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The profitability and competitiveness of the barley industry in South Africa

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The Bureau for Food and Agricultural Policy (BFAP)

The Bureau for Food and Agricultural Policy (BFAP) is a joint initiative between the Department of Agricultural Economics, Extension and Rural Development at the University of Pretoria, the Department of Agricultural Economics at the University of Stellenbosch, and the Department of Agriculture: Western Cape. BFAP was established with the objective of creating a system of modelling tools whereby scenarios for the agricultural sector can be developed and simulated. Due to the shortage of skills in South Africa in agricultural policy analysis and quantitative modelling of the agricultural sector, it was considered to be of great importance to bring together all people with such expertise. At this stage, researchers from the two Universities, ABSA agribusiness division, Department of Agriculture: Western Cape, and the National Agricultural Marketing Council work together and share the databases and the modelling framework. This family of experts has become a valuable resource to government, agribusiness and farmers by providing analysis of future policy and market scenarios and measuring the impact of these on farm and firm profitability. Core funding for BFAP is provided by: NAMC, ABSA Bank, The Maize Trust; Wine Tech, Eskort and the THRIP programme of DTI.

FOREWORD

The Bureau for Food and Agricultural Policy (BFAP) was approached by role players in the South African barley industry to conduct research on the profitability and competitiveness of the industry. The group of role players consisted of farmers, co-operatives and SAB.

This report is the first of a series of three reports – the other two are planned to be published in 2008 and 2009. The purpose of this report is to set the scene for further research into the profitability and competitiveness of the barley industry. Hence, this report does not make specific recommendations, but rather opens the debate on what changes on industry and farm level can actually improve the profitability and competitiveness of the industry as a whole.

The inclusive research approach followed and the resulting report reflects shared opinions on the key drivers and uncertainties that will determine the future profitability and competitiveness of the industry. This will hopefully lead to a positive, structured, and objective debate by the various role players on how the barley industry can be made more profitable, competitive, and at the same time contribute to key issues faced in South Africa such as poverty reduction, employment creation, and economic and social development.

Nick Vink

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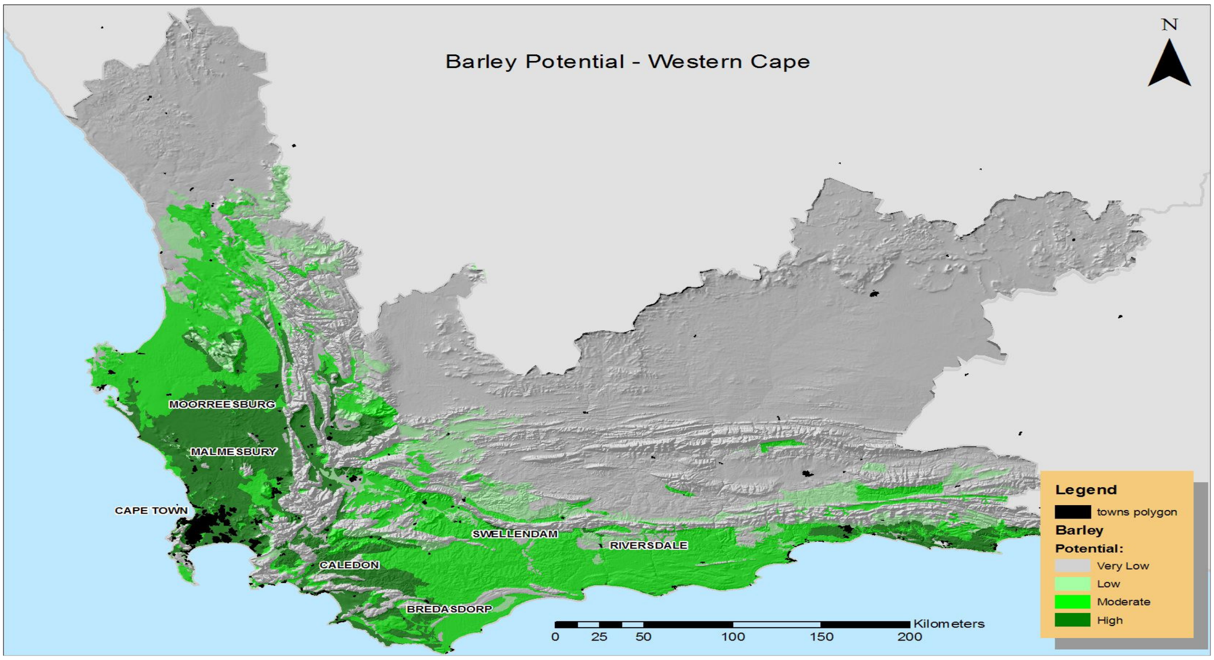
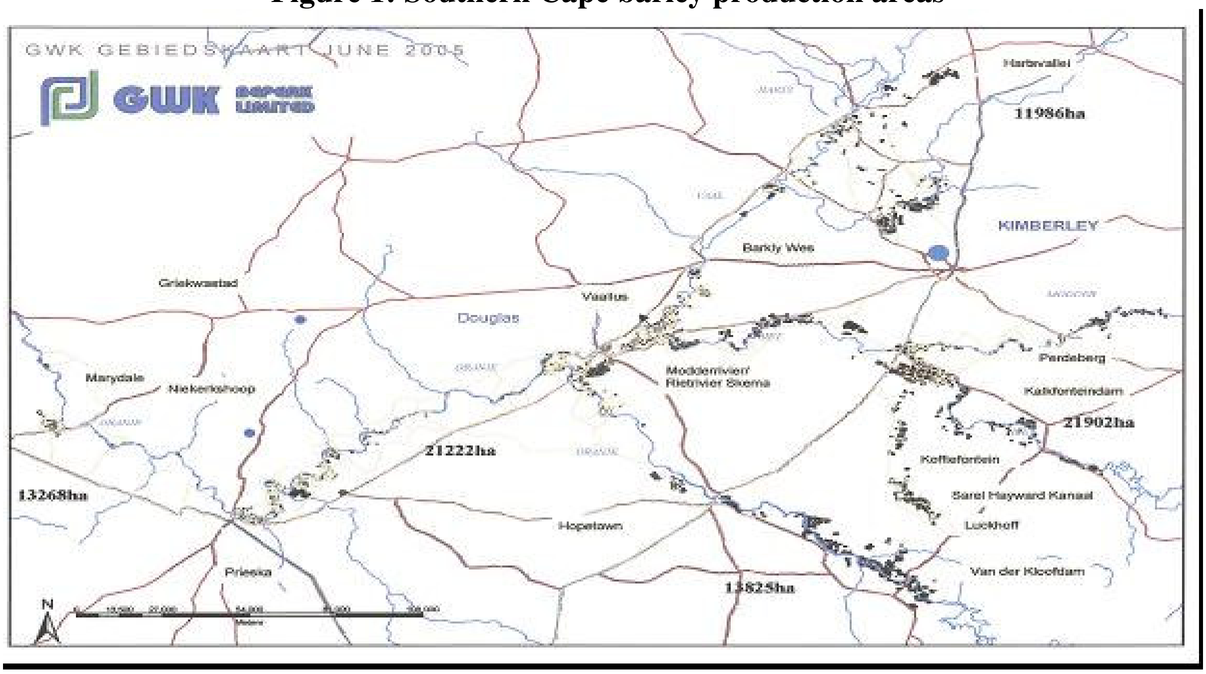
1. Introduction

Barley (*Hordeum vulgare L.*) production in South Africa is restricted to specific areas in the Northern and Southern Cape as well as the North West Province. In the Southern Cape, also known as the *Overberg* region, barley is predominantly grown in the areas surrounding Caledon, Riviersonderend, Bredasdorp, Napier and Swellendam, and is produced predominantly under dryland conditions (see Figure 1). In the Northern Cape and North West Province, most barley is produced under irrigation in places like Douglas, Vaalharts and Taung (see Figure 2). Since the main production areas differ in terms of biological and geographical characteristics, their cost structures are dissimilar.



Source: L. du Plessis, Elsenburg

Figure 1: Southern Cape barley production areas



Source: GWK Ltd.

Figure 2: Northern Cape barley production areas

Based on differences in barley production conditions, the Southern Cape region can be divided in three sub-regions namely Swellendam, Bredasdorp-Napier and Caledon-Riviersonderend. The Northern Cape consists of mainly two regions which includes Douglas, Hopetown, Prieska, as well as the Vaalharts Irrigation scheme, while in the North West Province barley production takes place around Taung. The difference in barley production techniques mainly stems from differences in rainfall patterns and timing as well as availability of irrigation water. Other factors such as differences in soil type, soil quality, crop rotational systems on the farm etc. also play a significant role in determining differences in barley production techniques.

Rainfall is relatively low and variable in the Southern Cape e.g. long term average rainfall for the Overberg region is 481mm per annum with minimum annual rainfall of 286mm in 1999 and an annual maximum of 863mm in 2002 (South African Weather Service, 2007). Since no major rivers or dams exist in the region, barley production practices entail dryland production. Many variations in terms of techniques, crop rotation systems and technologies exist within the region. In the Northern Cape and North West province, barley production takes place close to stable sources of water namely the Vaal River, Harts River, Orange River and the Vaalharts Irrigation scheme. This makes it possible to produce barley by means of irrigation. The implication therefore is that production techniques differ significantly when comparing the three Southern Cape regions with each other and with the three Northern regions. Furthermore, since climate, soil, topography, infrastructure, distance to markets, production alternatives etc. differ significantly between the Southern Cape and the Northern regions, farm sizes and farm compositions are likely to differ significantly when comparing the different regions.

This report provides the results of the first round of analysis of the South African barley industry. The purpose of the analysis was to identify the key drivers and uncertainties facing the industry, and to analyse the impact of these on the farm level. To this end, the research focussed on:

- An analysis of the South African barley industry in the international context (Section 2);
- The identification of the cost drivers that influence barley production at farm level (Section 3);
- Sector and farm level modelling to ascertain the contribution of barley production towards survivability, profitability and competitiveness of representative farms in the region. This would include the influence and cost of debt (Sections 4 and 5).

This analysis will be followed up by two further rounds of analysis to be published in 2008 and 2009.

2. International competitiveness

2.1 Introduction

Barley is produced in many parts of the world, both because it is a highly adaptable cereal that can be grown in climatic conditions ranging from sub-Arctic to sub-tropical, but also because of its use in malting beverages. Traditionally, the European Union and North America were the largest beer consuming markets and the production of malting barley is also concentrated in those countries. However, in the early 2000's China emerged as the largest beer market in the world and is expected to remain the number one consumer country for the next few years. South Africa is only the 48th largest producer of barley (2005) and ranked 11th in terms of total beer consumption (2004); hence, South Africa is a small player in the global barley and beer market. South Africa has little or no influence on the international market, but is highly susceptible to changes in the international arena.

China is not only the largest beer consumer of the world, but also the largest importer of malting barley. What will be the impact on world markets if China becomes self-sufficient in the supply of malting barley? Another potential big change in the global market is the possibility of Argentina rising as a producer and exporter of quality malting barley in high volume. How will these and other changes affect the South African market? More specifically, can barley be grown profitably in South Africa? This study is an investigation into the competitiveness of barley production in South Africa by comparing receipts and costs of malting barley production in South Africa to those of Argentina, the United States, Canada, Australia and France. The extent of government support and the impact thereof on profit margins is also taken into account. The Chapter is structured as follows: Section 2 provides a brief overview of barley production and yields in various parts of the world. This is followed by a comparison of receipts, costs, government support and margins for malting barley-producing regions in South Africa and selected countries. Section 4 identifies the major cost drivers in barley production and section 5 contains some concluding remarks.

2.2 World production and yield of barley

World production of barley (feed and malting barley) has increased steadily since the 1960s and peaked in 1993 at almost 168 million tons; since 1995 barley production has fluctuated between 125 million and 155 million metric tons. World production of barley was estimated at 135.8 million tons in 2005. The leading producing countries are Russia, Canada, Germany and France. Table 1 shows that these countries produced 15.7, 12.1, 11.7 and 10.4 million tons respectively in 2005, accounting for 37% of world production. South Africa produced 248,600 tons in 2005, less than 0.2% of world production.

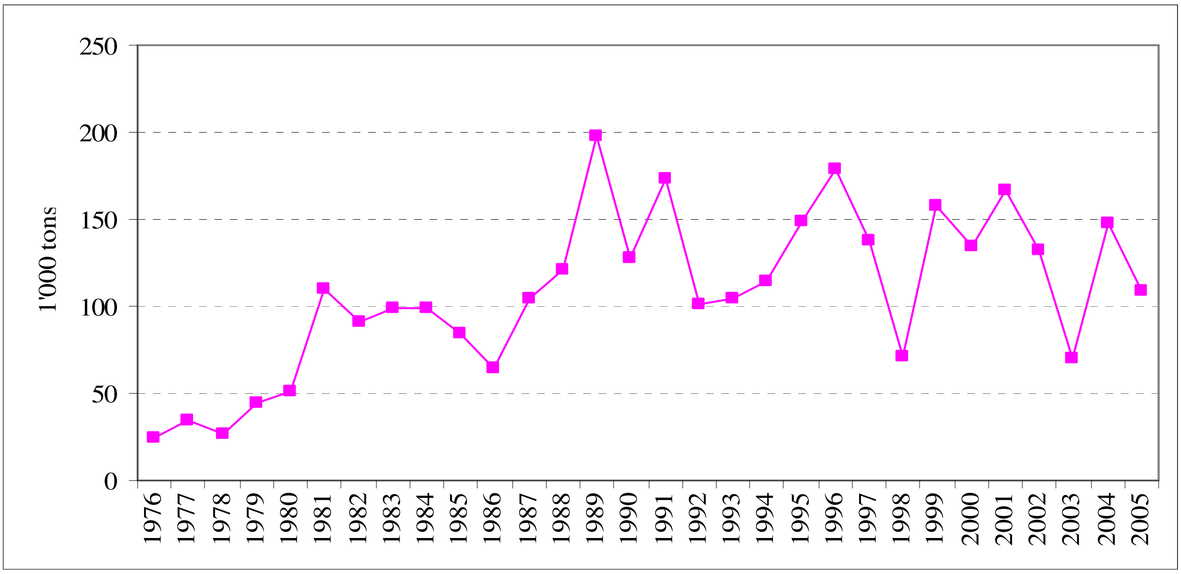
Unfortunately, a distinction is not made between feed and malting barley in the data provided by the Food and Agriculture Organisation (FAO). No estimate could be found on world production of malting barley, but estimates were obtained for selected countries. In Australia approximately one third of all barley is used as malting barley, and approximately 90% of malting barley is exported (ABARE, 2005 and ABARE, 2006). In the United States, approximately 60% of barley grown is used in food and industrial purposes, while the remaining 40% is used as feed (Taylor et al., 2005). In Canada approximately 75% of total production is from malting varieties, but only between 25 and 30 percent of these are selected for malting purposes (Grenier, 2001). Ernst and Young (2006) estimated total production of malting barley in the European Union at 12 million tons, with France being the largest producer of malting barley (3.3 million tons), followed by the United Kingdom (2.42 million tons) and Germany (1.65 million tons).

Table 1: World production of barley (metric tons): 2000-2005

	Rank (2005)	2000	2001	2002	2003	2004	2005
Russia	1	14,079,160	19,534,510	18,738,890	18,003,290	17,179,740	15,773,000
Canada	2	13,228,600	10,845,600	7,489,400	12,327,600	13,186,400	12,132,500
Germany	3	12,105,820	13,494,887	10,927,970	10,595,573	12,993,000	11,722,500
France	4	9,709,332	9,799,113	10,975,970	9,844,289	11,040,214	10,357,000
Turkey	5	8,000,000	7,500,000	8,300,000	8,100,000	9,000,000	9,000,000
Ukraine	6	6,871,900	10,185,700	10,363,800	6,833,200	11,084,400	9,000,000
Australia	7	6,743,000	8,280,000	8,280,000	10,382,000	6,454,000	6,640,000
UK	8	6,492,000	6,660,000	6,128,000	6,370,000	5,815,000	5,545,000
USA	9	6,939,480	5,430,480	4,933,040	6,058,900	6,090,680	4,620,020
Spain	10	11,063,008	6,249,139	8,362,328	8,698,400	10,608,700	4,448,400
Argentina	30	722,490	573,000	570,000	548,530	1,004,000	894,000
SA	48	116,215	156,751	180,000	240,000	185,000	248,600
WORLD		**132,643,156**	**143,454,823**	**139,781,068**	**141,245,534**	**152,280,140**	**135,752,263**

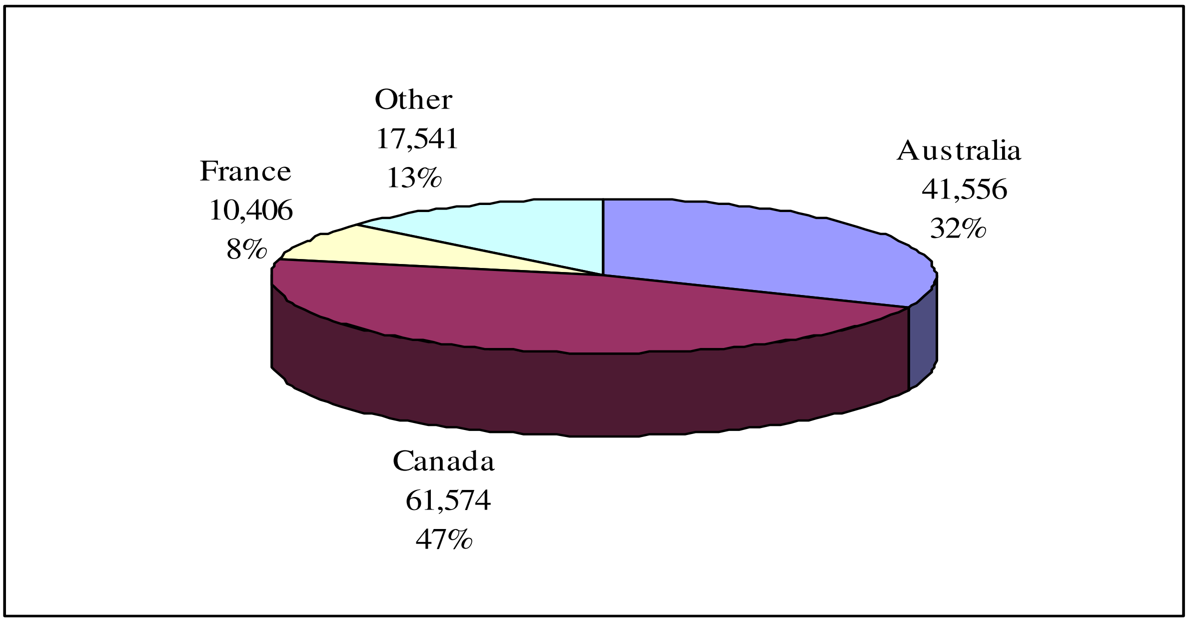
Source: FAOSTAT

In South Africa barley is planted only for malting purposes, as there is no significant feed market for barley due to the oversupply of maize produced in the country. South Africa is a net importer of barley as not all variety and quality specifications required by SAB can be grown. There are large fluctuations in the quantity of barley imports, as shown in Figure 3. The countries from which barley is sourced also differ annually, but Canada, Australia and France are the main exporters to South Africa (see Figure 4). The import parity prices (free on rail prices in Cape Town harbour) for French malting barley are displayed in Figure 5.



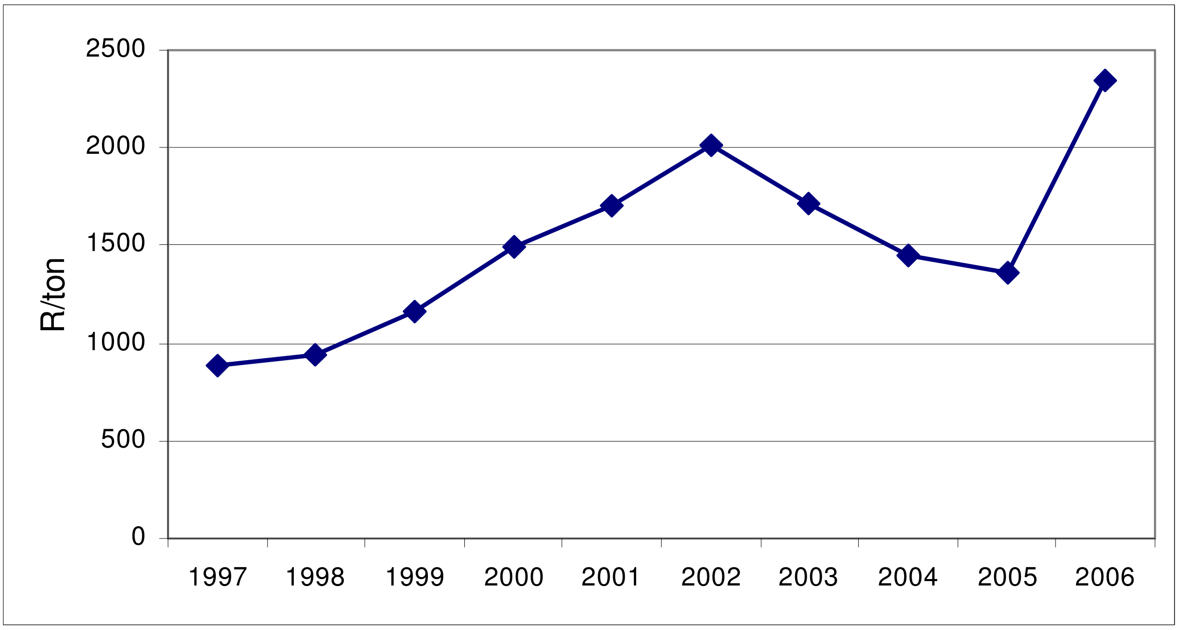
Source: National Department of Agriculture

Figure 3: South Africa barley imports since 1976



Source: FAOSTAT

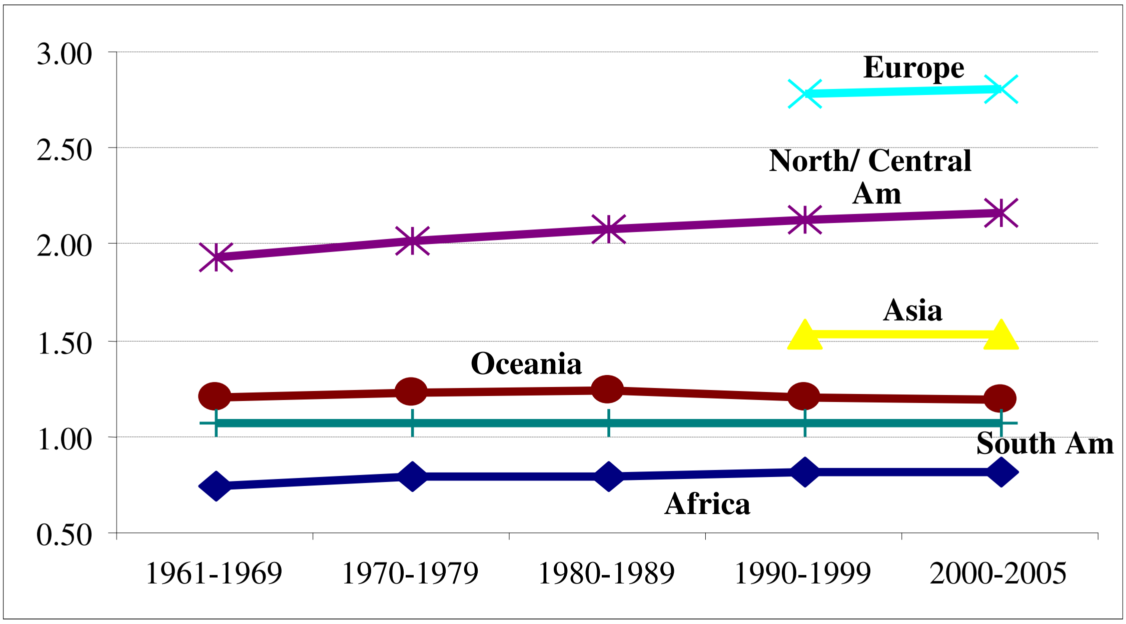
Figure 4: Barley imports by country of origin: Average 2001-2004 (tons)



Source: BFAP, 2006

Figure 5: French malting barley: Import parity Cape Town harbour: 1997-2006

Barley yields have increased in all regions of the world since the 1960's, except for Oceania (see Figure 6). Average barley yield is the highest in Europe, followed by North and Central America, Asia, Oceania, South America and finally, Africa.



Source: FAOSTAT

Figure 6: Trends in average barley yields since 1961 (ton/ha)

Table 2 shows the average barley yields from 2000 to 2005 for France, Germany, the United States, Canada, Argentina, Australia and South Africa as well as for various regions in South Africa. The figures for these individual countries also show that yields are higher in the European and North American countries and lower in the Southern Hemisphere countries. The variability in yields is quite large as can been seen from the minimum and maximum yields, specifically in Argentina and South Africa. The yield in Argentina ranged between 1.77 and 3.24 tons per hectare and in South Africa barley yield ranged between 0.7 and 3.1 tons per hectare on dry land in the Overberg and South Coast region, and between 4.3 and 7 tons per hectare under irrigation in the Northern Cape.

Table 2: Average, minimum and maximum yields (t/ha), 1995 and 2005

	10 year average	Minimum yield	Maximum yield
Argentina	2.45	1.77	3.24
Australia	1.98	1.74	2.32
Canada	2.93	2.24	3.26
United States of America	3.23	2.95	3.74
France	6.19	5.54	6.77
South Africa	**1.98**	**0.91**	**2.85**
-Swellendam/Heidelberg	1.80	0.70	2.20
-Bredasdorp/Napier	2.00	0.90	2.85
-Caledon/Riviersonderend	2.40	1.90	3.10
-SAB Barley Farm	2.37	2.19	2.55
-Douglas	6.50	6.08	7.00
-Taung	5.50	4.30	6.28
-Vaalharts	5.86	4.30	6.30

Source: FAOSTAT, South African co-operatives

2.3 Profitability of malting barley production

This section investigates the profitability of barley production in South Africa versus Argentina, Australia, Canada, France and the United States. The data are from independent sources and therefore result from a range of different methodologies, but nevertheless still provides a rough indication of costs differences among the various growing areas. The regions under review in South Africa (and the co-operative that supplied the data) include Swellendam/Heidelberg (SSK), Bredasdorp/Napier (Overberg Agri) and Caledon/ Riviersonderend (Overberg Agri) in the Western Cape and Douglas (GWK), Taung (Senwes) and Vaalharts (GWK and Senwes) in the Northern Cape and North West Province. Production data for the SAM experimental farm are also included. For the other countries, data refer to a specific region as soil and climatic conditions differ considerably within countries, In the case of Argentina, the country average is used.

Grain production in the United States is concentrated in the Northern Great Plains (covering North Dakota, South Dakota and parts of Montana, Wyoming, Colorado, Nebraska and Minnesota); hence data for this region, as obtained from the United States Department of Agriculture, are used as proxies for the US. Alberta and Saskatchewan are the main barley producing provinces in Canada. The Saskatchewan Agriculture, Food and Rural Revitalization Department only publishes production costs for feed barley and therefore production costs of malting barley as published by the Food and Rural Development Department in Alberta are used as representative for Canada. Hans-Henning Luetje from Toepfer International, an international trading company in agricultural commodities, supplied the data for France, Australia and Argentina. The costs for France are for the northwestern region and the data for Australia are relevant to South Australia.

Production costs are for 2005, with the exception of Argentina for which the data pertain to 2006. In order to make the margins more comparable, total receipts are calculated using the 2005 farm gate price and the average yield over the past 10 years. The average yield is used to eliminate the effect that climatic conditions might have had during a particular year. The profitability of malting barley production is measured up to net margin level. The gross margin is calculated as total receipts per hectare minus variable expenses per hectare. The net margin equals the gross margin minus overhead expenses allocated to barley production.

Some cost items were not included in the fixed expenses in an attempt to make the data internationally comparable. These include interest on borrowed capital, the opportunity cost of land (land rent) and entrepreneurial or ownership remuneration. It should be noted that methods of allocating overhead expenses to different farming activities differ and comparing fixed expenses and net margins should be done with caution. For the South African data, two different methods were used allocating overhead costs to barley production. For the dryland regions in the Western Cape total overhead costs are simply divided by the total number of hectares of arable land to obtain the overhead expenses per hectare, while for the irrigation regions in the Northern Cape the overhead expenses are divided by total area planted because of the system of double cropping.

Government support is based on the producer support estimates (PSE's) calculated by the Organisation for Economic Co-operation and Development (OECD). These estimates are calculated for selected commodities for each member country and are defined as indicators "of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farm gate level, arising from policy measures, regardless of their nature, objectives or impacts on farm production or income" (OECD website).

Table 3 summarises the receipts, costs and margins of malting barley production in the various regions/countries under review. In South Africa there is a clear distinction between regions producing barley on dryland in the Western Cape and regions producing barley under irrigation in the Northern Cape and North West Province. The yield and costs of producing barley under irrigation in the Northern Cape are much higher than on dryland in the Western Cape and this high-yield-high-cost structure of barley production under irrigation is similar to that of France (though in France barley is grown on dry land). One can classify these as high-yield-high-cost producing areas. The lower yield and costs of barley production in the Western Cape are comparable with that of Argentina, Australia, Canada and the United States and these regions can be classified as low-yield-low-cost producing areas.[1] The difference in the farm gate prices in South Africa compared to that of other countries is also conspicuous. Farm gate prices in South Africa are roughly double the farm gate prices in the other countries, mainly because South Africa is a net importer of barley and therefore barley is traded close to the import parity price. The prices received by farmers in 2005 varied between R1,122 and R1,370 (Table 3), while the import parity price of French malting barley in the Cape Town harbour was R1,359 (Figure 5).

According to the data in Table 3 the low-cost-low-yield regions in South Africa have positive net margins, whereas the other low-cost-low-yield countries have negative net margins (before direct payments from government is taken into account). The positive net margins in South Africa are mainly due to the higher farm gate prices paid to South African producers. The farm gate prices in South Africa vary between R1,122 and R1,334, while that of the other countries vary between R638 and R853. These higher farm gate prices result in higher gross margins for the South African regions, even though the average yield obtained in South Africa is lower than that of the international counterparts. The average yield in the South African dryland regions is 2.14 ton/hectare compared to 2.65 ton/hectare in the other countries. Note that the United States has a similar gross margin as the Western Cape regions due to the relatively high yield obtained in the United States. Variable costs in South Africa are higher than in the international counterparts (with the exception of Swellendam/Heidelberg, which has the lowest variable cost per hectare in the low-cost-low-yield group), despite the lower yield obtained in South Africa. On average, the variable cost in South Africa is R459 higher than that of their international counterparts. The lower yield and higher variable costs in South Africa indicate that, even though barley is produced profitably in South Africa, barley production is rather unproductive in South Africa vis-à-vis the other countries. Fixed costs vary considerably among the various regions ranging between R505 per hectare and R1,385 per hectare. There is less variation in overhead expenses in South Africa as these costs range between R505 per hectare (Bredasdorp/Napier and Swellendam/Heidelberg) and R780 per hectare (SAB barley farm). The average overhead expenses allocated to barley production in South Africa are R588, compared to R930 of the international counterparts.

[1] A similar classification was made for the production of wheat in a BFAP report "The profitability and competitiveness of wheat production in the Western Cape, South Africa" (BFAP Report No.: 2005-02)

Table 3: Income, costs and profit of malting barley production (Rand/ha)

	Ave yield	2005 Price[1] (R/ton)	Gross Income	Variable expenses	Gross Margin	Fixed costs	Net margin	Payments from government	Net margin + payments
Swellendam/ Heidelberg	1.80	1,122	**2,020**	1,103	**917**	505	411	0	411
Bredasdorp/ Napier	2.00	1,164	**2,328**	1,681	**647**	562	85	0	85
Caledon/Riviersonderend	2.40	1,242	**2,981**	2,039	**942**	505	437	0	437
SAB Barley Farm	2.37	1,334	**3,162**	2,098	**1,063**	780	283	0	283
Douglas (300ha)	6.50	1,320	**8,580**	3,497	**5,083**	2,692	2,391	0	2,391
Vaalharts	5.86	1,370	**8,028**	5,782	**2,246**	2,357	-110	0	-110
Taung	5.50	1,370	**7,535**	6,111	**1,424**	500	924	0	924
Argentina	2.45	638	**1,563**	1,122	**442**	543	-101	N/a	N/a
Australia	1.98	853	**1,688**	1,222	**465**	1,041	-576	N/a	N/a
Canada	2.93	702	**2,058**	1,561	**497**	751	-255	147	-108
United States	3.23	648	**2,092**	1,179	**913**	1,385	-472	1,189	716
France (2 row)	6.19	822	**5,090**	3,031	**2,059**	3,845	-1,786	4,612	2,826

[1] The farm gate price in South Africa is higher than in the other countries, because SA is a net importer of barley and therefore barley trades near the import parity price.

Similar to the low-yield-low-cost group, barley production in the South African regions of the high-yield-high-cost group was also rather unproductive compared to France. The average long-term yield in the Northern Cape is 5.95 ton/hectare compared to the 6.19 ton/hectare in France, while the average variable costs for the irrigation areas was R5,039 compared to the R3,031 in France. The higher prices received in South Africa result in higher gross margins and together with the lower overhead expenses, also higher net margins; making barley production more profitable in South Africa. Douglas and Taung have positive net margins indicating that barley was produced profitably in these regions. The negative net margin of Vaalharts is largely due to the high variable expenses compared to Douglas. It should be noted that the variable expenses of Douglas does not include costs on fuel and mechanisation as these costs were included under overhead expenses, but this does not account for the large difference between the variable costs of Douglas and Vaalharts. Taung also has relatively high variable expenses, but due to the structure of this farm, the overhead costs are minimal.

Government support is measured based on the producer support estimates calculated by the OECD. The PSE's are only available for Canada, the United States and the European Union[2]. In 2004 total expenditure by the Canadian, European Union and United States governments supporting barley production amounted to R647 million, R42,234 million and R2,233 million respectively. This translates into government support contributing 15%, 48% and 33% to the income of Canadian, European and American producers respectively.

PSE's consist of payments supporting the market price and payments made directly to producers. Since market price support payments are already reflected in the farm gate price, column 9 in Table 3 includes direct payments only. Though the PSE for barley production is not available for South Africa, South African producers receive no direct payments from the government (except for fuel rebates but these are most probably already discounted for under the fuel cost item), therefore are payments from government assumed zero[3]. Table 3 shows that, before taking direct government payments into account, Argentina, Australia, Canada, France and the United States have negative net margins. French producers receive the highest level of support and total direct payments for barley production translates into R4,612 per hectare. These payments are mainly based on area planted and to a lesser extent input constraints and input use. Payments received by US and Canadian producers amount to R1,189 and R147 per hectare respectively. Payments to American producers are mainly based on output, area planted and historical entitlements, while payments by the Canadian government are mainly based on area planted and overall farming income. If these payments are added to producers' incomes, the net margins in France and the United States turn positive, making it worthwhile for these producers to grow barley.

Though the PSE estimates contain a component of market price support, the overall impact of government subsidies on the world price of barley is unknown. The subsidies encourage production (by increasing profit/decreasing loss) and the higher supply reduces prices. Considering that in 2005, 32% of barley (feed and malting barley combined) was produced in the EU15 countries[4], 9% in Canada and 3% in the United States, the impact of subsidies on world production and the world price might be significant.

[2] Australia has no government payment estimate, because though Australia is an OECD member country, the OECD calculates PSE's only for those commodities that contribute more than 1% to total output of the country.

[3] The OECD did publish a report, "Review of Agricultural Policies, South Africa", earlier this year containing PSE's for various commodities, but it does not include barley.

[4] The EU15 countries include Germany, France, Italy, Spain, Sweden, Belgium, Luxemburg, Austria, Greece, the United Kingdom, Portugal, Netherlands, Finland, Ireland and Denmark.

It should be noted that income in Table 3 includes only barley delivered for malting purposes and not any income from malting barley sold in the feed market. It is difficult to determine the impact of including income from malting barley sold in the feed market on the relative competitiveness of the countries for two reasons. First, the proportion of malting barley sold in the feed market varies each year depending on weather conditions influencing quality. In countries like the United States and Canada, demand and supply of malting barley also influences the so-called selection rate as the oversupply of malting barley allows maltsters to choose barley of only the highest quality. Selection rates for some countries are published, but these are defined as the amount of malting barley selected (for malting) divided by the amount of all barley varieties grown. In South Africa where barley is grown only for malting purposes, the "selection rate" can vary between 40 and 90 percent depending on weather conditions.

Secondly, since there is no natural feed market for barley in South Africa the price of feed barley is not determined by demand and supply, but is estimated at approximately 90% of the price of yellow maize. Historical data show that in South Africa, yellow maize trades between import parity and export parity, but closer to import parity; hence, the price of feed barley in South Africa is based on the import parity price of maize. World prices for feed barley and maize are highly correlated, linking the price of feed barley in the South African market and the world price of feed barley.

One would thus expect that, considering that the domestic price for malting barley is also linked to the import parity price of malting barley, the price differential between feed and malting barley in South Africa should be comparable to the corresponding price differential in world markets. However, in the event of maize trading at the export parity price, as was the case in 2005 when South Africa had a bumper maize crop, the lower maize price resulted in a larger price differential between feed barley and malting barley relative to the price differential in the international market. This is however the exception as it only happened twice in the past 10 years that maize has traded at the export parity level.

Thus, based on the lack of appropriate data on selection rates and the linkages between local and international prices of feed and malting barley, no general conclusion can be drawn on the impact of including income from malting barley sold in the feed market on the relative profitability or competitiveness of the various regions/countries.

2.4 Identifying the cost drivers

The cost drivers refer to the largest cost items directly allocable to barley production and include seed, fertilizer, chemicals, fuel and lubricants and mechanisation (mechanisation includes maintenance and repairs, but excludes depreciation). In the Northern Cape and North West Province where barley is grown under irrigation, water and electricity is another cost driver. Unfortunately generic data are not available to disaggregate the cost items into price and quantity.

For the low-cost-low-yield areas fertiliser is the largest cost item, followed by other chemicals. These items contribute on average 26% and 21% respectively to total direct costs, while mechanisation, seed and fuel account for 16%, 11% and 9% of total direct costs respectively. For the high-yield-high-cost countries, fertiliser is also the largest cost item accounting on average for 33% of total direct cost, followed by water and electricity (13%), seed (10%), mechanisation (8%), other chemicals (7%) and fuel (5%)

Table 4 contains the various cost drivers per country and Figure 7 is a graphical representation thereof. Fertiliser is the largest cost item for 10 of the 12 regions/countries. The exceptions are Swellendam, where other chemicals exceed fertiliser, and Argentina, where fuel and mechanisation is one cost item. Comparing the costs of low-yield-low-cost countries, all the cost drivers are on average higher in South Africa than in the other countries. In 2005, the yield obtained in the Western Cape was lower than in the other countries, despite the higher expenditure on seed and fertiliser. Unfortunately it is unknown whether the higher expenditure is due to differences in prices and/or quantities used. More detail on input costs in South Africa and how these have changed over time and with respect to international prices is provided in the next Chapter of this report.

Table 4: Cost drivers in barley production (Rand/ha)

	Yield (2005)	Seed	Fertilizer	Other chemicals	Fuel & lubricants	Mechanisation	Water & Electricity
Swellendam/Heidelberg	1.90	137	262	313	90	112	
Bredasdorp/Napier	2.00	198	422	358	223	394	
Caledon/Riviersonderend	2.56	241	560	435	253	355	
SAB Barley Farm	2.19	208	616	593	172	217	
Argentina	3.00	133	316	122	N/a	469	
Australia[5]	3.40	165	291	259	48	48	
Canada	3.08	134	290	252	115	132	
Unites States	2.89	124	317	192	198	239	11
Douglas	7.04	448	1,770	252	0*	0	498
Taung	6.28	474	1,646	93	0*	494	882
Vaalharts	6.30	480	1,620	273	678	478	1,042
France	7.00	470	979	658	235	564	

*Fuel and lubricants were allocated as overhead costs and not as direct input costs, therefore, the values are zero.

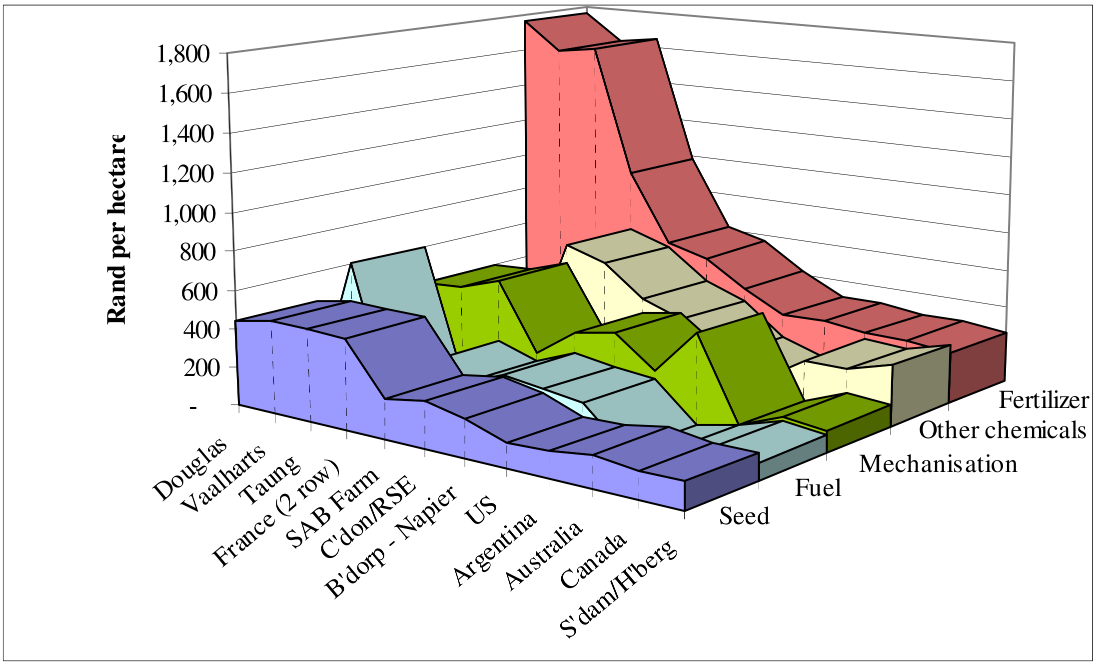


Figure 7: Cost drivers in barley production (Rand per hectare)

[5] Expenditure on mechanisation, fuel and lubricants seems relatively low in Australia, but Australia has a very high figure for "miscellaneous" (not shown in the table); hence, some of the mechanisation costs may be classified under "miscellaneous".

2.5 Concluding remarks

The results show that all regions in South Africa, with the exception of Vaalharts, have positive net margins, suggesting that barley can be produced profitably in South Africa. Conversely, the negative net margins of Argentina, Australia, Canada, France and the United States indicate that, before direct payments from government are included, barley was produced at a loss in 2005. The government payments to the French and American producers assisted these farmers to make a profit on barley production, while government payments to producers in Canada, South Africa's main trading partner, were not enough to offset the loss.

The data show that the profitability of barley production in South Africa is not due to the productivity of barley production, but rather the relatively high farm gate prices received by producers. The variable costs of producing barley are higher in South Africa, while the average long-term yield is lower – for both the low-yield-low-cost and high-yield-high-cost production areas. In other words, though South Africa produced barley profitably in 2005, it does not necessarily mean that South Africa produced barley competitively in the international market.

3. Driving forces behind input cost trends

3.1 Introduction

The open economy in which farmers operate poses many challenges. It asks of them to produce efficiently and competitively, amidst already challenging market conditions. Farmers are generally regarded as price-takers because of their inability to manipulate market conditions for higher product prices. One of the ways in which they can increase their chances of making a profit, is to manage their inputs and the associated costs properly. Overspending on inputs and expensive machinery might cost a farmer dearly when low commodity prices materialize. Conversely, it also happens that a farmer properly budgets his or her inputs, applies them effectively and efficiently, but yet fails to make ends meet. This might be the result of increased world prices for inputs, over which the farmer again has little or no control.

The purpose of this Chapter is to report on the variable input cost structures of the different barley production areas in South Africa, identify the main factors impacting on changing costs, and suggest some strategies to address the situation.

3.2 Disaggregating the input cost structure

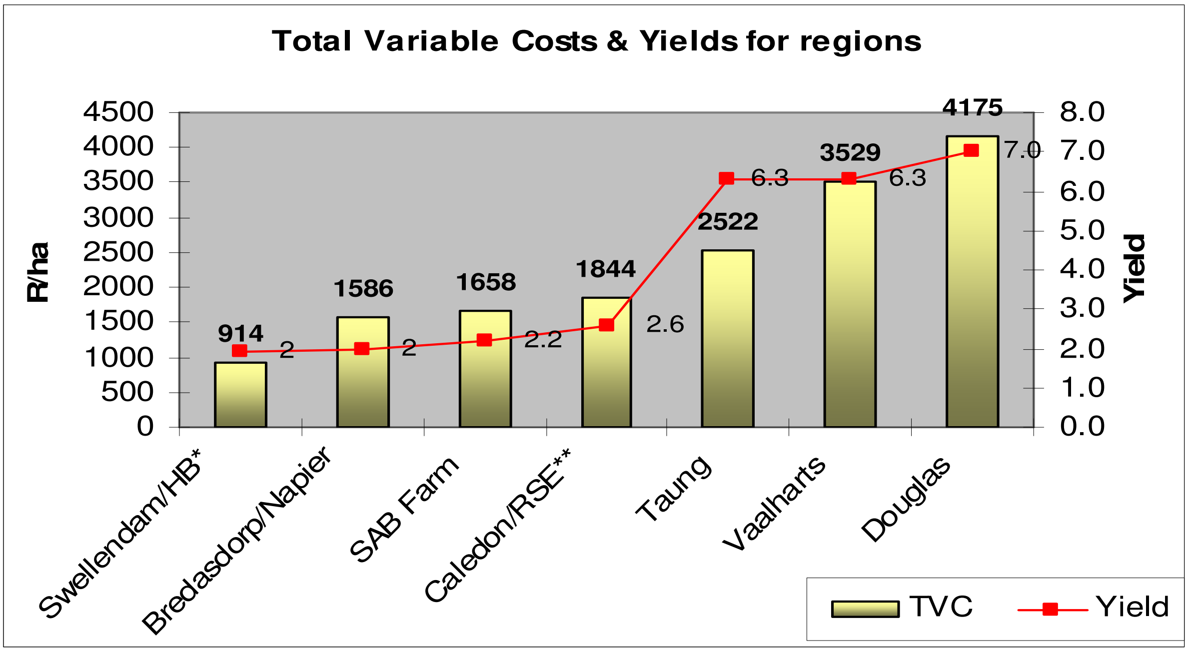
Table 5 shows how the different production areas differ with respect to their production costs. The first four regions predominantly operate on dryland conditions, whereas the last three entries use irrigation. The average total variable cost for dryland regions amounts to R1501/ha, and R3409/ha for irrigated regions. Average yields on drylands are in the region of 2.2 tons/ha, and about 6.5 tons/ha for irrigated lands. There is thus an input cost differential of 127%, and a yield differential of 201% between the dry and irrigated lands.

Table 5: Cost drivers in barley production (R/ha)

Region	Seed	*% of total*	Fertiliser	*% of total*	Other chemicals	*% of total*	Fuel	*% of total*	Mechanisation	*% of total*	TVC
Swellendam	137	*15*	262	*29*	313	*34*	90	*10*	112	*12*	914
Bredasdorp/N	198	*12*	422	*27*	358	*23*	253	*16*	355	*22*	1586
Caledon/RSE	241	*13*	560	*30*	435	*24*	253	*14*	355	*19*	1844
SAB Barley Farm	208	*13*	616	*37*	596	*36*	122	*7*	116	*7*	1658
Average DL	196	*13*	465	*31*	426	*29*	180	*12*	235	*15*	1501
Douglas	448	*11*	1,686	*40*	214	*5*	883	*21*	944	*23*	4175
Taung	474	*19*	1,461	*58*	93	*4*	0	*0*	494	*20*	2522
Vaalharts	480	*14*	1,620	*46*	273	*8*	678	*19*	478	*14*	3529
Average IR	467	*14*	1589	*48*	193	*6*	520	*13*	639	*19*	3409
% Differential	*138*	*8*	*242*	*57*	*-55*	*-81*	*190*	*15*	*172*	*22*	*127*
Overall average	312	*14*	947	*38*	326	*19*	326	*12*	408	*17*	2318

N=Napier, RSE=Riviersonderend, DL=Dry land regions, IR=Irrigation regions, TVC=Total Variable Cost

In Figure 8, a visual representation of the total variable costs per region is illustrated, together with the associated yields. This then gives an indication of the magnitude of expenses incurred, and the production capability of each. Because of the competitive advantage of the irrigation schemes in the Northern Cape and North West Province, together with relatively fertile soils, both their input costs and yields are high. The Southern Cape on the other hand has to rely on winter rains, and together with a relatively lower soil potential status, can only realize barley yields around 2,2 tons/ha. Their variable cost structure is thus much lower.



* Heidelberg **Riviersonderend

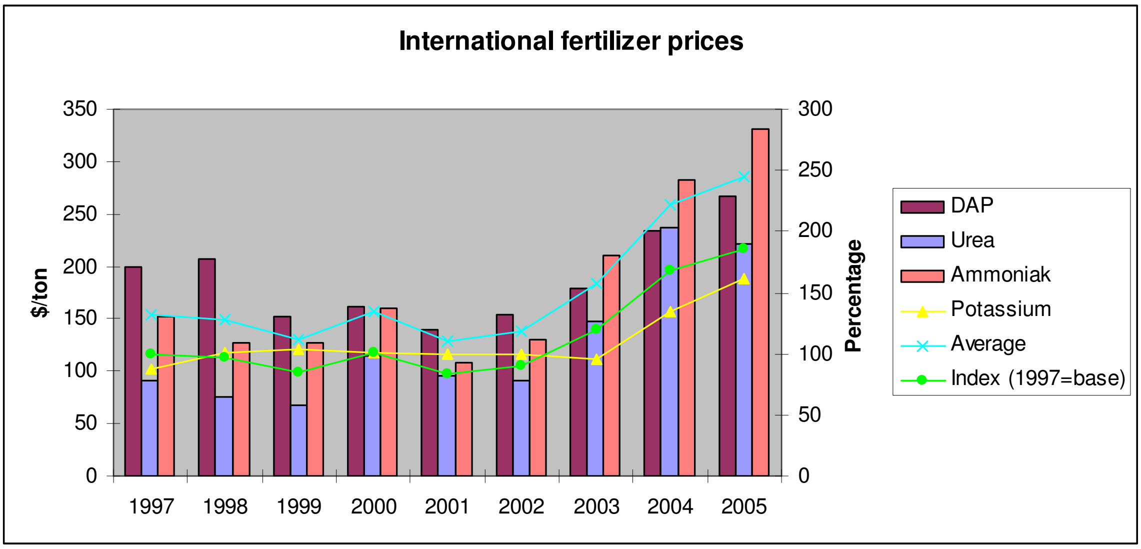
Figure 8: Total variable costs and yields for different regions.

To follow is a breakdown of the different cost items, narrowing in on their trends over time and how it affects the total variable production cost.

3.2.1 Fertilizer

Since the majority of raw materials used for synthetic fertilizers are imported, it is appropriate to look how international demand and supply dynamics influence the domestic fertilizer industry. A strong world economy, together with expanding Asian economies, has been sustaining a high demand for fertilizer over the last couple of years (Pitse, 2006). The International Fertilizer Industry Association (IFA) reported an increased demand for potash, phosphate and nitrogen for 2005 of 7.6%, 6.2% and 3.7% respectively. On top of this, the two hurricanes, Katrina and Rita, left a trail of destruction to oil and natural gas plants in the Gulf of Mexico, leading to increased oil prices.

These factors have contributed to unprecedented price hikes in international fertilizers in recent times, as depicted in Figure 9. Between 1997 and 2002, the average international fertilizer prices remained more or less within the $80/ton-$200/ton price band, with a decrease of 16% up until 2002. But for the period onwards until 2005, prices escalated above $200/ton, resulting in a 101% increase over the period. Urea prices saw increases of 72%, 61% and 61% for the years 2000, 2003 and 2004 respectively. For potassium, the year on year percentage change between 2003 and 2004 was 42%, and 19% for 2004-2005. It is interesting to see how phosphates (DAP) had the highest prices in 1997, 1998 and 1999, but towards 2005 have been surpassed by ammoniac prices.



Source: GrainSA, 2006

Figure 9: International fertilizer prices

Synthetic fertilizers have become an indispensable requirement in modern day agriculture. It is also the number one expense in the production of grains. For barley in particular, fertilizer contributed 38% to total variable costs, as depicted in Figure 10.

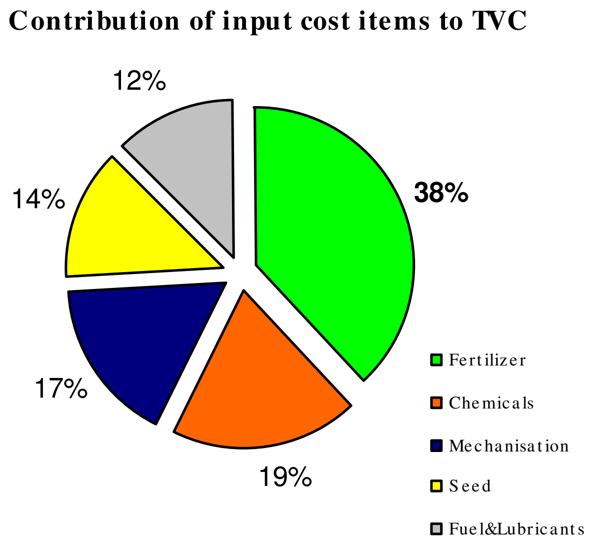
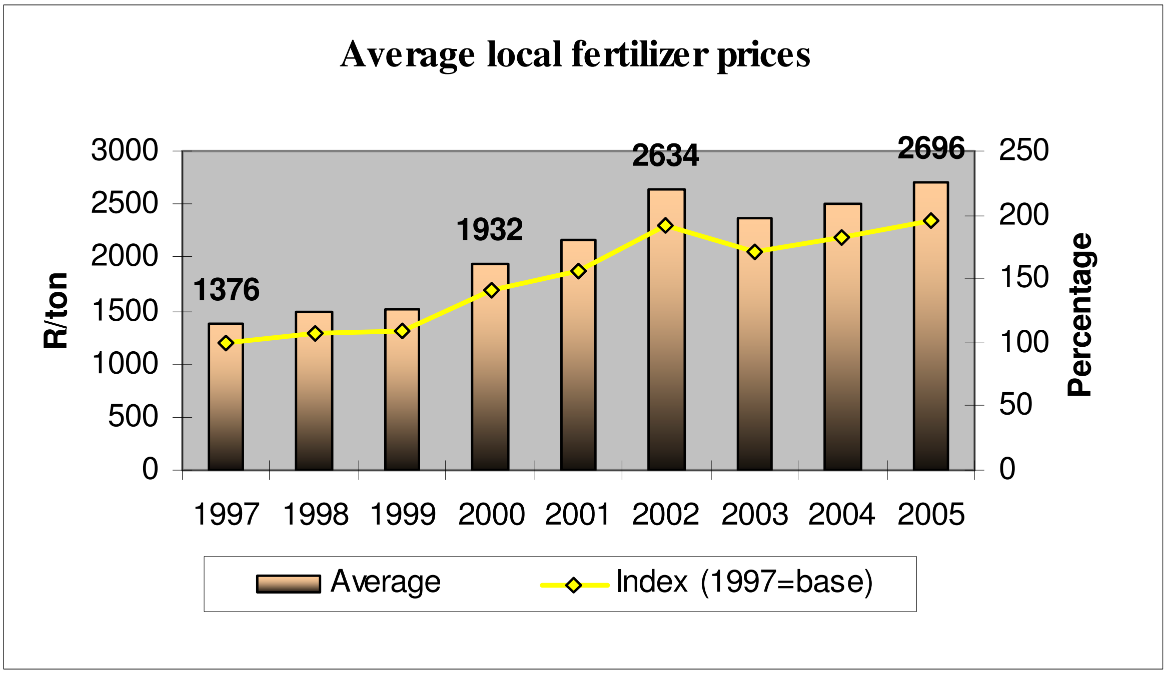


Figure 10: Ranked variable cost items and their percentage contribution

As was earlier shown in Table 5, fertilizer application in the irrigation areas is approximately 242% (in rand value) higher than in the dryland areas. Because irrigation has the potential to reduce or eliminate the water stress of plants, irrigation farmers can optimize yields by applying optimum fertilizer dosages, and therefore a large proportion of their Total Variable Cost (TVC) is allocated to fertilizers. Hence, rising fertilizer prices have a larger impact on the financials of irrigation farms, as opposed to dryland farms.



Source: GrainSA, 2006

Figure 11: Average local fertilizer prices

Local fertilizer prices, as reflected in Figure 11, started at R1376/ton in 1997, and with a 191% increase, reached R2634/ton in 2002. The decreased fertilizer prices in 2003 and 2004 are most probably the result of a prevailing stronger Rand. Over the 8 year period there has thus been an absolute increase of 196%. Overall, there seems to be a strong correlation between international and local fertilizer prices.

Table 6 summarises the data for the domestic fertilizer industry, and shows that for both nitrogen and potash, South Africa is a net importer. Most of South Africa's ammonia, urea and DAP is also imported (Pitse, 2006). Local fertilizer prices will therefore be influenced by the country's buying power (R/$ exchange rate) with which to import commodities and requisites.

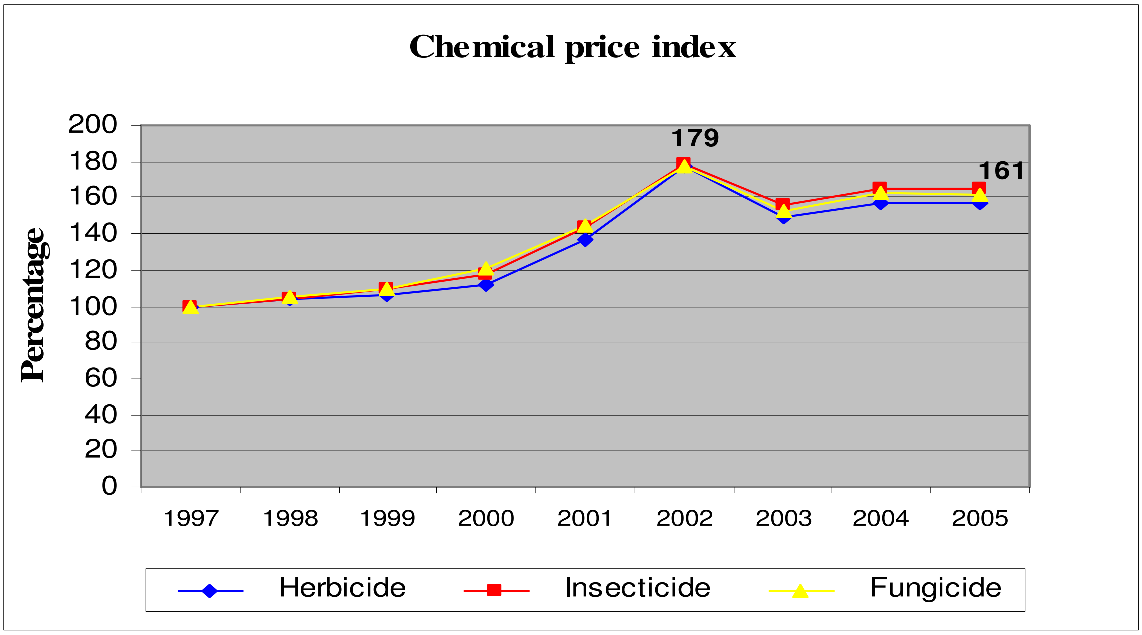
Table 6: Supply, demand and trade flows for major fertilizers in South Africa

		Nitrogen (N)	Phosphorus (P_2O_5)	Potash (K_2O)
Production	**Ton**	298 400	280 000	0
Consumption	**Ton**	570 800	231 200	163 100
Imports	**Ton**	395 300	74 300	188 200
Exports	**Ton**	51 300	86 900	29 000

Source: FAO, IFA, 2002

3.2.2 Other chemicals

Herbicides, insecticides and fungicides are combined to form an index called 'Other chemicals'. Their prices are shown as an index in Figure 12, with 1997 as the base year. An upward trend is observed from 1997 to 2002 to reach a maximum of 179% in 2002, followed by a dip in 2003 and a levelling off towards 2005. As was the case for local fertilizer prices in 2003 and 2004, chemical prices also decreased as a result of a stronger Rand. For barley in particular, chemicals are the number two contributor with a contribution of about 18% towards total input costs.

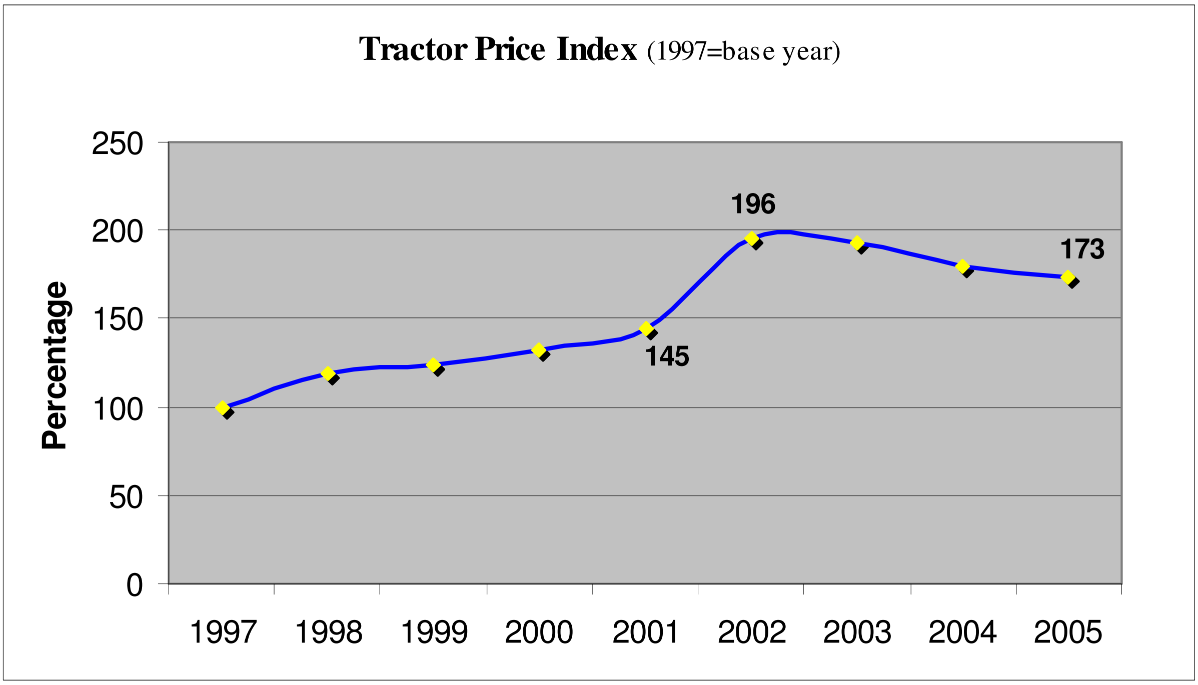


Source: GrainSA, 2006

Figure 12: Chemical price index

3.2.3 Mechanization

Mechanization is the third largest contributor to total input cost with 16%. It is a very expensive cost item on any farm, and therefore requires accurate planning and budgeting to justify purchases and activities. The tractor price index is shown in Figure 13, and although it doesn't reflect the entire realm of farm machinery, it does provide a general cost trend for mechanization in South Africa.



Source: GrainSA, 2006

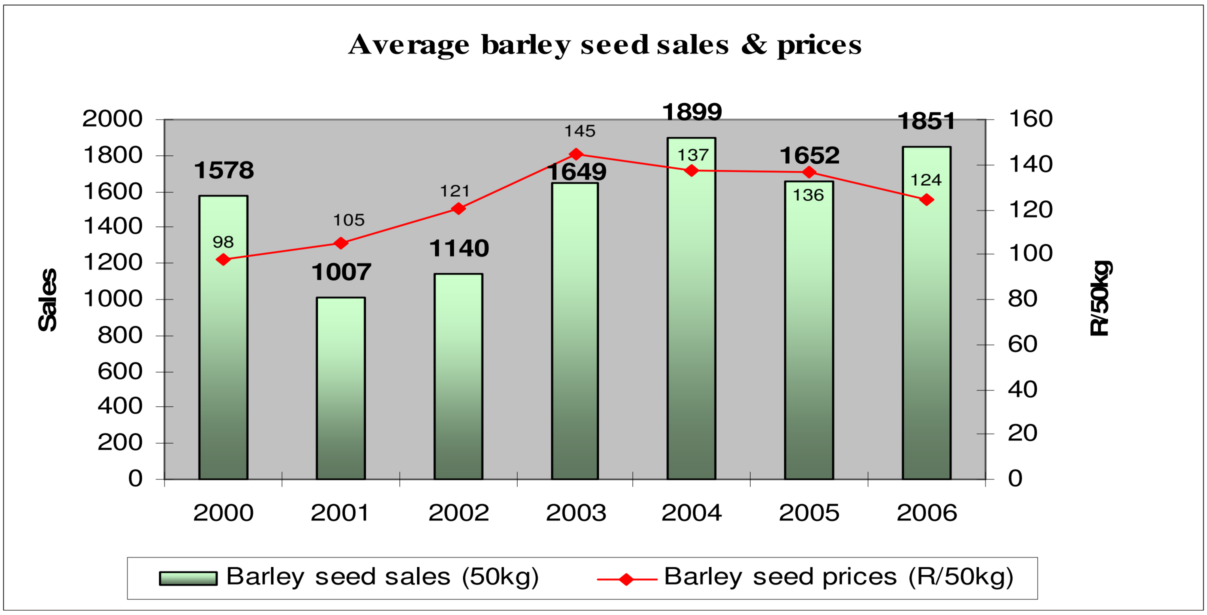
Figure 13: Tractor price index

Tractor sales have been estimated to make the bulk (60%) of the total agricultural equipment market in South Africa (National Agricultural Directory, 2005). These saw a steady upward trend from 1997 to 2001, an increase of 45% over 5 years. This was followed by a major price hike in 2002, which further increased prices by 51%. Tractor prices then levelled off towards 2005, decreasing by 23%.

3.2.4 Seed

There are two main barley seed developers in South Africa, namely the Agricultural Research Council's Small Grains Institute (ARC-SGI) in Bethlehem, and the South African Barley Breeders Institute (SABBI) in Caledon. They operate independently from one another, but are in the process of negotiating a merger (Smit, 2006). The ARC-SGI mainly focuses on irrigation barley and in particular the North Cape, whereas SABBI serves the Southern Cape.

The contribution that seed costs make to the total variable costs does not differ much between the two regions, and are in the order of 14%. However, the rand amount spent differs by 138%, with dry lands at R196/ha and irrigated lands at R467/ha. Because of the comparative advantage irrigation brings, farmers in the Northern Cape regions can plant a higher plant density, and therefore their seed expenses are higher.



Source: Southern Cape co-operative, 2006

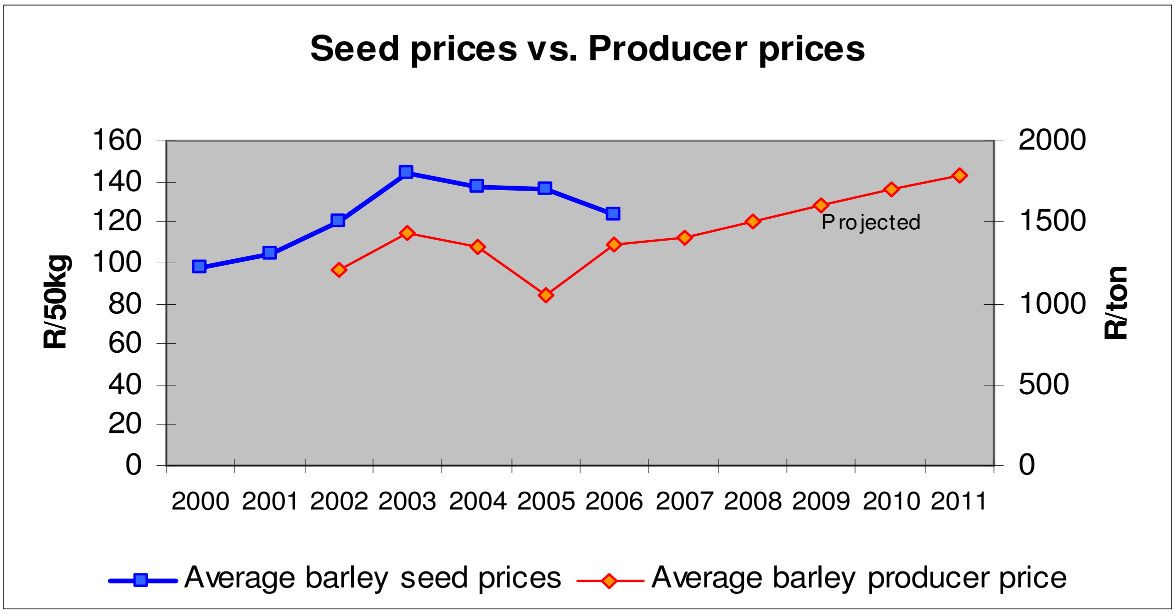
Figure 14: Average barley seed sales and prices

Figure 14 shows how sales and prices for barley seed have behaved over the last six years[6]. Barley seed sales saw a sudden decrease of 57% from 2000 to 2001, gradually picking up to levels around R1900/50kg in 2004, without huge changes ever since. Barley seed prices have followed a similar trend, with an increase of 47.9% between 2000 and 2003, and an overall increase of 26.5% for the period 2000-2006.

A positive correlation between barley seed prices and barley producer prices exists, since the former is a derivative of the latter (Greeff, 2006). SABBI contracts with barley growers in the Caledon/Bredasdorp region to grow barley seed, upon which they clean and distribute the

[6] This reflects the averages for the following cultivars planted in the Southern Cape regions: SSG 506, SSG 564, SSG 575, SSG 525, SSG 532, CLIPPER, SVG 13, SO 2/11, SO4/11, SO 4/16.

seed to co-operatives in the Southern Cape. The seed growers are paid a fee of R150/ton above the contracted barley producer price. This contracted base price is currently at R1295/ton for malting barley in the Southern Cape (De Lange, 2006). Barley producer prices are projected to increase in the future (see Figure 15), hence barley seed prices will also increase.

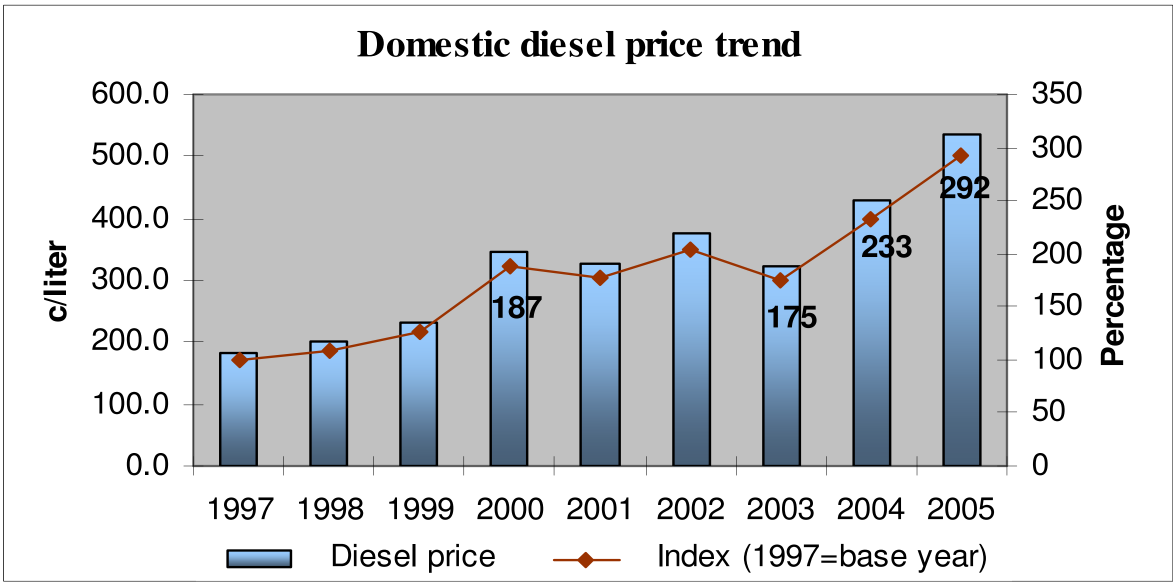


Source: Co-operatives, and BFAP Baseline 2006

Figure 15: Barley seed prices against barley producer prices

3.2.5 Fuel & Lubricants

Domestic diesel prices started at levels just below 200c/L in 1997, and increased to around 350c/L in 2000 (Figure 16). From then until 2003 it didn't fluctuate dramatically, but 2004 and 2005 saw an upward swing to levels of 428 c/L and 535c/L respectively. Hence, in the timeframe from 1997 to 2005, a diesel hike of about 300% presented itself, of which 117% took place from 2003 to 2005.



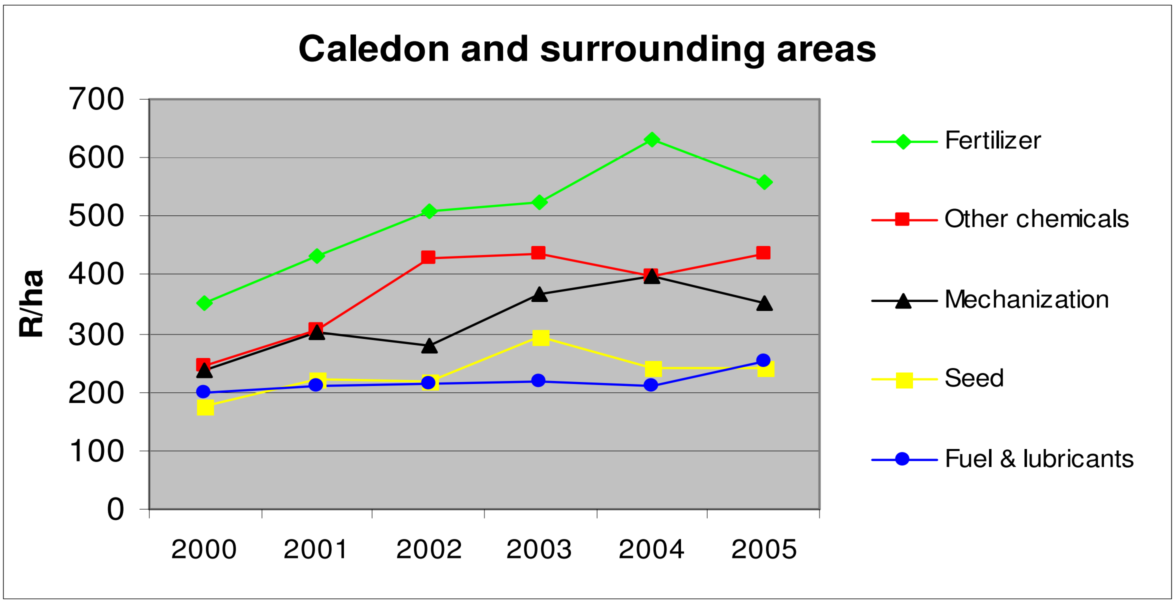
Source: GrainSA, 2006

Figure 16: Diesel price trend

3.3 Disaggregating barley production costs per region

3.3.1 Southern Cape regions

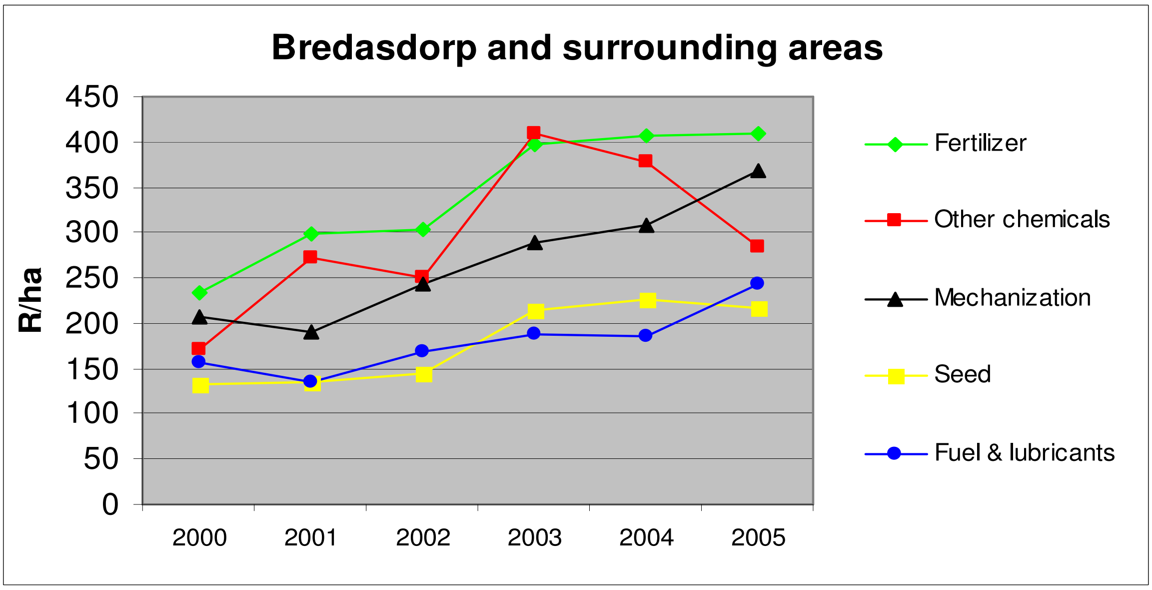
The next three Figures show the actual expenditures (R/ha) on inputs as received from Southern Cape co-operatives for 2000 to 2005, using 2000 as base year. It should be noted that these changes in expenditure could have come about as a result of changes in purchasing prices, changes in application rates, altered production practices etc.



Source: Overberg Agri

Figure 17: Actual barley production costs for Caledon and surrounding areas

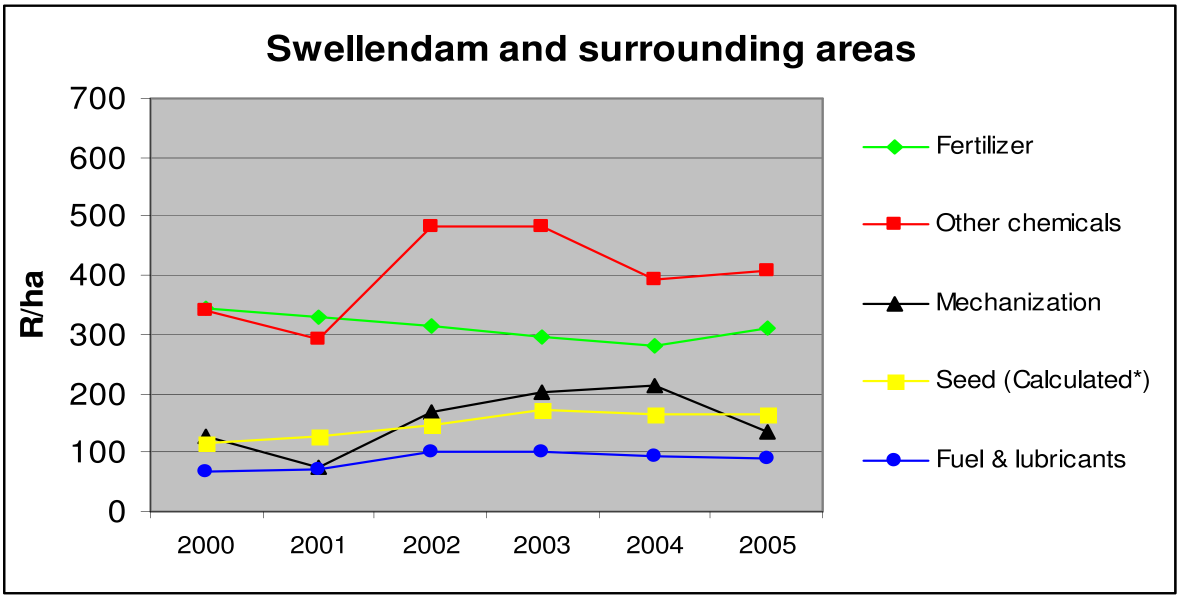
Caledon and its surrounding areas experienced increased expenditure on most inputs, especially for other chemicals (+77%), fertilizer (+59%) and mechanization (+49%) (Figure 17). Seed, fuel and lubricant costs remained fairly flat. A trend towards lower planting densities and lower seed prices helps explain the decreased seed expenditure in 2004 and 2005 (Lusse, 2007). Overall, the basket of production costs for this area rose by 50% since 2000.



Source: Overberg Agri

Figure 18: Actual barley production costs for Bredasdorp and surrounding areas

A similar upward trend in input costs was observed for the Bredasdorp region in Figure 18. Mechanization, fertilizer and fuel & lubricants increased over the period by 78%, 74% and 57% respectively. For the period 2000-2003, other chemicals rose by 138% to reach R409/ha, retracting back to R283/ha in 2005. Overall, expenditure on production inputs increased by 68%.



Source: SSK

Figure 19: Actual barley production costs for Swellendam and surrounding areas

The Swellendam area is generally regarded as having a lower potential for barley production compared to other regions, because of less favourable climatic conditions (Van Rensburg, 2007). Fewer inputs are thus applied by these farmers, which explains their lower cost structure. The graph in Figure 19 does not show drastic increases in production costs, and some items have actually decreased over time. 'Other chemicals' was their biggest cost item, and despite momentarily increasing by some 40% in 2002 and 2003, remained within a R350-R400 range. This area has seen ample adoption of conservation agriculture techniques, which caused them to increase their chemical applications in order to maintain good weed control (De Beer, 2007). Moderate expenditure increases had been experienced on mechanization (+4%), fuel & lubricants (+29%) and seed (+39%), but fertilizer decreased by 10% over the period. The net increase in production costs for this area was only 16%.

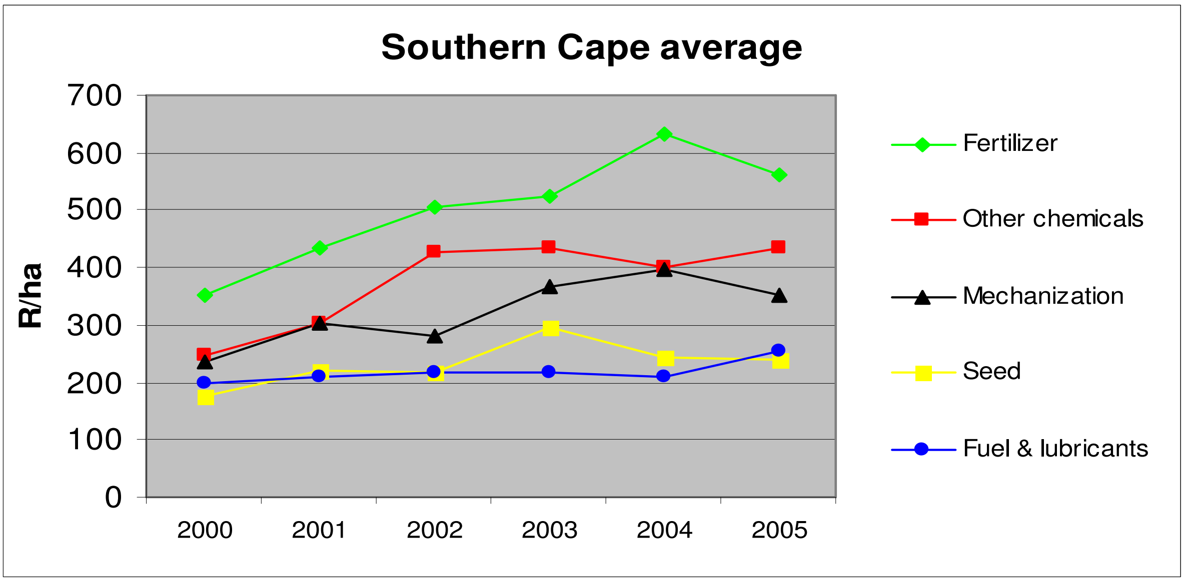


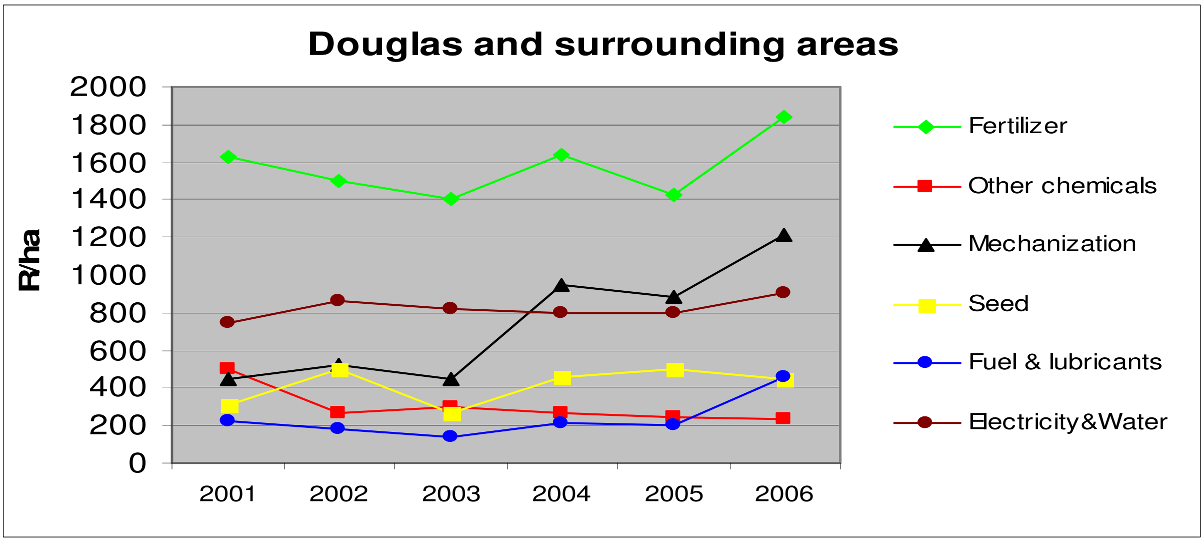
Figure 20: Summary of actual barley production costs for Southern Cape region

Figure 20 shows the aggregated index for the entire Southern Cape region. Most of the cost items had an overall increasing trend over time, with the greatest price increase experienced in 'Other chemicals'. In general since 2000, an overall average increase of 44% was calculated for the Southern Cape region.

3.3.2 Northern Cape regions

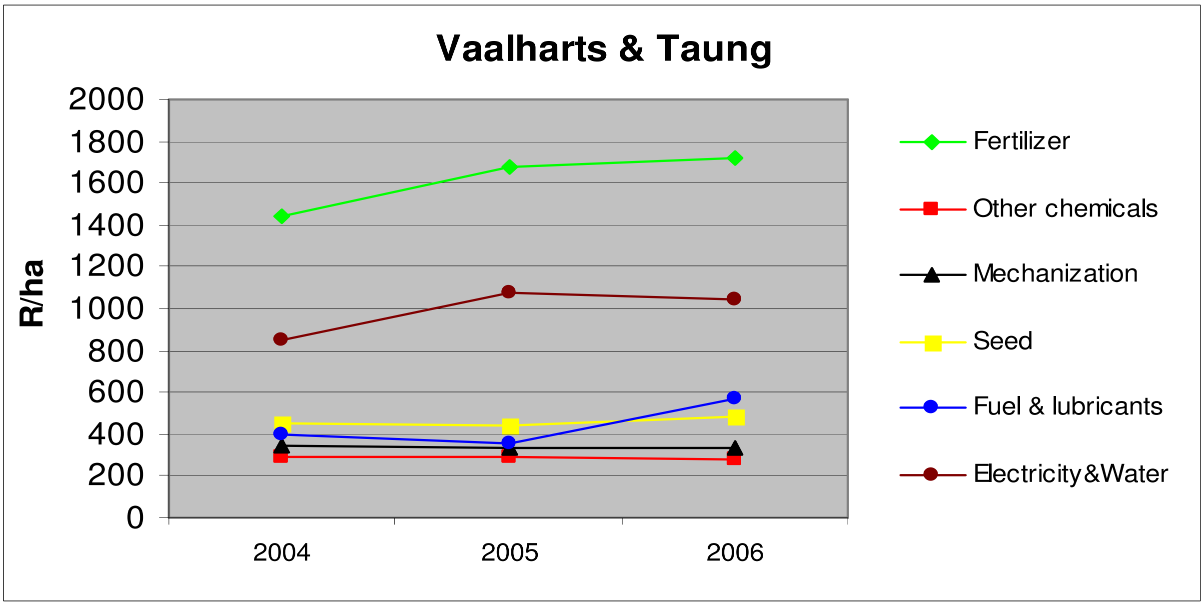
Production costs for the Douglas, Barkley West and Prieska region for 2001 to 2006 are shown in Figure 21. Barley production commenced only in 2001, and was taken as base year. Expenditure on fertilizer makes up the bulk of their production costs, contributing about 48% to total production costs, and ranges between R1400/ha and R1800/ha. Such high fertilization rates help optimize their competitive advantages (i.e. irrigation; good soils). A fluctuating trend for fertilizer is observed, increasing by 14% for the period. Expenditure on mechanization soared to levels of R943/ha (2004) and R1214/ha (2006), which equates to increases of 109% and 270% respectively. Electricity and water costs increased moderately. Fuel and lubricants were actually lower in 2002-2005 compared to 2001, but increased by 21% in 2006. Overall, the total variable expenditure rose by 51% in this period.

Barley production in the Vaalharts irrigation region commenced in 2004, and the budgeted expenses for barley production are illustrated in Figure 22. Because of the limited time series data available, inferences about the cost trend for this area couldn't be confidently drawn.



Source: GWK

Figure 21: Actual barley production costs for Douglas and surrounding areas



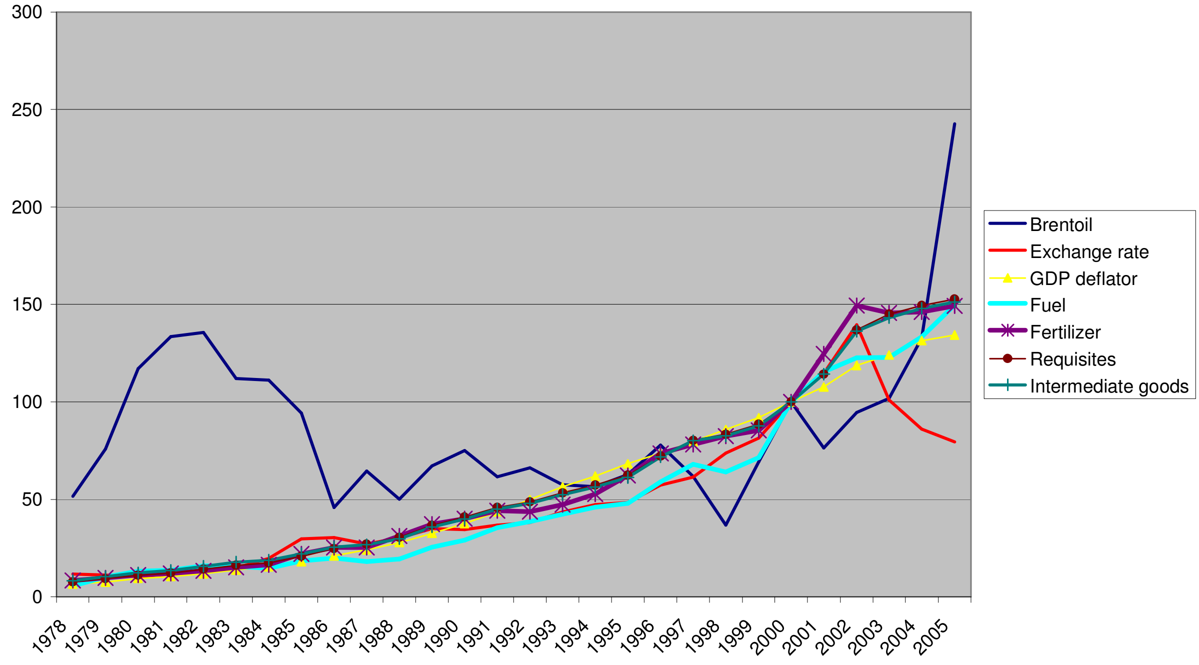
Source: Senwes, GWK, SAB

Figure 22: Budgeted barley production costs for Vaalharts and Taung

3.4 Factors impacting on changing input costs

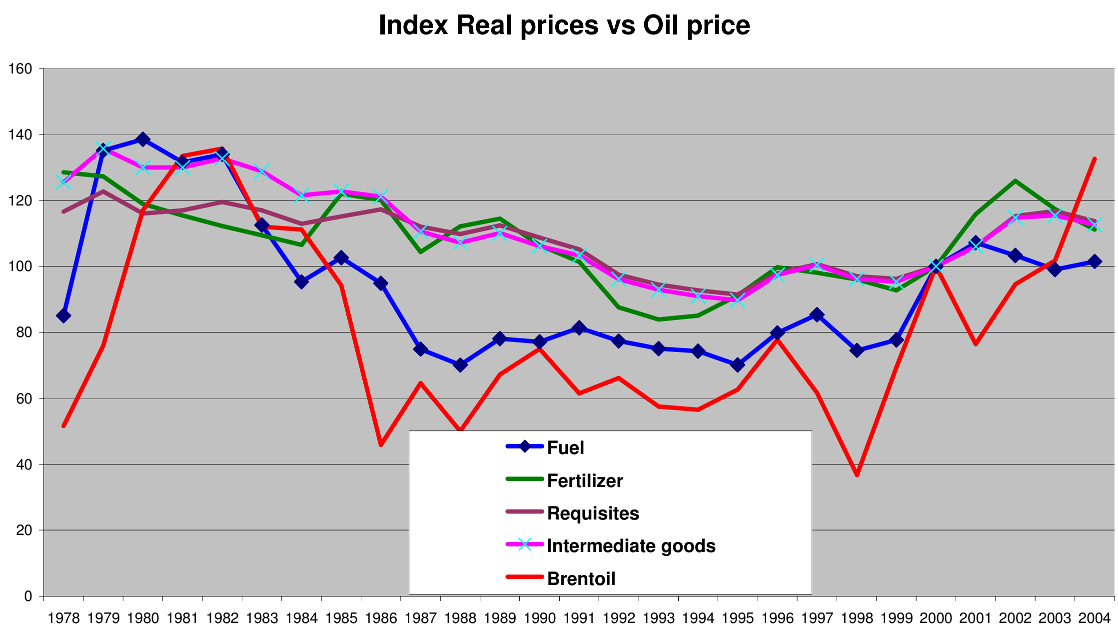
The following three Figures show that the oil price has been one of the key underlying drivers of fuel, fertilizer, requisites and intermediate goods prices over the past 27 years. This trend is quite evident in Figure 23. Regression analyses indicate the following relationship between input price variability and the Brent Oil price variability over the period 1978 to 2004:

- Brent Oil price variability explains 54% of fuel price variability.
- Brent Oil price variability explains 7% of fertilizer price variability.
- Brent Oil price variability explains 22% of requisites price variability.
- Brent Oil price variability explains 31% of intermediate goods price variability



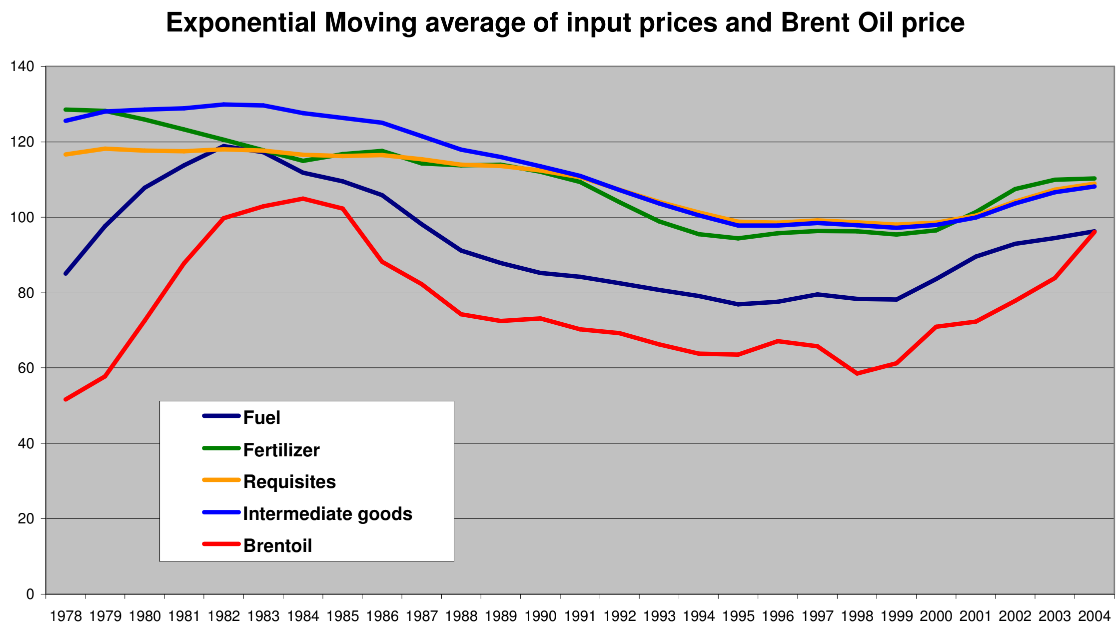
Source: Abstract of Agricultural Statistics, Reserve Bank

Figure 23: Indexed input cost trends in South Africa (2000 base year), 1978 to 2005



Source: BFAP, 2006

Figure 24: Index of real prices vs. oil price, 1978 to 2005

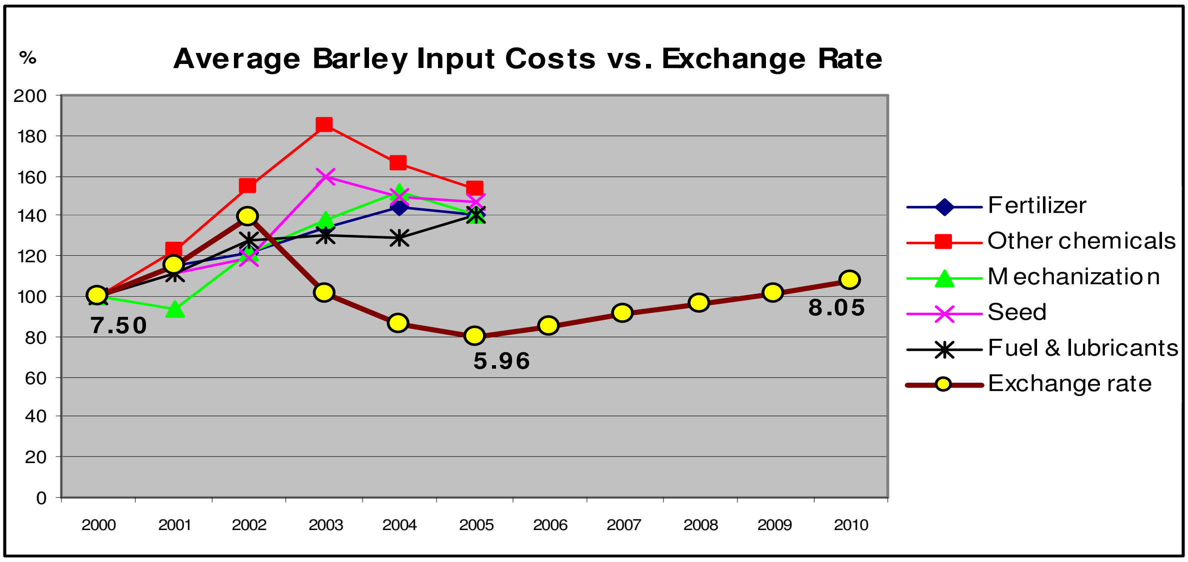


Source: BFAP, 2006

Figure 25: Exponentially weighted moving average of Brent oil price vs. input costs

In the shorter run, exchange rate variability seems to have caused variability around the long run trend of input prices. This is especially evident during 2001-2003. What is also clear from Figure 23 is the downward adjustment in real input prices from 2002 to 2004 due to an appreciating Rand/Dollar exchange rate, except in the case of fuel. However, the magnitude of downward adjustment of the input prices is not the same as that of the exchange rate appreciation.

Because many of the inputs used in agriculture are imported, it is important to keep a close eye on changing exchange rates and world oil prices, and how these influence input prices.



Source: BFAP, 2006

Figure 26: Average barley input costs versus R/$ exchange rate.

In plotting the average barley input costs against the R/$ exchange rate, a relatively positive correlation can be observed (Figure 26). As the Rand weakened from R7.50/$ (2000) to R10.47/$ (2002), input prices started to rise accordingly. Although the Rand strengthened from 2002 onwards to levels underneath R6.00 (2005), input prices kept a steady upward trend up until 2003 because of a lagging effect. From 2003 onwards, input prices started levelling off as the Rand strengthened. The projected future weakening of the Rand suggests that input prices will also most likely be adjusted upward.

3.5 Conservation Agriculture

Over the last years there has been a worldwide adoption of farming techniques that both lower economic costs and conserve the natural resources employed. *Conservation agriculture* is one such a technique, and is "the compounded term for field crop production systems that make use of no-tillage, minimum tillage or reduced tillage, maintains a permanent or semi-permanent organic soil cover, and often employs crop rotations" (FAO, 2006). Benefits of this technique include (National Agricultural Directory, 2005):

- Less soil erosion
- Increased yields in dryer years
- Improved water conservation
- Improved soil quality
- Savings in time, labour and money
- More sustainable in the long run

Worldwide, some 90 million hectares are cultivated using a no-tillage system, predominately in countries such as Canada, Brazil, Argentine and the USA. The FAO has been promoting this concept for the past 10 years, and has stated that "conservation agriculture has great potential in Africa." Since no formal data exist on the extent of conservation agriculture adoption in South Africa, estimates made by the *Crop Estimates Committee* have to be used. From a total of 4 402 255 hectares under cultivation in SA, they have estimated that 34.6% (1 522 718 ha) is under conservation tillage (minimum- or reduced tillage), and 8.6% (377 169 ha) under no-tillage.

Table 7 shows the extent of conservation-agriculture adoption for the different barley producing areas, as collected from the corresponding co-operative advisers serving the area. The Table shows that adoption of conservation-agriculture had been far greater in the Southern Cape, both in terms of years and hectares, as opposed to the Northern Cape. Referring back to Table 4, it is interesting to see that Swellendam and the SAB barley farm had the lowest machinery cost, 12% and 7% respectively, which is the direct result of their minimum tillage practices (Van Rensburg, 2007). According to Van Rensburg, the low machinery costs of the SAB barley farm may also be partly ascribed to the relatively new equipment used on the farm.

In the *Cost Guide* of October 2006 by GWK Ltd., the total mechanisation cost per hectare was calculated at R1026.05/ha for conventional practices and R188.28 for no-tillage practices. Despite this cost-saving, adoption of conservation agriculture in the Northern Cape has been slow, and considerable research and extension is needed before the majority of farmers will change their practices. Changing existing patterns of production is very difficult, and amidst other pitfalls, is highly dependant upon:

- Biophysical factors: such as soil- and climate characteristics;
- Human aspects: farmers' knowledge and perception about the technique;

- Financial position: especially the capital means to convert to a new cultivation system.

Table 7: Extent of conservation tillage adoption

Areas	Degree of Conservation Agriculture
CALEDON & RIVIERSONDEREND	30% of farmers do minimum tillage on approximately 50% of the total grain area of about 67 000 ha.
BREDASDORP, NAPIER, PROTEM & KLIPDALE	40%-50% of this area (12 820 ha[7]) has been switched over to minimum tillage systems in the last five to ten years.
SWELLENDAM & HEIDELBERG	For approximately the past seven years, this area has gained acceptance of no- or minimum tillage systems. Today, some 80% of the area (6109 ha[1]) follows such systems, where tined implements are still allowed, but not any ploughing actions.
DOUGLAS, PRIESKA & HOPETOWN	Currently, there is only one producer that has been following a complete no-till system for a few years, with great success. He plants 310ha of barley, and achieves an average of 6.45t/ha. In the Prieska and Douglas areas in particular, a substantial number of farmers have shifted over to reduced tillage systems, where only tines are used to create seedbeds.
VAALHARTS & TAUNG	The vast majority of farmers still plough their lands. Some have tried no-till and/or minimum tillage systems, but they have been negatively affected by diseases like *Fusarium* and *Vrotpootjie*, especially when not rotating crops.

Source: Co-operative representatives, 2006

3.6 Concluding remarks

South African farmers are generally price takers, having little or no control over their producer prices, and the exogenous factors (i.e. international trade, policies) which influence those prices. One way in which to assure financial survival is to carefully tend to production inputs.

Domestically, most input prices for grain production have been following an upward trend over the last couple of years. Surging international fertilizer prices have resulted in higher local fertilizer prices. Since 1997, chemical prices have risen by 79% (2002) and 61% (2005), and tractor prices have risen by 96% (2002) and 73% (2005). The price of barley seed has experienced moderate increases. The diesel price index indicates an increasing price trend, moving from 184c/L (1997) to 536c/L (2005).

The rand dollar exchange rate and the world oil price are two forces that directly impact local agricultural input prices. The purchasing power of the Rand is expected to weaken over the next few years, inevitably leading to higher input prices. Because oil is used as energy in many of the processes involved in the making of inputs such as fertilizers and chemicals, changes in quantities and prices of world oil reserves will likely have a strong influence on domestic input costs over time.

Local co-operatives have supplied actual barley production costs (R/ha) which indicate an increase in expenditures for both Northern- and Southern Cape areas, as indicated in Table 8.

[7] Census of commercial agriculture: Western Cape. 2002 Statistics SA.

Table 8: Summary of percentage changes in production costs for different regions

Area	Period	Absolute % change
Caledon area	**2000-2005**	+50%
Bredasdorp area	**2000-2005**	+68%
Swellendam area	**2000-2005**	+16%
Douglas area	2001-2006	+51%

4. The BFAP sector model

4.1 Model construction

BFAP has developed a system of econometric models using historical information from agricultural commodity markets as well as information obtained from producer and farmer groups as well as other industry specialists. For each commodity, the most important determinants of supply and demand have been identified. For a typical crop, these include the area under production, yield per hectare, total production, direct human consumption, industrial use, exports, imports, and ending stocks. This system is then linked to farm level models in order to generate projected market and farm trends under alternative scenarios. Table 9 illustrates which products have been included in the econometric system of equations, while Figure 27 illustrates the basic structure of the system of models. This model is a recursive dynamic system of equations, which has the ability to model the cross-commodity linkages between all field crop and livestock sectors. This implies that for example any shock in the wheat sector will have an impact on the barley sector and *vice versa*.

Table 9: Products included in the econometric system of equations for the BFAP model

Cereals	Oilseeds	Livestock and Dairy	Other
White Maize	Sunflowers	Chicken	Wine
Yellow Maize	Soybeans	Beef	Sugar
Wheat	Canola	Mutton	Potatoes
Sorghum		Wool	Ethanol
Barley		Pork	Biodiesel
		Eggs	DDG
		Dairy	

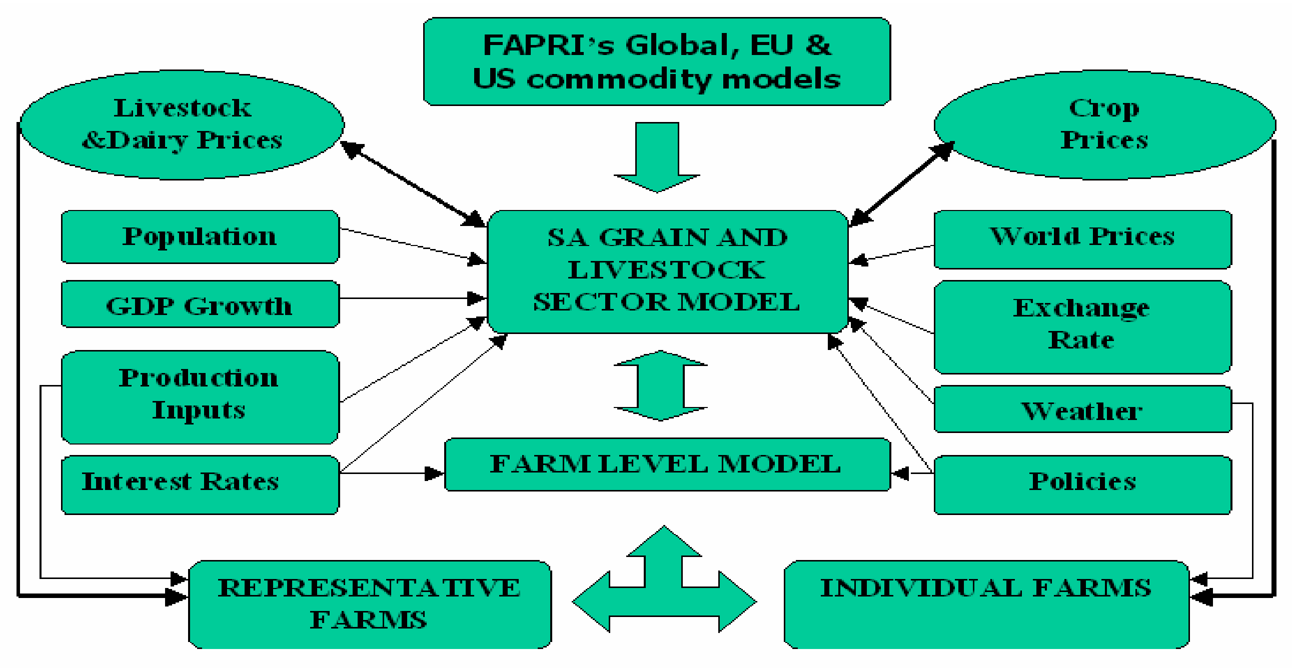


Figure 27: Basic structure of the system of models

The latest version of the sector model was adapted so that there is a clear distinction between the Western Cape and the rest of South African production by estimating an independent system of supply response equations for each region. Thus, to ensure that the cross substitution effects take place, the relevant commodities are taken into consideration for each of the production regions. Microeconomic influences at the production level for all the main field crop and livestock commodities that are unique to each of the regions were also taken into consideration to the extent possible. For example, the costs of irrigation were included in the system that estimates the production of barley in the irrigation region.

The high level of integration of South African markets into world markets implies that changes in world commodities also transmit to local markets. It is for this reason that BFAP has established a strong partnership with the Food and Agricultural Policy Research Institute (FAPRI) at the University of Missouri. FAPRI has been involved in commodity modelling for more than twenty years, generating baseline reviews for world commodity markets and conducting policy analysis for both the US Congress and the European Commission among others. Figure 27 clearly illustrates how the FAPRI global models feed into the sector level model, which in turn generates the projected commodity prices that are used in the farm-level model. This unique link between the global, sector and farm level models provides the opportunity to simulate the impact of various scenarios with respect to world market changes, subsidies and trade policies on the local commodity markets and farming operations.

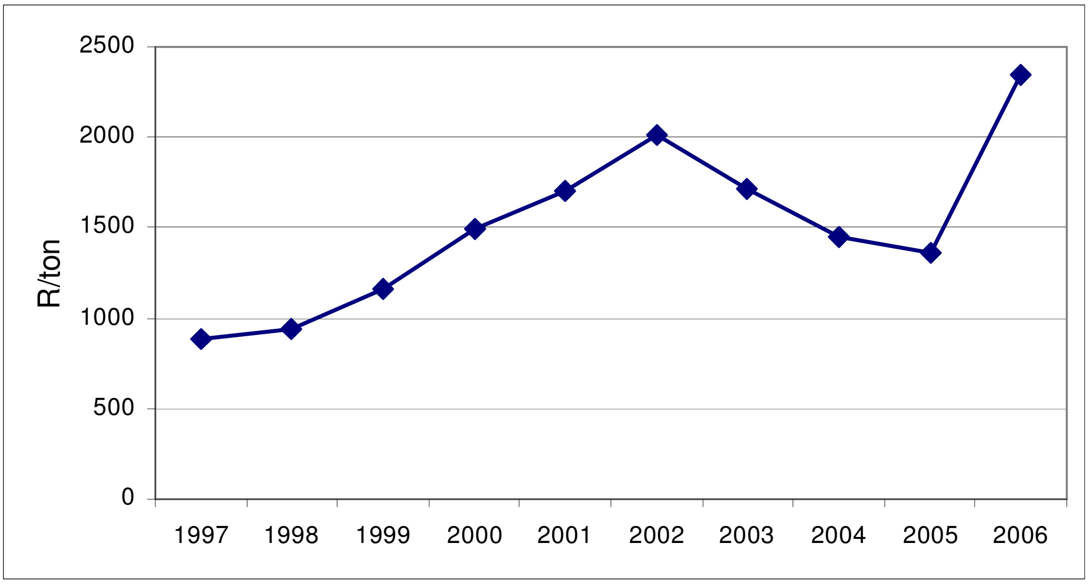
4.2 The baseline projections

The first basic projections generated by the sector level model are called *"Deterministic Baseline projections"*. These baseline projections are grounded in a series of assumptions about the general economy, agricultural policies, the weather, and technological change. Macroeconomic assumptions are based on forecasts prepared by a number of institutions such as Global Insight, FAPRI, ABSA Bank and the Actuarial Society of South Africa (for projections on population).

It is standard practice for BFAP to generate only one deterministic baseline and then analyse the deviations from baseline projections under alternative scenarios. Risk/uncertainty in many of the "drivers" or "exogenous factors" influencing the grain and livestock industry is taken into consideration with the help of stochastic analysis and results are presented in the form of probability distribution functions. However, the barley industry has proposed an alternative approach, and requested the presentation of two possible deterministic baselines, illustrating a "lower road" and a "higher road". This request is supported by the recent trends in world prices. Figure 28 illustrates the volatility of the import parity price for French malting barley over the past decade. Clearly, malting barley prices have also been affected by the sharp rise in the world prices of coarse grains and wheat, due to a combination of events such as the rapid expansion of biofuel industries and the severe drought in Australia, resulting in lower world exports. Prices of most commodities have increased to record levels and the question that needs to be asked is whether we are in a "new world". It is for this reason that two possible outcomes for the baseline will be presented. The lower road presents a baseline where the assumption is made that commodity markets pull back to the 10-year average levels and the effects of biofuel production are marginalised by the expansion in the areas planted. The higher road presents a scenario where the assumption is made that the biofuels industry has caused a permanent shift in the world commodity markets and commodity prices will trade higher than the 10-year average levels.

These baselines should not be mistaken for the scenario analyses that are conducted in the following section. The difference is that the scenarios present a combination of events and structural changes over the long-run, basically telling a story of a combination of events and what the world could look like in the next decade.

Apart from the impact of biofuels, the two possible outcomes of the baseline also make a distinction between the most recent trends in market conditions. For example, there is a lot of speculation on the effect of the current drought on summer grain crops. This has sent the future prices of all summer grain crops surging to high levels. Furthermore, after trading in a stable band, the exchange rate has recently moved outside of this band, demonstrating some weakness against other major world currencies. Therefore, the first baseline presents the outlook for barley under moderate market and weather conditions, excluding the major effects of biofuels on commodity markets. The second baseline presents the outlook taking the effect of biofuels, the drought and high world prices into account.



Source: BFAP, 2006

Figure 28: French malting barley: Import parity Cape Town harbour: 1997-2006

For each of the baselines three tables are presented. The first two tables present the baseline projections for key economic indicators and world commodity prices in the model. Only the prices for grains are presented and not the prices for oilseeds and livestock. The third table presents the deterministic baseline for the barley industry that was simulated by the model. It is important to note that despite the fact that only the baselines for the barley industry are presented, they were generated in a closed system with all the cross-commodity effects between the various commodities taking place. Two generic assumptions remain the same for both baselines. These are:

- Current agricultural and economic policies will be continued in South Africa and other trading nations.
- Rainfall is split into a summer rainfall region and a winter rainfall region for specific months, which influences the area planted and the output for each crop. The average rainfall for the past 31 years for specifics months influencing the area planted and the production is used as the projected value.

4.2.1 Baseline 1: "Lower road"

The first baseline presents a projection of local commodity markets for the period 2007-2012 under pre-drought conditions in the first quarter of 2007, and initial world prices in 2007 at 10-year average levels and not at the high levels actually seen towards the end of 2006. The exchange rate is projected to depreciate to R7.87/US $ in 2012.

Table 10: Economic indicators – lower road

		2007	2008	2009	2010	2011	2012
Exchange Rate	SA c/US$	667.80	703.90	732.55	756.57	772.68	787.85
Population	millions	47.68	47.65	47.54	47.39	47.22	47.04
Real per capita GDP	R/capita	17,601	18,391	19,233	20,121	21,042	22,018
CPIF	Index	218.72	229.17	238.89	248.68	258.97	269.92
FUEL	Index	361.07	369.78	374.30	378.99	386.83	397.29

Source: BFAP, Global Insight, FAPRI, Actuarial Society, ABSA

Table 11: World commodity prices – lower road

		2007	2008	2009	2010	2011	2012
Yellow maize, US No 2, fob, Gulf	US$/t	104.45	109.32	113.13	115.55	116.75	116.94
Wheat US No 2 HRW fob (ord) Gulf	US$/t	152.55	154.81	159.06	161.41	163.71	165.03
Barley, SPG malt scarlett, France (fob)	US$/t	156.12	160.36	165.27	171.08	176.74	181.12

Source: FAPRI, BFAP

Table 12: Deterministic baseline for barley – lower road

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	15.1	16.6	16.9	17.4	17.9	18.4
Barley winter area harvested	70.9	72.6	72.9	73.2	73.6	73.9
			t/ha			
Barley yield: Summer area	5.23	5.26	5.29	5.32	5.35	5.37
Barley yield: Winter area	2.36	2.38	2.40	2.42	2.44	2.46
			Thousand tons			
Barley production	246.0	260.0	264.1	269.9	275.1	280.2
Barley human consumption	299.5	310.1	320.9	332.5	344.3	356.9
Barley domestic use	323.4	334.6	346.1	358.2	370.5	382.6
Barley ending stocks	93.7	89.9	94.9	98.3	102.5	106.7
Barley net imports	91.2	70.9	87.1	91.6	99.6	106.7
			R/ton			
Barley producer price	1441.8	1530.4	1618.8	1689.3	1756.7	1823.2

The main findings can be summarized as follows (Table 12):

- The area planted in the summer region increases gradually to reach 18 400 ha in 2012. This implies the total production out of the summer region is projected at 99 000 in 2012.
- The area in the winter region increases marginally to 73 900 ha in 2012. Yields also increase in this region and, therefore, production increases.
- The human consumption of barley will increase to 356 000 tons is 2012. This implies that imports will have to increase to 106 000 tons to satisfy domestic demand.
- The outlook of the average barley producer price shows that prices will increase from

R1437/ton in 2007 to R1814/ton in 2012.

4.2.2 Baseline 2: "Higher road"

The second baseline presents a projection of local commodity markets for the period 2007-2012, taking the permanent shift in commodity markets due to biofuels into account and other recent events, like the drought conditions in the first quarter of 2007. Also, initial world prices in 2007 are projected to remain at the high levels that were achieved towards the end of 2006. The exchange rate is projected to depreciate to R8.86 /US $ in 2012.

Table 13: Economic indicators – higher road

		2007	2008	2009	2010	2011	2012
Exchange Rate	SA c/US$	751.75	792.38	824.63	851.67	869.81	886.89
Population	millions	47.68	47.65	47.54	47.39	47.22	47.04
Real per capita GDP	R/capita	17,601	18,391	19,233	20,121	21,042	22,018
CPIF	Index	155.57	162.53	169.74	176.76	183.95	191.31
FUEL	Index	171.62	181.01	190.85	200.65	210.82	221.36

Source: Global Insight, FAPRI, Actuarial Society, ABSA

Table 14: World commodity prices – higher road

		2007	2008	2009	2010	2011	2012
Yellow maize, US No 2, fob, Gulf	US$/t	161.00	143.01	145.66	145.87	146.33	145.44
Wheat US No 2 HRW fob (ord) Gulf	US$/t	188.82	187.64	191.03	192.71	195.00	196.68
Barley,SPG malt scarlett, France (fob)	US$/t	190.30	191.59	192.29	191.06	190.27	190.27

Source: FAPRI, BFAP

Table 15: Deterministic baseline for barley – higher road

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	18.0	17.4	18.2	18.5	19.1	19.4
Barley winter area harvested	70.5	82.3	83.1	83.1	82.9	82.7
			t/ha			
Barley yield: Summer area	5.23	5.26	5.29	5.32	5.35	5.37
Barley yield: Winter area	2.36	2.38	2.40	2.42	2.44	2.46
			Thousand tons			
Barley production	260.5	287.6	296.1	299.6	304.3	307.7
Barley human consumption	290.2	301.1	312.2	324.0	336.1	348.9
Barley domestic use	314.1	325.7	337.4	349.7	362.3	374.6
Barley ending stocks	73.1	63.7	66.8	72.2	76.8	82.3
Barley net imports	46.8	28.7	44.4	55.6	62.6	72.4
			R/ton			
Barley producer price	1823.9	1913.6	2013.1	2088.2	2159.1	2231.7

The main findings can be summarized as follows (Table 15):

- The main difference between the first and the second baseline is the level of projected prices. In the second baseline, barley producer prices are projected to increase from R1823/ton in 2007 to R2231.7/ton in 2012. Important to note is that the higher road baseline must not be regarded as the highest prices that barley can reach in the local market. Barley could trade at even higher prices than presented in table 15.

- Higher prices have an impact on all the other levels of the industry, increasing the areas planted under barley in both regions and, therefore, increasing the level of production. Domestic consumption decreases due to higher prices and fewer imports are required to satisfy domestic requirements.

4.3 Scenario analyses

This section presents four possible scenarios for the barley industry and illustrates the percentage changes for each of the scenarios from the baseline projections. The scenarios were based on a list of drivers and key uncertainties which were identified by the industry. After listing the drivers and key uncertainties, each scenario will be followed by a summary table illustrating the percentage deviations from the baseline. **It is important to note that the first baseline *("lower road")* was used as a benchmark for the scenario analyses.** The motivation for using the lower road is that at the time the scenarios were debated and formulated with the help of the industry, the effect of the biofuel industry on the commodity market was still unknown. Therefore, the lower road baseline is used as the benchmark for the scenario analysis. In section 5 of the report, the sector model results of the scenario analyses that are presented below are plugged into the farm-level model. The timeframe for the scenarios on sector level is 2007 to 2012.

4.3.1 Drivers (Predetermined factors)

- Chinese, Thailand and rest of Far East beer consumption keeps increasing at dramatic rates.
- Beer consumption in developed regions such as EU, USA and Japan remains stable and decreases in some instances. Hence the market for domestically produced barley shrinks, and therefore either barley production needs to decrease or exports need to increase.
- The US - Canadian barley trade situation remains stable, with the USA producing 6-row barley and importing some 2-row barley from Canada. However, US imports from Canada remain relatively stable, hence forcing Canada to export to alternative markets.
- Australian barley production remains stable.
- South African government policy remains that of free market; hence no direct agricultural producer support.
- The rainfall in the Southern Cape remains unstable.
- The cost of irrigation water keeps increasing, and is directly linked to government policy.
- Water quality, especially in Vaal River system, keeps deteriorating as industrial activity in Gauteng increases due to economic growth.
- The demand for human consumption of water keeps increasing as population in Gauteng increase, placing human water consumption demands and agricultural water consumption demand into direct conflict.
- Increasing competition from imported wheat remains an important variable in the determination of the South African wheat price. South Africa remains a net importer of wheat, hence the wheat price follows the Rand/$ exchange rate.
- Maize production is highly variable due to rainfall and exchange rate variability causing variability in maize prices.
- Barley yields in both dryland and irrigation areas remain relatively close to the historical trend, with variability caused by rainfall variability. Hence, no significant improvement in average yields due to cultivar improvements.

4.3.2 Key Uncertainties

- Can China improve the quality and quantity of local barley production by 2008 as planned?
- How will the Chinese situation then impact on world malting barley and barley malt trade, and how will it impact world prices?
- Will EU export subsidies for barley continue?
- Will Argentina become a major exporter of high quality two-row malting barley?
- What will happen with economic growth and therefore income per capita in South African and Southern African markets?
- How will this impact on the consumption of traditional, conventional, and premium beers as well as sweetened alcoholic beverages, wine and spirits?
- What will happen to oil prices and therefore input costs and shipping costs?
- What will happen to the exchange rate and therefore input costs, but more importantly the cost of importing malting barley into South Africa?
- Will ethanol production from maize cause significant increases in maize prices and therefore lead to increases in maize production? Thus, will maize area compete with barley area in irrigation areas?
- Can barley cultivars be cultivated that have Type A barley characteristics within the next five to ten years?
- South African government water policy – will it change as a result of increasing conflict between agricultural water demand and human and industrial water demand in Gauteng area? How will it change?
- What will happen to South American and Russian economic growth, consumer preferences and beer consumption?

4.3.3 Scenario 1: "Thirsty Dragon"

China's economic growth continues, causing per capita disposable income to increase. Therefore, Chinese beer demand grows at rates equal to those seen over the past couple of years. China fails to improve malting barley production and quality. As a result, malting barley exports to China keep increasing, causing world malting barley prices to increase. Strong Chinese economic growth together with other countries such as India and Thailand, keep oil prices around $60/barrel due to strong demand for oil as well as political uncertainties with respect to the Middle East and other oil producing countries. This causes input prices, and as a result inflation, to remain high. The South African Reserve Bank decides to increase interest rates, which causes the Rand to remain stable against most other major currencies. South African economic growth is between 4% and 5%, causing disposable income to increase and therefore beer consumption to increase. However, the demand for traditional beers such as Castle Lager decreases and the demand for premium beers and sweetened alcoholic beverages increases since the largest growth in disposable income occurs among people 20 to 35 years old. Therefore, the demand for Type A barley keeps on increasing, but the demand for Type B malting barley decreases. As a result imports of Canadian and Australian barley increase. Rainfall in the Southern Cape remains erratic over time. High population and economic growth in Gauteng leads to human and industrial water consumption increasing and therefore more expensive water to irrigation farmers.

Table 16: Percentage change from baseline – scenario 1

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	-17.99%	-16.28%	-14.33%	-11.84%	-8.80%	-7.51%
Barley winter area harvested	7.31%	2.11%	3.83%	6.56%	10.65%	11.87%
			Thousand tons			
Barley production	-5.62%	-3.17%	-1.62%	0.49%	3.17%	3.58%
Barley human consumption	-0.51%	-0.79%	-1.09%	-1.43%	-1.36%	-1.31%
Barley domestic use	-0.47%	-0.73%	-1.01%	-1.33%	-1.27%	-1.22%
Barley ending stocks	7.65%	1.74%	-1.71%	-6.54%	-10.33%	-10.21%
Barley net imports	21.31%	0.29%	-2.79%	-11.94%	-17.75%	-14.14%
			R/ton			
Barley producer price	3.92%	7.02%	10.76%	15.09%	15.30%	15.45%

The main findings can be summarized as follows (Table 16):

- Local barley prices increase as a result of the higher world prices for barley.
- Although the scenario states that the imports of Type A will increase, the model simulates a decrease of imported barley due to higher world prices. This highlights a shortcoming in the information and the modelling framework. The model will have to be set up to make a distinction between type A and type B barley in order to simulate to simulate a shift in imports and the demand for local barley.
- Whereas the area planted to barley increases in the winter rainfall region due to higher barley prices, the area planted in the summer rainfall region decreases due to the higher costs of water.

4.3.4 Scenario 2: "Made in China"

Chinese economic growth continues. Chinese malting barley quality and production improve by 2010, causing imports of Australian, Canadian and EU barley into China to decrease dramatically. This causes downward pressure on world malting barley prices, making imports of malting barley into South Africa more affordable. Together with economic growth in South Africa, cheaper imports lead to cheaper production of premium beers at the expense of conventional beers, causing an even more dramatic decrease in the demand for Type B barley, leading to a shrinking of market for South African - produced barley. Input costs remain relatively high as a result of high oil prices. Rainfall in the Southern Cape remains erratic over time. High population and economic growth in Gauteng leads to human and industrial water consumption increasing and therefore more expensive water to irrigation farmers.

Table 17: Percentage change from baseline – scenario 2

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	-17.99%	-19.64%	-19.36%	-19.04%	-19.59%	-18.88%
Barley winter area harvested	7.31%	-2.03%	-2.74%	-2.66%	-2.95%	-2.59%
			Thousand tons			
Barley production	-5.62%	-7.08%	-7.71%	-8.06%	-9.37%	-9.60%
Barley human consumption	0.24%	0.30%	0.39%	0.65%	0.68%	0.69%
Barley domestic use	0.22%	0.28%	0.36%	0.60%	0.63%	0.64%
Barley ending stocks	10.53%	13.30%	14.09%	15.46%	17.37%	17.23%
Barley net imports	26.71%	30.48%	26.70%	28.25%	31.02%	28.24%
			R/ton			
Barley producer price	-2.56%	-2.71%	-2.83%	-4.83%	-5.07%	-5.36%

The main findings can be summarized as follows (Table 17):

- Local barley prices decrease as world prices decrease due to lower imports by China.
- Lower world prices cause imports to rise rapidly. Rising imports and decreasing prices cause local production to decrease by close to 10% in 2012.
- The shift towards imported barley for premium beer consumption is clearly illustrated in the model.
- Similar to scenario 1, a split between type A and type B in the model will provide more detailed results

4.3.5 Scenario 3: "Local is Lekker"

Chinese economic growth continues, causing the prices of oil and other commodities to remain high. China negotiates trade agreements with several Southern African countries to ensure supplies of necessary commodities to sustain Chinese economic growth. This leads to economic growth in several African countries, causing disposable income to increase and therefore beer consumption to increase. China imports most of its malting barley, hence malting barley prices increase slowly. Poorer consumers switch from traditional beers to more conventional but affordable beers such as Castle Lager and Black Label, causing significant increases in demand for Type A and Type B barley. Input costs remain relatively high as a result of high oil prices. The growth in some African countries therefore creates opportunities for South African barley farmers to supply the African market with Type B barley in order to produce affordable types of beer. Rainfall in the Southern Cape remains erratic over time. High population and economic growth in Gauteng leads to an increase in human and industrial water consumption, and therefore to more expensive water to irrigation farmers, with irrigation water costs increasing more than in the previous two scenarios.

Table 18: Percentage change from baseline – scenario 3

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	-23.27%	-22.14%	-20.78%	-19.23%	-17.60%	-15.70%
Barley winter area harvested	7.17%	0.93%	1.84%	3.37%	5.68%	7.62%
			Thousand tons			
Barley production	-7.40%	-5.95%	-5.14%	-4.16%	-3.11%	-2.00%
Barley human consumption	2.81%	5.77%	8.78%	11.89%	15.17%	18.53%
Barley domestic use	2.60%	5.34%	8.14%	11.04%	14.10%	17.28%
Barley ending stocks	18.38%	21.71%	26.05%	30.41%	34.86%	39.46%
Barley net imports	47.99%	50.67%	54.39%	61.35%	67.21%	73.57%
			R/ton			
Barley producer price	2.07%	3.61%	5.20%	6.93%	8.75%	10.64%

The main findings can be summarized as follows (Table 18):

- Domestic consumption is projected to increase by 18.5% by 2012 on the back of rising disposable income levels.
- The area planted in the summer rainfall region decreases due to high costs of water.
- The increase in domestic consumption and the decrease in production implies that imports have to increase sharply and it is projected that by 2012 imports will have risen by 73% above baseline projections.

4.3.6 Scenario 4: "Dwindling Empire"

Chinese economic growth decreases significantly due to international political unrest, very high oil prices, high shipping costs and fragmented world trade. This causes a decrease in the growth in disposable income in China, and hence a significant decrease in China and the world's beer consumption growth rate; hence barley exports to China decrease. This leads to pressure on world barley prices. Political unrest causes oil prices to fluctuate dramatically. Average oil prices shoot up in 2007 and 2008 and then decrease sharply to levels below $40/barrel in 2010 as a result of weaker world economic growth. From 2010 to 2015 oil prices increase again to reach $90/barrel in 2015. This causes input prices to vary significantly as well as the Rand against other major currencies. The political unrest also boost the relative strength of the Dollar and Euro and the Rand depreciates sharply in 2007 and 2008. However, as investors prefer to invest in gold due to uncertainty in the world market, high gold prices cause the Rand to strengthen again after 2008 to level below R8/US $. Wheat prices and maize prices vary significantly, making farmers uncertain about what to plant. The cost of imported barley varies significantly as a result of varying shipping costs and the exchange rate. This makes long-term planning in terms of beer production extremely difficult. Also, South Africa and other African countries' economic growth rates decline sharply, leading to a decrease in the growth of disposable income and therefore decreases in beer consumption. People switch to more affordable beers such as Castle Lager and Black Label, causing an increase in the demand for Type B barley relative to Type A barley in South Africa. Rainfall in the Southern Cape remains erratic over time. As a result of slow South African economic growth, increase in general poverty and an increase in population, government is forced to make policy changes in line with public opinion, hence, decreasing supplies of irrigation water are available to agriculture in order to ensure supplies of drinking water to the growing population in Gauteng. This has a major impact on water availability and cost to irrigation farmers downstream from Gauteng.

Table 19: Percentage change from baseline – scenario 4

	2007	2008	2009	2010	2011	2012
			Thousand hectares			
Barley summer area harvested	-27.24%	-25.28%	-20.49%	-19.59%	-22.37%	-21.79%
Barley winter area harvested	4.63%	-1.72%	4.23%	1.90%	1.25%	-0.86%
			Thousand tons			
Barley production	-10.28%	-8.80%	-3.45%	-5.25%	-7.63%	-9.52%
Barley human consumption	-2.00%	-3.36%	-4.35%	-5.38%	-6.44%	-7.45%
Barley domestic use	-1.85%	-3.12%	-4.04%	-4.99%	-5.99%	-6.95%
Barley ending stocks	11.91%	5.58%	-5.37%	-2.70%	-0.93%	0.22%
Barley net imports	33.35%	9.00%	-17.28%	-1.37%	0.55%	1.23%
			R/ton			
Barley producer price	16.00%	27.53%	12.72%	3.42%	-2.50%	-4.45%

The main findings can be summarized as follows (Table 19):

- Domestic barley prices are very volatile due to the fluctuations in the exchange rate and the unstable world economy.
- The summer area planted decreases sharply due to the rapid rise in input costs and the costs of water.
- The local consumption of barley decreases on the back of decreasing disposable income levels.

5. The farm level effects of changes to the environment

5.1 Introduction

For the purpose of this report it was decided to construct representative farms for each of the separate regions namely Swellendam, Bredasdorp-Napier, Caledon (all three are part of Southern Cape region), Douglas, Vaalharts (Northern Cape, North West Province), and Taung (North West Province). The SAB barley farm is also simulated and results are presented. The purpose of the representative farms is (1) to attempt to understand what a typical farm in each of the regions look like in terms of hectares used, types of products produced, cost structure, income structure, and assets and liabilities; (2) how significant is barley production in terms of contribution to income, costs and profitability in each of the representative farms; (3) what likely the impacts will be on each of the representative farm's ability to survive and grow financially if changes take place in the South African as well as the international barley, beer, grain, and livestock industries as well as general economic conditions; and (4) what possible strategies can be followed by each of the representative farms in order to manage changes in domestic and international markets in order to survive and grow financially. Point 4, namely the question on what strategies to follow, will be answered in a follow-up study. *It must be noted that these representative farms are exactly what the word implies namely representative, therefore care should be taken in interpreting and applying the results since individual farms in the various areas will definitely differ from the representative farms.*

In this specific study, two output variables are used in order to define financial survivability and financial growth ability of a representative farm. In order to attempt to understand a representative farm's **ability to survive financially**, the **Annual Real Ending Cash Surplus or Deficit** is used as a proxy variable. Since this variable indicates the businesses' ability to generate a positive cash position on an annual basis, the researchers regard this as a good indication of whether a business can produce, pay all expenses and debts, replace equipment and still provide for a family. In the case where the business can't generate enough cash to cover all of the above mentioned elements, the researchers are of the view that the ability to survive financially is not good since the business is then likely to run into a financial position in future where it can't incur any costs to produce, implying that the business will have to be liquidated. Therefore, in the case where a positive real ending cash surplus is generated on a continuous basis over time, the business is likely to survive financially.

However, financial survivability is not the only important purpose of the business, but also **financial growth,** since a firm/farm owner wants to improve her/his financial wealth. In order to understand the ability of a business to grow financially, the **Annual Real Net Worth** was used as an indicator, because if Annual Real Net Worth declines over time, the "financial wealth" of the owner in terms of the business is essentially getting weaker since the business is not "beating" inflation. In the case of the Annual Real Net Worth increasing over time, the implication is that the business is growing in the sense that the owner's financial "wealth" with regards to the business is increasing and therefore "beating" inflation.

Therefore, by analyzing both the Annual Real Ending Cash Surplus/Deficit as well as Annual Real Net Worth one can get a fairly good idea of the current as well as potential future financial position of the farm business as well as that of the farm business owner. Furthermore, by analyzing changes and impacts of changes in terms of domestic and international barley markets, and other markets and policies, one is likely to be able to make sound deductions on what the likely impacts of the various possible changes would be on the firm's ability to survive and grow. Understanding these impacts can then add to the development of well-designed strategies by South African barley industry stakeholders on how to manage the possible impacts of these changes. This is likely to improve the ability of barley producers but also the South African barley industry as a whole to survive and grow financially and economically.

5.2 Farm-level data

Data for 2005 were used as the basis to construct the various representative farms for the various regions. Data on hectares planted, yields, livestock production, input costs, fixed costs, output prices, assets and liabilities were collected for the various regions in order to construct each of the representative farms. Data from farmer study groups were collected by the industry partners and supplied to the researchers. After data collection and processing, the results were tested and refined several times through discussions with knowledgeable individuals in each of the areas to ensure that the data are representative of each of the areas. Hence, verification and validation were done by means of testing the data and results with knowledgeable individuals within each of the areas. Furthermore, simulation results for 2005 were validated against actual 2005 data to ensure the model simulated the representative farm as closely as possible for 2005. As soon as actual 2006 data are available, the same verification and validation process will be followed. The same will be done for 2007. Table 20 shows the summarized data for 2005 as totals, Table 21 shows the data expressed as percentages, and Table 22 shows the data on a per hectare basis.

Table 20: Summary of farm-level data (totals)

Simulated figures for 2005 (Totals)

	Southern Cape (Dryland)				Northern regions (Irrigation)		
	Caledon	Bredasdorp	Swellendam	SAB farm	Douglas	Vaalharts	Taung
FARM AREA COMPOSITION (ha)							
Barley	158	238	163	919	72	20	10
Wheat	220	208	166	386	228	20	0
Maize	0	0	0	0	300	30	10
Oats	62	98	108	204	0	0	0
Other	965	1605	1163	1493	0	40	0
Total area	**1405**	**2149**	**1600**	**3002**	**300**	**75**	**10**
FARM INCOME AND COST COMPOSITION (Rand)							
Farm income	2,931,100	3,471,332	2,975,019	4,761,526	4,979,296	819,120	175,586
Farm Cash Expenses	2,170,250	2,617,991	1,874,784	3,694,256	4,394,339	922,796	143,780
Interest	125,667	224,720	295,791	289,516	442,035	107,645	-
Debt principal payments	23,834	85,968	249,862	384,805	208,196	144,967	-
Asset replacement payments	-	-	5,599	41,165	11,450	-	1,590
Family Living	290,000	290,402	230,000	-	492,211	60,000	30,330
FARM FINANCIAL POSITION (Rand)							
Total Assets	10,254,876	10,693,816	7,172,664	22,005,682	16,117,373	3,577,500	350,000
Total Liabilities	1,195,379	2,083,506	2,307,102	13,520,037	5,776,130	1,075,740	-
Net Worth	9,059,497	8,610,310	4,865,562	8,485,645	10,341,242	2,501,760	350,000

Source: GWK, Overberg Agri, SAB, Senwes, SSK

Table 21: Summary of farm-level data (percentages)

Simulated figures for 2005

	Southern Cape (Dryland)				Northern regions (Irrigation)		
	Caledon	Bredasdorp	Swellendam	SAB farm	Douglas	Vaalharts	Taung
FARM AREA COMPOSITION (% of total area)							
Barley	11%	11%	10%	31%	24%	27%	100%
Wheat	16%	10%	10%	13%	76%	27%	0%
Maize	0%	0%	0%	0%	100%	40%	100%
Oats	4%	5%	7%	7%	0%	0%	0%
Other	69%	75%	73%	50%	0%	53%	0%
Total area							
FARM INCOME AND COST COMPOSITION (% of farm income)							
Farm income	100%	100%	100%	100%	100%	100%	100%
Farm Cash Expenses	74%	75%	63%	78%	88%	113%	82%
Interest	4%	6%	10%	6%	9%	13%	0%
Debt principal payments	1%	2%	8%	8%	4%	18%	0%
Asset replacement payments	0%	0%	0%	1%	0%	0%	1%
Family Living	10%	8%	8%	0%	10%	7%	17%
FARM FINANCIAL POSITION (Debt:asset ratio)							
Debt ratio	11.66%	19.48%	32.17%	61.44%	35.84%	30.07%	0.00%
ANNUAL CONTRIBUTION TO TURNOVER (% of turnover)							
Barley	17%	16%	12%	66%	13%	21%	49%
Maize	0%	0%	0%	0%	53%	28%	51%
Wheat	19%	14%	13%	22%	34%	18%	0%
Oats	4%	2%	4%	10%	0%	0%	0%
Other Income	60%	68%	71%	2%	0%	33%	0%

From Table 20 it is clear that farm size differs significantly between the Southern Cape region farms and the Northern region farms. In general, the farms where dryland production takes place are much larger than the irrigation farms. No maize is produced by any of the Southern Cape farms, while wheat is produced by all farms except Taung. This implies that the substitute options in terms of barley production vs. the production of other crops are different especially when comparing North vs. South. This has significant implications when analyzing strategic options for barley production.

Table 22: Summary of farm-level data (per ha)

Simulated figures for 2005 (per ha used in production)

	Southern Cape (Dryland)				Northern regions (Irrigation)		
	Caledon	Bredasdorp	Swellendam	SAB farm	Douglas	Vaalharts	Taung
FARM INCOME AND COST COMPOSITION (Rand)							
Farm income	2,086	1,615	1,859	1,586	8,299	7,447	8,779
Farm Cash Expenses	1,545	1,218	1,172	1,231	7,324	8,389	7,189
Interest	89	105	185	96	737	979	-
Debt principal payments	17	40	156	128	347	1,318	-
Asset replacement payments	-	-	3	14	19	-	80
Family Living	206	135	144	-	820	545	1,517
FARM FINANCIAL POSITION (Rand)							
Total Assets	7,299	4,976	4,483	7,330	26,862	32,523	17,500
Total Liabilities	851	970	1,442	4,504	9,627	9,779	-
Net Worth	6,448	4,007	3,041	2,827	17,235	22,743	17,500

In Table 21 the farm area composition percentages indicate that barley and wheat carries an almost equal weight in terms of production area in Caledon, Bredasdorp and Swellendam. This is mainly because of a stringent crop rotation system followed. The barley area for the SAB barley farm is much larger since SAB not only produces barley for commercial purposes but also for experimental purposes. In the Douglas farm barley's significance in terms of production area is much less since producers mainly focus on maize and wheat in terms of grain production. Barley production uses a bigger area share on the Vaalharts farm, and uses all production land in the case of the Taung farm. Analyzing the production area share figures, the reader must keep in mind that double cropping takes place to some extent at all three of the irrigation farms; therefore the area used in production is larger than the actual farm size. Analyzing specifically the Southern Cape farms, excluding the SAB barley farm, other area e.g. grazing, increases as one moves eastward (from Caledon to Bredasdorp to Swellendam). This is due to lower and more variable rainfall as one moves eastward, forcing farmers to plant only high potential soils and using marginal soils for cultivated grazing. This has interesting implications in terms of farm income and cost composition.

The Southern Cape farms, except for Swellendam, all have a cost to income ratio of around 75%. The SAB barley farm's ratio is a bit higher, and the Bredasdorp farm's ratio is a bit lower. The interesting point to note is that the Swellendam farm's cost to income ratio is much lower compared to the other Southern Cape farms, at around 63%. This can mainly be attributed to a larger livestock component, namely sheep and dairy (low input type of dairy) as well as grain production techniques which entail minimum tillage and even zero tillage in some cases. The debt to asset ratio of the Swellendam farm is much higher than the other farms (excluding the SAB barley farm), which explains the higher debt payments by the Swellendam farm. The reason why interest payments of the Caledon farm are so high compared to the Bredasdorp and Swellendam farms, is because a large component of the debt of the Caledon farm is financed through an overdraft facility which causes debt payment to be higher given the level of debt. The debt of the Swellendam and Bredasdorp farms consists of a greater percentage of medium and long-term debt on which the interest rates and therefore interest payments are lower. The SAB barley farm has a large debt to asset ratio; however, a large percentage of the debt is non-interest bearing, and therefore the interest payments are lower given the level of debt.

The cost to income ratio of the Northern region farms is higher relative to the Southern Cape farms, because irrigation production techniques are used which implies that use of production inputs is much more intensive. Also, fixed costs are higher since significant investments need to be made in irrigation and other equipment to be able to produce under irrigation. This decreases the profit margin of the irrigation farms significantly compared to the dryland farms, but lowers the variability in yields. Debt levels of both the Douglas and Vaalharts farms are around 30% and higher, causing debt payments as well as interest payments to make up a significant percentage of total costs. The year 2005 was a difficult year for the Vaalharts farm in the sense that prices of especially maize were low. This caused costs to exceed income during the year, which in turn caused debt to increase. The result of this increase in debt will be presented in the following section of this chapter.

5.3 Farm level simulation results and discussion

The purpose of this section is to present the farm-level simulation results for each of the representative farms. The results presented focus on the two key variables analyzed on farm-level in this study, namely Real Ending Cash Surplus/Deficit and Annual Real Net Worth. As explained in section 1 the purpose of analyzing these two variables is to determine the specific representative farm's ability to survive and grow financially.

The results in terms of Annual Real Ending Cash Surplus/Deficit and therefore the survivability of the representative farm should be interpreted as follows: Since probability theory is used the various numbers in each of the figures indicate probabilities of that specific key variable being higher than a specified value, in-between two specified values, or lower than a specified value. These specified values differ from farm-to-farm since the 2005 financial position of the various farms differ as illustrated by Tables 1 to 3.

For example, in figure 29 (left hand picture) the probability of the Annual Real Ending Cash Surplus to be above R299 195 during 2007 is 52%, the probability of Annual Real Ending Cash Surplus to be between R0 and R299 195 during 2007 is 35%, and the probability of Annual Real Ending Cash Surplus to be below R0 is 12% during 2007. Hence, the probability of a cash deficit occurring during 2007 is 12%.

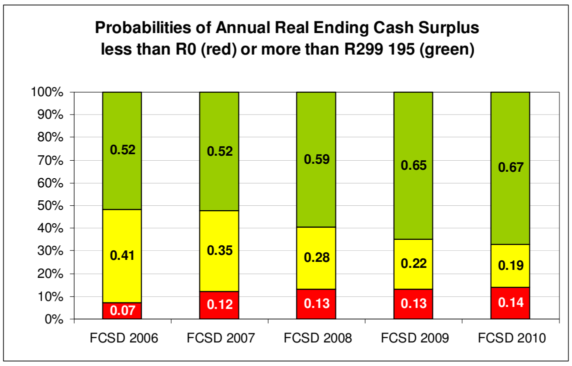
The same approach in terms of interpreting the figures should be followed when analyzing Real Net Worth which indicates the ability of the farm to grow financially. For example figure 29 (right hand picture) indicates that the probability of the Real Net Worth increasing above R9,5 million during 2007 is 1%, the probability of Real Net Worth remaining between R9,5 million and R8,2 million is 73%, and the probability of Real Net Worth declining below R8,2 million is 26% during 2007. Hence, for 2007 the probability of the farm growing financially above 2006 levels is 1%, the probability of staying at 2006 levels is 73%, and the probability of shrinking financially to below 2006 levels is 26%.

Each section on each representative farm consists of a baseline analysis and a scenario analysis. The scenarios analyzed were presented and discussed in the previous chapter of the report on the sector level modelling. The purpose of doing the baseline and scenario analysis is to give decision-makers a more complete picture on what the outlook of the farm looks like given a set of assumptions, and how this outlook might change should changes take place as described in the scenarios. The scenarios therefore form the purpose of a "wind tunnel", whereby the farm structure at present is "tested" in the various scenarios or "wind tunnels" to see whether it will survive and grow or not. This is likely to lead to better understanding by farmers and barley industry stakeholders of what strategies and changes in the barley industry are likely to improve the survivability and ability to grow of the various farms. The sections on the scenarios results are only descriptive to avoid an extremely lengthy report. Detailed scenario results which are similar to those presented in the baseline analysis is available in the Appendix to the report.

5.3.1 Caledon

Baseline Analysis

Analysis of Figure 29 makes it clear that the ability of the farm to survive financially during 2007 is relatively good given the probability of around 87% (combining the green/medium grey and yellow/light grey probabilities) that the farm will generate a Real Ending Cash Surplus on an annual basis. However, one bothering trend is that the red/dark grey probability (probability of a cash deficit occurring in a given year) slowly increases over time. This trend feeds through to the higher probability that the Real Net Worth decreases below levels at which it is at present in 2006 (red/dark grey probability increases). This indicates that the probability of survival is relatively high but is experiencing pressure, while the ability to grow financially is low and decreasing due to pressure on the cash position of the farm.



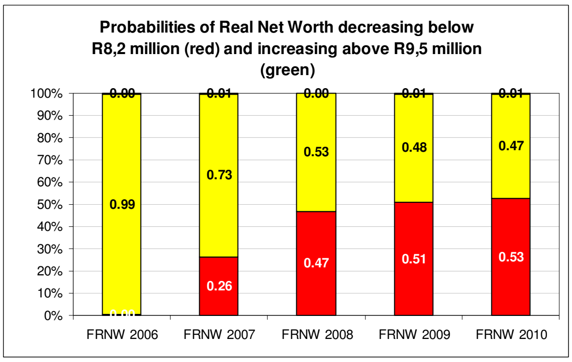


Figure 29: Caledon: baseline financial survivability (left) and growth ability (right)

Scenario analysis

Scenario 1 has a significant positive impact on the survivability and growth ability of the farm. The probability of a cash flow deficit occurring shows a declining trend as a result of higher barley prices due to higher international barley prices. Since debt is present in the case of the Caledon farm, the higher interest rates slightly dampen the positive effect of the higher barley prices. The increase in water costs does not have any impact on the Caledon farm's situation since no irrigation takes place.

In **Scenario 2** international barley prices decrease as a result of a shift in barley trade since China starts producing enough malting barley to satisfy domestic demand, hence China cease being a net importer of malting barley. As a result South African domestic prices also decline. This has a significant negative impact on the survivability of the Caledon farm. As a result, the probability of a cash deficit increases significantly compared to the baseline, and the ability to grow also declines significantly. Since the livestock side of the Caledon farm contributes relatively less to total income, the effect of the lower barley prices is significant. In a situation where the livestock component might be larger, the negative effect of a lower barley price should be dampened. Different grain production techniques such as those practised on the Swellendam farm might also lead to lower input costs and therefore also dampen the negative impact of the lower prices on the cash position of the farm.

Scenario 3 has the most significant positive impact on the farm's survivability and ability to grow. Here the combined effect of higher international barley prices and strong domestic demand for beers produced with domestically produced barley increase the South African barley price. The lesson from this scenario is that economic growth through various growth strategies such as ASGISA, black economic empowerment, and others along with international investment in South Africa and Africa can lead to significant opportunities in terms of profits for the South African barley industry. However, the beer market should be approached in the correct way to ensure that the full market potential is utilized on a sustainable basis through the supply of the correct quality of barley to produce the preferred quality and type of beer demanded by the consumer.

Scenario 4 has a significantly negative impact on the financial future of the farm. The negative impact is a result of higher input costs due to higher oil prices, lower international barley prices because of lower beer demand, and lower domestic barley prices because demand for beer decrease since disposable income decrease.

At the farm level, at first sight it appears there might be three options available to the farmer to manage the uncertainties described in the scenarios:

- Expanding the livestock component;
- Decrease production costs of grain by either decreasing target yields (and therefore lowering input quantities), or by changing production systems; and
- Managing debt strictly to ensure that possible increases in interest rates have a minimum impact.

On industry level, a change in the pricing formula might have a positive impact on the cash position of the farm. Research into more stable (drought-resistant) and higher-yielding barley cultivars that maintain quality may also have a significant impact on the survivability and growth of the farm. This is also likely to help the farm to mitigate changes in international and local markets that might impact negatively on the survivability and growth of the farm.

However, given all these options and possible changes, the question now is to what extent can and should the farmer and industry change all the above mentioned factors? This question will be analyzed in great detail together with industry experts during 2007.

5.3.2 Bredasdorp

Baseline analysis

The Bredasdorp representative farm's ability to survive is rather positive given the probability of 60% to 65% of a cash surplus being generated by the farm (Figure 30). The probability of a cash deficit occurring is higher compared to Caledon, as is evident by the probability of around 20%. The reason for this is because yields are lower on average because rainfall is lower, and since Bredasdorp is further away from the main grain markets which lead to higher transport costs and lower farm gate prices. One significant difference between the Bredasdorp farm and the Caledon farm is that the probability of a cash deficit occurring at the Bredasdorp farm remains relatively constant and even decrease slightly while in Caledon the probability of a cash deficit increases slightly, largely because the Bredasdorp farm has a significantly larger livestock component in terms of both sheep and dairy. This stabilizes farm income to a certain extent and therefore lowers the probability of a cash deficit occurring. This effect can also be seen in the Real Net Worth graph. Although the ability to grow is extremely low (1% in 2007), the farm has a significant probability of remaining at the same financial level (around 78% during 2007 to 2010), and therefore the chances of the farm actually losing ground against inflation is relatively low. Thus, the interesting point to note here is the stabilizing effect that the livestock component has on the survivability as well as growth ability of the farm.

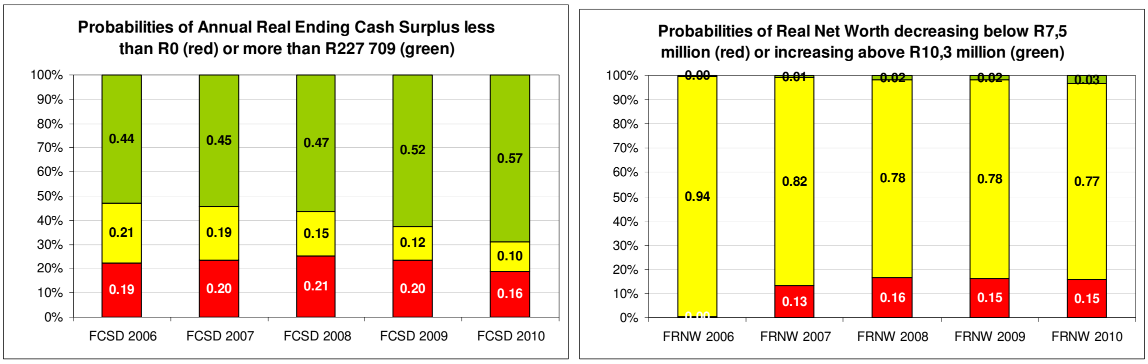


Figure 30: Bredasdorp: baseline financial survivability (left) and growth ability (right)

Scenario analysis

Scenario 1 has a positive impact on the survivability and growth of the farm compared to the baseline due to higher barley prices. However, this positive effect is dampened by the increase in interest rates. The dampening effect of the increase in interest rates is greater in the case of the Bredasdorp farm compared to the Caledon farm since the debt to asset ratio is greater. The positive effect of the higher barley prices is also smaller compared to the Caledon farm since barley contributes slightly less to income on the Bredasdorp farm than on the Caledon farm. Interestingly, the growth in the South African economy leads to higher demand for specifically dairy products. As a result, prices for dairy products increase slightly compared to dairy input costs which also has a small positive impact on the survivability of the farm since the Bredasdorp farm has a significant dairy component.

Scenario 2 has a less negative impact on the Bredasdorp farm compared to the Caledon farm since the livestock component's contribution is greater and also barley's contribution to income is slightly smaller. The increase in dairy prices compared to dairy inputs as a result of the economic growth within South Africa, helps to mitigate the negative impact of the lower barley prices.

The positive impact of **scenario 3** is also most significant on the Bredasdorp farm, since higher economic growth and demand for locally produced products improves prices for both barley and livestock products. This gives the farm "breathing" space which helps to improve the survivability and growth compared to the baseline.

Scenario 4 has a significantly negative impact on the farm's financial position since a downturn in domestic and world economic growth leads to lower prices in both barley and livestock products. This has a significant negative impact on both the survivability and growth of the farm. However, the shock compared to the Caledon farm is much smaller, again because of a larger livestock component compared to the grain component.

5.3.3 Swellendam

Baseline analysis

The Swellendam farm has a relatively high probability of generating a cash surplus, and at the same time a low but stable probability of generating a cash deficit (Figure 31). This links up with the increase in probability that the Real Net Worth increases above the 2006 levels (green/medium grey area), which implies that the probability of the farm growing financially remains small, but improves over time. Possible reasons for this improving trend in both survivability and growth are the large livestock component that the Swellendam farm has as well as the relatively low cost structure.

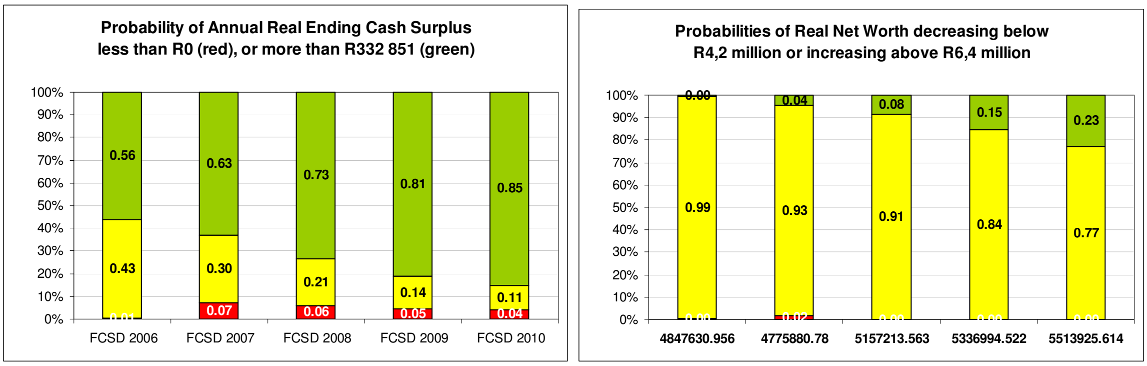


Figure 31: Swellendam: baseline financial survivability (left) and growth ability (right)

Scenario analysis

Since the contribution of barley to income on the Swellendam farm is relatively small compared to the Caledon and Bredasdorp farms, the impact of changes in the international and domestic barley markets as described in the four scenarios is relatively smaller. However, from the scenarios it becomes clear that the Swellendam farm is sensitive to changes in economic growth that influence disposable incomes, and to changes in interest rates. Since the major share of income on the Swellendam farm is dairy and sheep, changes in disposable income which influence demand for dairy products and meat, especially mutton, have a significant impact on the survivability and growth of the farm. Broad Based Black Economic Empowerment along with the development of the first and second economy might have a significant positive impact, since the market for dairy products and meat might increase significantly which results in higher and more stable prices. The question however is would these higher prices be fed trough to the farmer by the supermarkets and processors? A significant factor which is linked to the economic performance of the country is of course interest rates. Since the Swellendam farm's debt to asset ratio is significantly higher compared to the other farms (Bredasdorp and Caledon), changes in interest rates might significantly impact the financial situation of the farm depending on whether the rate is increasing or decreasing. The management of debt is critical to the survivability and growth of the Swellendam farm, and potential gains from economic growth might be lessened significantly should interest rates increase and cause the farm to pay all potential profits to cover debt payments. Again, however, the question is what should the debt to asset ratio be given that it is almost impossible to farm without debt? This question will be researched in co-operation with experts and farmers in the area in greater detail during 2007.

5.3.4 SAB Barley Farm

Baseline analysis

The SAB barley farm's ability to survive and grow improves over time as interest payments decrease as a result of debt repayments made. However, at present the ability to survive and grow is finely balanced and the probability of a cash deficit is rather large compared to the other Southern Cape farms (Figure 32). Possible reasons for this might be a large exposure to grain income especially barley and zero income from livestock, as well as slightly higher cost structure compared to the other representative farms of the region.

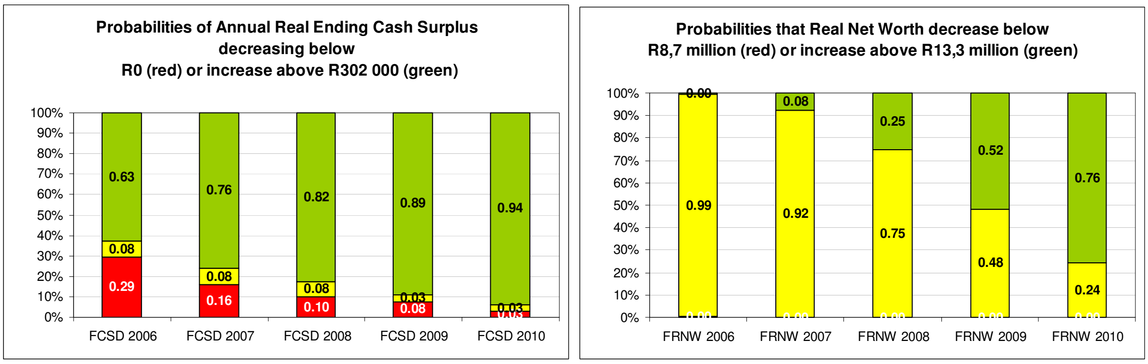


Figure 32: SAB barley farm: baseline financial survivability (left) and growth ability (right)

Scenario analysis

Since the major income of the SAB barley farm is from barley, changes in both international and domestic barley markets have a significant impact on the farm's financial survivability and growth. Therefore, changes in trade patterns of barley which cause either a decrease or increase in barley prices have a significant impact. However, the most significant impact is whether the trade in barley is in terms of locally produced barley or imported barley. Therefore, growth in beer demand as a result of economic growth might have a significant positive OR negative impact on the farm's financial position. Should the trade in locally produced barley increase and prices also increase as a result of greater demand for locally produced barley, the financial position of the farm might change significantly in a positive direction compared to the baseline. Since the debt ratio of the farm is extremely high, but only a portion of the debt is interest bearing, the impact of changes in interest rates is slightly smaller compared to other farms. Also, since no livestock component exist on the farm, a downturn in the barley or wheat industry is not mitigated by any other products produced on the farm. This indicates that the farm faces significant risks in terms of survival and growth, since many of the factors that can cause a downturn in the barley industry is not practically manageable since most of it is either international or macro-economic factors. Therefore, two possible factors that are manageable are a change in production techniques in order to lower production costs of the farm, and also to research the possibility of a livestock component in order to introduce greater financial stability to the farm.

5.3.5 Douglas

Baseline analysis

The survivability and ability to grow of the Douglas farm is currently under extreme pressure (Figure 33). The farm generated a cash deficit at the end of 2005 as a result of extremely low grain prices. This forced the farm to incur additional debt which is carried over to following years as a result of the difficulty to repay the debt. As a result, the probability of the farm incurring a cash deficit remains relatively high during the simulation period (42% during 2007 when adding up red/dark grey and yellow/light grey areas). As a result of this high probability, the ability of the farm to grow is extremely low, and although the probability of real net worth decreasing is stable over time, the probability still remains. This indicates that the financial position of the farm is under pressure and the probability of improvement only improves slightly over time. The lesson to be learnt from this is that the current high maize prices in the market, and the resulting profits that flow from this to the Douglas farm have to be used wisely in order to ensure that the farm's financial future does improve.

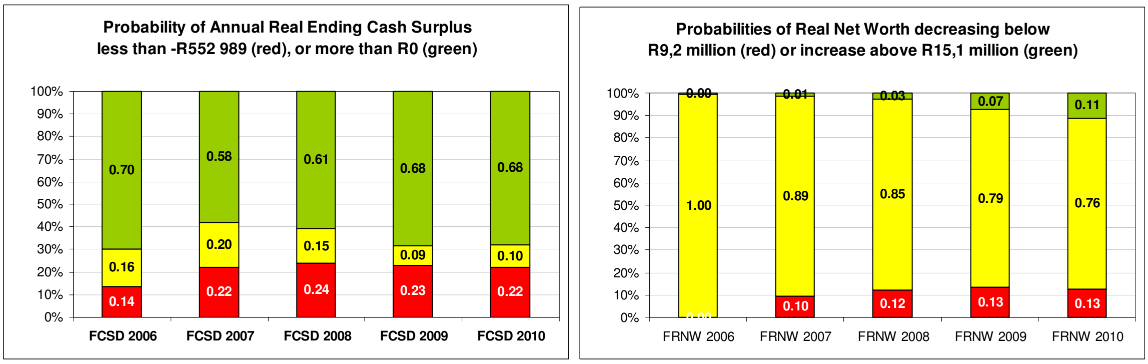


Figure 33: Douglas: baseline financial survivability (left) and growth ability (right)

Scenario analysis

The contribution of barley to income on the Douglas farm is relatively small; hence changes in barley prices as a result of external (international or local) factors are relatively small. One factor that clearly shows in the scenarios are the cost of inputs especially the cost and availability of irrigation water, which could influence the survivability and growth of the farm significantly. Should only water costs increase, production patterns on the farm would possibly change since the farm would have to decide which product is more profitable to produce and use the more expensive water to increase production of the more profitable product. Should both water cost and water availability change, as illustrated in Scenario 4, dramatic changes are likely to occur and the farm might possibly move away from a double cropping system. This has major implications for infrastructure use on the farm, which links up with fixed costs.

Since the farm's debt ratio is relatively high, changes in interest rates have a significant influence on the survivability and growth of the farm. Therefore, on farm level basically three aspects appear to be manageable that might make a significant positive impact on the farm's financial situation namely debt management, decrease in production costs by either changing production techniques or moving towards precision farming, and introducing a livestock component that might lead to better stabilization of the income side of the farm. On industry level factors that could make a significant impact on farm survivability and growth include a possible change in the pricing formula of barley, as well as positive and proactive involvement with water policy formulation in order to manage water costs and water availability.

5.3.6 Vaalharts

Baseline analysis

The Vaalharts farm is under severe financial pressure (Figure 34), mainly because of large carry-over debt, which results in high interest payments, as well as a high cost structure relative to the production and income structure of the farm. To be more specific, the fixed costs of the farm are high relative to the size and income of the farm. This creates the situation where the farm can't absorb variability in terms of prices of both inputs and outputs which in turn puts pressure on the profitability of the farm over time. As a result of the carry-over debt and the large fixed costs, the survivability as well as the growth ability of the farm deteriorates over time.

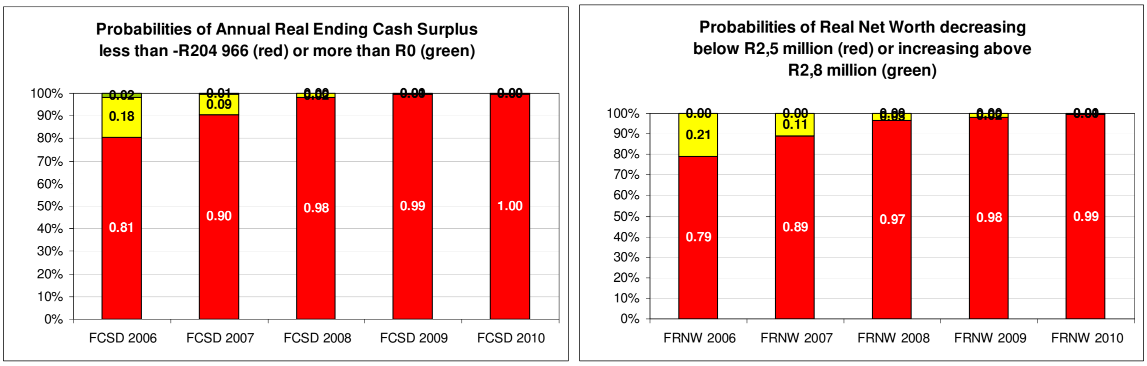


Figure 34: Vaalharts: baseline financial survivability (left) and growth ability (right)

Scenario analysis

Interestingly, the figures do indicate that there is a small glimmer of hope for this farm given a 10% probability (yellow/light grey area) that the farm's cash position could improve during 2007. Might the high maize prices currently in the market be this small probability and therefore opportunity that is actually occurring? How should the profits from these high maize prices be spent in order to improve the financial future of the farm?

From the scenarios it is clear that the factor that influences the financial position most significantly at this stage is carry-over debt and therefore interest rates. Since interest rates are in turn influenced by changes in macro-economic conditions, which are not within the control of the farmer, serious consideration needs to be given to means of managing debt levels. This implies the possible restructuring of debt.

Another factor that clearly influences the farm's position is the cost and availability of irrigation water. As is the case with the Douglas farm, significant changes in production patterns and cropping systems might occur should the cost and availability of water pose constraints in terms of production and also cause financial pressure on the farm given increasing input costs.

One aspect that needs mentioning is the size of the farm. Since the farm is relatively small, fixed costs are high relative to income. This makes the farm less adaptable to changes in output prices, input prices and yields as a result of disease or insects. Therefore, a change in the size of the farm might significantly improve the financial survivability and growth potential of the farm. Along with a change in the size, changes in production techniques might lower input costs significantly, making the farm more adaptable to variability in markets. Again, the question is what is the correct farm size and is it practically possible to change production techniques given capital outlays that are needed to change. These questions will be researched in depth during 2007 along with local area experts and farmers.

5.3.7 Taung

Baseline analysis

The survivability of the Taung farm initially improves over time but then slowly deteriorates, as indicated in Figure 35, because farmers do not own the land, and therefore have no incentive to save and reinvest in the farm business. The result is that all cash surpluses are invested or spent outside the farm business, hence no cash surplus is built up which could give the farm the ability to absorb variations in either input or output prices. This eventually leads to an increase in pressure on the survivability of the farm. This creates the unsustainable situation whereby the farm business survives but experiences increasing pressure, while the growth potential for the business is zero since no investment takes place.

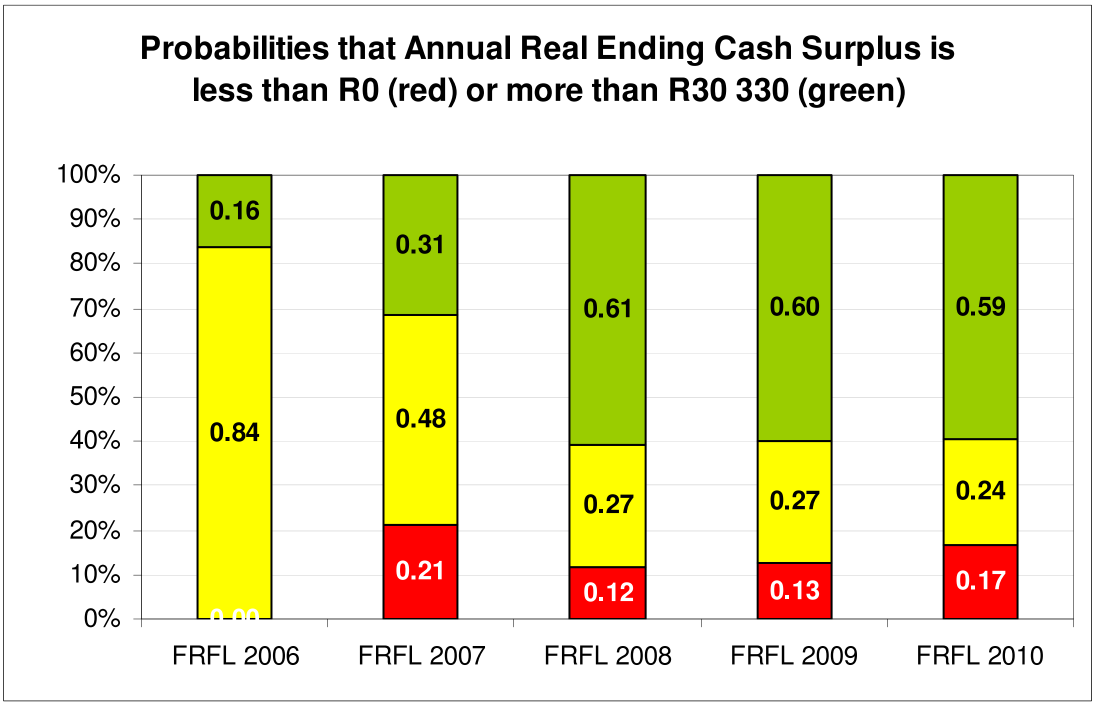


Figure 35: Taung: baseline financial survivability

Scenario analysis

The Taung farm produces only barley and maize. This creates the situation where the farm is sensitive to changes in international barley markets, local barley markets and also international and local macroeconomic and market conditions. Since the farm has no debt, interest rates have no impact on the financial position of the farm. However, the cost and availability of water has a significant impact. The increase in water costs together with less water available has a negative impact on the survivability and growth of the farm. Changes in input costs also impact the farm significantly, hence changes in production techniques might influence the financial position of the farm.

One factor that proves to have the most significant impact on the farm's survivability and growth is that no savings and reinvestment takes place. Should the farmer be able to save and reinvest in the farm, the possibility of building a cash surplus over time proves to provide the best possible buffer against changes in barley markets and macroeconomic factors. The cash buffer therefore supplies the necessary cash to survive in situations where the farm experiences pressure on its profitability. This has significant implications for the way in which the Taung farm is managed and structured at present, in the sense that the farmer has no land ownership or any other form of ownership which might provide an incentive for savings and reinvestment.

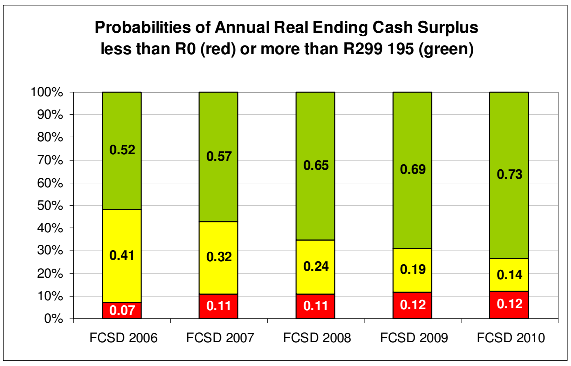
5.4 Summary and concluding remarks

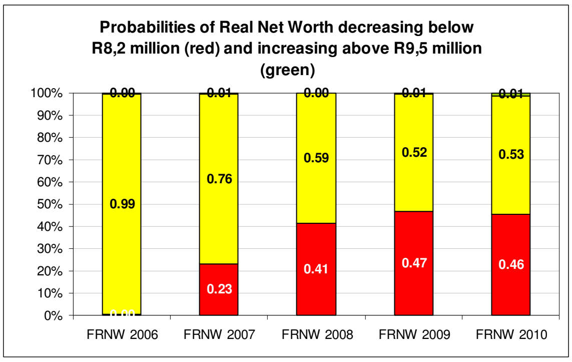
To summarize, from the "wind tunnel" tests conducted on each of the farms by means of the various scenarios, many of the factors that influence the survivability and growth of the various farms are directly related to changes in production techniques, debt management, and size and composition (diversification) of the farm. Major factors in terms of changes on industry level appear to be changes in barley cultivars that will produce higher but more stable yields as well as higher and more stable quality according to quality standards set by the international and therefore local beer industry. Another factor on industry level that might make a difference is a change in the pricing formula for barley. One factor which is even outside the barley industry but which proves most critical in the irrigation areas is water policy, which influences water cost and availability. Since South Africa is a country which experiences water shortages on a regular basis, and since South Africa aims to grow its economy significantly over the next couple of years, pressure on water availability and costs is likely to increase. Hence, positive proactive involvement in the formulation and management of water policy is critical to the survivability and growth of farms producing barley and also to the survival and growth of the barley industry.

Appendix: Farm-level scenario simulations

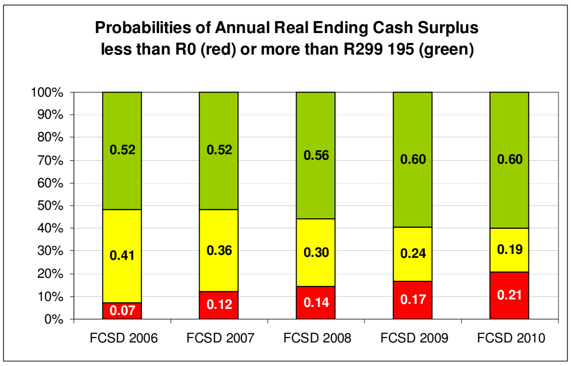
Caledon

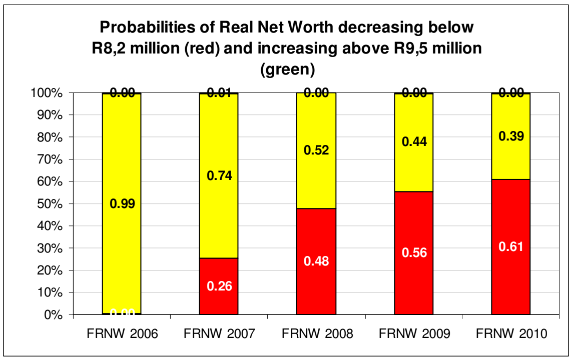
Scenario 1





Scenario 2





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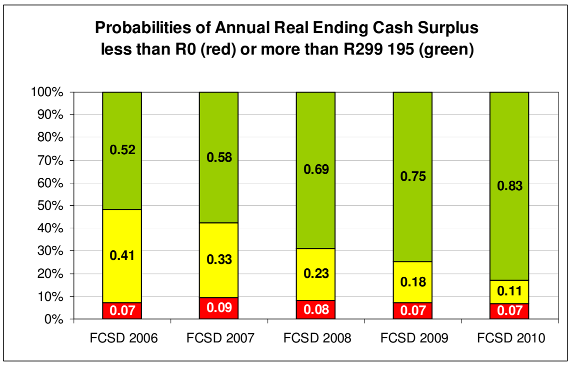

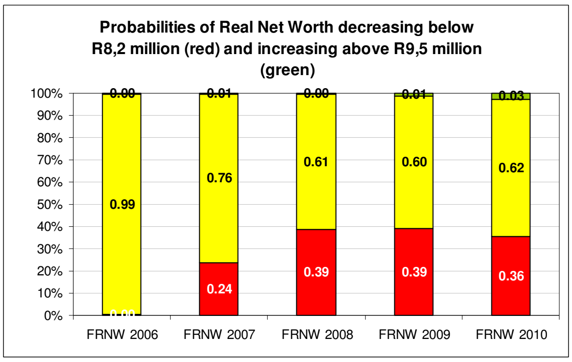

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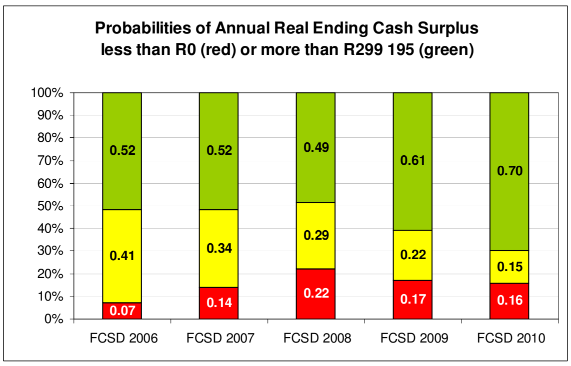
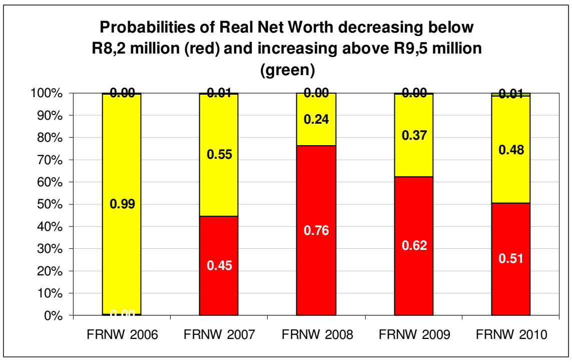
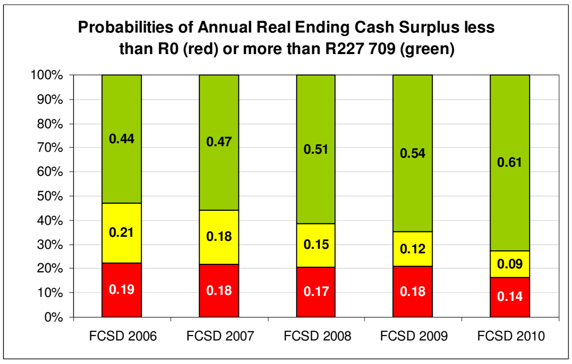
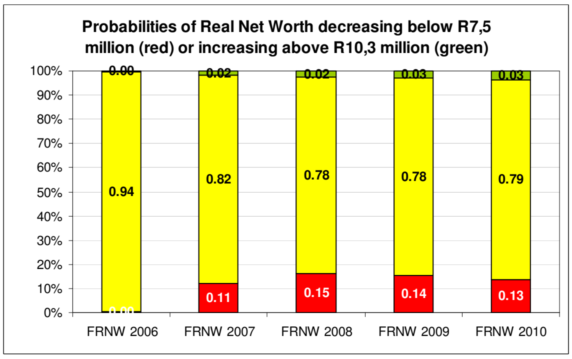




Bredasdorp

Scenario 1





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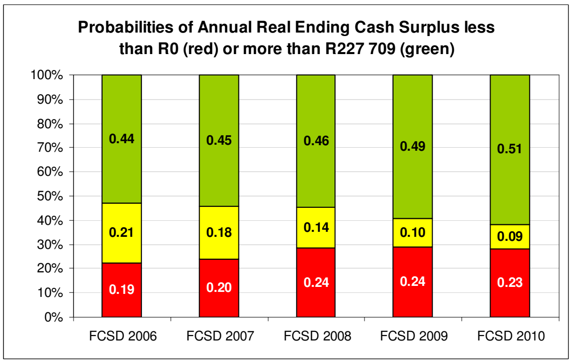

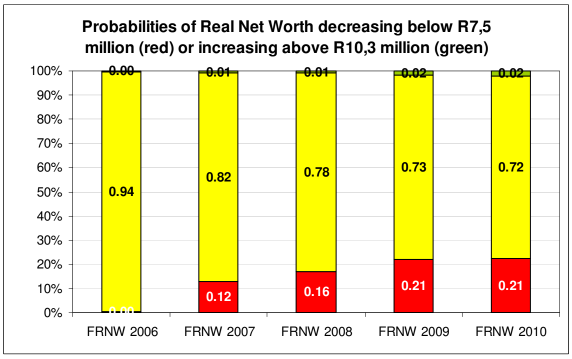

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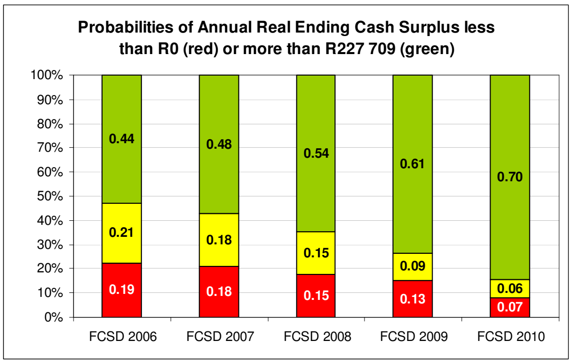

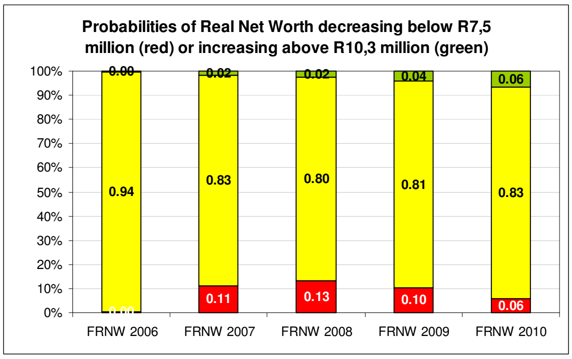

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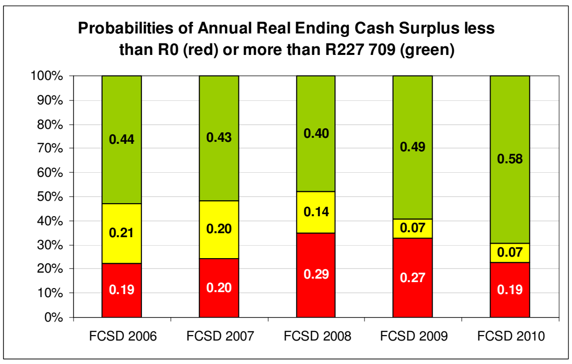
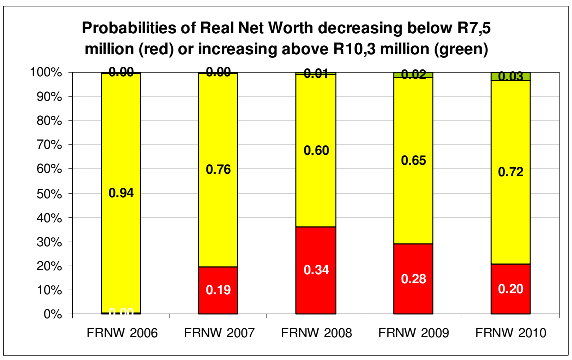
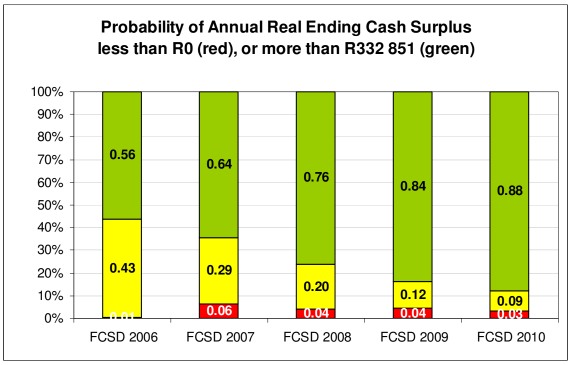
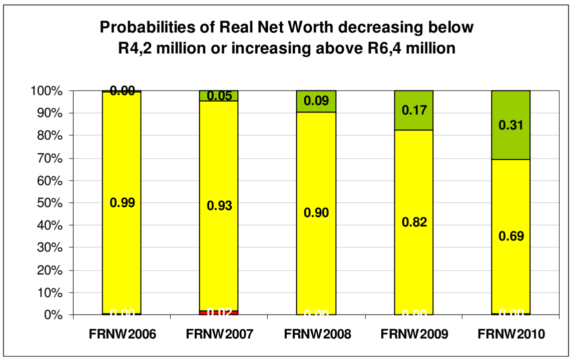




Swellendam

Scenario 1





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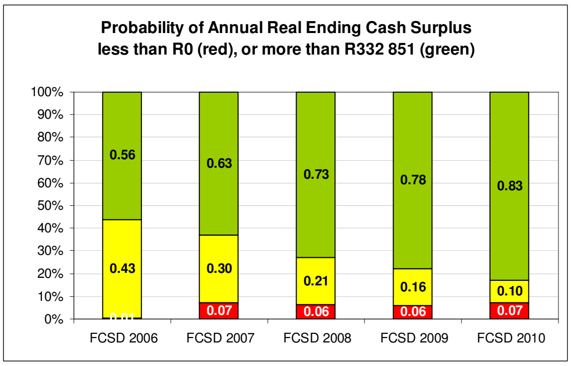

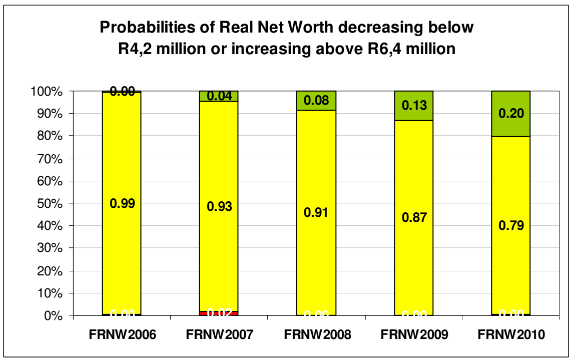

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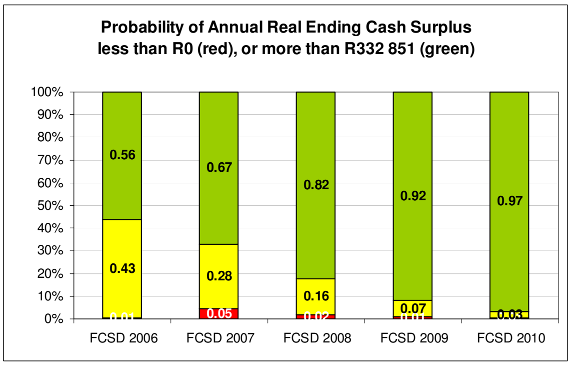

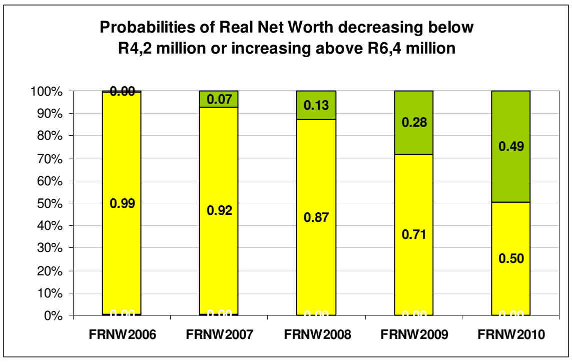

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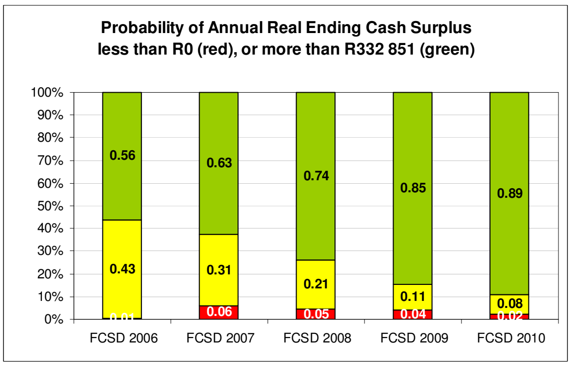
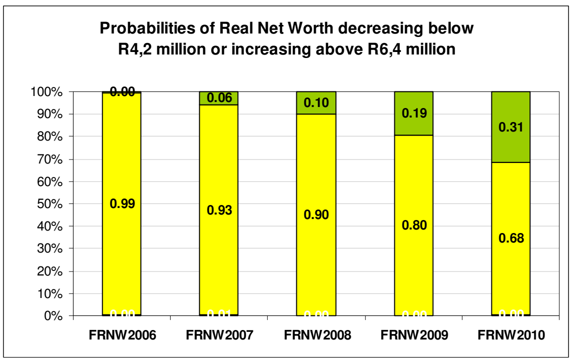
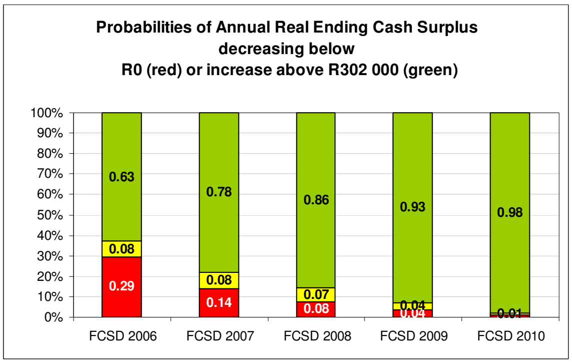
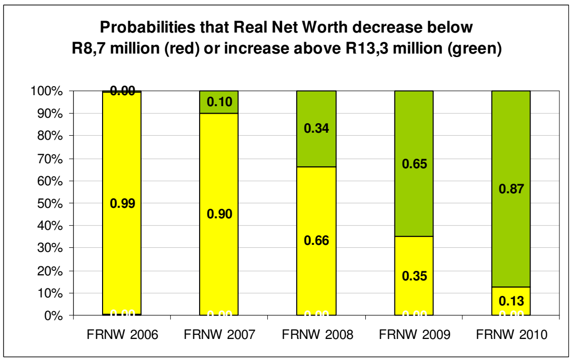




SAB Barley Farm

Scenario 1





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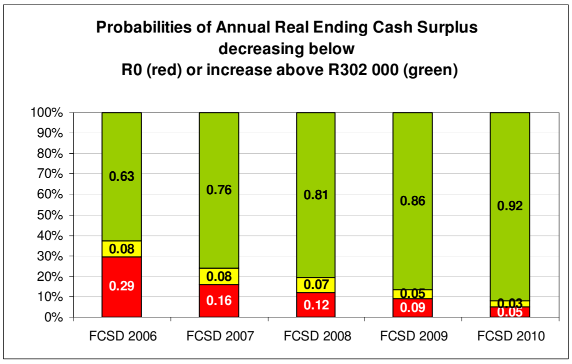

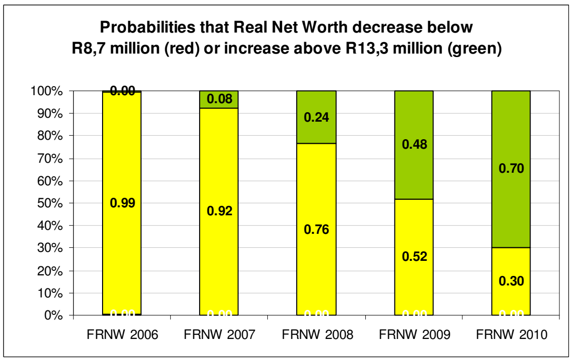

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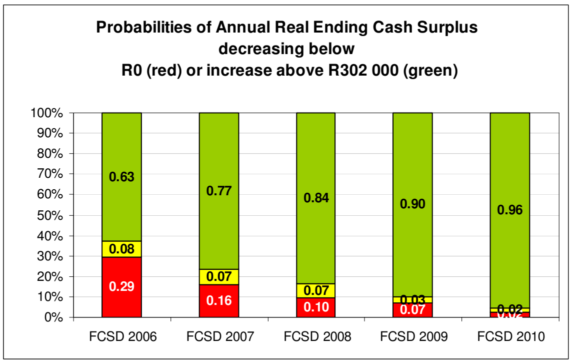

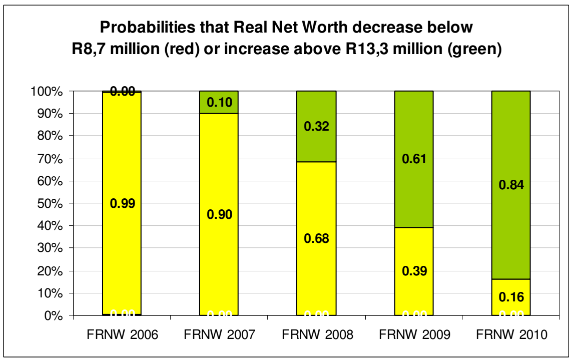

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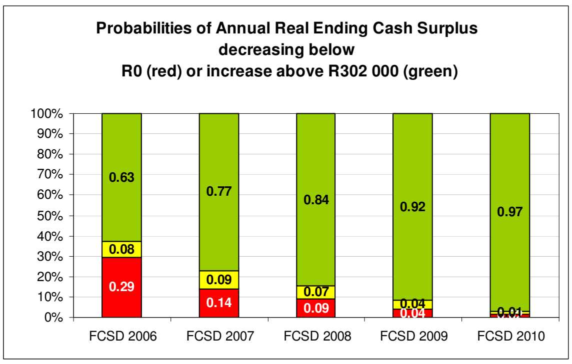
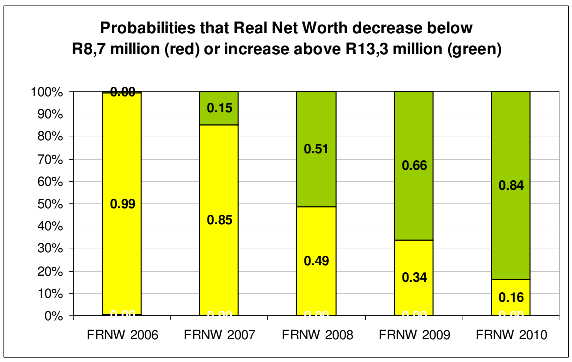
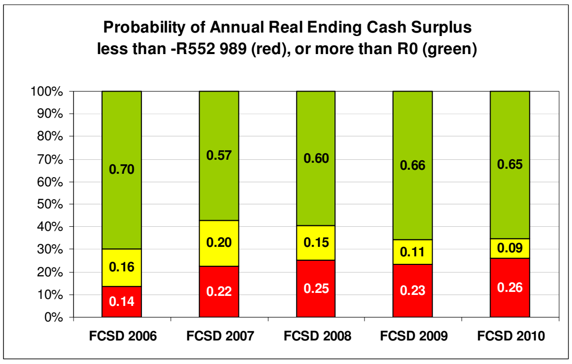
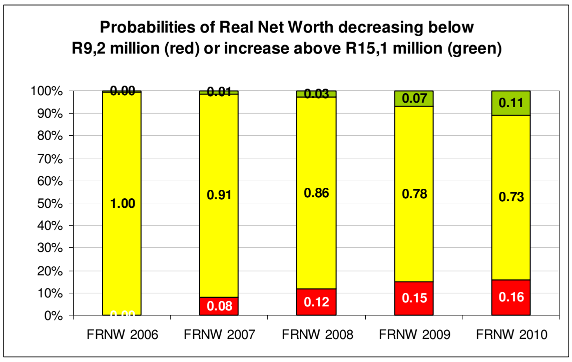




Douglas

Scenario 1





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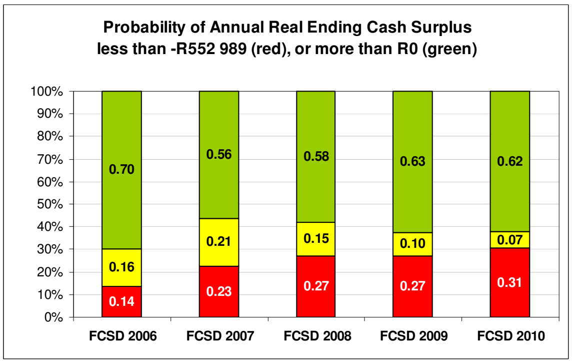

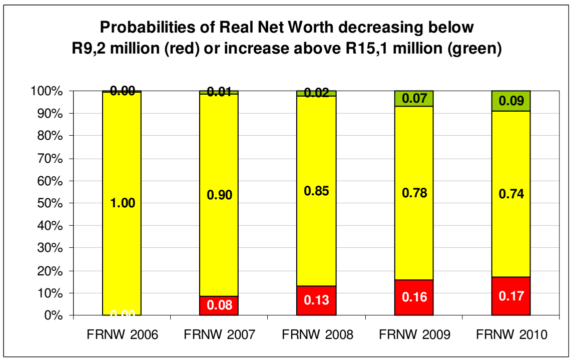

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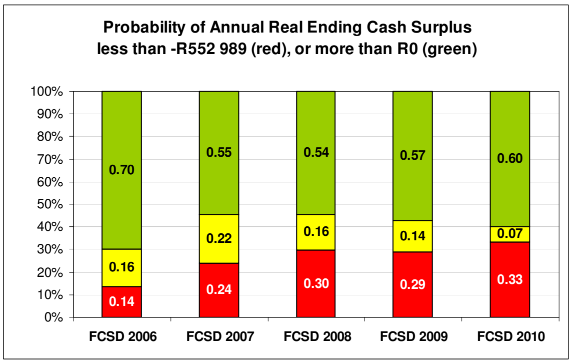

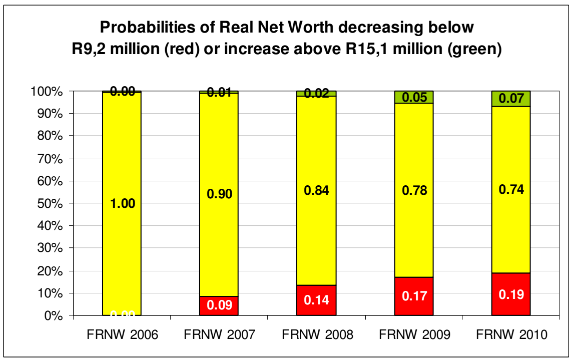

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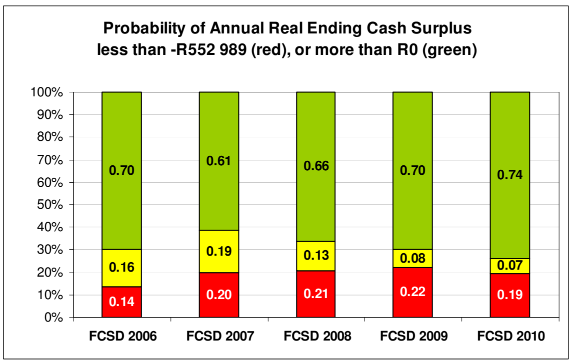
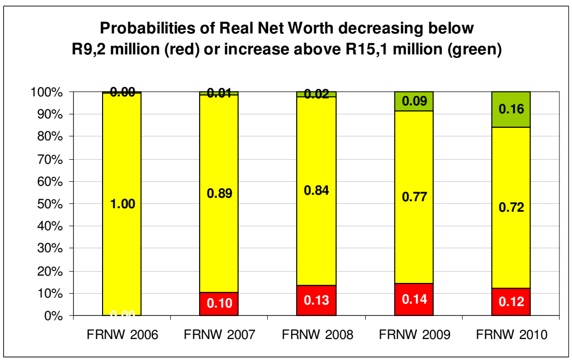
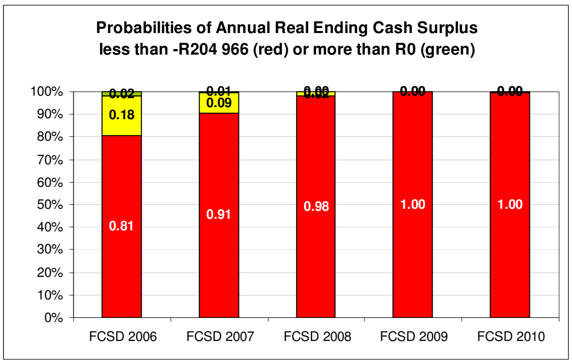
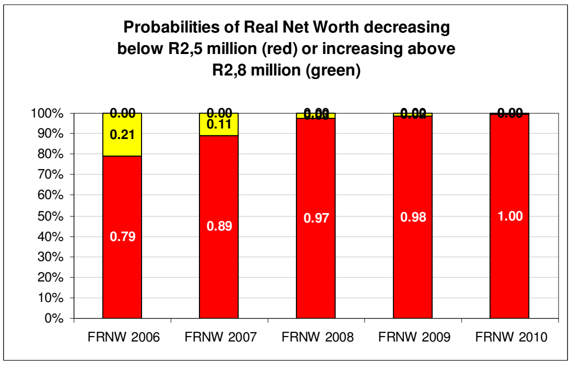




Vaalharts

Scenario 1





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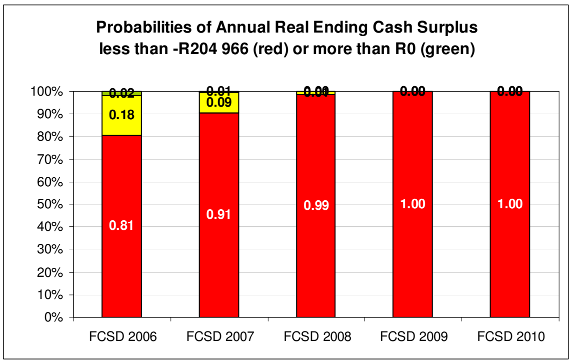

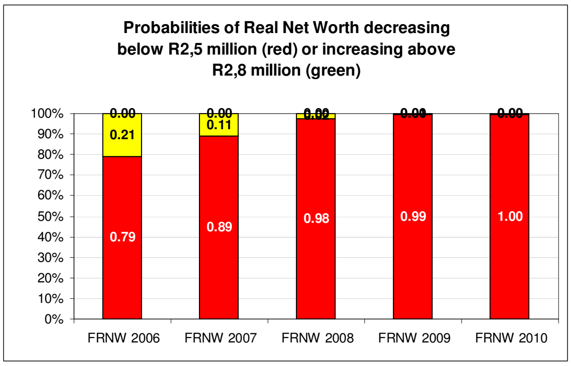

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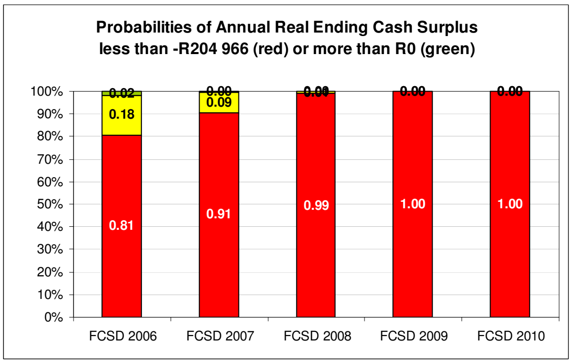

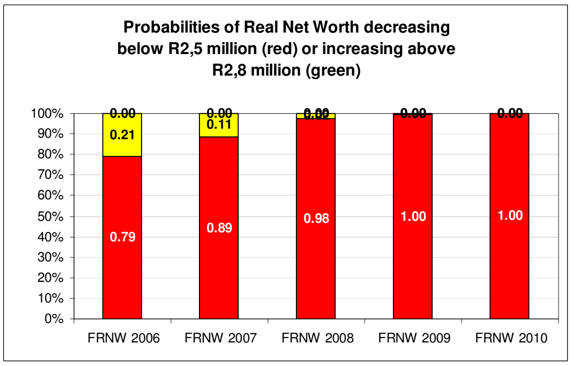

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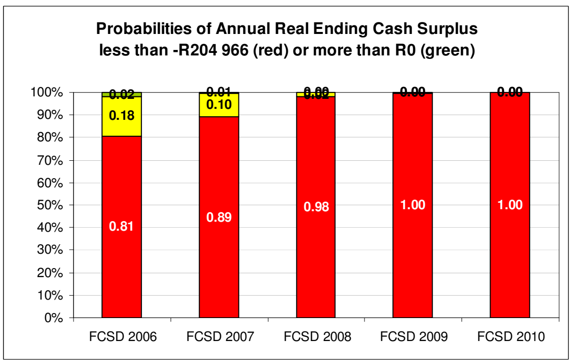
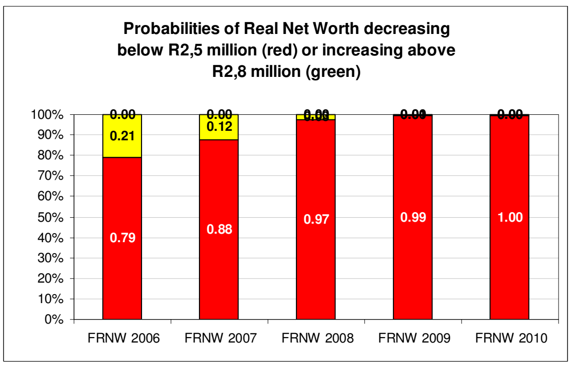
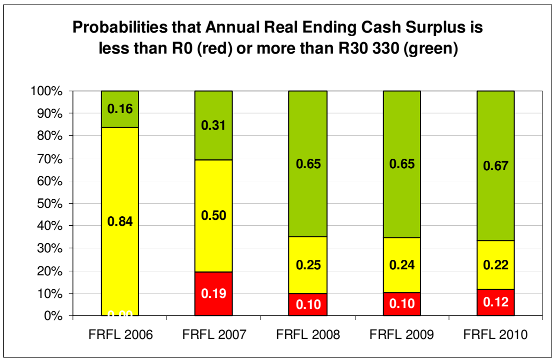




Taung

Scenario 1



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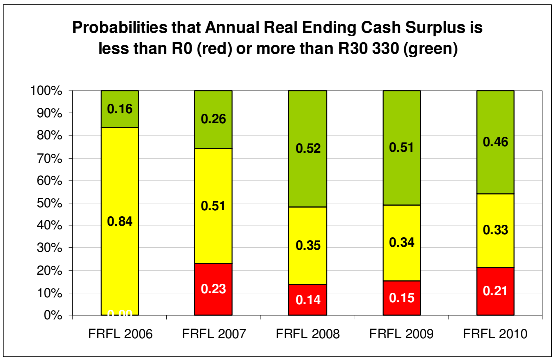

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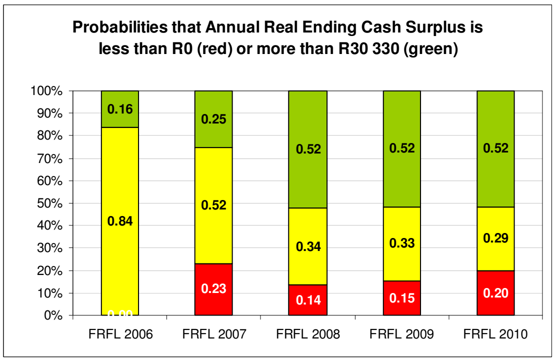

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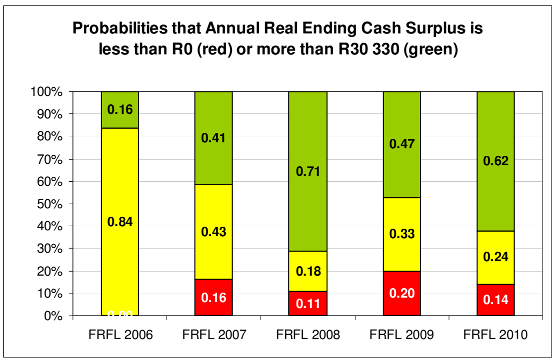

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Region	Co-operative/Institution	Contact Persons
Bredasdorp/Napier Caledon/Riviersonderend	Overberg Agri	Johan Lusse, Andre Uys Pierre Loubser
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Vaalharts	Griekwaland-Wes Co-operative Senwes SAB	Abraham Bekker Jaco Vermeulen Gawie Kotze
SAB barley farm	SAB	Tobie van Rensburg, Gerhard Greeff
Swellendam/Heidelberg	Sentraal-Suid Co-operative	Willem Burger, Henk de Beer
Taung	Senwes SAB	Burrie Erasmus Hennie Stander Gawie Kotze