TOWARDS A SADC FUEL ETHANOL MARKET FROM SUGARCANE: REGULATORY CONSTRAINTS AND A MODEL FOR REGIONAL SECTORAL INTEGRATION

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1. Introduction

This paper is an expansion of a case study produced by Emet Consulting for the South African Institute of International Affairs (SAIIA) in 2014. The case study (Regulatory Constraints to the Development of a Fuel Ethanol Market in SADC) was a component of a project kindly funded by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), through its ProSPECT project, investigating the most significant constraints to doing business in the SADC region. Through the project GIZ and SAIIA aimed to provide concrete examples of constraints to doing business in the region, as well as potential solutions. The overall objective of the research was to reduce these business constraints by facilitating a dialogue in the SADC region on their removal, thereby allowing the private sector to take advantage of the opportunities offered by regional integration.

2. Background

The economies of the SADC region are highly dependent on the importation of petroleum products to fuel their vehicle fleets, both government and private. In most cases weak currencies add to the cost of purchasing such fuels, which are priced in US dollars. This is exacerbated by the volatile global oil price, and fluctuating national exchange rates. Domestic production is typically not present. The size of the domestic fuels market and the prohibitive cost of building refineries to refine crude oil into transportation fuels mean that the bulk of the SADC states, with few exceptions, rely entirely on imported fuels. Cost-effective alternatives to petroleum based fuel use in the region are rare; with bio-diesel and fuel ethanol manufacture limited and electric vehicles almost non-existent.

Given the varying stages of economic development in the region, any solution must as a pre-requisite be cost-effective in terms of production and distribution; based on proven, off the shelf technology and must utilise existing infrastructure as far as possible.

This rules out electric vehicles as a solution. Current sales of such vehicles have not triggered the necessary economies of scale even in developed countries. The required infrastructure for recharging electric vehicles is a further constraint. In addition, many countries in the region are battling power deficits. Large electric vehicle fleets would add to these deficits.

The development of renewable fuels and a regional market for such fuels is therefore a more feasible option. Renewable fuels meet the criteria outlined above: they can be produced relatively cheaply, the technology is off the shelf and proven in the field (for example in Brazil and Thailand), and they can be stored and distributed largely using existing methods. A further impetus to the development of national markets and a SADC market lies in the economic disparities in the region. South Africa has a large fuel market, estimated at 70% of regional demand, but the country can only supply sufficient renewable fuels to meet a fraction of this demand. Other SADC states where renewable crops are grown have small fuel markets but are potentially significant sources of supply. The potential for the development of a regional market for renewable fuels therefore exists. It has the further advantage of reducing the sensitive trade deficit South Africa runs with the rest of SADC.

The growth of such a market has the added potential of stimulating related infrastructure and industrial investments, as noted in the 2013 SADC Industrial Development Policy Framework.

2.1 Key themes

The largest impediment to the development a regional market is not the feedstock. A suitable feedstock exists, and interestingly, is further suitable due to the existing regional commercial

and institutional frameworks which underpin regional production and public-private and inter-industry collaboration. These frameworks, detailed below, could serve as both models for further integration in other sectors and models for public-private and national-regional collaboration.

The largest constraint to the development of a regional fuel-ethanol market in fact comprises regulation. Regulatory frameworks for the development of a regional market are not yet in place. In many instances there is regulatory uncertainty in the region and in some cases there is simply an absence of such regulation. The existence of a regulatory framework for renewable fuel is an investment prerequisite for two key reasons. Firstly the boards of corporations will not approve the commitment of such resources without the certainty provided by a regulatory framework. Secondly, the existence of entrenched interests in domestic fuel markets often necessitates negotiation and then regulation to make space for a market. Negotiation between established fossil petroleum fuel producers, fuel distributors and renewable fuel producers, mediated by government, is necessary in order to prepare for the entrance of such fuels into the market. This is followed by regulated (mandatory) blending to ensure that the fuel companies proceed to blend such fuels.

3. Sugarcane as a Preferred Feedstock for a Regional Bio-Fuel Market

For the purposes of this paper bio-ethanol (and specifically ethanol from sugarcane) instead of bio-diesel, will be analysed as a potential feedstock for large scale bio-fuel production.

3.1 Commercial considerations

Firstly, sugarcane is one of the most energy efficient biofuel crops known, exceeding the yield of palm oil, sorghum and jatropha. One ton of sugarcane produces 80 litres of ethanol, equivalent to 1.2 barrels of oil[i]. The table below illustrates this.

Table 1: Comparison of bio-fuel yields, 2007

Crop	Seed yield (t/ha)	Crop yield (t/ha)	Biofuel yield (litre/ha)	Energy yield (GJ/ha)
Sugarcane (juice)		100	7500	157.5
Palm oil	9800	70	3000	105.0
Sweet sorghum		60	4200	88.2
Maize		7	2500	52.5
Jatropha	740		700	24.5
Soybean	480		500	17.5

Source: Johnson, FX, CARENSA presentation to AU/UNIDO/Brazil Seminar: Sustainable Biofuels Development in Africa: Opportunities and Challenges, 31 July 2007

Secondly, the industry is well established regionally, with substantial competitive large scale sugarcane and sugar production and a number of existing and emerging ethanol producing countries. Factors driving increased production are outlined further below in the paper. Thirdly, the regional industry also has access to regional capital, in that a large proportion of the existing

investment comes from regional investors. South African agri-business companies and multinationals are the dominant investors in the region, comprising around 60% of investment in the regional sugarcane and sugar sector. This creates an advantage for the sector relative to other potential ethanol feed stocks in terms of the design and implementation of financing mechanisms and the ability to raise capital. This is significant, as raising capital is often cited as a constraint to the development of biofuel production facilities in Africa. What is useful is that ethanol from cane has a lower capital cost requirement than fuel from an oil refinery or even a gas-to-liquids plant. See table below.

Table 2: Ethanol's capital competitiveness

	Oil refinery	GTL	Ethanol plant
	Capital costs in Rand per litre		
Plant and equipment costs	15	40	10
Infrastructure costs	4	4	5
Exploration	15	10	0
Agriculture	0	0	5
Total costs	**34**	**54**	**20**

Source: Fechter, W., 'Regional Energy from Cane Vision', THS, 2012

Even within South Africa, sugarcane is a significant crop, comprising the second largest South African field crop by gross value, surpassed only by maize. It also accounts for about 18% of agricultural employment[ii].

Sixthly, the logistics of sugarcane production necessitate the location of the industrial activity in rural areas, which 'pulls in' related infrastructure and will increase the developmental impact of this choice of fuel feedstock[iii].

3.2 Institutional considerations

The sugar sector is the most highly integrated agricultural sector in SADC and the only commodity group within SADC that enjoys a regional regulatory trade framework. Annex VII of the SADC Protocol on Trade deals with the promotion of production and consumption, maintenance of an orderly regional market, harmonisation of sugar policies, investment, competitiveness, sharing of information, research and training, development of small and medium sugar enterprises and employment creation. In an effort to promote regional development the Annex also provides for quota-based duty free, non-reciprocal market access into the region's largest market, namely the SACU or Southern African Customs Union (South Africa, Botswana, Namibia, Lesotho and Swaziland) for non-SACU SADC surplus sugar producers.

The Annex also provided for the establishment of a Technical Committee on Sugar (TCS), which reports to the SADC Trade Negotiating Forum and thereby to SADC Committee of Ministers for Trade. The TCS monitors the implementation and operation of the Sugar Cooperation Agreement, including the quota arrangements. The TCS meets three times a year,

and has two working groups, which consider various technical and trade related matters. TCS members comprise government and private sector representatives from the SADC member states. A Secretariat was created to coordinate, in conjunction with SADC Secretariat officials, the implementation of the work of the TCS. This Secretariat was originally envisaged as being funded by member states, but with the member states blessing, the funding for the Secretariat is provided by the regional industries. The Secretariat is housed within the South African Sugar Association.

The TCS developed a SADC Regional Sugar Strategy which was approved by SADC Ministers. A detailed Action Plan was subsequently developed by the TCS[iv]. No similar structure exists in the neighbouring trade blocs, and the collaboration has allowed the governments and industries to work together to raise the regional sector's levels of efficiency, capacity building, small scale grower support and bio-security responses.

A Federation of SADC Sugar Producers and associated representative structure, the SADC Sugar Producers Consultative Forum were created by the private sector players to support the work of the Committee and further the development of regional policy. This means the institutional vehicles and capacity exist to support the development of a regional market for renewable fuel from sugarcane. Comparable regional capacity for other feed stocks is not yet in existence.

The sector is also supported by the existence of local significant research capacity, for example the Mauritian Sugarcane Research Institute and in South Africa the SA Sugarcane Research Institute (SASRI) and the Sugar Milling Research Institute. SASRI is the largest agricultural research institution on the continent and SMRI is the only dedicated milling technology research institute in SADC. The extensive services already offered by these institutions to the SADC sugar industries and the on-going knowledge transfer will provide a solid foundation for tackling production or process issues which may arise during the roll-out of regional ethanol production.

Regional knowledge transfer through training is also prioritised. The Shukela Training Centre PTY (Ltd), established in 1974, is a wholly owned subsidiary of the South African Sugar Association and provides training for not only the domestic sugar industry but sugar industries in the SADC region as well. Training provided by the Shukela Training Centre (STC) covers three core disciplines - Agriculture, Engineering and Process. The STC curriculum is aligned with the South African Department of Labour, as are the trade tests that are conducted. On-site accommodation and meals are offered for local and foreign learners, making it easier for the centre to conduct training for learners from other SADC states. The STC has also assisting other SADC industries through visits, advice and consultation to specific milling companies and their associated training centres. Instructors even travel to clients in the SADC region and provide training, on a request basis. This capacity has allowed the STC to train 1500 SADC learners since 2003[v].

Implementation of the TCS Action Plan has been underway since 2009. Examples of activities successfully undertaken by the TCS include:

- Created a database on research facilities and programmes available in the region;
- Cooperated in the quarantine of sugarcane varieties imported from outside the SADC region to avoid the spread of diseases. Regional workshops have been held, and a bio-security plan for SADC is being developed;
- Considered an evaluation of the capabilities of national research centres to identify areas for strengthening;
- Created a database that contains information on training facilities and programmes available in the region;

- Established a comprehensive database that contains information on small-scale grower development programmes nationally and in the region;
- Considered Guidelines for Best Management Practice for Sugarcane Production[vi], which speak to water, chemical use and biodiversity;
- Identified general and country-specific capacity constraints for small-scale sugar farmers in SADC;
- Created a SADC statistical database;
- Compiled a list of value addition projects and potential projects in SADC sugar producing and non-sugar producing countries;
- Compiled a SADC Sugar Yearbook. This will also be updated on an annual basis and aimed at supporting investment decisions in the regional sugar industries; and
- Compiled a list of internal and external production efficiency constraints.

In addition, the following actions occur on an ongoing basis: cooperate and share information on research projects, particularly EC funded ACP sugar research projects; promote the use of SADC sugar sector training facilities, including seeking donor support for smallholder grower training; and share information and experience on the implementation of EC Accompanying Measures (support for countries who have been affected by reforms to the EU sugar regime); share information and reviews on recent developments in regard to the EU-ACP EPAs; monitor US market developments. The majority of these outputs are updated annually based on inputs by the relevant industries to the secretariat and discussion in the TCS.

The framework is unusual in terms of both the innovative relationships between constituent elements (the TCS and its Secretariat, sugar industries, governments and the regional SADC Secretariat) and the successes it has enjoyed. The structures created under Annex VII to support the development and integration of the sector and the support provided by the member state government officials and SADC Secretariat officials have highlighted the Annex as a potential model for sector-based regional integration. Although the Annex was developed primarily in recognition of the distorted nature of the global sugar market, the success of the TCS and the progress made highlight the value of establishing structures and processes to progress regional integration at sectoral level. What is further distinctive about the TCS is its largely cooperative ethos and the willingness of the various regional industries to act together and in partnership with their governments to develop the region. It is after all a key objective of regional integration to collaboratively develop a regional economy and grow trade, employment and revenue. It is at sectoral level that the often generic concept of regional integration can be directly nurtured[vii]. This framework could therefore serve as both a model for further integration in other sectors in SADC and as a model for private-public and national-regional collaboration.

4. Sugarcane Derived Ethanol Market Trends and Drivers

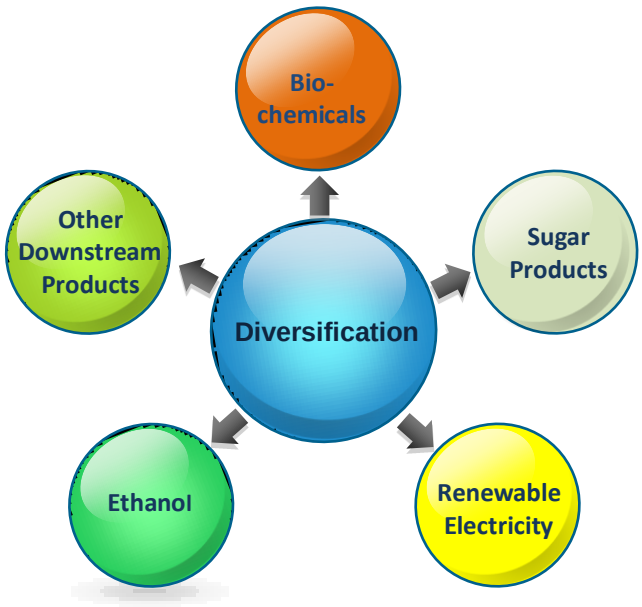
4.1 Global commercial diversification imperative

The move by sugar producers in the SADC region to the production of ethanol is part of a trend globally in the sugar sector towards diversification, whereby sugar, ethanol and electricity are derived from sugarcane or sugar beet. A few examples globally are Brazil (the world leader), Thailand and Australia. Within SADC Mauritius is the best example. The end result of such diversification is that the sugar mill is transformed into a bio-energy complex producing these three products, with each for sale to external parties. This is not the end of the story however. In the last few decades research into the sugarcane plant, has identified many potential bio-technology products. The next stage is therefore expected to be the evolution of this bio-energy

complex into a bio-refinery, producing bio-butanol[viii], bio-chemicals (including for the production of bio-plastics), polymers, cellulosic ethanol and furfural[ix], in addition to electricity, ethanol and sugar[x]. Ethanol the versatile and dynamic base product for many of these products. It can be used as base to produce ethanol gel for household cooking[xi]; bio-chemicals, including for bio-plastics (bio-degradable, plant based/non-petroleum plastic); industrial alcohol (for solvents etc.); and potable alcohol (for human consumption). The ISO estimates that worldwide production of ethanol for bio-plastics and bio-chemicals will triple to 4 billion litres by 2020[xii].

This move to diversify is a commercial imperative for sugar producers. The returns from sugar sales have been decreasing globally over the last few decades, as production input costs have risen (labour, fuel, chemicals and fertilisers) and domestic and export prices have decreased due to sporadic liberalisation in domestic and export markets and sugar's notorious market volatility[xiii]. Liberalisation has been delayed by delays in the conclusion of agriculture negotiations under the Doha Development Round. The majority of sugar produced globally is supported by government measures which distort market prices and such support was meant to have been decreased as part of the Doha Round's conclusion. This distortion is exacerbated by the fact that world trade in sugar is thin, with only around 25% of sugar produced globally traded on the world market and the remainder produced for domestic consumption. These distortions have historically supressed the world market price for sugar. SA's International trade Administration Commission notes that prices would trade as much as 60% higher in the absence of such distortions[xiv] (interestingly, South Africa is one of the most deregulated producers globally and would be one of the major beneficiaries of such liberalisation). Sugar industries globally are as a result increasingly diversifying into ethanol and electricity to diversify their revenue streams. The production of ethanol from sugarcane is therefore underway in the SADC region and will continue. The question is can governments, the private sector, the SADC Secretariat and development partners collaborate to realise the maximum developmental benefits for the region.

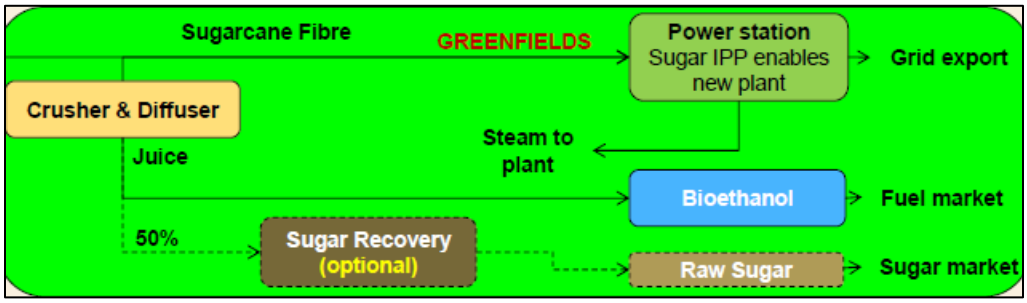
Figure 1: Diversification possibilities from sugarcane



Source: Adapted from Riddle: 2011

Both ethanol and sugar can be derived from the sugarcane plant during processing. The proportion can be varied according to the returns obtainable in the market for both. A mill can even be designed to purely produce ethanol.

Figure 2: Bioethanol production from a green fields bioethanol plant



Source: Tongaat Hulett: 2013

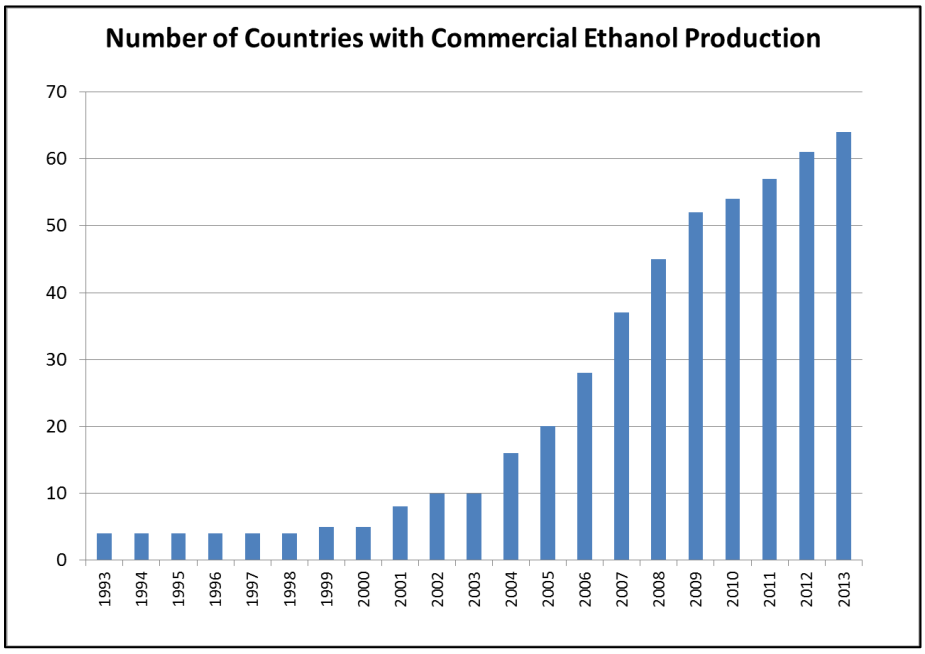
In addition, co-generated electricity can be derived by burning the left over sugarcane fibre, called bagasse. To obtain electricity, the bagasse is fed to the mill's boilers as fuel and steam is then produced to drive turbines and generate electricity, essentially swapping bagasse for coal and allowing the mill to operate 'off-grid'. Where co-generation agreements exist with the country's power producer/s the mill can sell surplus electricity to the national grid. For example, the South African (SA) sugar industry is in negotiations with the SA government and Eskom, the energy parastatal, to supply power to the national grid. The advantage of such co-generated power is that it can be quickly brought online, much faster than nuclear and even most coal plants. This illustrates the potential of the plant and its multifaceted nature as an energy feedstock.

4.2 World fuel ethanol market

The International Sugar Organisation, which is the largest commodity based organisation in the world, and represents the great majority of global producers, estimates that world consumption of gasoline/petrol for fuel could rise from the current 1.3 trillion litres to 1.4 trillion litres by 2020, and ethanol for fuel use in 2020 would then reach an estimated worldwide average blending rate of 10 to 11 percent, almost doubling from its 2013 level[xv]. In terms of global feedstock use for fuel ethanol, sugarcane comprised 59% of total feedstock use in 2012. The remainder came from grains, sugar beet, whey, raw alcohol and cassava chips[xvi]. So-called second generation or cellulosic biofuels (derived from grasses and non-traditional feedstocks) could be a component in future, but in spite of ongoing expectations and research, remain a niche product. Both the investment and operating costs of cellulosic biofuel still remain much higher than for production from traditional feedstocks.

The use of sugar for ethanol as a percentage of global sugar output has doubled from around 11 percent in 2000 to around 22 percent in 2012[xvii]. The number of countries engaged in commercial ethanol production has risen from 10 in 2002 to just over 60 in 2013[xviii].

Figure 3: Expansion of ethanol producing countries, 1993 – 2013



Source: BP, 22nd ISO Seminar, 2013

This has attracted interest and investment from oil companies. BP for example has investments in research facilities, demonstration plants and full-scale production facilities on four continents. In Brazil alone it has sunk $750 million into production facilities, achieving a 90% reduction in greenhouse gas emissions compared to similar fossil fuel production. Key producers include Brazil, Canada, China, the EU and the USA. By far the largest producers and consumers are the USA and Brazil though. In 2012 the US lead with production and consumption about 2.5 times higher than that of Brazil. No African country ranks amongst the world's key producers, consumers or traders of fuel ethanol. In line with the topic of this paper the size of the future world ethanol market and related production and demand is expected to hinge on regulatory choices, and especially decisions in the EU and US with regard to blending mandates and first versus second generation biofuels.

Introducing fuel ethanol blending can trigger technological change in a national vehicle fleet. To increase the percentage of ethanol that could be used in vehicles Brazil introduced 'flex-fuel' engine technology. A flex-fuel engine is one that can use any percentage of ethanol, up to 100 percent. Conventional engines can use between 15 – 25 percent ethanol, depending on year of manufacture. The adoption of a significant level of ethanol blending can in theory therefore be

used to develop additional domestic manufacturing capacity to provide and service flex-fuel engines for the domestic market. Brazilian sales of flex fuel and alcohol vehicle sales in 2012 were 3.1 mln units. In Brazil, once government policy started to target flex-fuel use, the percentage of flex-fuel cars rose from less that 1 percent in 2003 to 61 percent of the light vehicle fleet in 2013, and is expected to rise to 84 percent by 2020[xix]. First adopters were municipal/local, provincial and national government institutions and structures. This provided a guaranteed entry point for the technology. The net result of course was a reduction in petrol imports and an attendant foreign exchange saving. Brazil has already offered to assist African countries with technology and skills transfer, through an initiative proposed in 2012 to the African Union and announced at an International Sugar Council meeting in the same year.

The SA sugar multinationals are therefore considering additional investment to support diversification in their regional operations. Illovo plans to increase operating profit from these downstream businesses to 20% by 2017, up from 10% in 2012[xx]. It recently opened an alcohol distillery in Tanzania and is considering downstream plants in its operations in SA, Swaziland, Zambia and Malawi. Interestingly, Illovo obtains 90% of its operating profit from its non-SA operations.

4.3 Sub-Saharan fuel ethanol market

The current production of fuel[xxi] ethanol in Sub-Saharan Africa (SSA) as a whole is very small, estimated at around 145 mln litres, or 0.2% of world total. The domestic market for biofuels is at the same time attractive in many countries because of high fuel prices and rapid demand growth. The prices of fuel in sub-Saharan African countries are often about double those in the most competitive markets, exacerbated by long supply routes in those countries which are landlocked, as well as poor infrastructure, limited volumes, high logistics costs and high taxes on fuel. However, demand for transport fuels in SSA is still projected to grow by more than 4 percent annually[xxii]. Demand will be strongly supported by ongoing urbanisation, and GDP and population growth. Short of extended low global oil prices, the incentive to produce ethanol will remain for both government and industry. The table below gives an indication of expected petrol and ethanol use by 2020 for selected SSA countries.

Table 3: Indicative Petrol and Fuel Ethanol Use in 2020 (million litres)

Country	Blend rate used to determine demand	Petrol demand 2012	Petrol demand 2020	Fuel ethanol demand 2020
Ethiopia	10%	239	318	35
Kenya	10%	687	903	100
Mozambique	10%	138	167	19
Nigeria	5%	9 656	13 988	736
South Africa	8%	10 712	13 432	1 168
Sudan	10%	807	884	98

Source: ISO Ethanol Yearbook, 2013

Global fuel ethanol demand by 2020 is expected to be 170 bln litres, with sub-Saharan African demand of between 2 and 3.8 bln litres[xxiii]. This excludes ethanol used for other purposes (potable, industrial, gel). As mentioned, a significant demand booster to achieve economies of

scale in the African market would be the introduction of ethanol (usually in gel form) as a fuel for cooking, lighting and heating, as a safer, less toxic alternative to kerosene and a more sustainable product than charcoal for large urban populations. Regardless of ethanol's use as a transport fuel this alone is a significant source of demand, given that as much as two-thirds of households in sub-Saharan African use wood fuels for their daily cooking and heating needs. The World Bank estimates more than 3 billion litres of ethanol would be required to replace 10% of all African household energy consumption for cooking[xxiv], and the market could potentially expand to 12.3 billion litres. As with ethanol, regulatory intervention could spur the creation and expansion of such a market.

4.4 SADC fuel ethanol market potential

Sufficient natural resources exist in SADC to realistically develop a regional ethanol market, utilising only a fraction of available land[xxv]. To illustrate, the table below compares SADC land use to that of Brazil, the giant in global sugarcane, sugar and ethanol production.

Table 4: Land use, South Africa, Brazil and SADC, 2012

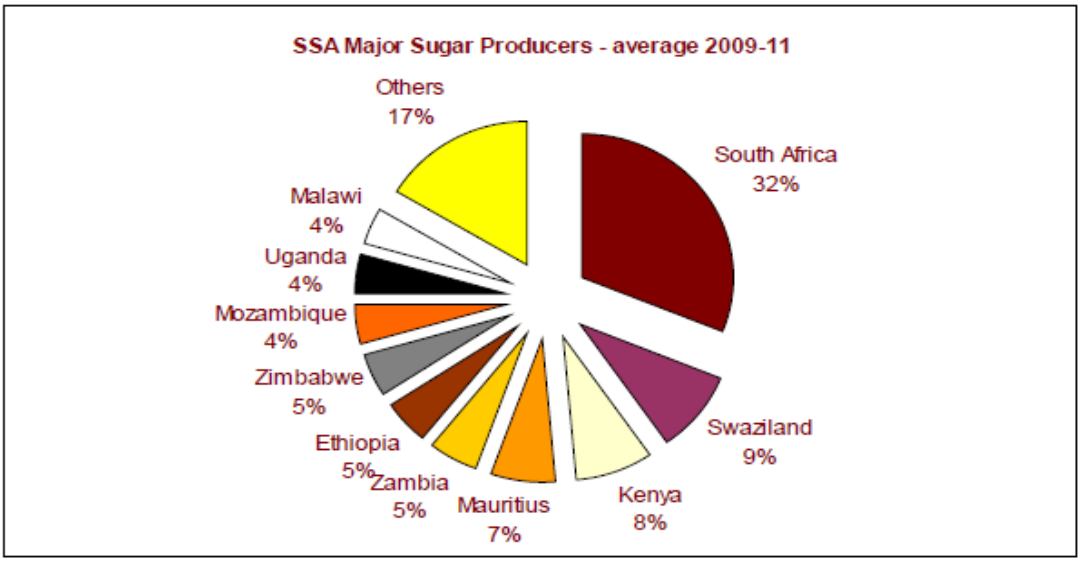
Land category	South Africa	SADC	Brazil
	Million hectares		
Forest area	10	370	480
Pasture	40	340	190
Cropland Potential	<10	60 - 120	60-100
Other	60	200	110
Total	**120**	**970**	**850**

Source: Kruger, 2011

The Southern African Development Community is comprised of fifteen states, eleven of which are sugar producers. Amongst the fifteen members of SADC, only Namibia, Lesotho, Botswana and the Seychelles do not produce sugar, due to agronomic conditions unsuitable for crop production.

South Africa is the largest producer in the region, producing on average 2.2 million tons of sugar per year, see figure below. It is also the largest investor, with South African sugar multi-nationals owning around 60% of regional production capacity, although one of the largest South African producers, Illovo Sugar, is in turn owned by a United Kingdom company, Associated British Foods. The SA sugar industry is member of the Federation of SADC Sugar Producers, which groups the eight largest producers, namely Malawi, Mauritius, Mozambique, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. These producers together were responsible for over 95% of SADC production in the 2011/12 season. Madagascar and the DRC have much smaller sugar industries. The smallest producer is Angola, with production believed to be under 70 000 tons. Angola has just re-commenced production after decades of non-production due to the civil war[xxvi].

Figure 4: Major Sub-Saharan sugar producers, 2009 - 2011



Source: Future Role of Sub-Saharan Africa in World Sugar and Sugar Crop Renewable Energy, ISO, 2013

Sugarcane and sugar production is a key agro-industrial activity in SADC and the sector is highly regarded for its developmental potential. SADC is furthermore the only surplus sugar producing region in Africa, i.e. regional production exceeds regional demand. In the 2011/12 season the Federation's eight members produced around 4.6 million tons of sugar, consumed around 3.7 million tons, imported around 0.9 million tons and exported around 1.6 million tons[xxvii].

It is calculated that between 50 and 60% of new SADC petrol requirements over the next 18-20 years, including growth, could be met using only between 3 – 6% of the available cropland and 8000 – 10000 MW electricity could be generated, equivalent to 16-20% of 2011 required capacity[xxviii]. This would require 120 sugar mills with a production capacity of 320 000 tons each per year. It is estimated that a remarkable 3 million direct jobs (1.8 million permanent) and 4 to 6 million indirect jobs could be created in SADC through the expansions in sugar production and diversification[xxix]. Further benefits for SADC include that it would address the regional power deficit, retain and generate jobs, and can be brought on line relatively quickly. Around R70 billion per annum would be added to the 'rural economy of SADC[xxx]. Development of renewable energy on a regional scale would also spur large scale industrialisation, beneficiation and component fabrication in SADC and related large scale training in farming and management skills. In South Africa alone, it is estimated that manufacturing and services worth between R20 and R30 billion would

be procured by the industry to support the building of ethanol plants, with the bulk of it ordered from domestic suppliers[xxxi].

South Africa has the largest domestic fuel market in SADC. It imported around 2 bln litres of petrol in 2011. Total market demand in 2011 was 10.7 bln litres. SA's sugar industry believes it can supply sufficient ethanol to support a blend of between E6 and at maximum E8, from existing surplus sugars alone. This would imply an equivalent supply of between 720 to 960 mln litres of fuel from ethanol. Allowing for expansion of the domestic industry through new estates and dedicated ethanol mills could boost this to 9% of domestic fuel demand[xxxii]. The market size should still leave more than sufficient space for market access by regional fuel ethanol suppliers and other regulated local reference crops (feedstocks), especially if the state increases the mandatory blending rate to a higher number, e.g. E25 or even E50.

Using ethanol also contributes to lower carbon emissions. Between 15 to 35% of South Africa's climate change commitments could be met just through renewable energy derived from sugarcane production[xxxiii]. Although the other SADC states do not emit carbon to the extent of South Africa, the reduction in emissions is substantial – using a 50% blend of in 2025 would lead to 70 million tons less carbon being emitted, about a 46% reduction in emissions against a zero ethanol scenario[xxxiv]. Ethanol projects may also be eligible under global carbon offset schemes. The cogenerated electricity from the sugar mills would further be well suited to SADC because the sugar cane season matches peak winter demand in the region, and power would be available during the dry season when hydro power can be unreliable, as for example often occurs in Uganda.

4.5 Existing biofuel regulation in SADC

Policy development to support the orderly development of a regional market has been underway for a number of years. Any regional investment programme should therefore be undertaken with reference to the existing frameworks. For example, a SADC Framework for Sustainable Biofuels was produced in 2010, comprising basic guidelines for the development of sustainable renewable fuel strategies, but with significant leeway for member states to pursue diverse national strategies. The framework seeks to ensure rural development, poverty reduction whilst minimising the minimal environmental impact of such fuels. It gives broad recommendations on how regional biofuel production should adhere to environmental, economic and socially sustainable approaches and calls on member states to facilitate the development of competitive and sustainable biofuel production, use and trade regionally and internationally[xxxv].

A SADC Regional Renewable Energy Strategy was further produced in 2010 and seeks to promote the uptake of clean energy and ensure that southern Africa takes advantage of the numerous renewable energy opportunities that exist in the region including biofuels and biomass based cogeneration.

These policies should be revised to include renewable energy (ethanol and co-generated electricity) from sugarcane, and frameworks to facilitate practical elements of implementation once the coordination of a regional investment programme is underway. The next step will be to coordinate the implementation of these policies with the development of national policies. Coordinated national policy development, through a pooling of best practice, will lead to better policy making and lay the foundations for regional trade in ethanol through proactive policy harmonisation.

Although ethanol production dates back to the 1980's (Zimbabwe and Malawi), few SADC states have got to the stage of including bio-fuel and commercial bio-energy strategies in their

energy or national development policies, or have developed relevant regulatory frameworks despite their natural comparative advantages of land, labour and climate for growing energy crops. Many SADC states are however now drafting strategies to utilise these sustainable energy sources. A number of member states have introduced blending, whereby a set percentage of ethanol is blended with gasoline/petrol. The resulting product is commonly referred to by its blend percentage, e.g. E10 means a blend of 10% ethanol and 90% gasoline/petrol. Blending percentages are influenced by availability of ethanol, engine specifications and refining technology.

Swaziland has an E10 ethanol mandate in place and a pricing model is being finalised.

Mozambique has an E10 ethanol mandate in place.

Zimbabwe promulgated an E5 mandate in 2013, with a view to moving towards E10 but a lack of consensus between stakeholders has delayed this.

Tanzania and **Swaziland** have established National Biofuels Task Forces to formulate and propose an enabling environment to facilitate the development of biofuels. All the relevant SADC states are considering the development of national sustainability criteria, in order to address the 'food for fuel' debate. Tanzania and Mozambique have developed investment criteria to guide their biofuel investment progress. They are attempting to avoid direct conflict with food production through spatial planning initiatives. They also have dedicated agencies to guide and regulate national biofuel developments[xxxvi]. South Africa and Mozambique have developed national strategies or policy's to address biofuel development. Swaziland has designed a strategy and action plan.

Zambia has an E10 ethanol mandate in place

Malawi has sub-Saharan Africa's longest running fuel ethanol blending programme. It has been blending for over 30 years and has a regulated 20% blend rate. This can be lowered to 10% in case of supply shortages. It is reported that a targeted blend of 100% (E100) is being introduced. This, similar to Brazil, will be utilised by vehicles fitted with a conversion unit to enable them to run on E100 or any other blend[xxxvii].

South Africa is on the verge of biofuels production and blending – mandatory blending regulations were gazetted in August 2012, for a 2 – 10% blend with an implementation date of October 2015. No pricing framework has to date however been agreed. The Ministry of Finance announced a 4c/l supportive fuel levy in early 2013 and a Biofuels Implementation Committee has been established. Stakeholders are concerned though that the date of 2015 may be unrealistic, as consensus still has to be reached on key technical fundamentals and pricing before planning can proceed to implementation such as the reconfiguring of mills and the purchasing and installing of necessary capital equipment by ethanol producers, and the reconfiguring of depots by fuel companies.

- **Incentives**

States with biofuel potential have also realised the necessity to further develop fiscal incentives to attract foreign and national investment. Most incentives seem to focus on reductions in taxes and levies rather than through direct grants[xxxviii]. Often the combination of a refining margin, dealer margin and domestic logistics all bring the price of ethanol so close to that of fossil fuels that the imposition of government taxes and duties will render it uncompetitive. South Africa, Tanzania, Mozambique and Zambia for example have prepared such incentives. Some SADC states are developing biofuel technical quality standards, generally based on international standards, for example South Africa has established standards for bioethanol and biodiesel.

Ideally, SADC states and partners must collectively create a conducive legal and policy environment that would make the region an attractive investment destination for bioenergy projects.

Outside of SADC there are also a few other examples in the broader southern/east African region. Ethiopia introduced an E5 ethanol mandate in 2009. Kenya has advanced plans to introduce an E10 mandate. Sudan has an E5 mandate in place.

4.6 Trade agreements and SADC ethanol production

For a SADC market to work, there needs to be large scale production of ethanol. The commercial imperative for SADC producers to produce ethanol has been strengthened by reforms introduced in the region's most important preferential market, the European Union (EU). For decades, the region's sugar producers, as well as other producers from member states of the African, Caribbean and Pacific Group of States (ACP) have benefitted from duty free access and high market prices for their export sugar in the EU market. This market access is preferential, in that the member states are parties to the successive comprehensive EU-ACP development and trade agreements which have been in place since the early 1970's (the Lome' and then Cotonou agreements). The value of this preferential access however started to decrease when the European Commission (EC) commenced with changes to its sugar sector regime in 2006 and is likely to further decrease when the current round of EC reforms is fully implemented in 2017. Deregulation introduced by the EC has led to sharply lower prices in the EU market and will lead to increased price competition from EU beet producers through consolidation and lower production costs, as well as from increased access by other non-ACP developing country producers. This deregulation has been undertaken in the face of strong opposition from the ACP and has had an increasingly negative effect on higher cost ACP producers.

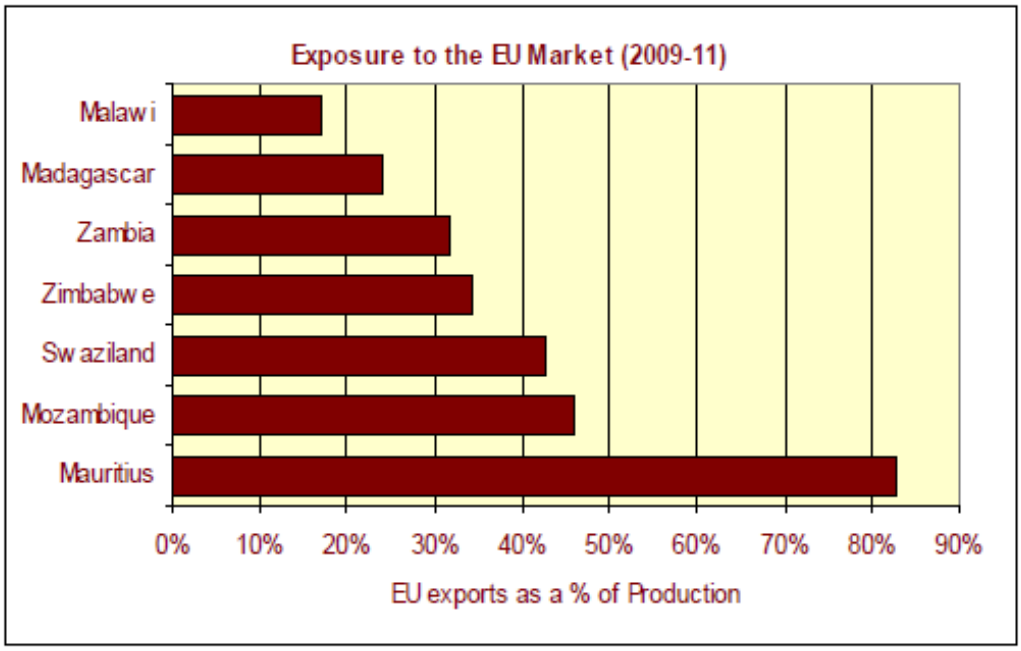
The SADC sugar sector contains some of the lowest cost producers globally and so has been spared the worst of the impact of the reforms, but research by the EC and other analysts points towards a decrease of about 42% in overall ACP market opportunity in the EU market. EC research, from late 2013, estimates that the planned 2017 policy changes will reduce the domestic EU sugar price from an average of €627/tonne in 2013 to an average of between €405 and €420/tonne over the period 2017 to 2023 and will reduce EU demand for imported sugar from an average of 3.63 million tons per annum from 2009 to 2011, to an average of 2.0 million tons per annum by 2021–23[xxxix]. With Brazil more than able to supply the same tonnage at very competitive prices (Brazil is the lowest cost producer globally), the ACP have a problem. Already many of the Caribbean sugar industries are in severe decline.

Diversification, even for the lower cost SADC industries, is consequently now a matter of urgency as the region exported just over a million tons to the EU in 2012[xl]. Either new markets or new uses must be found for this sugar. It's not as simple as just scaling back sugarcane or sugar production. A sugar mill is a very expensive operation to run. Most mills cost $100 – $150 million to construct and must run at a high level of capacity utilisation just to offset daily running costs. Cutting back on the cane supply will make the mills unviable. With each mill usually operating as the 'anchor employer' in its rural area, the developmental consequences of mill shutdowns are extremely negative. The SADC countries with the exception of South Africa (which does not feature as it only obtained preferential access to the EU market in 2014) do not have the welfare systems to absorb such consequences.

There will thus shortly be a significant amount of 'excess sugar' available in the region, with related revenue losses, unless new markets or uses for this sugar can be found. The

comparative exposure of the SADC exporters to the EU market is indicated in the figure below. The SA sugar market, although the largest in the region, is not an option to absorb such sales, due to the recent increases in the Southern African Customs Union (SACU) tariff on sugar and the presence of Swaziland in the SACU local market. Swaziland is one of the lowest cost producers in the world and will offer strong competition to those SADC exporters able to absorb the SACU tariff. Although a SADC Free Trade Agreement (FTA) exists, access for SADC producers is capped at around 40 000 tons per annum under Annex VII to the Protocol on Trade, with a small annual growth factor built in. Growth in domestic consumption in non-SACU SADC state domestic markets will absorb some of the excess, but not fast enough.

Figure 5: SADC sugar producer exposure to the EU market, 2009 - 2011



Source: Future Role of Sub-Saharan Africa in World Sugar and Sugar Crop Renewable Energy, International Sugar Organisation, 2013

A further option for absorbing ex-EU sugar exports by SADC might be preferential market access to the Tripartite Free Trade Area (TFTA). The TFTA is under negotiation and will encompass the 26 states of the COMESA, SADC and EAC trade blocs. The SADC sugar industry has been actively involved in negotiations towards a mutually beneficial arrangement for all TFTA sugar producers, so it is likely that this will eventuate. Negotiations are running behind schedule though, and final good offers and Rules of Origin negotiations have yet to be concluded. The degree of preferential access is further not guaranteed and in trade agreements it is best not to count your access until the ink is dry.

Competitive SADC producers would also benefit from increased exports resulting from any multilateral liberalisation under the World Trade Organisation Doha Development Round negotiations but it is no longer certain when or indeed if the Round will conclude.

The only other option on the table therefore is to absorb the excess sugar through the production of ethanol, as detailed above. Ethanol exports to the EU won't easily replace the sugar exports though as prices for ethanol derived from either sugar beet or sugarcane have fallen due to the reforms noted above. The EC's recent decision to cap first generation fuels as a percentage of fuels that are eligible for government support under the Renewable Energy Directive will also impact demand. The answer therefore is national, then regional demand.

5. Political Economy Considerations of a Regional Ethanol Industry

A political economy analysis of the development of a regional biofuels industry is a necessary component of any analysis of a regional market. Five key issues which must be taken into account – the use of food crops for fuel, resistance from established liquid fuel interests, land ownership, trade policy, and national versus regional energy security.

5.1 Food crops as fuel feedstock

The use of food crop feedstocks for renewable fuels has been widely criticised, both within the region and globally. Governments in the SADC region have in some cases banned the use of certain staple crops for the production of renewable fuels, e.g. maize by South Africa. The concern is that land used for food crops, will be diverted to the production of feedstock, thereby undermining food production and security. This would be even more relevant if the envisaged feedstock were a staple in the nation concerned. There can also be regional implications. For example, SA is traditionally the supplier of 'top-up' maize for the region when production falls in neighbouring states and thus any diversion of maize to fuel production would remove that buffer and surplus from the market.

In Europe the debate has focused on greenhouse gas emission reductions as well as land use change (LUC), and indirect land use change (iLUC), i.e. firstly where existing arable land is used for the purposes of renewable fuel production rather than the production of food (LUC), and secondly where displacement caused by such renewable fuel feedstock planting causes high biodiversity land elsewhere to be brought into production (iLUC). The first element could result in food insecurity, but ironically the second could result in increased carbon emissions, even though the drive for renewable is meant to reduce carbon emissions whilst increasing energy security. This reduction is negated if the production of renewable fuels generates too much carbon through iLUC, where the new farmland now emits more than it did as high biodiversity land.

With regard to a SADC sugarcane derived fuel ethanol market though, the ILUC risk is low, as the EU sugar market reforms mean that the proportion of existing sugarcane and sugar production which previously went into the EU market may simply be redirected to ethanol production. This will reduce the need for additional sugarcane planting to produce ethanol. In terms of sustainability, the sustainability criteria being imposed in the EU and other developed markets will by default lead to the adoption of such criteria in those low cost producers who wish to export ethanol to the EU. To ensure that food production within SADC is not disrupted, it would be necessary to incorporate similar criteria into emerging domestic regulation. The regional industry has already made progress towards laying the foundations of such an approach, through its efforts to design Guidelines for SADC Best Management Practice (BMP) for Sugarcane Production, drawing on regional (mainly SA) experience in BMP development. SA's BMPs are in fact regarded as global models for sugarcane farming sustainability.

It must be noted however that sugarcane and sugar should be assessed differently to other food crops. Firstly sugarcane is not a crop that is consumed directly, and sugar is not a staple food

in the sense that maize or potatoes are. Therefore a reduction in the availability of sugar is not equivalent in impact to a reduction in the availability of potatoes. Secondly, the soils in which sugarcane grows may not be suitable for the nation's preferred staple crops. Thirdly, sugarcane is not an easy crop to switch to. It requires an initial stage of establishment involving seed cane. The cane must then mature for 18 to 24 months to achieve full sucrose potential. The sugarcane root bundle or ratoon can further be re-used for between three to seven seasons, so farmers keep their planting costs low by utilising this feature. To switch crops annually would price you out of the market. As a result, farmers do not just suddenly switch to growing sugarcane from growing other crops. Fourthly, sugarcane is not frost tolerant. This limits the possible growing regions. For example, in South Africa it is only grown in three of the nine provinces, and cannot be grown in the country's main maize growing region. Fifthly, there is an additional automatic check on the potential for farmers to switch to sugarcane or for investors to plant massive sugarcane plantations. This is simply because 'no mill, no sugar/ethanol'. Sugarcane is a monopsonistic product, i.e. there is only one buyer. It is only of value to a sugar miller, and no-one else will be interested in buying thousands of tons of sugarcane stalks. You can't eat it as a meal as you would other foods and a farmer can't sell it to a supermarket. This inability to sell to other buyers also acts as a 'switching deterrent' for food crop farmers who are used to being able to sell to their choice of local markets, wholesalers and retailers. As a result, by regulating sugar mill numbers it is possible to cap the number of sugarcane plantations, thereby affording governments' significant control over the expansion of the sector.

5.2 Established liquid fuel interests

The second key issue would be the reluctance of established interests in the liquid fuel sector (e.g. domestic petroleum companies or foreign petroleum multinationals) to accommodate the entrance of new sources of supply, which would dilute their market share. As their practical cooperation is required for blending to occur, such opposition can be very effective. However fuel markets are almost universally closely regulated and so this in itself gives the state leverage. Resistance to such competition can therefore be overcome through regulation, forcing traditional producers of fossil fuels to cooperate with ethanol producers.

5.3 Land ownership

The third issue relates to land ownership, with opponents of renewable fuels noting that the production of such crops on a commercially feasible scale requires large plantations. The inhabitants of the targeted areas are in most instances subsistence / small scale farmers living in rural communities. A significant power imbalance exists between these communities and governments and investors. A solution could be to incorporate the existing communities into the envisaged investments, whether as communal sugarcane and fresh produce farmers or as service providers to the mills. Local communities must not be displaced or their livelihoods disrupted and if they do not wish to undertake sugarcane farming an agreed negotiated solution must be followed with support from civil society. Local communities must also be allowed to continue using sufficient land for growing subsistence food crops. Farmer structures should be strengthened to support the successful undertaking of such negotiations and any resulting investment projects.

5.4 SADC trade policy

The emergence of A SADC market may need to be facilitated by supportive trade policies. It may not be possible to attract the necessary production investment if non-SADC imported ethanol were to be allowed to enter the market unimpeded at a lower price. The largest

exporters of ethanol globally are the USA and Brazil, although market developments have rendered their exports volatile in recent years. It can be noted that these countries are massive producers, with massive agricultural support programmes that cannot be matched by SADC producers. They are quite capable of supplying large volumes into most African markets if the price is right. That these countries are capable of export to Africa is already evidenced by US and Brazilian exports to Nigeria of 57 and 73 mln litres respectively in 2012. For an initial period at least, effective, coordinated import measures and other forms of regulation may therefore be necessary across SADC to encourage the development of national production bases. This could be followed by phased liberalisation. Although SADC has not yet reached the stage of a customs union whereby a common external tariff for ethanol could be imposed, regional renewable fuel policy could call for member states to promote and support the production and consumption of SADC ethanol, similar to Annex VII to the Protocol on Trade which seeks to support SADC sugar production. Such supportive measures would be closely linked to realistic blending mandates and could make provision for imports under extreme situations such as drought, so as to preserve the consumer base. It is very likely as posited in the section below, that most regional governments will indeed utilise domestic regulatory measures to promote domestic ethanol production and energy security. Such regulation in this sector would not be unusual given the extremely regulated nature of the overall liquid fuel industry.

This position by member states would have to extend to new trade negotiations by member states. The Tripartite Free Trade Area (TFTA) is the most immediate example. The TFTA is directly relevant as SADC as a bloc is negotiating with the COMESA and EAC blocs. It is also especially relevant given the potential of some of the non-SADC TFTA producers, for example Sudan and Ethiopia. Sudan (not South-Sudan) is already an exporter, having exported 27 mln litres in 2012, and under the Sudan Grand Sugar Plan aims to be able to able to produce 591 mln litres per year by 2019/20, whereas projections by the ISO are that domestic demand under a blend rate of 10% would only be 98 mln litres in 2020[xli]. The surplus is presumably destined for export. It may be necessary therefore to include ethanol in the proposed special dispensation for sugar currently being discussed by the TFTA member states, whereby sugar and ethanol trade in the region would be treated under a special dispensation instead of under the general TFTA market access framework, along the lines of Annex VII to the SADC Protocol on Trade.

5.5 Energy security

As ethanol production increases, the debate on national energy security versus regional energy security would have to be addressed. Governments may attempt through import and export restrictions to ensure that domestic ethanol production is directed to meet domestic needs first. A balance would have to be found between the development of national and regional markets. This issue is further discussed below in the constraints section.

6. Constraints to the Development of a Regional Ethanol Market

6.1 Constraints overview

The development of a broader SADC renewable energy market comprised of various sources of renewable energy is being constrained by a range of factors ranging from the relatively cheap price of fossil fuels due to an absence of full lifecycle accounting for fossil fuels (which would take into account environmental costs), inadequate legal and institutional frameworks, difficulties in accessing financing to support market development, capacity and information barriers and lack of political will to support long-term planning and integration into regional energy markets. Projects involving more than one SADC Member State are particularly difficult

to develop. This is partly due to the tendency for national interests to prevail over regional energy needs[xlii].

Additional constraints include lack of national biofuels standards, lack of tariff and standard harmonisation, lack of integration into distribution networks, unclear benefit sharing amongst producers, unclear mechanisms to promote investment and uneven playing fields to compete with established energy forms[xliii]. Respondents during field work for this study identified technical barriers to trade as potential barriers. For example, even within SACU the administrative processes required by Swaziland to supply SA buyers of ethanol are apparently more cumbersome than exporting to non-SACU states. It can further be noted that there is still no common industrial or agricultural policy for SACU.

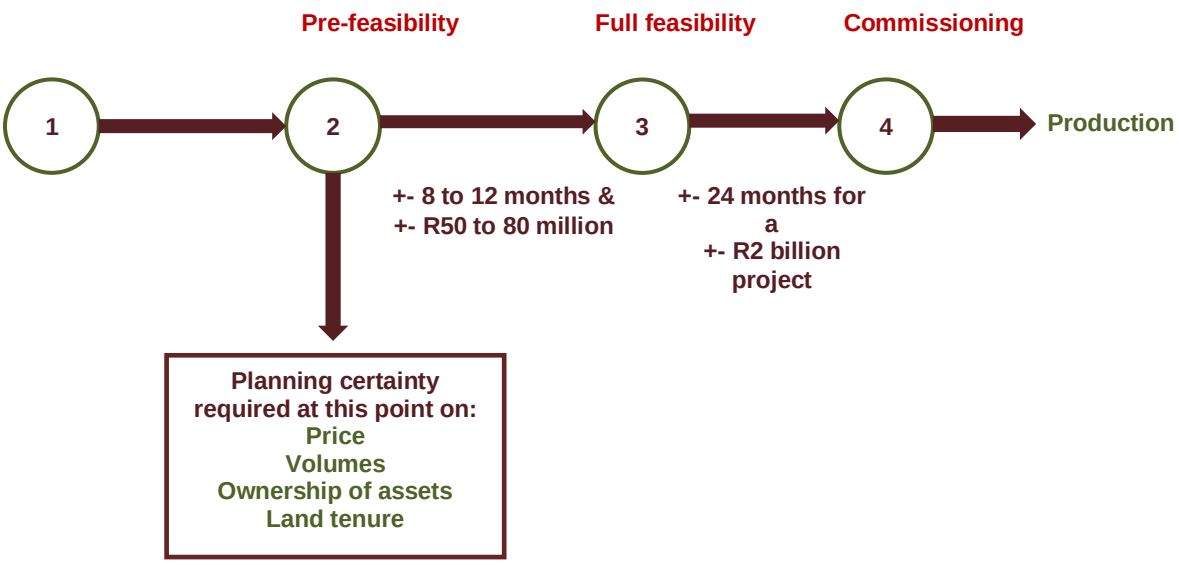
Interestingly, respondents did not identify the logistical challenges of moving ethanol around the region as overly problematic. This may be due to the fact that processes and infrastructure already exist to transport liquid fuels across the region. It can however be noted that using molasses as a base for ethanol production will decreases the amount and quality of molasses available for use by the animal feed market, which may lead to complaints by these downstream users and will necessitate planning by molasses users for a replacement input. A set of selected constraints are explored below.

The 2012 Mid-Term Review of the SADC Renewable Energy Support Programme highlighted such constraints[xliv], noting that a key constraint is securing investment, as is limited expertise amongst regional actors to develop bankable projects, which has led to investor reluctance to finance smaller scale projects based on a lack of supporting feasibility studies, data and viable business models to justify investment. As a result, there is a bias in the SADC region to develop larger energy projects to feed into regional networks. The advantage of fuel ethanol from sugarcane is that such data and models are already in existence or could be patterned on existing regional examples; and the feedstock is already at a scale needed for commercial production. It can be argued that constraints to developing renewable energy projects in the region would in many cases apply to a much lesser degree in the roll-out of fuel ethanol production from sugarcane, due to the connection to an existing sector with national and regional institutional capacity and an established investment base.

6.2 Regulatory uncertainty as a key constraint

The key constraint to the development of a regional fuel ethanol market is the regulatory uncertainty which prevails in many states in the SADC region. In some cases there is simply an absence of any such regulation. The existence of a regulatory framework for renewable fuel is a prerequisite for investment for two main reasons. Firstly the boards of relevant corporations will not approve the commitment of such resources without the certainty provided by a regulatory framework (blending mandates and agreed pricing formulas). However, this is often perceived by national governments as reluctance by the private sector to invest due to the lack of understanding of investment processes. Crucially, in most cases the boards will not even approve the pre-feasibility studies without the regulatory certainty provided by regulation due to the cost of studies for such capital intensive projects. A project worth R2 billion will typically require a pre-feasibility study costing between R50 to R80 million. The figure below illustrates this.

Figure 6: Ethanol project cycle and regulatory certainty



Source: Kruger: 2011

Secondly, the existence of entrenched interests in domestic fuel markets often necessitates regulation including mandatory blending. In most cases negotiation between established fossil petroleum fuel producers, renewable fuel producers, fuel distributors and government is necessary in order to prepare for the entrance of such fuels into the market, followed by regulated (mandatory) blending to ensure that the fuel companies proceed to blend such fuels. Ironically the introduction of blending should assist domestic refiners to achieve the EU5 technical standard for emissions as the blended fuel is cleaner.

What is clear from the literature and the field work is that this constraint of regulatory certainty is the key constraint. The South African case is illustrative. Although a National Biofuels Strategy was published in 2002 with a blend rate of 2%, it was not made mandatory, and pricing was not finalised. The private sector evidently did not feel this comprised sufficient certainty to invest. In spite of the depth of the capital market and investment muscle of the local sugar sector it was only with the promulgation of blending regulations in 2012 that further progress has been made. This was alluded to by the then Minister of Energy in early 2013, when he noted that incentives such as a 50% rebate on the general fuel levy for biodiesel manufacturers and a fuel tax exemption for bioethanol producers had been insufficient to lure investments in the biofuels sector, hence government saw the need for establishing a more enabling and supportive regulatory framework. Further illustrative of the complexity of developing supportive biofuels regulations is the fact that sugar, in spite of its merits as a feedstock, was not included for consideration until only recently, due to ongoing debates around single versus multiple reference crops (feedstocks). Consensus also had to be reached on the need to allow ethanol production from existing investments versus mostly greenfield investments. This focus had arisen due to governments desire to promote employment creation mainly through greenfield developments. This is an important focus, however to generate critical mass, existing industry assets must evidently be used as well.

The progress in South Africa is good news for the development of a regional market. Any coordinated regional sugarcane ethanol initiative will of necessity require South Africa to have established a biofuels market and a renewable fuels policy that includes the use of sugarcane

as a feedstock. The successful launch of a biofuels sector in South Africa will encourage the development of regional biofuel policy making and investment by SA multinationals in the region.

Pricing is usually used to incentivise renewable fuel production and a regulatory framework for renewable fuel production is not an anomaly because the liquid fuels market is highly regulated globally and within SADC. However, longer term, once a market is established and matures it is possible to deregulate the ethanol market, as evidenced by the Brazilian case, where government has progressively deregulated price and aspects of ethanol production, to the point where ethanol must now retain price competitiveness as against petrol to ensure demand. In SADC countries without oil refineries which cannot refine petroleum products locally, the local market is a price taker for such products and any deregulation would have to take into account the fact that oil is traded in dollars, and that exchange rates play a role. In addition, the world sugar price is itself volatile. Extending a pricing mechanism to biofuels will allow the state to control these variables to a greater degree during the development of a national market and reduce risk.

Most states would ideally want a national fuel refinery but cannot afford it. Biofuel regulation can create an environment similar to that which a refinery would enjoy, thereby stimulating the creation of biofuel plants which together may approximate some of the output of a refinery. Respondents proposed that support for biofuels should not exceed what is extended to fossil fuels, but would be necessary to level the playing fields.

6.3 National versus regional market

For a regional market to be viable there needs to be an 'anchor market' which can lend critical commercial mass to any regional trade. For the required capital investments to remain viable capacity utilisation is key and the bulk of the SADC states have small fuel markets which would not support large scale production. This necessitates a reliable and large enough consumer base. As noted, the only market with this scale is South Africa's liquid fuels market. Even the EU market, traditionally the most lucrative market for African commodity products, has lost much of its sugar sector value due to the reforms detailed above.

The SA government sees a diversified SA sugar sector as linked to a diversified regional sector. At the 2011 Federation of SADC Sugar producers Conference held in Durban, the Deputy Minister of Trade and Industry highlighted the important contribution of the industry to the SA government's strategic priorities and stated that for the sugar industry of South Africa and those of SADC, diversification is non-negotiable. The Deputy-Minister noted that the SADC sugar industry holds great potential for its citizens and holds the promise of increased trade, industrial development, employment and greater regional cooperation and solidarity. The Conference statement highlighted the importance of developing a diversified sugar industry, including advocating for mandatory or legislated policies and tariffs for renewable energy. It emphasised the need for an enabling policy and regulatory frameworks for attracting investment into renewable energy and agreed to support joint policies for renewable energy that could be underpinned by the combined size of the SADC markets and the SADC resource base. This government and industry support bodes well for an integrated region.

So this scenario of any future market would potentially be where other SADC states supply the SA market with fuel ethanol, following the regional supply pattern of electricity and natural gas[xlv] to the SA market. Ironically, South Africa will obtain additional benefit from such a model, as much of the investment in regional production will come from South African multi-nationals,

aiming to supply ethanol back to South Africa. Under this scenario, some production would be for local markets in the rest of SADC and some for export to South Africa.

During field research it became apparent though that another model may possibly develop, one where private sector and government interests combine to prioritise domestic markets over regional trade. From the perspective of the private sector, the decision would be made on commercial terms. It is believed that higher value would in most cases be obtained from the domestic market, and given the investment requirements, potential risk and domestic measures necessary to just meet the demands of the domestic market most national producers would opt to build a domestic supply platform and successfully supply the local market before attempting to export to the region and/or South Africa. The relevant private sector under this scenario would press for import measures to restrict competing imports of ethanol, and would push for the bulk of the domestic market to be reserved for domestic production, thereby undermining the development of a regional market. Interestingly, some respondents noted that such measures might also be necessary to prevent imports distorting or free riding on any regulated pricing mechanism. For example, if government has established a pricing mechanism for domestically produced ethanol, it will not wish to see cheaper imports turning this support into fruitless expenditure. Similarly, it will not wish to extend any related support to foreign imports, thereby essentially subsidising the imported production. This dilemma can possibly be solved through the nuanced application of 'smart tariffs' to level the playing field, and through domestic eligibility criteria for suppliers. The market in non-refining states is also complicated in that the fuel companies are the importers and would possibly put pressure on government to allow them to import biofuels from their own sources. In South Africa it can be noted that the regulations do not yet make provision for imports, except in drought years. In SACU though, import measures will not apply to Swaziland, and the National Treasury in South Africa will no doubt not wish to extend taxpayer supported measures to Swazi ethanol.

This prioritisation of the domestic market would at the same time attract the support of those within national governments who see domestic energy security as trumping export considerations. The 2012 Mid-Term Review of the SADC Renewable Energy Support Programme noted this tendency[xlvi]. As domestic ethanol production will save foreign exchange the lack of ethanol exports will not necessarily be revenue foregone. In this version of the 'domestic market' scenario it is possible that a government would impose export restrictions on ethanol, thereby undermining the development of a regional market. Under this domestic scenario, it may therefore be a number of years before any substantial regional trade would develop, and plans to harmonise regional biofuel policies would be undermined. The ISO has picked this up in its research as well, noting in a 2013 report[xlvii] that due to sustainability and costs issues it might be more prudent to start the production of ethanol at small to mid-scale, establishing domestic markets for blending ethanol with petrol, especially in countries with high oil import dependency where the benefits of such a strategy are higher.

6.4 Financing of investments

Investment financing for the establishment of ethanol production has been flagged as a potential constraint by a number of the sources referenced in this study and was noted by a few respondents as well. The cost of establishing an ethanol plant is high, and overall cost will be higher if the plant is a greenfields one and not just a converted industrial alcohol facility. The cost will be higher still if supporting greenfield sugarcane plantations must also be established. This is not a problem in South Africa, but in the broader SADC region capital markets are illiquid and the cost of borrowing is high. The design and execution of financing and capacity to attract investment are key components of such large scale agro-industrial projects, but the very nature

of the projects is complicated. It often requires the support of domestic or multilateral institutions. This constraint is further best addressed through the creation of a renewable energy development agency or similar body[xlviii]. It may be necessary for public-private partnerships to be used to overcome this constraint.

7. Conclusion and Points for Action

It is apparent that the sugarcane and sugar sector hold enormous promise for national and regional development and the development of a viable regional biofuels market. The key constraint is regulation. With this resolved, the remaining constraints can be managed. Without regulatory certainty, investment decisions will not be made, and production will not occur. What is also of key interest are the frameworks of inter-industry, public-private and national-regional cooperation developed in the regional sector. The combination of national business and government with regional structures is unprecedented in SADC and could well serve as both a model for further integration in other sectors in SADC and as a model for private-public sector collaboration.

7.1 Points for action

What's needed to make a regional market a reality?

- Regulation at national level (blending mandates, pricing arrangements)
- Investment in capital equipment for ethanol production
- Tariffs on ethanol and agreements on the specifics of trade in ethanol may need to be managed through a separate annex to the SADC Protocol on Trade to promote intra-SADC trade in SADC produced ethanol. Alternatively, the existing Annex VII dealing with sugar could be expanded to include ethanol. Similarly a specific protocol may be required under the Tripartite Free Trade Agreement. A Tripartite Free Trade Area Sugar Industries Consultative Forum has already been established by the respective industries.
- A discussion must be started between the South African government, South African producers, and regional producers to ensure that there is understanding of the merits of a regional ethanol market and the vital role that the South African market would play in this regard. Provision for such a role would need to be incorporated into any final biofuels legislation.
- A regional database of best regulatory practice should be developed in order to develop the capacity of governments to design and implement such policies. Technical assistance may be required through the establishment of dedicated programme management units within relevant government departments, together with additional support for the SADC Regional Petroleum and Gas Subcommittee and the SADC Secretariat Energy Division
- Explore the use of the Clean Development Mechanism to offset the investment required.
- New land use must be carefully allocated to ensure no negative impact on food security results.
- In terms of land ownership and community rights, communities must be incorporated into decision making and into project planning and implementation, to ensure that land ownership and livelihoods are boosted, not undermined by renewable fuel feedstock production.
- Pricing regulations should be monitored and customs cooperation boosted regionally to prevent the emergence of black and/or arbitrage markets for fuel.
- National research institutes supportive of the competitive development of the respective national industries need to be established. This need not be drain on government; in South

Africa SASRI and SMRI are funded almost entirely by the industry. Government should partner with industry to ensure domestic capacity is developed. However, in cases where the national industry is partly owned by SA multi-nationals these investors rely on SASRI and SMRI. This is not problematic as these large, very effective, well run institutes already act as de facto regional research hubs, offering a range of consulting services and membership options, thereby allowing for cost savings and preventing duplication. However, in these cases development of the national industry will still be accelerated by establishing dedicated research capacity within the relevant government department/s. This will allow for complementary, nuanced research aligned closely to national research agendas and increased awareness within government of the process and regulatory needs of the industry.

Along these lines, a number of areas for immediate action can be identified:

- Map the status of renewable fuel regulation and related production within SADC.
- Compile a summary of best practice in this regard and circulate this to relevant regional states.
- Advocate usage of multilateral carbon emission grant funding and trading schemes to offset the investment required.
- Engagement with private sector (specifically the sugar sector), SADC Secretariat and a few key SADC states to identify a small set of key common constraints and then tackle these jointly.
- Support the elimination of constraints through targeted technical support. Such technical support to be tracked and refined in successive interventions, with the twin goals of the publication of national bio-fuel strategies and regulations through the holding of related national investment workshops or conferences to facilitate the creation of such policy and subsequent investment.
- Facilitate the dissemination of information relating to the potential of renewable fuels at a local, national and regional level (for example workshops). Such workshops to also cover the distinction between sugarcane and other crops as far as food security is concerned and the nature of investment processes with attention paid to the prerequisite nature of regulation to attract investment.
- Set up renewable energy development agencies or similar bodies.
- Advocacy efforts should be focused on states where policy development has stalled.
- Within South Africa specifically, advocacy could focus on the achievement of the 2015 implementation date, and related to this, a quick finalisation of the Department of Energy's research process.
- SADC Secretariat structures that can be included in advocacy efforts include:
    - The SADC Energy Hub
    - The SADC Regional Petroleum and Gas Subcommittee
    - The SADC Secretariat Energy Division (the SADC Energy Division belongs organizationally to the Directorate of Infrastructure and Services)
    - The SADC Energy Sector Thematic Group (a partnership between SADC and International Cooperation Partners).

Provided clear and careful regulation is drafted, it should be possible for the South African government to facilitate the development of both a national and regional market. The potential socio-economic, energy and industrial benefits for the region are immense and would go a long way towards achieving the South African government's national and regional developmental objectives.

[i] Fechter W, '*Regional Bioenergy from Cane Vision'*, Tongaat-Hulett, 2010.
[ii] Conningarth Economists, '*Growing the Sugar Industry in South Africa'*, National Agricultural Marketing Council, 2013.
[iii] Ibid.
[iv] Braude W, 'Value Addition and Related Sugar Industry Products in SADC' in *South African Sugar Journal*, SADC Edition, July 2011.
[v] Braude W, 'Implementation of the Regional Strategy for Sugar' in *South African Sugar Journal*, SADC Edition, July 2010.
[vi] These guidelines are already in use in the SA industry, and together with the use of relevant sugarcane varieties, would ensure efficient water usage and conservation during production.
[vii] Ibid.
[viii] Butanol is an alcohol which has applications as a biofuel and in making paints, coatings and solvents.
[ix] Furfural is an organic compound used widely as a solvent in petroleum refining, in the production of phenolic resins and in a variety of other applications. Furfural is also a diesel substitute that can be produced from bagasse by steam distillation, water separation, and purification.
[x] '*Market Potential of Sugarcane and Beet Bio-products'*, International Sugar Organisation, London, 2009.
[xi] One litre of ethanol can replace 2 kg of charcoal.
[xii] *Ethanol Yearbook 2013*, International Sugar Organisation, London, 2013.
[xiii] Sugar is known as one of the most volatile of traded commodities.
[xiv] International Trade Administration Commission, *Report 308*, Pretoria, 2009.
[xv] *Ethanol Yearbook 2013*, International Sugar Organisation, London, 2013.
[xvi] Ibid.
[xvii] BP, Presentation to the 22nd International Sugar Organisation Seminar, London, 27 November 2013.
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[xix] Datagro, presentation to the 22nd International Sugar Organisation Seminar, London, 27 November 2013.
[xx] http://www.moneyweb.co.za/archive/illovo-sugar-aims-to-double-profits-from-sugar-pro/
[xxi] Fuel ethanol can be differentiated from industrial ethanol. Industrial ethanol, which is used as an input to a range of products, comprised less than a quarter of the total global ethanol trade in 2012.
[xxii] *Future Role of Sub-Saharan Africa in World Sugar and Sugar Crop Renewable Energy*, International Sugar Organisation, London, 2013.
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[xxxvi] Brown, R, Policy Support for Bioenergy in SADC, Presentation to the *2011 Federation of SADC Sugar Producers Conference.*
[xxxvii] *Future Role of Sub-Saharan Africa in World Sugar and Sugar Crop Renewable Energy*, International Sugar Organisation, London, 2013.
[xxxviii] Ibid.
[xxxix] European Commission, *Prospects for agricultural markets and income in the EU 2012–2023*, Brussels, 2013.
[xl] Non-EU export sugar could also be allocated for conversion into ethanol if such production were to prove more lucrative than sugar exports. Over the 2009-2011 the region's total sugar exports averaged nearly 2.2 million tons.
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[xlii] Camco Clean Energy, '*Mid-Term Review of the SADC Renewable Energy Support Programme'*, 2012.
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