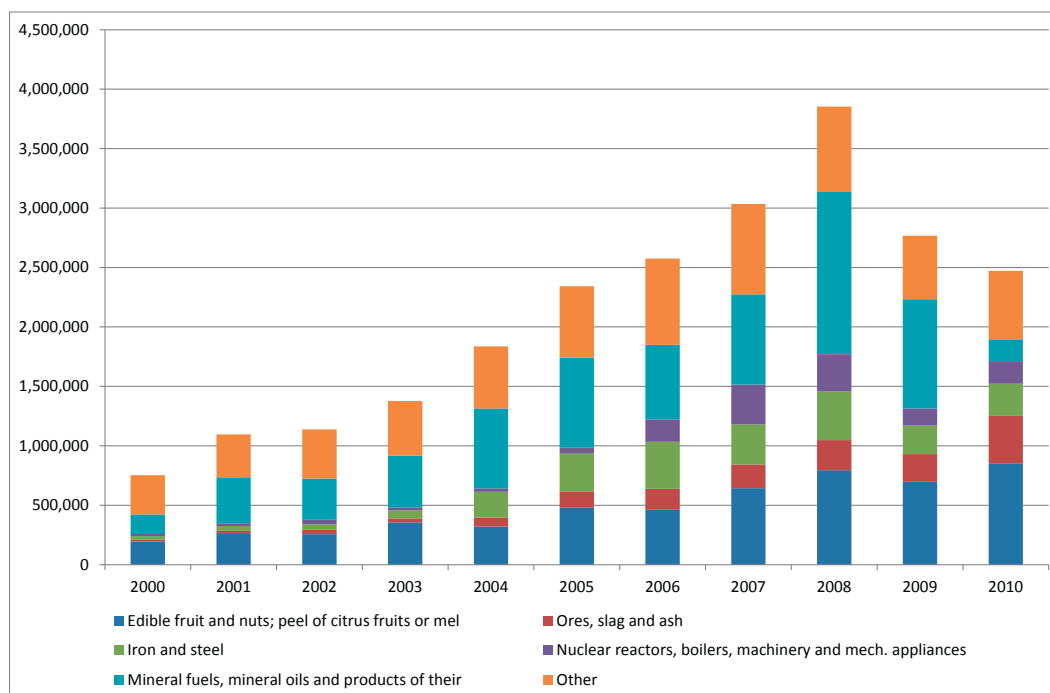


Figure 2.3. Imports from South Africa by the Netherlands in USD x 1,000 (2000-2010)

## 2.3.4 Agriculture

The contribution of primary agriculture to the national GDP was around 2.5% in 2010. In comparison, services accounted for circa 67% and industry contributes to 31% of GDP. There are no data available on the contribution of (protected) horticulture to the GDP.

The total number of farmers in South Africa decreased from over 60,000 in 1996 to 40,000 in 2009 (EKN, 2010). Agricultural industry contributes around 9% of formal employment, relatively low compared to other African countries. Circa 1.15 million individuals are employed in agriculture. The importance of agriculture as source of employment has reduced the last decade. In 2001 it represented 10% of the total labour force, while it represented only 6% in 2011 (Table 2.2.).

Table 2.2. Population division.

	Size (Millions)				Annual growth rate [%]		
	1996	2001	2006	2011 *	1996-2001	2001-2006	2006-2011
Total population	42.18	45.39	48.33	50.46	1.48	1.26	0.87
Agricultural population	6.69	6.08	5.43	4.76	-1.89	-2.24	-2.6
Total labour force	14.6	16.23	17.46	18.51	2.14	1.47	1.17
Labour force in agriculture	1.57	1.46	1.31	1.15	-1.44	-2.14	-2
*estimation							

Source: FAOstat, 2011.

Like the rest of the economy, agriculture is characterised by a dual economy: well-developed commercial farming with an established supply chain, and on the other hand a small emerging and subsistence sector. The commercial sector contributes 95% of the total produce while the emerging sector contributes only 5%. Compared to other African countries, South Africa's agricultural sector is not dominated by subsistence communal farming, with most farms being large commercial enterprises. The country is almost self-reliant and exports massive amounts of agricultural produce. Many other southern African countries rely on SA for their food imports. According to 2011 FAOstat figures, SA is one of world's largest producers of: chicory roots (4th); grapefruit (4th); cereals (5th); green maize and maize (7th); castor oil seed (9th); pears (9th); sisal (10th); fibre crops (10th). The main agriculture export products are: corn, wheat, sugarcane and fruits. Circa 50% of the 1.7 billion USD exported fruit to Europe is designated for the Netherlands. The import for fruits in Europe is concentrated in Rotterdam and the surrounding area. The Rotterdam port area has an efficient transfer and distribution centre with various fresh storage centres, fruit export/import companies, port facilities and logistic service companies.

## 2.4 Ecology

Conservation International (CI) ranked SA sixth out of the world's seventeen megadiverse countries, with more than 20,000 different plants, or about 10% of all the known species of plants on earth, making it particularly rich in plant biodiversity<sup>1</sup>. However due to the aridity of the land, only 12% can be used for crop production (Table 2.2.). Agriculture in SA faces declining soil health, water scarcity and climate change. It is estimated that about 400 million m<sup>3</sup> of soil is lost annually. In addition, water pollution, loss of biodiversity and declining productivity of land make the agricultural sector rather unsustainable (FAO, 2004).

Table 2.2. Land use South Africa.

	Area [Millions of ha]				Annual growth rate [%]		
	1994	1999	2004	2009	1994-1999	1999-2004	2004-2009
Total area	121.45	121.45	121.45	121.45	0	0	0
Arable land	14.6	14.75	14.7	14.35	0.2	-0.07	-0.48
Permanent crops	0.9	0.96	0.95	0.95	1.3	-0.21	0
Forest cover	9.24	9.24	9.24	9.24	0	0	0

Source: FAOstat, 2011.

### 2.4.1 Vegetation

The most prevalent biome is grassland (also comprising steppe), particularly on the Highveld, where the plant cover is dominated by different grasses, low shrubs, and acacia trees, mainly camelthorn and whitethorn (Fig.2.4). Vegetation becomes even more sparse towards the northwest due to low rainfall. There are several species of water-storing succulents like aloes and euphorbias in the very hot and dry Namaqualand area. The grass and thorn savannah turns slowly into a bush savannah towards the north-east of the country, with denser growth.

### 2.4.2 Climate

SA generally enjoys a warm temperate climate. Temperature ranges in January are 21° to 27° C in Durban, 14° to 26° C in Johannesburg, and 16° to 26° C in Cape Town. In July the temperature ranges are 11° to 22° C in Durban, 4° to 17° C in Johannesburg, and 7° to 17° C in Cape Town. Night temperatures are significantly lower in the higher mountains. In §3.2 facts and figures on climate are dealt with in more detail.

<sup>1</sup> The concept of megadiversity is based on the total number of species in a country and the degree of endemism at the species level and at higher taxonomic levels. Together, these 17 countries harbor more than 70% of the earth's species. The World Conservation Monitoring Centre recognized 17 megadiverse countries including Australia, Brazil, China, Colombia, Democratic Republic of the Congo (DRC), Ecuador, India, Indonesia, Madagascar, Malaysia, Mexico, Papua New Guinea, Peru, the Philippines, South Africa, the United States of America (USA) and Venezuela.

Rainfall is unpredictable. Much of the country has an annual rainfall of less than 600 mm with as little as 200 mm in desert areas. Rain falls primarily in summer between October and April, although the extreme south-west has a Mediterranean climate with westerly winds from the Atlantic bringing winter rainfall between June and September.

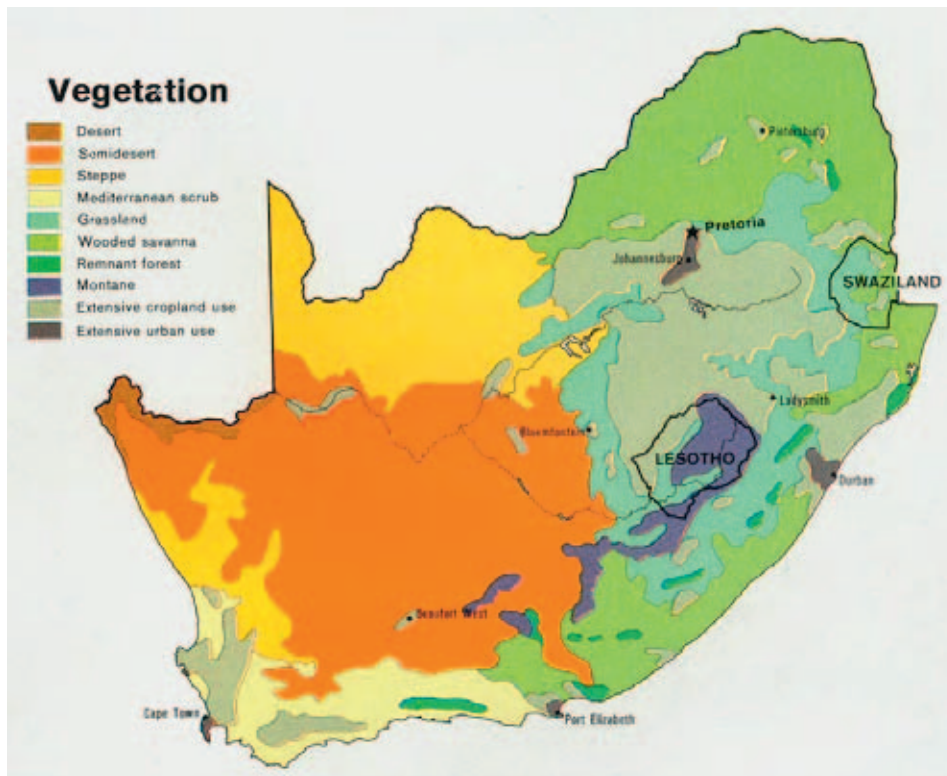


Figure 2.4. Vegetation map of South Africa.

Source: [http://mapas.owje.com/maps/3761\\_south-africa-vegetation-map.html](http://mapas.owje.com/maps/3761_south-africa-vegetation-map.html)

## 2.5 Technology and infrastructure

Structural challenges such as infrastructure bottlenecks hampered recovery in private investment and outdated infrastructure has constrained growth.

### 2.5.1 Electricity

At the end of 2007, the electricity crisis started. State power supplier Eskom encountered problems with aged plants, necessitating “load-shedding” cuts to residents and businesses in the major cities. New industrial projects could not be powered until additional power generation capacity could be brought on stream. Initially the lack of capacity was triggered by a failure at Koeberg nuclear power station, but since then a general lack of capacity became evident. Eskom has been widely criticized for failing to adequately maintain existing power stations and for the lack of forward planning of sufficient electrical generating capacity.

Eskom will be allowed to double electricity prices over a period of three years, drawing outrage from unions but relief from the mining sector where an even bigger hike had been feared. The power company says the increase is needed to finance its R385 billion scheme to meet the soaring demand for electricity by building new plants and expanding the national grid. The National Energy Regulator SA (NERSA) agreed to allow three annual price increases of roughly 25%. The first was in April 2010. This means that electricity will cost twice as much in 2012 as it did in the beginning of 2010.

## 2.5.2 Roads

SA has a modern infrastructure that supports a relatively efficient distribution of goods to major urban centres throughout the region. South Africa's total road network is about 754,000 km, of which over 70,000 km are paved or surfaced roads. The national road network is in good to excellent conditions with the proportion of roads in poor to very poor condition never exceeding the international benchmark of 10%. However the paved provincial road network has deteriorated significantly over time (SAICE, 2011). The Department of Transport is responsible for overall policy, road-building and maintenance is the responsibility of the South African National Roads Agency (Sanral) as well as the nine provinces and local governments. Sanral is responsible for the country's network of national roads. Around 3,000km of the national roads are toll roads. About 1,800km of these are maintained by Sanral, the rest by private companies.

## 2.5.3 Air- and seaports

SA has three deep-water ports located in Cape Town, Port Elisabeth and Durban. Currently many fruits are being exported from these harbours. It takes circa 2 weeks to ship a container to the port of Rotterdam. However in general containers have to be at the docks 1 week before shipping in order to load the ships. Currently Wageningen UR is involved in research projects to preserve the quality of fruits during shipment. There are no projects known related to the boat transport of vegetables. However indigenous flowers, like protea are often shipped by boat to Europe. Furthermore there are three international airports (Cape Town, Johannesburg and Durban). There are well-developed cold chain facilities at the airports and seaports. In general other countries, located closer to Europe find themselves in a more beneficial position since the cost of transport is cheaper.

## 2.5.4 ICT

According to recent data from the World Bank, there are 101 cell phone subscription per 100 people in 2010. Compared to other African countries this is relatively high (e.g. Kenya has 60 subscriptions per 100 persons). The fixed line network is good, but lines are regularly stolen for copper (EKN, 2010). Internet access has increased significant in recent years. In 2007 only 8.2 on 100 persons had access to Internet, in 2010 this has increased to 12.3 per 100 persons.

# 2.6 Political situation

## 2.6.1 New Growth Path framework

SA's former economic policy was fiscally conservative, focusing on controlling inflation, and attaining a budget surplus (AEO, 2011). The current government largely follows the same policies, but must cope with the impact of the global crisis. Therefore, the government outlined a number of interventions, addressed in the New Growth Path framework. This framework sets a target of creating 5.5 million jobs over the next decade. The framework addresses five key job drivers:

- substantial public investment in infrastructure;
- targeting more labour-absorbing activities across the main economic sectors;
- taking advantage of new opportunities in the knowledge and green economies;
- leveraging social capital in the social economy and public service;
- fostering rural development and regional integration.

To create these jobs, the government plans to implement both macroeconomic and microeconomic packages. The macroeconomic package essentially calls for a looser monetary policy. The microeconomic package includes reforms that touch industrial activity, rural development, competitiveness, labour, technology, developmental trade and African development policy, as well as the BEE.

## 2.6.2 Crime and corruption

Progress has been made in crime prevention: national crime statistics for 2009/10 show that street robberies declined by 10.4%, bank robberies by 8.8%, and truck and car hijackings by 6.8%. Violent crime also declined, with murder down by 8.6%. Reliability of police services also marginally improved in 2010 relative to 2009, according to the Global Competitive Index (GCI). Improvements are also due to the tightening of security during the FIFA World Cup organised in SA in 2010.

To fight corruption, organised crime, and economic crime a Directorate for Priority Crime Investigation was established mid-2009. They have made several thousand arrests against organised crime and commercial crime by mid-2010, with conviction rates of 15% and 60% respectively. However according to Transparency International, the Corruption Perceptions Index (CPI) has further decreased, from 4.7 in 2009 to 4.1 in 2011. Public trust in politicians, judicial independence, and decisions of government officials remains limited and so trust deteriorated further in 2010, according to the GCI.

## 2.6.3 Black Economic Empowerment

The Black Economic Empowerment (BEE) policy was formed in 2003. This policy of black economic empowerment is not simply a moral initiative to redress the wrongs of the past. It is a growth strategy that aims to realise the country's full economic potential (EKN, 2011).

BEE is driven by legislation and regulation. An integral part of the BEE is a sector-wide generic scorecard, which measures companies' empowerment progress in four areas:

- Direct empowerment through ownership and control of enterprises and assets.
- Management at senior level.
- Human resource development and employment equity.
- Indirect empowerment through:
  - o Preferential procurement,
  - o Enterprise development, and
  - o Corporate social investment (a residual and open-ended category).

## 2.6.4 Land reform

Land reform remains a sensitive issue in SA. In 1994 the new democratic government of SA inherited a racially highly skewed land distribution: 87% owned by the small white minority and 13% land owned by the blacks. Undoing the legacy of apartheid's unequal land distribution and ensuring the continued productive use of agricultural land transferred to black ownership is a national priority. Having so far acquired land on a "willing buyer, willing seller" basis, officials have signalled that large-scale expropriations are on the cards. The government aims to transfer 30% of farmland to black South Africans by 2014. Land reform has three important parts: land restitution of land taken away under apartheid; land redistribution to create more equal ownership of land; and land tenure reform to give people ownership of land they live on under tribal systems.

### 2.6.4.1 Land Restitution

Restitution can mean restoring the land itself or providing alternative land or monetary compensation or other relief. The form that restitution takes depends on the circumstances of each claim. Alternative compensation applies if the claimant prefers it, or if it is no longer feasible to restore the actual land. The claimants are always involved in negotiating the settlement. Individuals, communities or their descendants who lost land rights due to racially discriminatory laws or practices on or after 19 June, 1913 qualify for restitution in terms of the Act.

#### **2.6.4.2 Land Redistribution**

The purpose of the land redistribution programme is to provide the poor with access to land for residential and productive use to improve their livelihoods. Land reform cannot benefit the country if poor people have to buy land on the open market without assistance. Therefore, the government assists the needy to purchase and develop land and provides services (which is essentially BEE supporting black farmers or disadvantaged farmers). Government acknowledge the need to maintain public confidence in the land market while redistributing land to the poor. The redistribution programme has depended largely on transactions between willing buyers and willing sellers. People who qualify for the land redistribution programme include:

- Labour tenants
- Women
- Farm workers
- Emerging Farmers
- The urban and rural landless poor

The Redistribution Programme has different components or subprograms, namely;

- Agricultural development, to make land available to people for agricultural purposes so that;
- Settlement, to provide people with land for settlement purpose;
- Non-agricultural enterprises, to provide people with land for enterprises such as eco- tourism projects.

#### **2.6.4.3 Tenure Reform**

Land tenure describes the way in which people own or occupy land. In SA, registered ownership is more secure than other ways of holding land. Apartheid laws made it impossible for black people to get registered ownership rights, or any other rights to land in most parts of the country. This created a severe land shortage for the black majority and many people established homes in areas where they had no legal rights. Therefore, tenure reform must:

- Resolve problems of insecurity, inequality and lawlessness;
- Remove development bottlenecks;
- Resolve tenure disputes, overlapping tenure rights and conflicting claims;
- Balance systems of group rights with individual rights;
- Give all rights holders under communal ownership systems, including women, adequate representation in decision-making processes;
- Put in place an adequate system of land administration to support individual and communal land tenure;
- Provide for law enforcement agencies to intervene in land rights disputes in order to be flexible and allow for change and adaptation.



## 3 The South African Horticulture sector

### 3.1 Scale of horticulture

#### 3.1.1 Horticulture in South Africa

SA has a long history in horticulture. The very first vegetable production started in the VOC's Company's garden, in Cape Town by the Dutch in 1653. The flower industry began in the 1920's and 1930's. It was during these years that the country's first SA based horticulture projects started (EKN, 2010). Many projects were imitated by Dutch immigrants while establishing themselves among indigenous South African flower growers. Many of the most prominent flowers in the international cut flower industry have their origins in SA, such as gladioli, nerine, freesia, calla lilies and gerbera. In total there is estimated to be 250-350 hectare of protected flower cultivation and 20,000 hectare of production in natural environment (e.g. fynbos and proteas). The production is dominated by roses (40%), chrysanthemums (15%) and carnations (10%)<sup>2</sup>.

Vegetables are produced all over the country. There is a total vegetable areal of circa 136,000 hectares (Table 3.1.). However only a very small part of this area is protected cultivation. This depends often on the crop. Many crops are produced in climatically good conditions outside, where there is no need for protected circumstances. Of the vegetables especially tomatoes, and cucumbers have great potential for protected cultivation, e.g. because the growing season can be extended and improved growth conditions will increase productivity and fruit quality. Tomatoes are produced in all Provinces but Limpopo Province is the major production area with 3,590 hectare. The province accounts for more than 50% of the total area planted to tomatoes. The other main producing areas are Onderberg area of Mpumalanga Province at 770 hectare and Border area of Eastern Cape Province at 450 hectare. Cucumbers are also produced in almost all provinces of South Africa. Cucumber production is more concentrated in the Western Cape, Eastern Cape, Free State and Kwazulu Natal Provinces and is mostly produced outside.

Table 3.1. Area in ha of vegetable per crop in SA (2000-2010).

	2000	2005	2006	2007	2008	2009	2010
Beans, green	5,081	3,700	3,200	3,300	3,494	4,000	3,000
Cabbages and other brassicas	3,100	2,719	2,500	2,550	2,700	2,400	2,600
Carrots and turnips	4,221	4,515	4,600	5,300	6,100	5,300	5,200
Cauliflowers and broccoli	1,394	1,074	850	980	1,050	1,550	950
Cucumbers and gherkins	1,160	1,200	1,100	1,150	1,250	1,300	1,400
Lettuce and chicory	2,200	2,194	2,200	2,500	2,900	2,500	2,500
Maize, green	31,000	36,168	32,500	32,319	33,305	34,651	39,100
Onions, dry	19,000	16,088	18,000	19,000	22,000	20,500	23,300
Peas, green	3,000	4,625	4,600	4,500	3,000	5,500	5,400
Pumpkins, squash and gourds	19,983	18,940	10,000	12,000	11,000	12,291	11,500
Tomatoes	11,000	6,475	6,400	7,100	7,800	7,700	7,900
Other fresh vegetables	20,000	25,759	23,884	23,751	24,476	25,465	33,500
<b>Total vegetable area</b>	<b>121,139</b>	<b>123,457</b>	<b>109,834</b>	<b>114,450</b>	<b>119,075</b>	<b>123,157</b>	<b>136,350</b>

Source: FAOstat, 2012

2 Estimations based on interviews with the stakeholders from the industry

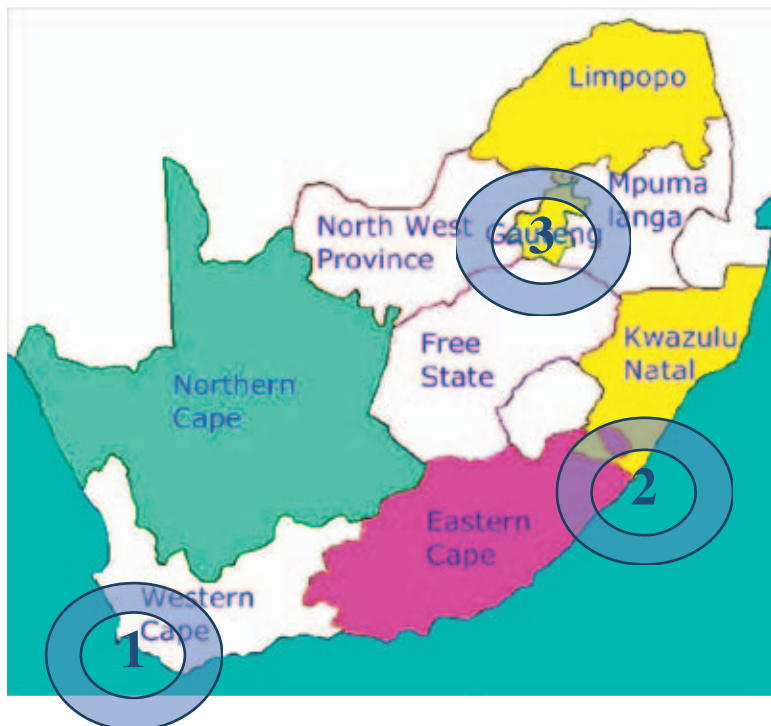
### 3.1.2 Type of farmers

There are basically three type of farmers, similar to the classification made for farmers in general: 1) the commercial farmers that have large scale modern greenhouses, 2) the emerging farmers or the previously disadvantaged Black farmers, which are usually inexperienced, resource poor and their scale of operation is in general too small to attract the provision and the service they need to increase their productivity (Boonzaaier, 2009) and 3) the subsistence farmers that focus on growing enough food to feed themselves and their families. In this study we focus on the emerging farmers and the commercial farmers.

To a considerable extent (no figures available), the commercial cut flowers growers were formerly Dutch, and immigrated in the previous century to SA. They carried with them horticultural knowledge and skills, and adapted the predominantly Israelian greenhouse techniques to their wishes.

## 3.2 Description of main horticulture regions

There are 3 main production areas in SA, namely around Cape town (1), Durban (2), and Johannesburg (3). These areas have their own characteristics related to the crops produced. The type products produced is related to differences in climate related with respect to rainfall distribution over the year, temperature, air humidity and to a lesser extend for radiation (Figure 3.1.).



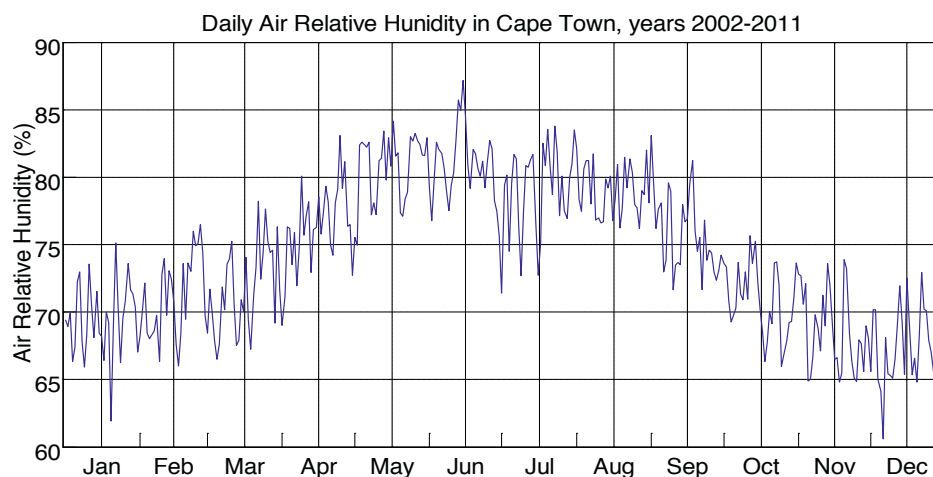
### 3.2.1 Cape Town

Cape Town is situated in the Western Cape province and has a Mediterranean climate. However there is great variation between certain areas within the Western Cape province. Ranging from the semi-desert region in Karoo (hot summers versus cold winters and hot days versus cold nights) to the wet Mediterranean southern tip and the rocky Cape Agulhas. The inland horticultural concentration area of Stellenbosch/Paarl is hotter in summer. Other horticultural area's as the Hottentot Holland (Grabouw area with lots of fruit cultivation) is much cooler. In general the temperatures are high in summer and mild in winter (Table 3.3.). The influence of the sea and the low altitude also damp out large temperature fluctuations as experienced in the continental climate in the inner country. The strong westerly winds from the Atlantic bring winter rainfall between June and September, which makes the climate better suitable for open field crop growth than that in the dryer inland. The annual amounts of radiation are rather high, and comparable to those in southern Europe. The time course of air humidity does not show large extremes (Figure 3.2.).

Table 3.3. Average annual climate Cape Town.

	Average Maximum temp	Average minimum temp	Average hours of direct sun	Average nr days rainfall	Average mm per month
January	26	16	11	6	0-5
February	27	15	10	5	0-5
March	25	14	9	5	6 – 30
April	23	12	7	8	31-60
may	19	9	6	11	61-100
June	18	8	5	14	101-200
July	17	7	6	12	101-200
August	17	8	7	13	101-200
September	19	9	7	10	31-60
October	21	11	9	9	31-60
November	23	12	10	5	6 – 30
December	24	14	11	4	6 – 30

Figure 3.2. Daily air humidity Cape Town 2011



In terms of flower production, the most important market consists of the harvest from the Western Cape's natural vegetation, i.e. the indigenous species from the Fynbos. Fynbos includes Protea, Leucospermum, Leucadendron, Erica, Berzelia, Brunia and all kinds of unique greens (EKN, 2010). The fynbos industry requires low inputs and is being transformed from wild harvesting to cultivation. The increased demand and production over the last decade has resulted in opening of new lands and habitat loss (Waarts and Kuit, 2009). Despite Rooitbos tea production, dried and fresh flowers form an important component of the fynbos industry and are exported, by sea transport, to The Netherlands. A large variety of proteas, cone bushes and other products are being produced. Currently an estimated 545 hectare of commercial fynbos is farmed on open land. With respect to protected horticulture, the size of production for ornamentals is far less than that on vegetable production. The main vegetable produced is tomato.

### 3.2.2 Durban

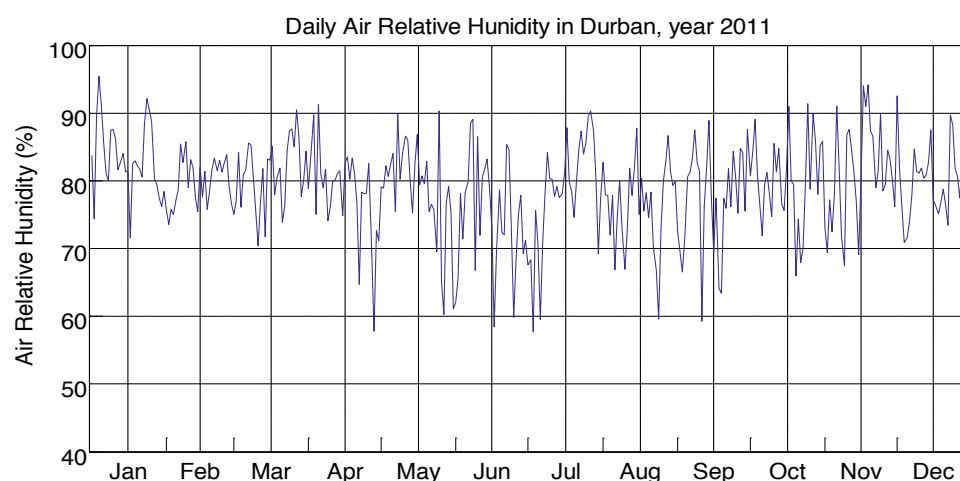
As a South African coastal city adjacent to the warm offshore Mozambican current, Durban experiences a strongly moderated sub-tropical climate. Consequently, the diurnal and nocturnal temperature differences recorded for all seasons are typically minor (Table 3.4.). Summer months are hot and humid with temperatures typically exceeding the upper 20°C and entering low 30°C with humidities typically exceeding 80%. Much of the approximately 1000 mm annual precipitation

falls during this season. It experiences mild and moderately humid, moist to dry winters, with the occasional anomaly of high temperatures transients immediately followed by relatively low temperatures due to the passage of cold frontal systems over South Africa from the South Atlantic, which may accompany rain. No frost or snow has been recorded in the city while the occurrence of hail is rare. In 2008 the combination of high humidity and low radiation caused large scale fungal diseases in greenhouse crops, which led to a close down of many farms.

Table 3.4. Average annual climate Durban

	Average Maximum temp	Average minimum temp	Average hours of direct sun	Average nr days rainfall	Average mm per month
January	27	20	6	16	101-200
February	27	20	7	14	101-200
March	27	19	7	14	101-200
April	26	17	7	9	61-100
may	24	14	7	5	31-60
June	23	11	7	3	6 – 30
July	22	11	8	4	31-60
August	23	12	7	6	31-60
September	23	15	6	10	61-100
October	24	16	6	15	101-200
November	25	18	6	17	101-200
December	26	19	7	16	101-200

Figure 3.3. Daily air humidity Durban 2011.



The high humidity makes cooling with a pad and fan system impossible. Therefore most greenhouses use natural ventilation. This ventilation is sometimes hardly sufficient, especially in Venlo-type greenhouses like the ones at Dube Tradeport. The original objective was to produce herbs for the Indian market to be flown there from Durban, however the international flights did not materialise and the greenhouses are now for a small part used for cucumber and tomato cultivation. This project was financed by private sector parties.

### 3.2.3 Johannesburg

The climate in Gauteng, where Johannesburg as well as Pretoria are situated, is continental (Table 3.5.). The average altitude is 1500 m above sea level. However there is significant climatic variation, since Johannesburg lies higher than Pretoria. Therefore Pretoria has a hotter climate (on average 2 degrees Celsius higher compared to Johannesburg). In

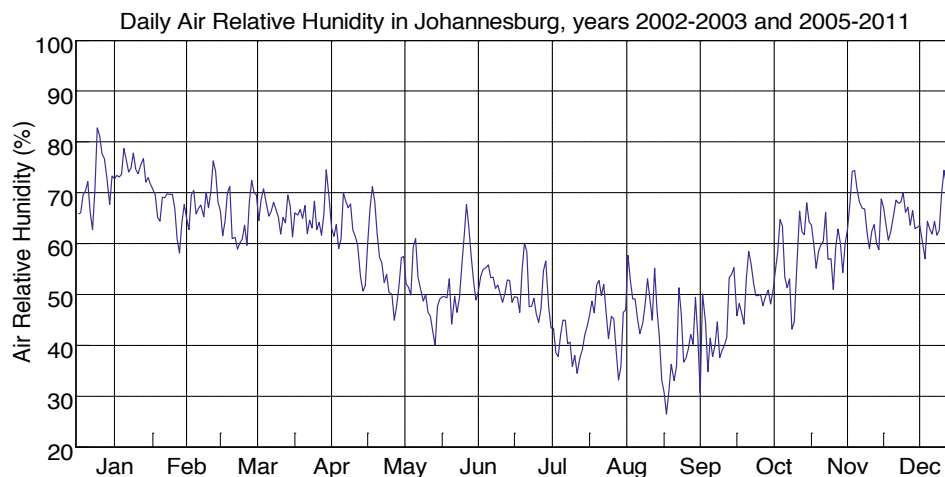
addition Krugersdorp and Brits have again different microclimates. The production area around Brits has the possibility to use irrigation water from the Hartbeespoort dam.

In general , the continental climate in the Johannesburg area is one of the reasons that temperatures show large daily fluctuations. In winter, on south oriented hill slopes the night temperatures easily reach a few degrees below zero, while the north headed slopes may not have frost. The winter of 2011 was relatively cold and a substantial number of outdoor crops died. Humidity levels in this region are rather low (Figure 3.4.). Solar radiation levels are high (totalling ca. 7.4 GJ per year per m<sup>2</sup>, being twice as much as in The Netherlands, see Campen *et al.* 2010 ) and far above the levels required for crop growth.

Table 3.5. Average annual climate Johannesburg

	Average Maximum temp	Average minimum temp	Average hours of direct sun	Average nr days rainfall	Average mm per month
January	27	15	8	16	101-200
February	27	14	8	11	61-100
March	26	13	8	12	61-100
April	22	10	8	9	31-60
may	19	7	9	4	6 – 30
June	17	4	9	2	6 – 30
July	17	3	9	1	0-5
August	19	6	10	2	0-5
September	23	9	10	4	6 – 30
October	25	12	10	10	61-100
November	26	13	9	14	101-200
December	27	15	9	15	101-200

Figure 3.4. Daily air humidity in Johannesburg, years 2002-2003 and 2005- 2011.



The main part of SA cut flower industry is predominantly located in the warmer areas of the Gauteng province, in the Krugersdorp region, as to avoid too low temperatures in winter nights, despite tunnel covers. The preferred areas are in the vicinity of Johannesburg, at a somewhat lower in altitude and close to the flower market and export facilities. Flowers produced are mainly roses, chrysanthemums and carnations.

The vegetable industry in protected cultivation is not as large as the flower industry. The vegetables are mainly produced for the local market, while a part the flowers is exported. North of Gauteng, the Limpopo province is located. In this province the majority of the tomatoes are being produced, predominantly by one company called ZZ2 (circa 1,500 ha

tomatoes). This company is making a shift from open field cultivation to protected cultivation in tunnels. ZZ2 produces an estimated 160,000 tons per year (EKN, 2011). Onion is also produced by ZZ2 although it is not produced at the same magnitude as tomatoes. This big tomato producer does only partly generate a market diversification on tomatoes: apart of the commonly available 'round' tomato, also cocktail ('Romanitos') and plum tomatoes are being produced.

## 3.3 Production and productivity

### 3.3.1 Vegetables

The commercial sector contributes 95% of the total produce while the emerging sector contributes only 5%. According to recent FAOstat statistics, the total production of vegetables is circa 2,426 million tonnes. The total amount of tomatoes production has increased with 35% the last decade despite a strong decrease in the production area. There are different tomato varieties that are grown such the Roma type tomatoes or jam tomatoes and the smaller cocktail tomatoes. Also the cucumber production has increased due to a strong increase in production area (Table 3.6.).

Table 3.6. Production in SA of main vegetable crops in tonnes.

	2000	2005	2006	2007	2008	2009	2010
Beans, green	35,927	33,777	28,535	21,359	23,481	26,141	23,772
Cabbages and other brassicas	191,019	155,270	141,525	143,698	152,865	136,016	148,903
Carrots and turnips	96,021	127,062	127,486	148,299	170,500	148,052	141,846
Cauliflowers and broccoli	19,746	19,340	14,500	16,636	18,003	27,063	15,497
Chillies and peppers, green	368	750	649	700	761	737	840
Cucumbers and gherkins	15,000	16,762	15,282	16,920	20,371	19,799	21,419
Lettuce and chicory	30,701	33,063	32,975	37,151	43,241	38,613	37,866
Maize, green	299,000	318,966	310,000	334,199	363,088	351,595	402,100
Onions, dry	329,000	387,270	403,191	432,901	496,425	461,548	518,062
Peas, green	16,112	15,255	15,188	14,070	15,543	16,978	11,868
Pumpkins, squash and gourds	282,000	253,907	78,293	81,200	166,110	158,335	170,871
Tomatoes	403,003	462,219	441,770	491,220	540,470	533,165	544,457
Other fresh vegetables	290,000	304,540	300,000	323,418	351,375	340,253	389,100
<b>Total production</b>	<b>2,007,897</b>	<b>2,128,181</b>	<b>1,909,394</b>	<b>2,061,771</b>	<b>2,362,233</b>	<b>2,258,295</b>	<b>2,426,601</b>

Source: FAOstat, 2012

Production of tomatoes takes place throughout the year. But in some regions production is very limited in the winter months and tomatoes can only be produced in frost-free area during winter, or under protection like tunnels. The last decade the tomato production per square meter per year has increased significantly and has almost doubled (Table 3.7.). The annual tomato production per square meter in The Netherlands is on average 49.9kg, including all varieties. For the traditional 'round' tomato, in Dutch greenhouses 60-70kg per square meter is reported (Heuvelink, 2005). In Kenya this is on average 29.2 kg per square meter per annum (FAOstat).

Table 3.7. Yield in kg per m<sup>2</sup> per year.

	2000	2005	2008	2009	2010
Tomato	3.66	7.14	6.93	6.92	6.89
Cucumbers and gherkins	1.29	1.40	1.46	1.52	1.52

Source: FAOstat, 2012

## 3.3.2 Flowers

The main cut flower is rose (T-Hybrid), and production varies between 150 and 200 stems per square meter. The average stem length is maximum circa 60 cm. Compared to other flower producing countries like Kenya this is a low productivity and quality. For example rose growers round Lake Naivasha harvest over 200 stems per square meter (sweethearts: small buds) and growers on Mount Kenya produce bigger buds (4-5 cm with a minimum stem size of 50cm) between 130 -170 stems per square meter per year (Min EL&I, 2011).

The second important cut flower is chrysanthemum, grown in greenhouses that are relatively high-tech, since screening and lighting are required for this short-day crop. The average chrysanthemum yield is ca. 300 stems per square meter per year, thus producing ca. 20 kg per square meter at 50 g per flower.

According to data from older studies, the average flower farm has roughly 4.5 hectares of cultivated land and employs 16 full-time and three part-time labourers per hectare (SADC, 2005).

## 3.3.3 Seedlings

The seedling grower business under shade net or in tunnels started in the late. Most seedling growers are located in KwaZulu Natal in the eastern part of the country. On average seedling growers produce 40 million trays per annum but a few large growers produce between 100 to 150 million trays per year. Most of these produce for local growers and the majority are vegetable seedlings. A provincial breakdown of seedling growers is presented in Table 3.8.

*Table 3.8. Estimated number of seedling growers per province in 2011 (pers. comm. J. Swiegers).*

Province	Number of seedling growers
Kwazulu Natal	19
Limpopo	14
Gauteng	13
Eastern Cape	11
Western Cape	10
Mpumalanga	9
Freestate & Nort-west Province	5

SA starts to lose its position as leading starting material supplier to countries in East Africa due to lower costs and a more stable climate year round.

## 3.4 Level of technology

### 3.4.1 Country wide

Of the flower production area, old numbers estimate that roughly 45% is unprotected, 27% under shade netting and 28% in greenhouses (SADC, 2005). Vegetables are for 50% grown under protected circumstances (including nets), yet the fraction under tunnel cultivation is much less.

The cut flowers are mostly produced in greenhouses and tunnels. Some of them (mainly the summer flowers group) are grown under shade. Very little is grown without any cover: nature is too harsh on the flowers to obtain the required quality standard. Despite the cover, due to the combination of warm summers and black PVC pots (Figure 3.5.), plant roots may get too warm and will suffer oxygen shortage, resulting in depressed yields.

The high temperatures have negative impact on growth and quality for both ornamentals and vegetables. Ideally, the high radiation levels should be accompanied by modest temperatures and high CO<sub>2</sub> levels to facilitate an enormous growth potential.





Figure 3.5. A rose crop and associated substrate on a medium-tech rose farm.

A limited range of technology levels exists. If we refer to the levels of technology described by Garcia Victoria *et al.* (2011) or Lamas Nolasco (2010), their highest level greenhouse type having a CO<sub>2</sub> fumigation system and recirculation of fertilizer solution, either under glass or plastic cover, is absent except for 2 greenhouses (Dube greenhouse complex near Durban airport and LVG near Pretoria). On basis of our expert judgement, roughly 3 levels have been noted and their properties are shown in Table 3.9. The classification agrees well with the one used for Mexico (Garcia Victoria *et al.* 2011) and focuses on the level at which the greenhouse construction intervenes the local climate. A series of photos illustrate the level of technology, from low to high (Figure 3.5.).

Table 3.9. Approximate classification of South African protected horticulture. Also the AMPHAC (Mexican Association on Protected Agriculture) Classification is listed.

	Low	Medium	High
Average size (ha)	1 – 10	2 – 50	3 – 20
Cover type	Shadow net	Plastic roof, net walls	Plastic, glass
Production process	Soil	Hydroponics	Hydroponics, climate control
Cooling system	Natural ventilation	Natural ventilation	Pad & fan
US 1 Quality of produce <sup>#</sup>	40%	60 – 70%	90%
Farmer	Subsistence– Emerging Farmer	Emerging– Commercial Farmer	Commercial Farmer
AMPHAC Classification	Passive	Semi-active	Active

<sup>#</sup>In the USA, the best fruits and flowers have quality level 1





Figure 3.5. Clockwise from low tech, medium-tech, to high-tech.

### 3.4.2 Adaptations per region

As reported in §3.1, considerable differences in climate exist in SA. Greenhouses and choice of produce have partly been accommodated to the local climatic conditions. In the Johannesburg region, the high levels of radiation enhance flower quality and production rates. Many ornamentals are produced under cover North-West of Johannesburg (at Krugersdorp) at slightly lower altitudes and on sun-exposed slopes, i.e. locations where night temperatures are mild and do not drop below 0 °C. Due to the large fluctuations between day and night temperature, protected cultivation by plastic (multi) tunnels is commonly used to improve the indoor climate. In these tunnels too high temperatures around noon occur in summer. The elimination of these supra-optimal temperatures is essential to enable an acceptable ornamental product quality. Therefore, many growers have installed pad & fan cooling systems. These systems result in high annual costs due to the increasing price for electricity, and the water use of pad & fan is also significant (reaching as high as the irrigation requirement of the crop). The supply of clean irrigation water may sometimes be problematic, but in this region the amount of water is sufficient due to the availability of water from different sources, i.e. rainfall, mountain rivers and bore holes.

Around Cape Town, the lack of frost permits the growth of ornamentals without under cover protection. A protection against high solar radiation on summer days is enabled by shade nets. Thus, for the Fynbos ornamental industry low-tech production systems suffice. The modest annual amounts of rainfall and remoteness of large rivers makes sufficient supply for all horticulture practices problematic. Although the main vegetables of the region, tomato and cucumber, are predominantly grown outdoors, there is a trend to protected cultivation for improved control of growth conditions. This will also favour a decrease of evaporative loss from the irrigated soil. The best water-saving production can be realized in high-tech systems with a nearly closed greenhouse and recirculation of water. An example of such a system was situated in Rawsonville (North of Cape Town) by Prominent Tulips (Figure 3.6.). Together with a misting system at the air inlet instead of a pad, and a rather high roof, the cooling realized the required indoor climate almost year long, but the investment costs were high.



*Figure 3.6. Construction elements in the high-tech greenhouse of Prominent Tulips at Rawsonville, in the Western Cape. Above left: tables with tulips and air outlet with fans; above right: air inlet and air hose; below left: measurement box of Priva; below right: light filtering screen.*

In the region around Durban, the moist and temperature climate facilitates outdoor growth of horticultural crops. At rather optimal air temperatures and humidities, the additional advantages of protected cultivation, e.g. control of irrigation amounts, IPM, no storms, limited weed inputs, are counteracted by the high moisture levels resulting from indoor evapotranspiration in addition to the high outdoor humidity. These high humidity levels easily promote fungal diseases, and this is further enhanced at high temperatures. Due to the risks involved with high humidity levels, at the Venlo-type glasshouses at Dube Trade centre no pad & fan is installed and passive ventilation from roof vents is used instead. Apart from the humidity problem, an expert (pers. comm. P. de Vries, Hygrotech) claimed that the absence of low night temperatures results in a too vegetative crop, not bearing sufficient fruits.

## 3.5 Profitability

Some of the major costs for SA growers are related to electricity and labour. Both have increased over the years and have significant impact on the profitability of the sector. Currently some of flower farmers have difficulties to sustain their business. Even some flower farmer had to close down their operations. In this paragraph we will discuss some of the costs drivers.

### 3.5.1 Electricity and heating

The costs of electricity has increased significantly the last few years. NERSA agreed to allow three annual price increases of roughly 25%, first being in April 2010. The jumps mean that electricity will cost twice as much in 2012 as it did in the beginning of 2010. Since growers use a lot of electricity to cool the crop during summer, this has major impacts on the profitability of the sector. Many greenhouses depend heavily on electricity for cooling during the hot summer period. The primary heating source is coal. Coal is abundant and cheap compared to other fuels, however the price has increased in recent years as well.

## 3.5.2 Labour

All employers in South Africa who employ Farm Workers are legally bound to pay at least the Minimum Wage. The minimum wages have increased from an hourly rate of R7.04 to R7.71; a weekly rate of R318 to R374 and a monthly minimum wage of R1376 to R1504. The increase was set on the advice of the Employment Conditions Commission following a consultation process and public hearings and will be implemented on March 1, 2012. Sectoral determination deals specifically with the protection of workers in vulnerable sectors or areas of work such as agriculture. Kenya's lowest-paid workers currently earn 8,364 shillings (100 USD) to 10,606 shillings a month, according to Business Daily, a Nairobi-based newspaper. In Table 3.10. various minimum wages for labourers of horticulture countries are presented. It's clear the labour costs for South African farmers are relatively high compared to other countries. This is also one of the reasons why various cutting companies have moved from SA to countries in East Africa (e.g. Uganda and Tanzania). The minimum wage in Uganda was set in 1984 at Ushs 6,000 per month, this amount has been eroded due to inflation and the purchasing power of that amount has vanished over the years. Therefore a subsequent Ushs 75,000 per month was recommended for unskilled workers by the Minimum Wages Advisory Council in 1995, but has so far not been implemented (Lumu, 2010). Despite having low wages in Eastern Africa, commercial and exporting farmers pay in general more than the minimum wage.

Table 3.10. Minimum gross wages of various horticulture countries.

	Monthly wage in LCU	Monthly wage in USD	Reference year
South Africa	R1,375.94	181.1	2012
Kenya	8,364 – 10,606 Shilling	100-126	2011
Ethiopia	None, 240-300 birr is common practice	13.8-17.1	None
Uganda	6,000 Ugandan shillings	2.6	1984
Tanzania	70,000 Tanzanian Shillings	43.3	2010
Netherlands	€ 1.562,33	2,073.4	2012

## 3.5.3 Water

In general, in SA water is not sufficiently available, and the water quality is constraining horticultural production. Circa 70% of the available water is used for agriculture. The open water quality is occasionally strongly polluted due to disposal of untreated sewage water and by pollution of chemicals and heavy metals originating from the mines. Apart of the rather low annual rainfall amounts, the quantity of water is reduced by the explosive growth of alien, strongly water-absorbing trees (especially Eucalyptus).

In order to supply society with sufficient, potable water, the governmental department of Water Affairs adopted the Integrated Water Resources Management (IWRM) approach, which provides a holistic approach to water management (Yearbook, 2011). The IWRM requires intensive planning to ensure efficient, equitable, and sustainable management of water resources and for coping with conflicting demands. To guide the IWRM the department developed two key strategic frameworks: the National Water Resource Strategy (NWRS) in South Africa of 2004, and the Water for Growth and Development Framework of 2008. The strategy seeks to achieve reconciliation between available water resources with growing requirements. The Water for Growth and Development Framework guides actions and decisions that will ensure water security in terms of quantity and quality to support South Africa's requirements for economic growth and social development.



On a regional basis, the eastern part of the country does not receive enough rainfall (<500 mm) to supply the crops year round. For this, North of Johannesburg (at Drakensbergen) big dams have been built to collect mountain rainfall for supply to the urban areas. In horticulture, water is derived from roughly 3 sources: collected rainwater, water from rivers and dams, and underground wells. Many wells contain water of poor quality, and should be diluted with water from other sources to be acceptable for irrigation. In the region of Cape Town the Mediterranean climate does not bring enough rainfall for horticultural production as well. Up to 60% of the used water may be supplied by wells (Yearbook, 2011). Due to the resulting irreversible decrease of these natural water resources, such practices are not sustainable in the long run.

Of the total water availability circa 72% water is used for agriculture. Various quality issues play a role due to the untreated sewage water being disposed into rivers and population from mines (e.g. chemical/heavy metals).

## **3.6 Government and horticulture policies**

### **3.6.1 Horticulture policies**

No specific horticulture policy on a national level is developed as compared to countries like Kenya and Ethiopia that address key obstacles that currently prevent the sector from further development. There is a general focus on emerging farmers on which we will elaborate in the following paragraph. Due to the negative environment created for white farmers, the BEE and land reform act, white South African farmers sometimes feel extremely intimidated and therefore reduce investments in capital items like hardware because of uncertainty due to the current land reform policy.

### **3.6.2 Empowerment of smallholders and land allocation**

The impact of land reform in horticulture is significant and many failures are known. For example it happens that white farmers with high enough turnovers must make their farm workers co-owners, for instance through shares. Another aspect of the governmental policy to uplift previously disadvantaged people is land allocation. Examples have been found where these people were not educated as farmers. When educated farmers who have been in farming families for decades struggle to make their farms produce enough. In general emerging black farmers do not have skills and capital to take over large scale grain producing farms as a consequence they will go into cattle breeding or horticulture, sometimes in mentorship relation or contract farming with retailers. Land allocation is perceived to be difficult for people with no farming experience or entrepreneurial qualities. Funds have been made available from the Department of Agriculture for small-scale farm development, but one organisation leading such development programmes and acting like a catalyst of development has not stepped in yet, although some groups have become active in this respect. According to Waarts *et al.* (2009), the risk is now that established farmers may try to use their lobbying power to receive subsidies for activities that may not ensure the development of small-scale producers. On the other hand, small-scale farmers have no voice and no funding and cannot make the development change happen, even though there is a lot of potential for the economic development of smallholders. Access for emerging farmers is generally not a problem, although transport for them is sometimes more costly because of smaller volumes and larger transport distances.

Emerging farmers are starting to organize themselves. At the local level various farmers have joined forces like in the Western Cape where emerging farmers have the opportunity to work with a new initiative Agrofresh that functions as intermediate and has a pack house and cold store facility that individual farms don't have. In this way farmers are able to store products and to distribute in a more efficient way. Furthermore there are initiatives on a national level. For example last year the African Farmers Association of South Africa (AFASA) has been established and this gives emerging farmers an unified voice. AFASA is said to have 6,300 members mid 2011 and the organisation aims to grow rapidly. They argue that emerging farmers need land and training to further develop. As a result they organize training and workshops for their members. Also on a regional level emerging farmers unite. The United South-African Agricultural Association has been established in 2008 and this organization focuses on emerging farmers in the Western Cape. Currently there are about 3,800 members.

## 3.7 Knowledge organisations

There is strong focus on emerging farmers from government side. One of the aspects is a strong research agenda set by the government to develop certain varieties that makes it easier for emerging farmers to grow. In addition there is a stepwise approach to train emerging farmers in protected cultivation, rolled out by the government. Some of this training is carried out by the ARC, which is one of the knowledge organisations. There is no research agenda developed for commercial protected horticulture.

### 3.7.1 The Agricultural Research Council (ARC)

The ARC is the principal agricultural research institution in South Africa. Its main goal is to provide scientific support for the agriculture sector. The ARC counts 11 institutes, distributed over the country, ranging from animal sciences to vegetables and flower bulbs. Within the institute of Plant production, a total of 700 people are employed, of which 50 are scientists. In this institute, 3 divisions are present: Plant Breeding, Crop Protection and Plant Science. These departments tightly cooperate. This is the sole institute in South Africa giving courses on hydroponics to growers. They focus more on the previously disadvantaged farmers, to the dissatisfaction of the commercial farmers. About 900 emerging farmers have already been trained the last few years in agriculture in general, part of them did the hydroponics course.

### 3.7.2 Universities and Agricultural Colleges

There are several agricultural universities and Colleges in SA. The more successful ones are the previously “whites only” universities like Stellenbosch, Free State, Pretoria and KwaZulu Natal. However according to farmers the current curricula are not up to date related to modern vegetable production (e.g. protected cultivation) and the graduates from these universities do not match the needs from the sector. Furthermore, agriculture is not regarded as an interesting sector to work in. Agriculture is still linked with white farmers and *boers* and this has a strong association with the former apartheid regime. Blacks see it as a negative, being a poor man's career (as labourers) and they rather study other fields instead of agriculture.

## 3.8 Financial institutions

Most SMEs and farmers in particular lack sufficient capital. Especially farmers have difficulties obtaining a bank loan in order to invest. Since land is not accepted as deposit many commercial farmers have their own capital or have alternative ways of getting funds for investments. Recently the Dube Trade Port has been financed by a foreign private bank.

Some of the emerging farmers receive governmental support (subsidised tunnels and low interest credits). “Free” or “almost free” tunnels were offered to growers without knowledge on growing in tunnels, without a descent feasibility study, or having followed trainings. Many of these projects have failed in the past. Therefore the conditions for new credits and subsidies have been sharpened and training is provided to train emerging farmers and to developed their technical and entrepreneurial skills.

## 3.9 Professional organisations

There are various organisation active within the horticulture that all have their own objectives. However between growers there is limited collaboration and knowledge is in most cases not shared. In this paragraph we discuss some the organisations within horticulture.

### 3.9.1 The South African Flower Export Council (SAFEC)

Binding the South African flower industry together is the SAFEC mission. SAFEC is a non-profit export council, supported by the four main producer organizations in South Africa. (SAFGA, KZNFGA, SAPPEX and PPSA). SAFEC aims to expand South Africa's floricultural exports by facilitating synergy amongst growers while reducing costs by getting more and better co-ordinated freight space and through building production capacity. SAFEC also serves to represent its member associations at government level to the Department of Trade and Industry (DTI), and with this assistance works to gain exposure for South African floral products on the international market.

### 3.9.2 The South African Flower Growers Association (SAFGA)

SAFGA is an association of flower growers and –exporters and related industries. SAFGA works to improve the conditions in which horticultural industry operates and runs its businesses. It promotes networking amongst members and strengthens the relationship between the flower industry and government, trade and industry and commercial and economic sectors. SAFGA represents some 120 members from the floricultural industry – a wide cross-section of growers, specializing in cut flowers, bulbs, and pot plants. It also has members who provide services to the industry.

### 3.9.3 The South African Protea Producers and Exporters Association (SAPPEX)

SAPPEX was established as a non-profit organization in 1965 under the name SAWGRA (S.A. Wild Flower Growers Association). The name was changed to SAPPEX in 1974. The association aims to represent all producers and exporters of Proteaceae and other floral materials originating from the SA indigenous flora, and to further their interest. SAPPEX is not a marketing organization and deals mainly with policy and other matters regarding the industry. SAPPEX is the umbrella organization for the Protea Export Association (PEXA), the Dried flowers Export Association (DEXA) and Protea Producers of SA (PPSA).

### 3.9.4 The Seedling Growers Association of SA (SGASA)

The SGASA was started to enable growers and members to research applicable topics and solve common problems. In addition they offer a SGASA certification scheme to all its members. This is an annual audit and is designed to allow each grower to maintain “best practice” and remain legally compliant. It ensures that a potential customer knows which nurseries are maintaining a high standard.

### 3.9.5 The South African Nursery Association (SANA)

SANA is a non-profit organization that was formed in 1947 to create an association to act as network platform to represent the interests of the green industry. The Association operates in five regions, namely, SANA Western Cape, SANA Eastern Cape, SANA Gauteng, SANA Central and SANA KwaZulu Natal. Today it not only represents the nursery industry as a whole but also represents individual related associations like the bulb and seed association, the bedding plant growers association and the garden centre association.

### 3.9.6 AGRI SA

Agri SA promotes, on behalf of its members, the development, profitability, stability and sustainability of commercial agriculture in South Africa by means of its involvement and input on national and international policy level.

### 3.9.7 Agriculture in Sustainable Natural African Plant Products (ASNAPP)

At the Stellenbosch University plant sciences are educated but no up-to date curriculum is available on protected cultivation. However, among the scientists knowledge level is supposedly high due to international contacts with respect to horticultural sciences. Dr Petrus Langhoven is the specialist in this field, and he is the director of ASNAPP. ASNAPP wants to expand the economic opportunities for rural communities by using world class science, technologies, partnerships and business approaches to develop and enhance Africa's competitive advantage in the Natural Plant Products industry.

### 3.9.8 Intensive Agriculture South Africa (IASA)

The Association for Vegetables Under Protection (AVUP) was founded in 1977, but changed his name in 2005 to IASA. Dr Petrus Langhoven (the director of ANSAPP) is their current chairman. This group consists of an active group of commercial growers, hobbyists as well as associated companies involved in the intensive production of mainly vegetable crops in a protected cultivation system (greenhouses, net structures, mini tunnels, cloches, modern soil covers etc.). Most of the growers use one or more of the known greenhouse production systems although a growing number of growers utilize soil again as a growth medium. IASA has a growing interest in organic production under protective coverings.

### 3.9.9 Private companies

Various private companies are active in supporting horticultural growers with advise. Also some Dutch companies play a role in this. Agro Advies Bureau (Naaldwijk) has supported several projects with feasibility studies and the like. GreenQ (Bleiswijk) has advised growers at the Dube Trade Centre greenhouse complex. Also DLV Plant has provided technical assistance in the past to some farmers. In addition various South African companies are active like Hygrotech, which is situated in Stellenbosch and supplies seed material to vegetable growers and gives training to growers on vegetable production.

## 3.10 Conclusion

The three studied horticultural regions all have a specific set of crops being produced, and this is predominantly governed by climatic conditions. The sunny region around Johannesburg is characterized by a large contribution of cut flowers, whereas the Mediterranean Cape Town region is famous for its naturally grown Fynbos products like protea. The undercover horticulture shows a different picture: in Cape Town area more vegetables than ornamentals are grown, while in Johannesburg it is the reverse. Around Durban the vegetable production seems to form the largest horticultural produce. Also relatively many seeding growers are present in the province (KwaZulu Natal) of Durban, may be favoured by the rather humid climate.

On a national scale, only a small part of the horticultural area is under cover, and the harsh open field conditions result in low productivity and variation in quality of produce. Generally, a medium level of technology is observed in protected horticulture. Often simple tunnels are used, without further equipment to control climate and irrigation. The occasionally hot conditions in the tunnel are the main reason for the noticed relatively low quality level of flowers. Over the last two years the costs of various inputs (electricity, labour) have increased, and no cheaper alternatives have yet been realized. These rising costs have a large impact on profitability.

The horticultural sector lacks organisation, especially if compared to the fruit industry. Sector organizations are present but among growers there is no willingness to co-operate and share their knowledge and experience. The sector would profit from a well-developed research agenda for commercial farming, but is not yet initiated. The knowledge level among farmers is variable: the commercial farmers have in general a sufficient knowledge level, but the emerging farmers experience a lack of education and information, and their lack of financial resources keeps them lagging behind. Dutch cutting companies have relocated operations to other African countries like Tanzania and Uganda.



## **4 The Market**

### **4.1 The value chain**

#### **4.1.1 Vegetables**

##### **4.1.1.1 Wholesales**

The Fresh Produce Market (FPM) has emerged as the vegetable price-setters or, as nicknamed, the “fresh produce stock exchange”. The prices at the FPMs are arrived at through a bargaining process mediated by market agents who have a dual objective to collect the best prices (and hence commission) for sales while ensuring that the highly perishable stocks are cleared. These prices are then used as reference prices even in transactions outside the FPMs. Johannesburg fresh produce market is the biggest market followed by Tshwane, Cape Town and Durban. In total there are circa 19 FPMs throughout SA. There appears to be move to privatize the FPM's. Currently Johannesburg is already privatized, but Tshwane still owned by municipality.

Wholesale retailing is relatively new in the South African vegetable industry with examples including the Fruit and Veg City chain (established in 1993), Evergreens in Pretoria (since 1994) and fresh produce satellite markets. Vegetables form a major part of wholesale-retailers' businesses and are sold in a variety of packages from bulk packs to loose singles. Vegetables are sold at predetermined prices. In Figure 4.1. the South African vegetable chain is depicted.

##### **4.1.1.2 Retailers**

The South African retail industry is the largest in the sub-Saharan region and is positioned as the 20<sup>th</sup> largest retail market in the world. It is an oligopolistic market with five dominant South African companies, namely Shoprite, Pick n Pay, Spar, Massmart and Metcash, constituting 80% of the retail sales (Thomas White, 2011). The South African Food Retailing market is dominated by Pick n Pay, Shoprite, Woolworths and Spar, which trade under several store names.

The retail channel is getting more and more dominant as a sales channel for vegetables and flowers. The SA retailers seem to be moving more and more towards cutting out the middleman. E.g. Woolworths has established direct links with producers. Shoprite has its own logistics company, Freshmark, sourcing directly from farmers as much as possible. Furthermore the main retailers have conditions towards quality and quantity (especially Woolworths has high quality standards). Furthermore some of the retailers (e.g. Woolworths and Pick n Pay are expanding internationally and keep on sourcing from producers in SA since there is not sufficient supply from other Southern African countries like Angola and Mozambique. This creates a lot of potential for South African producers.

The largest food retailer in SA is Shoprite. The company has followed an inorganic growth model and other expansion strategies such as franchising. The retailer operates over 1,800 stores in South Africa and Southern Africa. With a market share of around 34%, this retail giant caters to the middle-and lower-end consumer markets (Thomas White, 2011).

Pick n Pay Stores Limited is the second largest retail chain. Founded in 1967, this family controlled retail business operates in SA, Southern Africa and Australia. Its retail formats include larger supermarkets, hypermarkets and family franchise stores, with hypermarkets being the largest. This retailer caters to the middle-income class of consumers and hopes to improve its presence in the black consumer markets, according to South African media reports (Thomas White, 2011).

SPAR Group Limited (ZA), SA's third largest retailer (Thomas White, 2011). SPAR Group presently operates around 800 SPAR stores in SA. It is primarily a franchise formula focusing on smaller stores. The SPAR group has three store formats namely: SPAR which represents neighbourhood shopping, SUPERSPAR – known for competitive prices and bulk purchases and KWIKSPAR more of a convenience store format. SPAR caters to the middle- and high-income class of consumers. Woolworths is a South-African retail chain that owns over 400 retail outlets and caters to the high-income segment.

Woolworths has high quality standards related to fresh products. The group contains both corporate-owned stores as well as franchise stores. In line with its philosophy to incorporate new initiatives across its businesses, Woolworths is looking to strongly focus on an organic food venture, which was launched in 1999. The organic food market in SA is the second fastest growing sector following the segment for baby food.

Pick n Pay and Shoprite have also forayed into the organic food segment. Shoprite expects its organic sales to account for 10% of its fresh produce sales by 2015, Pick n Pay has already been reaping benefits from its wide range of organic products.

#### **4.1.1.3 Informal retail**

In addition to the formal retail there is large part the market dominated by the informal retail. This is also referred to as “the second economy” within the South African retail sector. This market is still a crucial supply channel of goods predominantly in black townships, which were largely ignored during the apartheid *et al.* Informal retail concepts vary from taverns to tuck shops (small food-selling retailers). In particular, spazas, or small retail stores most often run from home, are making inroads in the local retail arena, offering both food and non-food products.

Hawkers, street stalls, fast foods, kiosks and take-away are among the informal market retailers. A total of R51.7 billion was spent at informal businesses in 2004. Representing 6.3 of total household cash expenditure. Food is one of the most sizeable amounts (R16.7 billion) but also transport (R15.9) and alcohol (R4.6 billion) have a strong informal market (Ligthelm, 2006).

#### **4.1.1.4 Processors**

Processing of vegetables is common practice in SA. Processing consists of canning, freezing, dehydration and juice. For example: Tomatoes are processed into whole peeled, tomato and onion bruises, pasta, shredded, puree and pasta concentrate. The leading players in the tomato processing industry are Tiger Brands, Nestle and Giants Canning. Other processors use tomatoes (and tomato products) in food preparations. This includes caterers, hospitality and other institutions such as corporate, government institutions like hospitals and prisons. This is mainly related to the institutional market.

#### **4.1.1.5 Intermediaries**

Intermediaries occur throughout the vegetable value chain and perform they facilitate transactions. Prominent examples include export agents, buyers, contract buyers and market agents. The common element in these businesses is that for a fee, they enable other market players to focus on their core functions.

Figure 4.1. The South African vegetable value chain .



Source: DM, 2010

## 4.1.2 Flowers

Distribution of flowers is organized by direct sales, wholesale and retail. Crossovers between the channels occur as well as alternative small scale sales and distribution. Furthermore there are some street sellers at busy intersections but not many.

### 4.1.2.1 Direct sales

Direct sales happen often in the market of patio- and bedding plants. Most retail nurseries produce a large portion of their products themselves. Some large traditional flower producers have shops at their nurseries. In these shops they sell their own products. However some rose growers have reported to sell directly to consumers in the case of special events like weddings. For weddings often huge amounts of flowers are used that are sources directly from the growers.

### 4.1.2.2 Wholesale

SA has two mayor flower markets. Multiflora in Johannesburg and in Tswane the Pretoria Flower Auction Together these auctions handle about 50% of the flowers produced. The auction Multiflora is by far the largest and is privately owned by the growers and wholesalers who are the shareholders. The system has been copied from the Netherlands. Flora Direct is a part of Multiflora and they do the wholesale of potted plants. However, new shareholders are co-opted so it is not a co-operation like the Dutch auctions.

Local pricing is purely determined on a daily demand and supply basis. Multiflora. Different from the Dutch auctions is that the South African grower is not obligated to sell all his products at the auction. He can divide it over the auctions and even over other distribution channels. Several wholesalers have shops at the auction selling direct to the public as well. They also hold a large stock of necessities for flower arrangements.

### 4.1.2.3 Retail

The retail market for within the flower industry is dominated by the same retailers are described in the vegetable paragraph (see 4.1.1). In general, the retailers buy their flowers direct from the producer. Retailers mainly sell mixed flower bunches as well as the standard pot plants. Most patio and bedding plants are sold directly from the grower to the retailer. Flower growers deliver the produce to the distribution points of the retailer. From there distribution is organized by the retailer.

Currently, Woolworths is the leading retailer in the sales of flowers and they sell good quality flowers. The prices of the flowers at Woolworths is relatively high in comparison to other retailers. The quality demands set by this retailer are high. Woolworths was the first retailer that really paid attention to the sales of flowers and not handle it as a by-product.

#### 4.1.2.4 Processors

The main retailers have included bouquets in their product mix. There are numerous companies that make and sell bouquets as a core business (EKN, 2010). Some farmers also source from other farmers to comprise bouquets.

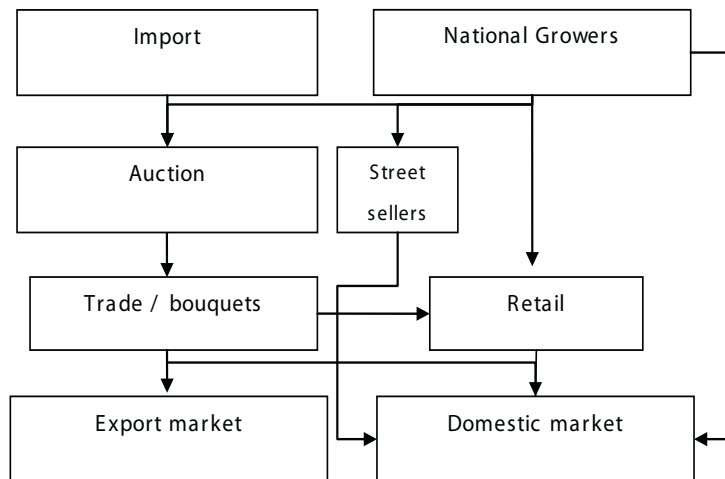


Figure 4.2. The SA flower value chain.

## 4.2 The domestic market

### 4.2.1 Vegetables

Most vegetables are produced for the domestic market and only small amounts are exported. Fresh Produce Markets (FPMs) remain the most important channel for the sale of vegetables in SA. As a result the FPMs prices are the benchmark used in all national vegetables sales. For example it is estimated that almost 50% of the tomato production and more than 60% of the cucumber production is sold on the FPMs.

Population growth, urbanization per capita income and the income elasticity of demand for vegetables are important factors influencing the demand for tomatoes. However the consumption of vegetables in SA is low. For example, the per capita consumption of tomatoes is only 12 kg per annum, compared to 32 kg in Europe (DM, 2010). Still this amount per capita consumption is only for metropolitan areas.

According to DM (2010) the processing industry experienced an increase of 6% in growth mainly from canning. In 2009 production season, 135,782 tons of tomatoes were canned. DM attributes this to an increasing consumer demand for vegetables. In 2009, total processing accounted for 25% and 9.8% of tomato's total volume and value respectively.

Table 4.1. shows that the production of tomato and cucumber has been higher compared to the total domestic consumption and that the remaining tomato production is used for processing. This indicates that in terms of tomato and cucumber production is self-sufficient and that the surplus is exported.

Table 4.1. Production and consumption in tonnes of the 2 main vegetables crops.

		2000	2005	2008	2009
Tomato	Consumption*1	290,000	310,000	310,000	390,000
	Production*2	403,003	462,219	540,470	532,695
	Processing			144,524	135,782
	Export	7,097	466	7,742	8,579
Cucumbers and gherkins	Consumption*1	13,000	14,000	15,300	18,000
	Production*2	15,000	16,762	18,231	19,787
	Export	126	125	227	215

Source\*1: DM, 2010. \*2: FAOstat

There was an increase in tomato prices between 2005 to 2009. Currently the average price per kg tomato on the main markets is between R4.2 and R4.4 per kg. However in the months with low productivity the price is far higher and can be traded at almost R7 a kg (March, October). In summer the price is in general below R4 (Figure 4.3.).

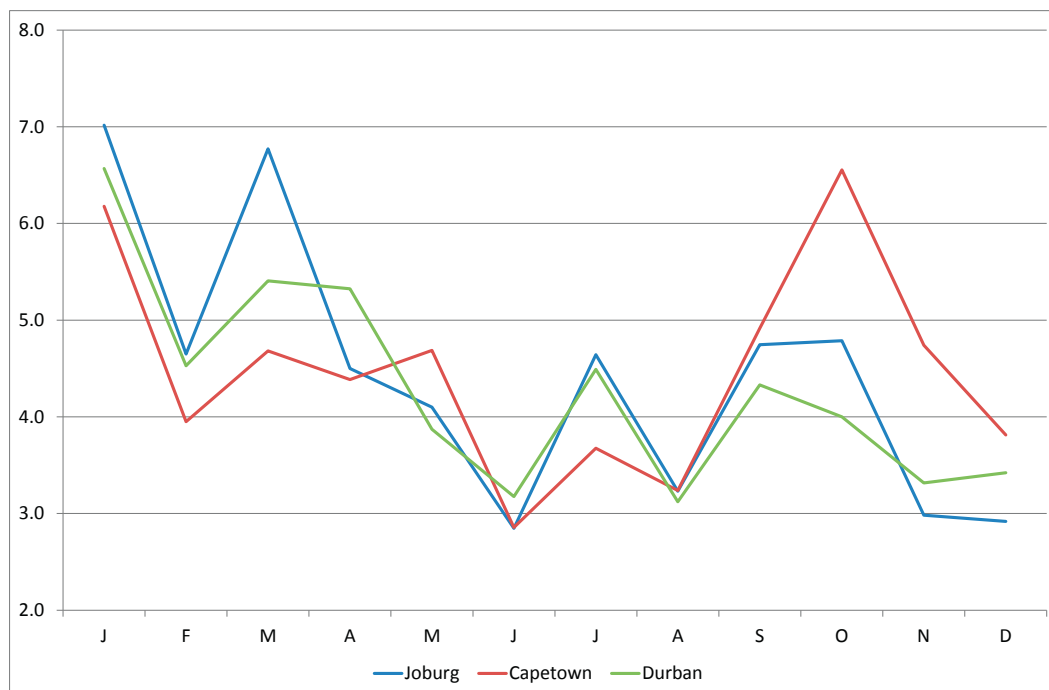


Figure 4.3. Tomato prices per month in ZAR per KG at 3 main Fresh Produce Markets (2009).

Source: DM (2010)

## 4.2.2 Flowers

Currently the South African flower producers grow mainly for the domestic market. The market for flowers as a present is small and is considered to be a luxury product. An exception is Valentine's day and Mother's day, when sales go up. However fresh flowers are an important part of weddings and this is an import segment of the market. Various growers supply directly for weddings to consumers. In addition the market for funerals is very large with the average South African spending a large sum on a funeral. However, at the moment mostly artificial flowers are being used, like silk flowers.

Flower shops are well established in SA. However, houses in SA are not well designed for flowers and pot plants: they are dark and in summer too hot and this tends to reduce the vase life dramatically.

Also the retailers have a flower and plant section serving the home and impulse market in the higher segment. Especially the up market retailers, like Woolworth, pay special attention to the flower and plant section. The quality in general is good. Impulse sales for flowers is limited. In general the South African flower market is still a developing market, but with potentials on the long term, due to the strong increase in income.

## 4.2.3 Consumer trends

With blacks constituting 79% of the nation's population, the emerging black middle class – estimated at around 3 million – is currently the largest spending group. South African consumers are characterized by class mobility, where consumers migrate to groups with more economic power, driven by economic growth as well as socio-economic empowerment (BFAP, 2011).

The first signs of black Africans making their presence felt in the middle-income bracket were shown in research by the Financial Mail in 2004. The survey data showed that around 300,000 South African blacks had risen to the middle-income status over the period 2001-2004. This emerging black middle class population was named the “black diamonds.” Further, the survey also found that 500,000 had risen to the lower middle-income level, still a small number relative to an unemployed population of 4-million. 20% of the richest blacks spent 3.5% of their household income on clothing compared to 1.5% by the whites. Retailers such as Woolworths and Shoprite cashed in on this trend (Thomas White, 2011). This increase in purchase power will stimulate the demand for higher quality food, flowers and processed food. A study by the University of Cape Town (Black Diamonds on the move, 2007) has identified that the black diamonds, whose combined spending power is presently around 250 million USD dollars, are expected to grow at an annual rate of 30%.

## 4.3 Export market

### 4.3.1 Vegetables

SA is not a major exporter of vegetables, in relation to other countries. Tomato is the most important export vegetable crop. The value of the tomato export has more than doubled between 2009-2010. It had a value off 4.5 million USD dollar in 2010. Peppers (Capsicum) also contribute significant to the export of vegetables, accounting for almost 1 million USD in 2010 (Figure 4.4.).

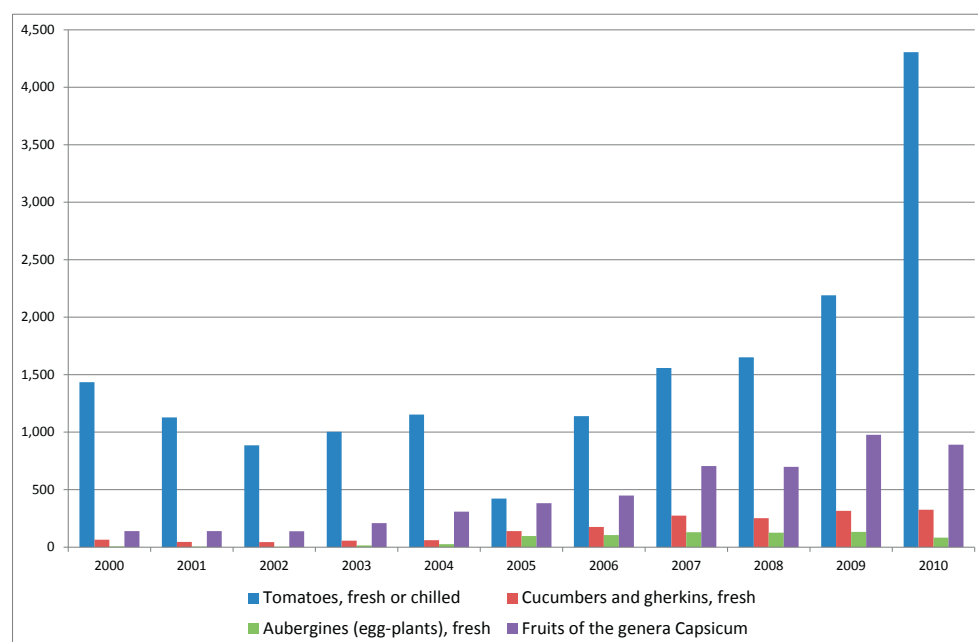


Figure 4.4. Total export value of main vegetables crops in USD (x1,000). Source: FAOStat.

South African export of vegetables is predominantly to other Southern African countries and are transported by truck: for example 95% of the total tomato value was exported in 2010 to neighbouring countries. Export of these vegetables to Europe is still a major challenge. The costs for shipping by sea transport is too high compared to other countries located closer to Europe (e.g. Morocco or Senegal). Furthermore the quality of fresh vegetable during a 2 week shipping journey to Europe is a major concern.

Currently Mozambique is the most important export destination for the South African vegetables. For tomatoes Mozambique has a share of 56% and this share has increased over the years. Mozambique has experienced impressive economic growth since the end of the civil war. Over the past five years, growth averaged 8.9%, spurred by foreign-financed “mega-projects” and large aid inflows. The economy is estimated to have expanded by 7.9% in 2006. In addition a large share of the South African vegetable exports are used for ship supplies and bunkers (Table 4.2.).

*Table 4.2. Export destination per region of main South African vegetables crops 2010 in USD (x1,000).*

	<b>Total export value</b>	<b>Europe</b>	<b>Africa</b>	<b>Countries not elsewhere specified*</b>	<b>Other regions</b>
Tomatoes, fresh or chilled	4,306	11	4,076	215	4
Cucumbers and gherkins, fresh	325		177	148	0
Aubergines (egg-plants), fresh	83	6	6	71	0
Fruits of the genera Capsicum	891	125	677	82	6

*\*Shipping and bunkers among others Source: UNComtrade 2011*

There are roughly three distinct sales channels for exporting vegetables (DM, 2010). One can sell directly to an importer with or without the assistance of an agent. One can supply vegetables combined, which will then contract out importers/ marketers and try to take advantage of economies of scale and increased bargaining power. At the same time combined vegetables might also supply large retail chains. One can also be a member of a private or cooperative export organization which will find agents or importers and market the produce collectively. Similar to combined vegetables, an export organization can either supply wholesale market or a retail chains, depending on particular circumstances. Export organizations can wash, sort and package the produce.

They will also market the goods under their own name or on behalf of the member, which includes taking care of labelling, bar-coding. Most of the time, export organizations will enter into a collective agreements with freight forwarders, negotiating better prices and services (more regular transport, lower peak season prices). Some countries have institutions that handle all the produce (membership compulsory) and sell only to a restricted number of selected importers (DM, 2010).

Agents will establish contacts between producers/export organizations and buyers in the importing country and will usually take between 2% and 3% commission (DM, 2010). In contrast, an importer will buy and sell his/her own capacity, assuming the full risk (unless on consignment). They will also be responsible for clearing the produce through customs, packaging and assuring label/quality compliance and distribution of the produce. Their margins lie between 5% and 10%. The contract importers of fruit combines market and distribute the product of the combines, clear it through customs and in some cases treat and package it (DM, 2010). Only a few exporters have long term contracts with wholesale grocers who deliver directly to retail shops, but with the increasing importance of standards (EUREGAP, etc.) and the year round availability of fruit.



## 4.3.2 Flowers and cuttings

The South African flower exports have grown since 2001, with downfalls in 2006 and 2009 due to an unfavourable foreign currency exchange rate of the ZAR (Figure 4.3.). Particularly the typical and unique South African flowers and foliage like protea and other so-called fynbos products are being exported. The different forms and colours make this product very attractive for use in exclusive flower pieces and presentations. More conventional floricultural crops like roses encounter major difficulties due to fierce competition from other flower producing countries. SA flowers face relatively high transportation costs compared to other floriculture producing countries. Flower distribution is a highly transport- and logistics-dependent operation, and it is often the single most expensive and crucial element of being a successful exporter of cut flowers.

For the international market flowers are often transported by air. Therefore it is essential to be located within a short distance from an international airport to have access to international freight carriers. The price of air freight fluctuates highly and freight prices are not transparent. This makes it difficult to compare prices of freight between producing countries. However based on discussion with stakeholders we have drafted a table with several freight prices per kg for air transport from Kenya, Ethiopia and Johannesburg to Amsterdam (Table 4.3.). It is common practice that flowers are shipped in boxes that weigh on average circa 10 kg. Based on the weight of these boxes a total price is compelled.

*Table 4.3. Estimated transport costs from Arica to Auction (Based on prices of January 2012).*

	<b>Nairobi- Amsterdam</b>	<b>Addis Ababa-Luik</b>	<b>Johannesburg – Amsterdam</b>
Freight price per kg in USD	2.10	1.88	2.50-3.00
Additional cost	x	0.13*	x
Total	2.10	2.13	2.50-3.00

*\*transport to auction in the Netherlands*

The key to being able to maintain the quality and therefore the value of the produce lies in a complete cold-chain system, which maintain flowers' freshness. The faster the flowers reach the market, the more competitive it will be and the higher the price it is likely to realize.

There are four main channels for growers and exporters to access international markets: directly through auctions, using an agent to sell the produce at an auction or via a wholesaler, via a wholesaler, or directly to a retail chain. According to an overview compiled by the Royal Netherlands Embassy in Pretoria, 16% of the total flower production is exported through an agent and 6% is exported directly (EKN, 2010).

Export of cuttings and live plants is mainly focused on the Europe, since various Dutch companies had propagation facilities in South Africa. Almost all was shipped to the Netherlands: A value of 4.9 million USD cuttings and a value of 2.8 million USD live plants. However in 2011 all propagations activities of the Dutch chrysanthemums cutting companies were shut down. This is expected to have a major effect on the export of cuttings for the statistics over the year 2011.

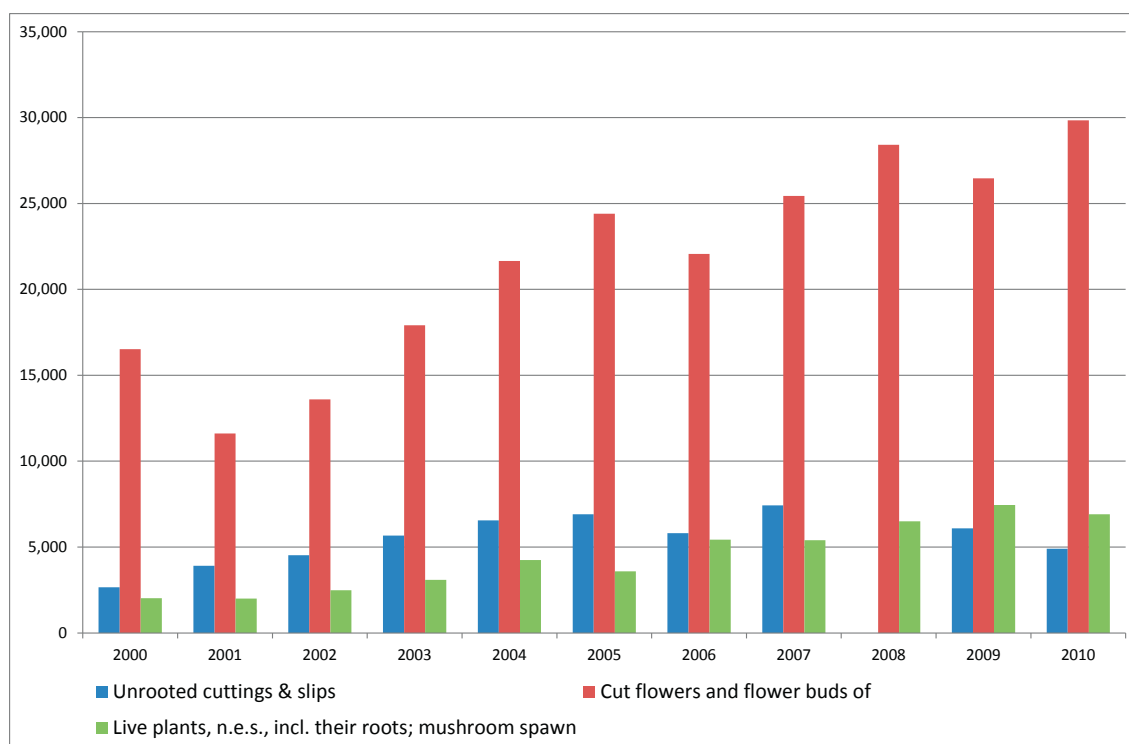


Figure 4.5. Export of flowers and cuttings in USD (x1,000). Source: UNComtrade.

The Netherlands is an important export destination of South African flowers. However compared to the total import of fresh flowers the share of SA is very limited. In total 23% was exported to The Netherlands in 2010. However the United Kingdom is the most important export destination for South African flowers. In total 38% of the global export value has been shipped to the U.K. The export of flowers to Asia consist only out of export to Japan (Table 4.4.). Circa 75% of the exported fresh flowers belong to the category 'other'. This consist also flowers like protea. The amount of chrysanthemums is estimated to be 15%, the amount of roses exported is limited (10%).

Table 4.4. Export destination of flowers and cuttings in USD (x1,000) in 2010.

	Total export value	Europe	Africa	Asia	Middle East	Other regions*
Fresh flowers	29,845	21,966	2,149	2,566	1,756	1,408
Cuttings and slips	6,464	5,162	115	207	0	980
Live plants	6,909	3,233	2,047	525	79	1,025

\*Including not elsewhere specified Source: UNComtrade

## 4.4 Conclusion

There is a large domestic market for vegetables. There is an increasing demand from the local market for quality food products and a constant supply of good quality vegetables. This is stimulated by high quality standards set by the leading retailers. Currently the South African export of vegetables is predominantly exported to other Southern African countries. But also transport to EU might be of interest in off season period. However a further development of sea shipping is something that needs to be further investigated. If this works for vegetables a huge market can be accessed.

The SA flower market is focused on the domestic market. Flower distribution is a highly transport- and logistics-dependent

operation which make competition with East African countries on the European market difficult. The indigenous flowers of SA produced in the fynbos are currently of great interest for European importers since they are unique. Flower growers in SA might look for other markets to develop, like emerging markets such as Angola or more established markets like Australia. However they need to work on their cost price, improve the productivity per square meter and enhance the quality of the flowers produced.

## 5 Supply industry

### 5.1 Introduction

Dutch companies play a dominant role in the international horticultural. Many Dutch suppliers are leading in their field. The Dutch horticulture has managed to become the world leader in production and export despite the country's relatively adverse climatic conditions. This selective disadvantage has led to a large degree of innovation in technologies and applications that have made it possible for the Netherlands to cement its position in horticulture with innovations in new greenhouses, improved production techniques, reduction of energy use, etc.

The unfriendly Dutch climate has prompted the sector to look to innovation in new techniques rather than adaptation of old ones. Innovation has given the sector the capacity to excel in product lifetime, quality and selection. The further dissemination of these innovations is linked to the other factors, such as firm support by the knowledge institutes involved in the further development and distribution of essential knowledge and innovations within the sector (Porter, 1990). The role of the related and supporting industries has, moreover, served as an important source of input by means of on-going innovation in production techniques. In this chapter we describe the current situation at the South African horticulture supply industry.

### 5.2 Current situation

#### 5.2.1 Research & development

The Dutch R&D in the horticulture and floriculture sector includes public and private sector organisations. Of all innovations in the protected cultivation 80% originate in the Netherlands (Min EL&I, 2011). Plant breeding and seed companies in the Netherlands spend on average 15% of their turnover on R&D activities (Bakker *et al.* 2011). Universities, research institutes and private sector companies provide new solutions in the field of quality enhancement and assurance systems, transport and logistics for fresh produce, greenhouse cultivation technologies, energy saving devices, and the like.

The Dutch R&D also provides solutions for almost all horticulture countries, like Kenya and Ethiopia. However Dutch R&D organisations (both public and private) do not have a strong position in the South African market. So far flower breeders do not have a dedicated breeding programmes for the South African floriculture. Koppert BV, through its distributor Vista Verde Biologicals, is present at the SA market.

#### 5.2.2 Suppliers of production equipment

"High Tech" is often associated with glass and as a result high costs. This is blocking the incorporation of high-tech items into mid-tech arched/ multi tunnel greenhouses. The South African market for complete greenhouse systems is currently dominated by Israeli and French greenhouse constructors. This is not due to a lack of quality. In terms of quality of greenhouses, energy and water efficient production technologies, climate control units, ICT- production solutions, etc. the Dutch suppliers are recognised as (one of) the best.

Many suppliers have agents or representatives in SA. If they don't have an agent they sell directly. One the main suppliers of greenhouses is VegTech2000. This is a local company that is owned by Netafim, an Israelian company. VegTech often does not only supply the greenhouse, but also irrigation systems, fertilizers and chemicals. According to industry insiders, VegTech supplies about 70% of the greenhouses in the horticultural sector. For many growers it is like a one-stop-shop. Apart from VegTech, 3 other important suppliers are active in the market (Table 5.1.). The advanced glasshouse complex at Dube Tradeport in Durban was built by the Dutch company Bosch-Inveka and partners.

The market in South Africa, however, requires mostly intermediate technologies with a lower price vs. quality ratio. Competitors from Israel are more competitive in this market segment. Furthermore, several competitors offer the greenhouse equipment, irrigation systems, etc. in combination with agronomic assistance and financing solutions. In these respects, Dutch suppliers cannot match the level of service provision of their foreign competitors. As an alternative many second hand materials (like hardware, machinery) are being imported in SA. This provides an affordable solution for obtaining good quality materials. For exporting second hand materials companies must be attention to the current import regulations.

*Table 5.1. Products sold in South Africa and their main suppliers, as noted in our interviews.*

Products	Suppliers
Complete greenhouse systems	VegTech2000, Dynatrade, Kibboe Greenhouses, Hytech Agriculture, GreenZone, Bosch-Inveka
Intermediar for most greenhouse materials	VegTech2000, Dynatrade, Greenhouse Technologies, Elvica
Plastic cover material	Richel, Ullman
Screens	Svensson, Alweco
Irrigation systems	Netafim, Stelza
Computerized climate control	Priva, R. vd Zande
Fertilizer	Vegtech2000, Osmocote, Multicoat, Hygrotech
Seed material	Hygrotech (importing ENZA)
Plant material	Rijk Zwaan, Monsanto-De Ruiter, K2
UV water cleaning	Priva
GFT (gravel flow technique)	Infagro
Lamps	Hortilux
Pad and fan	Pericoli, Mumtis
Fruit sorting systems	Ellips
Packing systems	Goldpack
IPM	Koppert
Rockwool	Grodan
Consultancy	Agro Advies Bureau Naaldwijk, GreenQ, Ben Safronovitz, Greener Solutions, DLV Plant

### 5.2.3 Suppliers of seeds and planting material

Various suppliers of seeds and planting material area active in SA. The suppliers of planting material for the floriculture sector are present agents and distributors or direct sales. In the past the 3 main breeders of chrysanthemums cutting facilities near Johannesburgwere able to supply local growers with cuttings. Nowadays these activities have been closed down and cuttings from chrysanthemums are being sources from Tanzania and Uganda. For vegetables the most dominant companies are Monsanto, Sakata and Syngenta. Also various Dutch companies (e.g. Bejo, Rijk Zwaan) have commercial activities in SA. They mainly sell through agents and dedicated distributors. In Appendix 4 we give an overview of the procedures for importing plant material in South Africa.

## 5.2.4 Distribution and presence

As said above, there are already many Dutch suppliers active in the SA horticulture. Good relations with customers are of great importance in doing successful business in SA. A local representation might help building those important relations. Sending a technician from the Netherlands to solve problems takes too long, and it is too expensive. Therefore local assistance and support from an representative is essential in being successful in the South African market.

In addition growers are too conservative to adopt new technologies, so they prefer to see new techniques in practice within their own local conditions. Currently there is no demonstration facility where growers can see the latest techniques that might be of interest for them.

## 5.3 Conclusion

At the medium and high technology level, the Dutch horticultural industry supplies, more than other countries can, the best quality of necessary materials to the grower to make a next step in technology. So, the Dutch industry has a competitive advantage. This was confirmed by South African importers of materials.

At the lower technological levels, yet no advantage is realized when Dutch products are bought compared to other suppliers from Israel, France or Spain. In some cases locally constructed greenhouses are also installed. However in general materials are available on the SA market. In addition second hand quality products are attractive to growers, since prices are modest and quality is still good. There are various companies that supply second hand hardware or techniques.





## 6 Forecast and developments

### 6.1 Possibilities for expansion

#### 6.1.1 The basis: increase of profit

The domestic market of vegetables is most certainly growing and will likely keep on growing in the near future for various reasons like the increase in economic wealth of a large share of the population. In addition the export market of vegetables will develop further due to increasing demand in neighbouring countries in combination with the international expansion of South African retailers. A further increase in the greenhouse production area is of great interest since this will lead to an increase of the production that matches the increasing demand.

By definition, the increase in profit, or net return on investment, of the production of greenhouse grown crops, will follow from the increase in scale of a greenhouse property. Three major options for this increase could be regarded: (1) increase of profitability per m<sup>2</sup> production, (2) increase of production area per grower, (3) increase of nationwide production area by increasing the number of farms.

##### *Increased profitability per m<sup>2</sup> ground area*

According to the inventory, yield increases per m<sup>2</sup> are very well possible. For example, potentially tenfold yield increases are possible for tomato, since we estimated a marketable yield of 6.5 kg fresh weight per m<sup>2</sup> per year, while Dutch yields amount 65 kg on average. For chrysanthemum, a well-trained and well-organized grower in SA produced 290 flowers per m<sup>2</sup> per year of a Reagan type of cultivar, which is similar to Dutch yield in soil. For rose however in SA the yields and quality are rather low, and offer potential for improvement. Apart of increasing yields and quality of produce, profitability also increases when production costs decrease. A lower use of inputs, a re-use of inputs, a more efficient production are a few opportunities to reduce costs. Most of the technologies required to either increase yield or decrease inputs are discussed in §6.2.

##### *Increase of production area*

The increase of production area depends on the availability of surrounding land, the land reform issues, the financial reserves of the grower and the willingness of the banks to supply loans at a reasonable interest rate.

##### *Increasing the number of farms*

In SA enough suitable land is available for expansion of the horticultural production area. Apart from an increase of acreage per farm, also more farms can be aimed at. This will require more skilled growers and personnel, and enough financial assets, then is currently the case.

Currently we have identified 3 type of farmers with their own characteristics (Table 6.1.) of which we have identified their own transition path what we will discuss in the following paragraph.

Table 6.1. Main characteristics South African farmers.

	<b>Subsistence farmer</b>	<b>Emerging farmer</b>	<b>Commercial farmer</b>
Average size	0-5 ha	5-100 ha	100- 1,500 ha*
Market	Own use	Domestic market	Domestic / export
Technology level	No tech	Mid tech	Mid tech – High tech
Crops	Vegetable	Vegetable	Vegetable/ flower
Flower farmers tend to have a smaller size ranging from 0.5ha-40ha			

## 6.1.2 Possible transition trajectories

The current greenhouse systems can evolve to systems that better fit with respect to climate, market, logistics and demography. The current status of SA horticulture is reported in Chapter 3, and is visualised in Figure 6.1. in a semi-quantitative way by ranking the greenhouse systems according to market (from local, domestic to export) and technology level. The ranking is a very global estimate, based on the information we gathered in interviews with stakeholders. The arrows depict the possible transitions per group towards more or less export or technology. The estimated requirements for these transitions per grower group are listed in Table 6.2. Below, the transitions are briefly described per farmer group. In §6.2.1 the required technology is described.

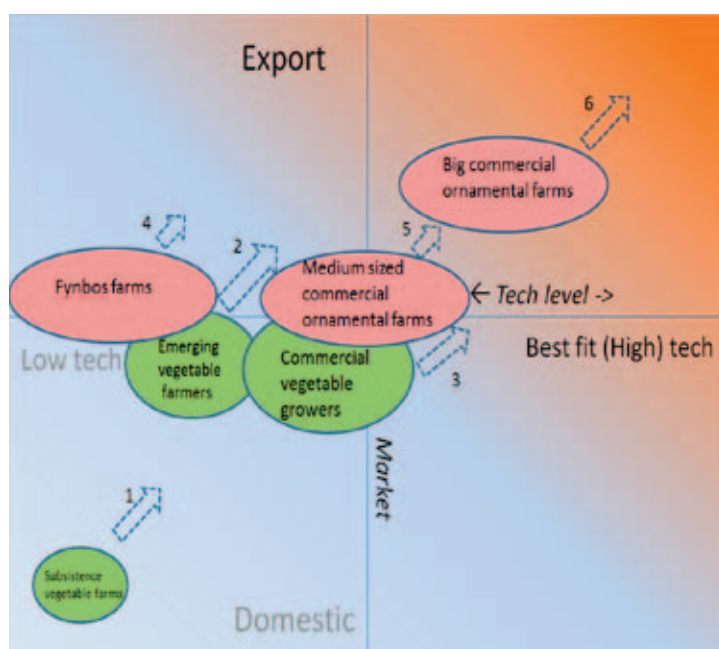


Figure 6.1. Current situation and transition paths to other market or technology levels.

### Transition 1:

The vegetable growers at subsistence level are not dealt with in this chapter, because of the lack of importance to the Dutch suppliers of technology.

### Transition 2:

The emerging vegetable growers may adopt numerous existing techniques to improve yield and quality: tunnels, irrigation, fertigation, IPM, screening, plant management. Their challenge is to find financial resources to invest in these techniques. As well, their knowledge level has to be increased, and probably the use of the new methods will require training and assistance by advisors.

### Transition 3:

The commercial vegetable growers produce large quantities per enterprise (an estimated > 1 million kg fresh produce per year). Productivity may be high per m<sup>2</sup> but may also rely on a large production area with relatively low production per m<sup>2</sup>, e.g. ZZ2, possessing hundreds of hectares. These growers will profit from a (further) increase in production per m<sup>2</sup>, if using tunnels, proper irrigation, fertilization and pest and disease management.

### Transition 5:

The emerging ornamental growers mainly comprise rose growers. The produced rose quality is rather poor due to too warm circumstances during growth. Improved cover materials, reflecting NIR, and use of (better) shading screens may increase product quality. Also techniques to reduce costs and protect the environment will be beneficial for production and 'licence to produce'.

#### Transition 6:

The commercial ornamental growers mainly grow chrysanthemum, carnation and lisianthus. Two greenhouse systems are described in detail in Appendix 2 to illustrate the complete system. These systems may benefit from technology that reduces costs, since yields are already quite optimal. Techniques like re-use of drain water and solar energy are appropriate. They would also benefit from addressing other than current markets, e.g. Japan and Australia.

Table 6.2. Transitions of the emerging and commercial farmers depicted by numbered arrows in Figure 6.1.

Farmer type	Transition elements	Required entities
Emerging vegetable farmers	Expansion of tunnel use	Tunnels
	Improved water and fertilizer use	Training
	Improved logistics	Knowledge and skills
	Better plant material	Land, personnel
	More penetration in market	Plant material, fertilizer
		Loans from government and banks
Commercial vegetable farmers	More efficient production	Computer controlled fertigation
	Reduce energy use	NIR blocking cover
	Reduce environmental burden	Alternatives for pad & fan
	Diversification of produce	Improved ventilation
	IPM	Solar energy
	More penetration in market	(Improved) screens
		Recirculation of drain water
		CO <sub>2</sub> fumigation
Emerging ornamentals farmers	Increase quality	Pad and fan
	More efficient production	Increase ventilation
	Reduce heat stress of crop	Measurement of drain water
	Improved water and fertilizer use	Irrigation control
	Increase market penetration	Contracts with retailers/exporters
		Switch to white pots instead of black ones
Commercial ornamentals farmers	Reduce energy use	Computer controlled fertigation
	Reduce environmental burden	NIR blocking cover
	Diversification of produce	Alternatives for pad and fan
	IPM	Improved ventilation
	More export	Solar energy
		(Improved) screens
		Recirculation of drain water
		CO <sub>2</sub> fumigation
		Contracts with exporters

## 6.2 Technology required

### 6.2.1 Stepwise increase in production by technology

Quite some land areas in SA are suitable for growth and production of horticultural crops, yet one or more climatic conditions require protected cultivation. This is most obvious for the occurrence of too low temperatures in winter nights that strongly stress the growth and production, thus requiring a covering structure with or without a heating device. The current level of technology varies considerably among growers, and this requires per grower a tailor-made advice on the way to improve technology in order to improve production and net income. Here we present an advice that addresses the grower types used in Figure 6.1. We assumed that company size and technology level are roughly positively correlated, and that the three current levels of technology, as described in §3.2, coincide with the three farm sizes in Figure 6.1.

- Transition 1: The subsistence farmers grow vegetables in the open field, have no crops under cover and could benefit from installation of simple tunnels to protect the crop from chilling in winter nights. The tunnel could be open at the front and back side to facilitate ventilation on warm days, but expensive heating devices are not present. A simple manual irrigation of collected rainwater or clean open water may be applied daily, in addition to solid fertilizers added to the ground or plant substrate. A water reservoir to store the rainfall intercepted by the tunnel would allow supply of water of sufficient quality.
- Transitions 2 and 4: The low/medium-tech production systems of both vegetables and ornamentals that already have a (multi-)tunnel but do not have active cooling or heating may benefit from installation of pad and fan and/or nightly heating. Such devices will prevent chilling night temperatures. A better design of the ventilation may prevent high humidity levels. In these low-tech systems the fertigation system often is very basic and manually operated, so an upgraded system could consist of a fairly simple computer driven irrigation that takes weather conditions (radiation, temperature, vapour pressure deficit) into account. Currently, shadow nets are frequently used, in open field and in tunnels, but the quality is poor thereby depressing light reaching the crop and limiting air ventilation. New types of shading screens allow more light to penetrate, while giving enough protection against high solar radiation.
- Transitions 3 and 5: The medium-tech system of both vegetables and ornamentals generally lacks a greenhouse climate computer and/or a modern fertigation system with feedbacks by sensors to the controlling systems. Therefore climate and nutrient and water supply to the plant roots are not optimal and plant growth may be constrained. The system may still use the original soil, or a mix of peat and saw mill. Such substrates may lead to clogging of water, hampering fresh nutrient solution and oxygen to reach the roots. In the warm SA climate also substrate temperatures may increase too much and oxygen levels that then drop. Alternative substrates like perlite can facilitate sufficient refreshment of the water solution, and white, reflecting plastic instead of black, will prevent too high substrate temperatures.
- Transition 6: The high-tech systems are intended to control all indoor growth conditions. However, in terms of energy saving and environmental load with pollutants, a number of technical alternatives are possible. Firstly, an alternative for the energy-consuming pad and fan system could consist of a combination of opening vents, mainly in the top of the tunnel, and permeable screens in the side walls and on top of the crop. The system should prevent occurrence of too high temperatures without using expensive energy for cooling. Such an alternative system also allows lower humidity levels relative to the pad and fan system that use water evaporation for cooling, and reduced humidity levels enable a better, more plant activating indoor climate. Secondly, an alternative for the current pest management is possible. A biological control could replace the use of chemicals to reduce the disease pressure in the greenhouse. A closed tunnel, with insect nets in the ventilation vents, however is a prerequisite in order to prevent loss of predating insects.

Further adaptations:

The best fit high-tech greenhouse in SA has a plastic cover, since this material suffices to maintain proper indoor temperatures while protecting against heavy rainfall and hail. The option to use a glass cover should not beforehand be ignored. In a cost-benefit analysis it may be the best option, amongst others because it lasts longer, is more durable and increases yield: higher penetration of photosynthetic active radiation (PAR), better insulation of indoor conditions (heat, humidity and CO<sub>2</sub>), easier to clean, more resistant against strong winds. One disadvantage of glass cover with regards to climate: the heavy hail storms will break the glass. So, glasshouses have been covered with cloth that unfortunately diminishes light penetration. The stronger supporting construction seems to be another advantage of glasshouses relative to plastic tunnels, and will facilitate the installation of heavier equipment (assimilation lamps, screens, etc.). However, also plastic multispan tunnels can be built with heavier construction elements. E.g. the Richel greenhouse at Greencrisp Farming in Namibia has 37 kg m<sup>-2</sup> carrying capacity that will facilitate installation of hanging gutters in the near future (Undercover farming, 2011). So, supporting system and cover should be separately dealt with in finding the optimized greenhouse system. For all technology levels, a better knowledge of plant behaviour in relation to growth conditions will also result in better crop management, crop quality and yield. This knowledge can be supplied by Dutch advisors. There are several approaches on how to transfer the 'green' knowledge to the growers, i.e. training, study, lectures, bilateral contact.

Region specific:

The need for a specific farmer to follow the improvement steps above will furthermore depend on the location, the financial situation, the degree of knowledge and the market. For the three regions detailed in Chapter 3 we expect some general recommendable steps are worth mentioning:

- Cape Town: Desalinization of sea water, water buffers, solar energy, tunnels with vents in the roof, shift from open field to protected vegetable production, market diversification (different cultivars)
- Johannesburg: solar energy for heat in the cold night, water buffers, recirculation, tunnels with vents in the roof, shift from open field to protected vegetable production, market diversification (different cultivars)
- Durban: as in Cape Town. In addition, innovative techniques should be available to reduce air humidity

## 6.2.2 Towards environmental sustainability

### *Energy*

Until recently, the sustainability on people, plant and profit hardly was an issue in SA. Nowadays the increasing costs for electricity demand for alternatives to (a) reduce energy use, (b) change energy source.

Ad a: The widely used pad and fan systems use much electricity, and other cooling systems should be considered.

Ad b: coals are burnt for heating, and this is not a sustainable, renewable energy source. Moreover, the CO<sub>2</sub> as a by-product of the production of heat cannot be used for fumigation in the greenhouse due to toxic compounds in the exhaust gas. An attractive alternative energy source is solar radiation. Radiation levels are high in SA, and enough land area is available close to horticultural production area to install solar collectors. The excessive use of energy to cool during the day and heat during the night could in one blow be diminished by collecting the heat during the day and re-use it with a hot water pipe system in the night. The possibilities of such a system are described by Campen *et al.* (2010). This year (2012) new solar collectors on the basis heated water were brought to the market that are relatively cheap and efficient (pers. comm. J. Campen). In addition, there is the option the company Ceickor is testing in other countries, with a system in which well water, extracted at some wells at temperatures above 40 °C, is warmed up by the sun during day time in an easy system of plastic tubes to 60 °C, and used to heat the greenhouse at night and in colder days.

### *Water*

More sustainable use of water is advocated by the SA government (Yearbook, 2011) but no legislation is substantiate these aims with regards to the horticultural sector. Yet, in summer periods the supply of good quality water is limited, and the irrigation to the crop falls short. Two options for improvement are apparent: (1) create water reservoirs to store excess rain water, (2) re-use irrigation water. For both options well-developed technologies are available. Since the options go with high investment costs, the government should stimulate the implementation of these sustainable techniques by supplying funds.

### *Pesticides*

The reduction in pesticides is an important method to maintain a healthy environment, increase the inocuity of the produce and food safety in order to access certification. Integrated Pest Management is not only feasible in high-tech greenhouses, but show good results also in mid-tech systems (*e.g.* East Africa; Elings *et al.* 2012).

### *Labour*

At the farm level, a higher number of workers per unit ground area is not profitable. Thus, greenhouse systems tend to reduce labour costs and enhance automation. Yet, at the country level, an increase in horticultural production should enhance the countries' level of employment. Since climatic conditions are favourable for crop growth, and the market demand and segmentation may increase with progressing wealth, there is a potential to expand production and employment in the horticultural sector. Stepwise adaptation of the greenhouse

## 6.2.3 Feasibility of transitions

It is difficult to adapt an existing greenhouse system in all its components right away. A transient approach, consisting of a stepwise improvement is recommendable and affordable for the grower. This strategy is valid for all levels of technology, so also low-tech growers can gradually improve their system, although after a number of steps another system should be considered. The 'adaptive greenhouse' concept has been nicely illustrated by a publication on Spanish and Dutch greenhouse systems (Vanthoor *et al.* 2012), showing that sufficient knowledge is present at Dutch horticultural knowledge institutes to recommend stepwise adaptation of greenhouses world-wide.

The feasibility of transition should be differentiated for the different farmer types and regions. If we limit ourselves to (1) emerging farmers, and (2) commercial farmers, different feasibilities and time spans are relevant:

- (1) For the emerging farmers with a low level of knowledge and skills, the supply of education, training and extension is relevant. Structural changes in the triangle of education, extension and private sector are needed. A national programme should guide the transitions in the horticultural sector. The sector could benefit from experiences in the arable agriculture in recent years in a project together with CDI (Centre for Development Innovation) at Wageningen UR, NL: the success of the transition process lies, amongst others, in the creation of a strong extension service coupled with appropriate training of farmers, extension staff and schoolteachers in agriculture. Accredited agricultural training and education is central to this initiative. The CDI, together with the educational institutes PTC+, MDF and Larenstein, contributed to this transition process by assisting four South African Colleges of Agriculture in improving their education and training programs on agricultural extension and education according to the needs of the developing agricultural sector and its land redistribution programs. The government should locate money to this transition programme. A governmental programme that subsidizes individual farmers for buying tunnels etc. is existing, but such initiatives are bound to fail in the long term if no organisation is set up to stimulate and monitor the transition processes.
- (2) For the commercial farmers, tailor-made advice may come from Dutch suppliers and advisors. The required technology can be bought everywhere, although it is claimed that the Dutch equipment is of high quality and durability. A representative should be present in the country, so as to advice or repair in case of failure. If farmers and advisors arrange a few sessions to formulate the proper innovations, on the short term the farmer may be helped with a practical solution.

The feasibility not only depends on available technology and know-how, but also on the financial assets and legislation on land property. For the emerging farmers the subsidy programmes should possibly be expanded. For the commercial farmers, the willingness of the banks to supply loans should be stimulated by a cooperative action of a sector organisation, *e.g.* the UniFlow rose growers organisation.

## 7 Discussion and conclusions

### 7.1 Discussion

General developments:

The horticulture sector in SA is small and concentrated in three areas. Especially in the areas around Cape Town and Johannesburg horticultural production can increase if technologies are improved. The major part of vegetable production is not grown in greenhouses which results in low production levels per m<sup>2</sup>. If covered, mostly plastic tunnels are used, according to foreign design (but generally not Dutch). The tunnels still fit very well in the local climate, yet adding or improving equipment, such as an automatic irrigation system, will increase production rate and quality.

As a population that grows in number and wealth, the market for vegetables will further develop due to strong domestic demand. Further demands for vegetables may come from increased export to neighbouring African countries and possibly to Europe.

Flowers growers face difficult times and some companies went bankrupt. Flowers are regarded as a luxury product in SA. Competition with other flower producing countries like Kenya and Ethiopia is difficult due to high costs (low productivity), large distance to the market and relatively low quality. Another disadvantage for flower growers that rely on the very competitive export market is that costs are increasing due to rising costs of electricity, labour and freight. A way forwards could be to reduce the use of electricity and inputs like water and nutrients to cut costs and get a sustainable 'licence to produce'. This also holds for a change from chemical to biological methods to prevent pests and diseases.

There is a lack of government support for commercial vegetables and flowers growers. One of the reasons is that no horticulture policy has been developed. Since the horticultural sector lacks organisation, the growers manage things on their own. Some big growers have proven that they can have a prosperous business if they are well-skilled and well-informed. Among growers there is no willingness to co-operate and share their knowledge and experience. A higher degree of organization is required if the sector wants to expand and get more sustainable.

Future outlook:

This report shows that the SA horticulture faces quite a number of challenges. A number of transition pathways (Chapter 6) are technically be feasible yet the sector needs a higher degree of organization and know-how. There are certainly opportunities for Dutch companies to facilitate these transitions and other developments. From the SWOT analysis (see appendix 3) a number of issues could be addressed by the Dutch industry which has much experience in the field:

- Productivity
- Collaboration, knowledge sharing
- Training
- Technical advice
- Logistics

Dutch companies should be aware that simply introducing a new device without considering the local horticultural settings is not useful. Instead, adapting the technologies to better fit to the local environment, labour and market, will be more beneficial in the long run, generating a more economically and environmentally sustainable production system. Training on the use of the new equipment, and a local agent that can assist in case of trouble will help much.

The developments are quite different for the different grower or farmer types (see *e.g.* §6.1.1), and should thus be tailor-made to be of help. The emerging farmers in the short term may benefit from receiving training on existing knowledge, and from installing standard equipment that can be supplied by any of the big suppliers world-wide (so not solely by Dutch companies). For the bigger, commercial growers, the development towards better quality and higher profits is less simple, not in the least because these growers have already exploited the expertise from *e.g.* Israelian or Dutch advisors. These larger companies face increasing costs for labour, electricity and water, and would be helped with in-depth research and experimentation to increase productivity and reduce use of inputs. One way to help is to establish a demo centre where new technologies are tested and demonstrated to the sector.



## 7.2 Conclusions

General purposes of the project were to provide:

- a detailed and actual description of the horticulture in SA, in terms of crops (vegetables, flowers, plants), acreages, production, production system, technological level, innovations, sustainability, market situation.
- an analysis of the technological level and a view on the expected technological developments.

Below, we will elaborate on these issues stepwise, using the information from previous chapters and discussion.

### 7.2.1 Data quality

The lack of up to date, complete and reliable data on the South African greenhouse horticultural sector is a real problem and might influence commercial decision making. The greenhouse horticulture sector would benefit from a better registration system, certainly for the medium and high-tech farms. The limited economic size and the lack of collaboration in the sector partly explain the lack of monitoring. In general, the available data are not complete, and nobody in the sector knows exactly the figures of protected horticulture. By comparing and combining information from various sources we have tried to establish a picture as complete and reliable as possible. Data should however be dealt with carefully, and in many instances be treated in a more qualitative way than in a quantitative way.

### 7.2.2 Regions and crops

There are three main production areas in SA, namely around Cape Town, Durban, and Johannesburg. These areas have their own characteristics related to the crops produced. The product type produced is related to differences in climate related with respect to rainfall distribution over the year, temperature, air humidity and to a lesser extend for radiation. There are basically three type of farmers, similar to the classification made for farmers in general: 1) the commercial farmers that have large scale modern greenhouses, 2) the emerging farmers or the previously disadvantaged Black farmers, which are usually inexperienced, resource poor and have a scale of operation that is in general too small to attract the provision and the service they need to increase their productivity and 3) the subsistence farmers that focus on growing enough food to feed themselves and their families. In this study we have focused on the emerging farmers and the commercial farmers.

*Table 7.1. Main characteristics South African farmers.*

	<b>Subsistence farmer</b>	<b>Emerging farmer</b>	<b>Commercial farmer</b>
Average size	0-5 ha	5-100 ha	100- 1,500 ha*
Market	Own use	Domestic market	Domestic / export
Technology level	No tech	Mid tech	Mid tech – High tech
Crops	Vegetable	Vegetable	Vegetable/ flower

*\*Flower farmers tend to have a smaller size ranging from 0.5ha-40ha.*

### 7.2.3 The international market

Relevant for the development of the vegetable sector is the economic growth in SA and the increase in purchase power of the black middle class. Also the economic developments in neighbouring countries provide good opportunities. Cooperation in the sector will be increasingly important in the future to become more competitive.

Floriculture will largely depend on the domestic situation, since export is a real challenge and productivity and quality are in general low. It is not realistic to compete with the East African countries like Kenya and Ethiopia on production volumes and cost price. Only the fynbos flowers are able to compete internationally due to their unique characteristics. It will require very large steps to develop an industry-type of ornamental industry that can compete internationally. Hardware, knowledge, infrastructure, cooperation are just some of the issues. The Netherlands can assist in many of these issues. The Netherlands has wide experience in setting up production facilities, farmer and sector organization, marketing, post-

harvest management, and many other issues. The question, however, is whether the sector is willing to invest in this involvement of Dutch knowledge. The possibility to allocate transition facilities from the Dutch Government might be of great interest.

## 7.2.4 Technology levels and transition processes

The present technology used in horticulture in SA can be distinguished in three categories, viz., low-tech, mid-tech and high-tech (Table 7.1.). The transition process is very different for the three technology levels, and should be seen as a rough description of what technology can do without differentiating for other farm characteristics like climate, region. The low-tech level will obviously profit from every single advancement in technology, and the first big step forward would be to install a tunnel to protect the crop from harsh conditions like high radiation at noon or cold winter nights. The mid-tech level may also favour significantly from implementing tunnels, yet having more techniques to improve the indoor climate like roof vents or pad and fan. In addition, the mid-tech level would benefit from a more careful control of irrigation, fertigation, IPM, screening, plant management with good equipment. Their knowledge level has to be increased to make use of these technologies. The high-tech level may benefit from technology that reduces costs, since yields are already quite optimal. Apart of finding alternatives for the expensive pad and fan cooling system, they may cut the input costs by re-use of drain water or using solar energy.

## 7.2.5 Recommendations for Dutch suppliers

The SA protected horticulture offer considerable possibilities for Dutch supply industry. Currently many Dutch suppliers are already present at the market.

### 7.2.5.1 Substitute “High-Tech” by “Best Fit”

“High Tech” is often associated with glass and high costs. This is blocking the incorporation of high-tech items into mid-tech arched/ multi tunnel greenhouses. As long as the term “High Tech” is associated with a glass greenhouse cover it will be very difficult to implement advanced (internal) greenhouse technology. Despite several glass greenhouse projects in SA, glass is considered inappropriate by the South African farmers and with respect to the climate in some of the growing areas it is indeed not required to grow under glass. However in most cases a good cost benefit analyses related to growing under glass versus plastic is missing. It is beneficiary to separate the technology of the installation from that of the greenhouse construction. Market opportunities are probably much larger for the installation than for the construction.

### 7.2.5.2 ADAPT, not ADOPT

Wageningen UR has developed a model-based design method for greenhouses, called “The adaptive greenhouse” (Vanthoor *et al.* 2012). The method is a very good decision making tool for the design of a custom-made greenhouse as it combines a greenhouse climate model, a plant growth model (tomato) and an economic model. By using this approach of location specific model based greenhouse design, combined with good arguments and knowledge of available materials, products and components, the chances for the Dutch supply industry in Turkey, where this approach is being followed since a few months, have tripled the forecasted value (Seraculture Project).

### 7.2.5.3 Keep on improving ‘High-tech’

A few examples of new developments can considerably increase the sustainability of protected horticulture, such as new cover materials (diffuse glass, Near Infra Red blocking or absorbing plastic), the energy source, more sustainable energy sources than coals (sun energy, geothermic energy, wind energy), combinations of both (Fresnel incorporated to the greenhouse cover, that block excessive light without requiring screens or whitewash and focus the excess light to produce both caloric and electric energy).

Some of these technologies (diffuse glass and coatings), are ready to be applied in SA after a good evaluation of the economic feasibility. Others are still in development in The Netherlands (sun panels or Fresnel lenses in the roof), and can inspire new local development. There are new developments being examined in passive, Mediterranean greenhouses (like Near Infra Red absorbing plastic additives or day-heat storage: the heat collected during the day is used during the night to warm up the greenhouse). Developing the most suitable new ideas together with South African enterprises can lead to great innovations in the South African horticultural sector. Tests and demonstrations of such innovations in a demo centre would help the sector.

#### **7.2.5.4 Incorporate “high-tech elements” in mid-tech greenhouses**

The current ‘High Tech’ definition does not consider the transition pathways from low to medium tech, and from medium to high tech. High-tech elements can be gradually incorporated in a medium-tech greenhouse without changing the total system or even without changing the structure of the greenhouse. This kind of transition could help the SA horticulture sector, especially those contributing to a lower environmental impact and a higher return of investment. A few examples are named here:

##### *Drain water re-use*

An example is recirculation of nutrient solution. Recirculation considerably reduces water and fertilizer use.

##### *Integrated Pest Management*

Integrated Pest Management can also be applied in mid-tech greenhouses. There are many examples of successful pest control in mid-tech greenhouses in different parts of the world, using e.g. the toolkits of the Koppert company. The reduction in pesticides is an important method to create investment capacity, to increase the innocuity of the produce and food safety.

##### *Heating by means of solar heated water*

Heating with gas burners or coal is at this moment considered to characterize the Mid-Tech level; however, the heating requirements are not the same for all areas, and so for areas with only a few cold nights a year or a short cold period in winter, other, cheaper systems can be developed or used. Ceickor is experimenting with a system in which well water, extracted at some wells at temperatures above 40 °C, is warmed up by the sun during day time in an easy system of plastic tubes to 60 °C, and used to heat the greenhouse at night and in colder days.

##### *“Tropicalize” Dutch technology*

Dutch technology is regarded excellent, but often too expensive for the South African farmers. Besides, in most cases, it cannot be applied directly to the South African circumstances, as the climate and the knowledge level are different. In cases the Dutch sold their technology without looking at the needs of the industry. For a sustainable development of the SA horticulture industry techniques should be simplified in order to match the the sector needs. Most products are easy to modify and become suitable for the South African situation.

##### *Demonstrate the technology under local conditions*

A certain technology needs to be locally tested and demonstrated. Local growers are rather conservative and wish to see the new technologies in practice, before buying. Currently there are no demonstration centres. However there are several possible test centres (e.g. Universities) in the country that would be welcoming to test technology under local conditions.

##### *Price and service count*

South Africans look at the price, at quality and service. Making the products affordable for the South African is as important as making the products suitable to the local conditions. Cost reducing innovations, from the manufacturing and shipping to the way the products are sold can contribute to a cheaper product. Sending a technician from the Netherlands to solve problems takes too long, and it is too expensive, since the technician is usually charged at Dutch price level, which is prohibitive for South African growers. Therefore local assistance and support from an representative is essential in being successful in the South African market.

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## **Appendix A List with interviewed stakeholders**

Royal Netherlands Embassy

Ludwig's Roses

Wild Lavender Farm

Undercover Farming

Dyna Trade

Oostdam & Oostdam

ARC – Vegetable and Ornamental Plant Institute

ARC – Institute for Deciduous Fruit, Vines and Wine

Floragran SA

Multiflora

Greenhouse Technologies

Dekker Chrysanten SA

Hygrotech SA

Vegtech

Ikhaya

Hortgrow

Department of Agriculture (Western Cape Province)

Prominent Tulips

Hans van Arend





## Appendix B Description of some High Tech greenhouse systems in South Africa

### Flamingo Flowers (Pty) Ltd

Contact person: Sven de Groot



This company has 22 ha of greenhouses and is located in the Krugersdorp region close to Johannesburg. They produce ca. 1 million chrysanthemums weekly, of which ca. 70% is exported. The annual coal use of the company is 500 ton per hectare. This includes steaming of the soil for sterilization purposes. During winter time 24 men are needed to operate the boiler 24 hours a day. The minimum temperature is set at 16 degrees. The darkening screen is used as an energy screen as well. It is a Ludvig Svensson screen. The cover is cleaned in wintertime every week. During summer the rain cleans the cover. The lower heating system is located between the flowers. The maximum temperature of this system is 38 degrees. The upper system is used when more heat is needed.

The company is very well managed. Their IPM is advanced. They did a lot of study on biological control. The whereabouts of spin are determined every day by counting, and based on these results the biological control is applied. The biological control predators is also being counted and monitored.

*Source: Campen et al. (2010).*

## Dekker Chrysanten

Contact person: Pieter Rodenburg



Dekker Chrysanten has formed a joint venture with Berg en Dal, owned by Pieter Rodenburg. He is also the managing director of the Dekker facility at Brits, South Africa. Dekker Chrysanten is a Dutch company which possesses greenhouse facilities for breeding and growing chrysanthemum cuttings Tanzania and Bolivia, these cuttings are sold all over the world. The facility in Brits consists of plastic tunnels covering 3.5 ha. The greenhouses are located in the North West region close to Hartebeespoortdam, and is situated at  $\pm 1450$  m altitude. High annual amounts of radiation are recorded. So, despite limited transmission through the plastic cover, crop growth is not limited by light. At this altitude temperatures in winter nights drop to an average of  $+5^{\circ}\text{C}$  but will occasionally drop below  $0^{\circ}\text{C}$ . The required heating is done by a warm water radiator system. Electrical backup power is generated by diesel generators. The water is supplied from both rainwater collected from the tunnel cover and stored in tanks, from wells that contain rather salty water, and from dam water. The irrigated water is not re-used. Cooling of greenhouse air is done by pad and fan. No roof vents are present. Climate control is regulated by a computer developed from scratch by a local company, A Priva computer is used for irrigation only. Plant material is imported from a facility of Dekker in Tanzania, comprising 30 ha. Training of personnel has been done within the company, but knowledge level of workers starts at a low level. The packing of bouquets was not profitable anymore and is now outsourced.

## LVG Plants



LVG has 7 ha of pot plants undercover and is situated close to Johannesburg. LVG is one of a few companies that form the Plantimex group (<http://www.plantimexgroup.co.za/plantimex/>). The company is well organised, and was founded in 1999 by a Dutch grower, Lous van Geest. LVG produces mainly 15 different roses, Anthurium, Burgenia, and production of cut Chrysanthemums has been started recently. These all go through Plantimex. LVG supplies about 60-75% of what Plantimex markets, the rest is bought from independent growers. On average LVG tries to keep plant production cycles at 3 – 4 months. The greenhouses at LVG plants are put up by LVG's own staff. The environmental computer control system is imported from the Netherlands (Priva or Hoogendoorn). In terms of energy, LVG burns coal to heat up the green houses. LVG has diesel back-up generators. The electricity supply from Eskom is not reliable – there are often voltage drops and power cuts. The outside dry climate is ideal for their pad and fan system. Water from boreholes is used for irrigation purposes. LVG has reverse osmosis equipment to make the water suitable for irrigation. Rainwater is also used. Plant material is imported from The Netherlands. LVG is a representative of Fides (NL) and has a cooperation with Anthura (NL). A packing system is present, and plants are sold through Hortimex, a partner in the Plantimex group.







## Appendix C SWOT Horticulture SA

<b>Strengths</b> <ul style="list-style-type: none"> <li>• Growing conditions (J-burg, Cape Town)</li> <li>• Well-developed transport infrastructure</li> <li>• Domestic market vegetable (high GDP growth)</li> <li>• High number of available workers</li> </ul>	<b>Opportunities</b> <ul style="list-style-type: none"> <li>• Increasing role of retailers in the market</li> <li>• Export vegetable (Southern Africa, EU)</li> <li>• Emerging farmers</li> </ul>
<b>Weakness'</b> <ul style="list-style-type: none"> <li>• Low productivity</li> <li>• Inefficient use of inputs</li> <li>• Outdated and unsustainable hardware</li> <li>• Lack of collaboration within sector</li> <li>• Lack of knowledge</li> <li>• Seasonal dependence</li> <li>• No knowledge agenda by national government to support commercial horticulture</li> </ul>	<b>Threats</b> <ul style="list-style-type: none"> <li>• Land reform</li> <li>• Access to finance by farmers</li> <li>• Wide spread corruption at all level in government</li> <li>• Competition East Africa</li> <li>• Electricity supply</li> </ul>



## **Appendix D Procedures to be followed when importing plants and plant products into SA**

Before importing into South Africa, an importer should:

- Find out the phytosanitary import conditions that apply to the commodity to be imported by consulting the Agricultural Pests
- Act, 1983 (Act No. 36 of 1983) or the National Plant Protection Organisation of South Africa (NPPOZA) within the Department of Agriculture, Forestry and Fisheries (DAFF).
- Apply for an import permit from the DAFF if the commodity to be imported is not exempted from an import permit in terms of the Act referred to above. If the commodity to be imported is exempted from an import permit, ensure compliance with phytosanitary measures for such exemption.
- When applying for an import permit, submit the completed application form together with proof of payment. The tariff information with regard to the issuance of import permits and the application form are available on the departmental website ([www.daff.gov.za](http://www.daff.gov.za) »Divisions »Plant health» Importing into South Africa).
- Forward a copy of the import permit to the exporter or supplier in the exporting country to ensure that the consignment to be exported meets the phytosanitary import requirements of South Africa.
- Ensure that the exporter or supplier presents the commodity to be imported to the National Plant Protection Organisation (NPPO) of the exporting country for phytosanitary inspection and certification where necessary in terms of the permit and/or exemption requirements.
- Inform the exporter or supplier to send the original phytosanitary certificate with the consignment to South Africa (if a phytosanitary certificate is required).

Procedures to be followed when imported commodities arrive at the port of entry in South Africa:

- South African Revenue Services (SARS) will detain the commodities for inspection.
- DAFF inspector/s from NPPOZA will inspect the consignment together with the accompanying documents.
- The following may happen following inspection of the imported commodities.
  - o If the consignment meets the import requirements, it will be released by the DAFF inspector/s.
  - o If the consignment does not meet the import requirements, risk management measures will be recommended whereafter a consignment may either be treated and released, sent back to the country of origin or destroyed. Once the consignment has been released by the DAFF inspector/s, the importer or his/ her agent must take the import documents to SARS for final release

*Source: [www.daff.gov.za](http://www.daff.gov.za).*











