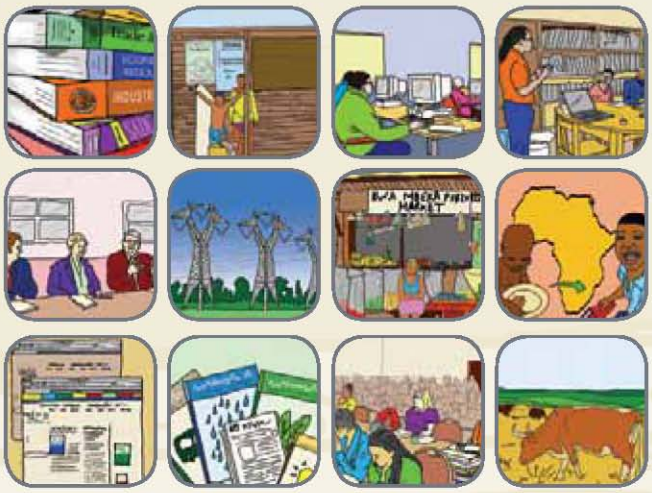
TRADE & INDUSTRIAL POLICY STRATEGIES



Trade and Pro-Poor Growth Thematic Working Group

Analysing the impact of Biofuels on the Rising Food Prices in SACU Countries

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indigenous **growth**

prepared for the

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By

The Bureau for Food and Agricultural Policy (BFAP)

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Terms of Reference as agreed to in the memorandum of understanding:

a) Analyzing the impact of bio-fuels on maize prices during the 2006-8 period on RSA and SACU maize prices
b) Analyzing the impact of the price rises on low income groups in the SACU region
c) Given the projected increase in the use of maize as a feedstock in US and rapeseed in the EU, the entry of China into bio fuel production determine whether any further increases in food prices can be expected as the global economy recovers from the current recession
d) Based on output and demand scenarios, determine whether and when RSA exportable surpluses of maize, ,wheat and sorghum are likely to occur
e) Prepare a draft report no later than 15th December, 2009.
f) Prepare a report to publishable international standards within ten working days of receipt of comments on the first draft.

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A.) ANALYZING THE IMPACT OF BIO-FUELS ON MAIZE PRICES DURING THE 2006-8 PERIOD ON RSA AND SACU MAIZE PRICES

I.) INTRODUCTION

A number of research organisations around the world have recently attempted to capture and explain the impacts that biofuel policies have on agricultural commodity markets. Previously, food price inflation has gone along with the general inflation trend but this has changed. On the supply side the international market has experienced a slightly shorter supply of commodities with weather conditions being one of the most important factors involved (Westhoff, 2008). Despite lower production of some crops, total world grain production still increased by an estimated 4.1% or 80 million tons between 2005 and 2007. On the demand side, total grain consumption has actually increased by 83 million tons or 4.3% with factors such as increased grain consumption in India and China, who together accounted for approximately 28% of the increase in global grain consumption. This together with the additional 35 million tons of maize used in the US corn to ethanol program during the 2005/06 and 2007/08 marketing years have had a combined effect on the total global demand. In addition a weaker dollar, higher energy costs and increased demand for biofuels as well as the response of many governments to restrain domestic price increases by curbing exports and reducing import barriers have resulted in lower supplies on the world markets and thereby raising prices even further (Westhoff, 2008). Among the factors influencing demand and supply has been the additional use of maize in the US ethanol program but also the additional use of feedstock for biofuel production in many other countries of the world. By how much did these programs actually influence the increase in prices?

Researchers agree that it is difficult if not impossible to compare estimates of one study to those of other studies due to the different methodologies used and different time lines compared as well as different food products examined. They do however agree that the production of biofuels did have some sort of impact on food prices. Mitchell (2008) estimates that 70-75% in the food price increases was caused by

biofuels and the related consequences of low grain stocks, large land use shifts, speculative activity and export bans. Collins (2008) puts the figure a bit lower and estimates that the increased maize demand for ethanol could account for 25 to 50% of the maize price increase expected from 2006/07 to 2008/09, while the USDA's secretary Schafer was quoted as saying, "According to our analysis, the increase in biofuel production accounts for only 2 to 3% of the overall increase in global food prices" (Lynch, 2008).

The International Food Policy Research Institute (IFPRI) has run some projections on changes in the biofuel policy programmes and has found that food prices increase in both scenarios. The first scenario plays out where the actual biofuel investment plans for countries investing in this sector remain as laid out, while increased investments and biofuel expansions take place in high potential countries that have not yet considered the biofuel route. The second scenario in their analysis includes a far more aggressive biofuel expansion strategy and results in doubling of levels compared to those used in the first scenario. The findings indicate that in the scenario with the current biofuel policy in place, prices of staples such as maize, oilseeds, sugar and wheat are expected to increase by 26.3%, 18.1%, 11.5% and 8.3% from their baseline levels, respectively. More worrisome for net food importers are the IFPRI IMPACT model results, simulated under a drastic biofuel expansion scenario. Price increases of 71.8% for maize, 44.4% for oilseeds, 26.6% for sugar and 20% for wheat above baseline levels are to be expected, which in turn can have a severe impact on the calories that are available for human consumption. The impact on calorie consumption is projected to be so severe that under a drastic biofuel expansion scenario, calorie availability in Sub Saharan Africa can decrease by as much as 8.5% (von Braun, 2007).

This said it becomes clear that governments around the world and in particular, governments planning to initiate a biofuel program should carefully consider their strategies as these could potentially have a severe impact on the rural poor. Various studies and models have indicated that there has been an upward movement in food prices from 2006 to 2008 and all of the studies have indicated that the additional processing of agricultural commodities, into biofuels, did to some extent contribute to this overall impact. Internationally, maize prices, $78 per ton in January 2006 to $215

per ton in June 2008, all of which had a severe impact on maize prices across the world.

The following section explores the impact that this increase in the US maize price had on the South African and SACU maize price and goes into deeper detail with respect to the different price trends that the various commodities followed.

II.) ANALYSIS

Economies, mineral prices and agricultural commodities all experienced a tremendous upward trend in both growth and prices from the end of 2006 up until mid 2008. The large economies of the world were growing at rates above 2% while the economies of the developing world, such as India and China were growing their economies at approximately 10% per annum (BFAP, 2009). Higher energy demands helped the prices of minerals along which also trended upwards. Due to the high dependence on fossil energy it was rather obvious that the price of crude oil would also increase along with a higher economic growth rate. Commodity prices are often correlated to some degree and it is often the case that through government policies, these links become stronger. The move towards producing biofuels from agricultural commodities and the subsidisation of these programmes in order to increase their financial viability, has resulted in now, more than ever before, that agricultural commodities are more closely linked to the energy markets.

Before the correlations between the world maize price, the South African maize price and the oil price are presented, it is important to have a basic understanding of the equilibrium pricing conditions in the South African grain markets that determine prices in the domestic market. More importantly, these equilibrium pricing conditions change as local supply and demand dynamics determine whether local prices trade at import parity, export parity or under autarky. The basic functioning of the South African white maize and wheat markets are presented in the two figures below. Whereas, the SAFEX white maize price has fluctuated between import parity and export parity depending on whether there is a surplus or a shortage in the domestic market, the SAFEX wheat price has traced the import parity price over the past decade purely because South Africa is a net imported of wheat.

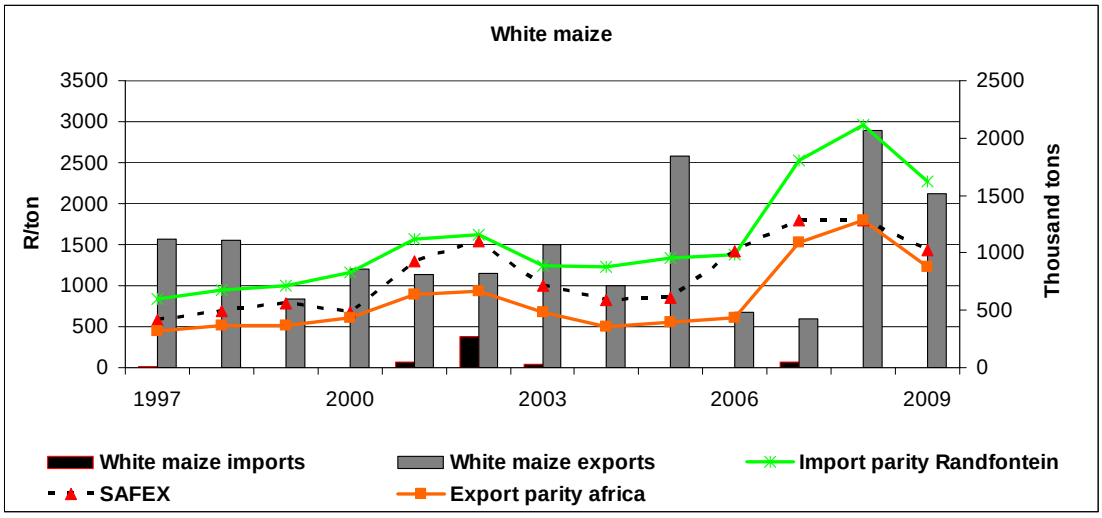

Figure 1: Import-export parity price space for South African white maize

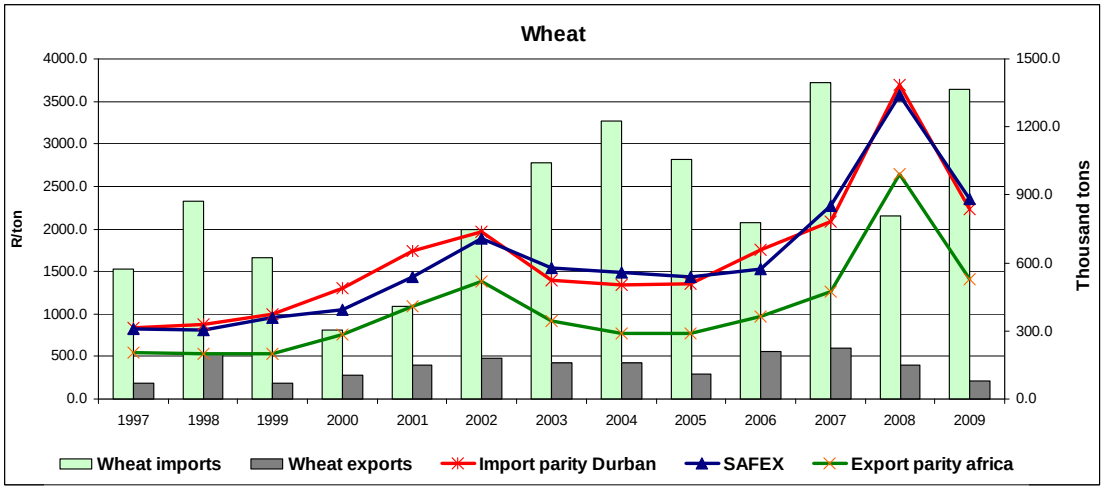

Figure 2: Import-export parity price space for South African wheat

The key implication from these two figures is, however, that the correlation and more importantly the rate of transmission from parity prices onto domestic prices change over time for some commodities, like white maize. This implies that there is not always a positive correlation between the world price, the exchange rate and the SAFEX white maize price. For other commodities, like wheat, that consistently trade at import parity, there is a positive correlation between the parity price and the local price and shocks on international markets are transmitted more directly onto the local markets.

All the discussions and projections that are presented in the following sections take these important equilibrium pricing conditions into consideration.

Analysis – correlation matrix

Prior to 2006, the correlation between the CBOT maize spot price and the crude oil price was relatively low at 0.43 while the correlation between the CBOT price and the South African maize price was positive, 0.27 for white maize and 0.41 for yellow maize. Interestingly, the correlation between oil price and the South African maize prices was negative, at -0.4 for white and -0.37 for yellow maize, respectively

Table 1: Correlation matrix, CBOT corn, SAFEX white and yellow maize, Oil

Correlation Matrix	2000 to 2005			
	Oil price	CBOT corn	SAFEX White Maize	SAFEX Yellow Maize
Oil price	1	0.43	-0.40	-0.37
CBOT YELLOW		1	0.27	0.41
SAFEX White Maize			1	0.96
SAFEX Yellow Maize				1

Post 2006 the correlation between the CBOT maize spot price and the crude oil price changed dramatically. For the period January 2006 to December 2008, the CBOT price and the crude oil price were correlated at 0.75. In addition, the South African maize price followed the CBOT price very tightly at a correlation of 0.83, meaning that the changes in the international market were having an impact on the South African price. The South African maize price was less affected by the oil price at a correlation of 0.57 while the exchange rate of the South African Rand to the US $ played and even less significant role at a correlation of 0.44.

Table 2: Correlation matrix, CBOT corn, SAFEX yellow maize, Oil, R/$ Exchange rate

Correlation Matrix	2006 to 2008			
	CBOT corn	SAFEX Yellow Maize	Oil price	Exchange rate
US Maize	1	0.83	0.75	0.57
SA Maize		1	0.57	0.44
Oil price			1	0.08
Exchange rate				1

When splitting up the time periods in order to determine during which time the correlation was highest, it becomes clear that as the oil price increases, so to does its correlation with the US maize price. During 2006 oil prices averaged $60 per barrel and the price was negatively correlated to the US maize price at -0.55. The SA maize price also had a weak correlation to the oil price at -0.12 but both the SA and US maize prices were strongly linked with a correlation of 0.82. In 2007 the oil price

averaged $66.55 per barrel over the 12 month period and the correlation with the US maize price improved to 0.37 while the correlation with the SA maize price was very high at 0.72. This can however be attributed to the South African maize sector trading at higher prices due to a smaller harvest. During 2008, a time of extremely high oil prices, the correlation amongst commodities seemed to at its highest level. In 2008, the price of crude oil averaged $94.2 per barrel and both the US and SA maize prices had a strong correlation to oil of both 0.87 and 0.82, respectively.

Table 3: Correlation matrix, CBOT corn, SAFEX yellow maize, Oil, R/$ Exchange rate

Correlation Matrix	2008			
	CBOT corn	SAFEX Yellow Maize	Oil price	Exchange rate
US Maize	1	0.58	0.87	-0.48
SA Maize		1	0.82	-0.65
Oil price			1	-0.78
Exchange rate				1

From the correlations it becomes clear that there is a definite closer relationship between higher oil prices, especially above $90 per barrel, and maize prices both in South Africa and the US. It therefore seems that at higher price levels, oil and maize follow a similar trend and have a higher correlation, while at lower price levels, below $60 per barrel, the trend is broken and prices could possibly diverge. It is however important that other factors also have an influence on the price. For example, in 2008 it should be kept in mind that the South African Rand depreciated strongly in the midst of the economic crisis and a large maize harvest resulted in the price of white maize trading at export parity for most of 2008 and the first half of 2009. This implies that for the past two seasons maize grain in South Africa traded at the lowest possible prices. The concern is that rainfall in South Africa is not always as stable and reliable as it has been in the past. One possible scenario could be a situation where the South African agricultural sector is in a drought and supply is outstripped by demand. Add a higher oil price due to a recovery in the world economy to this and suddenly the picture changes dramatically. Prices move to import parity and world prices escalate due to the correlation with oil and maize above certain levels, if such a situation had occurred in 2008, one could possibly have looked at a maize price of far higher than R3000 per ton. It is therefore important to understand that the level of parity prices together with a drought could be of great concern to food stability in the SACU region.

Analysis – Price changes

The movements in the price of South African maize seem to be closely linked to the happenings in the international market, often being highly correlated to the CBOT price by as much as 0.83[1] and in other instances showing a low correlation of as little as 0.42[2]. The correlation and international price relationship is of vital importance as this means that the South African agricultural sector and more specifically the maize price, is directly influenced by the changes in the world price and more importantly is the fact that the world maize price is even more strongly linked to the oil price once it reaches a certain price level.

A stronger link to the world maize price also means that the fluctuations in the maize prices, energy prices and world supply and demand will be more clearly felt in Southern Africa. During the period 2006 to 2008, the South African maize price fluctuated and increased steadily. In January 2006, the SA maize price was trading at R946 per ton and steadily increased by 63%, year-on-year, to R1540 per ton in January 2007. During 2007 the price increased by a further 25%, peaking at just over R2000 per ton, a monthly average, after which it stabilised and declined towards the end of 2008, ending the year at 75% higher than what the price was during January 2006.

Seeing that the South African maize price, to a certain extent, reflects what happens internationally depending on the domestic equilibrium price conditions, it can be expected that world maize prices followed a very similar trend. CBOT maize increased year on year by 53% from 2007 to 2008 and by a further 30% from January 2007 to January 2008. CBOT maize prices seemed to have peaked in June 2008 at around 294.17 US$ per ton after which they subsided ending the year on a monthly average of around US$ 160 per ton. Interestingly, the overall increase for the period 2006 to 2008 reflected an overall price increase of 105%.

[1] Period 2006 to 2008
[2] Period 2007 to 2008

III.) CONCLUSION

It seems that through the link of the biofuel industry maize and oil prices have become far more correlated. It is this link, at higher price levels, and the high volatility that seems to be the nature of the oil price, which can play a far more decisive and threatening role in the food stability situation within the SACU region. Higher oil prices thus spur on commodity prices, especially maize and with that influence its affordability. Yet from the following section it will be evident that South Africa exports into the region are positively influenced by higher oil prices since the domestic production will be increased as the profitability increases. When the oil price falls, the link between the commodity prices, in this instance oil and maize, is broken and the two are far less correlated. It is therefore important to understand that one of the main threats to SA and SACU maize prices affordability is a higher oil price.

B.) ANALYSING THE IMPACT OF PRICE RISES ON LOW INCOME GROUPS IN THE SACU REGION

I.) INTRODUCTION

The world maize price increased by 105% during the period January 2006 to December 2008, this constitutes a doubling of the price from a level of US$ 78.8 / ton to US$ 161.4 per ton in a period of 36 months. Locally prices increased by 75% during the same period from a level of R946 per ton in January 2006 to R1652 per ton in December 2008, peaking at an average price of R2073 per ton and a daily high of R2256 per ton on the 30th of June 2008.

Taking into account that maize is the staple food of most low income earners in the SACU region, these price increases are indeed a reason for concern. It is a fact that low income consumers do not entirely rely on maize for their staple diet but it does definitely form a major part of it (BFAP, 2009). In the following section the price movement in the retail prices of maize meal is analysed in a few SACU countries. In addition comparisons are drawn with respect to the price movement of a complete food basket designed by the Department of Agricultural Economics at the University of Pretoria and the National Agricultural Marketing Council (NAMC) so that the overall impact on the poor in Southern Africa becomes clearer.

II.) ANALYSIS – MAIZE MEAL RETAIL PRICES

Data and analyses indicate that there is a strong correlation between the local and world maize price and that the relation of these variables changes with respect to oil depending on the levels at which the oil price trades. Studies by the Food Price Monitoring Committee in 2002 and 2003 have found that the farm gate price of maize and the retail price of maize have a price transmission period of approximately 4 months, stating that a shock in the farm gate price, i.e. producer price, will be transmitted to the consumer within a period of 4 months as miller hedge their prices in advance (NAMC, 2003).

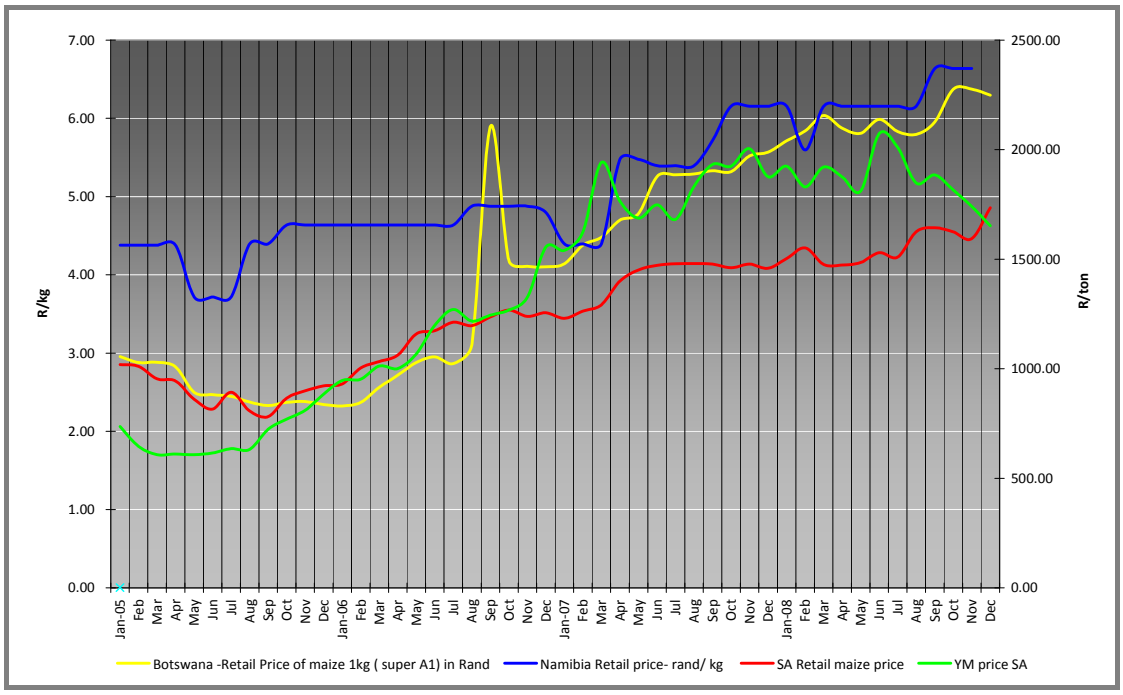

Figure 3: Prices of maize and maize meal in Botswana, Namibia and South Africa.

Source: Grain SA, Central Statistical service of Namibia and Botswana, 2009

From Figure 3 it becomes clear that there is indeed a lag in price changes between the producer and the retailer. This is also what one would expect, given the extensive research that has been conducted in this field. What is however of concern is that the retail prices seem not to be declining, even after the producer prices have followed a clear declining trend for some time! Figure 4 below shows clearly that the South African yellow maize price, which has been lagged by 4 months is already on a downward trend but prices in both South Africa and Botswana are still on an upward trend, especially South Africa, or declining at a far slower pace, as it seems to be the case in Botswana. In essence this could be a problem within the supply chain or perhaps and issue of market power, as was the case in 2002.

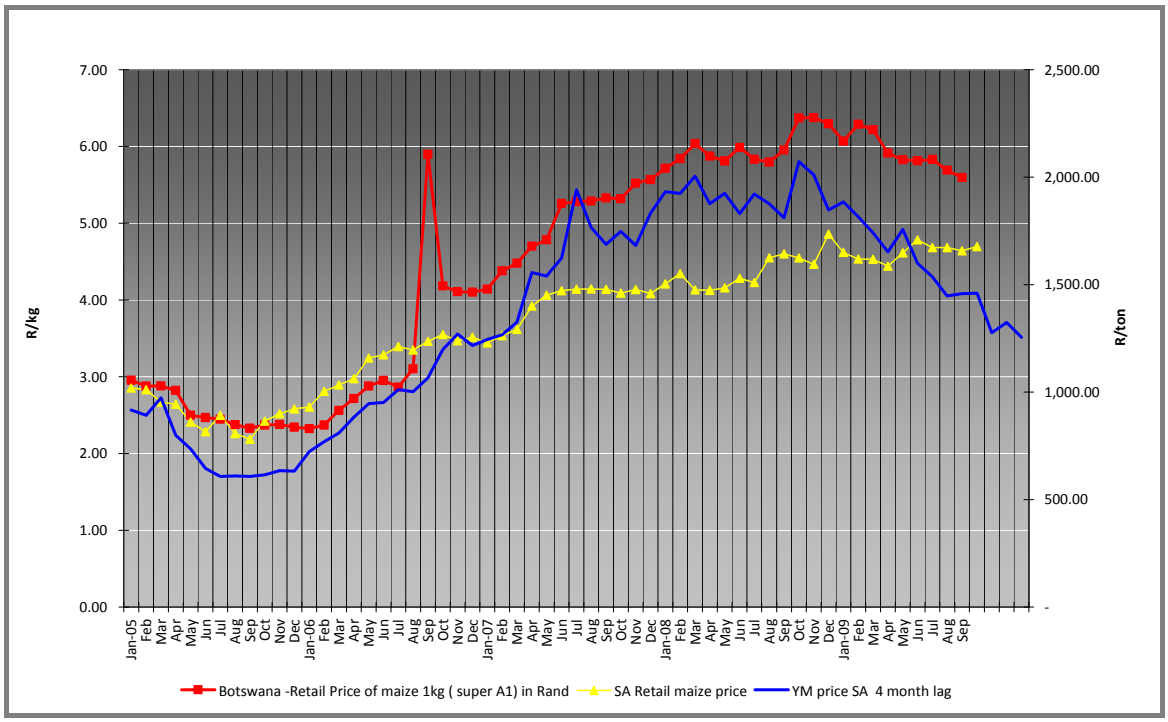

Figure 4: Retail and producer maize prices with a 4 month lag.

Source: Central Statistical Offices (Namibia and Botswana), Grain SA, 2009.

Retail prices of maize meal have increased in all three instances and interestingly the January 2006 to January 2007 year-on-year price increase seemed to be the most significant for both Botswana and South Africa at 78% and 21%, respectively. From January 2007 to January 2008, each of the three countries experienced an increase in the retail price of maize with the largest increase occurring in Namibia at 40%, South Africa at 22% and Botswana at 21%. Price increases during 2008 were moderated with the price transmission mechanism in the supply absorbing some of the impacts. Retail prices of maize increased by 10% in Botswana, 8% in Namibia and 15% in South Africa. Interesting is the fact that retail prices of maize meal have not been reduced in 2009 despite the South African white maize price declining by more than R280 per ton in 2009 from an average level of R1804 per ton in January to an average level of R1519 per ton in October 2009. This constitutes a decline of 16% in the spot price while retail prices in South Africa have increased by 5% and decreased by only 1.2% in Botswana.

Table 4: Price increases in the retail price of super maize meal

Retail prices	January 2006 - January 2007	Jan 2007 - Jan 2008	Jan 2008 - Dec 2008
Botswana	78%	21%	10%
Namibia	-5%	40%	8%
South Africa	21%	22%	15%

Source: NAMC and Central Statistics Offices (Namibia and Botswana), 2009.

Analysis – Food baskets

A food basket consists of various food items that a typical consumer would purchase as part of his monthly shopping activities. The food basket aims at creating a representative group of items that a person would purchase and in so doing captures the overall impact that price changes have on the person's purchasing power.

Table 5: Food basket items

Product	Unit
Bread - White Sliced	700grams
Bread - Brown Sliced	700 grams
KOO Butter Beans in Brine	410 grams
Lucky Star Pilchards in Tomato	425 grams
Cooking Oil	750 ml
Maize Super	5 kg
Sugar	2.5 kg
Rice	2 kg
Ricoffy Reg	750 grams
LongLife Milk Full Cream	1 litre
Rama Brick	500 grams
Black Cat Peanut Butter Smooth	410 grams
Chicken - Whole Fresh	1 kg
Eggs	2.5 dozen
Beef Stewing	1 kg
Onions Pack	1 kg
Cabbage	Per unit
Tomatoes pack	1 kg
Bananas	1 kg

Source: NAMC, 2003 – 2009.

The food basket of goods had a value of R208.96 in January 2006 taking into account the prices of the various items at that stage. During the first 12 months, January 2006 to December 2006, the value of this food basket increased by 14.3%. From January 2007 to December 2007 the value of the food basket increased by a further 9.4%. The greatest increase in the value of the food basket occurred in 2008 when the value of the food basket increased from R263.75 in January to R334.88 in December, a total increase of 28.1% and meaning that consumers now had to pay R125.92 more per

food basket purchased, than compared to what they paid in January 2006. The 28.1% inflation of the food basket in 2008 far outstripped the revised Statistics South Africa inflation figures of 7.1% for the same period, by almost 4 times as much! The high food price inflation, especially during 2008, had the largest impact on poor consumers especially as the items in the food basket largely form part of the diets of such individuals.

III.) CONCLUSION

The changes in the world maize price and the South African maize price have resulted in higher local retail prices and have hence had an impact on the consumer. The retail price of maize meal has increased dramatically in all mentioned countries during the period January 2006 to December 2008. Botswana experienced the highest overall increase at 170%, followed by South Africa with 86% and Namibia with 43%. It is clear that an impact of such magnitude is difficult for consumers of any country to absorb especially if the country is question is a net importer of the commodity.

An analysis of items in a food basket reveals that food price inflation in South Africa has also been largely affected by the international food price increases of 2008. General inflation levels, also called headline inflation, totalled 7.1% in 2008 (NAMC, 2009), but the food price inflation for the respective food basket ended the year on 28.1%, almost four times as high. In essence this meant that consumer were worse off during this time period, with the food basket costing them R125.92 more in December 2008 than in January 2006.

Another point of interest is the lag effect of changes in retail and producer prices. It has been researched extensively and the general findings include that retail prices lag producer prices by 4 months. In the case of South Africa it is rather disturbing that the price decline in the producer price already started in December 2008 and has been following a constant downward trend, but has still not been implemented at retail level. The data does however indicate that retail prices in Botswana have already commenced on a downward trend, even though the rate of decline is slower over the period at 7% compared to the 28% decline at producer level.

C.) GIVEN THE PROJECTED INCREASE IN THE USE OF MAIZE AS A FEEDSTOCK IN US AND RAPESEED IN THE EU, THE ENTRY OF CHINA INTO BIOFUEL PRODUCTION, DETERMINE WHETHER ANY FURTHER INCREASES IN FOOD PRICES CAN BE EXPECTED AS THE GLOBAL ECONOMY RECOVERS FROM THE CURRENT RECESSION.

incorporating

D.) BASED ON OUTPUT AND DEMAND SCENARIOS, DETERMINE WHETHER AND WHEN RSA EXPORTABLE SURPLUSES OF MAIZE ARE LIKELY TO OCCUR

I.) INTRODUCTION

Higher energy prices have contributed to higher farm commodity prices by increasing costs of production and by increasing the demand for biofuels. High petroleum and natural gas prices increase fuel and fertilizer costs. They also raise the cost of transporting agricultural inputs to producers and outputs to processors and consumers. High gasoline and diesel prices make biofuels more competitive, encouraging expanded production (Westhoff, 2008). The closer correlation between commodity and mineral prices has thus partly resulted in higher oil prices driving up food and agricultural commodity prices. During the past year, oil prices have increased from $39.98 per barrel in January 2009 to an average of $67.84 per barrel in October 2009. In November oil prices have been as high as $77 per barrel and but seem to be holding rather steady as world demand for oil is expected to increase slightly in 2010 (OPEC, 2009). The question that remains is if and by when oil prices will increase above $80 per barrel, which in turn is seen as the price level at which the change in correlation does become more significant. The recovery of the oil price is therefore also an important factor and with reference to the literature, it seems as if the recovery of economies across the globe, both developed and developing, can play an important role in driving a recovery of the oil price.

Another concern to higher food prices is the changes in mandate, i.e. Renewable Fuel Standard that the US might enter into when the profitability of biofuel producers come under pressure. As the blending wall nears, a maximum level of 10% that may

be blended into the fuel mix, ethanol producers are feeling their profit margins being squeezed and ethanol prices fall. Lobby groups have started various campaigns in which they aim to increase the current blending mandate to approximately 15%. Concerns are that such quantities of ethanol cannot be handled in the current fuel mix, due to older vehicle incompatibility and therefore an increase to such a level seems less likely. The high economic growth rate and lower oil price scenario as well as both high oil price scenarios include a E15 mandate as the pressure on government by lobby groups is simply too big and as a result the RFS is altered. This results in an expansion in ethanol production, drawing more maize into ethanol and therefore maize prices trade higher, so less maize is used to feed livestock or for exports and production increases (FAPRI, 2009).

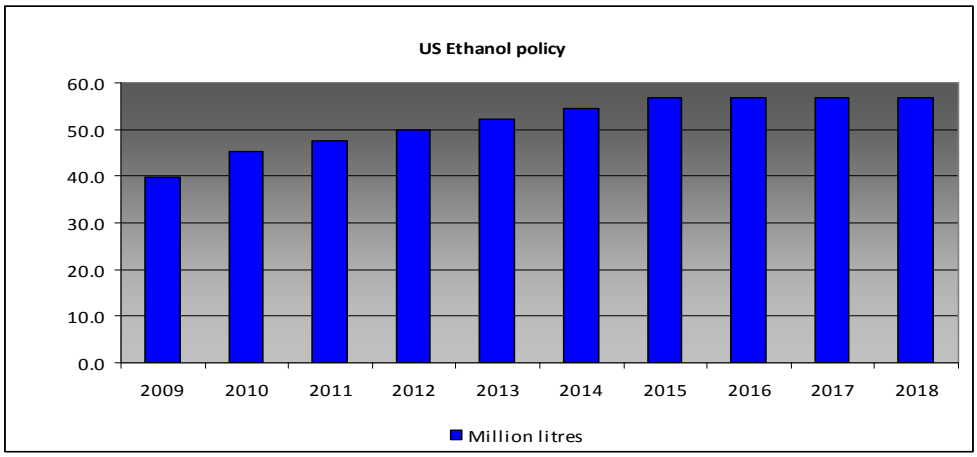

Figure 5: Current Renewable Fuel Standards, USA 2009 – 2018

Source: FAPRI, 2009.

The Brazilian ethanol industry also followed an evolutionary trend in terms of their blending mandates. At first the industry received substantial benefits from the government but these were later on abolished as the industry became self sustainable. Since 1976 blending ethanol into the local gasoline fuel mixture was mandatory with the mandate fluctuating between 10% and 22% and reaching amounts as high as 25% in 2008 (Ministério da Agricultura, 2008). The history of the blending mandate in Brazil is represented in Figure 6, below.

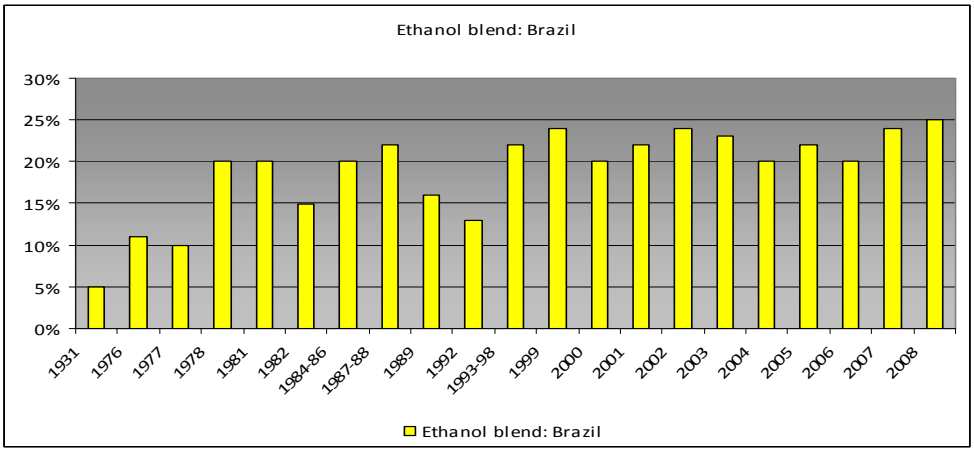

Figure 6: Ethanol blending mandate, Brazil. 1931 – 2008.

Source: Puerto Rica, J.A, 2007.

The following section of the report therefore explores the uncertainties that are faced by net importing countries, which in turn are highly dependent on the international prices of commodities. The scenario planning and thinking strategies are designed around the main uncertainties that are currently present in the sector while the model results of each scenario are simulated with the sector level model of the Bureau for Food and Agricultural Policy, in collaboration with expertise and outputs from the model of the Food and Agricultural Research Institute (FAPRI).

II.) THE SCENARIO ANALYSIS - FRAMEWORK

Food price movements and its links to the price of oil change as a result of the demand for the commodities in terms of food and biofuels, trade distortions and policies, local support programmes and international supply and availability of the product. The scenario planning section aims at exploring two critical uncertainties that will influence the international price of maize and the future price changes and variations in these prices if oil and other mineral commodity prices continue following their volatile trend of the past. The resultant impact of such an increase or decrease in oil prices can then be directly simulated on the prices of agricultural commodities.

The Matrix

The matrix of the four different scenarios is based on the oil price and the recovery of key economies that largely influence the demand for oil. The price range is to above $80 per barrel of oil or below $80 per barrel with various extreme points being included while the other uncertainty is the pace of economic recovery for various country groups, on the one hand Brazil, Russia, India and China (BRIC), and on the other hand, the OECD nations.

The framework of the scenario is structured in such a way that it includes the major uncertainties on the X and Y axes of the diagram while the assumptions, role players and rules of the game shape the model's output within each quadrant.

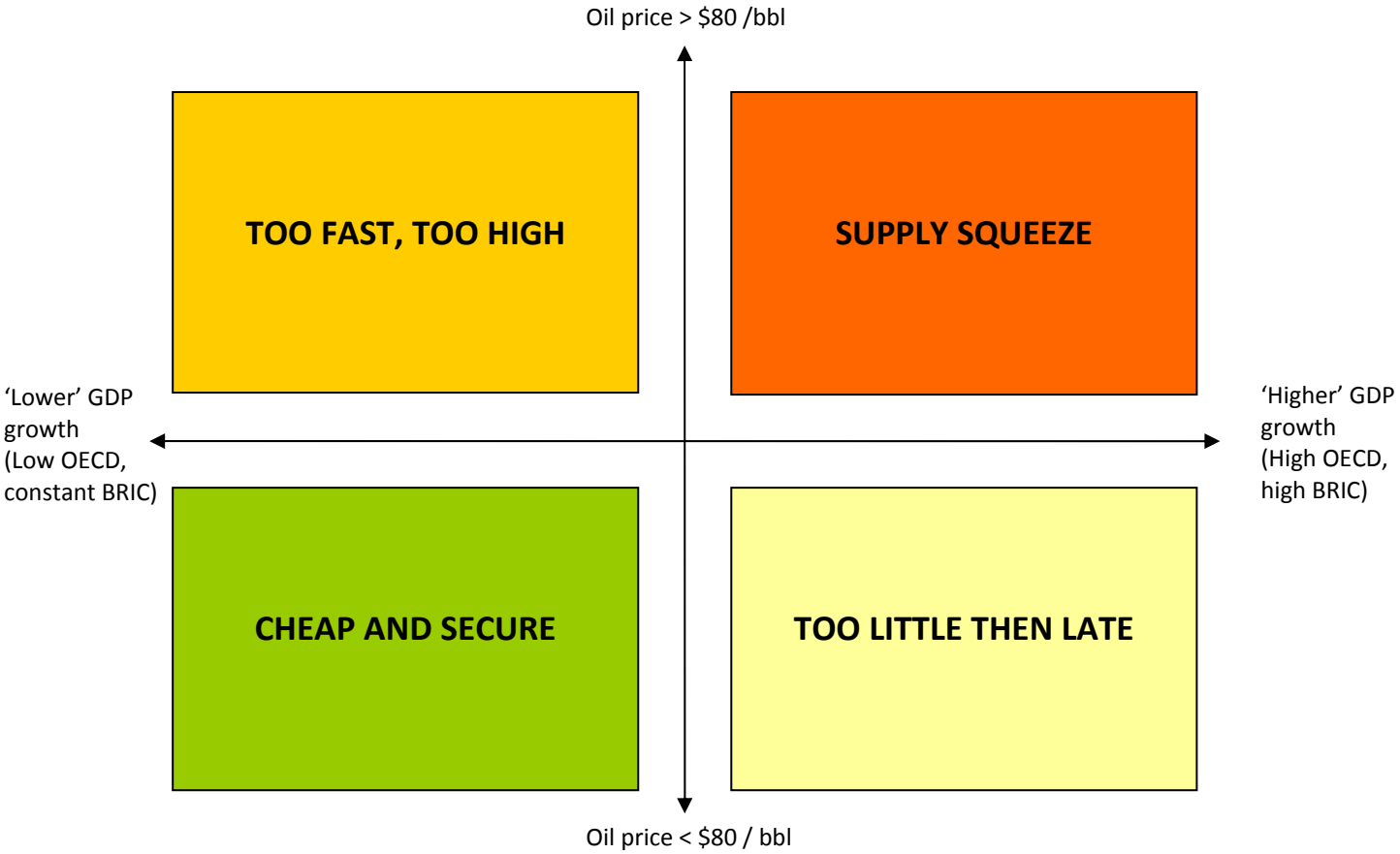

Figure 7: Scenario analysis matrix

The Players in the Game

There are a number of role players in the scenario "game" that have an influence on the price of oil. The role players can be broken down into various categories, all of whom, to a certain extent have an impact on the price and which crude oil will trade.

- Demand from outside the OECD: The demand for oil from countries outside the OECD is an important factor in the price determination as consumption rates in these countries can grow rapidly.
- Capacity developers: Oil and refinery companies that develop the oil industry's capacity to deal with overall transportation of the fuel.
- Distributors: Shipping (tanker) companies, pipelines, who determine how much capacity is available for transportation of the commodity.
- OPEC: Supply response to price rises
- Geopolitical shocks to supply and refining capacity. Weather shocks should also not be excluded but these are occurrences outside the control of any company, government of individual.
- Speculators and traders in terms of trading of contracts.
- The weather pattern and therefore two drought years have been incorporated both in 2012 and 2015.

In addition to the drivers that cause the oil price movements, there are a number of other role players that also influence the scenarios.

- Government departments and their policies on the exports of agricultural commodities. These will play critical roles during the times of high prices as, seen in 2008, when government restricted exports of agricultural commodities due to fears of food security in the home countries.
- Government policies that have an influence on the amounts of renewable fuels that need to be blended into the national fuel mix. Increasing the admixture of renewable fuels results in an additional demand for agricultural commodities, apart from food demand.
- National reserve banks, such as the Federal Reserve Bank in the US, Treasuries and government departments due to their policies that enhance and accelerate economic growth. These policies will be important as economic growth in OECD and BRIC nations (Brazil, Russia, India and China) will have an influence on the demand for various commodities.

- Farmers: As producers of agricultural commodities farmers are one of the main drivers of commodity prices as their decisions have an influence on the supply of the commodity to the market.
- Processors: Biofuel producers and food processors play an important role in the demand for agricultural commodities. When biofuel profit margins are favourable, the capacity of biofuel production is likely to expand and this results in a higher demand for agricultural crops which, in turn, drives up the price. On the other hand, food profit margins and the increased demand for food due to a larger population and higher income levels also results in a higher demand and has an increasing price effect as the result.
- Traders and speculators: The contracts that are traded and the demand for commodities on the stock exchange also increase the demand and as a result have an increasing effect on the price.

Rules of the game

There are a number of rules in this scenario game that need to be understood for it the scenarios to be logical. Without the rules, the formation of the scenarios will not make sense and the assumptions around the price levels will also seem unclear.

- ***Rule 1:*** The oil price and the prices of agricultural commodities have varying elasticities depending on their levels. At crude oil prices of higher than $120 per barrel, the elasticity to agricultural commodity prices is close to 0.9, at a medium oil price range the elasticity is closer to 0.5 and at a low oil price the elasticity is around 0.1 and less.
- ***Rule 2:*** The income elasticity of demand for oil is larger in developing countries, China and other Asian countries, than in the OECD. Income elasticities of demand in developing countries, China and Asia are between 0.7 and 1.4 while income elasticities of demand in the OECD are closer to 0.5 (Fattouh, 2007).
- ***Rule 3:*** The demand for oil has an increasing impact on the oil price as do various other inefficiencies in the supply chain. A shortage of available oil, due to restrictions on refining capacity and a lack of transport and low stock levels will have an upward impact on the price at which it is sold.

- ***Rule 4:*** Current mandates for biofuels are not fixed forever and could increase depending on the market situation, external influences and other variables. Important is that, as for example in the US, if the blending wall gets reached, lobby groups will start campaigning and will try and influence policy makers. The present blending requirement for the US is set at 10% but could possibly be increased to 15% depending on the safety of using higher blends of ethanol in standard, non flex fuel cars.
- ***Rule 5:*** OECD low growth (between 0% and 0.5% per annum), BRIC constant growth (5% to 6%), OECD high growth (between 1% and 2%), and BRIC high growth (9% to 10%).
- ***Rule 6:*** The Rand / US Dollar exchange rate weakens in times of poor economic growth as investors search for 'safe havens' and invest in the US dollar. The exchange rate strengthens in times of strong economic growth, when investors are eager to invest in higher risk derivatives.

III.) THE SCENARIO ANALYSIS – RESULTS

The results in the following section are simulated by using the South African Sector Model developed by the Bureau for Food and Agricultural Policy (BFAP) in collaboration with the Food and Agricultural Policy Research Institute (FAPRI). The sector model is used to simulate the impacts of the various scenarios on the South African agricultural sector taking into account the assumptions that have been made for the scenario analysis. Normal rainfall in South Africa cannot be taken as a given and as a result the weather phenomenon needs to be considered. The idea of incorporating a weather phenomenon within the framework of the scenarios has the purpose of simulating the impact of below normal rainfall. The 2007 drought in South Africa has been used as a benchmark for this simulation and within the framework of all scenarios a drought occurs in 2012 and approximately 40% below normal, baseline yields are realised, and this situation is again repeated in 2015.

Supply squeeze - Outline

The world's oil production has been reduced and as a result the supply of oil to the world is under pressure. In addition to a reduction in the supply of oil, the world's refining, transport and storage capacity has also come under pressure. This has resulted in a supply squeeze and as the economies of the world are growing at a fast

pace, there is strong upward pressure on the price of oil. In this scenario the oil price fluctuates increases steadily and climbs to a peak at an annual rate of $150 per barrel, while world commodity prices are also pulled upwards, with maize reaching a high of $305 per ton, wheat $448 per ton and soybeans $610 per ton. At higher oil prices, all of the commodities are strongly correlated to oil and therefore the oil price, together with reactions from governments, has the largest influence on their price. The South African exchange rate is relatively constant depreciating to R8.35 / US$ while economic growth is strong at between 3% and 4% per annum.

Higher oil and commodity prices result in governments taking a cautious approach towards increased implementation of biofuel policies and mandates. However, the pressure from lobby groups is extremely strong and economic models indicate that increasing the mandate will only have a negligible impact on maize prices (FAPRI, 2009). The reason why the lobby groups seek to increase the mandate, the ethanol blending capacity within the US fuel mix, is that the ethanol market does not reach a point of saturation, i.e. the blending wall. It is assumed that a certain percentage of the maize price increase thus occurs as a result of the increased maize use for ethanol while major factor driving the price is the price correlation to crude oil.

Table 6: Assumptions for scenario 4: Supply squeeze

Supply squeeze		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Yellow Maize US No2 FOB Gulf	$/ton	219.0	175.4	200.0	227.9	239.2	283.3	285.6	292.9	298.0	305.0
Wheat US No2 HRW fob Gulf	$/ton	350.1	220.8	325.0	350.0	380.0	405.0	420.0	435.0	445.0	448.0
Soyabean Price:Rotterdam FOB	$/ton	550.0	476.1	536.0	545.0	550.0	575.0	585.0	595.0	605.0	610.0
Exchange rate	SA cent/USD	825.2	746.0	797.0	796.6	799.9	803.1	809.7	816.2	822.5	835.7
SA % change in Real GDP forecast	%	3.2	0.5	2.3	2.9	3.2	3.5	3.8	4.1	4.3	4.5
Persian Gulf: F.O.B. Imported Crude Oil	$/barrel	94.7	74.0	80.0	92.0	105.0	120.0	130.0	140.0	145.0	150.0

Supply squeeze – Impact

The assumptions imposed on the model within the framework of the "supply squeeze" scenario result in all of the agricultural commodities experiencing various price shocks. The output from the model indicates that in all instances commodities are trading at export parity or close to export parity while the Rand value of the

international commodities as a result of a change in the exchange rate and higher oil prices. This is valid for all years except for the drought years of 2012 and 2015.

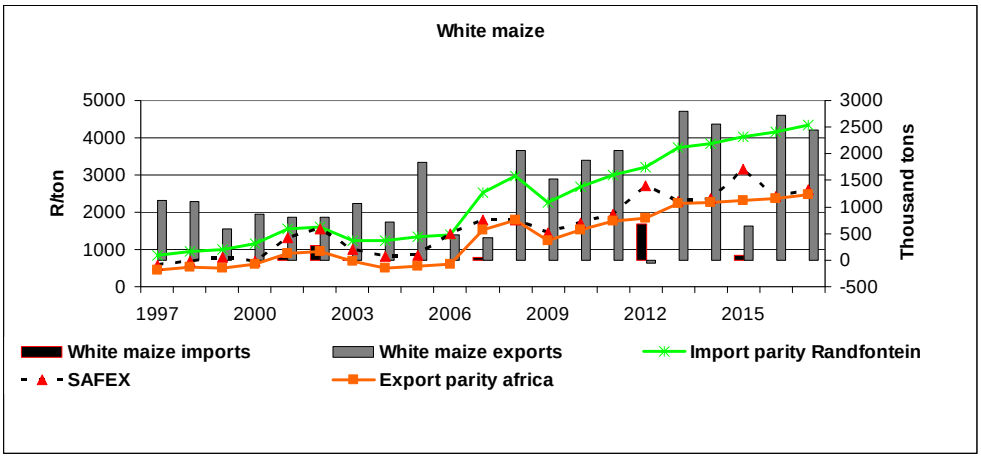

Figure 8: White maize – Supply Squeeze

In the supply squeeze scenario the weather shock, drought experienced in 2012 and 2015 is particularly strong with a 57% lower maize yield, 1.9 tons per ha, in 2012 and a 45% lower maize yield, 2.55 tons per ha, in 2015. The drought in 2012, results in South Africa becoming a net importer of white maize with 687 thousand tons entering the country at an average SAFEX price of R2702 per ton. In 2015 the situation is not as severe as the new varieties of maize are "relatively" resistant to drought and as a result South Africa only imports 98 thousand tons. The SAFEX maize price reaches an average of R2727 per ton from 2015-2017, 59% higher than in the 2010/2011 season. In the drought years the white maize price nears import parity levels of R2702 and R2162 per ton in 2012 and 2015, respectively.

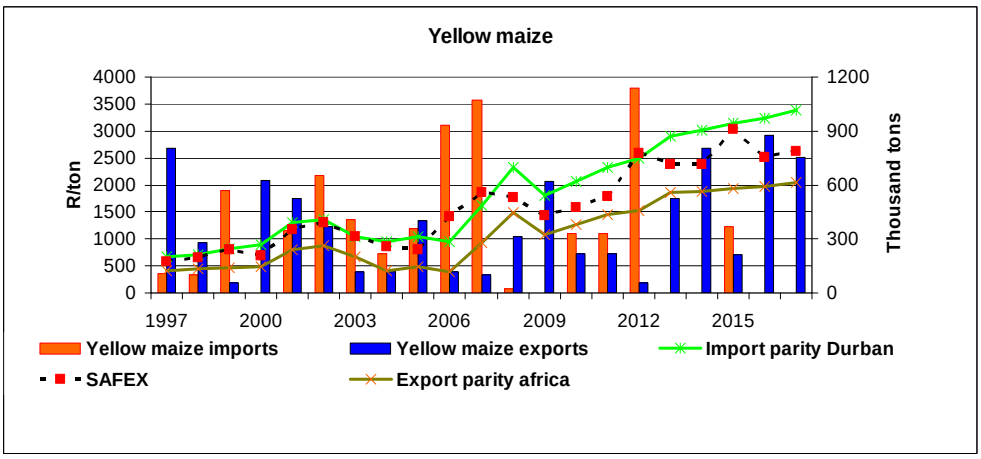

Figure 9: Yellow maize – Supply Squeeze

The drought results in the prices of yellow maize reaching import parity in those years and remaining at those levels. The drought simulated in 2012 results in 1.14 million tons of yellow maize entering the country at an import parity price of R2576 per ton while in 2015 approximately 365 thousand tons enter the country at a price of R3024 per ton. The drought together with international commodity price developments and a slightly weaker exchange rate increase yellow maize prices by 71.8% from the 2010/11 levels of R1599 per ton, while yellow maize production increases, on average, by 25.8% from 4.1 million tons to 5.16 million tons in 2015-2017. The net trade in white and yellow maize is positive within the framework of the scenario, except for the drought years, and South Africa exports both commodities. Exports of maize are largely driven by international price developments and the value of the South African Rand.

The retail price of maize meal is also impacted on by the developments within the framework of the scenario with the retail price increasing by a total of 48% from its baseline levels of 2010. The most severe impacts of this price increase take place during the drought years when meal prices increase by 13% and 14% in 2012 and 2015, respectively.

South Africa continues to be a net wheat importer during the period as a higher economic growth rate fuels alternative spending patterns and thus increases the local consumption of wheat. International price developments in wheat, therefore have a severe price impact on the local industry with SAFEX wheat prices moving as high as R4895/ton in 2017. The average price increase for wheat over the period 2009 – 2017 is 108% with wheat increasing by that percentage from a level of a level of R2353/ton in 2009. Wheat imports increase over time averaging 1.156 million tons in 2015-2017 while exports remain extremely low at 105 thousand tons.

The retail price of white bread increases by an average of 44% during the projection period but more importantly by an average of 14% from each baseline year. The change from the scenario indicates that the various shocks have a 14% price impact on the retail price of bread annually, which in the long run will have an impact on food price inflation.

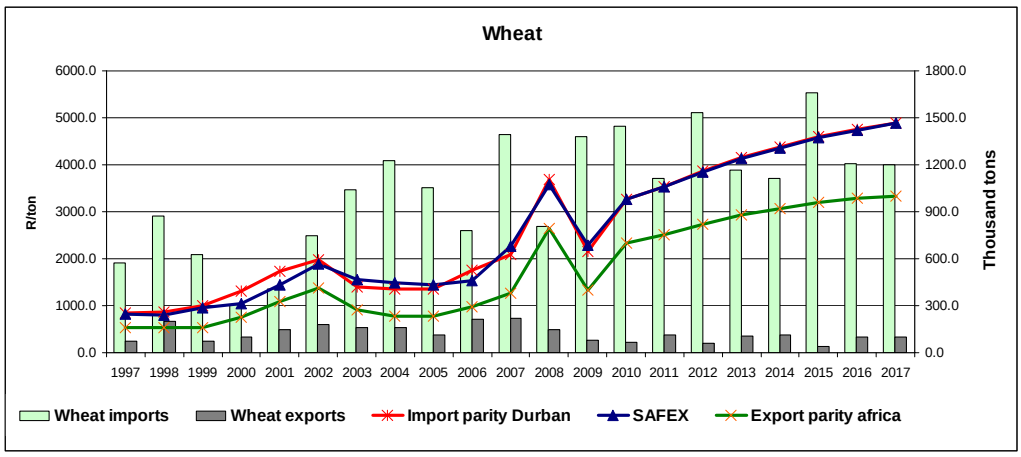

Figure 10: Wheat – Supply Squeeze

South African soybean production is expected to increase within the framework of the scenario, again driven by higher international commodity prices and changes in the average yields achieved locally. Soyabean production increases by 31% from its 2010 level reaching 739 thousand tons in 2017 while its SAFEX price increases with 34% to average R4934/ton in 2015-2017. This is an increase from a level of 486 thousand tons and R3737/ton in 2010, respectively. Soyabean cake imports decline slightly over time and still average 931 thousand tons, as the increase in local cake consumption is filled by the increase in local production.

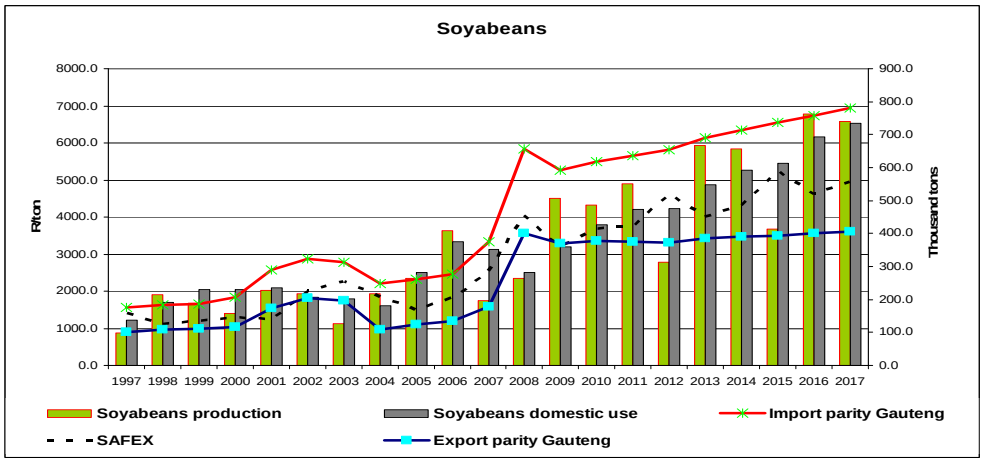

Figure 11: Soyabeans – Supply Squeeze

It seems that the higher oil price and a drought play a more severe role in the price increases within the framework of this scenario. The higher oil prices create a link with the agricultural commodities and as a result these are directly influenced by the

changes in prices. The “supply squeeze” framework dictates a relationship that has a correlation of 0.98 between the price of oil and US yellow maize price given the trends observed in 2007/08. The increase in the price of oil therefore has the greatest influence on the US maize and other commodity prices, compared to the relatively modest impacts of an increase in the blending mandate to E15, estimated at an average of 1.1% (FAPRI, 2009). The total combined South African price impact on the various commodities due to the drought (2012 and 2015), changes in international prices and different blending mandates in other countries is therefore on average 29.45%, 28.1%, 13.79% and 13.43% for white maize, yellow maize, wheat and soybeans, respectively while individual price increases are as high as 57%, 50.5% and 31.9% in years of drought for white maize, yellow maize and soybeans, respectively. This indicates that a situation where combinations of variables play a role within the same time period, the overall impact is far higher than if only individual factors where considered. The “supply squeeze” scenario reminds one of a similar situation that also existed in 2008 when various factors, amongst others oil prices, biofuel mandates and weather conditions, had a strong influence on agricultural commodity prices (Westhoff 2008; Collins 2008). It is therefore important to consider that a combination of events could and will have a far larger impact on local commodity prices and that increases in oil prices could well be a motivation to adopt the a country’s policies so that such price impacts can be marginalised.

Too little then late - Outline

The second scenario depicts a possible path into the future where the world economies recover but the oil price remains relatively constant, at below $80 per barrel. The reason for this is that the economies that the demand pull for oil of the various economies does not have as much an effect on the price of oil as other, previous developments in the world have had a more positive impact on the supply of oil. The additional, overall price impacts of increases in oil consumption are moderated by larger oil reserves together with an increased supply of oil from OPEC and other oil producing nations and previously increased refining capacity. Lower oil prices result in a slightly lower correlation with agricultural commodities with an elasticity of around 0.5 with agricultural commodity prices being more bound to the impacts of factors driving their demand and supply balances, rather than to changes in the prices of other commodities.

Table 7: Assumptions for scenario 2: Too little then late

Too little then late	Units	**2008**	**2009**	2010	2011	2012	2013	2014	2015	2016	2017
Yellow Maize US No2 FOB Gulf	$/ton	219.0	175.4	168.0	160.0	155.0	165.0	170.0	175.0	190.0	200.0
Wheat US No2 HRW fob Gulf	$/ton	350.1	220.8	220	215	220	225	215	216	260	285
Soyabean Price: Rotterdam FOB	$/ton	550.0	476.1	385	386	385	360	378	392	405	535
Exchange rate	SA cent/USD	825.2	746.0	766.3	758.7	751.1	743.6	736.1	728.8	721.5	714.3
SA % change in Real GDP forecast	%	3.2	0.5	2.6	3.2	3.6	4.2	4.5	4.9	5.3	5.5
Persian Gulf: F.O.B. Imported Crude Oil	$/bbl	94.7	74.0	67	65	62	55	63	68	70	72

In the scenario "Too little then late" the world economy recovers but still oil prices move sideward, increasing and decreasing as supply and demand evens out and the full available capacity becomes utilised. The blending wall in the US has been reached and lobby groups succeed in raising the renewable fuel standard to an E15 and B5 level. This results in higher volumes of ethanol and biodiesel being taken up and hence the industry remains profitable, even at lower oil prices. As a result the maize and soybean prices react positively to these changes in policy and reaching relatively high levels of around $200 per ton and $535 per ton, respectively.

Too little then late – Output

The model output for the "Too little then late" scenario indicates that a scenario as outlined in Table 7 will result in smaller price shocks as a stronger Rand helps prices remain at affordable levels. Due to the lower local maize prices, South African producers opt to plant only on the most fertile land, meaning that any agricultural land not capable of producing yields of more than 4 tons per hectare is taken out of production. The shift to more productive land has the effect that the white maize price moves away from export parity and trades close to R300/ton above the baseline level while exports also decline and imports enter the country. The trade in white maize declines as most of the commodity is used up in the domestic market with total production reaching an average of 5.26 million tons in 2015-2017, while exports decline from a level of 1.41 million tons in 2010 to an average of 594 thousand tons in 2015-2017. The white maize price increases by 21.1% from its 2010 level of R1418/ton to reach an average of R1718/ton in 2015-2017.

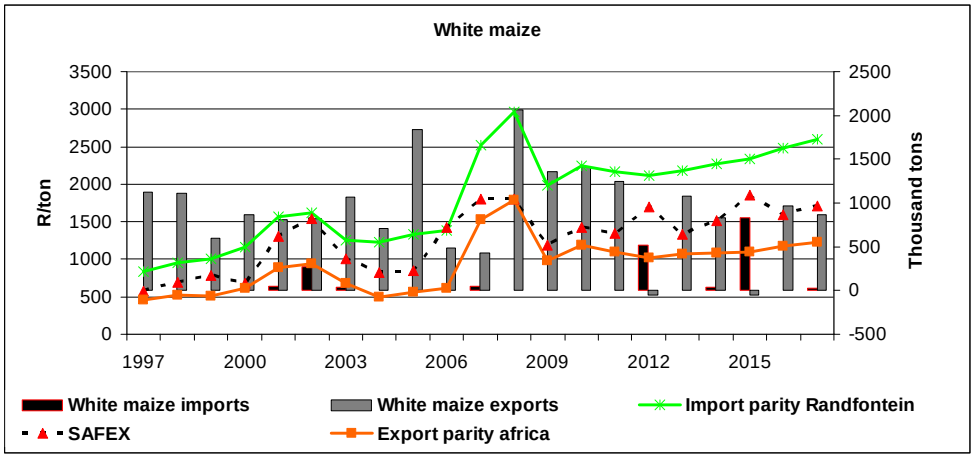

Figure 12: White maize – Too little then late

The lower international prices also result in yellow maize trading higher, close to import parity, due to the lower competitiveness of South African yellow maize. Yellow maize prices reach an average of R1789/ton for the period 2015-2017 with imports averaging 841 thousand tons and exports at around 127 thousand tons during the same time. Local SAFEX prices for yellow maize trade 23% higher than the expected 2010 average of R1454/ton. The drought in 2012 and 2015 creates a local shortage of yellow maize and as a result large volumes of imports, 1.54million and 1.58 million tons enter the country during those years respectively. This in turn pushes prices up and as a result the yellow maize prices do not move away from import parity.

The retail price of maize meal increases by 40% during the projection period but on average the price declines from the baseline's projection. This indicates that the impacts within the framework of this scenario do not necessarily result in an increase in the retail price of maize but rather that a range of relatively stable commodity prices have a similar stabilising impact on the retail price.

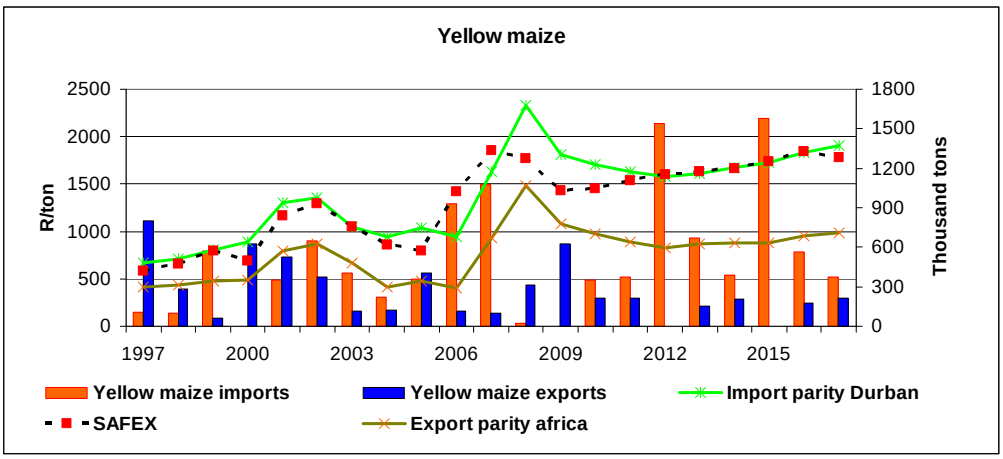

Figure 13: Yellow maize – Too little then late

Wheat production is under pressure in this scenario as a less competitive currency results in the SAFEX price moving higher than import parity and wheat imports reaching levels of around 1.98 million tons in 2015-2017. Lower international wheat prices help moderate the impact of price inflation but prices above import parity result in the SAFEX wheat price averaging R2774/ton up by 15.3% from its 2010 level of R2405/ton. Local wheat production declines slightly as high imports, 22% higher than in 2010, have a drastic impact on the industry. Local production of wheat declines by 5.6% from 1.67 million tons in 2010 to an average of 1.57 million tons in 2015-2017.

The retail price of white bread increases by 32% during the projection period but again the price in the scenario declines from the original baseline by an average of 7% per annum. This means that the average wheat price is lower than under the baseline assumptions, given the changes in international macro economic variables.

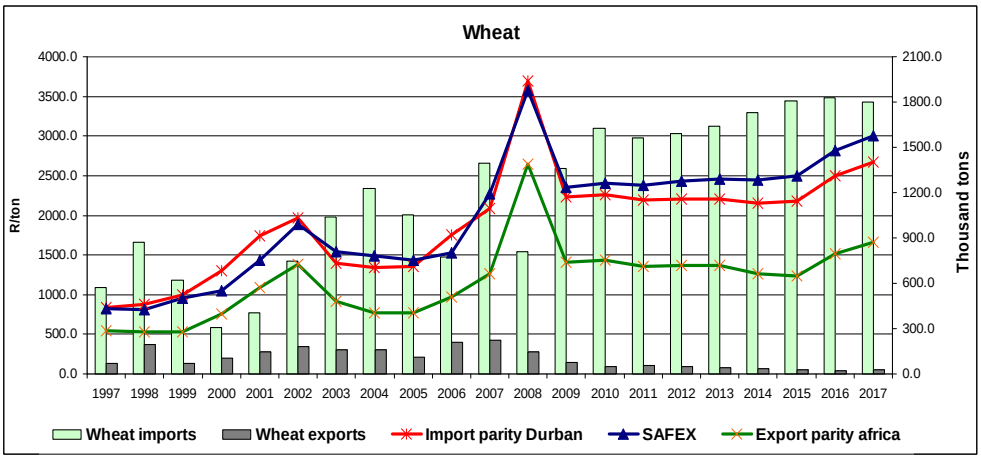

Figure 14: Wheat – Too little then late

Soyabean production continues on its upward trend as production methods improve and relative profitability shifts away from maize. Soyabean production increases to 552 thousand tons in 2015-2017, up 16.4% from 2010 while the SAFEX price also increases with 32% from its 2010 level of R2875/ton. The increase in local production assist the feed industry in sourcing feedstock locally but due to the strong economic growth in this scenario, meat consumption increases drastically, resulting in a higher demand for chicken and beef and with that higher quantities of soyabean cake. Soyabean cake consumption increases by 28% from its average in 2010 while imports to SA only increase by 10%.

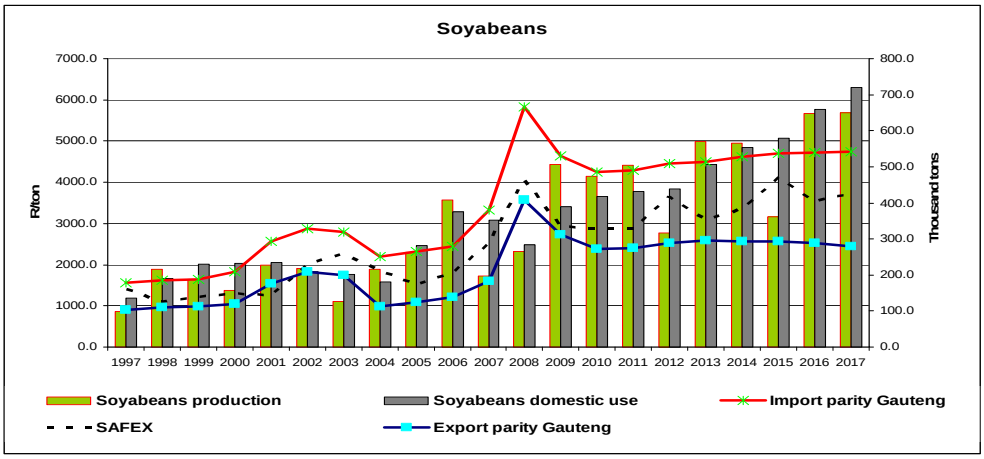

Figure 15: Soyabeans – Too little then late

Cheap and secure - Outline

The third scenario deals with a situation in which the economies of the world, especially OECD, do not recover sufficiently and the price of oil, amongst other variables, remains relatively low for the next half of a decade to come. Economic growth in the BRIC countries remains relatively stable at 5% to 6% and does not recover in the near future to the previous levels of 9% and 10%. As a result of a far lower demand for oil and previously built up capacity, oil prices move horizontally and do not reach levels higher than $70 per barrel. As a result of the slower growth in the world economies and previously increased oil refining capacity, as well as relatively large oil stocks and a lower demand for food due to lower GDP growth rates, agricultural commodity prices decline to lower levels.

The lower oil prices, of below $50 per barrel, result in a maize – oil correlation that might even be closer to 0.1, meaning that the two price ranges diverge at times. Thus prices of both oil and agricultural commodities do not necessarily follow the same trend, as market forces play a more important role in the individual industries.

As a result of the lower oil prices and lower GDP growth rate governments do not have the capacity of being able to finance any further biofuel developments. There are thus no changes to the ethanol and biodiesel mandates and thus the Renewable Fuel Standards in the USA remains unchanged.

Table 8: Assumptions for scenario 3: Cheap and secure

Cheap and secure	Unit	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Yellow Maize US No2 FOB Gulf	$/ton	219.0	175.4	184.8	176.0	176.0	162.8	159.5	165.0	167.2	159.5
Wheat US No2 HRW fob Gulf	$/ton	350.1	220.8	220	225	228	232	228	210	220	231
Soyabean Price: Rotterdam FOB	$/ton	550.0	476.1	385	372	345	330	335	365	375	372
Exchange rate	SA cent/USD	825.2	746.0	821.6	878.4	929.7	980.9	1037.9	1096.2	1161.6	1214.7
SA % change in Real GDP forecast	%	3.2	0.5	1.1	1.3	1.5	1.6	1.8	2.1	2.3	2.5
Persian Gulf: F.O.B. Imported Crude Oil	$/bbl	94.7	74.0	67	60	58	50	55	60	55	60

Cheap and secure – Output

Very cheap commodity prices and lower international prices of agricultural goods result in constant maize harvests with no large shifts in areas as maize production remains relatively profitable, given the exception of the two drought years in 2012 and 2015. White maize production increases from its 2003 – 2007 average of 5.39 million tons to an average of 6.18 million tons over the course of the projection period. As international prices rise and the Rand weakens to R12.14 to the US dollar, local commodities benefit and white maize prices increase by 32% from their 2010 levels to average around R2225/ton in 2015-2017. White maize exports also increase from their long term average to around 1.31 million tons over the duration of the projection period.

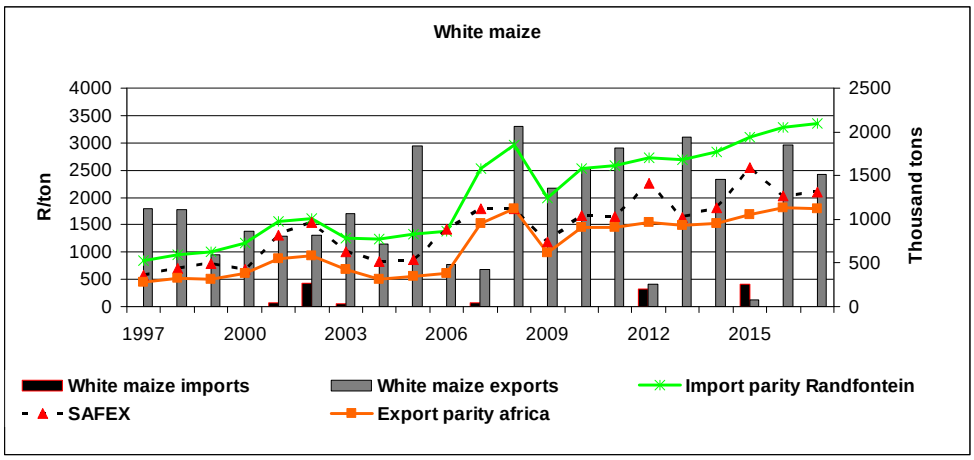

Figure 16: White maize – Cheap and secure

The yellow maize price is also impacted on by the weaker Rand, which in turn increases by 30.6% from their level in 2010, averaging R2223 per ton in 2015-2017. Yellow maize exports decline by 27% while imports increase to average 652 thousand tons in 2015-2017, largely influenced by the drought year in 2015.

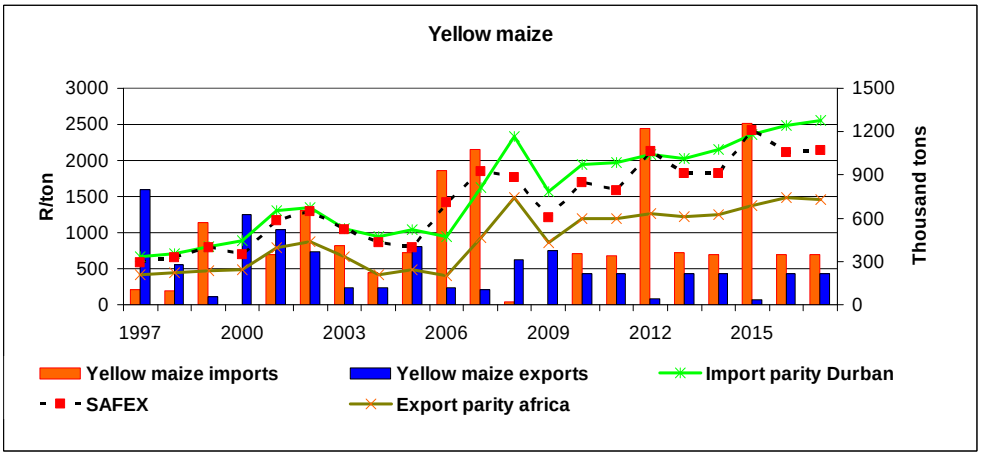

Figure 17: Yellow maize – Cheap and secure

The retail price of maize meal has increased by 41% from its level in 2010, largely driven by the increases in local prices. On average, the retail price changes by 3% from the baseline's price range with the largest price increases being realised in the drought years, which have shown to be as high as 8%.

The weaker Rand has a definite impact on inflation, spurring on higher prices not just in maize but also wheat. In this scenario the wheat price trades at above import parity,

some 39% higher than in 2010, at an average of R3542 per ton for the period 2015-2017. Local human wheat consumption increases by 5% and this additional demand is largely filled by additional imported quantities. Imports into South Africa increase by 12% with a projection period average of 1.67 million tons down by 45 thousand tons from the 2010 average of 1.71 million tons.

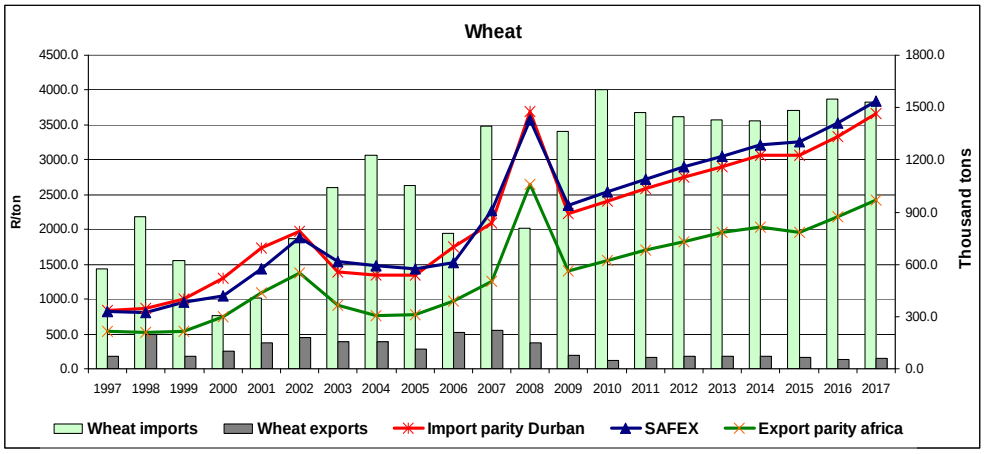

Figure 18: Wheat – Cheap and secure

The retail price of white bread increased by 42% during the projection period but there was no change from the average baseline level. This shows that the overall change in the retail price of bread does not change due to changes in macro economic variables and as a result there is no additional impact on the welfare of the consumer.

Total soyabean production increases by 22% to an average of 498 thousand tons in 2015-2017. Prices on the other hand increase by 52%, reaching levels of around R4606/ton in 2015-2017. Again the devaluation of the exchange rate plays an important role in the price formations and inflation of the commodity. Soyabean cake consumption as a result of higher protein consumption also has an inflationary impact on the price of cake.

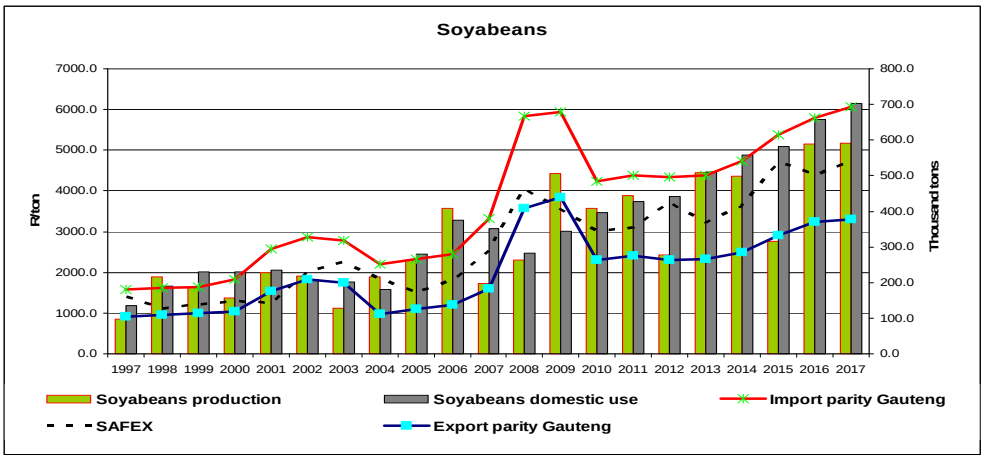

Figure 19: Soyabeans – Cheap and secure

Too fast, too high - Outline

The scenario "Too fast, too high" depicts a situation in which economic growth in the world is positive and even increasing. The OECD nations grow at a rate between 0% and 0.5% while the BRIC countries have not yet recovered and grow at 5% to 6%. In addition to the slight growth in the world economies and the resultant demand pull, oil prices are also being driven higher by various other factors influencing them. These, amongst others, include a lower supply of oil from OPEC, a lack in refining capacity and relatively higher transportation costs, due to lower investment within all of these sectors. As a result the rises in price levels are thus extremely rapid and in the medium term GDP growth proves to be unsustainable. At higher oil prices the correlation between agricultural commodities becomes close to one, meaning that an increase in the price of oil results in a similar percentage increase in the prices of the agricultural commodities. The ranges that have been used in the model's framework are as follows:

Table 9: Assumptions for Scenario 1: Too fast, too high

Too fast, too high	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Yellow Maize US No2 FOB Gulf	$/ton	219.0	175.4	200.0	215.3	227.8	236.9	255.0	267.7	280.0	304.5
Wheat US No2 HRW fob Gulf	$/ton	350.1	220.8	325	333	350	375	395	405	410	413
Soyabean Price: Rotterdam FOB	$/ton	550.0	476.1	536	541	550	565	572	574	580	585
Exchange rate	SA cent/USD	825.2	746.0	838.1	913.5	985.5	1059.4	1141.7	1227.8	1335.9	1421.2
SA % change in Real GDP forecast	%	3.2	0.5	0.8	0.6	0.7	1.0	1.4	1.6	1.7	1.9
Persian Gulf: F.O.B. Imported Crude Oil	$/bbl	94.7	74.0	80	87	95	105	120	125	130	135

The higher oil prices and a change in the US government's view on bio-ethanol together with an increase in pressure from the lobby groups results in the mandate being raised to an E15 level. Again, this has an impact on the price of maize as larger quantities are used in the ethanol production process and less is exported and fed to livestock.

Too fast, too high – Output

Higher oil prices together with a weakening exchange rate and slightly higher commodity prices result in severe price effects within the agricultural sector in South Africa. Higher international oil prices re-establish the food - fuel linkage and as a result inflation spirals upward. White maize prices increase by 120% from the 2010 level to an average of R3993 per ton in 2015-2017 while white maize exports from South Africa increase by 24% to above 2.3 million tons in 2015-2017. Favourable prices and high profits result in marginal areas being taken back into production with total maize area harvested increasing to 3.32 million hectares in 2017. White maize production increases by 5% to average 7.3 million tons up from 6.94 million tons in 2010 with overall consumption of maize declining slightly as price increase.

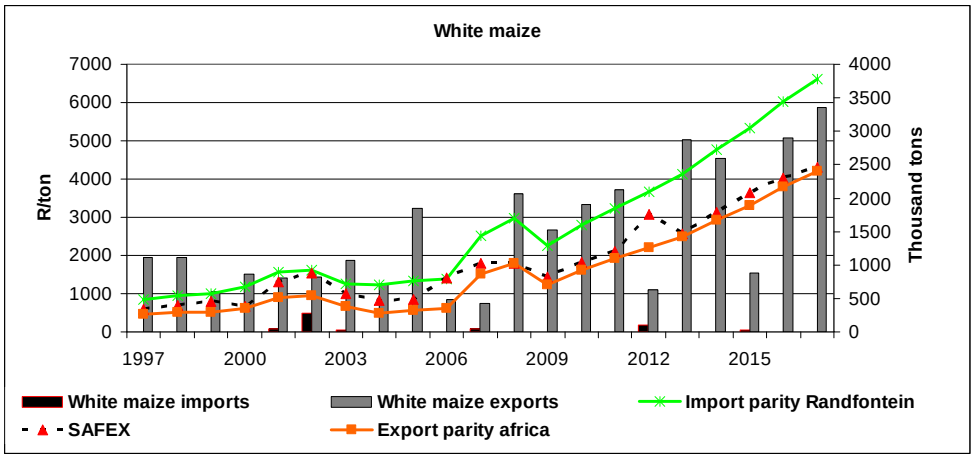

Figure 20: White maize – Too fast, too high

The higher world prices, weaker exchange rate and higher oil prices also benefit yellow maize production with the SAFEX price of yellow maize increasing by 136% from 2010 to an average of R3837/ton and exports increasing by 375% to reach 1.05 million tons in 2015-2017 up from 220 thousand tons in 2010. In the scenario South Africa becomes a net exporter of yellow maize. Yellow maize production increases by

25% from 2010 levels with most of the additional volumes being exported as domestic consumption declines.

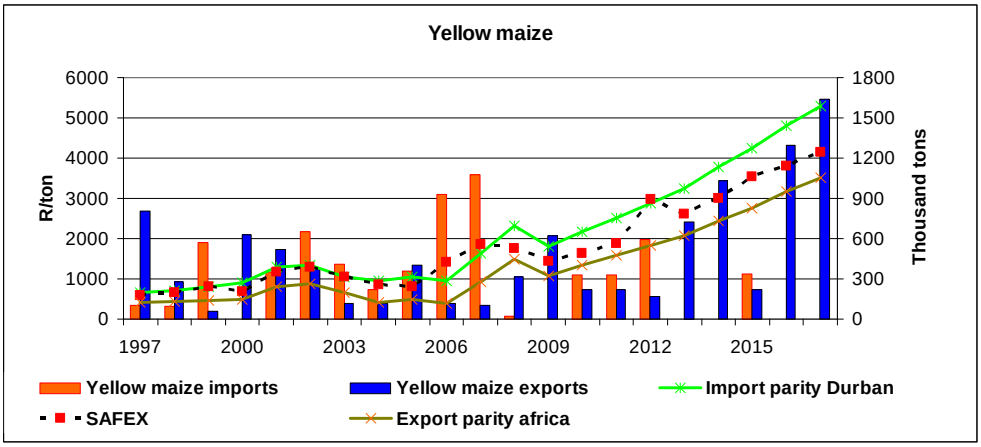

Figure 21: Yellow maize – Too fast, too high

The retail price of maize meal has increased by 59% during the projection period of which approximately 14% of the increase was made up by the changes in the scenario from the baseline.

The wheat industry also benefits from the higher prices as strong profit incentives result in higher production levels and with that prices moving to below import parity. Local wheat prices increase to extremely high levels increasing by as much as 95% to an average of R6634/ton in 2015-2017. The higher prices result in a strong decline in the imports of wheat, declining by as much as 31.8% from 2010 levels of 1.41 million tons. The weaker currency also helps to improve the competitiveness of the South African wheat sector and as a result the exports of wheat increase by 94%.

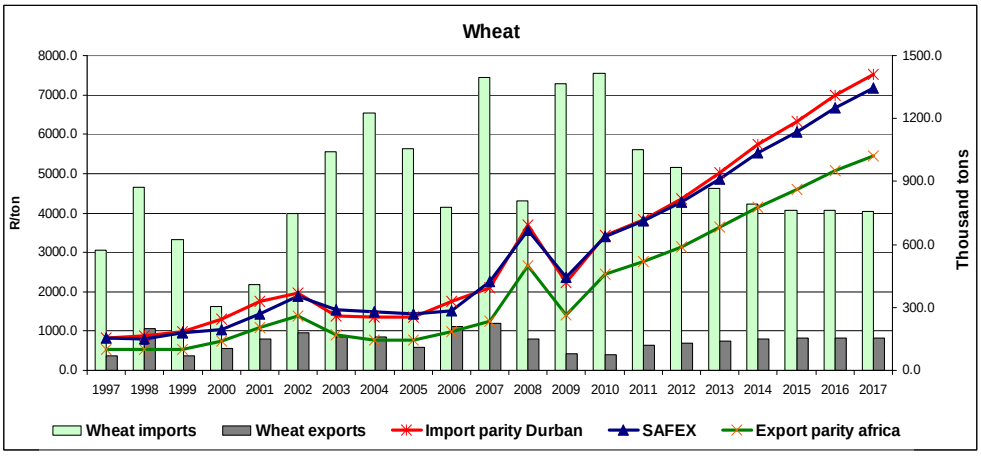

Figure 22: Wheat – Too fast, too high

The retail price of white bread increases by 44% during the projection period largely driven by higher producer prices. When comparing the increases to those in the baseline, it seems that the price increase is similar to that of maize meal. Retail prices of bread increase, on average, by 14% more than that during the baseline period.

The general price increase also benefits the soyabean industry. Soyabean production in South Africa increases by 49% from 2010 levels to an average of 715 thousand tons in 2015-2017. Price increases average 76% over the same period, which results in the price of soyabeans moving towards export parity. The domestic use of South African soyabeans also increases profit margins in the soyabean cake industry and as a result local production increases. Soyabean cake imports decline by 3% despite an increase in consumption of 22%.

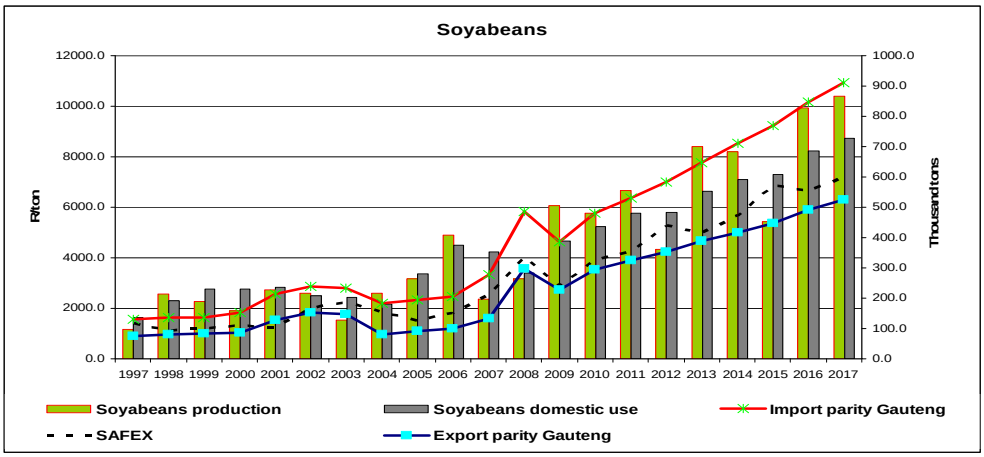

Figure 23: Soyabeans – Too fast, too high

IV.) EXPORTABLE SURPLUSES OF MAIZE, WHEAT AND SORGHUM

The quantities of agricultural commodities produced in each scenario differ widely depending on the assumption and exogenous shocks imposed on the system of models. Production and supply of specific crops is largely driven by expected returns that the farmers can realise per hectare, given costs of production, profit margins and prices. High prices and good profits spur on production while lower prices result in lower net returns and farmers react by excluding less profitable land from the

production process. Figure 24 represent the total exports of maize, both white and yellow, given the selected parameters within each scenario.

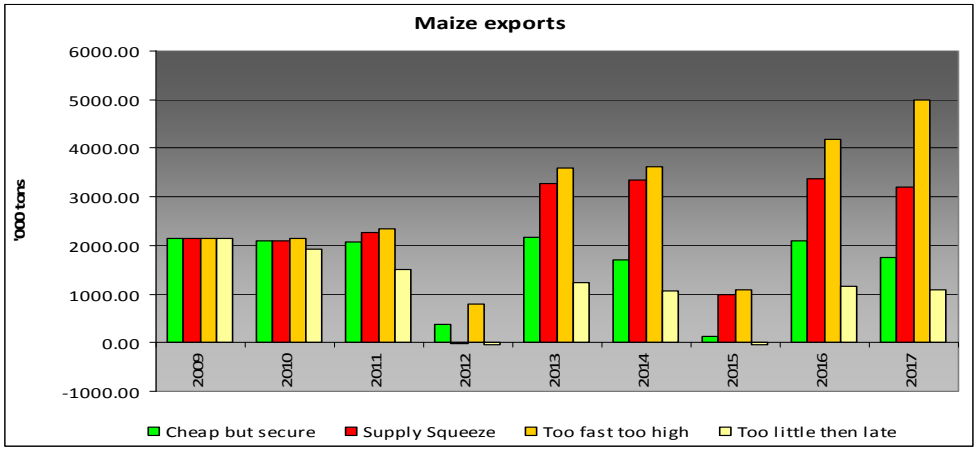

Figure 24: Maize exports in the various scenarios

Figure 24 indicates that within the higher price scenarios, it is far more likely that the South African agricultural sector will produce a large surplus than what it is if there are only small price changes. Higher prices in conjunction with a weak exchange rate improve the South African competitiveness worldwide and as a result SA will export its commodities. The drought scenarios in 2012 and 2015 have severe impacts on South Africa's position as a net exporter of maize.

In the case of wheat, it can be argued that international competitiveness is of extreme importance for the local industry. This is especially true as the Southern African region is a net importer of wheat and hence, competes even more directly with the international market. Again a weak exchange rate and higher world prices spur on production in the industry, while the scenario with lower oil and world prices has a lesser impact on the strength of the sector. Yet, although some wheat is always exported to the neighbouring countries, South Africa will remain a net importer of wheat under all the scenarios.

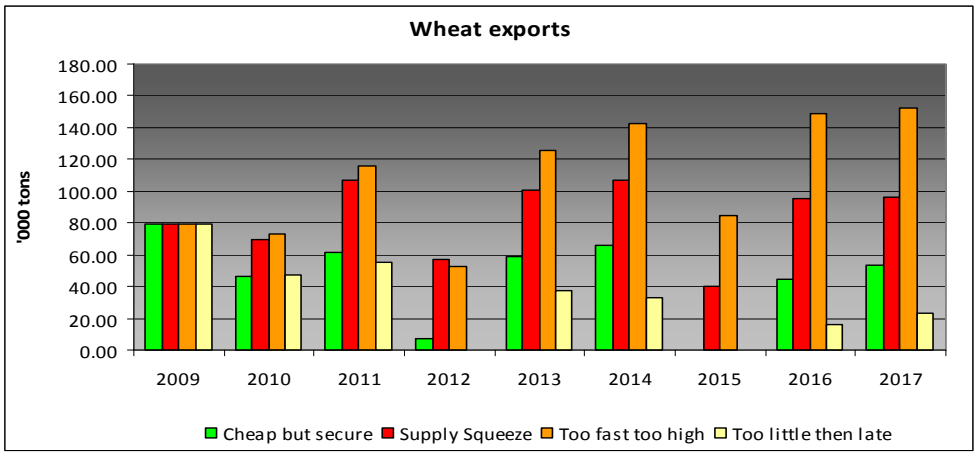

Figure 25: Wheat exports in the various scenarios

Soyabean exports are projected to be the most volatile under the various scenarios. It is important to note that net exports are presented in Figure 26, which implies that imports are already deducted from the exports. Hence, under the low price scenarios net exports of soyabeans actually turn negative, which implies that soyabeans have to be imported. Clearly, the high price scenario in combination with a weaker exchange rate boost soybean production in South Africa a lot since the domestic soybean price is derived from the soyacake and soya oil prices. South Africa is a net importer of soya meal and with a sharp depreciation of the exchange rate local soyabean prices will be supported by more expensive imports of soya meal.

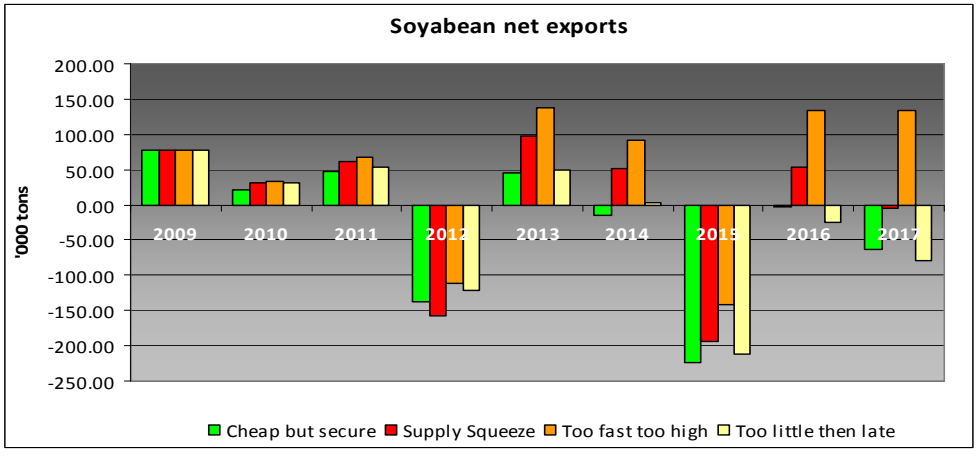

Figure 26: Soybean net exports in the various scenarios

V.) CONCLUSION

High oil prices, constraints in the oil supply chain, high economic growth in OECD and BRIC nations, changes in biofuel policies in the US and a weakening exchange rate all have a severe impact on agricultural commodity prices in South and Southern Africa. A scenario analysis and modelling exercise which was designed to capture these important elements indicates that a situation in which relatively low prices are the norm, such as the situation depicted by 'cheap and secure' incentives for agricultural production do not exist and as a result this could have an impact on the level of food security in SACU and even SADC. Lower prices impact on the famer's profitability and the supply response is to plant less in order to maximise profits on the most productive lands. A high price scenario, such as the one depicted in 'Too fast, too high' interestingly benefits the agricultural sector tremendously and the profit incentives that it creates result in South Africa being a net exporter of yellow and white maize as well as soyabeans. Increases in area and uses of less productive land result in slightly lower average yields but higher quantities produced.

It is however important to understand that normal rainfall does not always prevail. Droughts do occur in Southern Africa and these can have severe impacts on the yields achieved on rain fed agricultural land. Each one of the scenarios contains a drought element in the year 2012 and 2015. The simulated drought impact influences yields achieved by up to 60% less than during the baseline period and this indicates clearly just how sensitive agricultural production and agricultural commodity prices are to variations in rainfall. The scenario where the drought has the most severe impacts on food affordability in South Africa is shown in the "supply squeeze" and "too fast, too high" scenarios. These results indicate that maize prices can be expected to increase very steeply often, by as much as 136%! The model does simulate that the market reacts to such price increases in order to balance it would be even more devastating if for some external reason the market could not react.

The higher commodity prices also have a severe impact on retail prices. The "supply squeeze" and "too fast, too high" scenarios depict a similar situation to the one in 2007/08 where food prices increased dramatically at higher than inflation rates. Average retail price inflation rates of 14% per annum seem relatively high given the

structure of the scenario but it should be remembered that these are annual average figures meaning that monthly inflation could well be far higher! The higher oil prices and higher commodity price therefore pose a risk to food affordability and hence nutrition, as food supply, according to the model results, will increase as on farm net returns improve. The issue is therefore more a case of food affordability than it is a case of food availability, given the continuance of a stable political environment.

It is therefore important to consider the following; lower prices result in lower profitability and as a result, quantities produced decline. Higher prices have an impact on food price inflation yet can it be said that the agricultural sector (and the rural economy) benefits from such a situation through and the supply response. Higher volumes result in a food surplus and good exports but on the other hand, food prices have an impact on its affordability, especially amongst the poor. In the long term it does however seem crucial that the agricultural sector in South Africa maintains and builds on it status as a net food exporter, as this, even though perhaps at a cost, at least reduces the dependence on the international food supplies and more importantly the impact of international changes in policies, such as the change in biofuel mandates in the USA.

The economic outlook on the world economies does paint a picture of uncertainty in the sense that it is not certain when growth will resume to the levels of the past and with that when commodity prices will increase to their previous high levels. During the economic crisis of 2008 some countries, amongst others the BRIC, suffered the most severe setbacks, with their stock exchanges plummeting by 36% (Brazil), 75% (Russia), 50% (India) and 52% (China), respectively. The latest estimates (January 2010) indicate that China might well be on the path to recovery by most economists remain sceptical that the 8.7% growth rate for 2009 – 2010, year on year, is a true and accurate figure. Concerns are even raised and suggest that China is perhaps growing too fast and could well be the next “bubble” to burst, which could in turn send the world economy down a longer path of recovery (Saville, 2010). This means that even though higher oil and commodity prices seem to be a strong possibility in future, it is not to say that this will occur as rapidly as it is has in the past especially not if the new era of economic recovery is built on unstable foundations.

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Appendix A: The Model Overview

The BFAP sector model is a dynamic system of econometric equations, which has the ability to model cross-commodity linkages. The model is directly linked to the global models of the Food and Agricultural Policy Research Institute (FAPRI) and indirectly linked to the Computable General Equilibrium (CGE) models that are maintained by the PROVIDE group. Twenty six commodities are simulated in detail in the model. These commodities can be classified into the following four main industries; Livestock, Biofuels, Field crops and Horticulture. Figure 1 illustrates the linkages between the various industries and the list of exogenous variables that can be used to shock the equilibrium in the market.

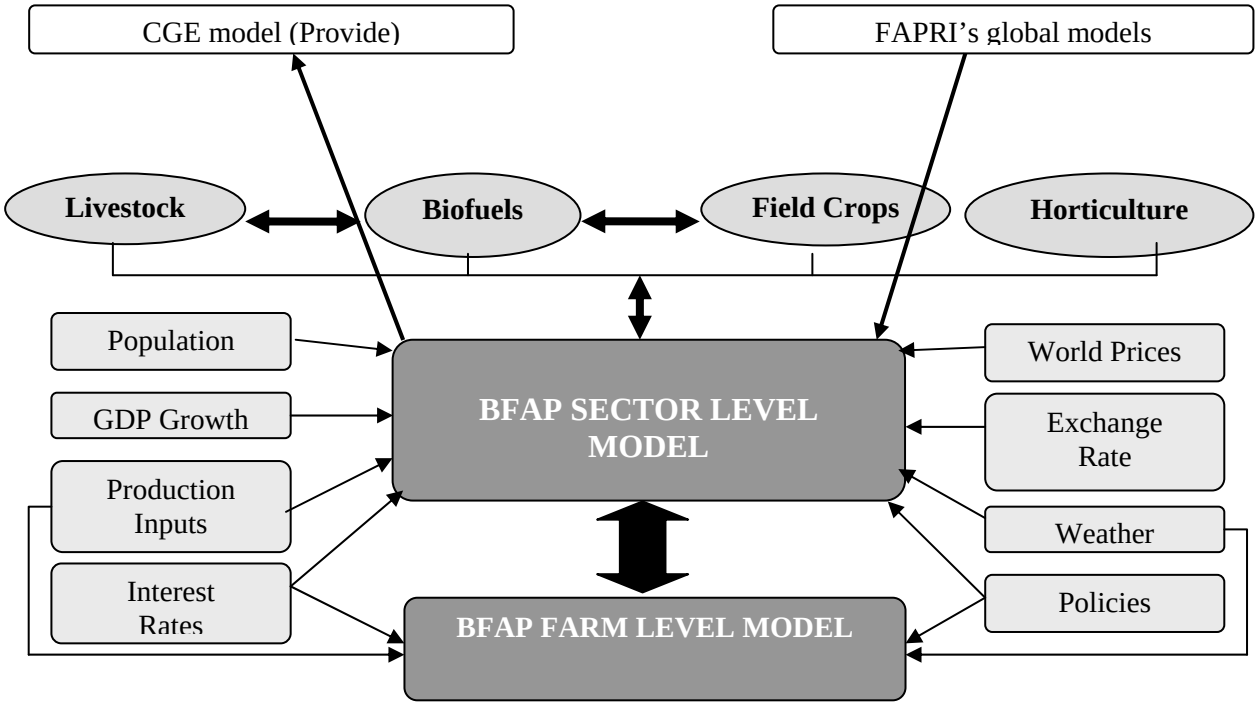

Figure 15: Basic Structure of the System of Equations

Important to note is that the model simulates for a dynamic equilibrium between all of the markets over time. For example, biofuel production will only commence in the model if positive profit margins can be obtained in the market. These profit margins depend on, amongst others, the price of feedstock like maize and sugar and the price of the by-products. So, if the production of biofuels under a certain set of conditions is economically viable, a new equilibrium will be simulated for all the industries in the model. For example, the maize and sugar prices will be higher due to increased domestic demand, the higher costs of grain and the supply of dried distillers grain (DDG) (a by-product in the production of bioethanol from maize) will impact on the livestock industries through feed rations for each of the livestock industries, due to higher feed costs the production of poultry meat will decrease and chicken prices will increase. For each commodity, all the determinants of supply and demand (production, consumption, imports, exports and prices) have been identified.