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Deregulation, Trade Reform and Innovation in the South African Agriculture Sector

TRADE AND INNOVATION PROJECT - CASE STUDY NO. 4

Ron Sandrey,

Nick Vink

OECD Trade Policy Working Paper No. 76

TRADE AND INNOVATION PROJECT

**CASE STUDY 4: DEREGULATION, TRADE REFORM AND
INNOVATION IN THE SOUTH AFRICAN
AGRICULTURE SECTOR**

by

Ron Sandrey and Nick Vink

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By Ron Sandrey and Nick Vink

Contact: Anthony Kleitz: Tel. +33-1-45248937; anthony.kleitz@oecd.org

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ABSTRACT

This paper is one of five case studies which is a part of a larger project looking at the various effects that trade and investment can have on innovation. This paper studies the effect of deregulation and trade reform on South Africa's agriculture sector. South Africa's agriculture sector is highly dualistic consisting of a developed commercial sector and a subsistence farming sector. Deregulation and trade reform has led to substantial changes in innovation in the commercial agriculture sector such as wine and fruit, leading to a large change in composition while innovation seems to have been more limited in subsistence agriculture which lacks absorption capacity. Legal uncertainties related to land reform may also be one factor which can negatively affect innovation in the commercial farming sector.

Keywords: innovation, deregulation, trade reform, South Africa, agriculture, wine, fruit, field crops, foreign investment, absorption capacity

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This project was carried out by Ron Sandrey and Nick Vink in consultation with Osamu Onodera under the supervision of Anthony Kleitz of the OECD Trade and Agriculture Directorate. Ron Sandrey is a Senior Research Fellow at TRALAC and Professor Extraordinaire in the Department of Agricultural Economics, University of Stellenbosch. Nick Vink is Professor and Chair of the Department of Agricultural Economics, University of Stellenbosch. The author wishes to thank Vaclaf Vojtech of the OECD Trade and Agriculture Directorate and Dr. Gerald Ortmann for comments.

The Working Party of the OECD Trade Committee discussed this report and agreed to make the findings more widely available through declassification on its responsibility. The views expressed in this paper do not necessarily reflect the views of the OECD or of its member governments. This study is available on the OECD website in English and in French: <http://oecd.org/trade>.

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EXECUTIVE SUMMARY

South Africa has undergone enormous economic, social and political change since the beginning of the democratisation process in 1994. Reforms of agricultural marketing structures and trade liberalisation have been a major feature of agriculture in South Africa over the past two decades, and by 1997, all controls had effectively been cut adrift, with the closing of agricultural Control Boards, phasing out of most import and export controls, elimination of subsidies, and introduction of tariffs and their reduction. Agricultural reforms and trade liberalisation has had a measurable but disparate effect on innovation in the agriculture sector.

South African agriculture is of a highly dualistic nature where a developed commercial sector co-exists with large numbers of subsistence (communal) farms. South Africa's commercial farmers have historically been relatively well advanced in terms of technology although quite dependent on imported technology, whether through imported machinery and/or agrochemicals, or under licence as is the case for genetically modified (GM) seed. On the other hand, subsistence farms have been less endowed in terms of technology. The question is whether reforms and trade liberalisation have had an impact on innovation within the agricultural sector as a whole. The limited data available shows that deregulation and trade liberalisation have led to some innovative response in the commercial farming sector, which has been the main driver in the growth of exports while the innovative response by subsistence farmers seems to have been much more limited.

An analysis of the composition of production finds that there has been a large shift from field crops to horticultural products, with fruits and wines showing exceptional growth. One of the main drivers of the changes in the composition of agricultural output has been exports. Agricultural export's share in production has increased from one fifth to around one third. While agricultural exports in general increased by an annualised growth rate of 9.2% between 1997 and 2007, wine, citrus and table grapes have grown by 17.8%, 16% and 12.9% respectively. While production and trade does provide some circumstantial evidence of innovation, the jury is still out on the results of the reforms. Analysis on productivity changes is difficult due to lack of reliable data, but limited available analyses find that very different patterns of technological growth can be observed by and even within regions over time. Extensive animal rearing had lower growth than field crops, which in turn fared far worse than horticulture.

Reform and trade liberalisation has led to innovative response in the fruit and wine sector, which mainly consist of commercial farmers. In the wine sector, deregulation and trade liberalisation has been followed by (1) a large number of new entries in the industry, (2) inward foreign direct investment which is offering a synergistic relationship between wine production, overseas marketing and the burgeoning tourism sector, (3) large scale replanting of vineyards with high-yielding lower-quality vines making way for the lower-yielding but higher-quality 'noble' cultivars, and (4) signs of more active industry cooperation. In the fruit sector such as table grapes and oranges, there has been an increase in production and exports, which has been driven by (1) the addition of new export-oriented production regions, (2) introduction of new production technology, and (3) introduction of temperature controlled integral unit specialised containers for transport among others. In the field crop sector, prices have generally adjusted downwards to world market levels as a result of reform and trade liberalisation. In response, farmers have shifted to minimum and low-tillage production systems, and reduced the use of inputs such as fertilisers, insecticides and herbicides, tractors and other machinery, and of fuel in crop production (i.e. while there has been relatively little product innovation and/or use of technology to improve productivity, there has been some process innovation).

Although lack of data makes analysis difficult, innovation seems to have been more limited in subsistence farming. This is partly because the main programmes such as land reform and Black Economic

Empowerment are relatively recent and ongoing and in some part because of implementation failures. However, the main reason seems to be because there is a large gap between commercial farmers and subsistence farmers in innovation capacity.

Productivity increases in commercial agriculture as a whole seem to have been quite limited, and mainly due to the shedding of labour. This is in contrast to the results of trade and agricultural reform in New Zealand where reform led to an increase in innovation and led to productivity improvements through technological developments.

South African agriculture faces a challenge going forward as it tries to balance efficiency and equity. Innovation and efforts to improve productivity can be at odds with policy to decrease rural unemployment and poverty when leading to the shedding of labour. Constraints in terms of infrastructure, for example, in electricity can also pose considerable problems in terms of absorption capacity for innovation. Some policies may be considered in order to provide poorer subsistence farmers with resources necessary to innovate, to widen the innovative response. It should be noted that legal uncertainties related to land reform may be one factor which can negatively affect innovation in the commercial farming sector.

TRADE, INNOVATION AND GROWTH: THE CASE OF THE SOUTH AFRICAN AGRICULTURE SECTOR¹

1. Introduction

1. This paper is one of a series of case studies which form part of an OECD project on Trade and Innovation which will look at how trade can facilitate or hinder innovation. Trade can promote innovation² through a number of ways, including through technology transfer, increased competition and economies of scale (OECD, 2007). This paper studies how deregulation and trade has affected innovation in the agricultural sector in South Africa, focusing on fruit and wine and the field crop sector. Three points need to be stated at the point of departure. First, this paper looks at the effects of deregulation and trade liberalisation together. This is because in the case of South Africa it is difficult to untangle the impacts of the two policy shifts as they occurred almost simultaneously³. Second, as a developing country, availability of data is limited, especially for the subsistence farming sector,⁴ which greatly constrains the scope of analysis. Third, because the reforms are relatively recent and in some cases, as in the case of land reform, are still ongoing, assessment on the effects should be interpreted as such.

2. South Africa, the leading economy in Africa, has placed increasing emphasis on innovation as a source of growth. South African commercial farmers have historically been successful in importing technology from developed countries (e.g. through imported machinery and imported insecticides, herbicides, etc.) and adapting these technologies to local circumstances with substantial assistance from the government-sponsored Agricultural Research Council and the Universities.⁵ In addition, in the past few decades they have also come to depend on technology transfer through the transfer of intellectual property rights, such as genetically modified (GM) seed. The country has undergone enormous economic, social and political change since the beginning of the democratisation process in 1994, and the economy is increasingly integrated in world markets. This has led to an increase in innovation as the economy has adapted to these changes.

3. During 2004 agriculture, forestry, hunting and fishing contributed some 3.7% to South Africa's GDP, while manufacturing contributes another 19.6% (the food-processing sector accounts for approximately 15% of this manufacturing sector). In 2002, the last figures available, agriculture employed

¹ This paper was prepared by Ron Sandrey and Nick Vink. Ron Sandrey is a Senior Research Fellow at tralac (Trade Law Centre for South Africa), and Professor Extraordinaire in the Department of Agricultural Economics, University of Stellenbosch. Nick Vink is Professor and Chair: Department of Agricultural Economics, University of Stellenbosch

² According to the OECD's Oslo Manual, an innovation is defined as 'the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.' The Oslo Manual identifies four types of innovations: a) Product innovations – new or significantly improved goods or services; b) Process innovations – new or significantly improved methods for production or delivery (operational processes); c) Organisational innovations – new or significantly improved methods in a firm's business practices, workplace organisation or external relations (organisational or managerial processes); d) Marketing innovations – new or significantly improved marketing methods.

³ See Sandrey and Vink, 2006, for a discussion of the timing and sequencing of these reforms.

⁴ As discussed later, South African agriculture is of a highly dualistic nature, where a developed commercial sector co-exists with large numbers of subsistence (communal) farms.

⁵ As noted in OECD's review of South Africa's Innovation policy, government continues to play a considerable role in R&D in Agricultural sciences. 39% of government R&D expenditure in 2004/5 was on agricultural sciences (OECD, 2007).

9.7% of employment in the formal sector (451 000), plus a similar number (459,000) of casual and seasonal workers. Agricultural exports increased from R 11.4 billion in 1997 to R 28.8 billion (roughly 4 billion USD) in 2007⁶. About one-third of agricultural production is exported and contributes approximately 6.1% to total SA exports. Agricultural exports share of the total value of agricultural income increased from 20% to 40% over the last 5 years. It ranks as one of the top five exporters of grapes, avocados, citrus, and plums, it supplies 70% of the world's ostrich products, and is the 9th largest wine producer in the world. More than 65% of all agricultural exports are processed products. At the same time, South African agriculture is highly dualistic with a small number of commercial operations run predominantly by white farmers and large numbers of subsistence farms run by black farmers. The commercial farming sector produces most of the outputs and is responsible for almost all of the exports. In 2002, fewer than 2500 farmers (6.6% of the total) earned more than 50% of the total gross farming income of the sector (StatsSA, 2005).

4. Wide ranging reforms liberalising domestic and foreign trade, and lowering support to agriculture were implemented in the 1990s with the democratisation process. The Marketing of Agricultural Products Act of 1996 led to the closing of agricultural Control Boards, phasing out of certain import and export controls, elimination of subsidies, and introduction of tariffs instead of control measures. A number of trade agreements have been put in place such as the EU-SA Free Trade Agreement⁷, the South African Development Community (SADC) trade protocol and the renegotiated South Africa Customs Union (SACU). Furthermore, South Africa is also a beneficiary of the US African Growth and Opportunity Act (AGOA). These have all led to increased competition and increased market access. The commercial agricultural sector adapted well to the policy reforms and liberalisation efforts. Part of the adaptation process has been an increase in innovation in the sector.

5. This study provides a brief overview of South Africa's agriculture and agro-food industry, changes in the trade and investment framework, and changing trends in trade and investment. It will then provide a more detailed description of how trade and investment has affected innovation and productivity in the agriculture sector, in particular wine, fruit and field crops. The case study incorporates first hand information gained through interviews as well as existing documentation.

2. Deregulation of South African agriculture⁸

6. By the late 1970s, the racial segregation of South African agriculture was complete, subsidization of commercial farming peaked and the productive base of the farming sector in the communal farming areas⁹ ceased to provide any meaningful income opportunities to all but a handful of farmers. In the period around 1980, however, farm policy started to change. Deregulation started outside the sector, with financial sector deregulation, which resulted in changes in the external value of the currency and in the

⁶ September years, using World Trade Atlas data and WTO agricultural definitions

⁷ Formally the Trade, Development and Cooperation Agreement, or TDCA

⁸ The process of reform has been well-researched (see e.g. Sandrey and Vink, 2006; van Zyl *et al.*, 2001; Vink, 2003; Vink and Schirmer, 2002).

⁹ After more than a decade of democracy, most black farmers still farm in the communal areas, which make up some 13% of the farming land in South Africa. There has been little evidence of increased production from these areas, which lack the basic necessities for successful farming: most areas are isolated and lack infrastructure to get farm inputs to the farmers and produce to the market, and farmers lack access to basic farmer support services such as finance, mechanisation services, etc. In addition, the land reform programme has not succeeded in providing meaningful livelihoods opportunities for the supposed beneficiaries. For this reason, this report concentrates on the commercial farming sector.

interest cost of farm borrowing. As the Rand started a decade long decline in value, farm input prices, which have a relatively large import component, rose faster than farm output prices. The use of interest rate policy by the Reserve Bank saw interest rates rise to very high levels during the widespread drought of 1983/4. Furthermore, many controls over the movement of labour were lifted by the mid-1980s, setting in motion vast population movements to the towns and cities. Finally, considerable microeconomic deregulation took place, leading to a significant increase in activity in the informal economy, including the increase in informal marketing of farm products in the urban areas.

7. Within the sector, there were a wide range of policy shifts, which included:

- Deregulation of marketing through revision of the Marketing Act, 1968 and other legislation, including large parts of the farm sector.
- A change in tax treatment of agriculture, reducing the income tax concessions and implicit subsidies to farmers which had previously led to overinvestment in capital equipment.
- A decrease in direct budgetary expenditure on agriculture as subsidies became unsustainable.
- A start to the tariffication of farm commodities.

8. The effects of these changes were summarised by Vink (1993):

- A considerable lowering of the overall debt in the farming sector in reaction to an increase in bankruptcies triggered by an increase in the annual weighted rate of interest paid by farmers from below 10% in 1970-1974 to above 15% in 1988-1992.
- A deterioration of the solvency position of the sector (total debt/total assets) from under 15% in 1980 to almost 30% by 1985, with critical debt concentrated mostly in the field crop sector.
- A shift in the pattern of farm production, including the withdrawal of almost a million hectares of land planted to maize in marginal areas and a concomitant increase of 720 700ha by mid-1993 in pasture land.
- Beginning of a shift from field crop production to horticulture (see later).
- Greater diversity of farm sizes, especially in the marginal cropping regions where farms became larger in terms of area as farmers switched to livestock (including game) farming. Another example was in the sugar industry where long standing support to emerging black farmers changed the pattern of land ownership.
- Marked decline in the level of total employment in commercial agriculture after about 1970, from some 1.5 million workers to below 1 million by 2002.
- A decline in the index of total input use in agriculture, mostly in terms of the value of land and the quantity of labour used.
- Sharp drop in real farm land prices since the early 1980s, with prices in the summer rainfall regions for example 45 per cent lower in 1990 than in 1982.
- Improvement in the flexibility of the commercial farming sector, as measured by the responsiveness of farmers to change.

9. In summary, the period of the 1980s saw attempts to improve the efficiency and viability of the commercial farming sector, but within the existing framework of support, and largely in the interest of fiscal sustainability. This changed with the first democratic election of 1994 and the subsequent withdrawal of the National Party from the Government of National Unity in 1996. The most important policy

initiatives in the agricultural sector taken since 1996 include trade liberalisation; gradual (and still ongoing) land reform; institutional restructuring in the public sector; the promulgation of the Marketing of Agricultural Products Act and the Water Act; and labour market policy reforms.

10. The key feature of post-1994 trade policy in South African agriculture has been the replacement of direct controls over imports and exports, exercised in terms of the Marketing Act of 1968, by tariffs, and the lowering of those tariffs below the bound rates agreed to in the Marrakech Agreement of 1993. In addition, countries in the Southern African region have been granted preferential access through the abolition of quantitative controls over agricultural trade within SACU, a range of bilateral treaties and the South African offer to SADC. Finally, South Africa has signed a free trade agreement with the EU. These changes came about in accordance with national trade policy, whose main purpose was to lower the average level of tariffs, to maintain a typical tariff escalation profile, and to simplify the tariff structure. Initial progress in rationalizing the tariff regime and with lowering nominal and effective protection was fast. Between 1990 and 1999, the number of tariff lines for the total economy was reduced from 12 500 in 200 tariff bands to 7 743 in 47 tariff bands. The maximum existing tariff was also reduced from almost 1400% to 55% and the average economy-wide tariff fell from 28 to 7.1%.

11. The structure of protection also affects agriculture. In South Africa, the average tariff cascades from a relatively high rate on consumer goods to moderate on intermediate goods and low on capital goods (i.e. tariff escalation). This pattern, which is typical of protection in many developing countries, implies that less progress has been made in rationalizing effective protection. It also results in a support to value-added production and exports. While certain manufacturing industries have benefited directly from such support (e.g. the motor vehicle and textile industries), traditional agricultural export sectors such as wine have been able to base their export strategies on growth in a protected domestic market.

12. The three most important trade relations in the Southern African region include SACU, which exhibits the deepest level of integration, SADC, and the South Africa-Zimbabwe bilateral agreement. Of the extra-regional influences, the Cotonou preferences (and the EPA negotiations), the US Africa Growth and Opportunity Act (AGOA), and South Africa's separate bilateral Trade, Development and Cooperation Agreement (TDCA) with the EU are most influential.

13. The purpose of policy reforms was multiple: to correct the injustices of past policy, principally through land reform; to get the agricultural sector on a less capital-intensive growth path; and to enhance the international competitiveness of the sector. The reconciliation of these policy goals is a major challenge for South Africa's agricultural policy makers.

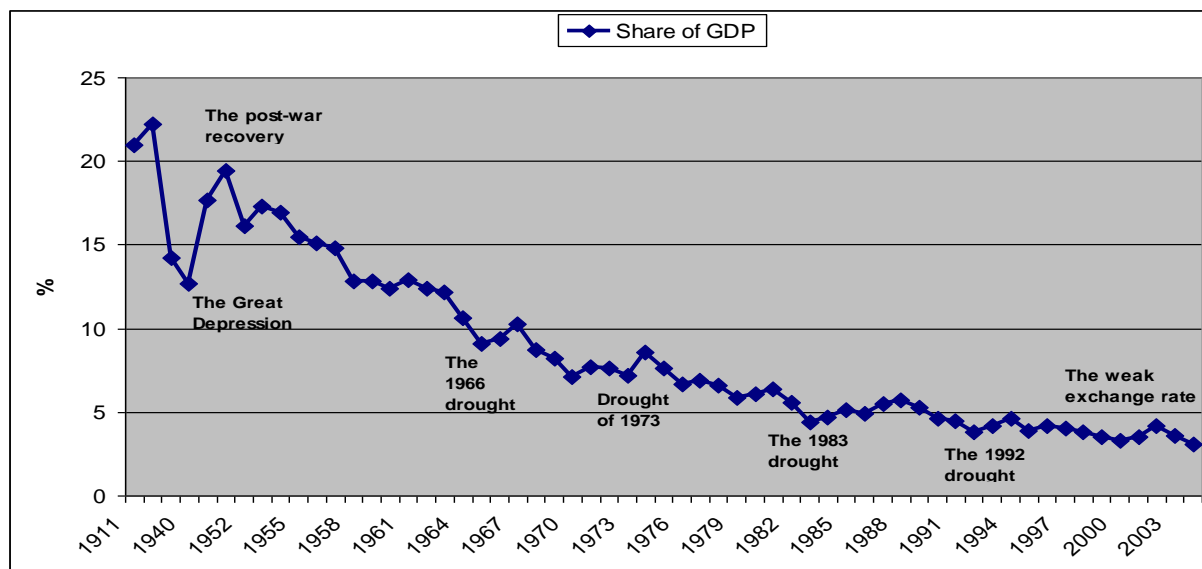
14. The consequences of these comprehensive shifts in policy have been extensively reported (see Vink, 2003). These policy shifts led to a general shift in the agriculture sector which can be evidenced in the data. In the next three sections we look at the change in the agricultural production portfolio of the country, the shift in trade patterns, and the productivity impact resulting from the policy shifts.

(1) Agricultural output and composition

15. South African agriculture is heavily influenced by weather occurrences, as is evident from Figure 1 below, which shows the GDP contribution of the sector since 1911. As a resource-poor country in terms of quality soil and water for agricultural use, South Africa is plagued by droughts, although these are often localised. The current period (i.e. since the first fully democratic elections in 1994) is unusual, as there has not been a country-wide drought in this period, as opposed to severe country-wide droughts in 1966, in 1982 to 1984 and in 1992/93. The sector is also highly exposed to global markets: farmers receive no

subsidies, and trade at the borders has been substantially liberalized. Hence the peak in the value of output in 2002, when the Rand was at its weakest against the major international currencies, is evident.

Figure 1. The contribution of agriculture to GDP since 1911

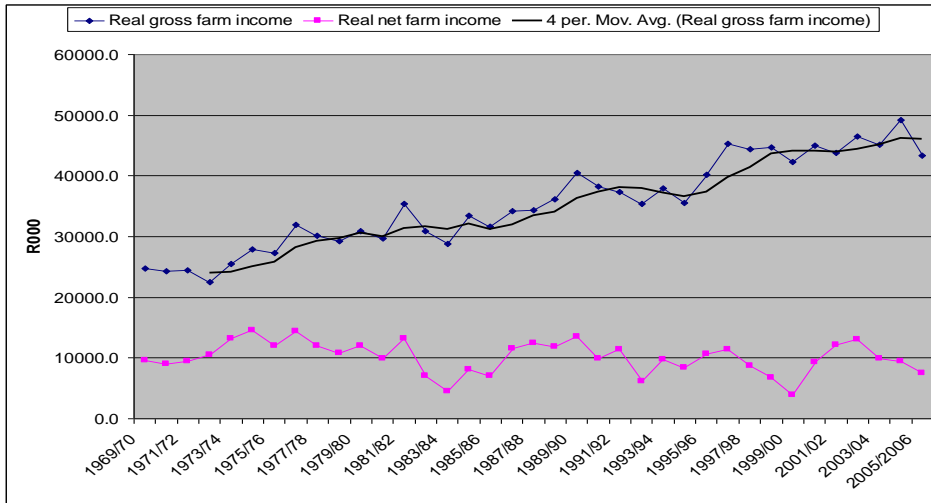


Source: Adapted from NDA, 2007. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

16. Figure 2 shows the trends in real Gross and Net Farm Income in commercial farms over the past 4 decades. Gross farm income has increased from around R25bn (with the year 2000 as the base year) in 1970 to almost R50bn in 2006 (R72bn in nominal terms). This growth took place during a period where the South African population more than doubled from around 20 million (1970) to some 47 million people. Figure 3 which looks at output per capita shows that the growth in physical production was not sufficient to keep pace with population growth until the middle of the 1990s, showing a declining production per capita until that time, and a flattening out since. The flattening coincides with the democratisation process, accompanied by trade liberalisation and internal market deregulation in agriculture. Physical output increased from around 18 million metric tons in 1975 to 28 million tons in 2006.

17. Net Farm Income (NFI) is a measure of the profitability of commercial farms. It is calculated as gross farm income (turnover) minus depreciation, salaries and wages, interest, and rent. Figure 4 shows the trends in real gross and net farm income and the cost of intermediate goods at prices in 2000. Expenditure on intermediate goods and services tracks the upward trend in real gross farm income over the entire period, while real Net Farm Income has remained stagnant. The case studies in Section 4 of this report will show that this increase in total expenditure on intermediate goods and services hides the variation within agriculture: expenditure on intermediate goods and services increased rapidly in the export-oriented horticultural sectors, and declined in the more extensive field crop sectors, while employment in agriculture declined. Given that the prices of intermediate goods have risen faster than output prices, this reflects an increase in Total Factor Productivity.

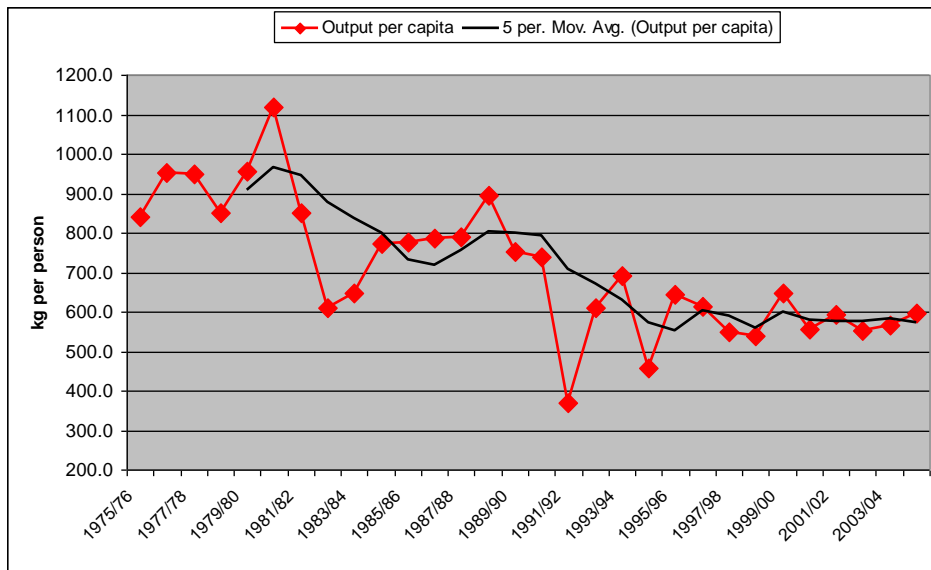
Figure 2. Figure 2: Trends in real gross and net farm income from 1970



Note: Base year = 2000

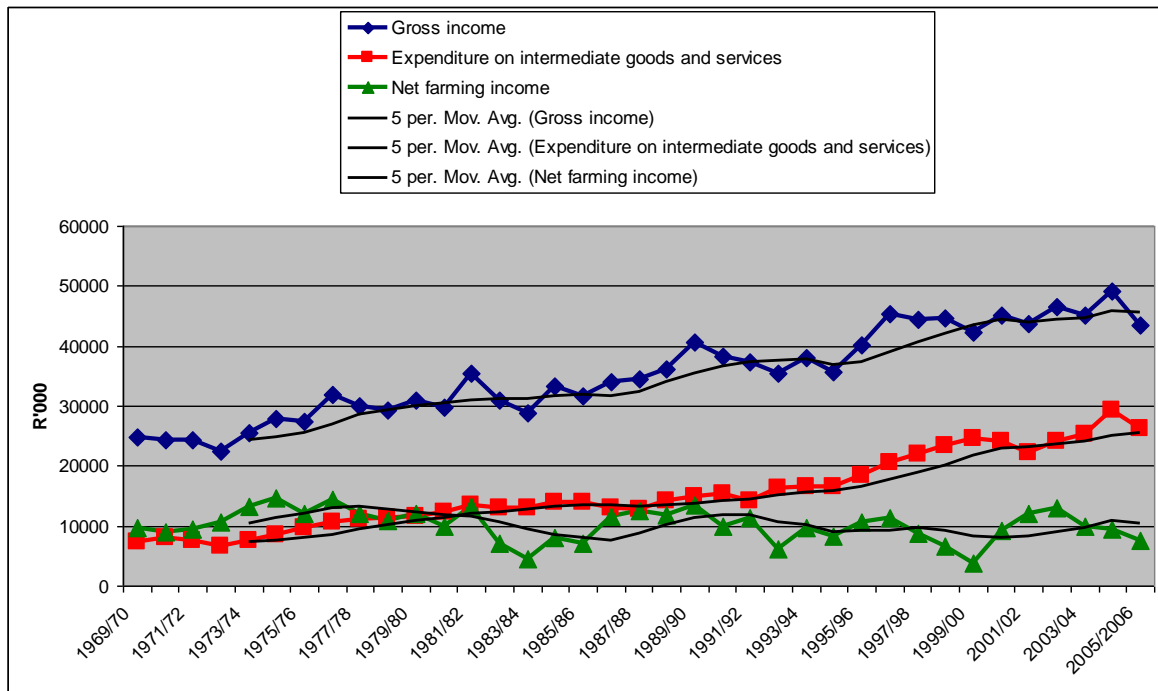
Source: Adapted from NDA, 2007. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

Figure 3. Output per capita since 1975/76



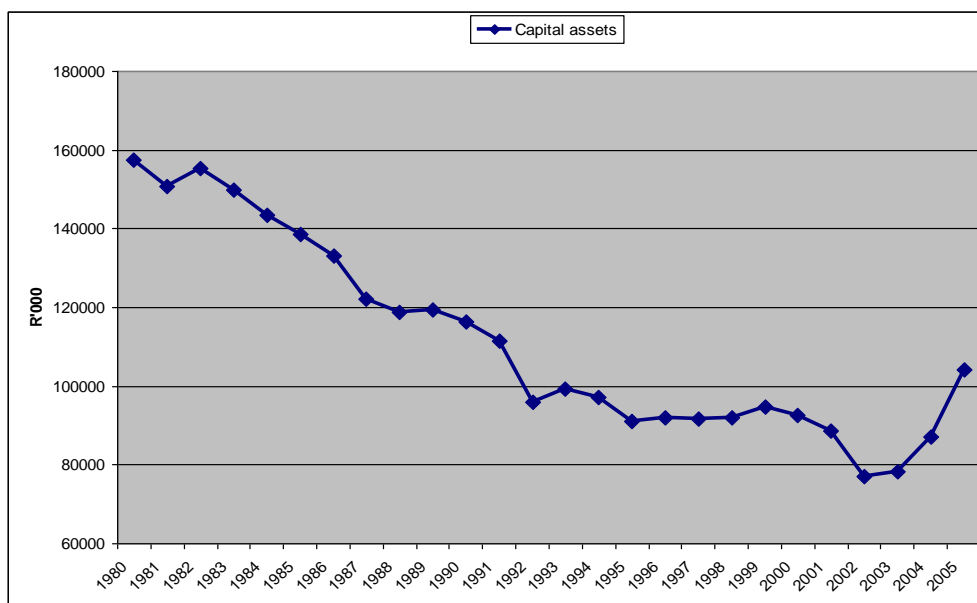
Source: Adapted from NDA, 2007. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

Figure 4. Real gross and net farm income, and the cost of intermediate goods

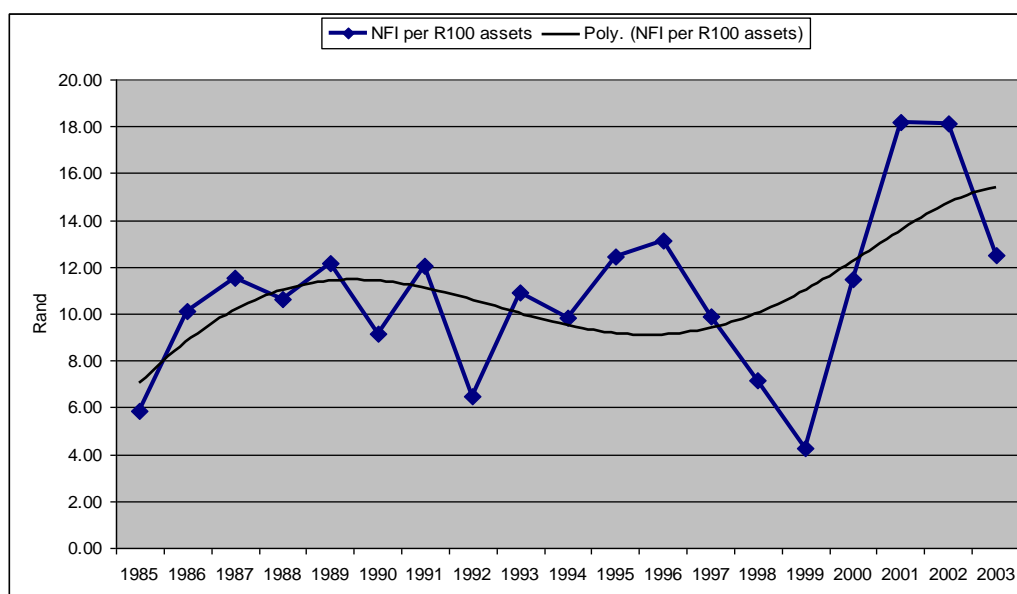


Source: Adapted from NDA, 2007. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

18. This stagnation in real net farm income should be seen in perspective: Figure 5 shows that the value of capital assets in agriculture declined rapidly throughout the first half of the 1990s, then increased moderately in the second half of the decade as nominal land prices recovered with the upsurge in inflation and the increase in net farm income that resulted from the collapse of the exchange rate in the period leading up to 2002, and its subsequent strengthening. The result (Figure 6) was that the amount of real net farm income generated from each R100 in assets increased in the early 2000s, a reflection of improved efficiency in the use of capital.

Figure 5. The real value of capital assets on commercial farms

Source: Adapted from NDA, 2006. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

Figure 6. Real net farm income generated from R100 in capital assets

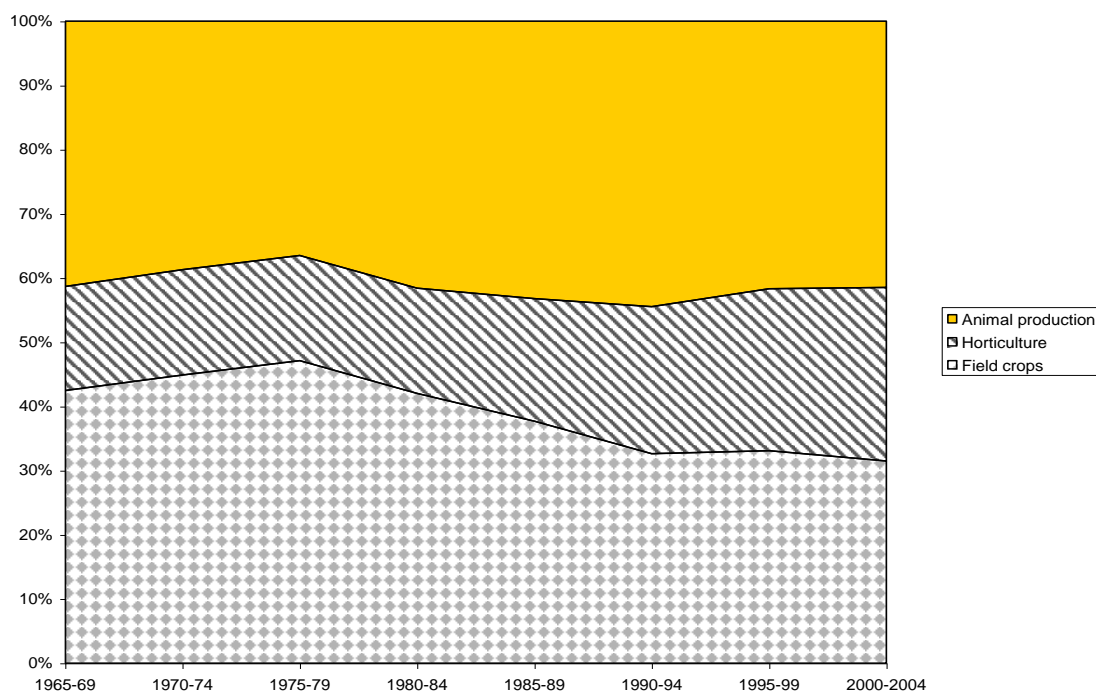
Source: Adapted from NDA, 2006. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

19. In terms of the composition, there has been a large shift from field crops to horticultural products. Within horticultural production, fruit and wines have shown exceptional growth. Figure 7 shows that animal production maintained its relative share of total agricultural production (40%) over the period 1965-69 to 2000-04, as can be expected, given the nature of South Africa's agricultural resources with only some 17% of the available agricultural land suitable for cultivation (NDA, 2006:5).¹⁰ However, the relative share

10. The remaining 83% is mainly extensive pasture.

of different kinds of animal products has shifted over this period: the production and consumption of red meat has stagnated, while the production of poultry meat has increased considerably. Horticulture has increased its share of production by 10 percentage points to 27% at the expense of field crops (33% in the latter period from 43% in the earlier one). As the production of virtually all agricultural commodities has increased over the past couple of decades, this means that the production of horticultural products has, on average, increased at a faster than average rate.

Figure 7. Agricultural production shares by agricultural sectors, 1965 to 2004



Source: Adapted from NDA, 2006. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

(2) *The trade portfolio*

The past: overall changes in agricultural trade

20. One of the main drivers of the changes in the composition of agricultural output (i.e. faster growth in the production of horticultural products) has been trade. The overall trade picture, and agriculture's contribution, is reflected in Table 1, which shows the trends in South Africa's agricultural trade during the 1990s. A number of important shifts can be identified from these data:

- Agriculture's share of total exports has remained at between 8 and 10% since the start of the 1980s (prior to this date, gold bullion exports were not included in total export data). In the second half of the 1990s the share increased from below 8% to above 9%, indicating that during this period agriculture played the role of a catalyst of export-led growth for the country as a whole.
- The next row in the Table shows the share of exports in total agricultural production: the share declined from around a third between 1965 and 1979 to just above a fifth between 1980 and 1994, and then increased back up to the level of the earlier period. This clearly shows the effect of sanctions in the middle period. This also partly explains the relative lack of competitiveness of agriculture (to be discussed below) during the latter part of the 1990s. The sector achieved little more

than a re-entry into markets lost during the 1970s and 1980s.

- Exports of processed agricultural products¹¹ have increased faster than exports of unprocessed agricultural products – the share of processed agricultural exports has increased from around 40% to 60 % since 1965, with the sharpest increase occurring since 1990.
- Agricultural imports have grown faster than agricultural exports. One of the drivers has been the dramatic increase of soy beans and soybean oil cake for poultry feed; from \$12 million in 1996 to \$132 million for the first nine months of 2007. As a result, import penetration has increased from 4.55% of total agricultural output to a fifth of total agricultural output. Import cover (the ratio of agricultural exports to agricultural imports, a measure of the ability of the agricultural sector to pay for its own imports) also declined drastically from 7.64:1 in 1965 to an annual average of 1.63:1 in 2000-2005. Preliminary data even shows that agricultural imports (R29 406bn) exceeded agricultural exports (R29 234) in the calendar year 2007. Agriculture's share of total imports which has remained relatively stable since 1970 declined from 6.6 to 5.2 % after 1999 because of rapid growth in total imports.
- There has been a significant increase in "openness" as measured by total exports plus total imports as a proportion of total agricultural production (Table 1).

21. Table 2 provides more background on the specific changes to South African agricultural exports over the period of the September years 1997 through to 2007. The average growth rate¹² was 9.2 percent, and the top four entries of wine, citrus, grapes and apples all exceeded this growth. Sugar and prepared fruits exhibited lower rates, while not shown is that maize (the main export in 1997), peanuts, wheat, jams and barley all exhibited negative growth over the period using the calculation methodology. Agricultural exports remain concentrated in a small number of tariff lines. In 2007 the top ten tariff lines at HS 4 digit level accounted for 68% of the total, and at 1998 these same tariff lines accounted for 59%. The predominance of horticultural exports is clearly shown (especially if one includes wine in a broad definition of horticulture).

22. There are, in addition, three further structural shifts in South Africa's agricultural trade portfolio that started during the 1990s that should also be noted:

- While the EU remains the largest destination for agricultural exports, there has been a rapid increase in exports to the rest of Africa, to the extent that these made up 25% of total agricultural exports by 2000. By 2000, South Africa had a positive trade balance in agricultural and food products of around R2.5bn with the non-SACU member countries of SADC, and only 3 SADC countries featured in the top 25 import sources, namely Zimbabwe, Zambia and Malawi.
- Argentina emerged as the main origin of food and agricultural imports into South Africa (largely animal feed, a consequence of the rapid increase in poultry consumption), followed by the United States, the UK, Australia and Zimbabwe.
- South Africa's trade balance in the manufactured goods category of food and beverages was positive for most of the second half of the 1990s; however, by 2005 imports were equal to exports, i.e. there was a neutral trade balance.

¹¹ These are higher value agricultural exports, as opposed to manufactured agricultural goods, i.e. food and beverages.

¹² Where this growth rate is measured in log form as the last observation over the first and then divided by the number of observations minus one.

Table 1. South Africa's trade in agricultural goods since 1965

	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989	1990-1994	1995-1999	2000-2005
	Annual average for period							
Exports								
Total exports (Rm)	1222	2092	7305	20746	45164	72534	133623	272382
Total agricultural exports (Rm)	430	689	1412	1946	3613	5520	12132	22293
Gross value of agricultural output (Rm)	1237	2100	4234	8458	16087	25581	42349	68282
Agricultural exports as a % of total exports	35.21	32.92	19.33	9.38	8.00	7.61	9.08	8.18
Agricultural exports as a % of agricultural output	34.79	32.80	33.35	23.01	22.46	21.58	28.65	32.65
Processed agricultural exports (Rm)	182	341	724	942	2010	2865	6650	13384
Unprocessed agricultural exports (Rm)	249	347	688	1004	1604	2654	5482	8909
Processed agricultural exports/total agricultural exports	42.18	49.56	51.25	48.42	55.62	51.91	54.81	60.04
Imports								
Total imports (Rm)	1862	3243	6536	18240	32499	55122	125364	264682
Total agricultural imports (Rm)	56	174	290	870	1689	3476	8317	13687
Agricultural imports as a % of total imports	3.02	5.38	4.43	4.77	5.20	6.31	6.63	5.17
Agricultural imports as a % of agricultural output	4.55	8.30	6.84	10.29	10.50	13.59	19.64	20.05
Import cover ¹	7.64	3.95	4.88	2.24	2.14	1.59	1.46	1.63
Openness ²	39.34	41.10	40.19	33.30	32.96	35.16	48.29	52.69

Note: ¹Agricultural exports/agricultural imports; ²(Agricultural exports + agricultural imports)/Agricultural output

Source: Adapted from NDA, 2006. Abstract of Agricultural Statistics. Pretoria, National Department of Agriculture

Table 2. South African agricultural exports, 1997 to 2007 September years

(millions of South African Rand except when specified)

Description / Year	Sep 97	Sep 99	Sep 01	Sep 03	Sep 05	Sep 06	Sep 07	Growth/annum
Agricultural exports	11,444	14,269	19,160	25,161	25,066	26,464	28,824	9.2%
(in million USD)	2,483	2,332	2,249	3,357	3,396	3,887	4,098	5.0%
Wine	738	1,152	1,885	3,113	3,867	3,584	4,378	17.8%
Citrus	815	1,537	1,751	2,611	3,280	3,348	4,054	16.0%
Grapes	674	1,238	1,320	1,680	1,885	2,177	2,438	12.9%
Apples	722	879	808	1,431	1,555	1,477	2,296	11.6%
Sugar	1,129	1,639	2,961	2,056	1,627	2,604	1,727	4.2%
Fruit, Prepared	693	809	844	1,299	1,127	1,076	1,204	5.5%
Wool	320	333	372	760	600	644	1,090	12.2%
Fruit Juice	305	424	584	943	790	877	960	11.5%
Ethyl Alcohol	518	188	525	511	635	730	755	3.8%
Cigarettes	238	376	679	311	369	461	583	8.9%
Food Preparations	84	137	258	328	252	326	493	17.7%
Ethyl Alcoholg	80	151	252	244	259	301	417	16.5%
Tobacco	2	6	15	94	428	470	403	55.0%
Sheep Skins	276	146	250	467	327	281	398	3.7%
Tobacco	86	227	354	327	202	193	380	14.9%
Offal	43	103	269	280	37	251	356	21.2%
Peaches, Plums	131	280	249	352	302	258	339	9.5%
Pineapples, Avo etc	96	161	179	293	318	218	314	11.9%
Waters	116	150	289	515	208	264	306	9.7%
Nuts Nesoi	34	75	138	202	352	306	288	21.5%
Sub total Rm	7,099	10,009	13,979	17,816	18,417	19,846	23,178	11.8%
Sub total % total	62%	70%	73%	71%	73%	75%	80%	

Source: World Trade Atlas data, tralac calculations

23. An analysis of exports according to their level of processing¹³ reveals that while there have been some changes in the composition of trade between 1996 and 2005 (i.e. increase in fruits and food preparations, decrease in eggs and dairy products), there has not been a fundamental shift towards higher levels of processing: both unprocessed primary and processed primary recorded the same 5.2 % growth rate between 1996 and 2005 (Table 3). Note that unprocessed primary as expressed here is predominantly fresh fruits, while processed primary includes both processed fruits and wines. At the same time the origin of farm exports has not shifted much: most farm exports still come from the Western Cape, with recent significant increases seen only from the Northern Cape with table grapes (discussed later).

Table 3. South African agricultural trade by TREC definitions, US \$m

TREC Description	Exports \$m		
	1996	2005	Change/annum
Live animals, chiefly for food	1.7	7.1	15.9%
Cereal grains	366.0	266.3	-3.5%
Vegetables fresh or chilled	99.7	29.1	-13.7%
Fruit and nuts (excluding oil nuts) fresh or dried	472.0	1,212.4	10.5%
Dairy products	3.5	5.5	5.0%
Other unprocessed food	65.4	95.3	4.2%
Hides and skins (excl fur skins), raw	49.3	54.5	1.1%
Fur skins, raw	0.1	0.1	4.7%
Unprocessed textile fibres and wastes	99.1	135.6	3.5%
Crude materials not elsewhere specified	66.1	143.9	8.6%
Subtotal Unprocessed primary	1,222.8	1,949.8	5.2%
Meat and meat preparations	31.7	55.4	6.2%
Dairy Products	39.7	19.5	-7.9%
Eggs, not in shell (liquid or dried)	1.5	0.4	-13.8%
Cereal Preparations	97.2	160.0	5.5%
Fruit and vegetable preparations	330.9	396.7	2.0%
Sugar, honey, coffee, cocoa confectionery	343.5	351.5	0.3%
Edible animal/vegetable oils, fats and waxes	48.1	31.4	-4.7%
Preparations food, beverage & tobacco	277.3	917.5	13.3%
Raw hides	54.7	32.5	-5.8%
Textile fibres	0.2	0.0	-22.6%
Inedible animal/vegetable oils, fats and waxes	2.6	1.5	-6.4%
Subtotal Processed primary	1,227.3	1,966.4	5.2%
Chemical and chemical preparations	116.7	121.3	0.4%
Chemicals	13.3	46.6	13.9%
Total agricultural	2,597.8	4,099.9	5.1%

Source: WTA data, tralac analysis

¹³ This analysis is based on the TREC code classification developed by the Australian government to assist analysis of trade performance by categorising trade according to the degree of processing or transformation they have undergone. The main purpose of TREC was to distinguish between commodities according to their level of processing - this led to the categories of 'unprocessed' and 'processed' within primary products, and 'simply transformed' and 'elaborately transformed' within manufactures. Classification of commodities within these categories is done by assessing the degree of manufacturing value added in the final export value of each commodity. Although this process is somewhat subjective, the resulting TREC estimates do provide users with an additional basis for measuring success in increasing the sophistication of its exports.

24. Oyewumi et al (2006) examined the export mix from South African agriculture using the PRODY index, which assesses the potential for growth¹⁴ and development through agricultural trade. This methodology postulated that the level of sophistication of the export product can stimulate or retard the growth of GDP. The study found that, based upon this approach, there is room for the government to encourage the diversification of new export products such as meat and dairy products, although the ‘traditional’ exports of sugar, some fresh fruits, and nuts scored highest on the sophistication levels within the current export basket.

The future: South Africa’s projected export profile by product to 2015

25. Expanding on the export theme, this section examines the likely export profile from South Africa at 2015 (Table 4). The left hand set of columns look at South Africa’s exports in 2001 in terms of US\$ million and as a share of global exports, the middle set examines South Africa’s projected exports, global share in these exports and the changes in share over the period, while the third set looks at the relative share of each of these GTAP commodity sectors expressed as a percentage of South Africa’s total exports.¹⁵ Thus, there are two features highlighted; (a) how well South Africa is doing in the global market and (b) what sectors are doing well within South Africa’s export portfolio. Note that agriculture is divided into the generally lightly processed Primary agriculture and further-processed Secondary agriculture. Some of the minor and largely non-traded sectors such as paddy rice and raw milk have not been included, so the subtotals expressed may not reconcile with the data shown.

26. Overall, agriculture is forecast to increase both its global presence and share of South African exports, with secondary agriculture doing better than primary agriculture. This is largely due to success in the vegetable, fruit and nuts sector where the South African global market share increases from 2.49 percent in 2001 to 2.67 percent in 2015, an increase of 0.18 percentage points (the sector also increases from 2.94% of total South African exports in 2001 to 3.27% in 2015, an even larger increase of 0.34 percentage points). Notably, both sugar products and beverages and tobacco decline in relative importance for South African exports (although the South African share of global exports of beverages and tobacco actually increases by 0.10 percentage points).

¹⁴ The PRODY analysis framework was developed by Hausmann et al (2005), Rodrick (2006) and Hausmann and Klinger (2006). Based on an assumption that an item that is exported by high income countries contribute to higher growth than those items exported by low income countries, the PRODY index provides a rule of thumb as to the potential for growth of items by comparing a countries export portfolio with those of other countries.

¹⁵ Trade models conventionally contrast a ‘baseline’ scenario with a ‘primary’ scenario, where the former includes best estimates of all known changes such as GDP and population forecasts, and the latter the results of a policy ‘shock’ such as the introduction of a FTA agreement. The above estimates provide a baseline scenario. Sandrey et al (2007) examines how certain policy shocks can affect the baseline scenario for South African agriculture.

Table 4. RSA global agricultural exports, 2001 and 2015

	RSA 2001 exports		RSA 2015 exports			RSA own share (%)		
	US \$m	Global %	US \$m	Global %	% Change	2001	2015	% Change
Primary agriculture								
Wheat	94	0.52	245	1.01	0.48	0.24	0.48	0.25
Other grain	180	1.28	272	1.34	0.06	0.45	0.53	0.08
Vegetables/fruit/nuts	1,177	2.49	1,668	2.67	0.17	2.94	3.27	0.34
Oil seeds	41	0.26	82	0.32	0.05	0.10	0.16	0.05
Plant fibres	26	0.32	45	0.33	0.01	0.07	0.09	0.02
Other crops	248	0.62	407	0.76	0.14	0.62	0.80	0.18
Live cattle	14	0.24	26	0.31	0.07	0.04	0.05	0.01
Other agriculture	124	0.80	180	0.78	-0.02	0.31	0.35	0.04
Wool	48	1.65	131	1.69	0.04	0.12	0.26	0.14
Sub total	1,957	1.16	3,062	1.28	0.11	4.87	5.98	1.10
Secondary agriculture								
Beef/sheep	46	0.21	83	0.35	0.14	0.11	0.16	0.05
Other meat	98	0.31	144	0.36	0.05	0.24	0.28	0.04
Vegetable oils	56	0.36	101	0.49	0.14	0.14	0.20	0.06
Dairy	90	0.30	217	0.63	0.33	0.22	0.43	0.20
Rice	24	0.34	40	0.40	0.07	0.06	0.08	0.02
Sugar	436	4.67	507	4.66	-0.01	1.09	1.00	-0.09
Other foods	813	0.61	1,213	0.79	0.19	2.03	2.38	0.35
Beverages/tobacco	579	1.11	672	1.21	0.10	1.45	1.32	-0.13
Sub total	2,140	0.71	2,977	0.86	0.15	5.33	5.86	0.53
Resources	4,605	1.25	7,267	1.09	-0.17	11.51	14.28	2.77
Manufacturing	27,238	0.56	32,937	0.60	0.04	68.03	64.65	-3.38
Services	4,097	0.33	4,686	0.33	0.00	10.23	9.20	-1.03
Total	40,037	0.58	50,930	0.63	0.05	100	100	0.00

Source: Sandrey et al., 2007

3. Productivity

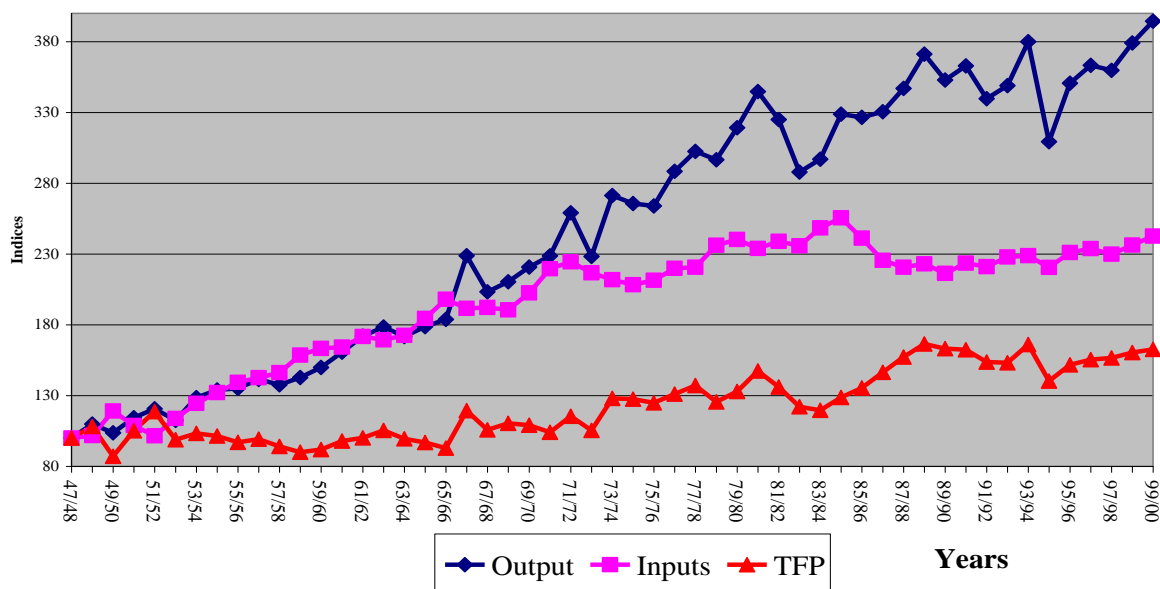
27. While trends in production and trade provide some circumstantial evidence of innovation, it is necessary to look at whether productivity has improved. Unfortunately productivity data in South Africa is hard to come by. Figure 8 from Thirtle et al (1993)¹⁶ shows inputs and outputs and the resultant productivity (total factor productivity - TFP) for South African commercial agriculture from 1947/48 through to 1999/2000. The trend in TFP (lower line) shows that before 1965, the index of outputs and inputs rose at roughly the same rate, so TFP did not grow, but from there the growth rate was 1.7% per annum, mainly due to the continued growth of output but little change in inputs. From that period employment declined as combine harvesters were introduced in field crop production, favourable tax breaks encouraged greater capital intensity, and agriculture's share of GDP decreased. From 1984/85, when the first round of deregulation commenced, there was a marked decline in inputs, largely fertiliser and machinery, as field crop farmers switched to minimum-intervention forms of farming, and of labour as

¹⁶ Updated to 2000 by Thirtle. The raw data are available from the authors

noted earlier. Outputs recovered after the severe drought of the early 1990s, and increased through to 2000. TFP continued to grow over this period despite an increase in the use of inputs, in this case as a result of the relatively faster growth in the horticultural sector, which rapidly increased its use of intermediate inputs. It is expected that productivity would have increased until 2002, when the currency had reached its lowest point, and flattened thereafter.

28. However, TFP growth in South African agriculture seems to be mainly the result of the reduction in the number of farm workers, as is the case in the developed countries. Yet in the developed countries labour is scarce and hence expensive, whereas in South Africa it is abundant. Therefore productivity increases in agriculture are at odds with the policy of trying to decrease rural unemployment and thus poverty¹⁷. How to increase productivity in agriculture in a way that does not contradict policies to redistribute income to the rural poor is a challenge facing the bimodal and dualistic nature of South African agriculture.

Figure 8. Output, Input and TFP Indices



Source: Thirtle et al., 1993 as updated to 2000

29. The problems in assessing productivity in South Africa include both the lack of reliable and up to date data and the problems of aggregation. Conradie et al (2007) examine regional agricultural productivity in the Western Cape province of South Africa, and find very different patterns of technological growth by and even within regions over time. Extensive animal rearing had lower growth than field crops, which in turn fared far worse than horticulture (fruit and wine). Product switching to higher-valued outputs can be identified at the disaggregated level, as can the impact of productivity change within a subsector for example through the introduction of modern irrigation practices of drip irrigation and electricity in some

¹⁷ This implies that while success of the agriculture sector is important for economic development, agriculture by itself does not have the potential to reduce poverty in rural areas and needs to come hand in hand with development of an industrial sector.

selected sectors such as horticulture. Their analysis is however based upon observations for 1993, 1998 and 2002, and the nature of this data precludes more than generalised observations.

30. While technological change usually contributes to an increase in productivity, in South Africa, where infrastructural constraints are the norm, this is not always the case. In Box 1 we present an example where restricted access to a technology as fundamental as electricity can become a constraint, even to the agriculture sector. Note that the example models the results of the potential impact of a one percent decrease in productivity. We would expect a similar positive productivity shock to lead to comparable positive results.

Box 1. Electricity generation; technology constraints

Currently South Africa's electricity generation is at crisis point, with regular and semi-scheduled power cuts (euphemistically called load shedding) becoming the norm and expected to be a permanent feature for the next few years. Using a CGE model the impacts of this unwelcome and largely unexpected technology constraint has been modelled as a negative productivity shock to the economy. Results of the potential impact of a one percent decrease in productivity indicate that this could lead to a decrease of three percent of the current level of GDP, an aggregate consumer price increase of up to 0.97 percent, decreases in imports and exports on average by 2.93 and 4.16 percent respectively, and a net decrease in employment opportunities of 129,100.

At the sector level consumer prices of primary agricultural horticultural products are likely to increase by 0.21 percent, with this in turn leading to a price increase of 0.95 percent in agribusiness fruit and vegetable products. Consequently exports of horticultural products decline by 1.53 percent and aggregate agricultural production declines by 1.08 percent in the Western Cape (the main fruit export region). Paradoxically, this productivity loss increases agricultural employment in the Western Cape (by 1,100) as inputs are substituted away from intermediate inputs back to labour, especially unskilled labour. The contraction of the economy reflects through wage rate decreases of skilled workers, with the average decrease in the wage rate of 3.32 per cent for skilled workers in the Western Cape.

Source : Punt, 2008.

31. The above productivity trend in South Africa (i.e. productivity improvements in a very limited number of sub-sectors) is in stark contrast to the experience of New Zealand¹⁸ where reform led to both a change in production/export profile as well as a general improvement in productivity in each sector (see Box 2). Agricultural and trade reform led to a rapid decrease in sheep, an increase in beef and dairy, and the introduction of deer, a new livestock. There were also spectacular gains in productivity in each sector. For example in sheep breeding, export revenues generated from around 40 million sheep in 2002 exceeded that generated from 70 million sheep in the 1980s, which mainly came from increased processing. The question is why?

32. One possible answer is the dual nature of the South African agriculture sector where a developed commercial sector coexists with large numbers of subsistence farmers. Smallholder farming, predominantly black and still located mostly in the former homelands, is an impoverished sector dominated by low-input, labour intensive production methods. Up to 2.5 million households subsist in this sector, being relegated to farming on 13% of available agricultural land (OECD, 2006). The South African government has implemented a wide range of policies to support black farmers, either as smallholders or as commercial farmers, since 1994. These include (but are not limited to) area-wide programs to address critical needs such as infrastructure (e.g. the Integrated Sustainable Rural Development Strategy), food security (e.g. the Integrated Food Security and Nutrition Programme); and environmental care (e.g. the National LandCare Programme); farmer support services (e.g. The Comprehensive Agricultural Support

¹⁸ See Vitalis (2007) and Sandrey and Vink (2006) for details on how New Zealand's agricultural production and export profile changed dramatically in response to reforms.

Programme or CASP and the MAFISA programme to provide rural financial services); and direct support through land reform and black economic empowerment or AgriBEE.

33. Macro-level evidence of the impact of these programmes is limited. Small farmers continue to provide only a small proportion of marketed agricultural output in the country, hence increases in productivity will take a while to show in the macro data, while there are no separate data for the output of black commercial farmers. However, there is a wide range of anecdotal evidence on the successes and failures of these programmes, including their productivity effects. Examples of successful projects can be found in the sugar industry (largely smallholder farmers (CDE, 2008), the fruit industry (where the most prevalent model has farm workers buying shares in the farming operation with their land reform grants (CDE, 2008), the wine industry (also variants of share equity schemes) (Vink, et al, 2004) and many others. Progress with land reform projects that were based on industry participation was summarised in the report of the Committee that reviewed the agricultural marketing environment (NAMC, 2007), while progress with land reform has also been investigated in some provinces (e.g. Agri-Africa consultants, 2006). The latter report found that more than a third of the projects could be classified as successful and sustainable, and that the more successful projects were those that innovated in terms of their institutional design. On the other hand, there is also considerable anecdotal evidence¹⁹ that small farmers, especially new farmers, are experiencing difficulties in improving productivity, which points to the need for more focused attention to post-settlement support for small holder farmers such as training, provision of financial resources and infrastructure development.

Box 2. A comparison between South Africa and New Zealand

New Zealand farmers' reaction to reform is best seen from changes in the composition of their livestock assets, with sheep numbers declining from almost 70 million in 1985 to less than 40 million in 2005, and an increase in beef cattle and cull dairy cows for the US market of manufacturing or hamburger beef. The deer sector, where numbers increased from fewer than 320 000 in 1985 to more than 1.5 million in 2005, is a fascinating case study of the only really new livestock domestication example globally since biblical times. Overall, agricultural production has steadily increased since 1985 as dairy, deer, fruit and wine production replaced the traditional sheep and beef sectors.

The reforms seemed to force productivity changes in the sector. Hall and Scobie (2006) show that the export revenues generated from around 40 million sheep in 2002 exceeding that generated from 70 million sheep in the 1980s, largely because of an increase in farm productivity and more value adding. In 1986/87, for example, around 72 per cent of lamb was exported as carcasses. Today, around 95 per cent is exported as processed products. They also found that lambing percentages have increased by over 20 per cent since 1990, that the amount of lamb sold per ewe has increased by over 60%, and that the dairy industry has seen very strong productivity growth, with milk solids per cow increasing by over 30 per cent since 1990. This is reinforced by Harrington (2005), who found there to be three periods that are consistent with the hypothesis that the reforms induced these productivity changes:

- (1) Modest but uneven growth from 1972 to 1985;
- (2) An almost linear increase from 1985 to 1995, except for 1993; and
- (3) An evening out or even a decline since then.

Both Vitalis (2007) and Sandrey and Vink (2006) elaborate on the kiwifruit and wine sectors as examples of new industries driven by technological change. Sandrey and Vink (2006) also expand on the New Zealand deer industry, and lament that South African agriculture has not responded to the reforms in as dramatic a manner as New Zealand did. Both papers also elaborate on how a more coordinated and 'text book' approach to marketing of several of New Zealand's agricultural products was also a factor in New Zealand's success. Improved marketing is of course an important form of innovation.

¹⁹ See for example Vink et al. (2004) and CDE (2008).

4. Trade and Innovation in selected sectors

34. While in general, the technological change in South Africa's agriculture sector has been modest, this section will take a closer look at some subsectors where technological change has been a factor, namely the wine sector, the fruit sector, and the field crop sector. Experiences vary from the wine sector characterised by new entry, investment and institutional innovations, the fruit sector characterised by the birth of new production regions and introduction of new transportation methods, and the field crop sector with changes in production methods. While there has been some innovation, the relatively limited exposure of South Africa to international markets, by virtue of its 'natural protection' in the form of high infrastructure costs and relatively large domestic market,²⁰ and delays in land reform implementation may well be a contributing factor to the modest level of innovation.

(1) *The wine industry*²¹

Rapid post-reform growth

35. Until 1997, the marketing of wine, like most sectors of agriculture in South Africa, was extensively regulated by statute. The 1924 Wine and Brandy Control Act pioneered statutory control of agricultural markets. Whereas most of the 22 marketing schemes introduced from 1931 and especially from 1937 brought markets under state Control Boards, wine, like sugar was regulated by the industry's own institutions, rather than under the Marketing Acts of 1937 and 1968. The state also provided few direct subsidies, although the industry did benefit from price support, import protection and controls, which enabled it to pass costs on to consumers, and from favourable excise taxes, which favoured the distilling of grapes into spirits at the expense of sugar producers.

36. The wine industry faced the same pressures from deregulation as the rest of the agricultural sector in South Africa. The purpose of the post-1994 reforms was to correct the injustices of past policy, principally through land reform, to direct agriculture towards a less capital-intensive growth path, and to enhance its international competitiveness. The wine industry did not escape these changes.

37. South Africa differs today from its competitors among 'new world' wine producers, including Australia, New Zealand and Chile, which all export a high proportion of their vintage: 28, 27 and 46% respectively for 1997-99. In this respect, South Africa (15%, though rising) and Argentina (9%) are 'wine industries of a special type'. Historically they produced large quantities of cheap wine for their domestic markets, a legacy they share with Languedoc-Roussillon in France. This pattern of demand and supply constrains their capacity to adapt to a more differentiated international demand. South African producers thus have to respond to both changes in global market conditions and in the South African policy environment if the country is to become and remain a global player.

²⁰ This is acknowledged by Vitalis (2007) in his opening paragraph on New Zealand. Conversely, redistribution, although certainly needed to redress earlier imbalances, may be detracting from innovation overall in South African agriculture (see also the recent report by the Centre for Development and Enterprise (CDE, 2008)). We also note that Vitalis shows in his Figure 3 that New Zealand's GERD (Gross expenditure on Research and Development) is higher than South Africa's, although both are at the lower third of developed country levels. We would also note that while Vitalis talks of the distance-related problems facing New Zealand, this can be an advantage in that isolation allows for a more secure disease-free and hence higher quality product for these same distant markets.

²¹The first part of this section draws on Vink, N, 2002. The impact of deregulation on the South African wine industry. A Section 7 report to the National Agricultural Marketing Council

38. Tables 5 and 6 illustrate the results of this historical dependency on the domestic market. Data on growth trends in the planting of vines and the production of wine from the 1960s show that, during the 1960s, area expansion in the South African industry was considerably higher in South Africa than modern rivals such as Argentina, Australia, Chile and the USA, and growth in the output of wine (measured in hectolitres) was even faster (Table 5). This rate of area expansion declined considerably in the 1970s. However, the rate of growth in output remained high relative to the rate of area expansion in the 1970s and 80s. This reflects, of course, the increased planting of relatively high-yielding, low quality (mostly white) wine grapes that resulted from the minimum price regime.

39. The data also shows how the South African industry has reacted to policy changes in the 1990s. Here the South African industry shows a positive, although small, growth in the planting of vines, but a decline in the rate of growth in output, the expected result of the new trading conditions of the 1990s as wine grape producers substituted low-yielding, high quality wine grapes in response to increased global demand for high quality wines.

Table 5. Comparative growth in vine planting and wine production, 1961 – 1999

	1961-1969		1970-1979		1980-1989		1990-1999	
	Growth in area under vines (% pa)	Growth in wine output (% pa)	Growth in area under vines (% pa)	Growth in wine output (% pa)	Growth in area under vines (% pa)	Growth in wine output (% pa)	Growth in area under vines (% pa)	Growth in wine output (% pa)
Argentina	0.72	1.46	0.34	2.51	-0.48	-1.87	0.00	-0.38
Australia	0.54	3.75	0.30	3.31	-0.48	2.16	1.79	7.71
Chile	0.41	-1.06	-0.06	3.25	-0.21	-6.37	0.44	4.77
China	2.86	0.00	2.09	0.00	4.68	na	1.12	10.13
France	-0.09	0.14	-0.15	-0.27	-0.31	-0.87	-0.06	-0.05
South Africa	1.24	5.77	0.10	2.52	-0.05	0.51	0.32	-2.41
Spain	3.62	0.68	0.11	2.90	-0.21	-2.99	-0.45	-0.72
USA	-0.25	2.90	0.91	7.03	0.21	-0.65	0.42	3.96

Source: Anderson, K. and D. Norman (2001), Global Wine Production, Consumption and Trade, 1961 to 1999: A Statistical Compendium, CD, Centre for International Economic Studies, University of Adelaide

40. Table 6 shows the effect on the wine industry of South Africa's increasing isolation from world markets from the 1960s. South Africa was the only country which showed negative export growth throughout the 1960s to the 1980s and only recovered in the 1990s, showing record export growth, albeit off a shrunken base (Figure 9). The decades of isolation were marked by a generally increasing per capita consumption of wine in the domestic market while the post reform period is characterised by rapid export growth. Export growth was initially in the main European market but has recently spread to other markets in Russia and neighbouring African countries (Table 7).

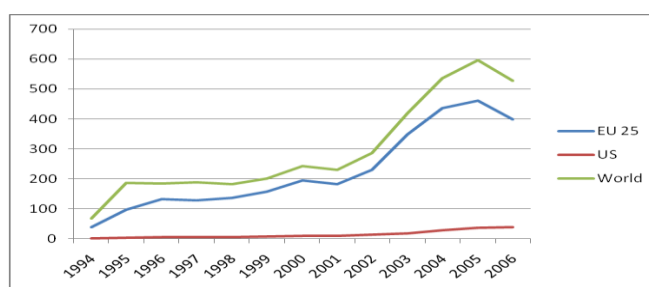
41. Figure 10 shows the main trends in producer income over the past decade. There was a lag between the reforms and actual increase in exports as it requires some time for vines to grow and production to increase. These data however clearly show the influence of wine export expansion on producer income as South African produce became socially acceptable once more and the exchange rate became favourable. Total nominal income almost doubled from R1,463 million in 1997 to R2,791 million in 2004 (left hand scale). Thereafter, producer income declined in both subsequent years. The Figure also shows that the share of this income from wine (as opposed to grapes, grape juice and wine for distilling purposes) reached its peak in 2002 (right hand scale) i.e. when the Rand was at its lowest.

Table 6. Comparative growth in consumption per capita and exports, 1961 – 1999

	1961-1969		1970-1979		1980-1989		1990-1999	
	Domestic sales growth (% pa)	Export growth (% pa)	Domestic sales growth (% pa)	Export growth (% pa)	Domestic sales growth (% pa)	Export growth (% pa)	Domestic sales growth (% pa)	Export growth (% pa)
Argentina	0.91	56.26	-0.56	29.40	-4.26	2.28	-4.36	24.15
Australia	6.96	0.93	7.30	-3.71	1.47	21.96	0.82	14.85
Chile	-3.84	-0.46	-0.54	19.32	-5.67	4.56	-6.89	18.73
China	0.00	0.00	0.00	0.00	0.00	0.00	10.62	11.60
France	-1.40	-1.29	-1.58	6.83	-2.61	5.61	-1.75	3.98
South Africa	4.06	-3.78	-2.02	-5.40	0.17	-7.91	0.56	31.49
Spain	0.94	6.57	0.76	5.12	-4.53	-2.24	-1.53	7.89
USA	2.68	13.48	3.94	21.00	0.52	4.04	0.81	16.56

Source: Anderson, K. and D. Norman (2001), Global Wine Production, Consumption and Trade, 1961 to 1999: A Statistical Compendium, CD, Centre for International Economic Studies, University of Adelaide

Figure 9. Wine exports (1994-2006)
(million current USD)



Note: Wine includes HS 1988/1992 Code 2204

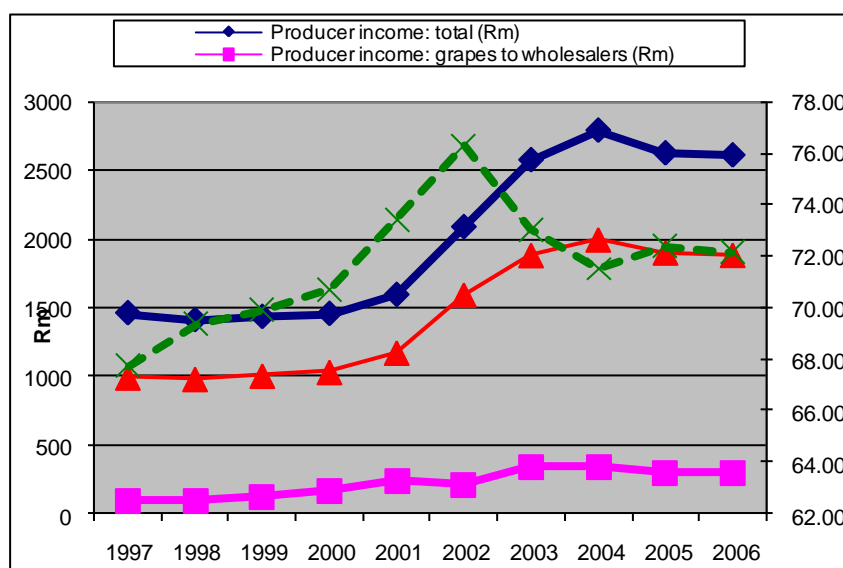
Source: Based on WITS data

Table 7. Wine exports by destination (1994-2006)
(million current USD)

1994				2000				2006			
Total Exports	69.3	100%	Total Exports	243.1	100%	Total Exports	528.0	100%			
1	EU 25	40.0	57.7%	1	EU 25	196.8	80.9%	1	EU 25	399.0	75.6%
2	Canada	7.1	10.2%	2	USA	9.8	4.0%	2	USA	38.3	7.3%
3	Zimbabwe	2.8	4.0%	3	Canada	8.1	3.3%	3	Canada	28.9	5.5%
4	USA	2.2	3.2%	4	Switzerland	5.3	2.2%	4	Switzerland	5.5	1.1%
5	Mozambique	2.2	3.2%	5	Japan	4.6	1.9%	5	Kenya	4.9	0.9%
6	Australia	1.8	2.6%	6	Mauritius	1.6	0.7%	6	Russia	4.5	0.9%
7	N. Zealand	1.7	2.4%	7	Zimbabwe	1.5	1.6%	7	Japan	4.3	0.8%
8	Switzerland	1.6	2.4%	8	Mozambique	1.5	0.6%	8	Mozambique	3.4	0.6%
9	Japan	1.2	1.7%	9	Norway	1.4	0.6%	9	Norway	3.2	0.6%
10	Kenya	1.1	1.6%	10	Kenya	1.2	0.5%	10	Angola	3.1	0.6%

Source : Based on WITS data

Figure 10. Trends in producer income, 1997-2006

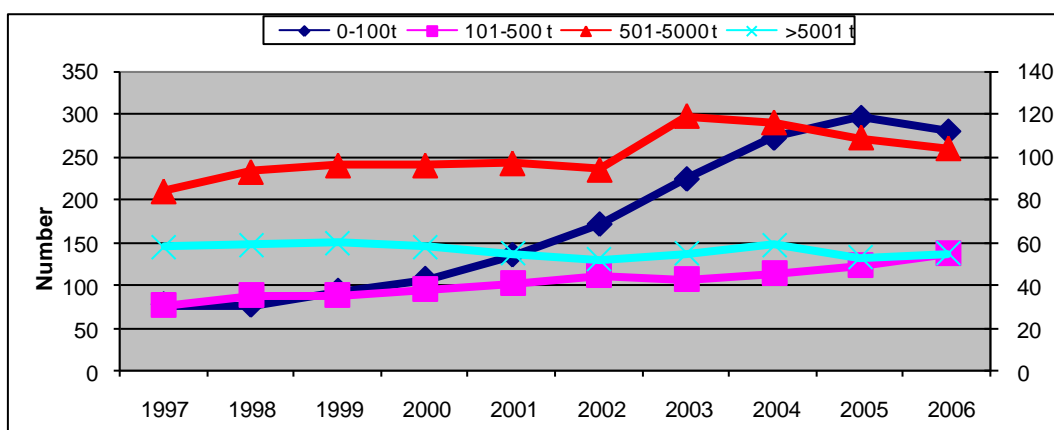


Note: Right hand scale in percentages

Source: SAWIS, 2007. Wine Industry Statistics. Paarl, South African Wine Industry Information and Systems

42. There are currently some 4,800 wine farmers and 560 wine cellars in the industry. Most of these farmers deliver grapes to their local wine cooperative (of which there are 66; many of these have, confusingly, transformed into regular corporations over the past few years²²), while there are some 480 farmers with their own cellars. With an increase in exports, the wine industry has expanded with new entries (Figure 11). What is most evident is that (1) there has been a substantial increase in the number of wine cellars in the industry (an increase of 279 cellars over the 10 years, or more than 2 cellars per month), (2) this increase has been mostly in the categories of less than 100 tons pressed (measured on the left hand axis), and (3) there has been an increase in the mid-sized category (501-5000) tons which implies that some of the more successful smaller vineyards have increased production.

Figure 11. New wine cellars in South Africa, 1997 - 2006



Note: 0-100 tons measured on left hand scale

Source: SAWIS, 2007. Wine Industry Statistics. Paarl, South African Wine Industry Information and Systems

43. Nonetheless, even if most new cellars are small, the scale of the addition to the processing capacity of the industry is impressive. Furthermore, the smaller size of the new cellars is because most have been built on wine farms, i.e. they fall into the category of private cellars rather than producer cellars (the former wine cooperatives) or producing wholesalers. The major investment in new grape-growing capacity peaked in 2000, five years before the peak in the creation of new cellars once the production lags are taken into account. This fall-off in investment happened despite the relative weakness of the Rand against the Euro and Pound Sterling (Europe constitutes the largest export markets for South African wine) indicating that the industry may have come up against other constraints to expansion such as the lack of suitable *terroir*, or that investment sentiment turned negative.

Foreign investment in the South African wine industry²³

44. While there are no official and comprehensive data on foreign investment in the wine industry, everyone in the industry is aware of many examples where foreign buyers have acquired some of the most venerable estates. It is generally considered that these investments offer a synergistic relationship between wine production, overseas marketing and, as many are developing on-farm restaurants, the lucrative South African tourism sector and its overseas marketing. Some prominent examples include:

²² The motive for such corporate transformation is unclear, as there is no evidence that this has given these entities improved access to capital.

²³ Source for the examples: Adapted and translated from Malan, Maureen, Rapport, 10 February 2008

- **Hazendal** in Kuilsriver, bought by Dr Mark Voloshin from Russia in 1994. The farm, which was originally established in 1699, now boasts considerable investment in an attempt to restore it to its former glory, as well as in new amenities such as a museum and a restaurant.
- **Blaauwklippen** in Stellenbosch, bought by the German billionaire Dr Stephan Schorghüber, who has also invested heavily in the Arabella golf and hotel group. The farm, which is 325 years old, and used to belong to Cecil John Rhodes, has also received a considerable facelift, including conference and restaurant facilities.
- **Bowe Joubert**, between Kuilsriver and Stellenbosch, which is now owned by Mr Alphonse Bowe of the Bahamas, along with Andrew Hilliard of Wisconsin and the Joubert family. The farm was first allocated in 1695.
- **Morgenhof**, outside Stellenbosch, which now belongs to the Cointreau-Huchon family of cognac fame, and where there has also been considerable investment in tourism facilities, such as a facelift to the buildings, a restaurant and coffee shop, conference facilities and a functions venue.
- **Asara** (formerly Verdun) outside Stellenbosch was bought by Marcus and Christiane Rahman, formerly of Hong Kong, in 2001. The farm was originally allocated in 1691.
- **L'Avenir** in Stellenbosch, bought by Michel Laroche of Chablis in France. Mr. Laroche also has investments in the Chilean and French wine industries.

Industry cooperation

45. The wine industry has also experienced institutional innovation in the form of enhanced industry cooperation. The central cooperative, the KWV, which exercised statutory powers over the industry, was transformed into a joint stock company in 1997. As part of this process, the statutory powers²⁴ were removed and the industry as a whole had to adapt to the free market. One of the earlier institutional responses was the commissioning of a strategic planning exercise that went under the title of the 'Vision 2020' project.

46. Vision 2020 resulted in the establishment of the South African Wine and Brandy Company (SAWB), the first time all interest groups in the industry were brought together under one roof. Under the auspices of the SAWB, a Consultative Conference on Black Economic Empowerment was held at the end of 2003, where the 'Wine Industry Plan' (WIP), which had been drafted by the SAWB, was tabled. At the Conference, the Minister of Agriculture and Land Affairs mandated the South African Wine Industry Trust²⁵ (SAWIT) to proceed with the drafting of a WineBEE Charter and Industry Scorecard in terms of the government's Broad-Based Black Economic Empowerment policy.

47. This initiative resulted in the drafting of the Wine Industry Transformation Charter, which was submitted to the Minister in final draft in September 2007. During the process of drafting of the Charter, the industry also embarked on a redesign of the SAWB: the result was the establishment of the South African Wine Industry Council in the second half of 2007.

48. The Wine Industry Transformation Charter is expected to contribute significantly to change in the industry. However, the exact impact will have to await its implementation.

Increasing innovation

²⁴ These consisted generally of the management of a vine quota scheme, a 'surplus-removal' scheme, virtual total control over exports, as well as the responsibility for industry functions such as the provision of information and farmer extension services, and the financing of research and technology transfer.

²⁵ Established with an endowment from the KWV at the time of its conversion in 1997.

49. The South African wine industry has changed rapidly since the early 1990s although the industry continues to be characterised by relatively small-scale operations, is still protected from import competition by a high tariff; still produces more low-quality wine than high quality wine; still distils a large proportion of the crop into brandy and related products; and still sells most of its output into a stagnating domestic market. Re-entry into global markets and domestic market deregulation has resulted in a large-scale replanting of vineyards, with high-yielding lower-quality vines making way for the lower-yielding 'noble' cultivars, a relative switch that initially favoured red wine grapes over white wine grapes; a shift into new production areas; a greater export focus; the rapid expansion of cellar capacity; and a range of technological and institutional innovations.

50. The industry is also changing in response to consumer demands in export markets, such as environmental concerns. The Intergrated Production of Wine (IPW) Scheme and the Biodiversity and Wine Initiative (BWI) are two such examples. The Integrated Production of Wine (IPW) Scheme²⁶ launched in 2000 aims to ensure to the consumer that the industry would produce wines in an environmentally friendly a manner as possible based on an understanding that monoculture production of wine grapes has the potential to impact negatively on the environment. Signatories to the Scheme are self-assessed by means of a checklist, while the documentation for accreditation is publicly available. The IPW guidelines for farms consist of 15 chapters which address all cultivation aspects such as correct selection of cultivars, vineyard layout, irrigation, Integrated Pest Management, pruning, etc. The Biodiversity and Wine Initiative (BWI)²⁷ is a partnership between the industry and the conservation sector, whose goals are to 'minimise the further loss of threatened natural habitat, and to contribute to sustainable wine production, through the adoption of biodiversity guidelines by the South African wine industry'. This is regarded as an important objective, given the uniqueness of the Cape Floral Kingdom. Participation is coordinated with the IPW scheme.

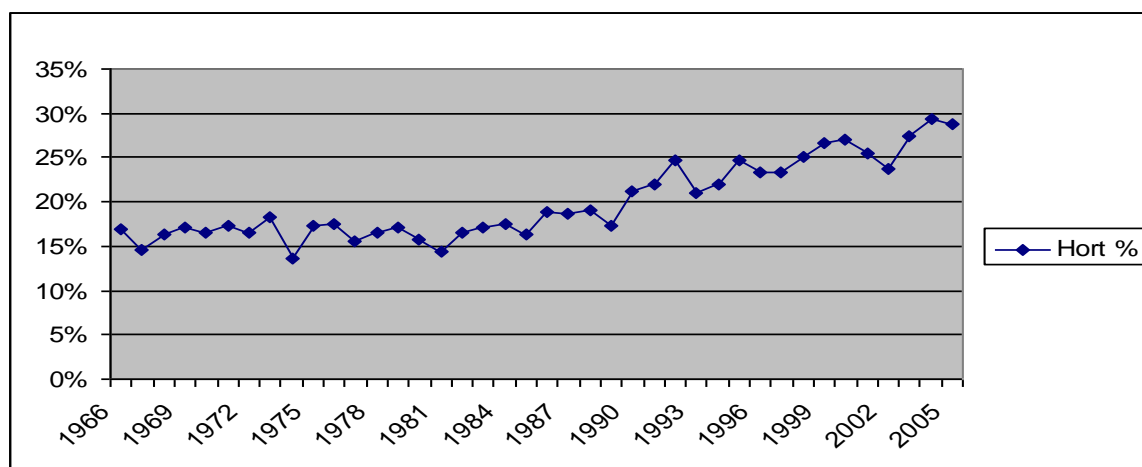
(2) *The Fruit sector*

51. Horticulture has been playing an increasing role in South African agricultural production (Figure 7, and expanded in Figure 12). While the share of horticulture in gross agriculture production was within a steady range of 15 to 17%, it began increasing from the opening of the South African economy around 1990 to reach 30% in 2004. The average growth²⁸ (expressed in Rand) from 1994/95 has been 9.72% for horticulture compared to 8.24% for total agriculture and horticulture, 8.26% for animal products, and as low as 6.74% for field crops. Within the horticulture sector, the highest performer has been citrus fruit (14.04%), followed by subtropical fruit (12.92%).

²⁶ See <http://www.ipw.co.za/>

²⁷ See <http://www.bwi.co.za/>

²⁸ This is calculated as last observation (in South African Rand) over the first divided by number of observations less one (10), and expressed in log form.

Figure 12. Horticulture's share of South African agricultural production

Source: Abstract of Agricultural Statistics

52. Historically fresh fruit exports from South Africa have dominated agricultural exports, and this continues to be the case. Fresh fruit exports have increased from \$509 million in 1996 through to \$1,191 million in 2006 (Table 7).²⁹ For the individual lines the data is presented in terms of market shares to illustrate the relative growth rates within HS 08, fresh fruit and nuts. Highlighted are the declining shares of apples and 'other', and the increasing shares of oranges and to a lesser extent in monetary terms, mandarins.

Table 8. Exports of fresh fruit from RSA, \$m and % shares

	1996	1998	2000	2001	2002	2003	2004	2005	2006
US \$ Million	509	666	597	569	585	891	1,174	1,259	1,191
Oranges	22.0%	22.2%	22.8%	24.2%	24.1%	24.7%	23.3%	21.3%	26.4%
Grapes, Fresh	22.7%	23.4%	28.6%	25.0%	20.9%	19.5%	23.6%	24.5%	23.2%
Apples	18.0%	19.4%	11.5%	12.9%	14.3%	15.8%	15.2%	12.2%	13.3%
Grapefruit	4.1%	5.6%	5.5%	4.9%	6.3%	5.5%	7.0%	8.1%	6.1%
Pears/Quinces	7.3%	7.0%	5.9%	4.9%	5.8%	5.1%	6.7%	7.0%	5.9%
Mandarins	1.0%	3.0%	3.1%	5.0%	3.5%	4.0%	4.0%	4.3%	5.0%
Lemons/Limes	2.0%	2.8%	4.7%	3.8%	3.3%	5.5%	4.8%	4.8%	4.5%
Other	23.0%	16.6%	18.1%	19.2%	21.7%	20.0%	15.5%	17.9%	15.6%

Source: World Trade Atlas, tralac calculations

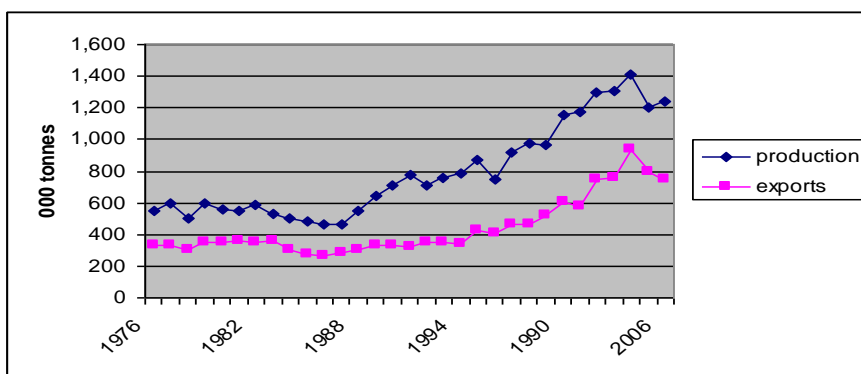
53. Figure 13 – 15 show production and export data for the top three products of oranges, grapes and apples. Production for oranges, the largest exported fresh fruit, shows a steady decline from 1976 through to 1987 before increasing almost year-on-year through to 2004 (Figure 13). The increases in exports show a similar pattern, but with more of a lag as exports did not start to accelerate until 1990. We note that there has been an increase in orange juice exports from South Africa; from US\$ 2.37 million in 1996 though to \$16.85 million in 2007. Production in grapes are relatively stable through to the increases from 2001 to 2004, while exports³⁰ (expressed as a share of production in the left hand scale) rose from the low levels

²⁹ Note that US\$ are used to isolate the currency effects

³⁰ .Note that these exports are fresh grapes, and do not include indirect exports in the form of wine.

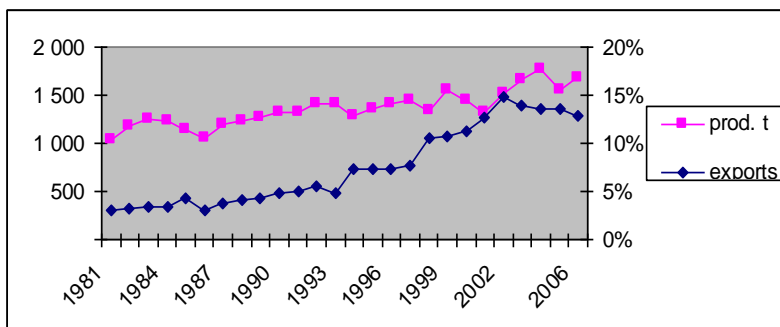
through to 1993 to highs of 15% of production in 2002 (Figure 14). Finally, Figure 15 shows the same data for apples, with both expressed in 000 tonnes again. The export data reflects the decline in the relative importance of apples as was evident in Table 8. Production fluctuated over the first few years before stabilising between 500 and 600 thousand tonnes during the 1990s. The increase through to 2004 has not been sustained, as production dropped below the 1990s level at 2006.

Figure 13. Oranges, total production and exports (000 tonnes)



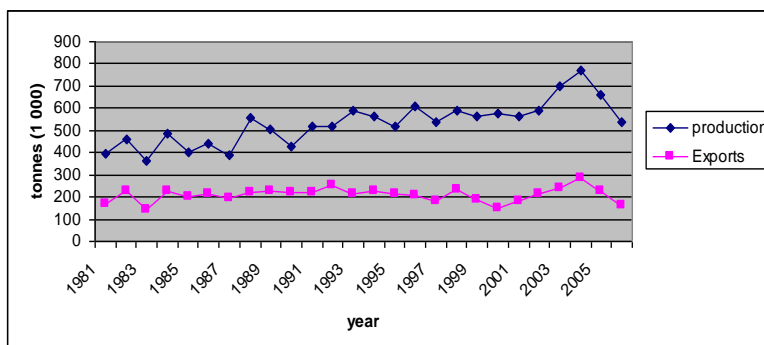
Source: Abstract of Agricultural Statistics

Figure 14. Grapes - production and exports (000 tonnes and exports as % share)



Source: Abstract of Agricultural Statistics

Figure 15. Apples, production and exports (000 tonnes)



Source: Abstract of Agricultural Statistics

(i) Northern province table grapes

54. The Northern District Table Grape region (mostly in the Limpopo province) is the newest export production region in South Africa with regards to table grapes. The region has grown significantly over the last 5-7 years, with approximately 90 farms now supplying grapes. As can be expected with a young production region, the varieties that are grown are also in line with ever changing market demands. The total production of grapes in the region has grown from approximately 150 000 cartons (4.5kg equivalent) in the 1998/99 season to a staggering 3.9 million cartons in the 2006/07 season – a growth of 2,530% over 8 years.

55. It is the first region to come into production in the South African grape season, starting as early as late September – early October. This factor is critical as very high prices are obtained on overseas markets in the first weeks of product because of limited other international supply at this time. The higher income has assisted the region to expand in an otherwise pressured industry where, over the last couple of seasons, see farm gate prices have been below breakeven levels.

56. The challenges for this region are numerous. It lies in the summer rainfall area which means that good quality grapes are always under threat from rain and hail damage as well as wet and humid conditions that can cause fungal diseases in the vineyards. Furthermore it lies 1,600 kilometres and more from the port of Cape Town where most exports take place from, necessitating very strict post harvest temperature control and efficient transport infrastructure.

(ii) Orange river table grapes

57. Exports from the Orange River region started in the early 1990's with the opening of new markets due to globalisation. Up to that point the region was known for producing raisins on a large scale. The summer rainfall patterns usually mean that early season harvest (November – January) take place in hot and drier conditions where vineyards bear early, good quality crops.

58. Production of table grapes for exports started around 1991/92 from the dried raisin base, and by the 1998/99 season the area produced 7.8 million cartons for export. This figure had doubled to 15.5 million cartons in the 2006/07 season. The season usually starts from late October – early November, creating an opportunity for growers to still achieve higher prices than are the norm. The distance from the port of Cape Town (700 kilometres plus) is also a challenge necessitating very strict post harvest temperature control and efficient transport infrastructure. It is technological changes in this transport infrastructure that has made the major difference to this expansion of exports. Sea containers with packed boxes on pallets were the norm until around 1998 when the introduction of temperature controlled integral unit specialised containers were developed. This current season around 90% of the crop will be transported in this manner, with some of the remainder air-freighted directly to Europe by dedicated charter flights from the grape-growing region. There was a technological change in the sea-freighting of grapes from South Africa early this century with the introduction of polymeric SO₂ gas-generated sheets, but while this was in operation for a period, recent consumer resistance to SO₂ use has made this technology redundant.

(iii) Apples

59. Productivity change in agriculture is not always the direct result of a laboratory scientist peering into a microscope. Western Cape farmer Mark Stanford has pushed the frontiers of apple growing and along the way proving that small is indeed beautiful. In an industry where average yields are 50 to 80 tonnes per hectare, Mark is consistently producing around 120 tonnes per hectare through a combination of drip irrigation that combines nutrients in the water ('fertigation') and a revolutionary approach to pruning

that sees him undertaking this task mid-summer. By pruning in mid-summer as opposed to the winter norm, the buds and resultant fruit are more uniformly exposed to sunlight. This assures that the shorter but densely planted tree's efforts are refocused on quality fruit production during the growing season.

60. The final result of this package is that some 70% of the fruit is export standard, meaning that Mark's higher-end export production of around 84 tonnes per hectare is more than the industry standard total production of 50 to 80 tonnes per hectare. This ensures consistently higher returns³¹ in an industry that has been under financial stress for most of the 15 or so years that Mark has been pioneering the technology. Many farmers had tried and rejected the technology of drip irrigation before Mark developed the total package of closely planted trees, fertigation and summer pruning³². He emphasises that the changes were indeed market driven, as the traditional South African farming patterns were not providing adequate returns in an era of overproduction and low prices. The pressure to maintain income and secure increased access to a more lucrative export market has been the main driver for Mark to introduce new innovations.

(3) *The field crop sector*³³

61. The most important implications of the new trade policies for the field crop sector have been that:

- The prices of field crops generally adjusted downwards to world market levels. Commercial farmers shifted quite rapidly to minimum and low-tillage production systems, and in certain cases even to no-till practices. The result has been a rapid decline in the use of inputs such as fertilisers, insecticides and herbicides, of tractors, combine harvesters and other implements, and of fuel in field crop production. This has been accompanied by an on-farm shift in field crop production to better quality soils, and a shift in production out of more marginal areas such as the western parts of the North West and Free State provinces (mainly maize), and the north-western and south eastern parts of the Western Cape province (wheat). A further effect has been the adoption of crop rotation regimes, for example the introduction of crops such as medics and lupins into wheat systems in the Western Cape Province and the gradual introduction of precision farming technologies. These locational and cropping pattern effects have allowed farmers to increase total output of the major field crops while ploughing less land.
- Commercial farmers have adopted a wide variety of risk management strategies to cope with the greater instability that they face. These have been focused on income diversification (e.g. more part time farming, investment in on-farm agro-tourism facilities), and on asset diversification (large farmers have tended to diversify into different subsectors of agriculture, or into different regions within the same subsector, e.g. a maize farmer will diversify into horticulture, or a table grape farmer will buy additional land in a different production area). The result is a simultaneous consolidation of large commercial farms with an increase in the number of smaller commercial farms, and an overall increase in the average farm size.
- South Africa has in the process also increased its imports of animal feeds based on oilseeds, as the

³¹ Over the last five years the average net export realisation for apples has ranged between 24 and 53 percent above domestic market values, with an average of 38 percent above.

³² It seems to be the ability to coordinate the separate components of this technology that sets Mark apart from others in the industry.

³³ Based on Vink, N, 2003. Macroeconomic and sector policy changes in South African agriculture, 1996-2002. FAO Project on the Roles of Agriculture in Developing Countries, Rome, FAO

evidence shows that commercial farmers in the country are not competitive in the production of these commodities.

- The notable exception in the effects of trade reform on field crop production is the sugar industry. While the lack of change is partly due to the large investment required in the processing of sugar and the large number of small-scale sugar producers, it is mainly due to the high levels of tariff protection, which in turn is a result of the greater lobbying power of the industry and the heavy distortions in the world sugar market which is heavily distorted by OECD country policies than other agricultural products. Sugar producers even enjoy protection from producers in other SACU and SADC countries. While the domestic pricing structure has been liberalised to some extent in the past 8 years, the sector has not had to adjust to the same extent as have maize and wheat producers.

5. Conclusion

62. Although the policies and the resultant institutional framework that was inherited from the apartheid era still heavily influence South African agriculture, considerable changes in policies over the last 10 to 12 years, including land reform programmes; the introduction of minimum wages and other employment conditions for farm workers; the deregulation of the Control Boards; substantial liberalisation of international trade; and the withdrawal of a large proportion of the farmer support services provided to commercial and small-scale farmers alike, continue to shape South Africa's agricultural sector. The comprehensive shifts in policy have led to three important consequences: a change in the agricultural production portfolio of the country, a shift in trade patterns, and innovation in some areas of commercial agriculture.

63. The structure of agricultural production has changed considerably. While the relative share of animal production in total agricultural production has been stable at around 40% since the 1960s, the relative share of different kinds of animal products has shifted: production and consumption of red meat has stagnated, while production of poultry meat has increased considerably. Horticulture has increased its share of production by 12 percentage points to 29% at the expense of field crops (with historical highs of 49.5% in 1980 to a 2005 low of 24.1%). As the production of virtually all agricultural commodities has increased over the past couple of decades, this means that the production of horticultural products has, on average, increased at a faster than average rate. The technological shift to minimum tillage and the introduction of genetically modified cotton and maize seeds have been important in the area of field crops.

64. One of the main reasons for the relatively faster growth in the production of horticultural products has been the demand pull from an increase in exports of these products. While average annual growth of exports between 1997 and 2007 was 9.2%, horticultural products substantially exceeded these growth rates (wine (17.8%), citrus (16.0%), grapes (12.9%) and apples (11.6%)). On the other hand, there has also been a dramatic increase in imports, in such items as soy beans and soybean oil cake for poultry feed, and preliminary data even shows that agricultural imports may have been larger than exports in the calendar year 2007.

65. Reform and trade liberalisation has led to some innovative response in the commercial farming sector. In the wine sector, deregulation and trade liberalisation has been followed by (1) a large number of new entries in the industry, (2) inward foreign direct investment which is offering a synergistic relationship between wine production, overseas marketing and the burgeoning tourism sector, (3) large scale replanting of vineyards with high-yielding lower-quality vines making way for the lower-yielding but higher-quality 'noble' cultivars, and (4) signs of more active industry cooperation. In the fruit sector such as table grapes and oranges, there has been an increase in production and exports, which has been driven by (1) the addition of new export-oriented production regions, (2) introduction of new production technology, and (3)

introduction of temperature controlled integral unit specialised containers for transport among others. In the field crop sector, prices have generally adjusted downwards to world market levels as a result of reform and trade liberalisation. In response, farmers have shifted to minimum and low-tillage production systems, and reduced the use of inputs such as fertilisers, insecticides and herbicides, tractors and other machinery, and of fuel in crop production (i.e. while there has been relatively little product innovation and/or use of technology to improve productivity, there has been some process innovation).

66. Innovation seems to have been more limited in the subsistence farming sector although lack of data makes analysis difficult (Vink 2003, Vink and Schirmer 2002). The pre-democratisation policies had resulted in a highly dualistic agriculture sector where a developed commercial sector co-exists with large numbers of subsistence (communal) farms. While agricultural reforms including land reforms have been pushed with a view to improving this situation, in 2002, almost a decade after the introduction of the new 'Rainbow Nation', fewer than 2,500 farmers (6.6% of the commercial farmers) still accounted for more than 50% of the total gross farming income. The contribution from the numerically greater non-commercial sector has been low. One of the main reasons seems to be the large gap between commercial farmers and subsistence farmers in innovation capacity, in terms of knowledge and resources.

67. There is also some concern that innovation and productivity growth may face some limitations even in the commercial agriculture sector. Analysis of TFP growth in South African commercial agriculture seems to show that TFP growth is mainly the result of the reduction in the number of farm workers, as is the case in the developed countries. Yet in the developed countries labour is scarce and hence expensive, whereas in South Africa it is relatively abundant. Therefore productivity increases in agriculture are at odds with the policy of trying to decrease rural unemployment and thus poverty. How to increase productivity in agriculture in a way that does not contradict policies to redistribute income to the rural poor is a challenge facing the bimodal and dualistic nature of South African agriculture. Overhanging this scenario is the shadow of land redistribution as has happened with South Africa's northern neighbour Zimbabwe.

68. The final word should belong to Thirtle et al (2005), who recognised that economic apartheid will not end in South Africa until reasonable opportunities are available to the mass of the population and not the few, and in the case of agriculture this overwhelmingly means the small holder sector. They highlight that all the evidence suggests that agricultural productivity growth is the most efficient way of reducing poverty in the shorter term, and that the poorest sector, small holder agriculture, should be the main target. While redistributing land in South Africa will lead to an increase in equity, depending upon the way in which it is done, will almost certainly have an efficiency cost given that it would be from the higher productivity sector to the lower productivity sector. It should also be noted that legal uncertainties related to land reform may be one factor which inhibits the investment and innovation in South Africa's agriculture sector (CDE, 2008). Economics is often about trade-offs between equity and efficiency, but in this case a high emphasis on improving technology in the large number of subsistence farmers through training and education, and improving efficiency in the sector by investment in lacking infrastructure may mitigate and hopefully prevent some of the huge potential costs of a poorly executed land redistribution programme.

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