

Brewing rural beer should be a hotter Issue

Dr. Mike McCall, Social Science Division, ITC, PO Box 6, 7500 AA Enschede, The Netherlands
Tel: ++ 31 (0)53 487 4223; Email: mccall@itc.nl

Fuelwood for beer – draining the natural resource barrel

Artisanal brewing of sorghum, maize and other local brews is a massive and unique user of firewood in sub-Saharan Africa.

A SADC-wide reconnaissance of rural woodfuel use in the late 1980s (Kaale 1990) may have shocked outside experts, if not field workers and practitioners, by the frighteningly high consumption associated with small-scale beer-brewing. An extreme estimate was made for Zambia, where about 25% of the total woodfuel consumed annually in Zambia, is used in brewing local beer (equivalent to 410,000 cu.m).

SADCC surveys may have been high because they are based on rapid surveys without a well-developed methodology; e.g. the wood can be simultaneously burnt for other end-uses. However, the importance of brewing as a fuel end-use is unambiguously shown by the few regional and micro studies.

A mid-1980s FAO study of Tanzanian villages found woodfuel for brewing – averaged over all households – was 0.1 cu. m. per year. This gave a median of 10% of total village fuelwood devoted to brewing – the highest village recorded over 50%; other regional studies estimated 15% of total village woodfuel. Such figures sug-

Energie pour la production de bière en milieu rural.

Les brasseries traditionnelles du sorgho, maïs ou autres produits locaux absorbent une grande quantité de bois de feu en Afrique Subsaharienne. La consommation de bière traditionnelle est estimée entre 0,5 et 1 litre par jour et par personne adulte. L'efficacité énergétique des procédés utilisés est faible. En moyenne le ratio est de l'ordre de 1 à 2 kg de bois par litre de bière. Le bois est le plus souvent coupé et non ramassé, ce qui contribue au processus de déforestation. En général, ces brasseries sont des entreprises gérées par les femmes. Cependant jusqu'à présent, elles n'ont guère attiré l'attention des ONG, gouvernements et bailleurs de fonds.

gest 300 to 500 cu. m. of firewood per year are used for beer-making in a 'typical' Tanzanian village, whilst a national overview went even higher at 720 cu. m.

A comparable 1990s Zimbabwe estimate is 3 tonnes per small-scale brewer per year. West African studies also suggest high figures – for example, 20% of total wood consumption in Ouagadougou, Burkina Faso is used for brewing (Figure 1). Two decades ago, this meant that Ouagadougou alone used 10,000 tonnes of firewood for 4300 tonnes of sorghum *dolo*.

Overall, brewing for home use, for ceremonies, and for sale in village bars, accounts for something like 5% to over 30% of total wood consumption in a 'typical' sub-Saharan village (Table 1).

Extending the crude estimate to a 'typical' village, say 400 households in eastern Africa, 300 – 800 cu. m. of fuelwood per village per annum is consumed in beer brew-

ing. Continuing with rough figures, a maximum area needed to provide the necessary woodfuel can be calculated at 150 – 400 ha. per village, on a sustainable basis. Sustainable, in this instance, means that natural woodland regeneration should produce a long term supply of trunks, branches and smaller fuelwood.

Brewing skills and beer losses

The high woodfuel consumption levels are due to the high level of demand, the lack of alternatives (i.e. bottled beer) in low-accessibility villages, the deficiencies in brewing technologies leading to very poor energy efficiency, as well as high levels of wasted brews.

Table 1: Some Sub-Saharan Africa estimates


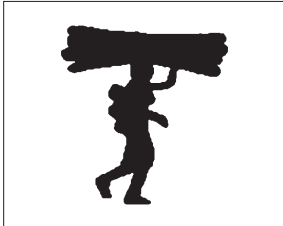
% of Woodfuel used for brewing 20 – 25 %		% of Woodfuel used for brewing 10 – 15 %	
	Zambia, national data 1989 Mufindi, Tanzania 1982		Central Tanzania 1983 & 1984 Zimbabwe, national data 1990 Ougadougou, Burkina Faso 1986



Figure 1: Brewing dolo in Burkina Faso

There is no single brewing recipe; the source material is such an important determinant of the method. *Mbege* banana beer for instance from Kilimanjaro, requires bananas to be boiled for 5 to 6 hours, but uses less fuelwood than sorghum beer. (Table 2.)

The basic brewing technique shows three stages: malting, brewing, and fermentation. Normally, all three are completed in a week to 10 days, from first preparations to drinking. Thus in many cultures, local sorghum /maize beer is called '7 days' brew'. Sufficient water is needed for the first two stages, and sustained high levels of firewood use are in the brewing – or mashing – stage.

Brewing involves skilled management; the technicalities are not as simple as they look to casual observers. Artisanal beer brewing is inherently risky, and losses can easily be up to 90% or 100%, from over-fermentation or failure to ferment.

Commercial bottled beers like Castle or Heineken require remarkably similar energy inputs, although in the form of electricity and oil or gas, rather than wood-fuel. Energy use is approximately equivalent to 0.035 – 0.050 cu.m. wood per 200 l. drum, (based on 8.5–13 kWh, plus 120–180 mJ heat per hectolitre of beer).

The first determinant of wood-fuel requirements is the choice of raw material for the malt, and thus the brewing technology process. For example, *mbege* may require little firewood, because banana wastes can be utilised.

Second is the specific technology. The brew containers affect cooking efficiency and thus fuel consumption (Figure 2). Bigger brewers make use of 44-gallon (200-litre) petrol drums made of steel which transmit heat quickly and effectively. The metal is tempered and thick enough to sustain the heat and survive months before needing replacement, in contrast to the small 20-litre clay pots used in the past. Their thick clay walls do not transmit heat well, demanding more time and more firewood.

Table 2. Fuelwood efficiencies in brewing

Location	Brew	Fuelwood consumption (cu. m./ 200 l. drum) *
Usambara, Tanzania	<i>puya</i> (sugarcane) brew + concentrate	0.600
Dodoma, Tanzania	<i>kangala</i> (maize)	0.500
Mufindi, Tanzania	<i>kangala / pombe</i> (maize)	0.340 – 0.480 (max. = 1.0 cu.m.)
Kilimanjaro, Tanzania	<i>Mbege</i> (banana + finger millet)	0.320
Uluguru, Tanzania	<i>pombe</i> (maize)	0.210 – 0.350
Central Tanzania	<i>pombe</i> (maize)	0.100 – 0.300
Botswana	Maize	0.290
Ougadougou, – urban Burkina Faso	<i>Dolo</i> (sorghum)	0.075 – 0.084
Zimbabwe	maize/ millet	0.060 – 0.070
Kilimanjaro, Tanzania	<i>Mbege</i> (pre-cooked?)	0.045 – 0.070
Tanzania, 8 regions	<i>pombe</i> (various materials)	0.045
Mozambique	'fermented beer'	0.005 – 0.016

*200 litres = one 40 imp. gallon drum
(after McCall (2001) –Various Sources, 1983–98)

Small-scale home brewers may use one (big) fire when they are simultaneously brewing and cooking, whereas large-scale brewers use separate fires. It is questionable whether the scale efficiencies of bulk brewing counter the better fuel management associated with small-scale brewers / cooks. Continuous fire management affects fuel efficiency relatively more than technical design; a well-managed 'three stone' fire can achieve higher end-use efficiency than a poorly managed 'improved stove'.

Improved fire management demands skilful multi-tasking: controlling fire draught, preparing the right-sized fuel pieces, feeding the fire and moving burning sticks, moving the pot, mixing; always to maintain intense heat and less flames. Fuel is saved by focusing maximum heat at the base of the brew-drum rather

than up the sides, but this affects drum stability, and excessive heat on the base promotes metal failure. Good energy management is at the expense of women's time, on top of their childcare and safety imperatives.

What is fuelling the brew?

Fuel for brewing is almost entirely met by firewood. Few places have alternatives, although coal is proposed in Zimbabwe.

Rural women are unlikely to possess cutting or transport technology for felling whole trees, in addition to culture-specific restrictions of customary property rights and resource control by adult men.

Critically, unlike household cooking, brewing needs large logs for cooking large quantities (i.e. 44 gallons) sustained over many hours at medium heat. Therefore, it is usually live wood deliberately cut as felled branches or whole



Figure 2: Brewing beer from sugarcane, Usambara Mountains, Tanzania

trees. The large quantities of bulky woodfuel are more likely purchased from professional woodcutters and traders than directly cut by female brewers.

Wood for brewing thus becomes a monetised commodity, unlike woodfuel for village household use.

Brewing is women's business

Household-scale brewing may be one of the few income-generating activities in sub-Saharan Africa where rural women are thoroughly involved. This does not mean village brewing makes people wealthy; micro-economic studies mostly show that financial returns to labour are poor, but that is true for most rural women's enterprises. Some argue that the inherent riskiness of artisanal brewing explains why it has 'been left as' mainly a women's enterprise, even in male-dominated societies. The labour may not be such drudgery, but the risks are great, as is the competition.

Artisanal brewing accounts for much of intra-community cash

Table 3: Brewing is women's business and brewing is household income

BOTSWANA

20–50% of households brew 1–7 times a week (5 village survey)
By far, highest income source for women (national village survey)
Second – highest household income source (after cattle) (ditto)

BURKINA FASO

Third – highest household income source nationally, (after farm produce sales & wage labour)

TANZANIA

25% of households brew regularly (national survey)
Second – highest household income source in Tanga Region (after 'agriculture')
75% state it is main income source of women, nationally

ZAMBIA

60% of households in Northern Province brew regularly
Main cash source for women in Mkushi District (ahead of wage labour and charcoal)
Most common income source for women in Northern Province

(after McCall (2001) -Various Sources, 1983–94)

flows, especially between men and women. Although women also drink, the customers are primarily men, including the brewers' own husbands. Many local studies demonstrate its significance for rural households and especially women.

Fuel-saving technologies

Technology development (for women or men) literature from, among others, ITDG or ILO barely touches brewing's technical problems, nor even recognises the importance of brewing.

Dolo stove improvements were tested in West Africa by the Dutch TNO and Woodburning Stoves Group, back in the 1980s, though now stopped. The primary motivation was to reduce overall wood consumption, although also to save women's cooking time. (Sulilatu 1986). The improved designs were based on:

- improving heat transfer to the earthenware *dolo* cookers.
- longer working life of the cooking jars.
- no increase in costs.

ZERO in Zimbabwe identified production and technological priority problems (ZERO 1998):

- energy-efficient methods of cooking beer,
- potential for coal to replace woodfuel,
- hygienic handling of beer,
- maintenance problems.

ZERO has produced the only Training Manual for local brewers (Nyabeze 1994). It reviews some problems, though technology design and dissemination are not resolved.

Are we already too late to join in?

The significance of artisanal brewing for woodfuel resources, and for rural women's livelihood, is consistently undervalued by governments, donors and NGOs alike. Their ignorance, even dismissiveness, being due to the small amount of detailed comparative studies and upheld by ideologies;

although the arguments for bringing it onto their agendas should overwhelm any moral qualms. Local brewing is central to women's livelihood, yet, in its current state is placing enormous pressures on woodland environments.

Before any agencies step in, however, to support this type of local enterprise, this whole development/environment problem is being transformed by the commercial brewers. South African Breweries and others are making technical advances in stabilising sorghum beers, producing more secure packaging, and developing soluble powders. This would solve their brief shelf-life and rural distribution problems, and thus eliminate a key 'marketing advantage' of local brews.

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Mike McCall is a geographer working mainly in eastern Africa on local-level natural resource management, environmental impact assessment and livelihood issues. Currently at ITC, a post-graduate institute of geo-information for environmental management and development. 🍷