

# Charcoal: A driver of dryland forest degradation in Africa?

## Facts

- In sub-Saharan Africa (SSA), woodfuels account for > 80% of energy supply.
- Over 90% of the population in SSA relies on woodfuels.
- In East Africa, 70–85% of urban households rely on charcoal.
- Between 2000 and 2010 the demand for charcoal grew at 3%/year, while that for firewood grew at 1%/year.
- The expected increase in charcoal demand could have significantly negative impacts on tree cover in dry forests, which supply much of the charcoal sold in the urban areas of SSA.



## Significance of woodfuels in sub-Saharan Africa

Wood has been used as fuel for millennia, meeting humanity's basic needs for cooking, boiling water, lighting and heating. Today woodfuel, i.e. firewood and charcoal, accounts for around 10% of global energy supply, but it dominates energy provision in many parts of the developing world. In particular, the inhabitants of sub-Saharan Africa (SSA) benefit significantly from woodfuel, with the highest regional per capita consumption of 0.69 m<sup>3</sup>/year in 2011, 2.5 times higher than the global average of 0.27 m<sup>3</sup>/year. Over 90% of SSA's overall population of 852 million and virtually 100% of the 535 million rural residents rely on woodfuel for energy.

## Geographic and sectoral demand and supply patterns of woodfuel

Firewood serves mostly rural populations' fuel needs. In contrast, charcoal demand is highly associated with urbanization, and is primarily met by unsustainable supply from drylands. Charcoal is preferred in urban areas due to its higher energy density, lower transport costs and relatively clean burn (although it emits more carbon monoxide than wood).

There is significant regional variation in supply and demand of charcoal in SSA. In the West African Sahel and dry savanna, selective cutting and coppicing of favoured species from savanna woodlands for charcoal was reported to be a common practice, causing depletion of preferred species and adverse effects on the ecosystem composition and biological productivity, but leaving forest cover above 10%. In east and southern Africa, clear-cutting or felling of desirable species for charcoal production was reported to be more prevalent; with the species mix and overall volume reduced, landscapes here were often transformed from woodland to bush, and from bush to scrub.

## Implications of the expected shift from firewood to charcoal on dryland forests

With urbanization, the demand for charcoal is growing steadily in SSA. Average annual consumption of charcoal grew by 3% from 2000 to 2010 (exceeding the annual population growth rate of 2.6%). Firewood consumption grew at 1% p.a. over the same period. Charcoal production by rural areas to meet the energy needs of urban households and commercial enterprises is one of the major causes of forest degradation in drylands, which leads to biodiversity loss. The sustainability of this type of incomplete removal of trees on farms/landscapes depends on the speed of ecosystem recovery against that of harvesting. Recent arguments suggest that the largest cause of deforestation is not charcoal production but land clearance for agriculture, a process that results in some charcoal as a by-product.

Firewood for domestic use, in contrast, is normally harvested within the sustainable cycle of tree regeneration (by selecting branches or already dead wood from farms or forests); it is thus a minor driver of forest degradation. Because most charcoal producers in SSA use traditional earth kilns with wood-to-charcoal conversion efficiencies of 8-20%, large quantities of wood are used per unit of charcoal produced. Improved kilns can attain over 30% efficiency, and should be promoted. The negative impacts of charcoal production on dryland forest and woodlands are likely to increase with urbanization and population growth.

### Elements of sustainable charcoal

- Demand management
  - Promote improved charcoal cooking stoves
  - Support shift to modern, cleaner energy alternatives
- Supply management
  - Produce wood for charcoal in agroforestry systems
  - Shift to more efficient kilns for charcoal production
- Enabling policy environment
  - Streamline policies to create legal environment
  - Harmonize policies to improve incentives to producers



### Promoting sustainable charcoal

Options to improve sustainability include promoting the efficiency of charcoal production and consumption within a framework of enabling policies. More efficient kilns will reduce the amount of wood required per unit of charcoal produced, particularly if accompanied by proper drying of wood before use. Improved cooking stoves will reduce charcoal consumption and also cut indoor air pollution if stoves are installed and maintained properly. Changes in land management are also required to create sustainable charcoal supply systems rather than 'one-off' harvesting of wood. With improved management, biomass carbon stocks in forests may recover and be maintained along with charcoal production. Agroforestry plays an important role in making charcoal supply more sustainable by reducing harvesting pressure on natural tree stands, through increased wood supply from farms. Other options include briquetting of waste charcoal and agricultural and tree by-products, as well as producing charcoal from invasive tree species.

### Economic potentials

Woodfuel production on farm can be economically viable and sustainable for smallholder farmers who struggle to satisfy subsistence needs and meet their energy demand. Trees on farms also maximize resource-use efficiency by allowing the reallocation of labour from woodfuel collection to agricultural production and off-farm income-generating activities. There is significant potential for further economic development of charcoal value chains when dryland residents, and especially women, become charcoal suppliers under enabling policy environments. In 2007, the charcoal industry in the SSA was estimated to be worth over US\$ 8 billion, employing more than 7 million people (close to 1% of the region's population) in production and marketing, up from US\$ 6 billion in 1995. By 2030, the market is predicted to exceed US\$ 12 billion, employing 12 million people.

### Policy challenges

Except for a few African countries such as the Sudan, where charcoal is sustainably produced under a favourable policy environment, in most SSA countries the charcoal market is viewed negatively. Charcoal production and trade is often an informal and sometimes illegal business, which reinforces unsustainable production. In some countries such as Kenya and Namibia, it is legal but has a complex, multi-layered, and unclear regulatory framework for stakeholders. This generally results in low returns for farmers and higher prices to urban consumers, because bribes can amount to 10–20% of the final price of charcoal. Streamlining and harmonization of policies is therefore a prerequisite for an enabling environment for sustainable woodfuel and charcoal provision.

**Contact: Miyuki Iiyama**  
**M.Iiyama@cgiar.org**

World Agroforestry Centre, United Nations Avenue, Gigiri,  
 P. O. Box 30677-00100, Nairobi, Kenya.  
 Phone + (254) 20 722 4000, Fax + (254) 20 722 4001,  
 Email: worldagroforestry@cgiar.org  
 Website: www.worldagroforestry.org

