Modelling the impacts of the industrial biofuels strategy on the South African agricultural and biofuel subsectors

T Funke[1] , PG Strauss[1] and F Meyer[1]

Abstract

The potential impact of the current South African industrial biofuels strategy on the economic feasibility of biofuel production in South Africa is analysed and discussed. The analysis is then taken a step further by means of a scenario to analyse the potential impacts of higher global prices on the feasibility of a local biofuel industry. The BFAP sector model, a partial equilibrium model, is used to simulate the various impacts over the period 2009 to 2017. This study shows that the incentives and commitments, as presented through the strategy, are not sufficient to get a local biofuel industry up and running and make it sustainable in the long term.

Keywords: Industrial biofuels strategy; government support; economic feasibility; South Africa

1. Introduction

The South African biofuels industrial strategy, issued during December 2007, reviews the objectives that the South African government wants to achieve and attempts to explain how these objectives are to be achieved. The first objective is that the government wishes to achieve economic and social development in the rural areas by means of creating an additional off-take market for agricultural commodities. The government proposes to achieve this by regulating firstly the geographic location of biofuel production plants, and secondly which commodities may be used to produce biofuels. Other objectives of the strategy are to promote agricultural development, substitute imported fuel by locally produced fuels to ease pressure on the balance of payments, overcome the trade distorting effects faced over time due to subsidised agricultural production in developed countries, add to the renewable energy pool in order to create cleaner energies, add downward pressure on crude oil prices through adapting fuel consumption patterns, and, to create a more energy secure environment by means of a local fuel production industry.

[1] *The Bureau for Food and Agricultural Policy (BFAP), Department of Agricultural Economics, Extension and Rural Development, University of Pretoria; E-mail addresses: ferdi.meyer@up.ac.za; pg.strauss@up.ac.za; Thomas.Funke@up.ac.za*

The December 2007 biofuel strategy deviates significantly from the initial draft strategy, especially in terms of biofuel blending rates and feedstock type usage. The biofuels strategy stipulates a blending rate of 2%, which is a significant change from the 4.5% proposed in the initial draft strategy, since it is argued that a 2% blending rate will not impact the country's overall food security negatively. Along with this deviation, the crops that have been proposed to be used as the feedstock for biofuel production have been narrowed down to sugar based commodities for bioethanol production, such as sugarcane and sugar beet, and sunflower, canola and soybeans for biodiesel production. Maize and jathropa have therefore been excluded, at least for the duration of the five-year pilot period as, according to the strategy, the use of maize and jathropa would impact negatively on food security and the natural environment.

The objectives of this article are to firstly indicate the potential viability of a local biofuels industry given the incentives provided by the biofuel strategy, and secondly to analyse how sensitive a local biofuel industry could be to changes in global macroeconomic factors. The impact of changes in the oil price, world sugar price and biofuel prices on a local biofuel industry's viability need to be understood in order to understand whether the objectives as stated through the biofuel strategy are achievable.

2. Literature review

Westhoff (2008) has summarised the arguments around the causes of the global food price increases in 2007/08, including the potential impact that biofuel policies have had on agricultural commodity markets. 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. 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%, partly as a result of increased grain consumption in India and China, which together accounted for approximately 28% of the increase in global grain consumption. The additional 35 million tons of maize used in the US corn to ethanol programme during the 2005/06 to 2007/08 marketing years also added to global demand. In addition, a weaker dollar, higher energy costs and increased demand for biofuels, and the attempt by many developing country governments to restrain domestic price increases by curbing exports and reducing import barriers resulted in lower supplies on the world markets and thereby raised prices even further.

Among the factors influencing demand and supply has been the additional use of maize in ethanol programmes in the US and many other countries. By how much did these programmes 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) estimated that 70-75% of 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) put the figure a bit lower, estimating 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 US Secretary for Agriculture 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).

This said, it becomes clear that governments around the world and in particular governments planning to initiate such a programme should consider their strategies carefully so that, in particular in developing countries, maximum benefit can be reaped from such developments. It seems that the development of the rural agricultural sector was one of the main priorities of the South African government when it drafted its final strategy. Such a strategy could indeed hold an opportunity for smaller farmers to take advantage of the new income generating opportunities presented by higher value agricultural commodities.

3. The BFAP sector model

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.

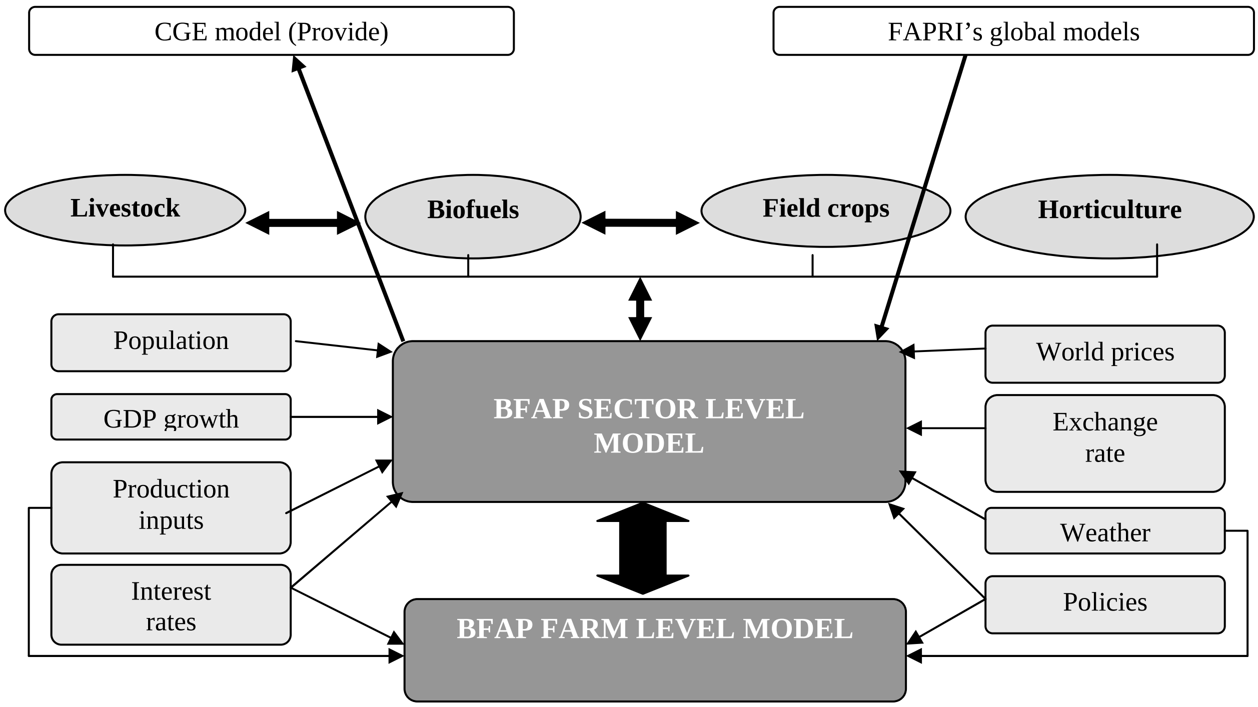

Figure 1: Basic structure of the system of equations

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 biofuel market. These profit margins depend on, amongst others, the price of feedstock such as maize and sugar and the price of the by-products originating from the biofuel production process (Section 3 of the paper discusses the calculation of the profit margins in more detail).

If the production of biofuels is economically viable, given a set of specific assumptions, a new equilibrium is simulated for all the industries included in the model. For example: bioethanol production from maize and sugar results in higher simulated maize and sugar prices due to increased domestic demand for both maize and sugar. The higher price of maize results in higher animal feed prices as maize is a basic animal feed ingredient. Along with this, the supply of dried distillers grain (DDG) (a by-product in the production of bioethanol from maize) increase as a result of bioethanol production from maize, resulting in further impacts on the animal feed industry since DDG can be included as part of the animal feed ration. In turn, the price of different meats such as poultry and beef is affected through the changes in feed costs as a result of changes in the maize and DDG prices. Due to the changes in meat prices, the production of the various meats change, this results in a new level of demand for animal feed, this in turn influences the maize price again. For the model to simulate all these cross impacts, each commodity or industry included in the model is simultaneously modelled in terms of supply and demand (production, consumption, imports, exports and prices) have been identified.

4. The industrial biofuels strategy

A. Fuel levy exemption

According to the Industrial Strategy the fuel levy tool plays a very important role in the indirect subsidisation process. The strategy stipulates that the current biodiesel fuel levy exemption be increased by 10%, implying that the fuel levy exemption will be 50% compared to its current level of 40%. In addition it is proposed that the fuel levy exemption on bioethanol be increased to 100% as ethanol gel could be a substitute for illuminating paraffin, which currently carries no levy. This respectively translates into a R1.21 per litre and R0.53 per litre support for bioethanol and biodiesel if calculated at 2007 prices (DME, 2007). If calculated at 2008 prices, it translates into R1.27 per litre for bioethanol and R0.56 per litre for biodiesel.

B. Rural development and license allocation

According to the strategy the main focus of rural development will be on the former homeland areas in South Africa, especially those neglected by the apartheid system. It is hoped that the strategy creates a development balance between the previously disadvantaged farming areas and commercial farming areas. It is further hoped that these initiatives stimulate development in the rural areas and reduce poverty by creating sustainable income-earning opportunities.

As poverty alleviation and the generation of economic activity in the former homelands are the most important objectives of the strategy, it becomes clear why it is only those agricultural products grown in the former homelands for energy use that will qualify for support and why only those biofuel plants that can assist in achieving the above mentioned targets will be supported and will qualify for a manufacturing licence. Thus the department that ultimately issues the licence will to a large extent control the location of biofuel plants and their operating conditions (DME, 2007). It is important to note that should this be the case, sugarcane for ethanol production will then be excluded from any benefits as almost all of the current industry's production area fall outside the former homelands and as a result do not qualify for support. This could have an impact on the various targets that are to be achieved.

The government plans to increase agricultural production in order to support biofuel investments by using existing support programmes such as CASP (Comprehensive Agricultural Support Programme). It is expected that CASP will prioritise those aspects of production that will enhance effective cropping for biofuels and in so doing it will make the supply of feedstock to the biofuels industry more reliable and efficient.

C. Contracting and mandates on biofuels

According to the strategy, the specifics of the biofuel uptake still need to be negotiated with the oil industry. This includes maximising efficiencies, reducing costs and ensuring the fuels adhere to the correct standards allowing them to be sold and used as standard quality fuel. The South African Bureau for Standards has recently established a working group among relevant stakeholders to finalise possible future regulations for a biodiesel quality management procedure to be applied in South Africa. These regulations don’t affect the biodiesel product standard significantly, but does influence the quality insurance process.

The strategy recommends biofuels to be sold on a contract basis. It suggests that biofuels be bought at a price that will ensure the long term viability of both biofuels refining and feedstock growing processes. The contract will come with an obligation to use approved crops grown only in designated areas, such as the former homelands, and with the guarantee that the said crops will be bought at a given price, regardless of the price of crude oil. On the other hand the price at which biofuel producers buy crops should be on par with the price that processors pay for crops destined for the food sector, in other words a market related price.

The strategy suggests that mandatory uptake can only be guaranteed once there is security in the supply of biofuels. It is at this stage of the bargaining process that both biofuel suppliers and oil refineries will enter into off-take agreements. The idea is that the oil company will then submit a claim to a certain slate account for the value of biofuels bought. During the initial phases of production, the mandating of biofuels is not favoured. It is instead suggested that biofuel producers be enabled to reduce their prices and, through this initiative, parties who are traditionally supplied by the oil companies are enabled to purchase fuel directly from the biofuel producers. The strategy further examines the concept of selling petrol containing bioethanol at a deregulated price to facilitate off-take.

The strategy envisages that to optimise efficiency, costs and logistics should be minimised. To achieve this, the existing oil refineries, in other words those closest to the biofuels plants, should be utilised. Furthermore, biofuels should be blended in accordance with the SANS standards, which currently limit biofuel content to 5% for diesel and approximately 10% for petrol. This will ensure that the appropriate quality blends of biofuels are produced (DME, 2007).

5. Modelling Assumptions

The assumptions on biofuel policies used in the modelling exercise are based on the policies as stipulated in the biofuel strategy document released during December 2007. A short summary of these variables is presented in the table below.

Table 1: Policy incentives in the industrial biofuels strategy

Description	Incentive for bioethanol	Incentive for biodiesel
Fuel levy exemption	100% exemption	50% reduction
Blending percentage	Voluntary	Voluntary
Import tariffs	0%	0%
Crops to be used	Sugar cane, sugar beet	Sunflower, soybeans, canola

These policies include blending biofuels on a voluntary basis, an increase in the fuel levy exemption to 100% for bioethanol and 50% for biodiesel and a licensing structure to regulate the exact location of biofuel plants and the quantities and types of crops to be used to meet the envisioned biofuel targets. As deducted from the biofuel strategy document, the government does not make any provision for the protection of the local industry by means of import tariffs. This creates an opportunity for biofuel imports should a blending mandate be enforced at a later stage. At present there is no mandate mentioned for the near future and therefore the blending of biofuels is purely on a voluntary basis. The strategy is designed as such that local refineries which import biofuels, and therefore don't source local crops as feedstock for their production, risk not qualifying for the fuel levy exemption. It is further stipulated by the government that only refineries complying with the rules and regulations as set out in the manufacturing licence, such as purchasing biofuels from the former homeland areas, will qualify in full for the levy exemption.

The modelling exercise is based on macroeconomic assumptions as obtained from the Food and Agricultural Policy Research Institute (FAPRI) Baseline 2008, as well as from Global Insight. The following table lists the macroeconomic variable assumptions underlying the simulations.

Table 2: Macroeconomic assumptions included in the baseline

Description	Units	2007	2008	2009	2010	2011
Crude Oil	US$/bbl	72.35	90.00	90.00	91.07	92.82
Exchange rate	SA cents/US$	709.98	766.99	814.06	857.60	899.51
CPI: Food	2000 = 100	224.99	245.47	259.46	273.80	287.49
World sugar price	US cents/lb	11.90	10.39	11.32	11.92	12.00
Brazilian anhydrous ethanol price	US$/gallon	1.68	1.84	1.83	1.74	1.65
Soybean oil, Argentina FOB	US$/ton	684.00	1423.85	1462.28	1566.22	1663.71
Sunflower oil, NW Europe	US$/ton	846.00	1860.00	1716.65	1765.90	1817.99

In terms of technical assumptions on biofuel production, different sources were used in order to develop these assumptions. Biofuel production costs and extraction rates were derived from standard and readily-available biofuel technologies information as supplied by technology providers and independent research institutes. Table 3 presents the technical assumptions

Table 3: 2008 technical data used in the BFAP model

Commodity	Extraction rate	Capital costs	Variable costs	Income from by-product	Feedstock costs
Sugar cane*	81.36 *l* ethanol	71.76 *c/l* ethanol	124.14 *c/l* ethanol	-	265.81 *c/l* ethanol
Sunflowers	398.5 *l* biodiesel	94.10 *c/l* biodiesel	95.00 *c/l* biodiesel	(240.05 *c/l* biodiesel)	1281.70 *c/l* biodiesel
Soybeans	194.1 *l* biodiesel	94.10 *c/l* biodiesel	137.20 *c/l* biodiesel	(1464.02 *c/l* biodiesel)	2291.83 *c/l* biodiesel

** Assuming that no by-product, such as electricity produced from bagasse, is sold back into the grid*

Since bioethanol and biodiesel are expected to trade as commodities, the cost of production will play a key role in terms of marketing competitiveness, especially in export markets. To illustrate the cost competitiveness of South African biodiesel, Figure 2 compares the production cost of biodiesel in South Africa to that of Germany. In Germany, rapeseed is used to produce biofuels, while in South Africa soybeans are assumed to be used. Figure 2 further indicates the international competitiveness of an assumed ethanol production in South Africa relative to that of Brazil, given prices at which ethanol traded recently.

The different prices that are compared in Figure 2 have been calculated from different sources and are representative of the following: The ethanol BFP Durban price represents the price at which Brazil could potentially land its ethanol in Durban harbour. In other words, it represents the import parity price of ethanol for South Africa. The bar to the left of the BFP Durban price represents the cost at which ethanol can be produced locally, together with the fuel levy exemption. At present ethanol from Brazil can be landed in Durban at approximately R4.80 per litre compared to local production of R4.90 per litre. Production costs of biodiesel in South Africa and Germany are very different. According to various sources, production costs of biodiesel in Germany are estimated at R17.50 per litre, inclusive of taxes while the cost of producing a litre of biodiesel in South Africa is closer to R11.00 (Oilworld, 2008). As illustrated in Figure 2, at present, the average cost of producing biodiesel in South Africa is still higher compared to producing fossil diesel (Diesel retail SA). This creates a significant challenge for the successful marketing of biodiesel in South Africa, and could hamper the successful development of a biodiesel market, especially in light of voluntary blending as stipulated in the biofuel strategy. It further indicates that the South African industry might face a serious threat if local blending mandates are imposed.

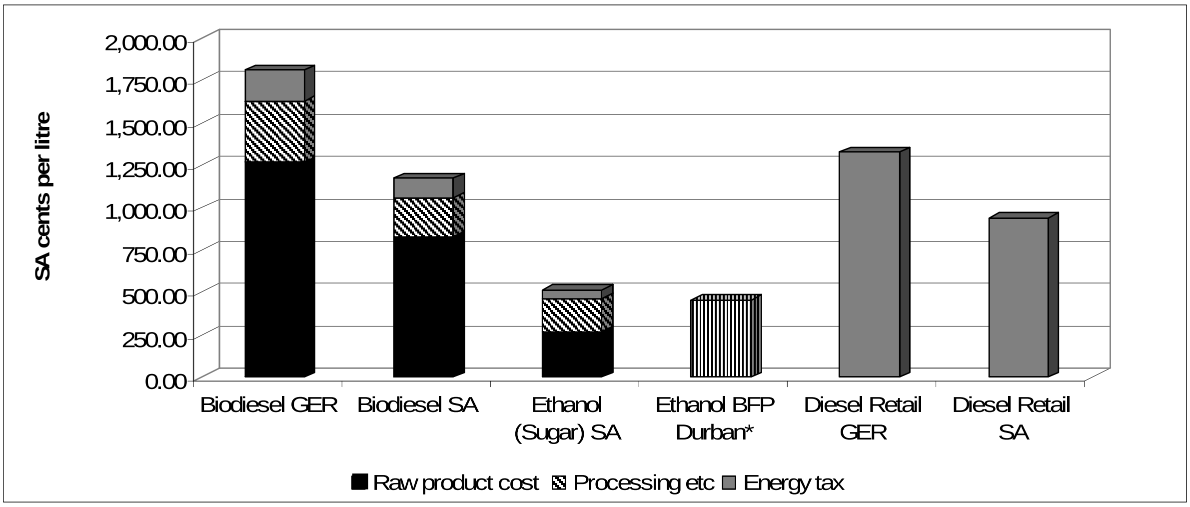

Figure 2: Production cost and retail price comparison of biodiesel and bioethanol

Source: Oilworld (2008), SAPIA (2008)

6. Modelling results: the baseline

The baseline modelling results presents the simulation results that can potentially be expected given the policy incentives as stipulated trough the biofuel strategy document as well as the macroeconomic assumptions as presented in the previous section in Table 2.

The respective biofuel industries, namely the bioethanol and biodiesel industries are split as different types of feedstock are used in the production processes, and hence are influenced by different markets namely the sugar and oilseed markets.

A. Baseline: the ethanol industry

Although the biofuel strategy stipulates that only production units that make use of sugar for the production of ethanol will have the advantage of fuel levy exemption, it is reasonable to assume that ethanol production from maize could be economically viable under specific favourable climatic and macroeconomic conditions. Hence, the model is set up such that if ethanol production does become viable from maize given favourable macroeconomic and climatic conditions, ethanol production from maize will occur along with sugar since sugar benefits from the fuel levy exemption.

Figure 3 presents the modelling results, and indicates that ethanol production from sugar could amount to around 100 million litres as a result of assumed sustained high oil prices. Given the assumed macroeconomic and climatic context, ethanol production from maize will be very limited and is likely to only occur on small-scale on-farm operations, such as the ethanol gel project near Sannieshof in the North West province of South Africa.

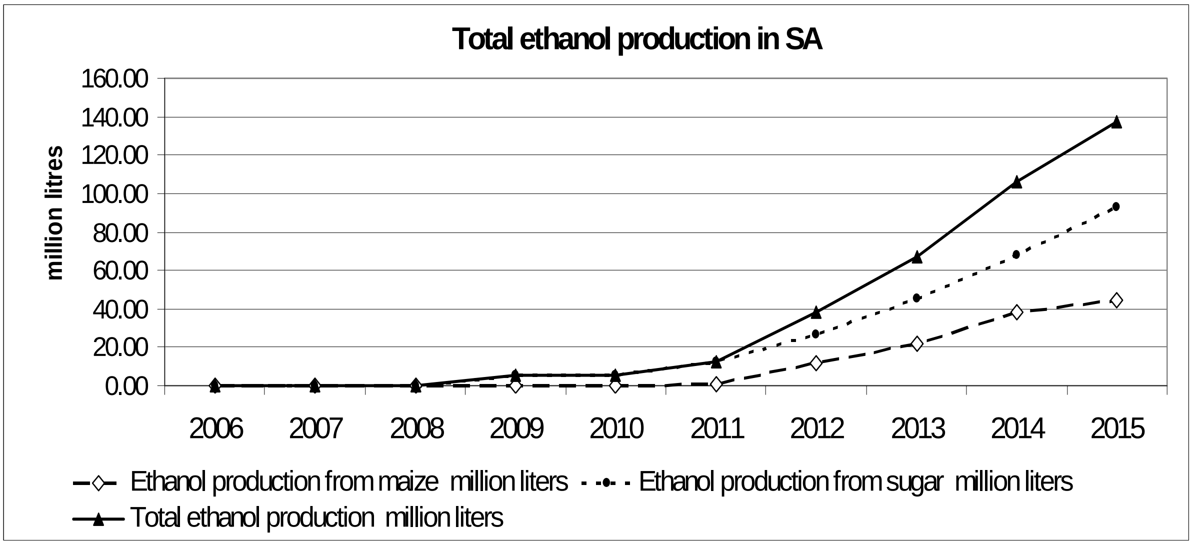

Figure 3: Total ethanol supply in South Africa

The production of ethanol from sugar will have trade impacts, and Figure 4 presents the potential changes in South African sugar exports on the back of assumed increasing crude oil prices and a stable world sugar price. Historically sugar exports totalled in excess of 1.1 million tons but the production of ethanol from sugar together with a higher crude oil price is expected to reduce exports to around 880 thousand tons in 2015. The local sugar cane price is also expected to increase as ethanol producers are assumed to mainly use sugarcane as a feedstock. The increased local sugar cane usage supports the local sugar cane prices, which are projected to increase over time. In 2015 the price is expected to average around R287 per ton.

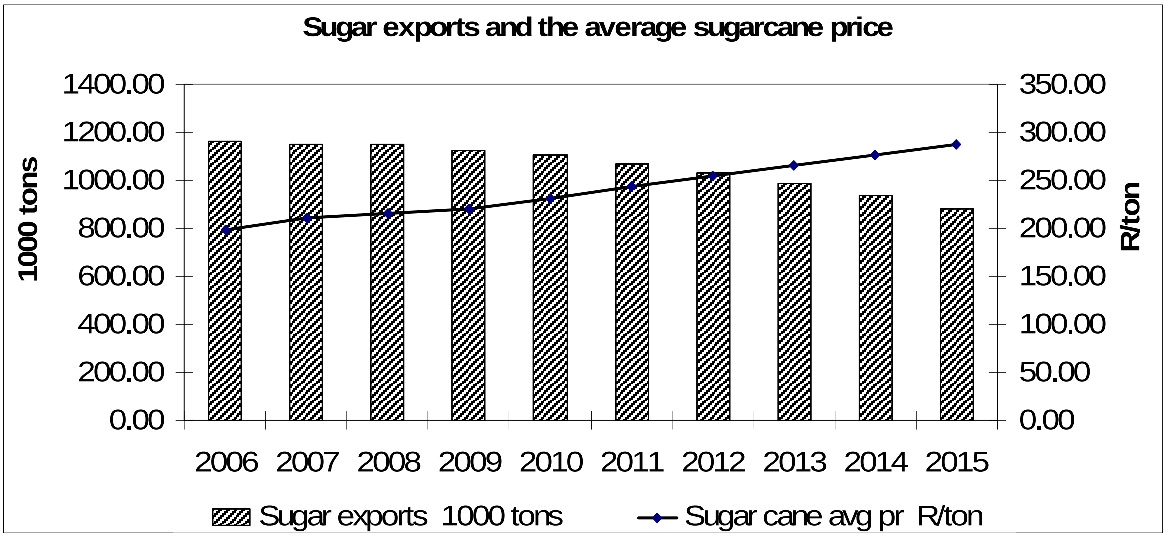

Figure 4: Sugar exports and the sugar cane price

Interestingly enough, prices of ethanol are expected to trade (if they are to trade in a deregulated market) below the retail price of petrol. In other words, the price of ethanol is simulated to be cheaper than the price of petrol at the pump given the tax structure, blending levels and other macroeconomic variable assumptions used for the baseline's simulation. The idea of letting the price trade in a deregulated environment is that a cheaper free trading price will allow ethanol to sell at higher volumes, and therefore it will make it more profitable for fuel companies to sell it at their retail outlets. Figure 6 depicts the prices at which ethanol is simulated to trade given the macroeconomic and policy assumptions as stipulated in the biofuel strategy.

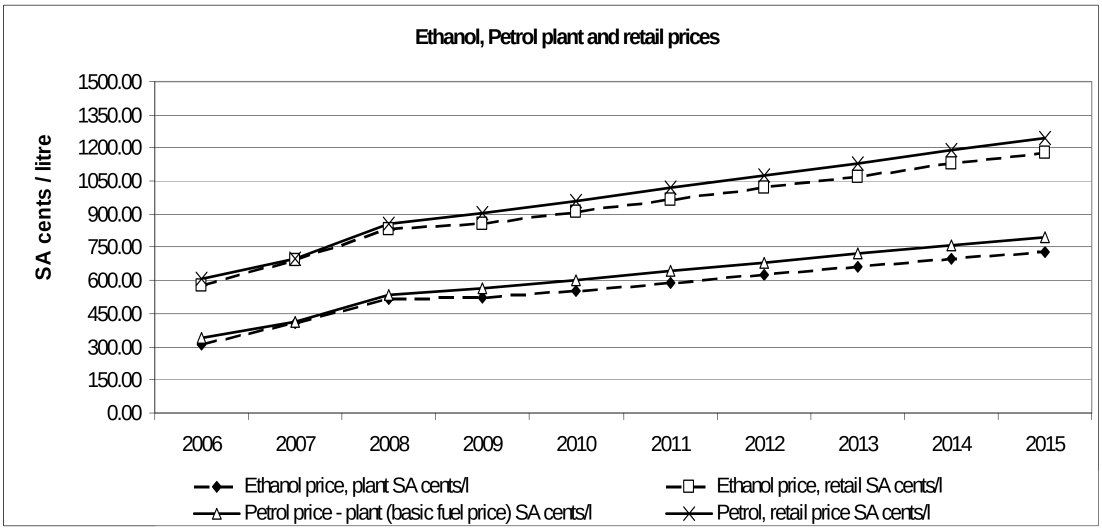

Figure 5: Ethanol and petrol plant and retail prices

B. Baseline: the biodiesel industry

It is assumed that the biodiesel industry will use soybeans, sunflower and canola as the feedstock for producing biodiesel. World prices and local commodity production capacities have played a large role in the baseline's simulation and in the outcome of what could possibly occur given the macroeconomic assumptions used. Historically, South Africa has always been a net importer of oilcake, which is used mainly in the livestock industry. This means the country has a high degree of dependence on the international market. Local prices, for example, will be directly dependent on the international prices and local supply will be directly dependent on the international market and policy developments, such as the policies of the EU and US on biofuels.

Figure 6 represents the total demand and supply of biodiesel in South Africa given the policies stipulated in the Industrial Biofuel Strategy document. As the figure indicates, there are no imports of biodiesel as there is no local market. All of the fuel that is produced locally is exported to international markets such as the EU where the product receives a better price. To support this point, referring back to Figure 2, indications are that due to the differences in biodiesel prices in Germany and South Africa, exports of biodiesel to such a market could be viable.

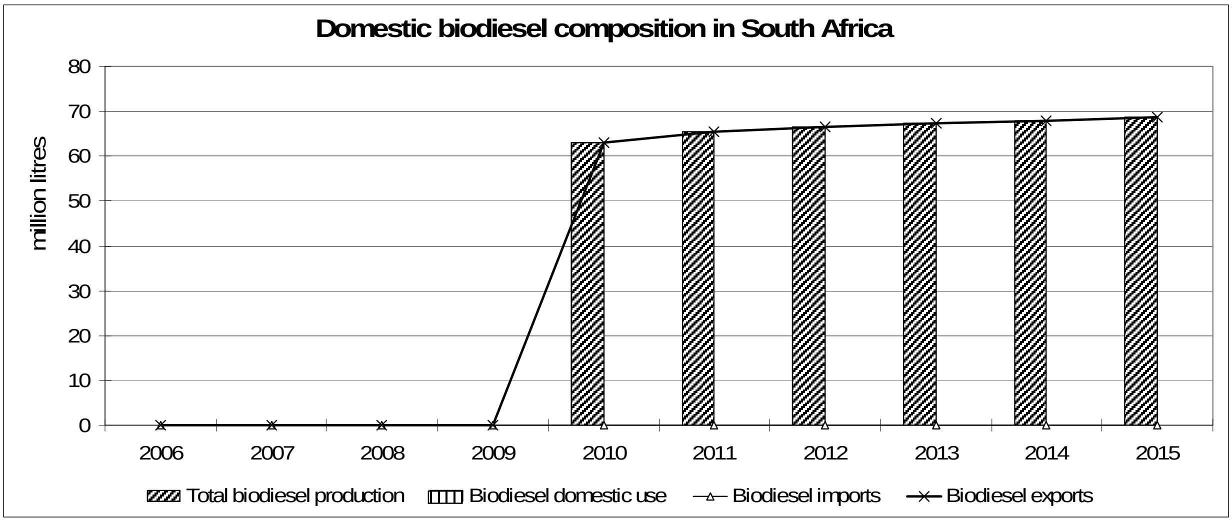

Figure 6: Total biodiesel supply and demand

Although the production of biodiesel from locally produced soybeans is projected to be relatively small, it will shift the demand for soybeans to the right and ensure the local soybean price trades close to import parity prices (Figure 7).

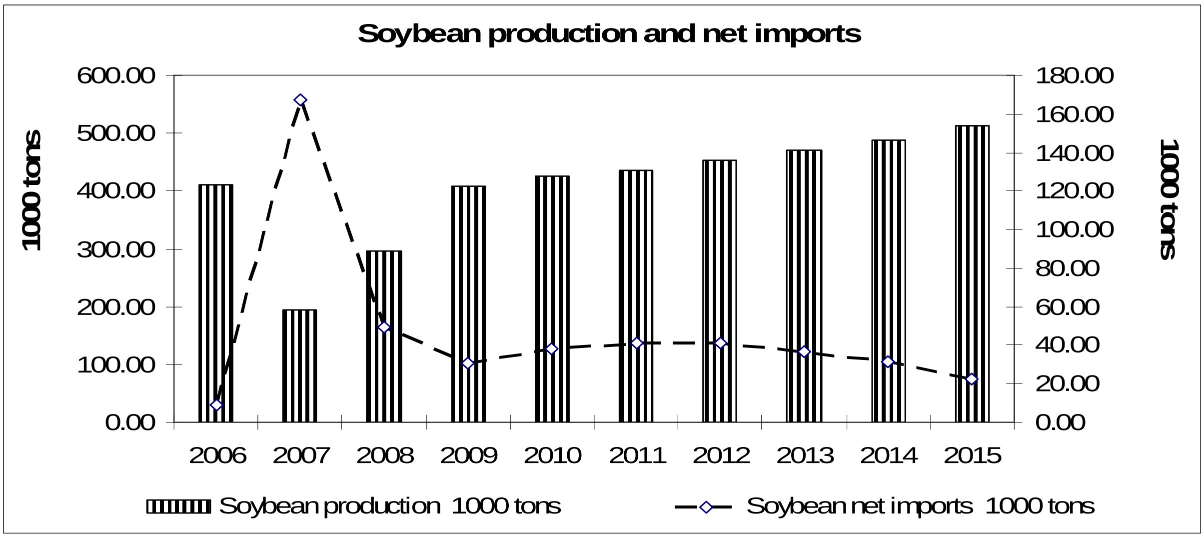

Figure 7: Soybean production and net imports

The biofuel strategy does not allow for an alternative retail price for the biodiesel. This is assumed in the modelling exercise, and the simulation results indicate that biodiesel is therefore likely to trade close to the fossil diesel price. Without the tax exemption, biodiesel could even trade at a higher price than fossil diesel (Figure 8).

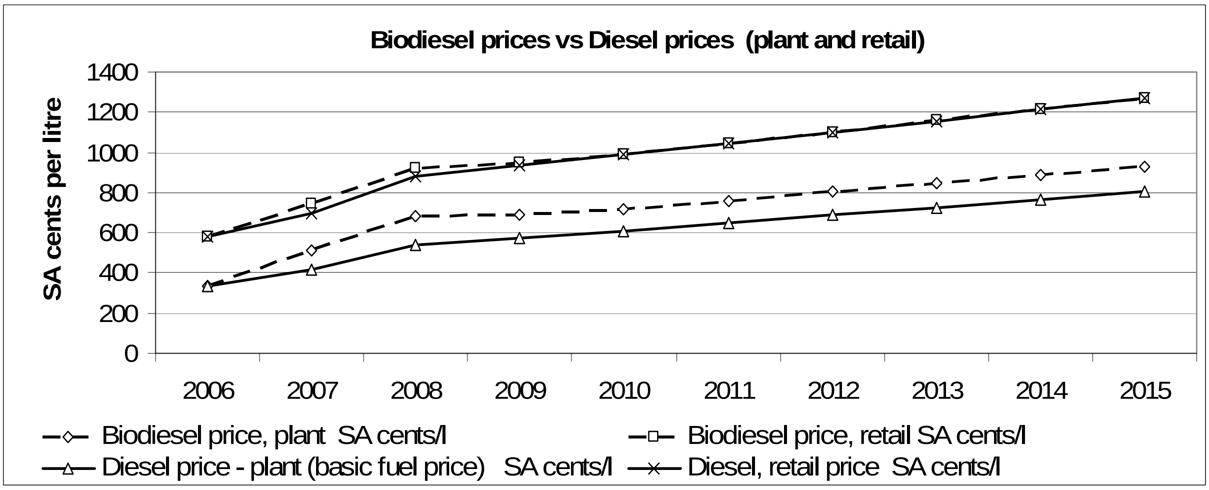

Figure 8: Biodiesel and diesel plant and retail prices

Biodiesel prices have a different structure to the ethanol and petrol prices. First of all the biodiesel industry receives a smaller fuel levy exemption than the bioethanol industry. The fuel levy exemption that the biodiesel industry receives is 50% and seeing that fuel taxes on diesel are, on average, less than those on petrol, this results in a smaller support. The biodiesel price is therefore expected to trade very closely to the normal fossil diesel price. The plant price of biodiesel is, however, higher than the plant price of fossil diesel as it costs more to produce biodiesel. Biodiesel is expected to trade at around R9 per litre in 2008, given that the baseline assumptions hold. Figure 8 presents the differences in prices of fossil diesel and biodiesel. It should be noted that biodiesel is, on average, more expensive to produce as it does not include the historical subsidies and supports that were extended to the fossil fuel industry. The plant price of biodiesel, as simulated, is a direct calculation of the costs of producing the fuel.

7. Modelling results: the scenario

The following scenario presents another possible outcome of an assumed South African biofuel industry as well as related implications for the agricultural sector under such a scenario. This outlook was generated under an alternative scenario with a different set of policy assumptions and macroeconomic variables. Table 4 presents the set of macroeconomic variables that were used to simulate this scenario.

Table 4: Macroeconomic assumptions made for the alternative scenario

Description	Units	2007	2008	2009	2010	2011
Crude oil	US$/bbl	78	105	116	125	130
Exchange rate	SA cents/US$	7.47	780	810	825	880
CPI: food	2000=100	160.89	235	265	295	335
World sugar price	US cents/lb	11.90	11.67	11.92	14.11	18.12
Brazilian anhydrous ethanol price	US$/gallon	1.68	2.4	2.65	2.86	2.97
Soybean oil, Argentina FOB	US$/ton	684	1423.85	1462.28	1566.22	1663.71
Sunflower oil, Argentine	US$/ton	751	1761.86	1615.01	1660.67	1709.10
Soybean price FOB Rotterdam	US$/ton	335.00	592.55	604.77	571.21	576.79
Sunflower cake price FOB Rotterdam	US$/ton	178.00	316.97	273.45	258.50	249.76

The scenario presents an alternative picture of the global economy that some economist regard as "most likely" with oil and commodity prices rising constantly over the outlook period. It is important to remember that a scenario presents a combination of events that have to take place for the scenario to unfold. For example, for this scenario the economic problems that the US has encountered should have a lesser effect on the emerging markets, such as India and China, and a relatively small impact on the developed markets, such as the EU. Furthermore, investors throughout the world are still risk averse and therefore opt to allocate their investments to more stable economies rather than the developing countries and as a result the Rand weakens. High oil prices and a weak Rand put upward pressure on the local inflation rate which in turn has an impact on the interest rate. The interest rate remains high (14 to 15%), but no further increases are announced due to fears that further increases would have a profoundly detrimental effect on the South African economy. The bottom line is that the macroeconomic picture that is painted in this alternative scenario is likely to significantly benefit the potential biofuel industry in South Africa.

A. Alternative scenario: ethanol industry

The contribution of maize to the ethanol pool is presented in Figure 9. The simulations indicate the production of ethanol could potentially be just over 1 billion litres by 2017, with 600 million litres produced from sugar and just over 400 million litres produced from maize.

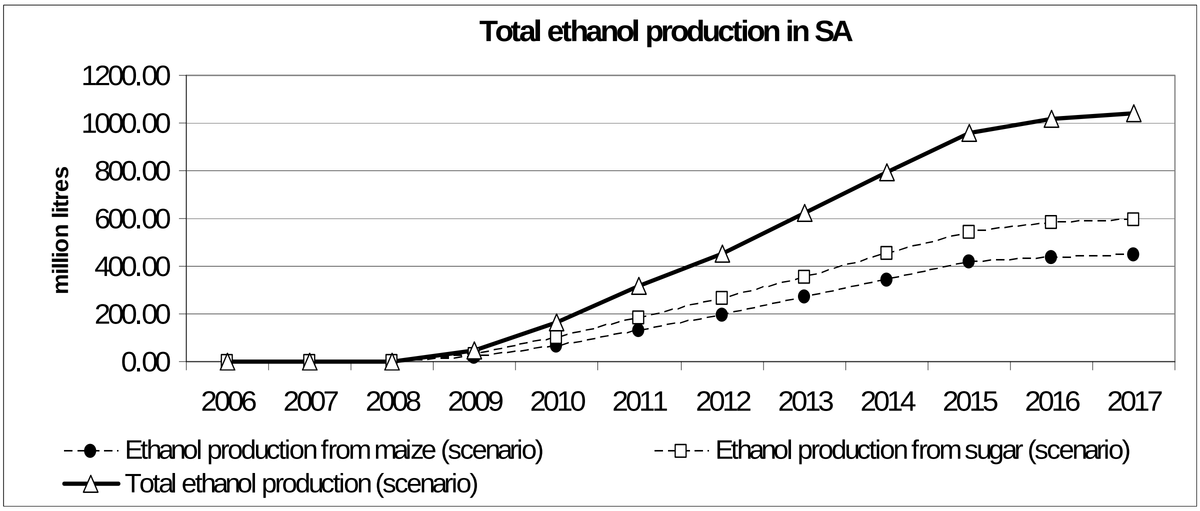

Figure 9: Ethanol production in South Africa

The results presented in Figure 9 is based on calculations indicating that sugar cane as a feedstock is more profitable than maize from a biofuel production perspective given the policies and macroeconomic variables in place. Sugar cane therefore dominates as the feedstock for ethanol production and as a result more and more of sugar cane are diverted to ethanol production instead of being exported. Given the high fuel prices as a result of assumed high oil prices, producers sell ethanol at a wholesale price of more than R 6 per litre. Bioethanol is therefore simulated to trade at a lower price than petrol as ethanol is exempted from the fuel levy causing it to be more price competitive compared to petrol (Figure 10).

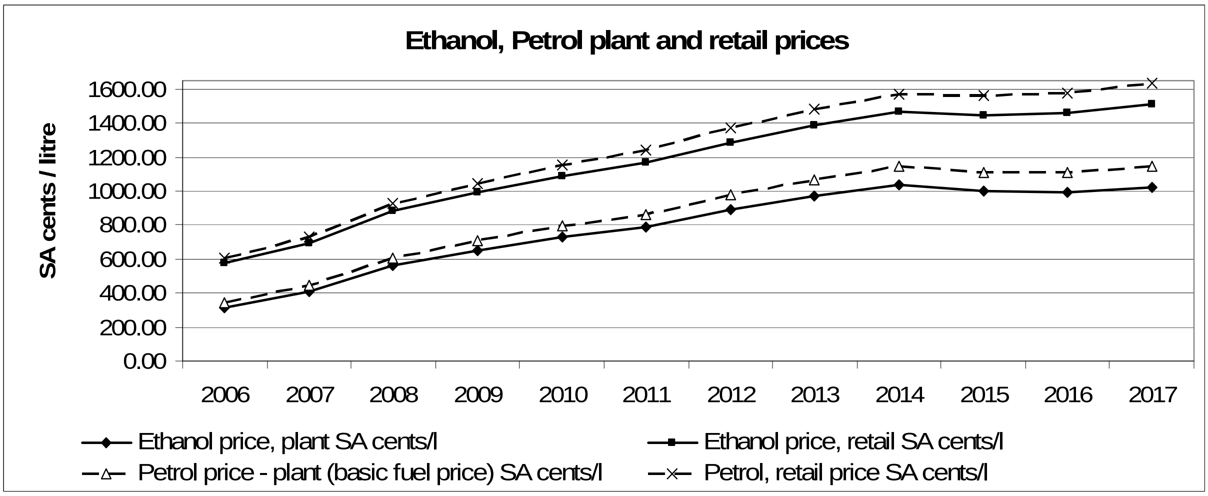

Figure 10: Ethanol price versus the petrol price

The sugar industry experiences a favourable change due to the production of bioethanol from sugarcane. Sugar exports increase at first as the international sugar price continues its upward trend. Thereafter, in 2010, the oil prices increase rapidly and, with that, benefit the local ethanol industry. As a result South Africa experiences a slight decline in sugar exports as sugarcane is diverted from the production of sugar to ethanol. The local sugar cane price is projected to increase as the local demand for sugar increases. This implies that the increased production of bioethanol from sugar cane results due to the increased profitability as a result of extremely high oil prices.

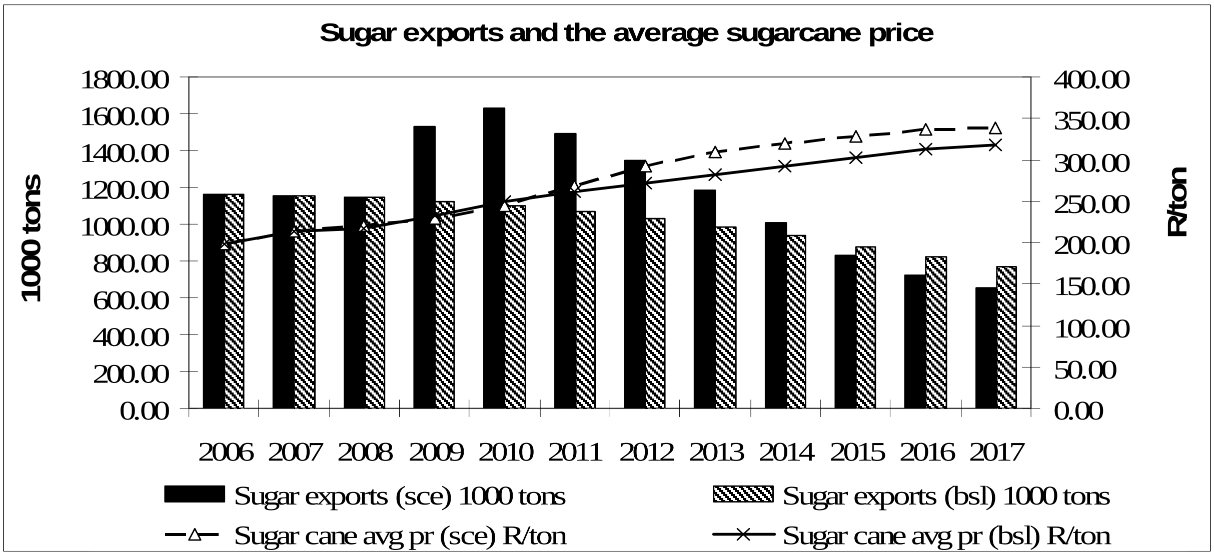

Figure 11: Sugar exports and the change in the sugar cane price
**bsl = baseline, sce = scenario*

Under the alternative scenario the production of ethanol from maize increases as conditions become more favourable. As a result of this, DDGS production also takes place and reaches a point where it is fully absorbed into the market. It seems as if two maize-to-ethanol plants, with a capacity of around 150 million litres, could be commissioned, given the profitability of the industry due to the changes in the macroeconomic variables. Figure 12 presents this situation.

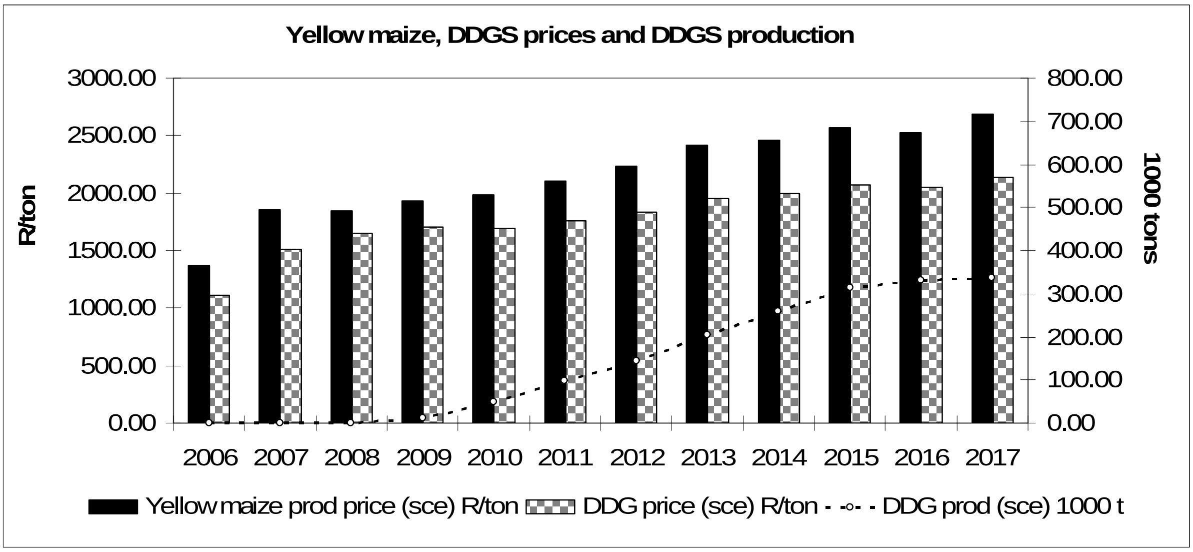

Figure 12: DDGS prices and production relative to the yellow maize price

DDGS production is simulated to reach a maximum of around 350 thousand tons and is expected to trade at an average of around R2000 per ton given the maize prices as simulated in the model.

B. Alternative scenario: biodiesel industry

A variety of oilseed feedstocks can be used to produce biodiesel. Soy oil is the largest contributor, approximately 57%, to the total volume of biodiesel produced; while sunflower oil makes up the remaining 43%. Given the regulatory policies that will inhibit the sale of biodiesel by producers, the vast majority of consumption will be on-farm. There are no imports as there is no mandate and thus no official market, and hence no demand, in place. The figure below represents just how the use of soybean oil as a feedstock in the production of biodiesel changes given the scenario's choice of macroeconomic factors.

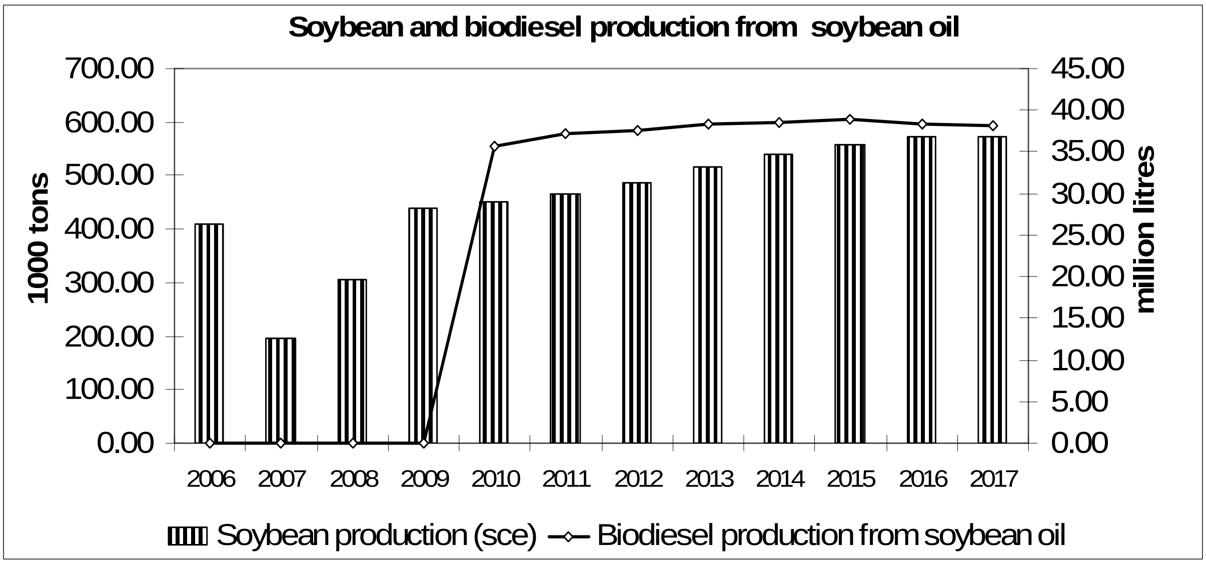

Figure 13: Soybean oil use in the biodiesel industry

A fair amount of biodiesel is produced from soybean oil and therefore the macroeconomic impacts also have a significant impact on total quantity of soybeans planted. Figure 14 shows these impacts more clearly.

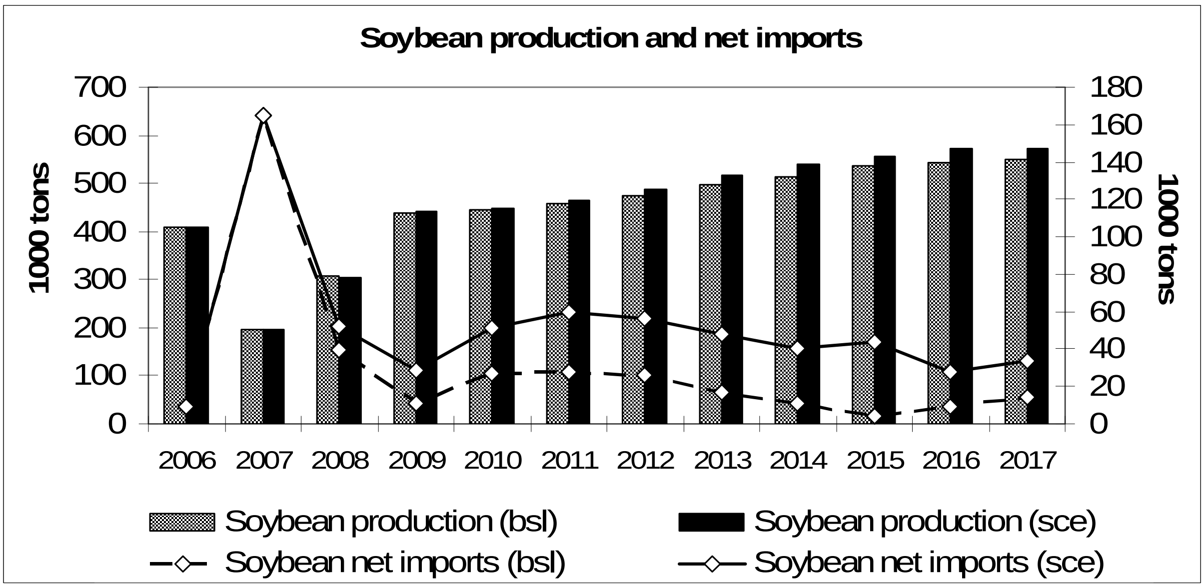

Figure 14: Soybean production and imports to South Africa

Figure 14 indicates that net imports of soybeans are expected to increase relative to the baseline. Local production also benefits from better technology and a higher demand for the commodity. The uses of more productive crop production techniques and better prices are assumed to support the local increase in production of soybeans.

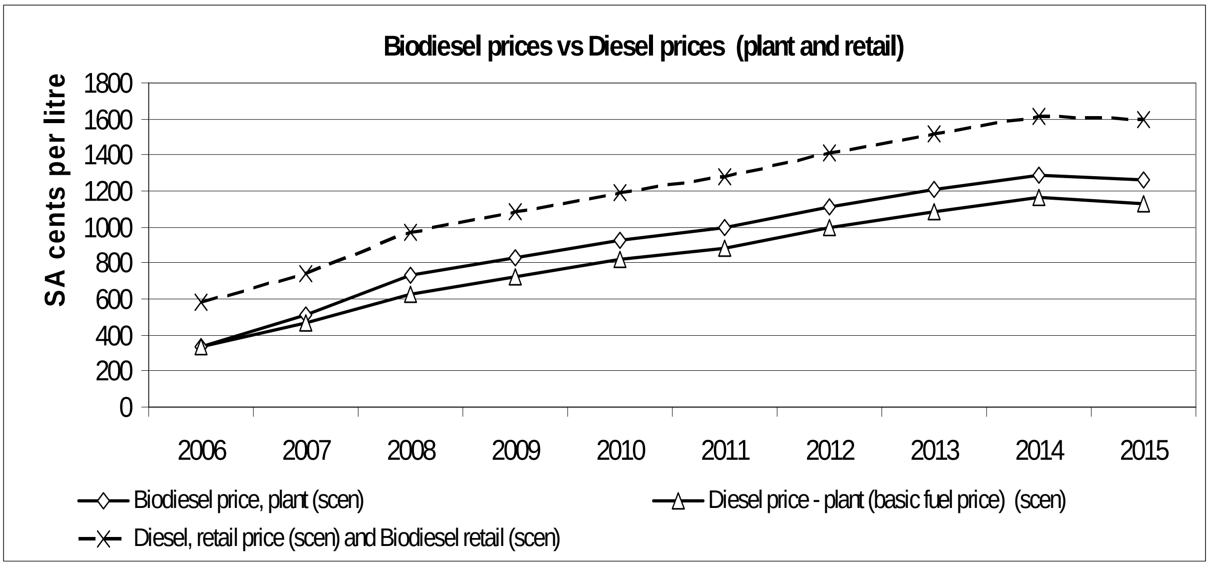

Figure 15: Biodiesel and diesel plant and retail prices

The price of biodiesel, at retail level is expected to trade at the same price as that of diesel as there is no real market for the product and local production is extremely low relative to normal diesel usage. Figure 15 indicates that greater incentives are required to get the industry off the ground. Revised and more clearly defined strategies are required to stimulate the set up of a biodiesel industry that can eventually lead to the successful obtainment of the objectives as set out in the biofuel strategy.

8. Conclusion

The baseline and scenario results presented in this article reflect just how the macro economic and policy factors impact on the success of a biofuel industry. The alternative scenario indicates that oil prices of around $150 dollars a barrel along with a favourable conversion rate of ethanol from sugar, could make ethanol production from sugar viable compared to exporting of sugar. The biodiesel industry, on the other hand, appears to remain under pressure in both the baseline and scenario due to higher raw material prices.

It can be concluded that correct government support together with favourable macro economic conditions could influence the success of such a South African biofuel industry to a large extent. Hence, care need to be taken in ensuring that strategies pertaining to the development of such an industry is formulated correctly and that the impact of macroeconomic conditions are kept in mind when formulating these strategies to ensure that the stipulated strategies are successful.

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Appendix:
Full description of assumptions used for the baseline

Description	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Crude oil	US$/bbl	72.345	90	90	91.07	92.82	94.59	96.403	98.248	100.127	102.04
Exchange rate	SA cents/US$	709.98	766.99	814.06	857.60	899.51	938.79	976.91	1015.05	1045.83	1075.42
CPI: Food	2000=100	224.99	245.47	259.46	273.80	287.49	355	390	425	465	510
World sugar price	US cents/lb	11.90	10.39	11.32	11.92	12.00	12.77	12.94	13.16	13.00	13.15
Brazilian anhydrous ethanol price	US$/gallon	1.68	1.84	1.83	1.74	1.65	1.63	1.67	1.76	1.83	1.86
Soybean oil, Argentina FOB	US$/ton	684.00	1423.85	1462.28	1566.22	1663.71	1704.26	1732.34	1769.36	1807.23	1845.64
Sunflower oil, Argentine	US$/ton	751.00	1761.86	1615.01	1660.67	1709.10	1721.45	1751.06	1787.60	1828.45	1871.93
Soybean price FOB Rotterdam	US$/ton	335.00	490.98	501.11	473.29	477.92	472.81	478.89	481.56	485.57	484.62
Sunflower cake price FOB Rotterdam	US$/ton	178.00	316.97	273.45	258.50	249.76	247.91	249.50	250.94	250.84	247.54

Full description of assumptions made for the scenario

Description	Units	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Crude oil	US$/bbl	78	105	116	125	130	142	150	155	145	140
Exchange rate	SA cents/US$	7.47	780	810	825	880	920	940	960	1000	1030
CPI: Food	2000=100	160.89	235	265	295	335	375	420	463	515	575
World sugar price	US cents/lb	11.90	11.67	11.92	14.11	18.12	24.35	28.55	30.22	29.45	32.55
Brazilian anhydrous ethanol price	US$/gallon	1.68	2.4	2.65	2.86	2.97	3.25	3.43	3.54	3.31	3.2
Soybean oil, Argentina FOB	US$/ton	684	1423.85	1462.28	1566.22	1663.71	1829.53	1859.67	1899.41	1940.07	1981.30
Sunflower oil, Argentine	US$/ton	751	1761.86	1615.01	1660.67	1709.10	1721.45	1751.06	1787.60	1828.45	1871.93
Soybean price FOB Rotterdam	US$/ton	335.00	592.55	604.77	571.21	576.79	570.62	577.96	581.18	586.02	584.88
Sunflower cake price FOB Rotterdam	US$/ton	178.00	316.97	273.45	258.50	249.76	247.91	249.50	250.94	250.84	247.54