



Review

Can there be energy policy in Sub-Saharan Africa without biomass?

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ABSTRACT

While much of the industrialised world is embracing biomass energy as a pillar of low-carbon growth, a review of national energy policies in sub-Saharan Africa reveals that biomass is widely viewed as a retrogressive source of energy that degrades the environment and engenders poverty. Initiatives to formulate alternative energy policies based on recognition, formalisation and modernisation of the sector are not appreciated by decision-makers in government, whose vision of economic growth and poverty reduction is usually based on fossil fuels and electricity. The authors argue that as long as the significant contribution and future potential of biomass energy to generate employment, support urban–rural revenue flow, strengthen domestic energy security and drive green economic development remain unrecognised, African governments will continue to endorse ‘anything-but-biomass’ policies. In this context, the development of new sector strategies that give biomass a higher profile faces a significant political challenge and may ultimately prove futile. To bring about change it is argued that first, a new image of biomass energy must be articulated, which offers a compelling and achievable vision of modernisation in production, processing, distribution and consumption. This requires an integrated set of measures to communicate the message of change, promote enabling framework conditions, expand sustainable biomass supplies, strengthen regional economies and value-addition, and capitalise on recent technological advancement. Second, valorisation of forest resources is essential to stimulate sustainable production, conversion and consumption, and can be achieved through interventions in governance, taxation, regulation and technology. Third, the modernisation process should capitalise on momentous technological advances in stoves, kilns, processing systems and means of salvaging waste energy for productive use. Fourth, replication and scale-up of the modernisation movement can be leveraged using new and innovative funding sources.

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Introduction

This paper explores the contradiction between the massive significance of solid biomass energy for countries in sub-Saharan Africa (SSA), and the low profile it is accorded in national energy policies. We argue that this tendency to side-line biomass energy, to focus on substitution or even to outlaw it, is ultimately prejudicial to the countries' sustainable economic and industrial development. We seek to make a case for the recognition, formalisation and modernisation of the solid biomass energy sector. We articulate a new strategy for conveying this case to policy-makers in a convincing manner, ultimately to improve the relevance and quality of energy policy and resulting sector strategies and regulatory frameworks.

Biomass energy policy in sub-Saharan Africa

Policy direction

National Energy Policies (NEPs) have been developed by most countries in SSA to articulate the manner in which governments seek to address issues of energy development, including its production, distribution and consumption. Within this broad policy framework, more specific strategy documents and action plans usually set out the means by which the policy will be implemented within various energy sub-sectors. For a summary of energy strategies and policies in 39 African countries, see [AFREPREN/FWD and ENDA-TM, 2006](#). Legislation, fiscal regulations and operational guidelines translate the policy and strategies into enforceable instruments.

Strategy development and target-setting is not consistent. While 35 governments in SSA have set strategic targets to increase access to electricity, only 13 have done so for other “modern” fuels (mainly kerosene, liquefied petroleum gas and natural gas) and just seven for improved wood or charcoal stoves ([UNDP, 2009](#)). Wood-based energy, despite its almost universal dominance in SSA national energy supply, is typically overlooked in the development of energy strategies. It is viewed as energy of the past, considered dirty and inefficient, and expected to be replaced as quickly as possible by alternative energy sources ([EUEI-PDF 2009a; World Bank, 2011](#)).

These negative perceptions are confirmed by the language used to describe solid biomass at policy level, compared with other sources of energy. While petroleum products and electricity are typically described as “modern” (e.g. [Republic of Rwanda, 2009, p.23](#)), solid biomass energy for cooking and heating is portrayed in energy policies as “traditional” (*ibid.*; p. 59). While wind, solar and hydro power are seen as “renewable”, biomass is typically excluded from this category and presented as an unsustainable source of energy, with its use potentially causing an energy crisis and even desertification (e.g. [Republic of Zambia, 2008, p.2](#)). Yet it has been found that in every region of the world, especially in developing countries, there is in fact a considerable surplus of biomass production compared to demand ([Openshaw, 2011](#)). While electricity, liquid fuels and renewables are said to be “commercial fuels” ([United Republic of Tanzania, 2003, p. 6](#)) that stimulate economic activity and reduce poverty, biomass energy is portrayed primarily as subsistence fuel. And in spite of its overwhelming dominance in SSA national energy balances, biomass energy is routinely addressed in policy documents only after fossil fuels (e.g. [Republic of Kenya, 2012](#)) or electricity (e.g. [Republic of Uganda, 2002](#)).

The inevitable conclusion arising from negative representations of biomass energy is that its consumption should be reduced, in favour of electricity and petroleum products. Most NEPs therefore address the means by which to dramatically increase the contribution of fossil fuels and electricity in national energy balances, while reducing the relative consumption of biomass. Malawi's NEP, for example, envisages a reduction in the relative contribution of biomass from 93% of total energy consumption in 2000 to 50% by 2020, along with the introduction of nuclear power by 2050 ([Republic of Malawi, 2003](#)). Tanzania's second National Strategy for Growth and Reduction of Poverty (2010–2015) endorses a switch from biomass to other energy sources such as electricity and aims to increase access to “clean and affordable substitutes for wood fuel” from 10% to 20% by 2015 ([United Republic of Tanzania, 2010](#)). The fact that solid biomass is used domestically for cooking and heating, while electricity is used for lighting and powering home appliances – hence one cannot substitute for the other – seems to be overlooked. Even in Rwanda, where most charcoal originates from plantations grown by private farmers and this value chain supports a significant financial flow into the rural economy, government policy still envisages a massive reduction in the use of woody biomass for energy supply ([EUEI-PDF, 2008](#)). Rwanda's Vision 2020 projects that by 2020, at least 35% of the population will be connected to electricity (up from 6% in 2000, and explicitly intended to substitute for biomass), while the contribution of woodfuels is targeted to decrease from 94% to 50% of national energy consumption ([Republic of Rwanda, 2000, p.26](#)).

Even in those countries where a significant fuel switching effort is not articulated, the biomass energy sector remains neglected and poorly governed. Policies that regulate the market are often conflicting, unrealistic or ineffective, partly because biomass energy is governed by different sectors, ministries and agencies, and reliable statistical data are generally not available ([World Bank, 2011](#)). Producers, transporters and marketers of commercially-traded biomass fuels also suffer from a lack of market incentives, steady support from financial institutions and proper oversight ([GTZ, 2007](#)).

Limitations of current policy

There are two significant problems with the widespread policy emphasis on substitution: first, it runs counter to reality and therefore fails to offer a valid framework for planning; second, it is based on out-dated perceptions that portray biomass energy in a disproportionately negative light.

It runs counter to reality

While national policies have for decades been supporting a wholesale energy switch away from biomass, consumption of biomass energy has continued to rise dramatically, even as its proportional contribution to national energy supply may have been in modest decline. The number of people in SSA dependent on biomass energy will rise by 60% between 2004 and 2030, from 575 to 918 million ([International Energy Agency, 2010](#)). In Malawi, while the NEP envisages a fall in the contribution of biomass energy from 93% of total consumption in 2000 to 50% by 2020, biomass will still account for 82% by that time if current trends continue, and demand for commercial woodfuels will have risen by 45% on 2008 levels ([EUEI-PDF, 2009b](#)). In Tanzania, the proportion of the population using woodfuel as their primary energy source rose from 92.7% to 95.8% between 2001 and 2007, while in the largest

Table 1
Benefits of biomass energy for Sub-Saharan African countries.

Benefit	Remarks
Availability, familiarity and price	Ready to use in traditional ways, no special appliance needed (though can cause air pollution problems), flexible purchases volumes, rarely out of stock
Employment creation	Charcoal creates 200–350 job-days per TJ consumed (vs. electricity 80–110, LPG 10–20, kerosene 10) (International Centre for Research in Agroforestry, ICRAF, 2002)
Energy security and diversity	Domestically-sourced biomass can be renewable, diversify energy supply, reduce imports and capitalise on SSA's land, labour and climate
Climate change mitigation	Potentially carbon-neutral and can replace fossil fuels (e.g. in power generation), especially with supportive fiscal measures
Significant potential for technological advancement and commercial investment	Renewable energy increasingly attractive for industrial and domestic applications in green economies, with rapidly growing investment. Modern use of biomass energy (amongst others through advanced conversion and combustion technologies) includes all of the benefits of traditional biomass energy plus in addition yields higher fuel efficiencies and cleaner combustion
Cleanliness and modernity	Can be a clean and modern source of energy if suitably produced, processed and burned.

city, Dar es Salaam, the number of households using charcoal for cooking increased from 47% to 71%, and those using liquefied petroleum gas (LPG) fell from 43% to 12% (World Bank, 2009). In Senegal, large numbers of consumers reverted to wood-based biomass for cooking after subsidies for LPG were removed (International Institute for Sustainable Development, 2010). In Madagascar, the upper middle class – increasingly unable to afford LPG – has begun to revert to charcoal (World Bank, in press-b). Meanwhile, in spite of highly ambitious national targets to increase the contribution of electricity to national energy supply – with a projected increase in the SSA electrification rate from 29% to 47% between 2008 and 2030 – the number of people in SSA without electricity is expected to rise by 110 million during the same period (International Energy Agency, 2010). Population growth and persistent poverty will mean that use of biomass energy continues to rise (both in user numbers and quantity consumed) for the foreseeable future, irrespective of increases in the electrification rates.

Current policies are therefore not fit for purpose, as they are based on two false assumptions: (a) that petroleum and electricity can substitute for biomass energy; and (b) that if they do so in line with national targets, then total biomass energy consumption will go down. These policy assumptions are unrealistic and unattainable. As such, they offer an inappropriate framework for sector strategies and legislative provision.

The ubiquitous policy goal of substitution is also based on out-dated perceptions. During the 1970s and early 1980s, the harvesting of biomass was mistakenly portrayed as the leading driver of global deforestation under the “woodfuel gap” theory (Mahiri and Howorth, 2001). More recently, biomass was taken to be an unavoidably polluting source of energy, and such fuels were widely linked to poverty and under-development (IIED, 2010). However, there have been significant revisions in both understanding and technology: it is now accepted that biomass harvesting is only a minor contributor to deforestation (Openshaw, 2011); it has also been shown that biomass can be burned cleanly and safely, if properly prepared and used in efficient appliances (Global Alliance for Clean Cookstoves, 2012); and it is appreciated that widespread biomass use is more often an indicator of poverty, rather

than a cause (Bojö and Reddy, 2003). Why then is this not reflected in the more recent NEPs?

Not only have many of the earlier perceived negative connotations of biomass energy been contested, but there is also now a significant movement in the industrialised world back to renewable, low-carbon sources of energy, many of them are biomass-based (Intelligent Energy Europe, 2011). Accordingly, densified woodfuel (wood pellets, briquettes and chips) is acquiring increasing importance because of the growing domestic and industrial applications for heating, CHP and electricity generation. Europe's woodfuel production increased from 125 million m³ in 2001 to nearly 160 million m³ in 2011 (FAO Stat, 2012). Developments of this kind will likely herald a renaissance of solid biomass also in developing countries, and will have implications for the wood management regime in Africa as pellets or chips can be transported economically over long distances, and open up opportunities for trade in biomass between countries of the north and south. Globally, much better end-use equipment is available and could be used in Africa if policies were more conducive to its introduction.

The persistent failure of NEPs in SSA to recognise current realities and to embrace the technological opportunities linked to biomass energy, means that the green growth revolution is leaving the region behind.

The case for change

Biomass energy offers significant benefits for SSA countries, as summarised in Table 1.

These benefits are elaborated below:

- Availability, familiarity and price: biomass meets energy needs at all times, without expensive conversion devices, and in a form that people can readily use. For traded firewood and charcoal, the quantity purchased can be adjusted to a household's available cash, and these fuels are available through a wide network of retailers from whom there is almost never a shortage. In contrast, consumers report that the supply of other fuels – especially LPG – is unreliable and this undermines its attractiveness for regular use (World Bank, 2009).
- Employment creation. Gross employment figures for the commercial solid biomass energy sector in selected countries may be found elsewhere (e.g. Openshaw, 2010). Even if conversion and utilisation efficiencies for biomass fuels increased to a level comparable with LPG and kerosene, they would still provide far more employment per TJ consumed.
- Energy security and diversity. Volatile world energy prices pose great risks for economic and political stability, and can have dramatic effects on energy-importing developing countries (Goldemberg, 2004). Renewable sources of energy, such as domestically-sourced biomass, can help diversify domestic energy supply, leading to increased energy security and independence from imports. Biomass production requires land, sunshine and labour, which many SSA countries have in plenty.
- Climate change mitigation. Sustainably sourced woodfuels are believed to be carbon-neutral, and can contribute to climate change mitigation by replacing fossil fuels (FAO, 2007), a trend that can be accelerated by appropriate carbon taxes.
- Significant potential for technological advancement and commercial investment. As the world moves toward a low-carbon economy, renewable sources of energy are becoming increasingly attractive for industrial and domestic applications. The generation of electricity and heat in combined heat and power (CHP) plants fuelled with biomass is already expanding rapidly in Organisation for Economic Co-operation and Development (OECD) countries. In Germany, for instance, biomass-based CHP grew by 23% p.a. from 2004 to 2008 (Fritsche et al., 2009). There is also growing commercial interest to

study cogeneration from charcoaling operations (see Miranda et al., in this issue), a process that enables pyrolysis gases wasted during traditional charcoal-making to be captured and converted to usable electrical or thermal energy. At least nine companies in Brazil, Denmark, France and Australia have developed commercial charcoaling cogeneration pilot plants (World Bank, in press-a).

- Cleanliness and modernity. Although biomass-derived fuels are often produced and used in a relatively polluting manner, they have the potential to become clean and modern sources of energy. This requires several conditions to be satisfied simultaneously. First of all, the fuel should be uniform, standardised in form and energy density to make it more attractive to industrial and aspirational consumers, and available in large quantities around areas where people live. This will include processed fuels such as briquettes and pellets that are sold industrially and through urban retail chains. Second, it requires end-users to buy specialised equipment, capable of combusting the standardised fuel not only very efficiently, but also very cleanly (with no particulate matter emissions or smoke), both indoors and outdoors. Stoves with electric fans and auto-start have already been developed. Finally, the production and conversion of the raw biomass into processed fuel, whether from trees, grass, or residues, should be efficient and not lead to a reduction in the availability of the biomass itself.

Initiatives to develop more biomass-friendly energy policy

EUEI-PDF

A number of development actors have supported the drafting or review of energy policies or strategies in SSA. A leading example is the Partnership Dialogue Facility of the European Union Energy Initiative (EUEI-PDF), an instrument developed and funded by several EU member states and the European Commission. Its objective is to support the development of policies and strategies for the promotion of access to energy at national and regional level. As part of this mission, EUEI-PDF supports countries in SSA to design action-oriented strategies that create an enabling environment and platform for government, private sector and donor-funded investments in improved energy access (EUEI-PDF, 2012). A key component of this effort has been the provision of technical assistance for the development of national Biomass Energy Strategies (“BEST”). In response to government requests, such assistance has so far been provided to Botswana, Lesotho, Malawi and Rwanda, where strategies were completed in 2008 and 2009, and in Ethiopia, Mozambique and Tanzania, where BEST development is currently underway.

In collaboration with the government counterpart ministry responsible for energy, EUEI-PDF develops Terms of Reference for BEST development in each partner country. These set out the means by which government-approved consultants should develop a strategy to (i) ensure a sustainable supply of biomass energy, (ii) increase efficient and effective use of biomass energy, and (iii) promote access to appropriate, alternative sources of energy. There may be minor differences in scope that reflect particular countries' specific interests (in Botswana, for example, the government wished the promotion of gasification of urban solid waste for power generation to be included in BEST development). The expectation is that the process will result in a strategy that closely aligns with the NEP and elaborates the means by which it may be implemented within the biomass sub-sector.

Experience from the four completed BEST documents and scoping studies in Tanzania and Mozambique with which the authors were involved exposes a divergence of opinion in this process. The contracted technical advisors have sought to develop strategies that embrace the biomass energy sector as a significant economic force and a potential driver of sustainable growth within the target countries. This perception has turned out to be at odds with the vision of biomass energy

set out in the NEPs. While the strategies subsequently drafted have sought to highlight the missed opportunity of biomass, the partner governments would have preferred an “anything-but-biomass” approach, as they look for ways to reduce – and eventually replace – this form of energy, in line with their NEPs.

Other policy change experiences

This is not a finding exclusive to the BEST process. The World Bank recently developed a forward-thinking policy paper on the charcoal sector in Tanzania (World Bank, 2009), in which a persuasive case for legitimisation and modernisation of the sector for national economic benefit was articulated. In spite of a pragmatic effort to reflect industry realities, its recommendations were effectively ignored by the government (Acacia Natural Resource Consultants, 2010).

Regional Forest Law Enforcement and Governance (FLEG) initiatives (e.g. ENA-FLEG, EA-FLEG, and A-FLEG), as well as the EU FLEGT Action Plan, support numerous countries in their quest to combat illegal logging and trade in illegally sourced forest products, including related issues such as corruption and poaching. However, these initiatives focus on internationally traded commodities and so far have had little – if any – bearing on the dynamics of largely non-regulated domestic wood energy markets. Owing to the fact that most national energy strategies and policies remain silent on solid biomass, national policy and regulatory frameworks likewise fail to address open-access use, lack of regulation and enforcement, price distortions and corruption related to the production and use of firewood and charcoal. Taken together, these factors curtail the desired impact of policy options and mechanisms typically promoted through technical assistance (specifically differential taxation, harvesting regulation, field checks and certificates of origin). Countries often lack implementation capacity, and suffer from low awareness levels, inadequate resource allocation and widespread corruption.

The UN Foundation recently launched the Global Alliance for Clean Cookstoves, with the intention of launching an all-out effort to disseminate improved cookstoves on a massive, global scale, based on lessons learnt from earlier experiences and recent technological improvements. However, the effort is almost entirely directed towards the use and dissemination of the stoves, with very little consideration given to the production and sustainability of the biomass fuels required to fuel them.

At country level, the example of Rwanda illustrates how good practice in the biomass energy sector can be thwarted by unsupportive policy. Although Rwanda's charcoal is mainly produced from farm-grown trees, its use continues to be perceived in political circles as one of the main drivers of deforestation. As a consequence, farmers are required to secure permits (that are difficult to obtain), even for cutting trees on their own land. Land-owners are discouraged from investing in more advanced production methods by such bureaucracy, and revert to quick illegal conversion out of sight using small and inefficient kilns. Adoption rates of improved carbonisation techniques with higher efficiencies would improve, if access to permits was simplified (CARE International, 2011).

The case for an alternative way forward

The BEST initiative, which seeks to promote recognition of biomass within the NEPs of developing countries, has often been frustrated. Given the obvious linkages between better management of biomass energy and poverty alleviation, environmental improvement and climate change mitigation and adaptation, this seems all the more surprising.

While it may be tempting to attribute failure in achieving policy change to lack of awareness, political will and ownership of the BEST process within the governments of the targeted countries, this

does not lead to solutions that would significantly improve the situation for subsequent BEST efforts. In any case, such deficits are but one part of a bigger picture — even in international circles and the wider development community, the promotion of biomass is often thwarted by lack of consistency and coherence. For example, international climate change debates and initiatives to promote renewable energy often regard biomass as an awkward “fifth wheel”. Biodiversity conservation organisations frequently regard the use of wood-fuel as a driver of forest degradation (Greenpeace, 2011). Initiatives with a social or health focus tend to emphasise the harmful consequences of indoor pollution (Bruce et al., 2000) and the workload of women and children in gathering fuel. The use of crop residues for fuel in countries of more extreme woodfuel shortage seems at odds with measures to enhance agricultural productivity, given the potential incompatibility of burning significant amounts of biomass for bioenergy production with alternative of more sustainable forms of agriculture that rely on biomass inputs instead of inorganic fertilisers for their nutrient balance (Muller, 2009).

If the promotion of biomass as a renewable, climate friendly, environmentally sound and technically adapted option is to find a more receptive audience and succeed, then it is time to re-consider established approaches. This requires much more than a country-specific effort to win over policy-makers resistant to the BEST process. It demands a concerted international effort with multiple points of simultaneous action.

Recommended measures

Image change

Can we realistically expect to break the political deadlock? This paper argues that an entirely new outlook on biomass energy is required, aiming for comprehensive modernisation of the ways in which biomass fuels are produced, processed, distributed and consumed. This shift of perception seems most likely to materialise if it can be linked to the emergence of green economies, climate change and poverty alleviation.

Modernisation, as defined by the authors, emphasises the significance and synergistic contribution of sustainably sourced biomass energy with a view to (i) promoting the predictability/security and economic viability of energy supplies, especially for poorer segments of society, (ii) providing energy that is environment-friendly and carbon-neutral, and (iii) avoiding health hazards associated with the use of low-tech biomass appliances.

To achieve these impacts in a balanced and harmonious way, modernisation addresses the entire biomass value chain from sustainable production to efficient and equitable distribution and technically advanced consumption. This requires streamlining of sector policies that apply to forestry, energy, economic development and environmental protection, with the aim of creating enabling framework conditions and providing incentives.

Modernisation requires a consistent development vision integrating two principal benchmarks: (i) demographics and (ii) the ecological and socio-economic limits of sustainable biomass production. As populations continue to rise, per-capita consumption of biomass must decrease. Viewed from this angle, modernisation of biomass energy means an evidence-based reduction of current consumption levels — as opposed to both the non-regulated status quo and unrealistic reduction goals informed by negative perceptions, rather than empirical facts.

It seems unlikely that the allocation of additional funds for biomass energy promotion will materialise on a significant scale. Any new approach must therefore aim to optimise efficiency within the limits of currently available resources. The modernisation agenda is accordingly market-based, and involves public funding only to the extent necessary to remove current market distortions caused by non-regulated access and use. It aims to facilitate the transition

towards sustainable energy, rather than to subsidise biomass energy.

Therefore *focusing*, defined by the authors as optimising impact on energy policy with existing resources, must be a key principle in the modernisation agenda.

First, focusing requires biomass energy support to be aligned with green economy development, climate change mitigation and adaptation and poverty alleviation with a cross-sector perspective. Rather than emphasising the improvement of sector-specific NEPs, international development agents should aim to mainstream biomass issues more broadly in rural development policies, forest policies, pollution control strategies (e.g. emissions standards) and the like. To this end, initiatives such as EUEI-PDF, along with other donor-supported efforts to engage in biomass energy promotion, should complement their engagement in partner countries with dedicated advocacy efforts that aim to raise the profile of biomass energy. When biomass energy is used in a modern way, it could substantially contribute to economic development, climate change mitigation and poverty alleviation. While the case for biomass energy seems compelling theoretically, it may be further strengthened through practical experience and lessons learned — based on a systematic evaluation of past support, and aiming to identify factors of success as well as challenges. Work along these lines may draw on the experience of developed countries, the European Union in particular. The EU Biomass Action Plan requires all member states to formulate national biomass action plans (BAPs). This exercise has so far been completed in Germany, the UK, Spain, Finland, Ireland and the Netherlands. In Germany, biomass energy is regularly referenced in the government's periodic forest report, the national Wood Promotion Charter, as well as the action programme “energy for tomorrow — opportunities for rural areas” of the Federal Ministry of Agriculture and Food Consumer Protection. The World Bank, when joining the United Nation's Sustainable Energy for All initiative, proposed to advance the clean cooking agenda by supporting clean cookstoves and household fuel programmes in Africa, South and East Asia, and Central America, an example that should be followed by other international, as well as bilateral, donor agencies (World Bank, 2012c).

Second, the scope of biomass energy promotion may be too wide to be meaningfully supported with currently available resources. For this reason, wood-based biomass should be prioritised over crop-residues or agro-industrial fuels. There are several reasons for this prioritisation. First, most countries already have consolidated political, legal-regulatory and institutional frameworks for the forest sector (regardless of how well those are implemented in practice). While forests are pivotal to the livelihoods especially of the rural poor, alternative biomass energy supply options (such as the burning of dung or crop residues that have dual use as fertilisers, or the promotion of agro-industrial fuels) often risk adversely impacting already-low agricultural productivity, and might intensify land use competition.

Modernisation calls for conceptually-linked interventions with the following components:

Modernisation — dimensions and conceptual elements	
Image change — spreading the message	<ul style="list-style-type: none"> • Linking modern biomass energy promotion to high-level or internationally recognised processes (climate change, national forest programmes, poverty alleviation, food security etc.) • Sensitising policy decision-makers in related sectors • Promoting science and research to counter the backward image
Promoting enabling framework conditions	<ul style="list-style-type: none"> • Regulating access and use of biomass resources (forests in particular), promoting tenure security • Harnessing decentralisation dynamics, local empowerment • Fiscal reforms, creating incentives, removing market distortions • Combating corruption and fostering good governance

(continued)

Modernisation – dimensions and conceptual elements	
Expanding sustainable supplies	<ul style="list-style-type: none"> • Sustainable forest management (SFM) • Agro-forestry • Plantation management
Strengthening regional economies and value added	<ul style="list-style-type: none"> • Market formalisation • Value chain development • Facilitating access to capital
Capitalising on technological advancement	<ul style="list-style-type: none"> • Disseminating efficient/safe/convenient conversion and consumption technologies and appliances • Promoting technical standardisation

Value chain approach

If biomass energy strategies are to realise their potential for poverty alleviation and the creation of employment and business opportunities, prevailing informal production and distribution of solid biomass must be replaced with economically viable and socially equitable arrangements in a more modern and organised fashion. Promoting solid biomass energy in a holistic manner means addressing the full value chain, from the sustainable production of wood-based fuels to their processing, conversion, distribution and marketing, all the way to end-consumers and related technology. This approach faces a formidable challenge arising from free access to forest resources, non-regulation of wood-fuel production, rent-taking by individuals opposing effective regulation, and non-formalised wood-fuel markets. These factors distort markets to a point where (i) sustainable production is not economically viable, (ii) producer prices are kept artificially low until such time as forest resources have been depleted and (iii) investments in advanced conversion and consumption technologies are not economically worthwhile. This situation underscores the need for cross-sector responses, linking the promotion of biomass energy to forest sector development and governance, through the following salient elements:

- Promotion of sustainable wood-fuel production based on secure tenure, community-based forest management under simple and effective plans, and governance interventions to suppress free access by non-legitimate users;
- Establishment of a tamper-proof system for documentation of origin, enabling operation of a differentiated taxation system to levy surcharges on wood from non-documented sources (with a view to generating funds for the operation of the verification and control system and for re-investments into promoting sustainable forest management);
- Establishment of regulated markets; and
- Dissemination of fuel-efficient, safe and advanced consumption technology.

The underlying strategy is to valorise forest resources (thereby ensuring their protection and sustainable management for the direct benefit of rural communities) and to generate funds required to cover (i) operational expenses, (ii) public support and incentives, as well as (iii) subsidies designed to ease the inevitable burden for the poorest segments of society. As prices of wood-fuel rise and market distortions are removed, advanced conversion technology and enhanced stoves become competitive. As the system continues to expand, efficiency rises and price increases are effectively compensated by energy savings and the added-value that advanced technology affords (including safer, less polluting and more convenient appliances). To be fully effective, the approach outlined above needs backing up with anti-corruption measures at the implementation level, and streamlining with national anti-corruption strategies. This highlights yet another cross-sector link and underscores the need for alignment of biomass energy support.

Innovation through research and development

Conceptually, modernisation of biomass energy needs to capitalise on recent substantial technological advances resulting in improved fuel efficiency, safety, cleanliness and ease of use. This requires refocusing biomass energy projects, shifting from small-scale interventions at the target-group level towards a modernization and commercialisation of the entire wood-fuel value chain. To be effective, interventions of this kind need to take full advantage of recent research and development and associated technological advances. This means amongst others promoting “next generation” improved wood and charcoal stoves (e.g. micro-gasifiers which operate on volatile gases, leaving charcoal instead of ash) (Roth, 2011) and improved kiln designs (e.g. low-cost retorts that utilise gases to pre-dry wood or assist in the carbonisation process, instead of venting them into the atmosphere). Other options are to move towards new types of wood-based fuels, including pellets and wood chips, as well as industrial timber residues that are often currently disposed of by burning them on site (in Cameroon, industrial timber residues amount to 2 million m³ annually). To this end, it is worthwhile looking into electricity production generated from biomass for off-grid areas (Dasappa, 2011). A key challenge in this regard is to devise ways of cushioning the economic burden of the (still relatively high) investment cost associated with the installation of advanced technology.

Optimising wood-fuel value chains holds the potential for synergies with on-going or emerging climate change mitigation frameworks such as REDD+ (Reducing Emissions from Deforestation and Forest Degradation), providing vital incentives for the rehabilitation and sustainable management of degraded forests and woodlands. It directly supports the shift to a green economy and promotes poverty alleviation. To this end, it should be focused on structurally disadvantaged regions lacking alternative options for employment and commerce and to promote pilot REDD projects.

Given the complexity of biomass value chains, multi-level approaches seem most appropriate: simultaneously addressing policies, energy demand management, energy supply enhancement and fiscal measures. Experience shows that it is difficult if not impossible to realise a real change through national policy support alone, or through small-scale project intervention at the level of rural communities. Instead, support for modernisation of the biomass energy sector ought to be embedded in the dynamics of the decentralisation processes which are emerging in many SSA countries. Field level demonstration of best practices and regional governance support combined create practical lessons learnt that can be fed back into the national policy dialogue – using hard evidence and demonstrating the economic viability of sustainable wood-fuel production, along with its environmental and social benefits. Since no blueprints or patent remedies exist, selection of the most appropriate modes of delivery and technologies needs to build on research and development. This requires north–south as well as south–south research cooperation.

Promoting replication through innovative and additional funding sources

The suggested holistic approach heralds new and additional funding sources which have thus far been largely ignored by biomass energy support strategies and interventions. Promotion of sustainable wood-fuel production, reforestation and forest rehabilitation may be compatible with emerging REDD + processes. Afforestation of denuded, degraded and marginal lands may be eligible for credits in voluntary carbon markets (and potentially even compliance markets, assuming appropriate institutional frameworks can be put in place for areas large enough to justify the cost). Payments for environmental services (PES) may offer further sources of funding, since sustainably managed forests provide a wide range of conservation benefits for soil, water and biodiversity. Projects promoting advanced stoves

have already been registered under the Clean Development Mechanism (GIZ, 2011), and the improvement of kilns may achieve similar recognition due to reductions in methane and nitrous oxide emissions.

The BEST process needs to link strategy development with follow-up support to implementation

In this respect, two improvements seem necessary: first, to link the development of biomass strategies as closely as possible to existing environmental policy processes (e.g. on climate change, rural development, or national forest programmes); second, to provide systematic follow-up support and monitoring for implementation of the new strategies.

Conclusion

Biomass is SSA's dominant source of energy, and will remain so for the foreseeable future. Demand is expected to rise significantly, despite major electrification programmes that governments mistakenly believe will provide a substitute. Current policies that prioritise fuel switching are unrealistic and incomplete, failing to recognise the realities of actual energy costs, future consumption trends, the significant potential offered by biomass energy and the natural advantages of SSA in this sector. However, efforts to develop a more supportive policy environment for the development of a formalised biomass energy industry are often thwarted by entrenched anti-biomass sentiment at high level. An alternative approach is required, if perceptions and policy are to become more realistic and effective. If this fails, then indeed the chances are great that SSA will see a future without biomass energy – but this will not be a future to look forward to.

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