

Turning the wheels of rural life

Kenya needs a sustainable wood fuel supply to meet the cooking, lighting and industrial needs of the majority

By Joseph Githiomi

Wood fuel is the major form of biomass energy in Kenya, contributing 70 per cent of the national energy demand, while over 93 per cent of rural households rely on it for cooking and heating. Wood fuel is also an important energy source for small-scale rural industries such as tobacco-curing, tea-drying, brick-making, fish-smoking and bakeries. Wood fuel's use relates to public sector interests such as environment, public health, rural development, employment and even foreign exchange.

Wood energy consumption in Kenya

Firewood is mainly used for cooking, water and house heating, lighting and other home needs. Households are the most important category in wood energy consumption with an estimated consumption of 6.5 tonnes per household per year (Mugo, 2001). The second highest group of consumers are cottage industries. Other consumers include small restaurants/hotels, kiosks and learning institutions.

In view of the importance of cottage industries in wealth creation for rural populations, their energy requirements need specific attention to ensure sustainability. On average, most cottage industries spend between 20 – 30 per cent of their total operation costs on energy, which is mainly from wood (MoE, 2002).

Tea industries are some of the most important fuel wood consumers in rural areas. There are over 50 small-scale tea factories run by the Kenya Tea Development Agency (KTDA), spread in 18 districts. Over 70 per cent of these factories have boilers that can use both furnace



Sale of charcoal and firewood along Garissa Rd, Mwingi district – an example of unsustainable wood fuel supply. However, this remains a lifeline for ASAL residents in times of drought. (Photo: BGF)

oil and firewood. Currently, in an effort to reduce costs in tea production, most of these factories use wood-fired steam boilers to generate heat. On average, the tea factories realise a saving of up to 60 per cent when they use wood, compared to using furnace oil.

Other small-scale rural industries like tobacco-curing, firing of lime and brick-making also consume substantial amounts of fuel wood. Table 1 below indicates the national energy consumption where about 31 million tonnes of wood were used for firewood and as raw material for charcoal in 2002. This figure is expected to be higher today due to population increase. The consumption of charcoal and other cleaner fuels like kerosene, LPG and electricity are relatively higher in urban households compared to rural households.

Supply/demand balance

Energy analysis and forecasting are essential activities in energy planning. They involve analysis and evaluation of data to assess the present and future energy situations. This is used in developing energy plans that provide a basis for formulating energy policies. Past wood energy studies in Kenya have shown that the country is not able to match demand and supply, leading to a deficit in wood energy (Barnes, 1984; KFMP, 1994; MoE, 2002).

Table 2 outlines the major changes in biomass consumption, supply and deficit/balances for the years 2000 to 2020 as far as households and cottage industries are concerned. The sustainable supply is computed using average annual increment. If the total annual wood fuel consumption is higher than the total average

Table 1: Annual Consumption of various energy types (year 2000)

Fuels category	Firewood (tonnes/yr)	Wood for charcoal (tonnes/yr)	Wood wastes (tonnes/yr)	Farm residues (tonnes/yr)	Kerosene (litres/yr)	LPG (kg/yr)	Electricity (Kwh/yr)
Rural household	14,065,004	7,624,935	136,459	2,649,981	172,761,463	1,406,270	93,376,810
Urban household	358,709	6,020,663	83,863	12,832	150,707,171	16,883,884	723,013,990
Cottage Industries	467,145	2,860,900	-	-	2,142,950	7,021,875	353,558,397
Total	14,890,858	16,506,498	220,321	2,662,813	325,611,584	25,312,028	1,169,949,197

Source: MOE, 2002 report

annual increment, then there is a deficit as observed.

A major observation in Table 2 is that the biomass deficit will increase to 33.9 million tonnes in 2020 if no significant policy measures are taken. This is due to an increase of a population that relies largely on firewood and charcoal. The continuation of unsustainable wood fuel production will lead to losses in environmental services offered by forests, besides leading to severe soil erosion and land degradation. However, the deficit in national supply/demand balance can be reduced to surplus through wood fuel policy intervention strategies aimed at improving management and conversion efficiencies as discussed below.

Strategies for sustainable wood energy production

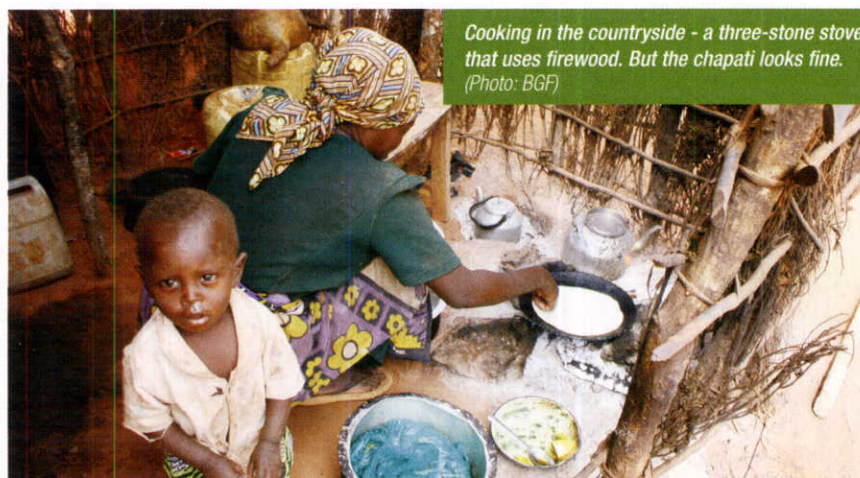
1) Allocation of gazetted plantation areas for fuel wood production

The Kenya Forest Service (KFS) should develop plantations for wood fuel as a national priority along the same lines used for timber production. The firewood plantations should be established with appropriate fast-growing tree species that match specific environmental and ecological conditions for maximum productivity. Other available land for fuel wood plantations can be leased within the municipalities (peri-urban plantations), trust lands, rangelands and community land areas.

2) Woodlot development/increase of tree planting in farmlands

This strategy considers integrating wood fuel into local farming systems since the agricultural sector has a key role to play in supplementing wood fuel through wood production. Fuel wood can be commercialised through development of woodlots in private farms where land is idle and/or unsustainable for agriculture.

This effort is supported by government policy which intends to increase the forest cover to 10 per cent by 2030 (Republic of



Cooking in the countryside - a three-stone stove that uses firewood. But the chapati looks fine. (Photo: BGF)

Kenya, 2007) and the legal notice No 166 of November 2009 of the Agricultural Act which requires farmers to maintain 10 per cent of tree cover in agricultural holdings.

This intervention strategy is supply oriented as it aims to increase wood fuel supply from farmlands.

Out-grower tree schemes are other possible options that can be used to increase the tree area cover in farmlands where tea factories and other service industries can develop contractual partnerships between the land owners and the tea factories/service institutions.

The scheme can be arranged such that the growers are provided with technical advice on forestry practices and planting material, which are essential to the success of out-grower schemes.

Following a contractual agreement, a clear management plan is essential to ensure effective implementation aimed at achieving the target for long-term viability. This will ensure a guaranteed market for farmers and a stable source of wood fuel for tea factories and service institutions.

3) Efficient management of rangelands

A strategy for efficient management of rangelands through enrichment planting

and controlled harvesting for charcoal, can improve charcoal supply greatly, especially since most charcoal in Kenya comes from the rangelands. Currently, rangeland resources are utilised unsustainably but this can be improved through application of the recently introduced charcoal rules.

4) Increase the adoption of efficient technology devices

This strategy aims at increasing adoption of improved charcoal kilns with efficiency of over 25 per cent, to replace traditional charcoal earth kilns whose efficiency is as low as 10 per cent. The technologies to be used should be simple, inexpensive and easily adopted by charcoal producers. Such technologies include the use of the Casamance kiln as well as the improved earth kiln developed by KEFRI. This would lead to a significant reduction of wood needed for charcoal making.

The conservation of wood energy should be given priority through promotion of improved, high efficiency stoves. The majority of rural households use three-stone *jikos* (stoves), which are very inefficient. The improved stoves to be promoted for adoption should consider users needs that include cooking comfort, convenience, health, safety and affordability.

Table 2: Projections of biomass consumption/supply

Years	2000	2005	2010	2015	2020
Population	28,686,607	32,694,444	36,810,671	40,941,673	44,981,767
Consumption (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

Source: MOE, 2002 report

5) Increase use of alternative sources of energy

This strategy assumes that with the government policy of promoting cleaner energy use and rural electrification, households will slowly switch from wood fuels to alternative cleaner fuels like liquefied petroleum gas (LPG), kerosene and electricity. This would reduce pressure on wood fuel for domestic use, leading to a decrease in demand.

The use of alternative energy is supported by the energy policy of 2004, which promotes the use of cleaner fuels like LPG through subsidies (MoE, 2004). As an example, the government removed value added tax (VAT) on LPG and kerosene in the last budget to encourage their use. The government has also enforced harmonisation of different types of LPG regulators, which previously reduced competition by restricting a customer to using one brand of LPG.

While the use of alternative fuels sounds fairly realistic, it is likely to be faced with difficulties due to the ever rising prices of LPG, kerosene and electricity. Other constraints that hinder their wider use include supply distribution, high initial cost of installation and appliances, among others. For an effective wood fuels substitution, subsidies are recommended for initial procurement of the appliances.

6) Use of alternative biomass energy technologies

Other forms of biomass energy include gasification, which is thermal treatment of solid fuel into gaseous form while retaining most of the energy in the original fuel. Biodiesel is also another type of biomass energy from tree seed oils like *Croton megalocarpus* and *Jatropha curcas*, among others. Biomass energy can also be generated from wood wastes like briquettes made from sawdust or charcoal dust, which can be an alternative to charcoal from wood. These biomass energy sources are gaining recognition in Kenya and their potential needs to be explored.

7) Strengthen wood energy institutional framework

Wood energy systems have multi-disciplinary characteristics, with many stakeholders strongly integrated between the socio-economic layers of rural areas, all requiring technical agencies from the forestry, agriculture and industry sectors. Therefore, wood energy development strategies should be pursued as a common task by all the relevant sectors. The coordination and linkages among the sectors concerned has been weak and needs to be strengthened.

8) Enabling wood energy policy and planning

Wood fuel production strategies should be

developed with the prime objective of making each district self-sufficient. Decentralised area-based wood energy planning is the most suitable in Kenya as the wood energy situation and problems are site-specific and vary from region to region.

Therefore, the implementation strategies in the decentralised wood energy plan should be site-specific, depending on the prevailing problems. The wood energy plans should be integrated with other decentralised planning activities at district development committees (DDCs).

There is need for clear charcoal policy guidelines which would encourage investments on improved charcoal processing technologies. Charcoal production should be like any other cash crop farming and it should be taxed and reflected as a potential revenue earner for government. The 2009 charcoal regulations, which are meant

to establish sustainable charcoal production, transportation and marketing, need to be put into operation.

9) Improvement of wood energy database

To improve the availability of wood energy within the country, wood energy databases should be established at regional and national levels. These can be achieved through establishing regular field surveys for wood energy, supply, demand and data analyses to monitor the changes over time.

Regular surveys need to be undertaken in the future, preferably at five-year intervals, to enable updating the data for future wood energy plans and policy formulations.

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