FEASIBILITY STUDY REPORT

The demand for activated charcoal has been steadily growing across various sectors due to its exceptional adsorption properties. These applications span from water filtration, air purification, gold recovery, to healthcare (such as poisoning treatments). In Nigeria, the NIFOR biomass, a by-product of oil palm processing, is abundant but underutilized. Leveraging this biomass for activated charcoal production could help reduce waste, create jobs, and provide a sustainable alternative to traditional charcoal production methods.

Raw Material Availability and Quality

The primary feedstock for activated charcoal production in this study will be the biomass from NIFOR. And other communities' Key sources of biomass include:

- **Palm Kernel Shells (PKS):** These are rich in carbon and are an excellent precursor for activated charcoal production.
- **Coconut shell:** These are typically discarded after coconut fruit has been harvested and can be a good source of carbon.

These materials are abundant in the NIFOR region and available throughout the year, which ensures a steady supply for the pilot-scale production.

Technical Process

- **Carbonization**

The first step in the production process involves carbonizing the biomass in a controlled environment at high temperatures (300°C–600°C) in the absence of oxygen. This converts the raw material into biochar, which is rich in carbon.

- **Activation**

Activation is typically performed in two stages:

- **Physical Activation:** The biochar is treated with steam at temperatures ranging from 800°C to 1000°C, which increases the surface area and enhances its adsorption properties.
- **Chemical Activation:** The biochar may also be treated with a chemical agent such as phosphoric acid or potassium hydroxide to further increase surface area and porosity.

The choice between physical or chemical activation will depend on the target product specifications and cost considerations.

Quality Control and Testing

The activated charcoal will be tested for various parameters such as:

- **Surface area:** Ideally, activated charcoal should have a surface area greater than 1000 m^2/g.
- **Iodine number:** This is a measure of the charcoal's adsorption capacity, with higher numbers indicating better adsorption properties.
- **Moisture content and ash content:** Both need to be controlled to ensure the quality of the final product.

Market Analysis

Demand for Activated Charcoal

The global market for activated charcoal is expanding rapidly due to its use in various industries. The demand is driven by:

- **Water and air purification:** Due to increasing environmental concerns and regulatory requirements.
- **Pharmaceutical and healthcare:** Activated charcoal is used in treating poisoning and in cosmetics.
- **Industrial applications:** Activated charcoal is used in gold recovery, gas purification, and other industrial applications.

Local and International Market

- **Local market (Nigeria):** The demand for activated charcoal within Nigeria, especially for water filtration and industrial uses, is high. Nigeria's water pollution levels and urbanization trends increase the demand for filtration solutions.
- **Competitive Landscape**

The local charcoal production market is primarily dominated by traditional charcoal producers using wood from unsustainable sources. The production of activated charcoal from NIFOR biomass can provide a more sustainable, eco-friendly alternative, which will appeal to both local and international markets.

Environmental Impact

The use of NIFOR biomass for activated charcoal production offers several environmental benefits:

- **Waste reduction:** It reduces the waste generated by the palm oil industry.
- **Carbon sequestration:** Biomass carbonization traps carbon, preventing it from being released into the atmosphere.
- **Sustainable charcoal production:** Unlike traditional charcoal production, which often leads to deforestation, this process utilizes waste biomass, making it more sustainable and eco-friendly.

Market Feasibility

Develop specialized grades of granular and powder forms of activated charchoal replacing imported activated charchoal with our locally producted ones from NIFOR Biomass.