

Promoting the use of Biomass Charcoal Briquettes as an Alternative Energy Source for Resettled IDPS in Borno State

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Abstract

Biomass charcoal briquettes are a sustainable, alternative energy source that can improve the livelihoods and resilience of Internally Displaced Persons (IDPs) who have been resettled in Borno State. The use of biomass charcoal briquettes can provide a reliable and affordable source of energy, reduce dependence on traditional fuels such as firewood and charcoal, and promote economic empowerment through the production and sale of briquettes. This research paper will explore the potential of biomass charcoal briquettes as an alternative energy source for IDP communities in Borno State. The research instruments that were used were questionnaires and interviews. The researcher carried out a pre-test of the questionnaire before using it in the research.

Keywords: *biomass, charcoal briquettes, alternative energy, Borno state*

Introduction

The current global economy is heavily dependent on technologies that rely on fossil fuels such as petroleum, coal, and natural gas. The use of these conventional energy sources has increased significantly over the past 25 years. While these energy sources have enabled economic growth and development, they also have major environmental and social impacts, including climate change, air pollution, and energy insecurity. Therefore, there is a need to transition to alternative, more sustainable energy sources. Renewable energy sources such as solar, wind, and biomass can help to meet the world's growing energy needs while reducing the negative impact environment.

Charcoal briquettes are a solid, compressed fuel source made from densified agricultural waste. Briquettes are a convenient and easy-to-use fuel source, offering several advantages over traditional fuels such as firewood and loose biomass. Briquettes have a higher bulk density than

loose biomass, allowing them to burn for a longer period and reducing fuel costs. In addition, briquettes burn with minimal smoke and odor, leaving less ash residue and are dust-free, making them more suitable for use in homes and businesses.

Despite the many benefits of briquettes, many rural and peri-urban communities continue to rely on traditional fuels such as firewood and crudely made charcoal. This reliance on traditional fuels has led to significant deforestation and environmental degradation. The over-exploitation of forests has led to a loss of biodiversity and increased risk of soil erosion and desertification. In addition, the use of crudely made charcoal has negative health impacts due to the emissions of harmful pollutants. By switching to briquettes, we can reduce the negative environmental and health impacts of traditional fuels while improving energy security and affordability for rural and peri-urban communities. According to recent data by (FAO) 2016, Nigeria loses approximately 350,000 hectares of forest cover each year, mostly due to deforestation caused by the use of firewood and charcoal. This loss of forest cover has significant impacts on the environment, biodiversity, and local communities who depend on the forests for their livelihoods.

Description

Research rationale

In Nigeria, the use of biomass for cooking and heating is common in both urban and rural areas, with firewood and charcoal being the main forms of biomass used. The use of biomass has several negative impacts, including deforestation, air pollution, and health risks associated with indoor air pollution. There is a need for alternative energy sources that are cleaner, more sustainable, and more affordable than biomass. One promising option is the use of briquettes made from agricultural waste, which has the potential to address these concerns. Biomass accounted for about 64% of the total primary energy supply in Nigeria in 2018 (United States Energy Information Administration, 2022). It is used by a majority of households for cooking and heating, which has significant environmental and health impacts (Adejumobi & Anyanwu, 2021).

The project will have a positive impact on the preservation of Borno State's forests and endangered biodiversity, as well as protecting the environment through reduced agro-waste in dump fills and lower emissions as compared to firewood and conventional charcoal. Additionally, relocated crisis-affected communities and other communities within the state can engage in briquette production as an income-generating activity, especially for women, youth, and people with disabilities.

Review of Related work

In Borno State, firewood is the predominant source of energy, with over 80% of households relying on it for cooking and heating. According to a study by the United Nations Development Programme (UNDP), the majority of households in rural areas (about 90%) and a significant proportion of those in urban areas (about 65%) use firewood as their main source of energy (UNDP, 2012). The over-reliance on firewood has led to the depletion of forests and other negative environmental impacts. One of the main factors that has contributed to the heavy reliance on wood

fuel in Borno State is the lack of access to alternative energy sources, such as electricity or liquefied petroleum gas (LPG). In addition, the high cost of these alternatives makes them out of reach for many people, particularly in rural areas. This has led to the overexploitation of wood resources, leading to deforestation and environmental degradation.

According to Mogen and Nielson, 1999 (briquette), defined the term briquettes as used concerning the dust, slack, and other small size waste remains of lignite, peat, coke, etc. compressed into different shapes of regular form, with or without binder. Good-quality briquettes should be hard and resistant to breakage. They must be able to withstand exposure to weather conditions and handling during use. These properties are achieved through the use of a suitable binder or through a process such as pre-heating and pressing. Asphalt and pitch are the most commonly used binders, and they produce excellent results. Briquettes made with the right binder or process will be more durable and will deliver better performance. The general conclusion is that 5-8% binder should be used to produce high-quality briquettes. In the prior art, there was a variety of compositions that were used to form articles or to retain heat during cooking (Krizan, 2009).

Naturally, the briquettes must be made of a material that can store and retain heat, as well as be strong enough to withstand high temperatures and wide temperature variations. In addition, the briquettes must be sturdy enough to withstand rough handling during their production, transportation, and use. Furthermore, they must be easily cleaned due to their exposure to grease and food substances. (Krizan *et al.*, 2009) concluded that briquettes must be designed to meet these requirements. Briquettes have several examples and these include solid type ogatan, quick grill briquettes, coal briquettes, straw or hay briquettes, peat block briquettes, biomass briquettes, and so many others (Grover and Mishra, 1996).

Uganda relies heavily on wood fuel for energy, with 80% of the country's energy needs met by wood-based fuels. In rural areas, 90% of households use wood fuel, while in urban areas, the number is 85%. This level of dependence on wood-based fuels is unsustainable and has negative consequences for both the environment and human health. The depletion of forests and the resulting indoor air pollution caused by burning biomass pose serious health risks (Forestry Department Mityana district, 2006).

Types of Briquettes

Non-carbonized briquettes (also known as biomass briquettes) are made from agricultural byproducts like maize cuttings, cotton stalk; garbage sawdust, rice, and coffee and groundnut husks. They are a potential replacement for firewood as a fuel supply. Biomass briquettes are a renewable source of energy when they are made by recycling agricultural by-products. They can be used as cheap cooking fuel in schools, hospitals, prisons, and households in most parts of Uganda. The biomass is compressed and extruded to make a log or pellet. Under pressure, the natural lignin in the agricultural by-products binds the particles together to form a solid block. Therefore the use of binders is not necessary in this process (Krizan, 2009). An advantage of

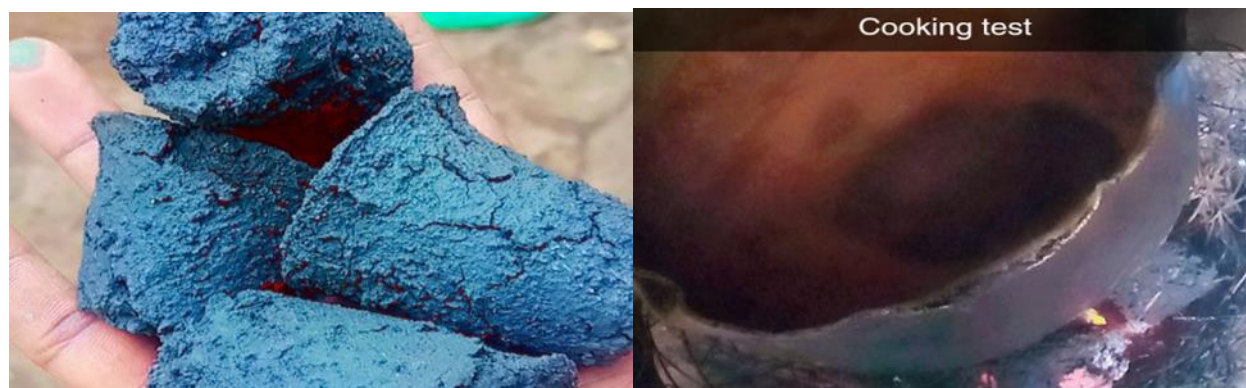
briquettes is that the burning time is longer than firewood due to the higher density. Compared to firewood or loose biomass, briquettes have about 800 to 1500 kg/m³ on average a 10 times higher density because of compression and lower moisture content than wood.

Carbonized Briquettes Carbonized briquettes are made from either charcoal dust or char (burned agricultural by-products under a limited supply of oxygen). Charcoal fines are compressed or densified to form briquettes with the help of a binder. These briquettes can be produced commercially and at a household level. Carbonized briquettes require no major behavioral change by users because they can be used in normal charcoal stoves (Paulrud and Nielson, 2001).

The necessity of using briquettes as an energy conservation technique in comparison to the use of wood fuel at the household level in Borno State

According to several studies, such as that of Mohammed, Ahmed, and Umar (2016), the use of briquettes as an energy conservation technique has several advantages over the use of wood fuel. Briquettes are more efficient and emit fewer pollutants, leading to lower levels of indoor air pollution and a reduced burden on the environment. Additionally, they are easier to transport and store and can be produced locally from waste materials, making them more sustainable than imported wood fuel. Furthermore, they can be produced at a lower cost than wood.

In terms of economic benefits, the use of briquettes has been shown to save households money on fuel costs. For example, a study by Abdullahi, Bhatia, and Semple (2019) found that households using briquettes saved an average of 18% on their fuel costs compared to those using wood fuel. This savings can be significant for households in Borno State, where many people are living in poverty. Briquettes can also help reduce the time spent gathering fuel.



The challenges that are hindering the extensive adoption of briquette usage by household levels

According to Musa Bayana, Sithole, and Chigara (2018), some of the challenges include a lack of public awareness about briquettes, limited availability of raw materials, and a lack of briquette production facilities.

Project description and projections

The briquettes will be manufactured using a proprietary process that combines various dry agricultural byproducts such as cotton stalks, sugarcane bagasse, and maize cobs. These materials will be processed in a specialized carbonizing unit to produce high-quality char/carbon, which will then be milled, sifted, blended, and molded into uniform briquettes. Finally, the briquettes will undergo a drying process to achieve the desired physical properties and enhance their commercial appeal.

The production of charcoal briquettes can help to relocate Boko Haram insurgents by providing economic opportunities and improving living conditions in affected areas. Briquette production can create jobs and provide a source of income for those who have been displaced by the insurgency. In addition, the improved cooking efficiency of briquettes can reduce the demand for firewood, which is often collected by women and children in dangerous areas, putting them at risk of violence. Improved access to cooking fuel can also reduce the health risks associated with indoor air pollution and improve quality of life.



Cost of briquettes

In theory, briquettes are cheaper to produce than traditional fuels because they can be made from agricultural by-products that are available at low cost or even for free. However, in practice, the cost of equipment and other production expenses must be considered, which may make briquette production less cost-effective on a small scale. In addition, for briquettes to be competitive with traditional fuels, their price must be low enough to attract buyers, even in areas where wood and charcoal are relatively inexpensive.

Conclusion

There is a need for greater public education and awareness about the benefits of using briquettes, as well as the proper maintenance of briquette production and briquette appliances. Government and international organizations should work together to support energy conservation and environmental protection initiatives, and to promote the use of all types of organic materials for energy production, rather than relying solely on wood fuel.

International NGOs should consider supporting energy conservation initiatives like briquette making, by providing financial assistance for such projects. Governmental subsidies for briquette users and the purchase of briquette machines would also be beneficial.

Biomass charcoal briquettes are a sustainable, alternative energy source that can be used in place of traditional fossil fuels such as kerosene and wood. They offer several advantages over conventional fuels, including improved efficiency and reduced emissions. Biomass charcoal briquettes are produced from organic waste materials, such as agricultural residues and wood chips, which makes them a renewable and environmentally friendly source of energy.

In addition, they are more affordable than conventional fuels and can be used in a variety of applications, including heating, cooking, and lighting. As a result, the overall energy input for biomass charcoal briquettes is still significantly lower than that of traditional fossil fuels such as kerosene and wood. The production process for biomass charcoal briquettes is considered to be carbon-negative, which means that it reduces the amount of carbon dioxide in the atmosphere. As a result, the use of biomass charcoal briquettes can help to offset the emissions from other sources and contribute to reducing the overall carbon footprint of a community.

Some of the challenges faced in the adoption of Briquettes as an energy option include limited awareness of the benefits of briquettes, including their lower cost and improved environmental impact; Lack of infrastructure, such as access to briquette production facilities and distribution networks; Lack of government support and regulation, which could help to promote and regulate the use of briquettes; Cultural and traditional preferences for wood fuel.

Recommendations

- Establish a system for collecting and sorting organic waste materials from households and businesses in Borno State.
- Build briquette production facilities in strategic locations around the state, with a focus on areas with high concentrations of resettled IDPs.
- Offer training and support to resettled IDPs to start and operate their briquette production businesses.
- Educate communities about the benefits of using biomass charcoal briquettes, including cost savings and environmental benefits.
- For financing, create a micro-lending program to provide low-interest loans for the purchase of briquette production equipment and the startup costs for businesses.

- For production, provide technical assistance and training on the most efficient methods of briquette production, including raw material selection, drying, and briquette pressing.
- For marketing, create a branding and marketing campaign to promote the use of biomass charcoal briquettes, emphasizing their environmental benefits and cost savings.

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