The Reality of Ethanol Production in Nigeria

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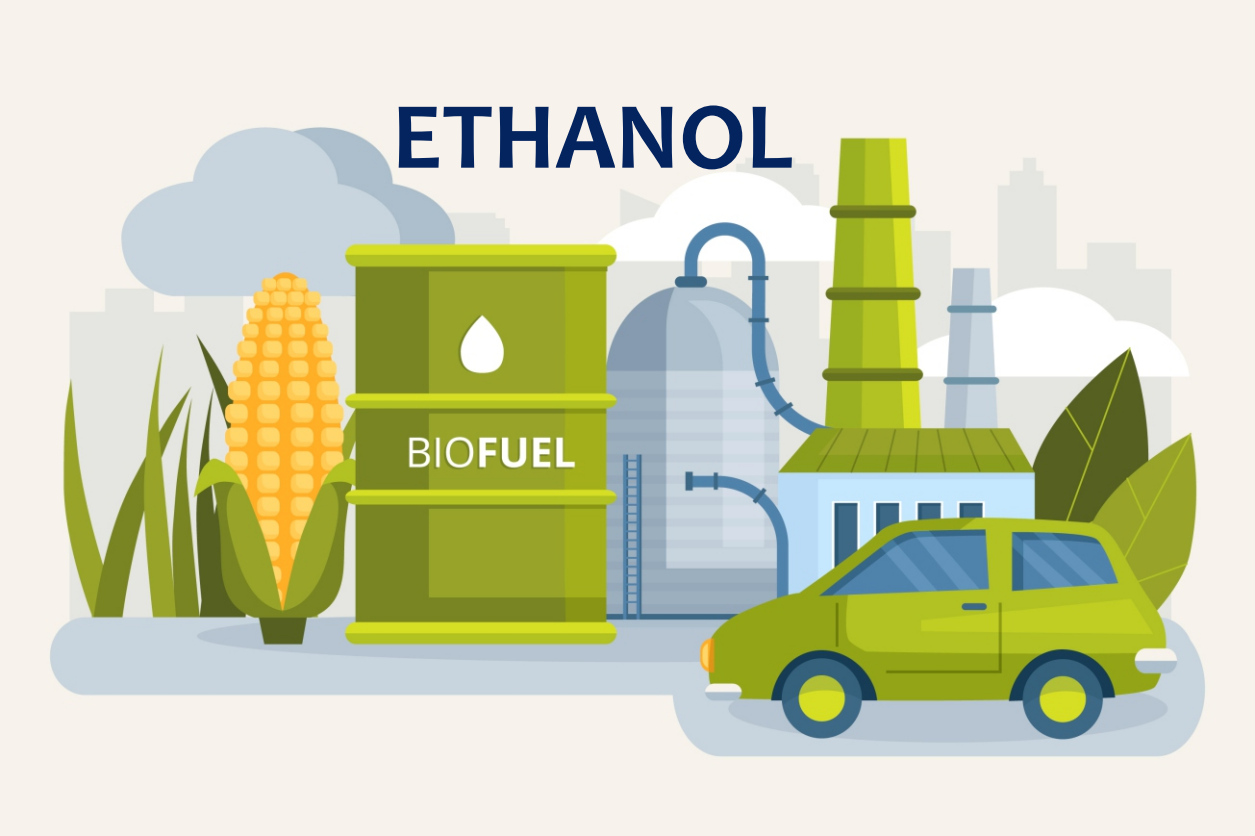
1. Introduction

Ethanol is a renewable and versatile biofuel that can be used for various purposes, such as producing industrial solvents, fuel and fuel additives beverages, disinfectants, and personal care products. Ethanol can be produced from different sources, such as sugar, molasses, grains, and second-generation feedstocks, such as cassava, corn stover, and switchgrass. Ethanol can also be used as an energy transmission fuel, which is a fuel that can store and transport energy from one place to another and convert it into useful forms, such as electricity, heat, or motion. Ethanol has some advantages over other energy transmission fuels, such as natural gas, hydrogen, and batteries, such as:

- Ethanol is renewable and sustainable, as it can be produced from various biomass sources, which are abundant and diverse, and can be replenished and regenerated.
- Ethanol is versatile and compatible, as it can be used for various applications and purposes, such as power generation, heating, and transportation, and can blend with gasoline or diesel, or be used in pure or flexible-fuel vehicles.
- Ethanol is economical and beneficial, as it can create employment, income, and wealth for the farmers, processors, traders, and consumers of ethanol and its by-products, and can reduce the import bill, increase the export revenue, and improve the balance of trade for Nigeria.

Nigeria has abundant natural resources and favorable climatic conditions for ethanol production, especially from cassava, which is one of the most widely cultivated crops in the country. However, despite the potential benefits of ethanol production for the economy, the environment, and the society, Nigeria still lags behind in the global ethanol market and relies heavily on importation to meet its domestic demand. This article will examine the current state of ethanol production in Nigeria, the role of the government and the private sector, the policy framework, the challenges and opportunities, the gender dimension, and the prospects of ethanol as an energy transmission fuel in the ethanol industry.



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2. State of Ethanol Production in Nigeria

The Nigerian ethanol market size is expected to grow during 2020-2026, owing to the increasing adoption of ethanol in various applications, coupled with changing lifestyles and preferences of the people. Nigeria is a net importer of ethanol, importing between 300 million and 350 million liters of ethanol yearly while producing only about six percent of its national need. This gap is also confirmed by the director of Allied-Atlantic Distilleries, Mr Rajavelu Rajasekar, who reports that Nigeria produces only 9 million liters of ethanol annually, while the demand is much higher. There are only two major ethanol-producing companies in Nigeria, namely Allied-Atlantic Distilleries and Unichem, both located in Ogun State, and both using cassava as their main feedstock. The ethanol produced by these companies is mainly used for industrial purposes, such as solvent, disinfectant, and personal care products, while the ethanol used for fuel and beverages is mostly imported.

2.1 Private Sector Involvement

The private sector plays a vital role in the ethanol industry in Nigeria, as the main producer, importer, and consumer of ethanol. The private sector is also involved in the research and

development, innovation, and advocacy of ethanol production and utilization. Some of the notable private sector actors in the ethanol industry include:

- Allied-Atlantic Distilleries, which is the first and largest ethanol-producing company in Nigeria, established in 2004, and producing 9 million liters of ethanol per year from cassava.
- Unichem, which is the second ethanol-producing company in Nigeria, established in 2017, and produces 6 million liters of ethanol per year from cassava.
- Nigerian Breweries, which is the largest brewer in Nigeria, and one of the major consumers of ethanol for beverage production.
- Nigerian National Petroleum Corporation Limited (NNPCL), which is the state-owned oil and gas company, is one of the major importers and distributors of ethanol for fuel and fuel additives.
- Nigerian Institute for Oil Palm Research (NIFOR), which is a research institute that researches oil palm and other crops, and has developed a technology for producing ethanol from oil palm.

2.2 Nigeria Policy on Ethanol Production

The government of Nigeria has shown some interest and commitment to promote ethanol production and utilization in the country as part of its efforts to diversify the economy, reduce dependence on fossil fuels, and mitigate the effects of climate change. Nigeria has enacted several policies that are relevant to ethanol production and utilization. However, these policies are not well implemented, coordinated, or harmonized, resulting in a lack of clarity, consistency, and effectiveness. Some of the challenges and gaps in the policy framework include:

- The National Biofuel Policy and Incentives (2007) aims to provide a framework for the development of the biofuel industry in Nigeria and to achieve a 10 percent ethanol blend in gasoline by 2020. It has not been fully operationalized, and the target of 10 percent ethanol blend in gasoline by 2020 has not been achieved.
- The Nigerian Cassava Master Plan (2013) seeks to increase cassava production and processing and create a market for cassava-based ethanol and other products. The Nigerian Sugar Master Plan (2013), on the other hand, intends to boost sugar production and processing and to produce ethanol and power from sugarcane. However, both have not been adequately funded, monitored, or evaluated, and the expected outcomes of increased cassava and sugar production and processing and ethanol and power generation have not been realized.

- The Renewable Energy Master Plan (2015) envisions increasing the share of renewable energy in the national energy mix, and supporting the development of biofuels, including ethanol. In line with this, the National Automotive Industry Development Plan (2017) encourages the use of ethanol as a fuel additive or alternative fuel for vehicles, and provides incentives for ethanol producers and consumers. Both policies have not been effectively implemented, enforced, or incentivized, and the potential of ethanol as a renewable and alternative fuel has not been fully exploited.

In general, the policy environment is not conducive for ethanol production and utilization, as there are no clear standards, regulations, or guidelines for ethanol quality, safety, and sustainability, and there are no adequate incentives, subsidies, or tariffs for ethanol producers, importers, and consumers.

2.3 Potentials

Ethanol production and utilization has immense potential to bring economic, environmental, and social benefits to Nigeria. Some of the potentials include:

-  **Economic benefits:**

  Ethanol production and utilization can create employment, income, and wealth for the farmers, processors, traders, and consumers of ethanol and its by-products. Ethanol production and utilization can also reduce the import bill, increase export revenue, and improve the balance of trade for Nigeria. Ethanol production and utilization can also stimulate the development of other sectors, such as agriculture, industry, transport, and power.

-  **Environmental benefits:**

  Ethanol production and utilization can reduce greenhouse gas emissions, air pollution, and noise pollution and improve the quality of the environment. Ethanol production and utilization can also enhance the conservation and management of natural resources, such as land, water, and biodiversity.

-  **Social benefits:**

  Ethanol production and utilization can improve the access, affordability, and availability of energy, food, and health services for people, especially the rural and poor population. Ethanol production and utilization can also promote social inclusion,

empowerment, and participation of marginalized groups, such as women, youth, and minorities.

2.4 Challenges and Solutions

Ethanol production and utilization face several challenges in Nigeria, which hinder its growth and development. Some challenges include:

-  **Technical Challenges:**

  Ethanol production and utilization require advanced technology, equipment, and infrastructure, which are lacking or inadequate in Nigeria. Ethanol production and utilization also require skilled and trained manpower, which is scarce or insufficient in Nigeria. Ethanol production and utilization also face issues of low yield, quality, and efficiency, which affect the competitiveness and profitability of the industry.

-  **Economic challenges:**

  Ethanol production and utilization are subject to market fluctuations, price volatility, and currency devaluation, which affect the cost and revenue of the industry. Ethanol production and utilization are also constrained by high production and transportation costs, low and unstable demand, and unfair competition from imported ethanol.

-  **Social challenges:**

  Ethanol production and utilization have social implications, such as land use conflicts, food security risks, and health and safety hazards, which affect the livelihoods and well-being of the people, especially the rural and poor population. Ethanol production and utilization also face social resistance, ignorance, and mistrust, which affect the acceptance and adoption of the product.

-  **Environmental challenges:**

  Ethanol production and utilization have environmental impacts, such as water consumption, soil degradation, and waste generation, which affect the sustainability and resilience of natural resources. Ethanol production and utilization also face environmental regulations, compliance, and monitoring, which affect the feasibility and viability of the industry.

To overcome these challenges and harness the opportunities of ethanol production and utilization, some of the possible solutions include:

-  **Technical solutions:**

  Producers, researchers and policymakers need to adopt and adapt appropriate technology, equipment, and infrastructure which are suitable, affordable, and accessible for the local context. Industry stakeholders also need to enhance and expand the capacity and capability of the manpower, through training, education, and extension. Ethanol production and utilization also need to improve and innovate on the yield, quality, and efficiency of the product, through research, development, and dissemination.

-  **Economic solutions:**

  Market players need to stabilize and strengthen the market conditions, price mechanisms, and currency value, which are conducive and competitive for the industry. Producers and marketers also need to reduce and optimize the production and transportation costs through economies of scale, value addition, and integration. Players also need to increase and diversify the demand and supply segments of the product, through promotion, awareness, and partnership.

-  **Social solutions:**

  Private actors and policymakers need to address and mitigate the social implications, such as land use conflicts, food security risks, and health and safety hazards, through consultation, compensation, and regulation. There is also a need to enhance and empower social benefits, such as income, employment, and energy access, through inclusion, participation, and distribution. Ethanol production and utilization also need to foster and facilitate the social acceptance and adoption of the product, through education, communication, and demonstration.

-  **Environmental solutions:**

  All players need to minimize and manage the environmental impacts, such as water consumption, soil degradation, and waste generation, through conservation, restoration, and recycling. They also need to maximize and measure the environmental benefits, such as greenhouse gas reduction, air quality improvement, and noise reduction, through assessment, verification, and certification. Finally, producers and marketers need to comply and cooperate with the environmental regulations, standards, and guidelines through enforcement, reporting, and collaboration.

2.5 Gender Inclusion

A key component of the social benefits, challenges and solutions is that of gender. Women and men have traditionally played different roles, responsibilities, opportunities, and challenges in the ethanol value chain. Women are often involved in the cultivation, harvesting, and processing of feedstocks, such as cassava and sugarcane, while men are more involved in the transportation, distribution, and consumption of ethanol and its by-products. Women also face more barriers and constraints than men in accessing and benefiting from the resources, services, and markets related to ethanol production and utilization, such as land, credit, technology, extension, and education. In addition, women have less voice and influence than men in the decision-making and policy-making processes related to ethanol production and utilization, such as planning, implementation, and evaluation.

To promote gender inclusion and equality in the ethanol industry, some of the possible actions include:

-  **Gender analysis:**

  Industry stakeholders need to conduct a gender analysis, which is a systematic examination of the different roles, needs, preferences, and impacts of women and men in the ethanol value chain and the underlying causes and consequences of the gender gaps and inequalities. A gender analysis can help to identify gender gaps, challenges, and opportunities, and to design and implement gender-responsive and gender-transformative interventions.

-  **Gender mainstreaming:**

  Gender mainstreaming is a strategy to integrate the gender perspective and the gender equality goal in all aspects of the ethanol value chain, from the policy level to the operational level. It can help to ensure that the policies, programs, projects, and activities related to ethanol production and utilization are gender-sensitive and gender-inclusive and that they address the different needs, interests, and rights of women and men, and promote their equal participation and benefit.

-  **Gender empowerment:**

  There is a need to empower women, which is a process of enhancing the capabilities, choices, and agency of women in the ethanol value chain, and enabling them to overcome the barriers and constraints that limit their potential and well-being.

Women empowerment can help to improve the access and control of women over the resources, services, and markets related to ethanol production and utilization, and to increase the voice and influence of women in the decision-making and policy-making processes related to ethanol production and utilization.

3. Conclusion

Ethanol in Nigeria is a promising and emerging industry that can offer various benefits for the economy, the environment, and the society. However, ethanol production and utilization in Nigeria is also a challenging and complex endeavour, that requires the involvement and commitment of various stakeholders, such as the government, the private sector, the civil society, and the communities. Ethanol production and utilization in Nigeria also require the consideration and integration of various elements, such as policy frameworks, the market conditions, social implications, and environmental impacts. Ethanol production and utilization in Nigeria also require the promotion and enhancement of gender inclusion and equality, as inequalities in opportunity between women and men across the ethanol value chain need to be addressed.

However, to overcome the challenges associated with ethanol production and utilization in Nigeria and harness the opportunities of ethanol as an energy transmission fuel, some of the possible solutions include adopting and adapting appropriate technology, equipment, and infrastructure, stabilizing and strengthening the market conditions, price mechanisms, and currency value, increasing and diversifying the demand and supply of ethanol, addressing and mitigating the social implications, such as land use conflicts, food security risks, and health and safety hazards, minimizing and managing the environmental impacts, such as water consumption, soil degradation, and waste generation, and implementing, coordinating, and harmonizing the policies, regulations, and guidelines related to ethanol production and utilization. By overcoming these challenges, Nigeria may take advantage of this renewable and alternative source of energy for the country, which will advance its energy transition goals for a sustainable and inclusive future for the country.