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Wood Energy in Sub-Saharan Africa: How to Make a Shadow Business Sustainable

Summary

There is no getting away from it: wood is, and will remain crucial for meeting global energy demands, in particular those of the poor. Although wood provides 'only' about 10% of total global primary energy, it is the most important source of energy in many parts of the developing world. Around 2.8 billion people worldwide consume wood-based fuels on a daily basis. In sub-Saharan Africa (SSA), 70% of households depend on wood energy. In several SSA countries, it makes up to 90% of household energy mix, and represents up to 3.5% of gross domestic product (GDP).

As for the current trends in population growth in SSA, the amount of wood energy consumed is likely to increase in future. Even with very optimistic assumptions about renewable energy development, in 2030 wood-based energy will still be two-thirds of what it is today. Charcoal will remain the main energy source of the urban population.

As they are the central component of SSA's household energy mix, production and trade of wood energy have far-reaching social, economic and environmental repercussions. Many of the poor earn a living in firewood and charcoal value chains. Charcoal has been called an "engine of pro-poor economic growth" (Van der Plas & Abdel-Hamid, 2005, p. 297). However, typically uncontrolled wood extraction has made wood energy an important force of forest and biodiversity degradation. Moreover health is threatened by traditional use, particularly of firewood.

Many of the attempts in the past to control the wood energy sector have been short-sighted, top-down, and have failed. Most energy policies in SSA largely ignore the potential of wood energy as a source of reliable, storable, renewable and sustainable energy, and as the main and unavoidable energy supplier of the future. This must change!

This policy brief first outlines the typical wood energy value chains in SSA, while scrutinizing unsustainable practices in every segment of the value chain. It then sketches previous, often unsuccessful interventions to manage the sector and replace wood energy. It highlights the key role of location in shaping efforts to manage the sector. Subsequently, it provides condensed policy recommendations.

The primary findings of this analysis are the following:

- There is a strong case for pro-actively supporting the emergence of a sustainable wood energy sector. Wood energy must be recognized as an inter-sectoral issue, connected to forestry, energy, agriculture and land.
- Although new technologies to reduce wood and energy waste are important, governance issues remain key to attempts to manage wood fuel value chains.
- Previous attempts to upgrade the wood fuel value chains have been too narrow and have relied too strongly on technology and/or central state regulation and have not been able to control the sector under SSA conditions. In particular, relying on top-down prohibition, certification and central state control has disregarded the role of weak implementation capacities, local realities (informal community rules, power imbalances) and corruption in circumventing such measures.

For future approaches to be successful, they need to target the multi-level nature of the wood energy sector and provide more comprehensive and location-specific interventions.

The wood energy value chain

Wood energy is being produced, traded and consumed all over rural and urban regions in SSA. While we often lack reliable statistics from developing countries, it is evident that trade in charcoal in particular is huge. Estimates of the value of wood fuel use reach up to 3.5% of GDP.

i. Production

Wood for direct use and charcoal production is mostly extracted from open woodland in rural or peri-urban areas. Although in most SSA countries, wood extraction for commercial use is forbidden in principle or requires a licence to be purchased; unclear land and resource use rights and overlapping responsibilities regarding the management of local land and forest stocks lead to large quantities of wood being extracted without official monitoring and revenue collection. Widespread corruption exacerbates the problem. The failure to control licences effectively results in no penalty being charged for (semi-)illegal harvesting. The lack of sustainable harvesting plans, the disregard of sustainable harvesting techniques by producers, and weak tree regrowth contribute to the degradation of forest stocks or even to deforestation, though again good data is lacking about the actual state of forest and tree regrowth and other degradation factors such as open grazing.

The charcoal producers' range of operation differs in particular and depends on forest resources and their governance. Charcoal is usually produced by small-scale rural charcoal makers, as this constitutes one of the few income-generating activities of the rural population. It is often an activity of the poorest, particularly in periods of distress. But there are also large-scale operators. Women are important actors in firewood collection and charcoal production.

In SSA, carbonization mainly takes place in so-called traditional earth-mound kilns operating with low efficiency rates of 8% to 30%. This leads to high wood extraction for a given amount of charcoal which exacerbates forest depletion. Technical modifications have the potential to increase the efficiency of production. However, application of improved techniques is hindered by a lack of respective awareness and the unpredictability of profit margins.

In a nutshell, while charcoal production is challenging, particularly for environmental sustainability, it can also be considered an "engine of pro-poor economic growth" (ibid.). Charcoal production substantially contributes to livelihood security in many rural areas in SSA, particularly in times of financial stress including droughts and pre-harvest seasons.

ii. Transport and trade

Most fuelwood is consumed locally or sent over short distances to rural towns, although in some regions such as the Sahel longer distance trade is also observed.

Transport and trade of charcoal is much more diversified and mainly destined for urban centers. It can roughly be categorized into a legal and an illegal sub-chain – in reality, however, a complex continuum prevails. Generally, the business is dominated by dealers who are officially obliged to obtain licences and pay taxes and levies at governmental checkpoints. When choosing the official chain, dealers thus face significant formal trade costs. Widespread corruption and insufficiencies in (centrally) controlling the checkpoints and tracing the fluxes results in many traders reducing costs by evading formal taxes. Hence, operating an official charcoal business leads to comparably lower profits for dealers and/or higher prices for their products. For this reason, the vast majority of charcoal transported and sold in SSA is illegal. Often, high-level officials and business people are involved in illegal charcoal trade.

iii. Consumption

Wood-based energy is the central component of SSA's household energy mix (75-90%). Charcoal is mainly consumed by the urban population; firewood is mostly used by rural households. Firewood is consumed in so-called three-stone fires, which are characterised by efficiencies of 7% to 20%. Traditional charcoal stoves, the major devices for charcoal use, have been characterised as being equally (in)efficient by some authors while others report much higher efficiencies. The low efficiencies of traditional charcoal and firewood combustion are accelerators of forest resource depletion. Increasing efficiency could contribute to lowering that rate, but would not solve the challenge of resource depletion fundamentally, particularly given the strong population growth, and is often less successful than has been assumed based on technical and economic efficiency gains measured in trials and experiments.

Wood-based fuels are the main source for household energy use for a number of (good) reasons: wood and charcoal are relatively cheap, and traditional stoves are almost costless. They constitute reliable sources of energy since they are available throughout the year – they can be stored easily. Also cooking habits, existing kitchen utensils, negligence of health issues, and other behavioural factors favour the traditional energy carriers. Alternative energy sources such as liquefied petroleum gas (LPG) thus have difficulties competing with wood-based energy, even if subsidised. They are concentrated on high- and middle-income households (which very often use wood-based energy as well). Women are the key for all energy concerns related to cooking.

Previous attempts at regulation and managing

In the past, a number of strategies have been outlined to counteract unsustainable wood energy production and consumption. These attempts can be categorized into (1) legal regulation of forest use, charcoal production, transport and consumption; (2) sustainable production in wood lots; (3) increasing focus on the efficiency of production and consumption/combustion mainly through improved cooking stoves; and (4) a switch to alternative energy sources such as LPG, often delivered at subsidised prices.

However, most attempts at regulation at central government-level have not accounted for the complex multi-level structure and governance of the wood energy sector. In general, the sector has been a 'battlefield' of a number of policy measures, ministries and governmental agencies

focussing on interwoven sectors such as energy, agriculture, forestry, natural resources and the environment. Unclear division of responsibilities regarding forest management and monitoring of wood production, processing and trade lead to a lack of comprehensive policies, strategies and legal frameworks. Information and control deficits at all governmental levels additionally prevail. Existing regulations in SSA are either widely circumvented or doomed to fail due to insufficient control capacities or corrupt officials.

There have been a number of attempts by various development programmes to sustainably increase the supply of wood energy through the establishment of rotational woodlots. A common challenge is that woodlot maintenance requires investments in human, control and real capital over time. As the commonly applied illegal wood extraction is not charged with such investments, the competitive cost advantages of the latter result in the abandonment of existing and a lack of new rotational woodlots.

Programmes aimed at the distribution of improved cooking stoves for firewood and/or charcoal combustion have a long history in SSA. They are employed to reduce wood consumption for a number of co-benefits (greenhouse gas (GHG) emissions, health, and costs). The efficiencies of improved cooking stoves vary widely depending on design, insulation, the food prepared and consumer habits but very generally, a savings rate of 30% fuel consumption might be an acceptable value. Nevertheless, the acceptance rate has been low. A major crux of adoption of new cooking technologies is the consideration of users' cooking habits, but also higher start-up investment costs and the lack of flexibility in using kitchen utensils. Experience shows that households are slow, or refuse, to adopt new energy systems for cooking, while they are fast to take over electric lighting, cooling or other new energy technologies. Combined with a lack of (financial) capacities by governments to substantially subsidise alternative energy, it is unlikely that a leapfrogging to modern cooking energy will happen in the near future.

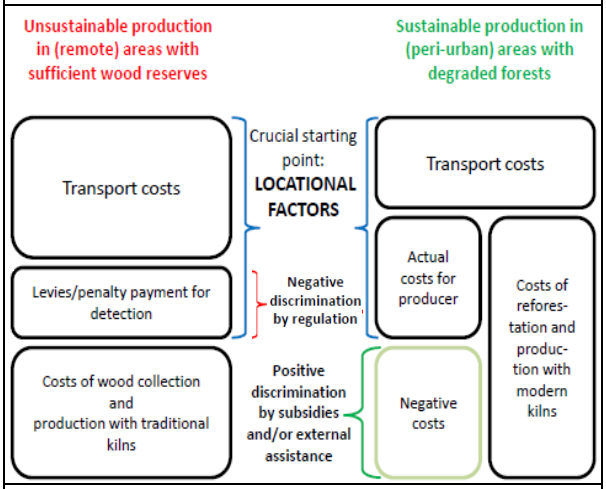
Reservations in respect to the adoption of efficient technologies also hold true for the diffusion of modern kilns. Even when their promotion is increased, producers often refrain from adoption. Their handling costs may increase, and investment costs are a major impediment.

In short, many attempts to foster a sustainable wood energy sector have been made, but they were (1) not comprehensive enough; (2) not adjusted to the local conditions; or 3) too costly. On the contrary, many attempts have induced negative effects by distracting from creating an incentive for more realistic alternatives within the wood energy sector.

Solutions need to be location-specific

When designing interventions to foster more sustainable wood energy practices, a lesson learned is that many of the factors affecting the choice of energy production, trade and consumption are location-specific. Several components of the production and transaction costs depend on location and (length of) trade routes, such as transport costs and levies (see locational factors along value chains in Figure 1). Several other factors also change with location of production and use, for instance, income alternatives, ease of corruption in production and trade or the costs of alternative fuels. In addition, local rural realities such as informal (traditional) rules, capacities to monitor natural resource use by the central government, local (traditional) governance rules or power relations (within communities, and between communities and charcoal-makers) play a role in determining the way central state regulations are, and can be, implemented. Thus, location matters!

Fig. 1: Production and transaction costs of unsustainable versus sustainable charcoal production



Source: Authors

Usually, charcoal production follows concentric circles around and along the roads towards major consumption centres, expanding over time as demand grows and depleted land is left in the inner circle. This increases urban charcoal prices, while the additional gains are absorbed by transport and other transaction costs. In this case, a location-sensitive intervention would focus on the inner 'charcoal production circle': production places more proximate to the city have a competitive cost advantage (lower transport costs) relative to more remote areas. The chances of achieving sustainable production such as by supporting adequate reforestation and sustainable production techniques (for instance, technically improved kilns) is more probable than in remote regions as relatively higher production costs can be absorbed by higher marginal gains. These marginal gains can be even higher if not only energy wood but also other values are produced (e.g. timber, fodder or fruits).

Sustainable wood production can also be made more attractive by the implementation of payments for ecosystem services. The cost of unsustainable production can be driven up by efforts to better enforce regulations, thereby increasing transactions costs. The higher these penalty costs, the lower can be the subsidies on the other sites.

In summary, interventions and targeted assistance need to be tailored in a way that the transaction costs of sustainable wood production in the inner circle remain below the ones

for unsustainable production within and outside this region. A careful analysis of combining negative and positive discrimination is the key to 'location-specific interventions'.

Conclusions and recommendations

Wood energy production is a highly pro-poor sector. In the long run, however, this is only true if it can be made sustainable, otherwise it will destroy its own basis. A successful upgrading of wood energy value chains is recommendable but can only be achieved in a holistic way. Appropriate regulations must be combined with targeted external initiatives or projects in a concerted way. We further conclude that:

- Wood energy is and will for a long time be the major source of energy for rural as well as urban households. Production can be made sustainable if wood regrowth within and outside forests is achieved.
- Interventions regulating (wood) energy are deeply gender-sensitive.
- Technological 'fixes' are important in reducing immediate pressures, but governance at central and particularly at local level is key in the long run to developing a sustainable wood energy supply.
- Previous approaches towards cooking energy system change focussed too closely on individual mechanisms, technological fixes such as improved cooking stoves, regulations and prohibition at the national level, or attempts to leapfrog wood energy by subsidies for fossil energy. They did not take into account governance, habits and specific factors at local levels where control of production would have to take place. Also, they disregarded interactions with other influencing factors such as agriculture (livestock, itinerant cropping) which shape the practice of tree cutting. Hence, these approaches were often not very successful.

This 'business as usual' will lead to continuation of the destructive cycle. Neglecting the wood energy sub-sector is paramount to neglecting a crucial factor contributing to the degradation of forest resources, land, biodiversity as well as GHG emissions.

The complexity of the wood energy sector including the local realities in different locations need to be taken into account in customising adequate strategies to sustainably improve wood energy supply systems. It is important to generate and support the competitive cost advantages of sustainably produced wood energy products vis-à-vis non-sustainable products. Thus, complementary to national regulation and support measures, 'location-sensitive interventions' need to take local conditions into account, such as ease of control over and creation of long-term economic interest by local communities and their members in their local resources; their motivations/incentives to exert control; targeted subsidies for tree schools and reforestation; locally adapted charcoal technology promotion or capacity building. Land-use planning must include wood energy issues. Agro-forestry research and promotion can also take energy issues into account. Closer to consumption centres, it will be indispensable to provide active incentives for reforestation while, further away, community empowerment plus slightly better control of regulations may be sufficient.

Decriminalising sustainable charcoal production in particular would be a step towards accepting given realities and might foster the transfer of financial resources to rural areas. This is also a necessary precondition for a wide-scale diffusion of more efficient kiln technologies.

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