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REEEP looks at complexity of producing biofuels in South Africa

The [Renewable Energy and Energy Efficiency Partnership](#) (REEEP), one of the leading non-profits promoting clean energy in the developing world, is studying the potential and problems associated with biofuels in South Africa. Simon Wilson of the [African Sustainable Fuels Centre](#) leads the effort for REEEP and helped produce a study



assessing the biofuel potential of the country. In this exclusive article, he sketches the complexities of the situation and concludes that a strong land use policy is key to developing biofuels in a country with limited resources. Biogas for local use may be more feasible than the production of liquid biofuels, Wilson argues.

Compared to other countries on the continent, South Africa has a low technical biofuel potential ([earlier post](#)), but major sugar cane growers there are prospering. Tongaat-Hulett, an important local sugar producer, reported a 47% increase in operating profit to ZAR 470m (US\$67m) in 2006. Like other sugar cane producers, the company operates in the Eastern part of South Africa radiating from the province of Kwazulu Natal. It is one of the few that has decided to invest in the ethanol business by building an ethanol plant, though this will be located in Mozambique. Other more local plants could eventually follow ([earlier post](#)).

"South Africa is exporting sugar on a regular basis, and this should be our initial choice for ethanol feedstock," comments Remi Burdairon, manager of commodity trader Louis Dreyfus, which may also take a stake in local biofuels production. Ethanol could be a major earner for South Africa's sugar industry, which is 13th largest in the world.

All roads are open to biofuels producers. Maize, sugar cane, soya and lesser known crops are all possibilities. Agricultural companies are poised to act on a big opportunity, as the South African government says it wants biofuels to make up 4.5% of the nation's fuel (75% of its renewable energy target). It wants an 8% and a 2% blend for bioethanol and biodiesel respectively and is open to different types of crop ([earlier post](#)).

But as industrialists, politicians and farmers consider the future, a delicate question needs to be addressed. Which land is most suitable, and how should it be used? Could the cultivation of land for biofuels encroach upon food production or create pressure on arable land, thus perhaps jeopardising the livelihood of small-scale and subsistence farmers?

Good land in a hot country likely to be affected by climate change is precious. According to national statistics from the agricultural department, about 13% of South Africa's land surface is arable, though not all of it is used. However, only 3% (equivalent to 22% of total arable land) benefits from high potential, rich conditions. In addition, there is a good deal of degraded land that could be improved:

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Maize: food versus fuel

Joe Kruger, Managing Director of Ethanol Africa, argues that maize is the way forward. There are around 9,000 commercial maize producers as well as thousands of small-scale farmers in South Africa, which produces 8.8 million tonnes on average per year. The company plans to open eight ethanol plants primarily using maize feedstock. The first will open in Bothaville and the last is due to be commissioned in 2012. All will be located inland in the central and Eastern part of the country ([earlier post](#)).

"South Africa is a major consumer of maize; it's a large industry but it's shrunk locally in the last few years as consumer patterns have changed and people eat different types of food," argues Kruger. This, he suggests, is creating more maize availability, which can be diverted for fuel production.

At the moment, there is a three million tonne surplus of white maize that he says could be switched to the yellow maize suitable for ethanol feedstock. Hence, he believes that land use at the moment does not need to be increased to accommodate maize production for ethanol. Maize grown for ethanol would be on dedicated land.

It could be an attractive proposition. Many European countries are mandating biofuels content, but there is not enough local production. Hence, substantial imports are likely. Japan and South Korea, too, could be important export markets for Southern Africa. Japan alone might be importing around 75% of the world's fuel ethanol in 2012, according to statistics provided by Ethanol Africa.

At the same time, North American demand for maize for ethanol production, combined with a distorted market and questionable trade regimes, has been creating a tight maize market ([earlier post](#)). Under these conditions, South African companies could be in a good position, as they can supply the global market but benefit from lower production costs and, in some respects, better economics, than some of their international competitors.

Sugar cane's potential

But Remi Burdairon, whose company trades in a range of different commodities including maize and soyabean, counsels against counting on maize. "Even until two months ago, the possibility of maize industrial production for ethanol was highly questionable. Up until now, the market has been very much in balance. Yes, it is becoming more viable, but it has been dangerous as a prime feedstock up until now," he comments. His argument is based on the fact that the industry's track record does not provide a sure enough footing to plan ahead.

That is why he points to the sugar industry. Whereas the maize track record is variable, sugar production in South Africa has consistently produced a surplus that has in turn been sold overseas or in neighbouring African countries. Hence, there is less risk of the emergence of food/fuel competition.

There is further potential for sugar production but this could create its own problems relating to land and also water use, as sugar plantations often absorb heavy amounts of water. However, a [UK-Brazil-South Africa partnership study](#) published in July 2006 on behalf of the UK Office of Science and Innovation found clear possibilities emerging for the Southern African Development Community (SADC). An increase in bioethanol production, it said, could come about by improving yields in current sugar cane crops, diverting some production from food to fuel and also increasing sugar cane cultivation.

Sugar cultivation, it said, could be more than doubled to 1.5 million hectares in the region over the next 10-15 years. Although some of this could be in South Africa, the possibilities for expansion are limited there, while other countries show more promise. However, South African gasoline consumption makes up 80% of the whole region and the development would therefore act as a major response to new South African ethanol demand.

If this land usage were doubled, sugar cane production would meet more than twice the current regional sugar consumption while also creating 7.3 billion litres of bioethanol each year. It is an attractive option, because the sugar cane-bioethanol fuel chain "has the potential to be among the lowest cost and lowest CO2 fuel chains," according to the report's authors.

There are around 47 000 registered sugarcane growers producing an average 22 million tonnes of sugarcane, and more than 45 500 of these are small-scale growers, according to the South Africa Sugar Association. About 80% of production comes from larger commercial players. Since land extension possibilities are limited, however, most supply increases for ethanol would need to be found from yield improvements or from the annual surplus, or from land consolidation, whereby individual plots too small to produce sugar cane commercially would be aggregated and the biofuels company would lease it.

Some of these plots are on land that is currently degraded, and pilot projects have shown that this system has worked to a limited extent: "Production has risen to 70t/hectare, far higher than non organised small scale farming where 30t/hectare is the average, but not as high as commercial farmers who average 120t/hectare," state Annie Sugrue and Richard Douthwaite in a 2006 report on land use.

Monocropping versus intercropping

Annie Sugrue, the South African co-ordinator for the international NGO [Citizens United for Renewable Energy and Sustainability](#) (CURES), warns against "huge mono-cropping", especially of maize: "we don't believe it shows a good energy balance – we're completely against it and any possible competition with food. The maize production is up and down, and a surplus is not guaranteed," she asserts.

Instead, she promotes the use of perennial crops, including jatropha, moringa (a tree which produces no waste as all its parts can be used) and two local plums. Under optimal conditions jatropha can generate 2.5 tonnes of biofuel/hectare out of jatropha in comparison to, for instance, soya, which averages at 0.8 tonnes/hectare.

Sustainability campaigners favour the use of intercropping which enhances productivity, and they propose the development of food forests that include different types of plants (trees and bushes) as well as species. These plantations also offer advantages to local communities.

"We have lots of arable land but it's degraded, and long-term crops such as these help to stabilise and improve it over time. A lot of the degraded arable land is owned by small-scale farmers," says Sugrue, pointing out the benefit to this group.

REEEP's nuanced approach

Simon Wilson is working on a biofuel project in South Africa for REEEP, the highly recognised global organisation promoting the development of clean and sustainable energy. He says that "agricultural energy production has the potential to conflict with a large number of other natural resources, not just land area. Increased agricultural production of food and energy crops together will undoubtedly increase the use of many agricultural inputs including water, fertilizers, agricultural chemicals, and these increases may result in impacts to the production system itself through loss of fertility, soil biodiversity and availability and quality of water.

On the other hand, he argues that "by integrating energy crops into food production systems, several social and environmental benefits may be realised such as the diversification of agricultural output and energy supply, rural development as well as benefits to the health of productive land."

Local issues are on the agenda. The government has opted for a policy which considers small-scale farming needs, and forthcoming land reforms will also help. But perhaps there is no need for biofuels at all: "Europe will import, but 30% of our people don't have energy," points out Annie Sugrue. Instead she suggests that biogas, which would be used locally, might be a more suitable option.

Besides funding and creating public-private partnerships for concrete biofuel projects in Africa, REEEP works towards developing innovative financing mechanisms, political capacity-building and disseminating important information on case-studies and broader analyses of the sector.

More information:

REEEP's [activities in Southern Africa](#).

British Government, Dept. of Trade and Industry: [Brazil - UK - Africa: Partnership on Bioethanol Scoping Study](#), s.d. [July], 2006.

African Sustainable Fuels Centre: [National Biofuels Study](#) [*].pdf], March 20, 2007, an investigation into the feasibility of establishing a biofuels industry in the Republic of South Africa which was prepared to assist in the development of a national strategy.

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