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energy issues

Burning Charcoal Issues

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Introduction

Charcoal plays an important role in both the energy sectors and the economies of most African countries. However, the inefficiencies inherent to the production and use of charcoal, rapid urbanization¹, and the preference of urban dwellers for charcoal place a heavy strain on local wood resources. This in turn has severe environmental consequences. The use of charcoal cannot be stopped; but, experience has shown, it can be reduced through implementing a variety of measures that promote the sustainable production of wood and efficient use of charcoal through incentives at the local level. Players in the charcoal market need to be guided so that they can make efficient use of the resources. This should have a high priority in the development plans for most African countries. The World Bank can help by allocating more funds for the realization of these plans.

Significance of Charcoal

Charcoal plays a considerable role in African economies; however, governments and development agencies seldom perceive this.

Key Market

The value of the charcoal market for 26 Sub-Saharan African countries for which we have known data exceeds \$1.8 billion per year. In energy terms, charcoal consumption in many African countries is higher than gross electricity consumption (although the value of the electricity market is usually much higher than that of charcoal).

Employment

Charcoal making provides a considerable amount of employment in rural areas; it allows for a quick return on investments and is often practiced in conjunction with agricultural activities. In Kenya and Cameroon, for example, some 30,000 people are engaged in the woodfuels sector; in Côte d'Ivoire, as many as 90,000.

Why Do Users Like Charcoal?

Charcoal is a relatively inexpensive fuel that perfectly suits the users' needs.

A Modern Fuel?

Many Africans consider charcoal a modern rather than a traditional fuel. For them, not having to use firewood and agricultural residues, represents an improvement in

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the quality of life. Like firewood, charcoal can be purchased in the preferred quantity. But unlike firewood, it burns without smoke; does not decompose even after extended storage; does not create dangerous flames around cooking vessels; and requires a simple stove whose heat output is relatively easy to control.

Inexpensive

Charcoal is also probably as close as many householders in poor countries will come to modern fuels, since petroleum fuels (kerosene, LPG, natural gas) and electricity are – and are likely to remain – too expensive. When charcoal users switch to kerosene, they double their fuel expenditures, and this sum is at least doubled again when they switch to LPG or electricity. Costs of cooking equipment also increase dramatically with the comfort levels associated with modern fuels. Thus, unless disposable incomes increase considerably, most Africans will continue using woodfuels.

**Why Do Others
Dislike Charcoal?**

Inefficient Fuel

Charcoal is a very inefficient fuel to produce. It does not make much sense to waste energy, not even if it is traditional, indigenous, and renewable. Evaluation of hundreds of traditional kilns in Madagascar and Rwanda showed charcoaling efficiencies of only about 8 to 9%. In several countries, higher production efficiencies of 8 to 20% have been reported. The very low efficiencies obtained in practice can be increased considerably through a systematic effort to help charcoalers become more professional; efficiencies of up to 28% have been observed in practice.

Inefficient Stoves

Charcoal is also inefficient in use. Although charcoal stoves are more efficient than firewood stoves (20 to 35% vs 10 to 25%), they are much less efficient than modern-fuel stoves such as kerosene (35 to 50%), LPG (45 to 65%) and electric stoves (75 to 85%). The combined production and use inefficiencies have important consequences. A significant increase in wood consumption could result when urban households switch from firewood to charcoal; cooking with charcoal uses more wood than cooking with firewood, sometimes even three to four times more.

CO₂ Emissions

Since the burning characteristics of charcoal and mineral coal are very similar, charcoal use results in high volumes of CO₂ emissions, as well as of CO and CH₄ (but not SO_x).² However, if charcoal were produced on a sustainable basis (without causing deforestation), it would be neutral to the carbon cycle; the burning of charcoal would simply release timescale CO₂ back into the air.

No Market Incentives

Environmentalists feel that charcoal production should be stopped altogether because of its destructive nature as presently practiced. However, urban dwellers in some developing countries have a strong appetite for charcoal, and attempts to ban the production or the use of charcoal have been mostly unsuccessful mainly due to the interplay of commercial interests.³ Since operators can use free raw materials (wood from natural forests or clear fellings) and turn them into a marketable commodity in high demand, they do not have much respect for the sustainability of the resource.

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Institutional Inadequacies

Woodfuels – and thus also charcoal – fall between the organizational cracks. Frequently very little coordination and collaboration are evident between energy and forestry ministries since energy ministries are more concerned with electrification and the supplies of petroleum products, and forestry ministries are more concerned with the production of wood in industrial plantations and conservation of wood resources in natural forests. *In general*, developing countries lack the organizational capacity to formulate effective regulations for woodfuels or even to apply the existing inadequate rules to improve the functioning of the woodfuel market chain. Arbitrary interventions in the woodfuel sector have resulted neither in effective regulation nor in control of the sector.

How Should the Charcoal Issue be Addressed?

Demand for charcoal is increasing; this cannot be reversed easily. At best, the rising consumption trend can be leveled off, and planners can hope that substitution takes place before wood resources run out. This will involve: facilitating substitution with modern fuels, increasing end-use and transformation efficiencies, introducing economic pricing, enhancing the management of natural resources, and introducing an incentive framework involving local participation.

Substituting with Modern Fuels

Switching from woodfuels to petroleum-based fuels such as kerosene and LPG is affordable now for any upper- and middle-echelon households. Further improvements in pricing and delivery (particularly of LPG) are required to enable households lower on the income scale to make the switch away from traditional fuels. Electricity is not a substitute for woodfuels; although electricity is affordable and practical in many areas for lighting, communications, and possibly for refrigeration, few households, rural or urban, will be able to afford to cook with electricity if it is priced at cost-reflective tariffs.

Substituting with Briquettes

Substitution of lower-grade fuels for traditional fuels can be facilitated as well. Briquettes made of agricultural waste may, for example, compete with traditional fuels if they are of sufficient quality and are priced correctly. This would allow the conversion of low-grade residues to marketable fuels.

Improved Stoves

Increasing end-use efficiency requires the promotion of improved stoves. Traditional stoves are normally made by the informal sector; models with higher heat transfer efficiencies should be developed in collaboration with end-users and stove producers, and manufactured and marketed by the private sector.⁴

Transformation Efficiency

Improved kilns do not require a large capital outlay; they simply require better understanding and control of the carbonization process. Drying of wood, better stacking methods, and better process control, in combination with a chimney to force inverted draft, can increase carbonization efficiency from 9% to over 20%. However, some charcoalers are reluctant to pursue these improvements since it takes more time and effort to prepare the kiln and control the carbonization process; where the wood

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is basically free, the charcoaler is better off poorly preparing several traditional kilns in quick succession. Increasing the efficiency of carbonization thus requires regulatory measures, systematic training, and demonstration programs for traditional charcoalers at their habitual work sites.⁵

Pricing

Prices of charcoal in real terms have declined or stayed at about the same level for some 10 to 20 years. This fails to give clear signals to governments that the resource base is declining, or incentives to users and producers to use charcoal more efficiently. Wood prices should reflect their cost of production, and levying taxes may be a good way of achieving this. Taxes on charcoal should be based on the wood inputs rather than on the charcoal output. Revenues earned should largely be invested back into the local communities rather than flowing into the central treasury. Regulatory measures should also be put in effect, such as the devolution of control of wood resource to the local population.⁶ Development of the market should be left to the private sector, once prices are right and a control system is in place. In contrast to other regulatory measures, this can work, as it is in the local population's interest to manage their surrounding environment and resource.

Management Plans for Natural Resources

Sustainable management plans are required to ensure that resources are not over-harvested. These should be based on detailed knowledge of the standing stock (species, growth characteristics, etc.) and an exploitation plan that maximizes wood output and minimizes degradation of the resource base. Such plans need to be verified by the local population in collaboration with local authorities.

Institutional Strengthening

Institutional strengthening of the public sector is needed to create capacity to design and implement policies and programs in the traditional energy field. Stumpage fees should be levied to finance the implementation of the management of resources by the local population. Substantial input is required from the government, particularly in the field of policymaking and regulations, but actual implementation should be left entirely to the private sector.

¹ The 1994 World Development Report shows 5.5% annual urban growth during the period 1980-92 (page 222 and 223).

² See "CO₂ Emissions by the Residential Sector: Environmental Implications of Inter-fuel Substitution" (Industry and Energy Department Working Paper, Energy Series No. 51).

³ In Ghana, a total ban on production from the Afram plains (largely failed, despite much government attention); in Thailand, a ban on the transport of more than 2 bags at the time except with a permit (general noncompliance); in Rwanda, total ban on the production from the Southeastern Savannah zone (quite successful); in the Gambia, a total ban on the use of charcoal (partly successful); in Mauritania the number of transport licenses was limited (failure).

⁴ See "What Makes People Cook with Improved Biomass Stoves?" (World Bank Technical Paper 242).

⁵ See "Rwanda Project Carbonization, Etat D'Avancement" (ESMAP Report, October 1993).

⁶ See "Niger - Household Energy Project" (forthcoming FPD Energy Note).



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