GRANT PROPOSAL

PROJECT TITLE: PILOT SCALE PRODUCTION OF ACTIVATED CHARCOAL FROM NIFOR BIOMASS

Project Facilitator: Dr. (Mrs.) Ojieabu Amarachi

Co Project Facilitator: Mrs. Umweni Itohan Mercy

Location: Nigerian Institute for oil Palm Research! Benin City.

Duration: 24 months

SUMMARY

This project needs funding in order to establish a pilot - scale commercial facility for the production of high quality activated charcoal from Biomass of NIFOR mandate crops. We want to develop a cost effective method to convert NIFOR Biomass to high quality activated charcoal through Steam Activation. So far we have produced activated charcoal from Palm kernel shells and coconut shells. With the rapid industrial growth in Nigeria, there is great and increasing demand for activated charcoal in industries such water purification, food processing, mining, pharmaceuticals and environmental managements. Nigeria currently imports the majority of its activated charcoal despite the abundant availability of Biomass resources. This project aligns with Nigeria's national goal of promoting Waste-to-Wealth. Nigeria generates millions of tons agricultural waste annually, much of which is underutilized or discarded, leading to environmental pollution. This project aims to turn NIFOR Biomass into a valuable commodity through Steam Activation technology.

PROJECT OBJECTIVES

To establish a pilot scale facility for the production of steam activated charcoal technology.

To reduce Nigeria's dependence on imported activated charcoal.

To utilize NIFOR mandate crops Biomass waste (coconut shells, palm kernel shells, oil palm tree trunk, Shea tree stalk) for sustainable industrial production.

METHODOLOGY

Raw Material Procurement: collection of NIFOR mandate crops Biomass and Pretreatment of them.

Carbonization: A carbonization kiln will be constructed using steel which will have insulator to help conserve heat during carbonization of the different biomass.

Activation: A Steam Activation kiln will also be constructed using steel that will have a high temperature to develop high porosity and high surface area of the activated charcoal produced.

Product Development and Packaging: The Activated charcoal produced will be characterized that is iodine number determination, BET and Surface area, pore volume will be done. Packaging of the activated charcoal into different forms like Granular and powdered forms of 5kg, 10kg, and 25kg sterile bags, Kraft paper sacks with polyethylene liners and resealable pouches.

Despite Nigeria having access to carbon/charcoal rich agricultural by products like palm kernel, coconut shells, there is evidence of little to no local production of activated charcoal to meet the country's demand. In 2023 Nigeria imported approximately $4.81 million worth of activated charcoal.

EXPECTED OUTCOMES OF THIS PROJECT

Establishment of a profitable value chain for oil palm biomass utilization.

Skills development and technology transfer in waste -to- wealth processing.

Reduction in production cost for Nigerian industries by replacing imported charcoal with cheaper, high quality local alternatives.

4. Scientific publications, patents, and knowledge sharing on biomass based charcoal technologies.

CUSTOMERS READINESS

Industries (water treatment, mining, food and beverage, pharmaceuticals) are already familiar with activated charcoal and actively use it. Customers are actively seeking cheaper, reliable and sustainable local alternatives. This activated charcoal produced from NIFOR biomass (palm kernel and coconut shells), was exhibited and sold to participants that attended NIFOR in house review and workshop held in September 2025. Good and satisfactory reviews where got from them, after their usage of the activated charcoal.

INNOVATION STAGE

A small scale processing Steam Activation kiln and A carbonization kiln were constructed in order to improve the existing practices employed by many local people in the carbonization of different Agricultural biomass. These kilns successfully carbonized and also activated the charcoal derived from coconut shells and palm kernel shells. These were packaged in 5kg bags and resealable pouches in granular and powdered forms .with the help of this grant a steel carbonization kiln and activation can be procured, constructed or bought to scale up production of the activated charcoal.

Technology Readiness

This project technology is purely a production process which involves the conversion of NIFOR Biomass into activated charcoal. The biomass are first and foremost collected and washed, then dried in an oven or sun dried. Then 10kg of the palm kernel shells or coconut shells is put into the carbonization kiln. It is heated in a continuous process in high temperatures of over 600°C for 30mins or 90mins depending on the biomass to be carbonized. The carbonized precursor material is impregnated with activating agents and put into the steam activation kiln and heated to high temperatures for 30mins. The activated charcoal is washed severally to obtain a neutral pH after which it is dried in the oven. A sample of the activated charcoal is used to determine the iodine number using a spectrophotometer. The iodine number is the degree of porosity of the activated charcoal.

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CONCLUSION

This project, pilot scale production of activated charcoal from NIFOR Biomass using steam activation provides an opportunity for Nigeria's agro-industrial and environmental sustainability. We aim to create a viable, sustainable and commercially competitive activated charcoal industry. This will empower local farmers and communities with steady income streams from Biomass supply. It will help in price reduction in using this locally made alternative compared to the imported activated charcoal used by industries, pharmaceutical companies etc.

TEAM MEMBERS

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