

RENEWABLE ENERGY

BIOFUELS

Opportunities and Challenges for the Southern African Development Community

The use of biofuel as an alternative source of energy is increasingly being embraced globally as the world is seeking to reduce carbon emissions from fossil fuels that cause global warming. Some countries such as Brazil have already implemented successful biofuel initiatives. However, in southern Africa and elsewhere on the continent, biofuel development remains stagnant despite the potential for biofuel production in the region. This Policy Brief highlights some of the opportunities and challenges to boost biofuel development in the region to enable the provision of clean and adequate energy supplies to advance the integration and development agenda.

What are Biofuels?

The term biofuels refers to a wide range of fuels such as biodiesel and ethanol which are derived from plant and other organic matter. For example, biodiesel is obtained from organic oils, mostly vegetable or animal fats and recycled greases. Ethanol is produced from sugar-based crops such as sugar cane, sweet sorghum, and starch-based crops such as maize, cassava, or any type of grain or tuber. A distinction is made between primary and secondary biofuels. In the case of primary biofuels, organic materials are used in an unprocessed form, mostly for heating, cooking or electricity production. Secondary biofuels result from the processing of biomass and include liquid biofuels such as ethanol and biodiesel that can be used in vehicles and industrial processes.

Why Biofuels Matter for SADC

Southern Africa is experiencing unprecedented and sustained growth with a population now reaching 305 million according to the latest SADC Statistical Yearbook. However, only five percent of rural areas in the region have access to electricity; and the region falls behind other Regional Economic Communities (RECs) in Africa regarding access to electricity, with just 24 percent of citizens having access, while in

Eastern Africa and West Africa the figures stand at 36 percent and 44 percent respectively. Therefore, the region needs to invest more resources in establishing a vibrant and thriving energy sector that is able to sustain socio-economic development including the industrialization agenda.

One way of boosting energy production is to harness alternative sources of energy such as biofuels, which provide a Renewable Energy (RE) source. RE is regarded as a cleaner source of energy compared to traditional sources such as coal which are fast running out and causing environmental damage through extraction and use. The production of biofuels is a favourable option for the region for various reasons, as biofuels are produced from sustainable energy crops, which has a good agriculture potential. There is a strong incentive to expand the use and production of biofuels at a time when petroleum price increases persist and put pressure on foreign exchange resources, hampering socio-economic development in SADC.

Benefits of Harnessing Biofuels

The potential benefits of biofuels are immense. In addition to being produced from sustainable energy crops, biofuels can play a pivotal role in strengthening the region's energy security. The production of biofuels can create employment and stimulate agriculture. Some potential benefits for increased biofuels production and use in SADC include:

- Foreign currency saving through reduction in the volume of fossil fuel imports;
- Improved energy security;
- Reduced emissions of greenhouse gases that cause climate change;
- Increased use and production of clean energy;
- Improved soils as most oil-bearing crops are nitrogen-fixing plants that allow the nitrogen, phosphorus and mineral elements to return back to the ground;
- Most biofuel programmes have the potential to halt deforestation and desertification, as they can include the use of oilseed-bearing, drought-resistant trees such as jatropha and pongamia; and;

- In the event of a famine, energy crops initially identified for biofuel production can be reallocated for human consumption.

Opportunities for SADC to Harness Biofuel

SADC has great potential for biofuel feedstock production, processing and utilization. The region is hugely endowed with arable land and vast water resources including some of Africa's largest rivers such as the Congo and Zambezi. The SADC region has the necessary ingredients to farm energy crops such as maize, sugar cane and cassava which are needed to produce biofuels. In addition, the ecology of the region can accommodate energy crops, and production of such crops will not disturb food production.

With an abundance of arable land and water resources, the potential for biofuel production is vast, particularly if farmers in the region are encouraged to embrace the energy crops and grow them to produce the fuel necessary for vehicles and machines in the region, as well as kerosene for cooking and lighting. Such a development has the potential to uplift most smallholder farmers in SADC.

The drive towards biofuel production can impact on improved farming practices and avoid environmental degradation associated with modern farming if guided by a set of sustainability criteria that are sensitive to production methods and operational scale. Biofuel feedstock production can provide an additional cash crop for farmers, thus supporting a diversified cropping system. Biofuel production can increase rural incomes and if well managed can empower women through development of farming skills for biofuel feedstock. However, the ability of rural women to take advantage of these opportunities depends on an enabling legislative environment and investment in extension services and skills training.

Research has shown that the production and use of biofuels can reduce poverty and promote socio-economic development. For example, if farmers produce biofuels which are used for transport, then distribution costs will go down and there will be a guaranteed market for the products. At macro-economic level, the production of biofuel could employ millions of rural labourers, thereby boosting economic growth. Most SADC Member States can save on import costs and earn foreign exchange through

the use of biofuels, and, as the benefits are immediately re-injected into the economy, biofuels have the potential to generate a sustainable growth. The SADC energy sector will be less dependent on external vagaries and exchange rates, and will produce clean energy, contributing to a clean environment.

Challenges to Harnessing Biofuels

One of the challenges to large-scale production of biofuels is that this can threaten food security in the region, especially in cases where agricultural production may be diverted from food crops to energy crops. In that situation, food prices could rise, thus impacting on low-income earners in urban and rural areas. Growing of food crops may compete directly with energy crops in multiple ways, including competition for land, investment and water. The diversion of land from food crops to bio-fuel manufacture may have serious consequences including the environmental impact that could encourage deforestation as land is cleared to make way for production, hence the importance of ensuring sustainable production.

Another challenge is that most biofuels programmes, particularly those focusing on jatropha were based on very limited information on soil quality, weather conditions and nutrient requirements, and suffered from a lack of fuel distribution and refining capacity. As a result, several international investors in Mozambique and Zambia have since withdrawn from the market, leaving a massive gap in biodiesel production. The challenges with insect infestation, low yields and larger-than-expected water requirements have affected the jatropha industry, and efforts are now underway regionally and internationally to undertake selective breeding to produce jatropha varieties that are better suited to conditions in southern Africa.

Current Biofuel Status in SADC

SADC countries are slowly embracing the use and production of biofuels as a partial substitute for fossil fuels in the transport sector. For example, ethanol from sugar cane is produced and blended with petrol in several SADC member states that produce sugar. Biodiesel is also produced in the SADC region and is made from vegetable oils. However, the production of biofuels in the SADC region is not yet widespread, and only Malawi, South Africa and Zimbabwe are currently producing biodiesel and ethanol.





Malawi and Zimbabwe are in the process of increasing mandatory ethanol blend ratios and are exploring the possibility of operating fleet vehicles on pure ethanol going forward. In Malawi, ethanol processing facilities have been operating for more than 25 years, and Zimbabwe produced ethanol for blending in the 1980s for a period, and has now resumed.

Other countries with small sugar industries such as Angola, Mozambique, Tanzania, and Zambia are monitoring developments and considering a conversion to low blends of ethanol to offset the cost of imported fuel. In 2014, Angola launched the 32 million litre/year BioCom plant to produce ethanol exclusively for vehicle transport. The SADC region possesses great potential for ethanol production from sugar cane and other crops such as cashew nuts, manioc, maize, citrus trees and related crops.

South Africa has been involved in biofuels development and published a Biofuels Industrial Strategy in 2006, which was revised following public consultation and finalised in 2007. The purpose of the strategy was to stimulate the development of an industry for the production, refining and distribution of biofuels, aimed at achieving a two percent displacement of fossil fuels within five years. After failing to meet this target through fiscal incentives such as rebates on the fuel levy, some governments decided to make blending mandatory, commencing in late 2015. The target will be B5 for biodiesel and between E2 and E10 for ethanol in petrol.

Zambia has plans to go into biofuel production. In 2014 the Copperbelt Energy Corporation announced that it had built a biodiesel facility in Kitwe with a capacity of 1 million litres per day, which would be used entirely to supply the company's own equipment. A 2014 review of the status of the biofuels industry in southern Africa indicated that sustainable jatropha biodiesel projects can be found in Madagascar, Malawi and Mozambique.

Policy Considerations to Boost Biofuel Production

SADC Member States should consider the following policy options for production and use of biofuels in the region:

- Study the extensive global experience in all aspects of biofuels including policies, feedstock, technologies and business models;

Biofuel Lessons from Brazil

Brazil was the first country to start a major biofuel programme in the 1970s. The basis was ethanol, produced from the country's massive cane-sugar programme. Brazil has built its biofuels policy primarily on a well-established sugarcane-ethanol industry and on an emerging biodiesel sector. The government has put in place regulatory and economic incentives to stimulate those sectors, such as tax breaks, cheap credit through public banks and blending mandates to secure captive markets.

A highly concentrated ownership pattern and an imbalanced allocation of burdens and benefits mean that the sugarcane agribusiness captures all value addition while the rural poor participate only as seasonal migrants. In addition, the expansion over smallholder farms and indigenous lands has affected the social profile of the sector. To address this, Brazil has attempted to compensate for these issues through a socially oriented biodiesel programme that promotes feedstock cultivation among smallholders and the establishment of contract farming schemes with biodiesel industries.

To promote diversity and encourage parties to honour contracts, the government has mobilized rural social movements, including revising the biodiesel policy which led to the creation of a subsidiary Petrobrás Biofuels to engage with small stakeholders, distribute higher quality seeds, and give power to smallholder farmers to leverage on contracts, thereby contributing to food security. As a result, the programme has met with increasing success in terms of income generation and the number of affiliated smallholders.

- Increase awareness of the potential for the production of biofuels in the SADC region to allow countries to have all the necessary information to plan any investments in biofuel development;
- Showcase pilot projects at the earliest opportunity to demonstrate technology and the workability of the biofuel programme;
- Formulate practical and simple standards as a priority;
- Assure farmers of procurement of biofuels feedstock at a minimum support price, in case of temporary surpluses;



- Develop a regional vision and mission on biofuels, that can be harmonized to create a regional programme;
- Formulate and adopt holistic and friendly policies on biofuels, and a workable and practical strategy for implementation;
- Set up an institutional framework to promote biofuels by establishing a Biofuels Development Board or a similar autonomous organization to coordinate all aspects of biofuel programmes in the region;

Way Forward and Conclusion

Addressing the current energy situation in the SADC region will require stakeholders to support the increased use and production of

renewable energy sources such as biofuels. As indicated, the potential for biofuels production is significant in southern Africa. Therefore, there is need to strengthen policy formulation to promote biofuel production, particularly now when the global community is running short of the traditional sources of energy, as well as the persistent petroleum price increases that have stretched financial resources and hampered socio-economic development. The development and use of biofuels holds enormous potential for the SADC region and national economies. However, the potential negative economic and environmental effect should be thoroughly investigated before fully embracing biofuels.

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