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Briquette making in Kenya: Nairobi and peri-urban areas

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ARTICLE INFO

Article history:

Received 27 November 2013

Received in revised form

17 July 2014

Accepted 30 July 2014

Keywords:

Briquette

Biomass

Wood fuel

Biomass waste

ABSTRACT

Briquettes made from biomass residues could contribute to ensuring the sustainable supply of biomass energy. The paper reviews the present briquette making process in Kenya especially in Nairobi and peri-urban areas. The paper introduces the energy situation in Kenya, then the briquette making process and finally presents the challenges and opportunities in briquette making. In the opportunities section, eighteen briquette producers participated in the question and answer exercise to quantitatively provide information on briquette making. Most producers use bare hands (handmade briquettes), others make use of novel-based machines such as ram-piston type, motorized screw press, shredder, wooden press and the mold-box piston type all made from locally available materials. The mixing ratios and the various ingredients used in briquette making are haphazard with no standard ratio and specific mixture for optimum briquette production. Despite these, most briquette producers are well along in the briquette business. At the same time, the end-use consumers are very positive in using the briquette fuel as an alternative fuel. Some of the end-use consumers are the schools, churches, hotels and some households. This study indicates that the opportunities for briquette making are immense and could help curb deforestation thereby reduce environmental degradation.

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1. Introduction

1.1. Geography and other information in Kenya

Kenya lies across the equator located on the coast of the Indian Ocean covering an area of about 582,650 km² [1]. According to the recent census [2], there are 39.5 million people in Kenya.

The country has a tropical climate with different topographical regions experiencing different climates: the coastal region is hot and humid; the northern part is dry while the inland is temperate. Sunshine is experienced throughout the year with alternating cool conditions at night and early morning. Nairobi, the capital city of Kenya, has an altitude of 1661 m with temperatures ranging from 13.60 °C to 25.20 °C. Normally, the months of February to March are the hottest while July to August are the coldest [3].

1.2. Energy in Kenya

Wood fuel accounts for the largest proportion as a primary fuel in Kenya. In aggregate, wood fuel accounts for 70%, petroleum (21%) and electricity (9%) [4]. These fuels are mainly used to generate electricity, power household appliances, cooking, lighting and greenhouses [2].

Wood fuel demand is increasing with the rise in population. This situation is worsening as more people move into urban areas and more industries are established. All these need more energy. According to the Ministry of Energy (Kenya) [5], the demand for wood fuel is projected to rise to about 54 million tonnes per year by the year 2020. Table 1 shows the projected wood fuel demand up to the year 2020. The average growth in wood fuel demands is about 4.7 million tonnes per year (a linear increase of 2.7%) while the sustainable supply increases by only about 0.6% per year. The average annual increment method is used to determine the sustainable supply (tonnes per year). Fig. 1 illustrates that wood fuel demand would be higher than total average increment by about 34 million tonnes per year (deficit tonnes per year) by the year 2020.

Wood fuel is unsustainable as shown by the deficit tonnes per year together with the information that Kenya's forest cover is about 6% of total land cover [6]. Both wood fuel and wood charcoal usage are increasing on a large scale [7]. According to a survey [8], 1.6 million tonnes per year of charcoal are produced in Kenya. This value is increasing at an alarming rate and effective regulation of the charcoal industry by the government remains a key challenge. Charcoal produced is harvested from the following lands: government land (13%), individual and family land (44%), business or land owned by corporate bodies (38%) and communal land (5%) [8].

Moreover, the government of Kenya estimates that 700 tonnes of charcoal per day (about 16% of the total amount of charcoal made in Kenya) are consumed in Nairobi. 10% of the 700 tonnes per day forms charcoal dust which either clogs waterways or is dumped at the dumpsites. In Uthiru (Nairobi), a charcoal business is not uncommon, as shown in Fig. 2, indicating that most of the forest cover is cleared and destroyed for charcoal production [9].

The above findings concur with studies [10,11] that the demand for biomass energy is directly proportional to the increasing population in most sub-Saharan African countries. This has however necessitated search for alternative energy sources to overcome the anticipated deficit and ensure sustainable energy supply and security.

This paper considers the use of biomass wastes/residues to make briquettes. Historically, particularly in the industrialized world, briquette production was mainly for economic benefit such as converting the unused biomass wastes into marketable fuel that could be transported over long distances. Consequently, developing countries such as Zimbabwe, Mozambique and Romania [12–14] respectively, have carried out evaluations to ascertain potential of biomass wastes/residues. These evaluations are a follow-up to the finding that the global potential of sustainably harvested agricultural and forest residues could be converted into nearly 50 EJ of energy per year

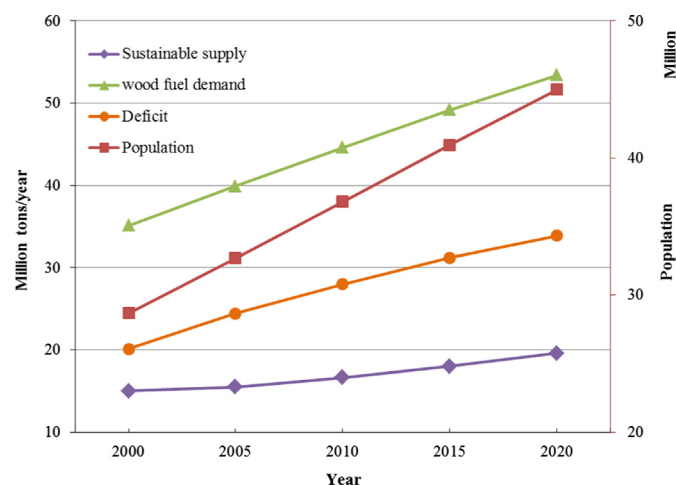


Fig. 1. Graphical representation of wood fuel demand and supply as depicted in Table 1.



Fig. 2. A charcoal open-air market in Uthiru, Nairobi. Every drum famously known as 'debe' sells @ 0.625\$. American dollars, where 1\$ = 80 Kenya shillings.

Table 1
Wood fuel demand and supply by the year 2020 in Kenya.
Source: [5].

Years	Yr.2000	Yr.2005	Yr.2010	Yr.2015	Yr.2020
Population	28,686,607	32,694,444	36,810,671	40,941,673	44,981,767
Demand (tonnes/yr)	35,119,615	39,896,632	44,599,347	49,164,960	53,416,327
Sustainable supply (tonnes/yr)	15,024,510	15,488,936	16,634,550	17,984,406	19,559,738
Deficit (tonnes/yr)	(20,095,105)	(24,407,696)	(27,964,797)	(31,180,555)	(33,856,589)
Deficit (%)	−57.2	−61.2	−62.7	−63.4	−63.4
Deficit (tonnes/person)	−0.701	−0.747	−0.760	−0.762	−0.753

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