BRIEFING DOCUMENT

SOUTH AFRICA, BIOETHANOL AND GMOS: A HEADY MIXTURE

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May 2006

"Producing GM crops for non-food purposes, as a renewable source of alternative fuels, may also provide the basis for a more rational and balanced consideration of the technology and its potential benefit, away from the disproportionate hysteria, which has so often accompanied the debate over GM foods." **Agriculture Biotechnology Council** (comprised of Bayer Cropscience, ABSF, Syngenta, Monsanto)[1]

"Politicians clinging to their colonial gestures are incapable of learning or reshaping themselves in the face of the end of the oil era. They attempt to replace agriculture with agribusiness and take a gamble on the globalised capitalism of the soya, either as animal fodder or as biofuels. They not only ignore the impending tragedy, but they also try to evade their responsibilities towards the alleviation of global Climate Change…… " **Grupo de Reflexion Rural**[2]

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[1] Evidence Submitted to the United Kingdom's Environment, Food and Rural Affairs Select Committee Inquiry on Biofuels by the Agricultural Biotechnology Council (abc).

[2] *Current Proposals To Manufacture Biodiesel From Soya Crops Threaten Latin America With Catastrophe* Buenos Aires, 28 April 2006 www.grr.org.ar

FOREWORD

On the 12th May, Syngenta South Africa (Pty) Ltd, a subsidiary of Swiss Agrochemical giant, Syngenta, notified the South African public of its intention to seek commodity clearance for its genetically modified (GM) maize, Event 3272, for use in the production of ethanol.[3] This precedent setting application, the first GM application for commercial approval in the world for a non-feed, non-food GM crop, (using a food crop), has simultaneously also been launched in the US, the EU and China.

The application by Syngenta illustrates its expediency and desperation: Syngenta hopes to cash in on a potentially lucrative burgeoning global bioethanol market, riding on the back of escalating oil prices and supply fluctuations, while at the same time, securing new markets for its GM products where there is little risk of consumer rejection.

However, Syngenta's application is also mysterious, for 2 reasons. The application made to South Africa is for clearance to expedite imports and not for growing. It is a guarded secret as to where Syngenta hopes to grow the GM maize. South Africa does not import GM maize from the US, for several reasons, including the fact that the US has approved many more GM events (varieties) than has South Africa and contamination by unapproved GMOs cannot be ruled out or avoided.[4] In any case, the US will rely on its own domestic market to sustain the demand for ethanol from maize in that country. South Africa, does, however, import huge amounts of GM maize from Argentina. Will Argentina become the factory farm or will it be another developing country?

Second, the application seems to be superfluous in the light that Diversa Corporation, well known to anti-biopiracy activists, recently brought to the market, the same enzyme alpha-amylases, used in Syngenta's GM maize. The enzyme is derived from a deep-sea micro-organism[5] and is meant to convert the starch present in maize into sugars for processing into ethanol. This same rationale is being given by Syngenta to the South African authorities as motivation to grant approval for the GM maize! What makes it all the more curious is that Syngenta owns substantial shares in Diversa.

INTRODUCTION

Interest in ethanol as a biofuel is not new. It began during the oil crisis of the 1970s at that time when several countries, led by the US, began to phase out lead from gasoline. In 1978, the US Congress approved the National Energy Act, which included a Federal tax exemption on gasoline blended with 10% alcohol. Federal subsidies also reduced the cost of ethanol to around the

[3] Such clearance would be given by the Executive Council, Genetically Modified Organisms Act, and will therefore serve as a blank cheque, for the international grain traders, to ship the GM maize into South Africa in huge quantities.
[4] Personal Communication, National Department of Agriculture, February 2006.
[5] "It came from beneath the sea" Nature Biotechnology, Vol. 23, No.10, Oct. 2005, pp. 119-1201.

wholesale price of gasoline.[6] Thus, in the US, ethanol relies heavily on subsidies to remain economically viable as a gasoline- blending component. The current Federal subsidy of 51-cents-a-gallon makes it possible for ethanol to compete as a gasoline additive. The US also imposes a 54-cent-a-gallon tariff on imported ethanol, thus promoting its domestic ethanol production.

However, gleaning from the literature, the ethanol subsidy is due to expire in 2007/8, and it is not clear whether ethanol will continue to receive political support.

In the US, ethanol is derived mainly from maize and is blended in quantities up to 10% in gasoline (also called E10 or low-blend). In terms of the Energy Bill passed called "EPAct 2005", the volume of ethanol will be increased from the current 4 billion gallons/year to 7.5 billion. It is reported that a booming ethanol industry will consume 20% of the 2006 US maize crop, cutting the maize surplus in half by 2007, or 1.14 billion bushels. Some 54 million tonnes of the 2006 maize crop is projected to go to ethanol plants, up 34% from 40.6 million tonnes).[7]

There are 97 ethanol plants in the US with a capacity of 4.5 billion gallons (17 billion litres) a year. There are 44 projects under way that will add 1.4 billion gallons of capacity this year. By early 2007, the US it is expected to be producing at a rate of 24.6 billion litres of ethanol, requiring 2.15 billion bushels of maize.[8] This implies an increase in maize production in the US to sustain the demand for maize. Currently, the US is the world's largest maize derived ethanol producer, accounting for 33% of the global market. Brazil is the world leader in ethanol production, derived from sugarcane, accounting for 37% of the global market.[9]

At the beginning of 2006, South Africa phased out the use of lead, which created a boon to the ethanol industry, as ethanol can be used as an additive to boost the octane number of unleaded fuel. In addition, and following on from the lead of the US, at the launch of the National Energy Regulator of South Africa in November 2005, Deputy President Phumzile Mlambo-Ngcuka said that the South African Cabinet had approved a proposal by the Departments of Minerals and Energy (DME), Agriculture and Land Affairs, and Science and Technology, to explore biofuels as an important component of South Africa's energy mix.

Touted as a cleaner, greener fuel, by reducing CO2 emissions by 60%, ethanol is said to bring huge socio-economic benefits through especially job creation. According to Busi Nxumalo, South Africa's Energy Development

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[6] Joseph DiPardo *Outlook for Biomass Ethanol Production and Demand*, Energy Information Administration.

[7] Ethanol, Biodiesel eats into Corn Stockpiles, 15 May 2006 http://www.planetarket.com/dailynewstory.cfm/newsid/36348/story.htm

[8] According to the United States Department of Agriculture's chief economist, Keith Collins. Ethanol, Biodiesel eats into Corn Stockpiles, 15 May 2006 http://www.planetarket.com/dailynewstory.cfm/newsid/36348/story.htm

[9] Worldwatch: *State of the World 2006,* Chapter 4, Endnote 13.

Corporation's (EDC) business and market analyst, a strong local biofuels industry will also make a significant contribution to South Africa's GDP. According to him, if a 10% blended bioethanol is achieved, it will add 0,25% to the country's GDP. In addition, a 10% blending ratio will enable South Africa to save R2.5-billion a year in imports, which equates to a reduction of 1% in overall national foreign expenditure. [10]

Industry lobby groups are feverishly pushing the South African government to create the economic regulatory framework to do two things: to make the blending of ethanol into petrol mandatory for oil companies, and to allow a 30% reduction in the fuel levy to be extended to bioethanol industry, as it currently does, the biodiesel industry. Indeed, Ngubane has said very recently that the EDC was investigating the viability of adding a 10% ethanol blend to petrol.[11]

South Africa's Infatuation With Ethanol

"We believe it is going to be mandatory to be used as a blend and even if there is no regulatory blending of ethanol, we plan to export what we produce." **Johan Hoffman, Ethanol Africa**[12]

"We may by-pass the sugar industry completely, develop new sugar cane production to supply ethanol mills" and… the Makhathini Flats near Jozini Dam can be turned into small-scale sugar cane production, with numerous job-creation and economic benefits for the region[13]

South Africa's ethanol production is currently controlled by Sasol, which produces (synthetic) industrial alcohol from coal and gas, used to make ethyl acetate, high purity ethanol and a small volume for fuel. South Africa also produces fermentation ethanol, with Illovo Sugar producing molasses for feedstock. Indeed, Illovo Sugar is the largest ethanol producer in South Africa from a renewable source-sugar cane.

A recent study found that the bio-energy potential of Sub-Saharan Africa-after accounting for food production and resource constraints-was the greatest among all major world regions. [14] The high potential results from the large areas of suitable cropland in the region, large areas of pasture land that are not currently used and the low productivity of existing agricultural production

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[10] South Africa Sows Crops-to-Energy Seeds, Engineering News 5 December 2005.
[11] Energy body probes ethanol-mixed petrol, 17 May 2006
http://www.businessday.co.za/articles/economy .aspx?ID=BD4A201198
[12] South Africa Company to Build $1 Billion Ethanol Plants, 10 March 2006
http://www.planetark.com/dailynewsstory.cfm.newsid/35584/story.htm
[13] Big Sugar, sweet life, 8 April 2006
http://www.mg.co.za/articlePage.aspx?articleid=268802&area=/insight_econ
unknown politician quoted. The Makhathini Flats has become synonymous with Monsanto's GM cotton hype, see, Elfrieda Schorn-Strauss *Bt Cotton in South Africa: the case of the Makhathini Farmers* http://www.biosafetyafrica.net/_DOCS/SEED-05-04-3.pdf
[14] Smeets et al, 204. *A Quickscan of Global Bio-energy Potentials to 2050. An Analysis of the Regional Availability of Biomass Resources for Export in Relation to Underlying Factors*, Report WNS-W-2004-109, ISBN 90-393-3909-0, March

systems as well as the low cost of labour. South Africa's total land area is 121.4 Mha, of which, 99.6 Mha or 82% is comprised of total share of agricultural area, of which only 12.9 % is comprised of cultivated area.[15]

Recently, the South African media unexpectedly broke the story that South African company, Ethanol Africa, announced plans to build a string of eight maize-to-ethanol plants in South Africa at a total cost of $1 billion. Carbon credits company, Sterling Waterford, is Ethanol Africa's 50/50 partner. South Africa's Energy Development Corporation (EDC), a division of the state-owned Central Energy fund, is to buy a 25.1% stake in Ethanol Africa.[16] The Industrial Development Corporation (IDC) has also given the ambitious project its blessing.[17] An undisclosed Black Economic Empowerment (BEE) partner is also involved, as is Belgian biofuels company, Alco.[18]

Hundreds of South African maize growers had taken up a minor stake in Ethanol Africa, through Grain Alcohol Investments. These farmers have pledged thousands of tonnes of maize a year to pay for their stake in the firm.[19] Each of the 8 plants is likely to consume 370,000 tonnes of maize a year totalling 2.96 million tonnes if all 8 plants were built, and producing 1.2 billion litres of ethanol.[20]

Construction of the first plant, in Bothaville the heart of the maize belt in the Free State province, is expected to cost 700 million rand ($111.4 million), and is due to be completed in late 2007. The plant will require a further 200 million rand to purchase about 375,000 tonnes of maize yearly for processing into approximately 473, 000 litres of ethanol daily. Shareholders in the Bothaville plant include Ecofields, a group of maize farmers are expected to sign contracts on a yearly basis to supply the plant with an estimated 375 000 tons of maize a year.[21]

Farmers' organisation, Grain South Africa is fully supportive of the ethanol scheme, because they see it is a solution to the surplus maize produced, which is likely to be around 4.5 million tons surplus in 2006.

However, it is reported that the scheme has yet to have a significant impact on the Johannesburg SAFEX maize prices. Traders are reported to be more

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[15] Food and Agriculture Organisation Statistical Database (FAOSTAT), 2005, Food and Agriculture Statistical Database, http://foasta.foa.org
[16] Ethanol Africa: Clean Maize Fuel, 12 September 2005
http://www.southafrica.info/ess_info/sa_glance/sustainable/ethanol-120905.htm
[17] IDC eyes ethanol at $40 a barrel, 2 May 2006
http://www.mg.co.za/articlePage .aspx?articleid=270550&area=/insight_econ
[18] Ethanol Africa: Clean Maize Fuel, 12 September 2005
http://www.southafrica.info/ess_info/sa_glance/sustainable/ethanol-120905.htm
[19] South Africa Company to Build $1 Billion Ethanol Plants, 10 March 2006
http://www.planetark.com/dailynewsstory.cfm.newsid/35584/story.htm
[20] South Africa Maize Farmers See Ethanol Plant in 18 months, 15 March 2006
http://www.planetark.com/dailynewsstory.cfm/newsid/29938/story.htm
[21] Free State to get first bio-ethanol plant, 24 February 2006
http://www.busrep.co.za/index.php?fArticleId=3128837

worried about short-term overproduction and poor exports and are sceptical that farmers will agree to cooperate on the project.[22]

Furthermore, large-scale production will require a structured economic and regulatory framework. The CEF is suggesting a 10% blending ratio with conventional petrol. Based on this proposal, and taking into account that South Africa uses about 11-bilion litres of petrol a year, the CEF is hoping that some 1, 1-billion litres of bio-ethanol will be produced a year.[23]

However, according to the IDC, most ethanol would, however, not come from maize but from sugar cane. The IDC expects the bulk-about 50% -of the 1,1 billion litres of ethanol to be produced from sugar cane, with 150 million litres coming from sugar beet and the rest from maize and sweet sorghum.[24] At this point in time the South African sugar industry appears to be still closed to the idea of using sugar cane for ethanol production and discussions to this effect, are speculative, at best. According to a recent report, the sugar industry will not discuss ethanol as an industry, and is arguing that it needs R2-a-litre subsidy to supply ethanol to the fuel market.[25]

However, the government is reported to have said that they "may by-pass the sugar industry completely, develop new sugar cane production to supply ethanol mills" and in this regard, the Makhathini Flats near Jozini Dam can be turned into small-scale sugar cane production, with numerous job-creation and economic benefits for the region.[26]

GENERAL CONCERNS

Once maize is harvested, three energy expenditures in ethanol production raise the total costs. These include energy to the transport of maize grain to the ethanol plant, energy expended to provide the capital equipment requirements for the plant, and energy expanded in the plant operations for the fermentation and distillation processes. The effective energy balance of ethanol as a biofuels is therefore in doubt.

A study by Pimental and Patzek shows that turning plants such as maize, soyabeans and sunflowers into fuel uses more energy than the resulting ethanol or biodiesal generate.[27]The researchers demonstrated that sunflower oil requires 118% more fossil energy to refine it than the fuel obtained from it. Likewise, soya requires 27%, and maize 29% more fossil fuels than that

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[22] South Africa Maize Farmers See Ethanol Plant in 18 months, 15 March 2006 http://www.planetark.com/dailynewsstory.cfm/newsid/29938/story.htm

[23] South Africa Sows Crops-to-Energy Seeds, Engineering News 5 December 2005.

[24] http://www.mg.co.za/articlePage .aspx?articleid=270550&area=/insight_econ

[25] Big Sugar, sweet life, 8 April 2006 http://www.mg.co.za/articlePage.aspx?articleid=268802&area=/insight_econ…

[26] Big Sugar, sweet life, 8 April 2006 http://www.mg.co.za/articlePage.aspx?articleid=268802&area=/insight_econ…

[27] "Cornell ecologis's study finds that producing ethanol and biodiesel from corn and other crops isnot worth the energy", Cornell University News Service, 5 July 2005, http://www.news.cornell.edu/stories/July05/ethanol.toocostly.ssl.html

obtained from the crops themselves[28] According to the researchers, it takes six units of energy in corn farming, distillation, and transportation to yield one unit of energy produced by ethanol in an automobile.

Ethanol for example can't be transported via pipeline-it has to be carried from distillation plants via truck and railraod, which creates additional energy costs. Fuels blended with ethanol cannot be shipped in multi-fuel pipelines, because the moisture in pipelines and storage tanks is absorbed by ethanol, causing it to separate from gasoline. Rather, the petroleum based gasoline components have to be shipped separately and then blended with ethanol at a terminal as the product is loaded onto trucks. [29]

Thus, bio-ethanol from maize has a much worse energy balance and does not have environmental benefits.

Using maize for ethanol production is costly in terms of land use, fossil energy, and most importantly it subverts valued human food and animal feed from direct use. The fact that ethanol production has a negative energy balance further precludes its place as an alternative liquid fuel for the future.

It must also be borne in mind that maize prices are the dominant cost factor in ethanol production, and ethanol supply is extremely sensitive to maize prices. Ethanol production will drop when maize is in short supply and prices are higher.

It is apparent that bioethanol production for a fuel blend will require enormous government assistance and subsidies to be viable for the bioethanol industry as a whole, subsidies that can be more appropriately allocated to other pressing socio-economic priorities for South Africa.

SYNGENTA'S APPLICATION AND BIOSAFETY CONCERNS

> Bioethanol, will provide a much-need outlet, as has been the case with biodiesel, for the glut of genetically modified crops that consumers are rejecting worldwide.[30]

The African Centre for Biosafety (ACB) has received 2 appendices out of 19, in response to our application for access to information in terms of the Promotion of Public Access to Information Act, in keeping with the un-transparent regulation of GM technology in South Africa.

According to Syngenta's application filed with the South African authorities, Event 3272 has been developed to serve as a source of amalyse enzyme in the dry-grind fuel ethanol process from maize, replacing the external addition

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[28] "Cornell ecologist's study finds that producing ethanol and biodiesel form corn and other crops is not worth the energy" Cornell University News Service July 5, 2005 http://www.news.cornell.edu/stories/July05/ethanol.toocostly.ssl.html

[29] Carlo Stagnaro *Biofeuls Delusions The Saga Of The Costly Fuels That Do Not Benefit the Environment* IBL Focus N. 18-22 February 2006

[30] Elizabeth Bravo and Mae-Wan Ho, The New Biofuel Republics, ISIS Press Release 7 March 2006, http://I-isis.org.uk.NBR.php

of microbially produced enzyme. The Event 3272 maize grain expresses an alpha-amylse enzyme, which is to be mixed with conventional maize at the processing plant.

The application by Syngenta is not for commercial cultivation in South Africa and according to the application, the GM maize will be grown outside of South Africa and will be **used locally** in the dry-grind fuel ethanol process. It is also not intended to be used in other processing applications such as wet milling and dry milling processes or to be exported as a commodity crop. However, according to Syngenta, it cannot be excluded that the harvest originally intended to be used in the dry-grind fuel ethanol industry could finally enter international trade routes albeit at an extremely low level.

By-products of the dry-grind fuel ethanol process produced from maize are used as feed (e.g. Distillers Dried Grains and Solubles). By-products of the dry-grind fuel ethanol process produced from Event 3272 will be co-mingled with by-products from conventional maize could therefore enter the international food and feed trade routes.

According to the application, grain containing Event 3272 could be imported in all the areas where non-genetically modified maize is sold, e.g. the North West Province, the Free State, Limpopo Province, Mpumlanga, Kwa-Zulu Natal and the Eastern/Western Cape regions.

The ACB is still in the process of reviewing Syngenta's application with the objective of submitting biosafety objections, particularly with regard to the potential allergenicity of the novel enzyme, alpha-amylase. Nonetheless, we make the following preliminary biosafety observations:

1. The ACB is concerned that the GM maize variety will be pushed through the lax regulatory regime in South Africa and present unacceptable risks to human health. Contamination of the South African food supply by this GM maize cannot be excluded, as the chances of contamination taking place are very high, along the entire production chain in the secret country of export, in the course of international trade and within the supply chain in South Africa itself;
2. The current application for commodity clearance for GM maize that is not yet in commercial production and which has not yet been approved in the country of export (since we do not even know where it will be grown) is in contravention of the objectives, spirit and provisions of the Cartagena Protocol on Biosafety ("Biosafety Protocol"), which South Africa is a Party. The Biosafety Protocol requires that the country of export first approve the GMO, before the Party of import can grant any biosafety approval and indeed, that the GMO in question must exist;
3. Genetic modification by the application of recombinant DNA technology is characterised by scientific uncertainty. This stems from several factors including the inherent imprecision of currently employed recombinant DNA techniques, the use of powerful promoter sequences in genetic constructs and the generation, as a result of genetic

modification, of novel proteins/enzymes to which humans and animals have never previously been exposed;

4. The genetic modification is not necessary because as already discussed, the "built in" processing enzyme in Syngenta's proposed new GM maize variety for ethanol is already on the market as a stand-alone product offered by Diversa; and
5. The novel enzyme is an unknown quantity and may present unacceptable risks to human and animal health should it enter the food and feed supply.

CONCLUSION

Our work on biosafety in South Africa has led us to this juncture: the interface between biosafety and energy. We know some things about GMOs and biosafety and not much, about the very deep discourse currently taking place in South Africa on climate change, renewable energy, carbon trading and so forth. These issues, we leave to those who are better qualified to deal with and will be led in this regard by our fellow activists.

We offer this briefing paper in good faith, and as a contribution to our joint struggles for social justice and equity.