

Challenges hindering development of small scale of biodiesel Production in South Africa

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Abstract— the interest in renewable resources has seen a focus on the production of biodiesel in South Africa as an alternative source of energy. While this sector show huge potential for economic growth, employment creation and the production of alternative energy, the sector is faced with many challenges. Looking at the case study of the Western Cape biodiesel plants, the paper discusses challenges faced by the few emerging biodiesel producers. The paper further highlights the positive impact of biodiesel production even at such small scale. The paper biodiesel production offers huge opportunities for the South African economy, suggesting that government should consider supporting local players in the sector to expand their businesses and to expand opportunities for economic growth.

Keywords—*Small scale biodiesel production. Renewable resources, used vegetable oil, South African economy, unemployment.*

I. INTRODUCTION

Biodiesel production could provide immense opportunities for green energy and employment creation. [1] Biodiesel has many times been mentioned as potential fuel for fighting the greenhouse emission. [2] Biofuels is promoted worldwide as environmentally friendly and renewable energy that alternatively can reduce the use of fossil fuels. Many other researches and case studies shows that biodiesel production is a good source of renewable energy and job creation in sustainable environmentally friendly ways. [3] The initiated project on biofuel industry in Eastern Cape of South Africa is expected to generate 4-5 billion in revenue annually and create 350 new permanent jobs. There are efforts to invest in biodiesel production in South Africa. Such efforts are led by small scale players, mainly white commercial farmers, who in spite of their access to capital, find it very difficult to run full-fledged production. Using the case study of the Western Cape Province, this paper biodiesel production holds great potential for the South Africa economy. This sector could support the future energy needs of South Africa, while

providing employment opportunities if government proactively engages and supports the sector in addressing the critical challenges that are currently derailing its productivity and expansion. Outside Cape Town, the Western Cape Province has the fourth highest population in South Africa and the lowest employment rate. [4] The province is sitting on 22.2% compared with the national average of 23.2% unemployment rate. As the province with business sectors that are growing fast this could also aid the biodiesel producers with the access to the market and to also help increase the employment rate. The emerging small scale biodiesel sector could immensely improve livelihoods in the province. It is currently consisting of five small biodiesel plants that have been running for more than a decade. These plants have three to four employees and produce less than 3000 litres per year. The biodiesel produced is sold to nearby farmers and companies that support the green initiative. The biodiesel is also used as fuel in their own vehicles. Most small scale producers do not have licenses as they do not meet the requirements of policies and regulations for biofuels industries. Despite the challenges of not getting adequate support from government these small holder producers show huge potential for growth and expansion. Western Cape with five small biodiesel plants that does not get much support or attention from government as all of them is using the used vegetable oil as their feedstock. Mostly government is interested in feedstock from the agricultural perspective

Small scale diesel producers recycled used vegetable oil (UVO) from local fast food outlets, restaurants and hotels into biodiesel. They operate in very small spaces, with production plants built in while others are mobile plants. There is only one plant that is running a continuous production while the rest use the batch methods. The batch method is defined [5] as a method that involves batch reactors is favoured over continuous reactors because of low acquisition cost, simple design and ease of operation.

They buy the UVO in (quantity) litres from the fast food outlets and restaurants. They are buying these litres for 6.50 each and this is due to the overseas market that they are competing with. Most of the UVO is been exported and this make it difficult for the producers of biodiesel to get the litres of UVO with lesser price that will help their plants be more profitable. The exporting of the UVO is then becoming a challenge to these plants to produce enough for their loyal customers that they have been serving for more than ten years.

II. CURRENT STATUS OF THE BIODIESEL PLANT IN THE PROVINCE

There are five small biodiesel plants that does not get much support or attention from government in the Western Cape. All of them use the used vegetable oil as their feedstock. Mostly government is interested in feedstock from the agricultural produce. [6] Crops that have been proposed to be used as the feedstock for biofuel production have been narrowed down to sugar based commodities for bio ethanol production for example sugarcane, sugar beet, sunflower, canola and soybeans for biodiesel production. [5] The South African biodiesel industry is mostly small scale using waste vegetable oil collected from food outlets as feedstock. The majority are owned by the Whites, the plants are very small just to make the own survival and could not massively create employment as they only have three or five employees.

Currently existing plants do not get government support or subsidy.[7] The eligibility for the subsidy scheme will be on a first come, first served basis subject to meeting predetermined economic development criteria in terms of reaching the market with sellable product and with reference to actual production and not mere plant capacity. Some of these plants may not be able to meet the criteria and economic development goals set for them by government looking at the lots of challenges they are faced with. The major challenges are shortages in feedstock, difficulties in registration and poor profit margins if any.

Feedstock seems to be a huge challenge as it is the major raw material for diesel production. Without it the plants cannot produce diesel. The country cannot produce enough feedstock for biofuels. [8] South Africa has more than 200 small entrepreneurs that produce biodiesel on small scale, mostly from waste vegetable oils. Major concerns for these entrepreneurs are feedstock (virgin oils are too expensive), uptake (no mandatory blending) and meeting specs required by petrochemical industries. Most of the biodiesel plants are using used vegetable oil to produce, as the only means of feed stock for majority of running biofuels industries in South Africa.

The other main challenge is that European companies are now buying the used oil with the high price which the small biodiesel plants cannot compete with. [9] The main driver for the development of a biofuels industry in South Africa is neither the economic threat of increasing oil prices nor mitigation of greenhouse gas emissions, but the need to create a link between the country's first and second economies. Existing biofuels industries to get the registration must involve the previously disadvantaged in to the business as the shareholders which many plants find it difficult to find such investors. As [10] biofuels strategy should also promote the advancement of previously disadvantaged citizens.

Government regulation impeaches on business viability, hence biodiesel production does not in its current attract private investment. Many investors are interested in businesses from which they can draw good returns. The biodiesel industries are restricted by government to only produce a certain amount of biodiesel making them not to be profitable ventures. Government regulation makes these initiatives to be financially unattractive. [11] Even though biofuels, like most renewable fuels, require incentives in order to be cost-competitive with conventional business, their upside is that such incentives also account for benefits such as jobs creation, balance of payments savings, energy supply security, and economic growth that is fairly stable.

Most of the plant owners lack the knowledge or the understanding of the government requirements, which make it difficult for them to get access to the government support, facilities and funding. [11] The government of South Africa sees biofuels as one of the vehicle to eradicate poverty, create employment and grow the economy. While this attainable because there are already many promising plants in South Africa, there are equally many challenges.

There are also many plant owners who are committed, skilled and knowledgeable on how to produce the biodiesel. If the government is to pursue the idea of biodiesel, it really has to get the people who are committed at this. As to jowl they are being able to survive despite many challenges that they can across as and a small plant and be able to survive for 8 years. This is mentions because most of the supported plants by government do not survive for longer, especially the once that starts as cooperative, it can be because of lack of passion while the biofuels industries are facing many challenges in terms of profit, feedstock and not getting much attention like other business. What is it that can be done to ensure that the small biodiesel plants benefit from government policies, legislations and strategies of the biofuels? To come with an intervention that can be used to insure a good interacts between the government and the small plants in South Africa.

The biofuels industries are also seen as a promising vehicle to can grow the economy of South Africa. [12] The developing of the biofuels is very crucial and a good requirement for market access, but the challenges are the loss of biodiversity, changing land use patterns, social economic impacts and greenhouse gas emissions, [12] in order to address the challenge the DoE in consultation with Biofuels Task Team (BTT) focused on the implementation, monitoring and refinement of the biofuels, [13]. Dispute all the challenges [8] states biofuels can make a contribution to saving, foreign exchange and development of both the biofuels production and local agriculture. It can also create employment opportunities in the rural of South Africa and biofuels could make a considerable contribution to foreign exchange savings, boosting local agriculture production and providing additional markets and revenue for farmers, help generate employment and local economic development opportunities in rural areas and assist in reducing greenhouse gas emissions and preservation of the quality of atmosphere.

Biofuels industries can be a driver of economic development, regulations and strategies drafted to regulate, monitor and implement biofuels in the country, to show the plan and a way forward of the make industries and farmers of the biofuels efficient and productive, [9] Before the release of the Strategy, commercial sugar producers and maize farmers represented the majority of the parties looking to drive the South African biofuels industry. However, two years after the release of the Strategy none of the ventures that were planned by these stakeholders have been able to take off.

[6] To become clear that governments around the world and in particular governments planning to initiate such a program should consider their strategies carefully so that, in particular in developing countries, maximum benefit can be reaped from such developments. Hence [7] despite the approval of the Biofuels Industrial Strategy no single scale biofuels industry player has emerged, as was envisaged by the Biofuels Industrial Strategy to date, this is attributed to the fact that biofuels projects are on their own not financially attractive at the prevailing feedstock and crude oil liquid fuels prices. [9] Indeed no commercial biofuel plants have been established in the country. Only biodiesel is currently being produced for the transport market, and this is from the more than 200 small---scale initiatives that use recycled vegetable oil, most of which were established long before the Strategy was released in 2007.

Most of the small biodiesel plants visited during the study feel the reason the biodiesel not being financially attractive is because of the regulations from government. Financial support to biofuel producers the [13] recommend that government intervention in the form of tax reductions and capital incentive schemes are needed as well. [13] The incentives to ensure the profitability of the biofuel enterprise should factor in the impact that crude oil price fluctuations have on profitability. The producers of biodiesel using OVU should not be restricted by regulations as they are not harmful to the world. They just needs to be educated in to how to work with the BEE strategies to make the better trade in South Africa

III. THE IMPORTANCE OF SMALL SCALE BIODIESEL PLANTS

Biodiesel production has immense potential for renewable energy production, which can be alternative source of clean energy in South Africa. It can potentially also generate a multimillion rinds economy, which together with its down chain subsidiaries could create thousands of new job available for low income earners. [14] The 2% biofuels penetration if implemented it was going to create 25000 jobs by reducing the unemployment rate mainly in the rural with 0.6% of the national unemployment rate of 23.2%. It was also going to increase the economic growth by 0.05% .The is also opportunities for communities to cooperate and collaborate in small business ventures and cooperatives.

The literature on possibilities from these sectors shows that government of South Africa strategy excludes the traditional players in the sector, those who have been using the recycle oil to produce the biodiesel. [15] Crops that have been proposed to be used as the feedstock for biofuel production have been narrowed down to sugar based commodities for bio ethanol production, such as sugarcane and sugar beet, and sunflower, canola and soybeans for biodiesel production. [5] The South African biodiesel industry is mostly small scale using waste vegetable oil collected from food outlets as feedstock. The use of both vegetable oil and the other oil could increase the raw materials available to the sector and potentially expand and increase the output.

The current level of production is too low for participants to receive a subsidy. The majority of enterprises are owned by the Whites, the plants are very small just to make the own survival and could not massive create employment, as they only employ three or five employees. [7] Eligibility for the subsidy scheme will be on a first come, first served basis subject to meeting predetermined economic development criteria in terms of reaching the market with sellable product and with reference to actual production and not mere plant capacity. These plants may not be able to meet the criteria of economic development goals set by the government, looking at lots of challenges they are faced with.

There are numerous major challenges that also the Western Cape biodiesel plants are experiencing, namely feedstock, getting registration and profit. Feedstock seems to be a huge challenge as it is the drive of the business without it the plants cannot produce the plants. [8] South Africa has more than 200 small entrepreneurs that produce biodiesel on small scale, mostly from waste vegetable oils. [8] Major concerns for these Small Biodiesel producers are feedstock as the virgin oil is too expensive and meeting specs required by petrochemical industries. And this is due to the export of the UVO.

Most of the biodiesel plants using used vegetable oil to produce, as the only means of feed stock for majority of running biofuels industries in South Africa the main challenge is that the producers states that Europe companies are now buying the used only with the high price which the small biodiesel plants cannot compete with. [9] The main driver for the development of a biofuels industry in South Africa is neither the economic threat of increasing oil prices nor mitigation of greenhouse gas emissions, but the need to create a link between the country's first and second economies. Due to the lack of information and understanding the once that falls under the first economy find it difficult to register their biodiesel industries.

For the existing biofuels industries to get the registration they must involve the previously disadvantaged in to the business as the shareholders which many plants find it difficult to find such investors. As [10] biofuels strategy should also promote the advancement of previously disadvantaged citizens. Many investors are looking in to the business where they get the good returns and it's not that possible with the biodiesel industries as they are restricted by government to only produce 3000 liters per year of biodiesel

Most of the owners of the plants lack the knowledge or the understanding of the government strategies, which make it difficult for them to get access to the government support such as facilities and funding. [11] The government of South Africa sees biofuels as one of the vehicle to eradicate poverty create employment and most importantly grow the economy. This is doable because they are many promising plant in South Africa, even though there is a challenge with the feedstock but they are also many plant owners who are really passionate. So it will not really be a problem in terms of the skills and knowledge on how to produce the biodiesel as well as to tackle that challenges faced within the biodiesels industries.

IV. RESEARCH METHODOLOGY

The data that was used in this report is the result of the visit to all plants that are situated in Western Cape as well the government department and agencies that service the biofuels industries in the region. This study was conducted through qualitative research methods. The qualitative research included community observations, interviews and literature review, the government if it is to pursue the idea of biodiesel;

it really has to get the people who are passionate at this. As small scale biodiesel industries are being able to survive for more than a decade despite many challenges the biodiesel producers came across. What is it that can be done to ensure that the small biodiesel plants benefit from government policies, legislations and strategies of the biofuels? The paper try to come with interventions that can be used to insure a good interacts between the government and the small plants in South Africa.

V. FINDINGS AND DISCUSSIONS OF BIODIESEL INDUSTRIES IN THE WESTERN CAPE

Western Cape only consists of five biodiesel plants that have been running for more than a decade. One plant has since closed down as a result of the common challenges these plants are facing. Out of all the plants visited there is a huge challenge of feedstock, profitability and lack of support from government. The business people are also struggling to comply with the DoE's regulations. The plants have been running for several years but they are still small and all the plants do not have more than five employees in their business. For businesses that have been running for this long, they should be expected to be experiencing very huge growth in terms of the size of their plants, numbers of employees, numbers of customers and profits. But these plants seem to have stagnated for several years now.

A. *feedstock as a challenge*

The other big challenge of such plants is the feedstock. All the Western Cape plants used the UVO to produce the biodiesel and other biofuels products. The managers of these plants are very worried of their markets and the future of their businesses. The used oil is tending to be more expensive for them because of some of it is exported abroad at very high prices. Such small businesses find it very difficult to compete with huge European companies to buy oil. The plant managers suggested that since the legislation is binding the importing and exporting the biodiesel, there must also be a law that is against the exporting of the used vegetable oil in South Africa. This is the only means that they used as a feedstock for their production of the biodiesel.

B. *Profitability of the biodiesel industries*

The people running the biodiesel company seem to mostly doing the business for passion. The small companies do not generate much profit from the diesel production. The industries, mainly the plants are not showing any signs of growth. Despite lack from government support, the owners said that they will continue to produce bio diesel. They just busy making a living as the plants of generate minimum income for maintaining their lives. They are very busy because of few staff the management is hands on.

C. *Balancing the first and second economy as a challenge*

Since the plants are not that profitable in the market, it is difficult to get potential business partners with all the required resources such as finance, skills and experiences. As it claims that such group are willing to invest in businesses that are fast growing and have a good return on investment. The plant managers are also not willing to take someone with no skills and experience as that is a threat to their business.

These farmers are not licensed and they blame it on government as they say the communication within the government departments are not the same. SARs and the DoE are sending conflicting messages in terms of their departmental plans and expectations on the plant owners. The plant owners say mostly they are being visited by the SARS employees to come check how much they are producing so that they pay tax, mean while they did not tell them to pay tax they must also register with the Department of Energy (DoE) for the license. This seemed to be a problem more of lack of knowledge from the plant owners. Some plant are not happy with the BEE concept, as most of the plant managers without really understanding the BBE, feel discouraged. More training and education should be provided on the issue in trying to make this group understand and work together with government. As South African are being encouraged to start business and create employment, this is one way to do that without the harm of the environment as the plants owners are using the used vegetable oil to create biodiesels and all they need is to understand the regulations and procedures

D. *Unemployed graduates*

South Africa has a big challenge in terms of youth unemployment, including amongst university graduates, which is very high (statistics). The small biodiesel plants have a potential to provide youth experience through experiential trainings in the premises, which government can then subsidize. The small biodiesel plant can register with seta, is believed that a lot can be learnt, and they can then be the potential members of the enterprise or they will earn valuable employers to employ them. There is much that these small biodiesel plants can involve in to stay in business and also contribute in the country in terms of eradicating poverty and create employment.

VI. CONCLUSION

There is a lot of potential for generating clean energy, new employment opportunities and stimulating economic development in biodiesel production. A study of the few existing enterprises however shows that there are teething challenges which require urgent government attention. Other than licensing and providing incentives for private players to participate in the sector, relevant government departments should clarify policy issues; engage all stakeholders while

leveling the field to ensure that this sector can benefit the previously disadvantaged people, women and youth.

Acknowledgment

Authors would like to acknowledge both University of Johannesburg and National Research Funds (NRF) for the financial support.

References

- [1] A. Jorgensen, P. Bikker, I.T. Hermann, (2012), Assessing the greenhouse gas emissions from poultry fat biodiesel, *Journal of Cleaner Production*, Elsevier, (24) 85-91
- [2] R. Blanchard, D. M. Richardson, P. J. O'Farrell, G. P. von Maltitz (2011), *Biofuels and biodiversity in South Africa*, *South African Journal of Science*, Scielo, (107) 5-6
- [3] The Crop Site, 2009, *South African Biofuels Annual Report*, Available in: <http://www.thecropsite.com/articles/1775/south-africa-biofuels-annual-report>
- [4] T. Funke, P.G. Strauss, F. Meyer - Agrekon, (2009), *Modelling the impacts of the industrial biofuels strategy on the South African agricultural and biofuel subsectors*, Taylor & Francis, 48(3) 223-244
- [5] C. Mbohwa, and A. Mudiwakure, (2013) *The Status Of the Used Vegetable Oil Production in South Africa*, *Proceedings of the World Congress on Engineering* London, U.K. (I) 3 – 5.
- [6] Western Cape Government, 2014 *StatsSA Confirms Western Cape Creates Most Jobs in South Africa*, Available at: <http://www.westerncape.gov.za/news/statssa-confirms-western-cape-creates-most-jobs-south-africa>
- [7] Department of Energy, DoE, (2014), *Draft Position Paper on the South African Biofuels Regulatory Framework*, Available in: http://www.energy.gov.za/files/policies/Draft_position_paper_on_the_SA_Biofuels_Reg_Frmwrk.pdf
- [8] W.H. Van Zyl, and B.A. Prior, (2009) *South African Biofuels*, IEA Taskgroup 39 Progress Report, Chair of Energy Research: Biofuels, department of Microbiology, Stellenbosch University. Andreas
- [9] T. Letete, and H. Von Blotnitz, (2012) *Biofuel Policies in South Africa: A critical analysis*, *Bioenergy for Sustainable Development In Africa*, Springer 191-199
- [10] Department of Minerals and Energy, DoME, (2006), *Draft Biofuels Industrial Strategy of the Republic of South Africa*, available in: http://www.compete-bioafrica.net/policy/Biofuels_Strategy_SA.pdf
- [11] Department of Energy, DoE, (2013), *Update on the Biofuels Industrial Strategy*, Presented by Modise, M. Chief Director of Clean Energy. Available in: http://www.irena.org/DocumentDownloads/events/2013/July/Africa%20CEC%20session%203_RSA%20Department%20of%20Energy_Modise_220613.pdf
- [12] A. Brent, (2009), *Exploring A Clean Development Mechanism Methodology for Biodiesel, Funding and Backing of the Clean Development Mechanism (CDM) of the Kyoto Protocol could help the Biofuel Industry to Reach Maturity and Form a Sustainable Part of the World Energy Landscape, An Energy Secure South Africa*, CSIR,

- [13] National Biofuels Task Team (NBTT), (2006) An Investigation into the Feasibility of Establishing a Biofuels Industry in the Republic of South Africa, prepared to assist the development of an industrial strategy, Available at: <http://www.mabelefuels.com/wp-content/uploads/2011/12/National-Biofuels-Study.pdf>
- [14] Department of Minerals and Energy, (2007) „DoME Biofuels Industrial Strategy of the Republic of South Africa, Available in: [http://www.energy.gov.za/files/esources/renewables/biofuels_indus_strat.pdf\(2\).pdf](http://www.energy.gov.za/files/esources/renewables/biofuels_indus_strat.pdf(2).pdf)
- [15] T. Funke, P.G. Strauss, F. Meyer - Agrekon, (2009), Modelling the impacts of the industrial biofuels strategy on the South African agricultural and biofuel subsectors, Taylor & Francis, 48(3) 223-244