

# Sustainable Biodiesel Development Strategies in Fossil-Driven Economy of Nigeria

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**Abstract -- Nigeria's bio-fuel sector is still at the experimental and research stage, a situation where she can neither scale-up biodiesel production nor join her contemporary developing countries in proffering alternative fuel to finite fossil diesel. This paper looks at the efforts of government in biofuel development, challenges confronting its production and the strategies to salvage the coming generation from total extinction. Succinctly put, for Nigeria to attain appreciable level of sustainable energy development, it has to take pragmatic steps in identifying the significant role of energy for attaining the Millennium Development Goals.**

*Keywords: Biodiesel, Sustainable development, Renewable energy, Fossils.*

## I. INTRODUCTION

BIOFUELS are liquid transport fuels made from plants and animal residues used for car, trucks, airplanes and trains [3]. Two primary sources of biofuel are ethanol and biodiesel. Ethanol is an alcohol produced from renewable feedstock such as cassava, maize, sorghum and potatoes, while biodiesel is a non-toxic biodegradable fuel made from vegetable oils or animal fats. Specific sources of biodiesel are coconut oils, jatropha, soyabean oils, cotton seed oil, and beniseed oil. The use of biofuel reduces air toxic gas emissions radically and green house building up. In terms of biodiesel hybridization, its addition to petroleum produces lead to complete combustion thus reducing dangerous emission along with their impact on the environment.

There is a complex link between biofuel and sustainable development [2]. Sustainable development is defined as a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also in the future generations. In spite of opportunity that biofuel/biodiesel production can provide towards contributing to the Millennium Development Goal (MDGs) and preserve environment for sustainable socio-economic development, Nigeria has been experimenting with feedstocks [1] and at present, stakeholder seem not to have adopted any meaningful strategy for preparatory sustainable biofuel development [4]. This revelation is a pointer that more

efforts and strategies need be put in place for Nigeria's biofuel production to take effect.

This paper will look at the government efforts in biofuel development; highlight the obstacles/ challenges to the development of biodiesel and strategies to scale-up biodiesel production in Nigeria.

## II. GOVERNMENT EFFORTS IN BIOFUEL DEVELOPMENT

Effort by the government of Nigeria to develop biofuel industry started with the establishment of a Renewable Energy Division (RED) by Nigeria National Petroleum Commission (NNPC) in August, 2005. The framework of the Commission includes: the coordination of the country's vision for efficient production of biofuel; the integration of petroleum sector with agriculture; and the creation of rural wealth and employment through biofuel industry. Between 2005 when RED was established and 2008, very little has been achieved. A summary of these achievements include:

- Public awareness campaign especially in the cultivation of crops use for the production of biofuel. Farmers were encouraged to cultivate cassava, sugar cane, maize etc.
- Quality assurance framework was set up by Standard Organization of Nigeria (SON) for the importation and production of biofuel.
- Retail outlets were selected for effective distribution of the products.
- NNPC staffs were trained on biofuel handling techniques, especially in quality assurance.
- Facilities in the downstream sector of the petroleum industry especially in Atlas Cove and Mosimi were modified to handle biofuel products imported into the country (NNPC, 2007).

## III. EXPECTED BENEFITS OF BIODIESEL INDUSTRY TO RURAL AND URBAN COMMUNITY IN NIGERIA

There are numerous benefits to derive if biodiesel industry is properly developed in Nigeria. These benefits include:

- *Employment Stability and Wealth Creation:* Biodiesel production links with community and agricultural produce area. It also goes with greater loans and agricultural incentive from government and the private sector. With these facilities on ground, jobs would be created for citizens. The proportion of workforce in Nigeria will increase when biodiesel industry is fully integrated into the country. Hence, great wealth will be created.
- *Enhancement of market:* Biofuel industry in rural and urban areas would attract services providers; this would activate multiple effects in the moment. Business would expand and the demand for agricultural produce would improve. People would have access to varieties of goods and services.
- *Skill Acquisition and Improvement in School Enrollment:* The establishment of biodiesel industry in Nigeria would lead to skill acquisition and improvement in school enrollment. The industry would need skilled and semi-skilled worker, and this would enhance improvement in school enrollment in both rural and urban areas.
- *Investment in Transport Energy Sector:* The development of biodiesel industry would create investment in transport and energy sector. More people would be opportune to run their vehicles on bio-fuel and establishment that utilize heavy machines run by diesel would operate at a profit margin.
- *Stabilization in internal Revenue:* Inclusion of Biodiesel industry to the system would stabilize foreign exchange as the country would be in a better position to make use of domesticated produced fuel instead of depending on expertise from abroad.

#### IV. CHALLENGES TO THE PRODUCTION OF BIODIESEL IN NIGERIA

- *Land Ownership:* Biodiesel industry needs large cultivation of biodiesel crops. Hectares of land are required for this exercise. The present practice rural areas where land is communally owned with a pocket of private ownerships would pose as hindrance to large scale farming; this would in turn affect the availability of raw material for the production of biodiesel.
- *Availability of Feedstock:* The availability of feedstock and the overall energy balance for biodiesel compared with other alternative fuels are the biggest issues facing the biodiesel industry.
- *Lack of Skilled Labour:* Although there are many labour forces in Nigeria, the need for specialized workers would arise. Owing to the re-revolution technology, works to suit this technology may not readily available for the

effective running of biodiesel industry. This will hamper the country's capacity to develop, operate and maintain machinery and equipment.

- *Insufficient Funds and Expertise Knowledge:* This affects the implementation of modern biodiesel technologies in Nigeria that would be not only efficient but also cost effective (from an emission perspective) and equitable (from a social perspective).
- *Poor Linkage between Research Institutes and Manufacturing Sector:* There is a general low level of partnership between energy research institutes, University, polytechnics and the manufactory sector. Owing to this inadequacy, research finding on biodiesel technology are low.
- *Lack of Technological Base:* Technology is the bedrock of industrialization. However, there is a weak appropriate technological base in the country to fully utilize the huge biomass resource as a source of fuel. In addition, there is a lack of strategy for acquisition of advanced technology to harness the abundant natural resources in the country.
- *Low Level of Awareness of Biodiesel technology's Advances:* Biodiesel technologies have not been given adequate publicity in Nigeria among policymakers, business community and the civil society. Some have erroneously believed that biodiesel industry synonymous to existing agro industries. Some communities are already suffering pollution from agro-base industries; the fear that biodiesel industry could do the same may yet retard its development.
- *Inadequate Policy and Lack of Implementing Existing Policy:* In Nigeria, policy formulation is often left in the hands of government officials and consultants without consulting with the civil society. In other instances, policies are not given adequate publicity and thus rot away in the shelves of government officials. Such policies do not adequately reflect the needs of civil society.
- *Inadequate Access for Biodiesel-Set up:* Inadequate access by installers and end-users to funds or financial services necessary to buy, install and operate biodiesel-set up and energy efficiency systems.

#### V. STRATEGIES TO SCALE-UP BIODIESEL DEVELOPMENT

- *Amendment of land Use Act:* The land act of the country should be amended, with the aim of making land available for agricultural activities. Rural communities should be sensitised on the need to available for biodiesel crop production.
- *Training of Nigerian Personnel:* Training of Nigerian personnel on biodiesel technology is an important factor that will assist to scale-up biodiesel market in this

country. This will help to reduce the over reliance on foreign experts in the installation and maintenance of biodiesel technologies, consequently helping to reduce the cost of biodiesel services.

- *Establishment of Partnership between Research Institute and Manufacturing Sector:* Level of inter-relationship between research institute and manufacturing sector should be broadened. This will enhance actualisation of research finding into practical demonstration.
- *Development of Suitable Technology:* There is a need to embark on more research in order to build an appropriate technology for biodiesel industry that will suit our local settings. The needed technology should be simple and compatible with our local and economic conditions. In this respect, the manufacturing sector should partner with energy research institutes, Universities and the polytechnics.
- *Awareness Creation:* Lack of awareness of biodiesel technologies led to major setback to development of biodiesel production in Nigeria. Creating awareness of the technology will go a long way to help Nigerians start to integrate the technology into their practices. The media personnel if adequately trained on these issues can help to create awareness. The government should commit enough funds to train media personnel as well as to run jingles and advertorials in national dailies to project the importance and benefits of biodiesel.
- *Implementable Policy Formulation:* In Nigeria, there is a need to develop an implementable strategy, policy and investment program for a transition to the use of sustainable energy. In view of the most drastic energy needs and present capacities of the majority of their population, states in Nigeria should develop targets for improving access to modern energy services and develop national biodiesel production goal. Such a system should be anchored on the use of inedible oil, waste cooking oil. Policies have to be established so as to promote cycling and energy efficiency of waste management. Also, such policies should be driven by the state in partnership with private sector and active civil society participation. Although the government of Nigeria has formulated biofuel policies, the policies are too often consultant driven and lack inputs from the wider civil society and many policies in the past have passed their implementation life in the shelves of senior government officials. New policies should address all issues such as trade, production, consumption, investment in biodiesel fuel and end-use and demand- side energy efficiency.

- *Financial Viability:* The sustainable introduction of biodiesel/ biofuel into Nigeria must be founded on commercial viability. This implies that the users of biodiesel technologies, and the suppliers of these systems, must all see some form of financial benefits. For instances, increased access to micro-finance for lower income purchasers to help overcome the high start-up costs of plant construction and can facilitate construction of biodiesel plant in Nigeria.
- *Development of Sustainable Standards and Certification:* Sustainable standards and certification should be developed in order to ensure at least minimum improvement of biodiesel compared to fossil alternatives.

## VI. CONCLUSION

Bio-diesel production and utilization is alternative way of developing clean energy that is environment friendly. The country is endowed with great opportunities and would assist masses. It would create jobs, wealth, develop rural infrastructure and reduce poverty. There are challenges confronting its establishment in Nigeria. However, these constraints can be nipped in the buds through carefully planning and implementation strategies as recommend in this study.

## VII. REFERENCES

- [1] Aniento, U. Biofuel: How prepared is Nigeria? Sahara Reports, [www.reporters.com/article/biodiesel](http://www.reporters.com/article/biodiesel), 2010.
- [2] Dufey, A. International trade in biofuels: Good for development? And good for environment? International Institute for Environment and Development, 2007.
- [3] Schnepf, R. Agriculture based renewable energy production, *International Journal of Energy, Environment and Economics*, Vol. 13, No.3; pp.219- 242, 2007.
- [4] O.D. Samuel, O.T. Koledoye and P.T. Zubairu. Current Perspective and Future of Biodiesel Industry in Nigeria". *Proc. International Conference on Renewable and Alternative Energy*, Federal University of Technology, Owerri, Nigeria (7th-11th August, 2011), Book of Abstract p.74, 2011.



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