

Policy Brief

ISSUE 1 No.1

JUNE 2024

Climate Change Adaptation and Mitigation: Factors influencing the adoption of biomass briquettes in Tanzania

Key Messages

- Lack of awareness of climate change and biomass briquettes among people and businesses contributes to the slow adoption of biomass briquettes,
- Likewise, the quality, availability, and affordability of the biomass briquettes influence their adoption,
- The absence of biomass briquette producers' outlets and biomass briquettes in many department stores also reduces the acceptance of this type of energy source.

Introduction

The Earth's natural systems such as the atmosphere can threaten life's existence when tampered with. Since the 1800s, global temperatures have risen steadily due to natural and human-induced factors, leading to varied and changing climates worldwide. The effects of climate change, such as more frequent and intense heatwaves, melting ice and glaciers, sea-level rise, altered rainfall patterns, prolonged flooding, and droughts, are increasingly felt globally. The energy sector significantly contributes to greenhouse gas emissions, with everyday cooking practices being a major consumer of energy. The use of traditional cooking fuels like coal and wood releases GHGs into the atmosphere. Biomass briquettes present a mitigation and adaptation solution by reducing carbon emissions and replacing wood fuel and charcoal, thereby enhancing carbon sequestration by forests.



Biomass Briquettes produced from coconut shells

Despite its environmental and health benefits, biomass briquettes have seen limited adoption since their introduction in Tanzania in the 1980s. End-user acceptance plays a crucial role in the uptake of this innovation. The question remains: what factors contribute to the low adoption rate of such a beneficial innovation in the country? The purpose of this policy brief is to summarise the findings on the degree of awareness and use of biomass briquettes in Tanzania.

Methods

A quantitative approach was utilized for data collection and analysis. Data were gathered via a survey using questionnaires administered to 78 households, among which 57 have used or currently use biomass briquettes, while 21 have not. The survey also covered 44 businesses, with 31 reporting use or past use of biomass briquettes. Data sources were selected using a non-probability sampling strategy that combined purposive, convenience, and snowball techniques. These sources were located across diverse regions including Arusha, Coast (Pwani), Dar es Salaam, Iringa, Kilimanjaro, Lindi, Morogoro, Mtwara, Mwanza, Tabora, Tanga, and Mjini Magharibi (West Town). These regions were chosen for their potential in biomass briquette production and their wide geographical coverage across the country. Fieldwork took place from June to August 2022.

Results

The results comprise sample features, awareness of climate change and biomass briquettes, use of biomass briquettes, proportion of biomass briquettes in fuel use and expenditure, and their promotion.

Sample characterization

Individuals from diverse households and businesses participated in the research. Among them, women were twofold more than men as depicted in Figure 1. Half had primary education, a quarter completed secondary education, and a small percent pursued college degrees. O

One in ten held a university degree. Most households were headed by men, with an average household size of five members, ranging from one to 14 members.

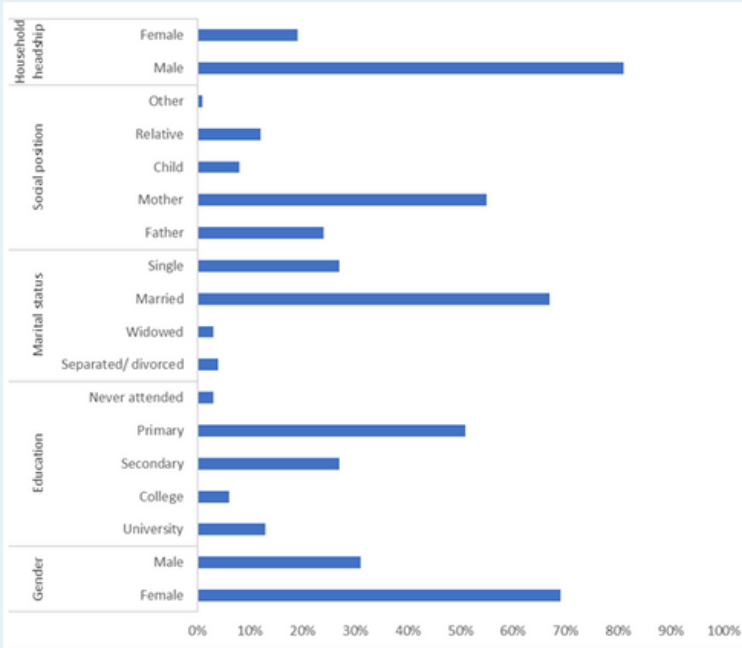


Figure 1. Demographic features of household respondents

Respondents engaged in various income-generating activities, with 64% being self-employed, 22% working for organizations, and 14% involved in farming.

Respondents from the business category worked in education institutions, prisons, hotels, care centers and food vending stores as shown in Figure 2. Street food vendors predominated, particularly those specializing in French fries, known locally as 'Vibanda vya chips.' On average, these businesses served 190 customers daily, ranging from 20 to 1,000.

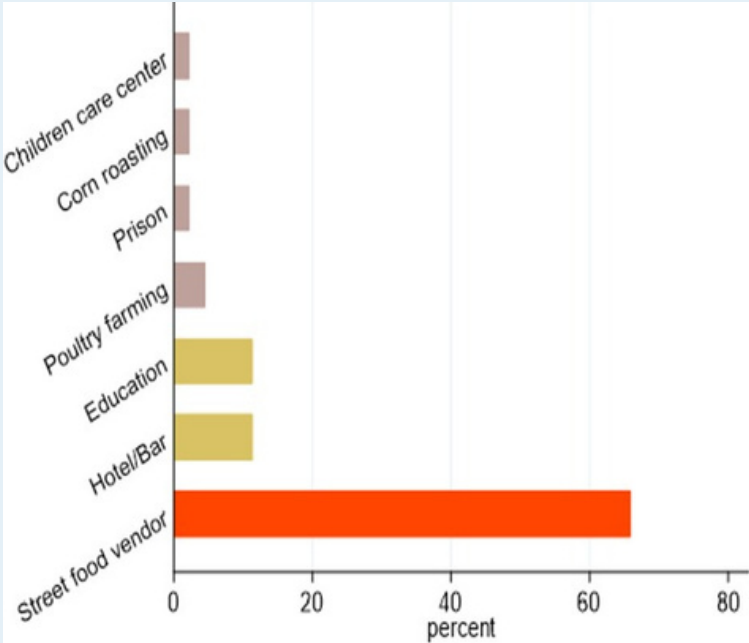


Figure 2. Type of business/Institution

Awareness of climate change

Due to the role biomass briquettes play in climate change mitigation and adaptation, understanding communities' awareness of climate change is crucial. The study revealed that a majority (54%) were unaware of the term 'climate change'. Those familiar with climate change, cited deforestation, wildfires, and CO2 emissions from vehicles and industries as its causes. Effects mentioned were prolonged droughts, severe flooding, sea level rise, and temperature increase (see Table 1). Moreover, 73% of respondents aware of climate change believed that the use of biomass briquettes mitigate deforestation and enhance carbon sequestration.

Table 1. Awareness of effects of climate change

Climate change effect	Frequency
Drought	18
Less rainfall	13
Temperature rise	11
Seasonal change	7
Weather change	6
Unpredictable rainfall pattern	4
Disease eruption	3
Desertification	2
Sea-rise	2
Unpredictable weather	2
Flooding	1
Global warming	1
Species loss	1
Poor harvest	1

Awareness and use of Biomass briquettes

Awareness of biomass briquettes is crucial for their adoption, though other factors also influence their uptake. The study found that 72% of respondents learned about biomass briquettes through various communication channels like radio and newspapers. Among these, 74% mentioned reasons such as longer burning time, cost-effectiveness, and smokelessness (see Table 2) as factors for using them. However, nearly one-third discontinued their use due to reasons like poor quality, factory closures affecting availability, high prices, or personal preference changes (see Table 3). Additionally, concerns regarding biomass briquettes included difficulty in ignition, single-use nature, unpleasant odor, and seasonal availability.

Table 2. Reasons for Using biomass briquettes

Reason	Score		
	1	2	3
It makes food taste good	-	-	2
It is less expensive than wood charcoal	4	5	24
It can be used in normal wood charcoal stove	-	1	8
It is easier to use it for cooking than wood charcoal	1	2	2
It cooks for a long time/lasts longer	1	5	37
It does not produce smoke	3	13	9
It conserves the environment/mitigates Climate Change	1	-	3
It does not produce soot	2	1	5
It is readily available/accessible	6	-	10

Table 3. Reasons for stop using biomass briquettes

Reasons	Frequency
Factory closure	11
High ash content	5
Not readily available	4
Inefficient	2
Smoky	3
High price	2
Not preferred	1

Availability of biomass briquettes

Respondents cited unavailability of biomass briquettes as one of the hindering factors for their wide adoption. The sourcing of biomass briquettes is mainly from producers to end users. The research revealed that 98% of respondents who use them reported to acquire them directly from producers, while a handful (2%) bought them from agents and distributors. Again, none of the users purchased them from the supermarkets and charcoal vendors.

Share of biomass briquettes in fuel use near production areas

The households and businesses rated their use of different types of fuel mainly wood charcoal, biomass briquettes, Liquefied Petroleum Gas (LPG) and wood fuel. The analysis showed that the use of wood charcoal was generally rated the highest, followed by biomass briquettes, Liquefied Petroleum Gas (LPG), and firewood (see Figure 3).

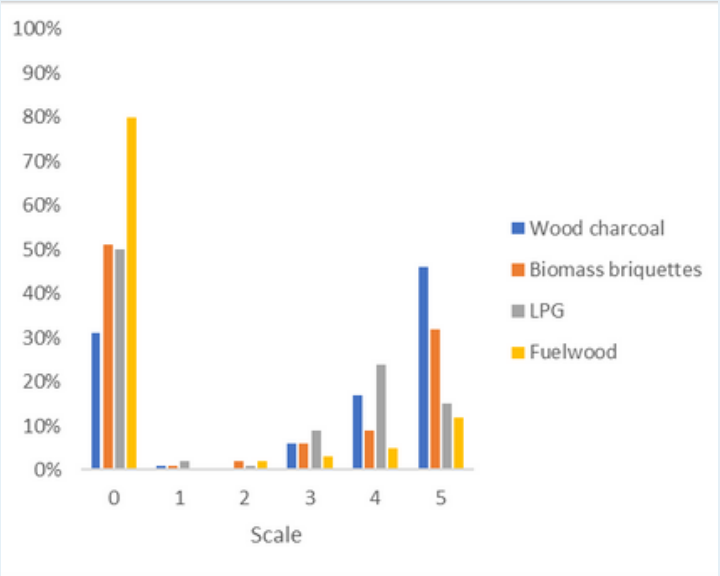


Figure 3. Rating of fuel energy use

Note. On a usage scale, five means highly used, while zero means not used at all

Fuel expenditure

Households spent an average of TZS 50,000 per month on cooking energy, with expenditures peaking at TZS 170,000. Similarly, businesses averaged TZS 150,000 monthly, ranging from TZS 15,000 to TZS 5,250,000. Wood charcoal was mentioned as the most expensive fuel energy compared to others (see Figure 4). Most of the respondents used more than one source.

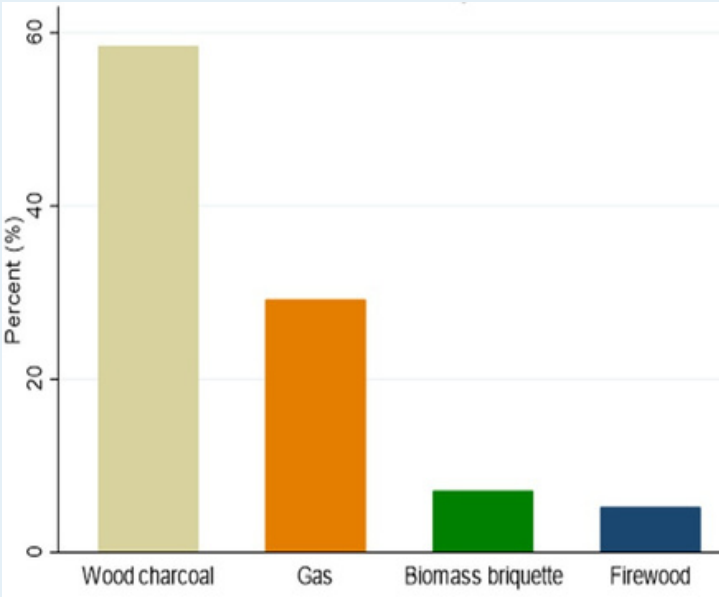


Figure 4. Comparison of fuel cost

Promotion of biomass briquettes

The majority of respondents (78%) proposed raising awareness of biomass briquettes to the community and communicating their advantages on the environment and health to increase their use. Additionally, close to two-thirds (62%) of respondents who heard about biomass briquettes through mass media such as radio and newspapers suggested the same means to promote this type of fuel energy (see Figure 5).

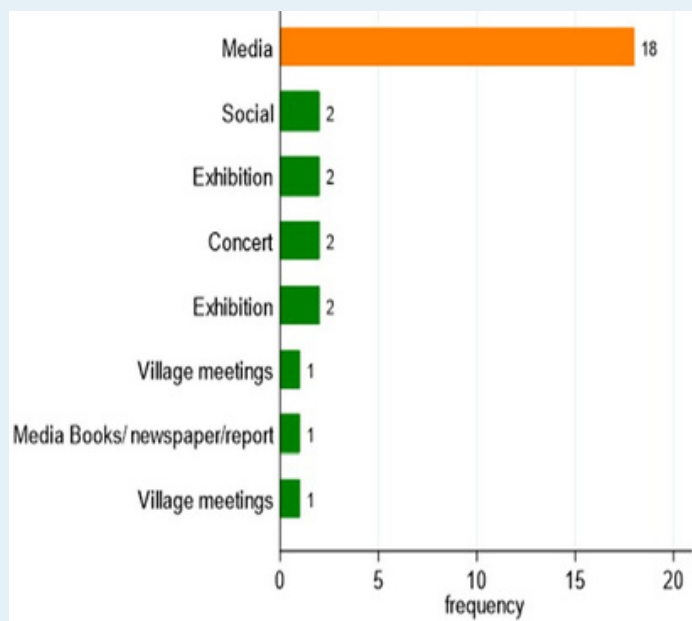


Figure 5. Means of promoting biomass briquettes use

Conclusion

The biomass briquette adoption is not as high as expected despite their benefits because of the lack of climate change and biomass briquette awareness. Additionally, their quality, affordability, and availability vary, and can mainly be sourced from producers selling such products due to lack of distribution models. However, because of the design of this research, the findings are not generalisable.

Recommendations

All stakeholders must act to promote biomass briquette adoption for environmental preservation and public health enhancement. Key actions include:

- Conducting community awareness and promotional campaigns on biomass briquettes through mass media

and other effective channels.

- Collaborating with the private sector and civil society organizations to enhance climate change awareness and boost adoption of biomass briquettes. Support
- biomass briquette producers with machinery, startup capital, and training to improve both the quality and quantity of production.

Bibliography

- Bloom, A. J. (2010). *Global climate change: Convergence of disciplines*. Sunderland, MA: Sinauer Associates, Inc.
- Burroughs, W. J. (2007). *Climate change: A multidisciplinary approach* (2nd ed.). Cambridge, United Kingdom: Cambridge University Press.
- Helm, D. (2012). *The carbon crunch: How we are getting climate change wrong and how to fix it*. London, United Kingdom: Yale University Press.
- IPCC. (2023). Summary for policymakers. In Core Writing Team, H. Lee, & J. Romero (Eds.), *Climate change 2023: Synthesis report. Contributions of Working Groups I, II, and III to the sixth assessment report of the Intergovernmental Panel on Climate Change* (pp. 1–34). Geneva, Switzerland.
- Mung'ong'o, C. G., & Mwevura, H. (2019). Climate change and socio-ecological systems' vulnerability in the coastal areas of Tanzania: A synthesis. In *Climate change and coastal resources in Tanzania: Studies on socio-ecological systems' vulnerability, resilience and governance* (pp. 205–211). Cham, Switzerland: Springer Publishing Company.
- Obasi, G. O. P. (2005). Preface. In P. S. Low (Ed.), *Climate Change and Africa* (p. xxix). New York, NY: Cambridge University Press.
- Pogue, D. (2021). *How to prepare for climate change: A practical guide to surviving the chaos*. New York, NY: Simon & Schuster.
- Shuma, R., & Madyira, D. M. (2017). Production of loose biomass briquettes from agricultural and forestry residues. *Procedia Manufacturing*, 7, 98–105. <https://doi.org/10.1016/j.promfg.2016.12.026>
- Sterling, A. Y. (2010). IPCC assessment reports: Challenges presented. In A. Marquina (Ed.), *Global warming and climate change: Prospects and policies in Asia and Europe* (pp. 14–31). New York, NY: Palgrave Macmillan.

This brief was drawn from TIRDO published report by the following authors from TIRDO and REPOA: Sikazwe, K.S; Elibariki, R; Shija, H; Masse, A.A; and Lichinga, K.N.