

# *Used Vegetable Oil (UVO)*

## *As a Feedstock for Biodiesel Production in South Africa*

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**Abstract**— Although there has been much debate about biodiesel production, only now is the government showing real interest in the sector. Small scale biodiesel production has been running for more than a decade, despite all the challenges faced by biodiesel producers. The industry remains gripped by so many challenges hampering its prospects for economic development, employment creation and alternative energy production. This paper argues that there is a need for comprehensive government support, including the protection and availing of UVO to local producers if the emerging industry should sustain.

**Keywords**—Used Vegetable Oil (UVO), Cooperatives, Small Scale Biodiesel Plants

### I. INTRODUCTION

[1] states that biodiesel is one of the environmentally friendly alternative liquid biofuels that has proven itself commercially, with international standards all around the world.

Debates about the production of clean energy have seen an increased interest in the production of fuels from organic materials that produce less carbon. [2] states that biodiesel is one of the significant alternative energy sources and it becomes more and more strategic because of the critical global environmental problems. The enthusiasm to produce environmentally friendly fuels that reduces reliance on fossil energy has also seen many actors experiment with several varieties of feedstock for biodiesel production. While the government of South Africa is focusing biodiesel from feedstock such as canola, soybean and sunflower, used vegetable oil (UVO) remains the most cheaply accessible type of feedstock. As it will be argued in this paper that it can be locally obtained in huge quantities. It is used to produce diesel, can protect environment from the damaging effects of random dumping of oil, while creating new economic prospects and jobs for low income earners.

UVO is readily available in South Africa from many existing fast food chains, restaurants and hotels. These food chains produce approximately thousands of litres of used oil per day. Although some of the companies currently export the used oil to European countries, some of the oil is dumped causing serious environmental contamination. The government could ban the exportation of UVO, while at the same time open up the domestic market for used oil by directly supporting biodiesel production ventures in the country. This means UVO which was previously exported could be cheaply sold to domestic entrepreneurs. At the same time, the UVO which was being randomly dumped polluting the environment can potentially be mobilized for the purpose of domestic biodiesel production.

## II. THE IMPORTANCE OF USED VEGETABLE OIL IN BIODIESEL SOUTH AFRICA

Capital, and has its own implications on environmental damage. UVO is readily available and its use simply takes the process of recycling the available resources, thus mitigating the costs of both pollution and high capital investment requirements. All small plants in South Africa producing biodiesel are mostly using UVO. [3] stated that the South African biodiesel industry is mostly small scale using waste vegetable oil collected from food outlets as feedstock. Only one plant in South Africa uses soybeans, an agriculturally produced raw material, which takes a lot of labor and financial costs.

The main supplier of UVO is the fast food outlets and restaurants. According to [4], South Africa set with 672 outlets in 2012, which catered for the South African small biodiesel plants and UVO exports. [5] states that South Africa has more than 30 000 franchised store with fast food outlets and restaurants making the highest number of franchised units with 22% of the total franchised stores. This excludes the informal small food outlets that are operating in small towns, townships and villages. Clearly the country has a huge supply of readily available UVO.

The government target to develop the economy through biofuel industries can really benefit from the use of UVO. The usage of waste frying oils in biodiesel production also prevents the hazardous effects to the environment [2]. According to [6], South Africa has more than 200 small entrepreneurs that produce biodiesel on small scale, mostly from waste vegetable oils. [6] further states that the major concerns for these entrepreneurs are feedstock (virgin oils are too expensive). As small biodiesel plants are competing with the export market when buying the UVO at very high prices.

With the huge number of growing fast food outlets and restaurants, value chains can be one of the essential interventions to be used by the government, small biodiesel plants and fast food outlets and restaurants. The outlets will be selling their used vegetable oil at a very reasonable price.

## III. BACKGROUND OF USED VEGETABLE OIL IN SOUTH AFRICA

Biodiesel producers are grappling with the challenges of sourcing farm feed stocks to use as raw material for the production of biodiesel. [2] argues that although biodiesel cannot be economically- competitive with D-2 since it is generally produced from high quality expensive feedstock, the problem of high costs of feedstock may be alleviated by using low-cost feedstock such as waste frying oils. The White Paper on Renewable Energy states that biomass production for energy should not compete and conflict with food production [7]. This could be sustainably achieved if players in the industry, in the meantime, use UVO pending the expansion of the production of other alternative sources of feedstock.

The exportation of the readily available UVO to European markets has heightened the costs of the domestically available oil out of the affordable prices that could be paid by the small local producers. The plants that are currently producing the biodiesel in South Africa are afraid that the fast growing market of trading the UVO to the European countries will push them out of business. The government of South Africa could intervene to protect the interests of small emerging biodiesel companies by protecting them from competition with international buyers in sourcing UVO. The weak value of the South African currency renders it impossible for local biodiesel production players to compete with European buyers of UVO who use international currency. The only restaurants that are willing to sell their UVO at a cheaper cost are those

that are involved with the green initiative which focusses on promoting South African business ventures. The majority of the restaurants, hotels and fast food chains sell their UVO abroad.

There are reservations about the efficacy of using UVO in biodiesel production. The National Biofuels Task Team [8] observed that UVO has limited use in South Africa's production of biodiesel as it is mainly used as cooking oil in spite of its certain carcinogenic risks. They further say that it is often sold as new oil to the poor in the townships, at high price relative to the value of the biodiesel feedstock prices. As much as this has serious health implications to the consumers, it is only viable because of lack of incentives in the use of UVO as feedstock. The expansion of the biodiesel production would automatically open a huge domestic market and raise profits for producers of biodiesel and UVO. The [8] substantial health costs of using used cooking oil as new oil requires a value chain approach analysis to minimize harmful impacts. The collection of used cooking oil should be used for processing into biodiesel rather than to use as new oil or for animal feed.

There are many small biodiesel plants in South Africa that are using the waste vegetable oil to produce biodiesel. However the lack of clarity in the regulatory regime has hampered their growth. The regulation and protection of feedstock in the absence of proper protection mechanism for domestic industries presents a serious challenge to the growth and expansion of these industries. According to [8], internationally waste-cooking oil is generally the first and most economic source for production of biodiesel. This study argues that even in South Africa the used vegetable oil is the number one feedstock in the production of biodiesel. If the used vegetable oil is regulated, and protected from being exported as well as being resold for food it can be adequate for the small plant producers who are producing biodiesel for a living. [3] emphasizes the only feedstock being used to produce biodiesel is UVO collected from restaurants. Other than the famous restaurants, fast food outlets and hotels, other enterprise that produces UVO as a waste product including the fish and chips cooperative enterprises could reap reasonable profits as part of the value chain. Small food outlets can also sell their waste UVO to biodiesel producers as well.

#### IV. GOVERNMENT'S INITIATIVE ON COOPERATIVE ENTERPRISES

One of the government's initiatives is to promote cooperative enterprises in the communities of South Africa, especially supporting those communities that were disadvantaged by the apartheid government. Cooperatives ventures could participate in biodiesel production. Cooperatives are defined by the Department of Trade and Industry [9] as an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise. There are so many possibilities for cooperatives and involvement of the low income earners in the production of biodiesel.

The youth could also benefit from the sector through new employment opportunities and entrepreneurship. National Youth Development Agency (NYDA) could foster the creation of new jobs through supporting youth co-operative enterprises in biodiesel production. The NYDA came with an initiative to open the fish and chips outlets in the location, towns and rural areas that will be owned by the youth cooperative members. These cooperatives could sell their waste oil to producers of biodiesel thus increasing their income. As the [10] states the NYDA set aside R10 million for youth owned cooperatives during July 2013 to set up fish and chips business across the country. Where will the used oil go? This can be the first value chain that can be used to support the existing biodiesel plants. Some cooperatives can be formed to also produce the biodiesel. There are many informal fast food outlets in the townships. In addition, the fish and chips cooperative enterprises that were initiated by the Department of Trade and Industry (DTI) and NYDA could be a source of subsidized UVO for biodiesel production. This will ensure that the UVO goes directly to the South African biodiesel plants which will enhance the economic development of the country. There is a need for interaction between the government departments, the NGO and the agencies that are employed by the government to aid in developing economy to cooperate and collaborate if biofuels are to be one of the initiatives in eradicating poverty by creating employment.

#### V. USING COOPERATIVE ENTERPRISES TO UPLIFT THE EXISTING BIODIESEL PLANTS AND MERGING THE FIRST AND THE SECOND ECONOMY

Cooperative enterprises in South Africa are one of the interventions which can help in the eradication of poverty, creating employment and having a great impact on economic growth. Efforts to produce biodiesel in the Western Cape Province demonstrate great potential that can be replicated in the whole country. The province has five plants that have been running for more than 6 to 8 years. Despite all the challenges that the biodiesel plant in South Africa are facing, such plants producers persist. The plants are mostly registered as a close cooperation (cc) as they cannot afford to run as a private company. Such plants can be transformed into cooperatives members as these members have the mutual interest which is keeping their passion of producing the bio-diesel. Both the development of the cooperative enterprises as well as the biofuels industries are in the emerging stage. Since the small biodiesel plants are not profit driven, they can do well with the skills and experience to combine and come with the cooperatives.

By drawing from the two major layers of the South African economy – the first and the second economy, cooperatives would help in the sharing of resources and skills between the sectors, which stimulates further development. As most of the plants are owned by the once who were advantaged by the first economy, with the formation of cooperatives they can include some of the workers who have been with the plants from the start to form part of the members of the cooperative. There will be a need to educate the members of the cooperatives in terms of the values and principles of the cooperative enterprises and mainly the equity and equality. Biofuels are

indicated as not the financial drive but also seen as part of creating jobs and developing the economy.

To deal with transport challenges, the plants should be closer to suppliers of their feedstock given that as they expand they will need large quantities of UVO. Specific locations in South Africa can be targeted where there are many small businesses that sell fast food, but they do not have the companies which will buy their used oil. These locations can be targeted by government as one of the good value chains. So there will be a need for locations where the small fast food chains are situated to form a cooperative biodiesel plant. The biodiesel plant will then provide biodiesel to other cooperatives at the reasonable price. Also each mall in South Africa can collect and supply all their used oil to the cooperative enterprises which will be producing biodiesel.

## VI. FINDING AND DISCUSSIONS

### A. Stoppage of Producing Biodiesel

There are many white people who are still stung by the BEE, as mentioned by a white man who is also a manager of a biofuel company. The company instead of producing biodiesel, they are producing biofuel for heating. The company stopped producing biodiesel as they say it is not profitable because of the tax and road fee that has to be paid when producing more than given 3000 tax-free litres. The good part is that the company is developing their members by allowing them to practice their skills within the business. They make their employees part of the business which has helped in reducing employee related strike to zero. What is amazing about the company is that in producing biofuel for heating instead of biodiesel, they are able to create jobs, develop their employees and this is done within their own business. They employed a psychology company to train their employees and teach them how to run the business. The company also has passion for producing biodiesel and might start producing biodiesel again in the future when the biofuel regulations becomes easier on biodiesel plant and running biodiesel industry becomes profitable. It makes sense because the biodiesel plants that where visited only have two or three employees and they are not able to employ more employees. Furthermore, the tests which confirms that the biodiesel produced is of high standard and within specifications is too expensive and the biodiesel plants cannot afford to pay in order to make such tests.

### B. Issue of registration

Many plants have not registered their biofuel industries because they do not have a BEE member. It seems they do not understand why they should share their business with someone suggested by government. This is still the duty of the government to unite the two groups through providing the understanding and the benefits that come with the interventions that government are implementing. There is nothing to lose and more benefits to get from government with their supporting initiatives, however there is a huge lack of understanding of what BEE is and people are having their own perceptions, so such business entity needs to have trainings and awareness of such programmes.

The government strategy is there to help develop and tackle most challenges faced by the biofuel industries, but this strategy cannot implement and run smoothly beside the help of the community. There are two communities here, but 90% of the existing biodiesel plants are owned by the whites. They are committed for producing such product, but the question is how the amalgamation of the two economies be found; the answer is by allowing black and white people to share the membership within the biodiesel industries. The regulations are not to close down the whites business but to ensure the industries grow in a way that even the once that were previously disadvantage are able to participate in the economy

### C. Exporting of the feedstock of the small biodiesel plants

In every province, all the biodiesel producers are being threatened by one thing - feedstock. Without used vegetable oil, the small biodiesel plants would run out of business. The feedstock that they can rely on and make a living from is very scarce as much of it is exported abroad. Furthermore, the small biodiesel plant owners unfortunately cannot compete with the price as the countries that are buying this used vegetable oil use forex that has a higher market value than the rand.

The producers of biodiesel, would like to see the export of UVO from South Africa being regulated in a way that not all of UVO is exported. This is not an immediate solution to such problem, as currently they are many fast food restaurants in South Africa compared to a very few biodiesel plants. If UVO is not allowed to be exported from South Africa at all, the companies will just dump their used cooking oil everywhere and pollute the environment. The government should implement a value chain to ensure that emerging biodiesel producers can exploit all the available UVO.

## VII. RECOMMENDATION

The small plants in South Africa can really be useful to the youth that are unemployed, as government and Seta can have a

relationship with these small plants. The undergraduate as well as the postgraduate students could do their experiential learning in such plants especially those who studied something related to industries. Students can get the experience that will help them be more saleable in the competitive job market.

There should be a regulation of the export of the used cooking oil and the government must work together with the restaurants and the biodiesel plants, this will eventually help the plants to grow and more people will be able to get jobs and this will be a good initiative as government is looking at interventions that will decrease the unemployment rate. According to [11], the growers and suppliers are the major actors in the feedstock production stage.

Fuels are extremely expensive, so selling biodiesel at the reasonable price to the farmers will help their farm to be productive. Biodiesel will also help the country to reduce its dependence on imported fuels. The restaurant outlets will also be benefiting from the biodiesel industry as they can sell their UVO at a reasonable price domestically. The training institutes can be developed in the country so that all the biodiesel producers can go for the trainings where they can update with the standard quality of the biodiesel that can be sold to the consumers, and they can also learn about new creative and innovative ways of producing biodiesel.

### VIII. CONCLUSION

Feedstock is a huge challenge in the biofuels industries. The biodiesel industries in South Africa are using used vegetable oil as feedstock because of its availability. However, the export of UVO must be regulated and a good value chain must be established to ensure the smooth running and trading of both UVO and biodiesel. The owners of the plants will buy UVO at the reasonable price and without a fear of running out of feedstock if UVO is stopped from being exported. This will also help biodiesel producers to assure the customers who they are selling with the year round supply of biodiesel. In addition, the government together with other industries requiring biodiesel can buy locally made biodiesel. All the interested parties and the communities must come together to benefit from biodiesel business and help the government achieve the objective of biofuels playing a role in the economy, higher employment rate and the graduates getting the relevant experience. South Africa can really benefit from the domestic use of UVO to produce environmentally friendly transportation fuel which will help the country towards fuel independence. The future research can be focused on more technical issues to come with good engineering models to ensure that biodiesel plants sells good quality biodiesel

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