

## About briefs

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## Abstract

Biofuels production is increasing inexorably all over the world, driven by the rise in oil prices and the threat of climate change. This in turn is pushing up the price of food, especially of those foodcrops used to produce biofuels. This paper examines the likely effect of increased prices of maize, sugar, etc on South African consumers, especially on the very poor for whom such staples form a substantial proportion of their food basket. It then looks at the SA government's industrial biofuels strategy, and finds it seriously flawed in its assumptions, and particularly in its analysis of the likely impact on the poorest: it suggests the strategy will result in a highly unequal contest between the poor having to compete for the basics on which they live, and the rich who want to burn it to run their cars. Finally the paper makes four specific recommendations on how the strategy could be modified to ensure that the potential benefits of bioenergy are captured by the poor in rural areas, rather than monopolised by rich, urban consumers

## Biofuel production and the threat to South Africa's food security

Biofuels production is expanding rapidly all over the world. In the US President George W Bush used his 2007 State of the Union address to propose a mandatory target for the replacement of about a fifth of oil-based transport fuels by inclusion of 35 billion gallons of biofuels in the fuel sold by 2017. This is a sharp increase from the current production of 4.2 billion gallons by 97 ethanol refineries. 78 more refineries were under construction in the US in early 2007.

Ethanol production already takes 26% of the US sorghum crop and it is estimated that it will take 25% of the maize produced in the US in 2007. Since the US has been supplying 70% of all the grain traded internationally, the amount it has available for export is almost certain to shrink and further increases in the world price of grain can be expected. Price pressure will be increased further because the EU has set itself the target of replacing 10% of its transport fuels by biofuels by 2020. This follows on from the current target of 5.75% biofuels in the transport mix by 2010. The EU accepts that it does not have the agricultural resources to produce the additional biofuel itself and that substantial imports will be required.

This dash for more biofuels is due to two factors - the rise in oil prices and the threat of climate change. Oil prices have roughly tripled since early 2002 partly because the major energy companies have not invested in building enough refinery capacity to meet the growing level of world demand. World oil production has gone up by 40% in the past 20 years while refinery capacity has only gone up 15%. In particular, the companies have failed to invest in the right type of refinery. The world's output of 'sweet' (that is, easily refined) oil is declining because the fields from which it comes like those in the North Sea are becoming exhausted. As a result, they have too little of the more complex and expensive refinery capacity needed to process the remaining 'sour' oils<sup>1</sup>.

A second reason for the high prices is that the companies have not been able to find enough new oil fields to replace those becoming exhausted. This is despite the use of increasingly sophisticated exploration techniques. 2003 was the first year in recent times when no new major oil field was discovered. Oil is being pumped out of the ground three times faster than it is being replaced by new oil finds. As a result, the oil reserves discovered between

<sup>1</sup> Emissions Rationing and the oil price crisis. [www.feasta.org](http://www.feasta.org)

1950 and 1980 are being run down. Consequently, unless a global economic depression develops, oil's decreasing availability is likely to push its price up to levels far above those ruling at present. A Texas investment banker and a former energy adviser to President Bush, Matt Simmons, told the BBC in 2004 that a price of \$182 might be required to balance supply and demand. Even if a depression does develop and prices fall back, oil may not become any more affordable for many poor people because, as less work will be available for them, their earnings will drop. Most Southern African countries import oil and the rise in price has had a serious negative impact on their balance of payments.

The price of oil has also had a large impact on the price of food. Modern agriculture is highly energy intensive. A recent study conducted by the South African Department of Agriculture<sup>2</sup> estimated that at least 12.5% of the final energy demand in South Africa came from the agricultural sector and its backward and forward linkages. The higher cost of this energy has to be passed on. This means that food prices can be expected to rise for two reasons – the higher cost of producing it and because the surpluses which have had the effect of depressing the world price of grain have been removed from the market to be converted to motor fuel.

To some extent, the price rises will restore a long-running relationship between the price of oil and the price of grain - what Lester Brown has called "the wheat-oil exchange rate"<sup>3</sup>. From the 1950s to mid 1970s the price of both wheat and oil was remarkably stable and a bushel of wheat could buy a barrel of oil. But from 1973, oil prices went up but foodstuffs did not and it now takes 13 bushels of wheat to buy one barrel of oil.

**Table 1: The oil/wheat exchange rate**

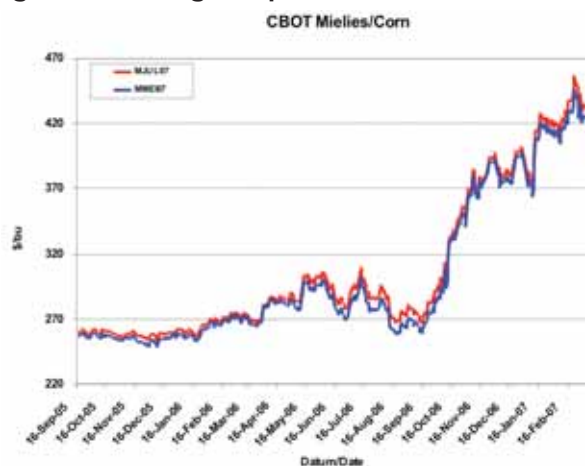
Year	Bushel wheat (dollars)	Barrel of oil (dollars)	Bushel per barrel (ratio)
1950	1.89	1,71	1
1960	1.58	1.85	1
1970	1.49	1.79	1
1975	4.06	11.45	3
1980	4.70	35.71	8
1990	3.69	22.90	6
1995	4.82	17.20	4
2000	3.10	28.23	9
2005	3.90	52.00	13

## Food price rises

The re-balancing of food prices in relation to the price of energy is likely to cause severe social distress. At the end of 2006, grain prices were the highest they had been for a decade and in February 2007, tens of thousands of people marched through Mexico City in protest at a 400% rise in price of tortillas. These are made from corn and are the staple food of the poor. Experts blamed the US for using corn to make ethanol, pushing up export prices. Mexican President Felipe Calderon responded by capping the price of tortillas.

Back at home, in South Africa, food price increases are also a worry. A report issued by the National Agricultural Marketing council in March 2007 stated that although the food price inflation for the year ending Dec 2006 was 7.88%, a drop from 9.45% in 2005, some important foods which are staples in poor people's diets had increased much more dramatically. For example, the average maize price increase was 28.% and sugar rose by 12.6%.

**Figure A: local grain prices**



**Figure B: International grain prices**



Both graphs were reproduced from [www.grainsa.co.za](http://www.grainsa.co.za)

2 Energy Use in South African Agriculture and its Future Supply. R. Douthwaite and A. Sugrue. Prepared for the Department of Agriculture. Draft format available only

3 Plan B2.0. Rescuing a planet under stress and a civilization in trouble. Lester R Brown. [www.earth-policy.org](http://www.earth-policy.org)

Figures A and B make it clear that SA maize prices have moved in step with the global maize price. The CEO of Grain SA, Neils Ferreira, does not believe that this is coincidental and in a statement quoted in Farmers Weekly (23rd March 2007) he indicated that it was the use of maize in ethanol plants in the US that was driving the global price up and that this was forcing up local prices. There is no reason to believe that the trend to higher global prices will be reversed in the foreseeable future and that, consequently, South African maize prices will fall.

The South African maize harvest in the 2005-6 season, 6.62 million tonnes, was very much lower than the previous season's 11 million tonnes. The reason for the decrease last season was that farmers planted less since about 3 million tonnes of the previous year's harvest had been left unsold. This year, the farmers planted a lot more land to maize and the overall acreage is up by 17.2% but the yields are almost a third down on last year. This is because South Africa is experiencing a serious drought that some farmers say is the worst they have seen in 40 years. The predictions for the 2007 harvest released by the crop estimates committee are that the total maize yield will be around 7 million tonnes, which is not enough to provide the (minimum) 8 million tonnes required for South African annual consumption. South Africa will have to import maize this year to feed its own people. On this basis, prices of maize are set to increase even further and they are already, in March 2007, at nearly R 2000 a tonne, way up from the R600 a tonne of recent years. Prices here are still below world levels - imports are currently R2500/tonne, - but it is very likely they will reach parity quite soon.

Despite this, Ethanol Africa plans to build eight maize-to-ethanol plants in the Free State on the assumption that past surpluses will re-appear. Sir Nicholas Stern, who was in South Africa recently to talk to key decision makers about climate change said this of the maize to ethanol plans of South Africa " Biofuels, if narrowed down to sugar and maize (in South Africa) will create problems, there is an opportunity cost to using good arable to make biofuels.....SA needs to look for biofuels technologies that can be grown on marginal land, such as rough grasslands, perhaps *Jatropha*". Stern also pointed out that climate change will have a big impact on South Africa with some parts becoming dryer and others wetter, but predicting exactly what will happen is difficult, he noted. This is important for the agricultural sector and means that it is risky to rely on data from

previous years as this may all change with unpredictable weather patterns.

## The South African biofuels strategy

In 2004 the Food, Agriculture and Natural Resources (FANR) division of the SADC secretariat released a study on the feasibility of the production of biofuels in the SADC region in the light of rising oil prices. All SADC nations should develop strategies which would make the sub region more self reliant in energy production, the report said.

The first SADC country to respond was South Africa. The South African cabinet approved the development of an industrial biofuels strategy in late 2005 and released its draft strategy in late 2006. The strategy has many shortcomings, and this paper will only address those that have a direct impact on food security. The strategy describes ways in which the SA government can apply various economic tools and instruments to support the nascent biofuels industry with money from the taxpayer. It proposes that biofuels be mixed with their fossil equivalents in a 4.5% blend. This would, the strategy contends, contribute 75% to the government's renewable energy target of 10,000 GWh by 2013.

Biofuel developments are seen primarily as being in support of the government's Accelerated Shared Growth Initiative (AsgiSA), which aims to increase growth to 6% and merge the 1st and 2nd economies. It suggests that job creation through the biofuels sector will achieve this and proposes that 55,000 new jobs will be created in rural areas.

A study recently completed by the Carnegie Institution, department of global Ecology<sup>4</sup> shows that the rise in recorded temperatures between 1981 and 2002 cut the combined production of wheat, corn, barley and other crops in the US by 40 million tonnes/year. This resulted in a loss of farm revenue of an estimated US\$5 billion annually. Crop yields decreased by between 3% and 5 % for every 1 degree increase in Fahrenheit (0.56 °C). A similar effect has to be expected in South Africa, and thus the grain surpluses may not persist.

4 <http://globalecology.stanford.edu/DGE/GIWDGE.html>



The strategy does not focus specifically on crop types but mentions sugar and maize as being two energy crops that could be used to make ethanol. It quotes the surpluses of the 2005 maize growing season as the main reason for choosing these crops over others suggesting that each could contribute 5% towards the proposed 4.5% fuel substitution target.

The draft strategy's primary focus is on fuel production for the transport sector. It suggests that assisting the motorist to get cheaper fuel is the link between the first and the second economy. It favours an unregulated environment, suggesting that if perversions arise as a result of market failures (described as being detrimental to a growing biofuels industry), that government can step in and regulate at that point. It does mention food security but completely waves away any possible negative impact resulting from the proposed strategy saying

*"The scenario examined, assumed that all biofuels would be produced for local crop production, and found that this had an insignificant affect on food prices, or about a 5% average increase through to 2015 for the crops used. This affect would be offset by increased supply of agricultural co-products, and agricultural efficiency gains, that are possible for energy crops and for better supported, dedicated farming. It is also important to note that crop varieties for fuels focus on starch (for ethanol) or oil (for biodiesel) content whereas crops for food focus on protein content and this tends to keep the markets separate. "*

Three arguments are being made here. The first is that the increased use of South African supplies of maize, sugar and vegetable oil for biofuel production for fuel will not affect food prices to any great extent. Whether this argument is correct depends on the extent to which the South Africa market is open or closed. If it were entirely open, world prices would apply and the increase in the production of biofuels in South Africa would have very little effect on world prices. If the market were completely closed, a very small increase in demand could remove any surpluses and drive prices up sharply. In fact, the market is somewhere between the two extremes, as evidenced by Figures A and B and Mr. Ferreira's comments. The strategy should have cited empirical evidence on the degree to which the market is open. The 5% per annum rate of increase it mentions would result in a 70% increase in prices in a ten year period. The incomes of the poor cannot be expected to rise at that rate.

The second argument is that co-products will tend to cancel out the effect of any price rises. There is an element of truth in this in that the spent grain and oilseed can be sold as cattle cake. This might help to keep meat prices low. However, the overall effect on the very poor might still be negative because of the increase in the cost of their maize meal, sugar and cooking oil.

The third argument, that the effect on prices will be limited because different varieties will be grown for the food and fuel market is quite spurious. It is true that special varieties of high starch maize will be grown for ethanol production but the farmers growing these will have switched out of the food varieties to do so, and they will switch back and forth according to the relative returns in the two markets. In other words, as the returns on food maize will have to match those on fuel maize, there is essentially one price and one crop.

Another point needs to be made. Sensitivity analyses done by Ethanol Africa on the maize price, co-product price and the oil price show that the return on investment of the ethanol plants is quite sensitive to all three variables. In recent years, two of these prices have been volatile – those for oil and for maize. As a result, the draft strategy assures investors that government will impose a levy on the sale of all vehicle fuel so that it can pay above the market price for biofuels if the oil price drops below \$45 a barrel. It also proposes increasing the 40% reduction in the excise duty paid on biofuels to up to 70% if necessary.

Maize is not the only biofuel feedstock to go up in price recently. Wheat, which is also used to make ethanol, has seen its price increase by about 35%. Further increases will impact on the price of bread and South Africa is a net importer of wheat. Sorghum has almost doubled in price in the US in the past two years. Soya beans, used for making biodiesel, have increased by almost 30% in the past year, Sunflower seeds, a source of cooking oil as well as biodiesel, have seen a local price increase of about 25%.

The very poor (those determined by Statistics South Africa to be in the "very low" expenditure category), spend over 62% of their income on food if they live in the rural areas and over 51% if they live in the towns. Even the middle income people spend a lot on food - 53% in the rural areas, 44% in the towns. No breakdown is given in the Consumer Price Index on how much of

the very poor's food budget goes on grain, but the average in the rural areas is 38%, and 19% in the towns. A doubling in the price of maize would cause a 16% jump in the cost of living for the average rural dweller and an even greater jump for a family in the very poor category. Great hardship is therefore inevitable if the world price of oil rose strongly and, primarily because of the biofuels strategy, dragged the prices of maize meal, bread, sugar and cooking oil up by significant amounts, particularly since the price of paraffin, cooking gas, light and transport would rise as well. As a result, the government needs to make contingency plans for relieving the distress that could be caused by the increased use of food as fuel. Ministers may well feel that it is wrong for them to offer to protect biofuel investors if one aspect of the policy turns out badly and yet not to offer similar protection to another group of people if another aspect of the policy proves to be wrong. In the 12 months between January 2006 and January 2007, the food costs of very poor rural dwellers rose by 9.6% and very poor urban dwellers by 8.3%. Foodstuffs linked to biofuel production rose by 10.7% (grain), 11.8% (oils) and 12.8% (sugar) in the rural areas, and by rather less in the towns.

#### **The threat to the poor**

The average U.S. automobile, traveling 10,000 miles a year on pure ethanol (not a gasoline-ethanol mix) would need about 852 gallons of the corn-based fuel. This would take 11 acres to grow, based on net ethanol production. This is the same amount of cropland required to feed seven Americans. If all the automobiles in the United States were fueled with 100 percent ethanol, a total of about 97 percent of U.S. land area would be needed to grow the corn feedstock. Corn would cover nearly the total land area of the United States.

<http://www.news.cornell.edu/Chronicle/01/8.23.01/Pimentel-ethanol.html>

In our view, the government needs to accept that, in its present form, the biofuels strategy will increase the extent to which the poor have to compete for food on which to live with the rich who wish to burn it to run their cars. This is an highly unequal contest. A socially-divisive situation could arise unless remedies are found. We will comment further on this in our recommendations.

Another threat to the economic security of the poor is that, while the draft strategy notes that South Africa has limited arable land, it highlights 3 million ha of high potential land that is currently underutilized in the former homelands. It suggests that this land could produce enough energy crops to provide 5% of the national diesel usage. One area that is being targeted by the Eastern Cape Provincial government is the Mzimvubu Basin in the former Transkei, which has both good arable land and good rainfall. A R1 billion investment there will involve the planting of 20,000 ha of canola, with expansion to 70,000ha. The investment is supported by a German company, ThyssenKrupp, which has already invested R 3 billion in building large biofuels plants in the Eastern Cape.

The danger of developments of this sort that involve taking unused or underutilised land into more intensive cultivation is that people who are getting some benefit from the land may be displaced. In many rural households, it is not just the land used to grow some mealies and vegetables immediately around the house that has value. The land beyond that has far greater value than has been understood previously. The Wits Rural Facility estimated the value of land surrounding poor villages and found that communities get benefits from that land worth approximately R 3 959 / household / year<sup>5</sup>. The study found that this value was a significant amount in relation to the households other expenses such as the purchase of maize meal and payment of school fees. In other words, the livelihood of the household and certain aspects of its food security needs would be seriously compromised if its use of this land was lost.

## **Recommendations**

The increased production of biofuels in South Africa has the potential to be either a bane or a blessing to the poor. If handled badly, it could drive up the price of food in both urban and rural areas and deprive the rural poor of the benefits from the land - such as growing vegetables and maize for maize meal, fuel wood, local wild fruits and berries, insects, thatching grass and wood and grass for brooms and utensils that they get from currently underutilised land. If handled well, it could increase incomes and employment in rural areas and improve rural energy security in ways that could

4 Consumption and direct-use values of savanna bio-resources used by rural households in Mametja, a semi arid area of Limpopo Province, South Africa. M.Twine, D Moshe, T. Netshiluvhi & V. Siphugu. In South African Journal of Science, 99, Sept/Oct 2003

offset the losses. There will be fewer benefits from a programme that seeks to export the produce out of the local community without ensuring the maximum usage for and by that community. Our recommendations are designed to bring about a result that will accrue the greatest benefits to the rural poor.

1. **Tax breaks and excise duty reductions should not be given for ethanol produced from maize, wheat or sorghum, or for biodiesel produced from canola or soya.** We have two reasons for taking this view. One is that the net energy gains from producing biofuels from the food crops named are very small. Almost as much fossil energy is used to grow the crops as is delivered by the biofuels themselves. The climate benefit is consequently negligible and the processing would not be financially worthwhile without the tax and excise subsidies. The other reason for this recommendation is that the subsidies are, essentially, strengthening the position of the richer person who wishes to burn food in his or her vehicle against the poorer person who wants to eat it. They therefore make an unfair situation worse. Our recommendation is that any state subsidies for ethanol should be confined to ethanol from sugar cane, where the energy gain is high, and from processes involving the splitting of cellulose into sugars and their conversion to fuels. Biodiesel should only be subsidised if it is produced from perennial crops such as *Jatropha* or *Moringa* rather than annual or biennial ones.

The science of calculating energy balances is not perfect but we do have figures that can be used for comparison.

<b>Maize</b>	<b>1:1.3 – 1.6</b>
<b>Sugar</b>	<b>1:8</b>
<b>Wheat</b>	<b>1: 1.3</b>
<b>Canola</b>	<b>1:5</b>
<b>Soya</b>	<b>1:6</b>

2. **Increased biofuel production should not involve the concentration of land ownership and land access into fewer hands.** Every effort should be made to ensure that the bulk of South Africa's biofuel production is carried out by the small farming sector. This will involve the provision of extension services and also of financial support. In Honduras, small

farmers are being enabled to plant *Jatropha* by being given loans which can be repaid by supplying a certain weight of the tree's fruit. A similar system could be considered for South Africa.

3. **The government should develop contingency plans to ensure that undue hardship is not caused to the poor if the food and fuel prices they face rise more rapidly than their incomes.**

One possible plan would involve issuing tradable emissions ration coupons regularly to every citizen, the total ration any year adding up to just less than the country's expected CO2 emissions for the year. In each subsequent year, the total emissions ration could be cut by, say, 3%. Recipients would sell their coupons to the banks, which would sell them on to businesses introducing fossil fuels to the economy. The competition among businesses for the limited number of permits would give them an increasing value. This approach would bring three benefits.

- It would force the country's industry and the public to be more energy efficient. This would stand the country in good stead as the world price of fossil fuels rose over the years. Moreover, the technologies that industry develop might find a market overseas, in the way that the encouragement given by the Danish government to its windpower industry has paid off many times in export sales.
- The cost of buying the coupons needed to purchase fossil energy would rise year by year as the size of the total national ration fell. The income from selling coupons would, in effect, provide everyone with a citizen's income which would be of most benefit to the poorest people.
- As the price of fossil energy rose because of the increasing cost of buying the coupons to purchase it, it would become financially attractive to develop renewable sources of energy without other subsidies. As many of these sources could only be developed at a local level, the benefits would be shared out across the country.

4. **The biofuels strategy needs to be developed in a wider context than is currently apparent.** In particular, it needs to be consistent with, and draw upon, existing South African policy and legislation such as the National Environmental Management Act, the Air Quality Act and the Spatial Development Framework. The strategy should also take a far more

holistic approach to bioenergy in general. The existing draft strategy focuses too heavily on liquid fuels for motor vehicles. Policies should be developed for the greater use of locally-produced biofuels by the rural poor, such as the production of ethanol gel by mixing ethanol with a thickening agent and water for use in stoves and lamps as a healthier, safer and more efficient alternative to paraffin and coal. The strategy should also take account of recent research that suggests that generating biogas from biomass could be a better use of biomass than simply burning it as a fuel.

Biofuels could have an important place in the development of rural areas if they are approached carefully and with consideration to the unique needs of the poor. Instead of seeing the rural areas as being places where commodities can be grown and exported to the rich, they could become places where commodities are used to enrich the local residents. This may be a departure from how we have approached poor rural areas in the past, but perhaps it is time to accept that current strategies do not help the rural poor and building on the existing and failing strategies could possibly make them even poorer.

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