

*Bio-fuels may provide a stable market for maize farmers in the long term.*

## Bio-fuels: South Africa going for green

The South African economy is highly dependent on oil and the agricultural sector is suffering from pressure on commodity prices.

It is therefore essential to explore the viability of ethanol production from agricultural crops.

### Background

Brazil has been the leader in ethanol production since the 1980s and is still the largest supplier in the world, followed by the United States. In 2005, Brazil produced 16,5 billion litres of fuel ethanol (45,2% of the world's total), with the United States producing 16,2 billion litres, or 44,5% of the total worldwide. In these countries, ethanol provides roughly 40% and between 2% and 3% of non-diesel fuel respectively (Worldwatch Institute, 2006).

According to the Worldwatch Institute report (2006), even when subsidised, the economic savings from using bio-fuels (and reducing oil imports) can be significant. Between 1975 and 1987, ethanol saved Brazil \$10,4 billion in foreign exchange, while costing the government \$9 billion in subsidies. This investment continued to pay off in subsequent years. Studies show that from 1976 to 2004, Brazil's ethanol production substituted oil imports worth \$60,7 billion – or as much as \$121,3 billion when taking into account the interest that would have been paid on foreign debt (based on debt previously incurred importing oil).

Furthermore, world ethanol production more than doubled between 2000 and 2005, while production of bio-diesel, starting from a much smaller base, expanded nearly fourfold. In contrast, oil production increased by only 7% over this period. This indicates that the world is moving towards bio-fuels as an alternative energy source, in the face of soaring oil prices.

### Potential benefits that the bio-fuel industry can bring

It is believed that changing subsistence farmers into cash crop producers to supply the crops (or inputs) for bio-fuel will start to address the high level of

unemployment in the country, particularly in rural areas. New job opportunities will also be created in refining, blending and distributing the bio-fuels. According to a national study conducted into the socio-economic benefits of the bio-ethanol industry (based on the 10% blending ratio envisaged), the production of bio-ethanol can support 35 000 additional jobs. In addition, World Bank reports that bio-fuel industries require about 100 times more workers per unit of energy produced than the fossil fuel industry (The Globalist, 2006).

Bio-fuel production could counter the challenge of low grain prices that result from South Africa's surplus production. It may well provide a stable market for maize farmers in the long term. The production of bio-fuel can therefore provide an alternative market for agricultural crops, which will help spread the risk.

A 10% to 15% bio-ethanol blend with conventional petrol can be introduced without it being necessary to adapt vehicles to use the product. Current crude-oil prices and the long-term price forecast for oil favour the introduction of bio-fuels. By using South African feed grain and technology, bio-ethanol can be produced at a cost of R2,50 a litre, and the basic local price is more than R3 a litre. The economic viability of producing bio-fuels could, however, come under threat if the crude oil price were to fall below \$40 a barrel.

South Africa is the third-highest producer of carbon dioxide in the world in relation to per capita income. This is measured against the pollutants emitted to produce economic wealth (Engineering News, 2005). Bio-ethanol reduces CO<sub>2</sub> emissions by 60% compared with crude oil, and compared with the use of oil from coal, bio-ethanol produces five times less CO<sub>2</sub> emissions.

Government subsidies and tax incentives can help establish the bio-fuel industry and the South African government has already approved a 40% rebate for bio-diesel production. It is possible that a 40% rebate can also be negotiated for the production of bio-ethanol.

A strong local bio-fuels industry will make a significant contribution to the country's gross domestic product (GDP). According to the Engineering News (2005), every 100-million-litres-a-year bio-ethanol plant, which will produce about 1% of the country's annual petrol consumption, will add R250 million (or 0,025%) to the GDP. If a 10% bio-ethanol blending is achieved, bio-ethanol will add 0,25% to the country's GDP, and furthermore R2,5 billion a year will be saved on imports.

A local bio-ethanol industry will also serve as a hedge against high oil prices, the profits for the local producers will be increased and the producers will be taxed locally.

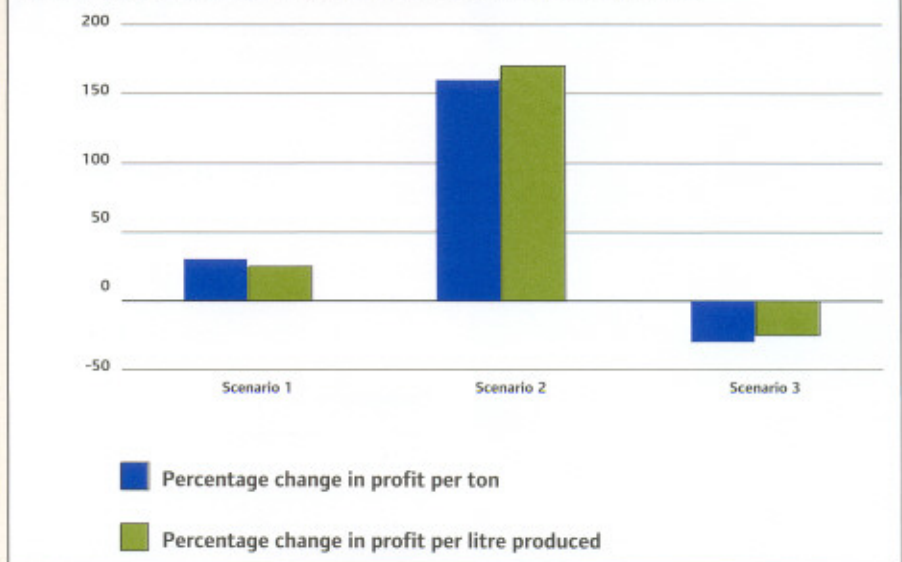
Bio-fuel development affects not only the socio-economic domain, but also the state of the environment and natural resources. Bio-fuels are renewable and have low pollution levels. Bio-ethanol can also be blended into fuels to oxygenate them, which results in a cleaner and more thorough burning fuel that reduces smog and air pollution, and makes for efficient energy utilisation (Bureau for Food and Agricultural Policy (BFAP), 2005).

### Government's move towards bio-fuel production

The Department of Minerals and Energy is leading a revolutionary approach to energy supplies in a move to promote the production of environmentally friendly bio-diesel and bio-ethanol fuels from crops such as maize and soya beans. According to the previous Minerals and Energy Minister, Lindiwe Hendricks, South Africa imports about 60% of its crude oil requirements. This has economic implications in terms of balance of payments, as well as vulnerability to rising crude oil prices.

Government wants bio-fuels to account for 40% of South Africa's renewable energy, in order to achieve the target of 10 000 GWh of renewable energy by 2013. In 2005, a task team was appointed to develop a bio-fuels production strategy for the country. The strategy is expected to be presented by October 2006.

**Figure 1: Percentage change in the ethanol plant's profits from 2007 to 2010**



Source: BFAP (2005)

The use of bio-fuels in South Africa has several benefits. For example, in addition to being used in the liquid-fuels industry, bio-ethanol in the form of a gel provides a cleaner and safer alternative to paraffin.

### Baseline scenarios

In the Bureau for Food and Agricultural Policy publication: Bio-ethanol Production in South Africa: An Objective Analysis (November 2005), three scenarios were presented:

- Scenario 1 titled "The new baseline" represents the impact that a single ethanol plant has on the South African maize sector, when holding all other baseline assumptions constant, as published in the BFAP Baseline, June 2005.
- Scenario 2, on the other hand, is designed to represent the likely success or failure of the ethanol plant in an environment in which the world's economies are growing, and higher oil prices are the norm.
- Scenario 3 represents the opposite, namely, a cooling down of the world's economies and a continual decrease in the oil price.

These scenarios represent a scenario-planning exercise to help explain possible effects of changes in key drivers.

According to Figure 1, the percentage change in the ethanol plant's profits is greatest in Scenario 2; and there is greatest risk if Scenario 3 prevails. In the production of bio-fuels, the producer price of agricultural commodities, the oil price, the exchange rate and weather conditions are all critical in the successful production of ethanol in South Africa.

### The way forward

According to the Bureau for Food and Agricultural Policy (2005), price competitiveness of bio-fuels can either be a threat or an opportunity. If the bio-fuel price in South Africa is higher than in other countries that are either highly competitive or subsidised, they will want to share in the gains. For that reason, it is important that the South African bio-fuel industry become globally competitive.

Strict regulations and structures will be required to ensure that tax incentives and subsidies encourage local production, and that conditions are not favourable for manufacturers to import their raw materials, or even the bio-fuels themselves. Tariffs might have to be used to protect the local bio-fuel industry. Mandatory blending is also necessary to help the industry to succeed, and the government should make it compulsory to blend 10% ethanol with petrol to guarantee a market for bio-fuels. This will also help to attract investments without it being necessary to adapt vehicles to use the product in the industry, and make it more viable over the long term.