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Charcoal briquetting from Agriculture Biomass Waste

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The views expressed are those of the author and do not necessarily reflect the views of UNCTAD.



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Introduction

- Zambia's energy needs have continued to increase
- Wood and charcoal still play a major role in meeting the energy needs
- Wood fuel contributes 68% of Zambia's energy consumption ¹
- 82% of the Zambian population use biomass from wood for cooking ¹
- Charcoal production employs an estimated 40, 000 people in the sector ²
- This has contributed to the high rates of deforestation
- Deforestation contributes towards the average annual loss of over 300, 000 ha of woodland ³

1. Nzobadila G. African Energy Commission (AFREC) Paper on Energy Poverty in Africa.; 2017

2. WWF DGIS-TMF Programme. Managing the Miombo The Biggest Charcoal Consumer in Southern Africa.; 2005.

3. Merbold L, Maurice M, M MM, J SR, Waldemar Z. The Charcoal Trap : Miombo woodlands versus the energy needs of people. 2010.



Introduction

- Forests play an important ecological role and help mitigate climate change
- Effect of deforestation on the climate and eco-system can have far reaching devastating impacts on many social and economic activities



Climate change is a matter of life and death.

3 out of 4 people living in poverty rely on agriculture & natural resources to survive.



Ref: Mercy Corps



Value Addition of Cotton Waste

Zambia has 42 million ha cultivatable land and 14% is currently utilized.

The agricultural sector and agro-processing accounts for about 40% of the GDP contributes about 80% of total employment in Zambia (formal and informal). Cotton production and processing is part of this positive achievement making up about 15% of this.

In Zambia for every hectare of cotton a farmer harvests from the field, three metric tons of cotton stalks are left in the field⁴

Due to the phytosanitary regulation which requires farmers clear and burn cotton stalks, about 372,000 metric tons of cotton stalks go to waste every year country wide⁵

Cotton stalks can be used to make paper, particle board and corrugated

In this project, cotton stalks have been identified as a possible feedstock for charcoal briquettes

4 Central Institute for Research on Cotton Technology (CIRCOT) - Mumbai, India, Utilisation of Cotton by-Products for Value Added Products, 2005

5 Chitah, K, Cotton and Its by-products Sector In Zambia 2016



Aims and Objectives

The aims and objectives of this project are to

- Investigate and identify suitable feedstock
- Investigate and identify suitable binders and their effect on product quality
- Optimize the pyrolysis process by identifying suitable operating conditions
- Optimize product quality by identifying suitable blending options of biomass feedstock
- The aim is to develop an alternative fuel product that can compete with charcoal (from cut down trees) which is affordable with the goal to reduce deforestation
- **Part of 7NDP is to promote the development of renewable and alternative sources of energy such as solar, wind, biomass and nuclear as a way of diversifying the energy mix**

It is expected that small scale farmers, small and medium scale enterprises and communities across the country will benefit by supplying feedstock and participating in the production of charcoal from agriculture and forestry waste



Methodology

• Research Methodology and Key Questions

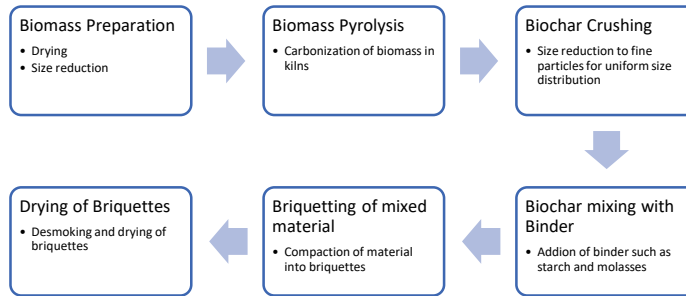


Figure 1: Biomass Briquetting Process

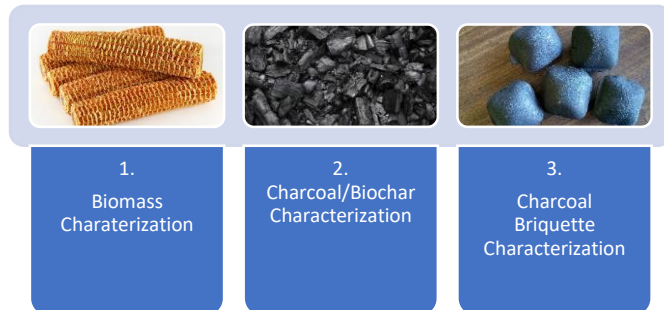


Figure 2: Biomass Characterization

1. How does blending of feedstock affect fixed carbon, volatile matter, ash content, moisture content, and the calorific value
2. Does the type and dosage of binders affect the properties of charcoal briquettes?
3. Does blending of feed material before pyrolysis and blending of feed material after pyrolysis result in different properties of charcoal briquettes
4. What is the effect of pyrolysis temperature, heating rate and residence time on blended biomass?
5. What is the effect of fixed carbon, volatile matter, ash content, moisture content and the calorific value on burning characteristics i.e. the ignition and combustion?



Research Challenges

Challenges



- Sufficient and uninterrupted supply of feedstock
- High Energy Use during briquette drying
Comparatively, charcoal briquette may be more expensive than ordinary charcoal
- Inefficient kilns for pyrolysis resulting in smoke emissions, energy loss and ash production

Proposed Interventions



- Bulk Stocking
- Involvement of farmers and SME's for supply
- Process optimization
- Sun drying during sunny times
- Process optimization
- Identification/design of efficient kilns



Thank You?

The biggest threat to African Growth is
Climate Change

Paul Polman