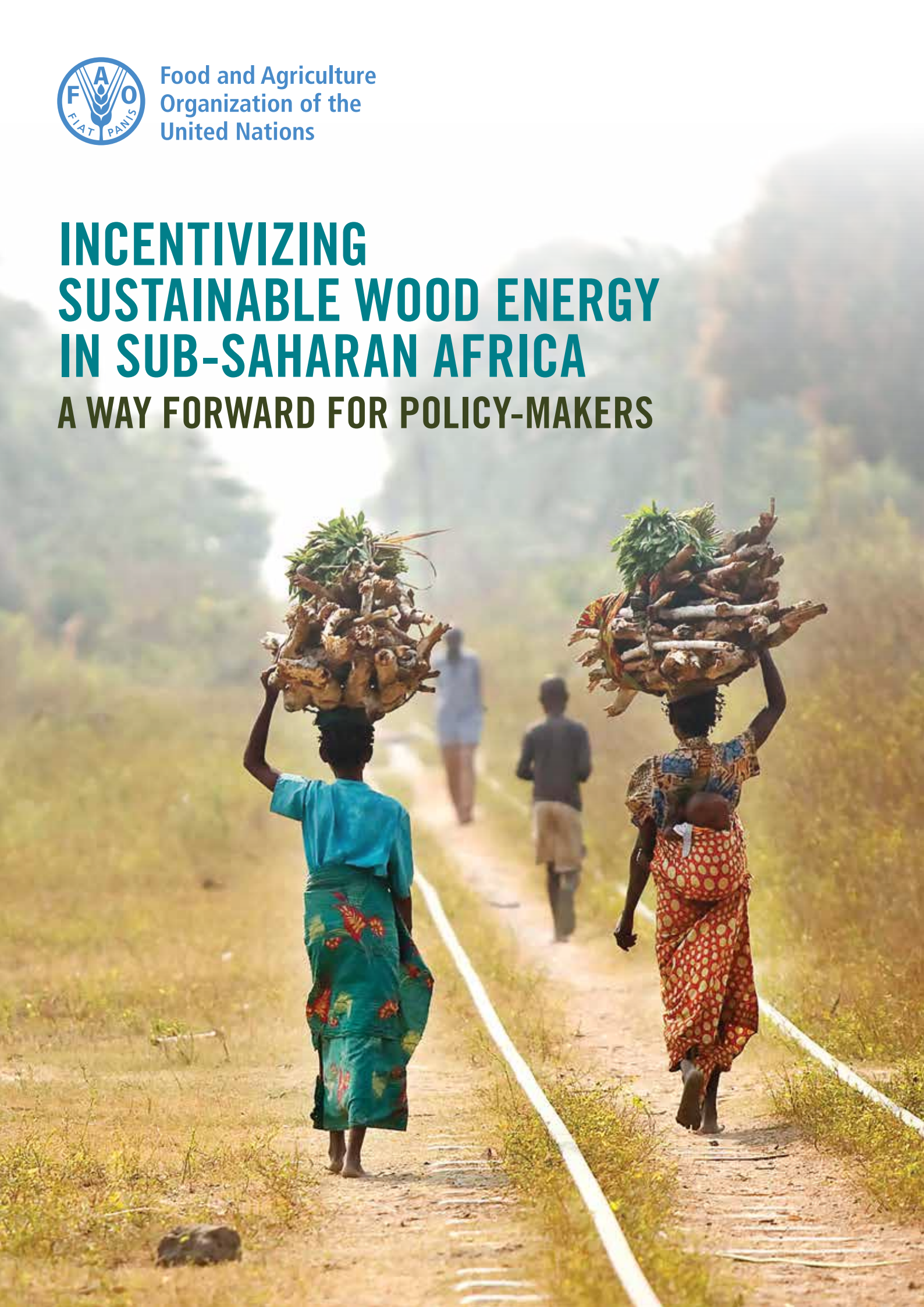




Food and Agriculture  
Organization of the  
United Nations

# INCENTIVIZING SUSTAINABLE WOOD ENERGY IN SUB-SAHARAN AFRICA

## A WAY FORWARD FOR POLICY-MAKERS



# KEY POLICY POINTERS

Sub-Saharan Africa (SSA) will continue to rely predominantly on woodfuel for energy for the foreseeable future. Governments in the region have tried a range of policies and regulations to avoid the negative impacts of woodfuel sourcing and to accentuate the benefits, from which many lessons can be learned.

This policy brief reviews experiences with woodfuel policies and regulations in SSA and presents the following six main findings for promoting sustainable wood energy in the region:

- 1 Multiple measures involving structural changes and targeted regulatory measures have the most profound and lasting impacts.
- 2 Secure tenure, either individual or communal, is a crucial ingredient in sustainable woodfuel sourcing.

- 3 Permit systems must be **simple and easy to enforce**, with quotas based on **simple management plans** developed with local participation.
- 4 **Differential taxation** that rewards harvesting from sustainably managed sources can be an effective targeted financial measure.
- 5 When taxes or permits are implemented, a substantial fraction of the **revenues must reach rural communities** to incentivize participation.
- 6 Efforts to bring about sustainable woodfuel sourcing **need to be maintained for long periods** and must not be undermined by contradictory policies.



# INTRODUCTION

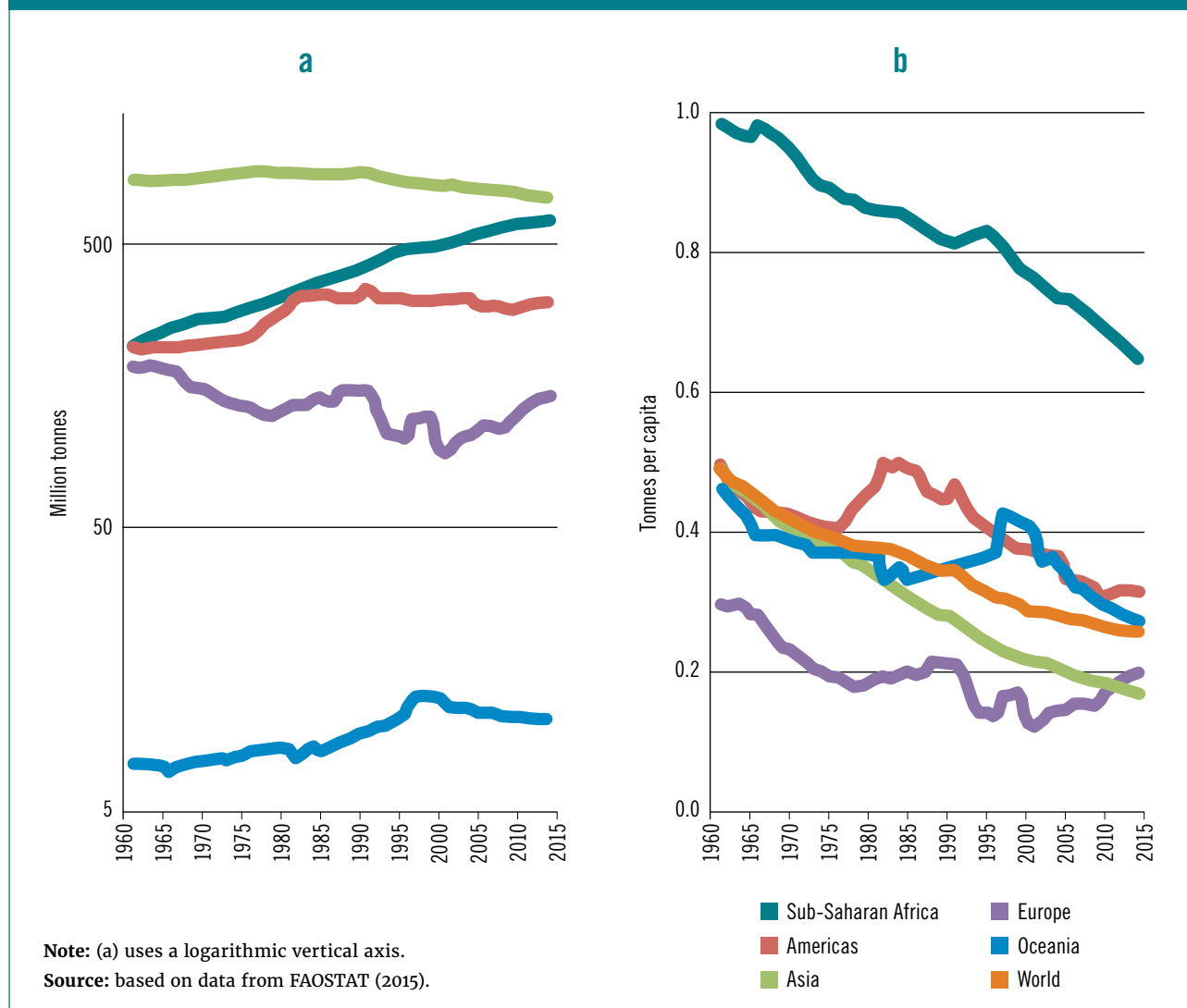
Throughout sub-Saharan Africa (SSA), people rely predominantly on woodfuels<sup>1</sup> as a source of energy. In most of the world's regions, woodfuel dependence has declined or remained steady; in SSA, however, per capita consumption is 2–3 times higher than in any other region, and total consumption continues to increase (Figure 1). Although demand for commercial energy sources such as electricity and cooking gas is increasing in SSA, these sources are unlikely to fully displace woodfuels, particularly among the rural population, which is projected to reach nearly 750 million by 2030 (UNDESA, 2014).

Woodfuel use is associated with many negative impacts (Bailis, Ezzati and Kammen, 2005); on the other hand, the widespread availability and potential renewability of, and enormous market for, woodfuel creates employment and presents opportunities for sustainable value chains. Motivated by a desire to avoid the negative impacts and accentuate the benefits, many SSA countries – often with support from development organizations – have

implemented regulations, policies and projects attempting to bring sustainability to the woodfuel sector. This policy brief reviews those interventions, identifies (partial) successes as well as failures, and sets out six best practices for promoting the sustainable sourcing of woodfuels in the region.

<sup>1</sup> In this brief, “woodfuel” comprises both charcoal and unprocessed firewood.

FIGURE 1. TOTAL (A) AND PER CAPITA (B) WOODFUEL CONSUMPTION IN THE WORLD'S MAJOR REGIONS





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Charcoal for sale in Ngozi, Burundi

## SUSTAINABILITY OF WOODFUEL

In countries throughout SSA, as in many other developing countries, woodfuels are often sourced from natural woodlands with minimal management, or they are produced as a by-product of land clearance for agriculture. In any given landscape, tree cover declines when woodfuel is harvested faster than wood is produced, potentially contributing to forest degradation and deforestation. Notwithstanding this, woodfuel plays a pivotal role in the livelihoods of countless poor and marginalized families throughout SSA, and actions to make its production and consumption more sustainable can generate wider socio-economic and environmental benefits. There is growing consensus that formalizing and modernizing the woodfuel value chain in SSA would increase the benefits and reduce the negative impacts.<sup>2</sup>

Transforming the woodfuel sector has proved difficult in SSA, however. The issues that need to be addressed cut across government sectors, which rarely coordinate with each other and which often consider woodfuel to be beyond their jurisdictions. For example, energy ministries largely focus on oil, gas and power production, forestry departments concentrate on tree plantations, and environmental agencies are dedicated to conservation. Woodfuel licensing and taxation systems are in place in some countries, but

decades of legal ambiguity or outright criminalization have fostered corruption and prevented woodfuel markets from gaining legitimacy; the net result has been little actual revenue collection. Foregone annual tax revenues from woodfuel range from US\$2–3 million in Mali, Burkina Faso and the Niger (de Miranda *et al.*, 2010; Schure *et al.*, 2013), to US\$8 million in Côte d'Ivoire (GIZ, 2015b), US\$17 million in Malawi (Zulu, 2010), and US\$100 million in the United Republic of Tanzania (World Bank, 2009). Other benefits, such as employment and increased afforestation and reforestation, have failed to materialize to the extent anticipated.

<sup>2</sup> For informative reviews of key issues and sources, see Sander, Haider and Hyseni, 2011; Mwampamba *et al.*, 2013; Schure *et al.*, 2013; Zulu and Richardson, 2013; GIZ, 2015a, 2015b.

# INTERVENTIONS SUPPORTING THE SUSTAINABLE SOURCING OF WOODFUEL

A number of policy measures have been devised and implemented to promote the sustainable sourcing of woodfuel. These include structural changes in major socio-political institutions, such as land-tenure and sustainable forest management regimes; regulations banning woodfuel products and promoting producer associations; and fiscal policies such as taxes and subsidies. These approaches are examined in more detail in the following sections.

There have also been attempts to introduce modern technologies, such as efficient charcoal kilns and processed woodfuels like wood pellets and briquettes. Such technological change could play an important role in modernizing woodfuel value chains, but it is unlikely to be effective without major structural and institutional changes to ensure sustainable woodfuel sourcing.

## SECURE TENURE AND FOREST MANAGEMENT RIGHTS

Secure land tenure is often considered a precondition for sustainable development, particularly in rural areas, where livelihoods are tied closely to the land. Both land-tenure reform and the devolution of forest management have played roles in transforming woodfuel markets in SSA. Policies addressing these issues have mostly been implemented as part of larger shifts in governance rather than specifically to reform the woodfuel sector (Ostrom and Nagendra 2006; Robinson, Holland and Naughton-Treves, 2011). But tenure and forest management reforms have also been implemented specifically to support woodfuel value-chain development. Years before Chad introduced a broad ban on charcoal (discussed below), for example, it was host to one of the earliest attempts to develop a formal market for woodfuel sourced from community-based production, including measures to decentralize forest management and strengthen communal tenure in woodlands.

In the Niger, donors funded a succession of woodfuel market development programmes, with more than 300 rural woodfuel markets established by 2005 (Sepp, 2008). In the late 1990s, Burkina Faso introduced participatory forest management areas, which, combined with regulations governing the harvesting and marketing of forest products (including woodfuel) and a system of taxes and fees, resulted in substantial community benefits (Schure *et al.*, 2013).

Tenure reform was undertaken in a reforestation initiative (“Reboisement Villageois Individuel”) in Madagascar, focusing on individual smallholders (Ackermann *et al.*, 2014; Etter *et al.*, 2014). The reform, which relied on voluntary community participation, jump-started community-based reforestation and enhanced woodfuel supply.

Some East African nations have implemented forest management and tenure reforms with implications for woodfuel sourcing. In 2003, Uganda implemented a major forest-sector reform that made district forest offices responsible for charcoal production in their jurisdictions (Shively *et al.*,



Farmers carry firewood in Goulbi, the Niger

2010). Ethiopia piloted participatory forest management in the 1990s, whereby control over certain state-owned forests was ceded to community forest user groups, which were permitted to extract firewood for commercial sale (charcoal production was not allowed) (Ameha, Larsen and Lemenih, 2014). Similarly, Kenya’s 2005 Forest Act permitted the formation of community forest associations, which were given rights to use forest resources and were obliged to manage and conserve the areas under their control. Kenya’s Charcoal Rules, passed in 2009, allow community forest associations to produce charcoal; the regulatory requirements are complex, however, and few associations have applied for permits.

Although the effectiveness of broader tenure reforms on woodfuel production is difficult to determine because the

impacts cannot be attributed directly, secure tenure appears to be particularly important for a sustainable woodfuel sector. Depending on the context, such tenure may be over communally held woodland resources (e.g. Chad, the Niger) or individually held private land (e.g. Madagascar).

### **BANS ON WOODFUEL PRODUCTION OR TRANSPORTATION**

For decades, woodfuel harvesting has been perceived as a cause of forest degradation and deforestation. Often, the policy response has been to ban the practice, but the evidence indicates that blanket bans are ineffective in delivering sustainable outcomes (and can have significant negative impacts), particularly if states fail to take measures to promote and facilitate access to alternative fuels and have low enforcement capacity.

Kenya and Ethiopia, for example, have had tight restrictions on charcoal production for many years, but these have had little impact on demand other than to drive up prices and encourage corruption. Bans have had similar effects in Cameroon, Malawi and the United Republic of Tanzania (World Bank, 2009; Zulu, 2010; GIZ, 2015a). The Government of Chad strictly enforced a 2009 ban on charcoal: it stopped charcoal from being brought into the capital, N'Djamena, seriously undermining food security. As a replacement for charcoal, the government promoted liquefied petroleum gas, but few people could afford this fuel, forcing them to obtain cheaper but lower-quality alternatives such as cow dung and combustible trash, which are more polluting than charcoal (Hicks, 2009; FAO, 2017).

### **LICENCES, QUOTAS AND PERMITS**

Licences, quotas and permits are common regulatory tools for controlling production and revenue. Quotas define the volume of wood to be harvested, ideally in line with the sustainable yield (i.e. the volume of wood that can be harvested without causing a long-term decline in growing stock). Typically, licences and permits are applied to harvesting or transport and may or may not be linked to quotas. The overall effects of these measures are unclear. Onerous bureaucratic hurdles can be created for rural producers when a central authority defines quotas and issues permits. In Cameroon, for example, applications are submitted to an interministerial committee, and approved applications are forwarded to the prime minister's office (GIZ, 2015a). Permits may also specify species, age or other characteristics of the trees to be removed. In Madagascar, forest administrators only issue permits for trees over a certain "exploitable age" and above a minimum diameter (GIZ, 2015a).

Under decentralized management, local communities set quotas or work in conjunction with local forest officers. In Zambia, licences issued at the district level are required for the production and transport of charcoal. One analysis noted, however, that the fees for such licences increased dramatically through the 2000s, and adherence to the regulations declined accordingly (Gumbo *et al.*, 2013).

Woodfuel harvesting and production are dispersed activities and therefore difficult to monitor, and efforts to regulate them through licences and permits have had mixed results. In contrast, transportation, which is usually confined to roadways, is easier to oversee; transport permits, therefore, are popular regulatory tools. These can also be linked to production: in Madagascar, for example, applicants for charcoal transport permits must show authorized harvest permits with the origin, destination and quantity of charcoal transported (GIZ, 2015a). Transport permits may be provided free of charge, contingent on the payment of upstream fees (e.g. in the case of Senegal – see GIZ, 2015a), or costs may vary according to the size of the vehicle, as in Cameroon (GIZ, 2015a).

Regulatory measures such as licences, quotas and permits provide more flexibility in woodfuel production and supply than do bans. The complexities of determining quotas and issuing and enforcing licences and permits, however, can strongly affect the efficiency and effectiveness of such measures. Permit systems must be uncomplicated and easy to enforce, with quotas based on simple management plans developed with local participation. Systems under local management – with permits issued by communities or local authorities – are likely to function better than centralized systems, and communities must have recognized, enforceable rights over forest resources.

### **TAXES AND SUBSIDIES**

Taxes and subsidies have both been employed in SSA as a way of regulating the woodfuel sector. Taxes can be imposed at any stage of the value chain, from extraction through to retail. To minimize tax evasion, however, governments must have the ability to monitor and enforce tax collection. In Burkina Faso, a tax of 300 FCFA (about US\$0.50) is levied per cubic metre of wood extracted, and the revenue is shared equally between communities and the national treasury (Schure *et al.*, 2014), thereby providing an incentive for communities to adhere to regulations.

Differential taxation is an approach implemented at the extraction stage. West African states levy lower taxes on wood harvested in managed forests and higher taxes if the wood is obtained from open-access sources. In Chad and the Niger, such differential taxation created an incentive to obtain wood from community-managed sources (NL Agency, 2010; GIZ, 2015b). In contrast, Mali's tax system did not catch on: weak enforcement made it more profitable for producers to risk getting caught with illegal wood than to pay for permits. Senegal has also had difficulty in implementing differential taxes (Schure *et al.*, 2013).

Subsidies – another type of fiscal measure – have been used or proposed for the following:

- ▶ The establishment of small-scale plantations and woodlots.
- ▶ To provide incentives for reforestation and afforestation – such as with free or subsidized seedlings, land for woodlots, cash transfers to offset establishment and



Rural women sell their fruits and charcoal, United Republic of Tanzania

maintenance costs, and below-market credit; investments may be recovered through taxes on the woodfuel produced. These approaches have been successful in Latin America (de Miranda *et al.*, 2010).

- ▶ Assisted natural regeneration, which was used in the European Union-funded Makala (charcoal) Project in the Democratic Republic of the Congo in 2009–2013.
- ▶ The funding of demonstration projects, concessionary loans, training and market development for alternative sources of supply, such as briquettes and pellets.

Data on woodfuel subsidies are limited, making it difficult to determine their impact on the overall sustainability of woodfuel supply. Nevertheless, analyses generally show that taxation is effective only when combined and implemented with other measures, such as strong enforcement and the equitable sharing of revenues with local communities. Differential taxation to reward harvesting from sustainably managed sources has been used successfully as a targeted financial measure. When taxes or permits are applied, a substantial fraction of the revenues raised must reach target communities as a way of incentivizing compliance.

### COOPERATIVES AND PRODUCER ASSOCIATIONS

Cooperatives and producer associations have been promoted in a number of countries as a way of supporting the sustainable production and supply of woodfuel. There is evidence – for example in Mali and the Niger – that this approach can help producers gain bargaining power, but it can also be ineffective, particularly if producers lack the capacity to formulate and operate such associations. In Senegal, for example, middlemen rather than producers formed

cooperatives to gain leverage over other actors (Ribot, 1998). Associations can also support the sustainability of woodfuel production by adding structure and allowing self-policing, such as occurred in the Sudan (Mugo and Ong, 2006). Associations can facilitate two-way communication between officials and market actors and provide greater transparency in revenue collection.

### VOLUNTARY MEASURES

Voluntary measures such as sustainability certification and “zero deforestation” pledges aim to promote sustainable natural resource management in industrial forestry, biofuels and food production. Such measures are generally not being applied in SSA, where woodfuel producers are overwhelmingly small-scale informal operators, but lessons can be drawn. For example, sustainability certification is grounded in a set of comprehensive principles and criteria that bring attention to the full range of positive and negative impacts arising from the use of forest resources. In addition, practical elements of sustainability certification, such as chain-of-custody tracking and product traceability, could be adapted to woodfuel markets. Some certification programmes have been developed through consensual multistakeholder processes, thereby ensuring that principles and criteria reflect multiple viewpoints and creating a sense of legitimacy among stakeholders; such processes could be adopted at the national and subnational levels to develop sustainability principles for traditional woodfuel markets. A good starting point would be the FAO publication, *Criteria and indicators for sustainable woodfuels* (FAO, 2010), which presents principles, criteria and indicators to guide the sustainable use of woodfuel resources and the sustainable production of charcoal.

# CONCLUSIONS

A wide range of policy measures (summarized in Table 1) has been implemented in an effort to bring sustainability to the sourcing of woodfuels in SSA. Although there is no unequivocal success story, many examples exist where woodfuel production has shifted towards a sustainable trajectory, at least for a time. Effective approaches almost always consist of multiple, rather than single, measures; indeed, measures implemented in isolation appear to have had little impact. Meaningful shifts towards sustainable woodfuel value chains are achieved when structural changes and targeted policies are implemented in tandem, such as tenure reform and devolved forest management combined with differential taxation. In most cases, structural change has not been achieved through policies directed specifically at the woodfuel sector; nevertheless, the former appear to be instrumental in the success of the latter.

In addition to multiple policy measures, successful woodfuel value chains incorporate effective monitoring and enforcement mechanisms supported by two characteristics. First, rules are simple and straightforward, ensuring that all actors, including people in remote rural communities, can understand and adhere to them. Regulations that are excessively costly, time consuming or amenable to corruption are unlikely to be respected or enforced. Second, rules are reinforced by broader structural and institutional change. Figure 2 shows how structural change, targeted policies and monitoring, and enforcement mechanisms might interrelate to support the sustainable sourcing of woodfuels. Although policy measures such as the reform of land tenure and forest governance require action at the highest levels of government, targeted regulatory and financial measures can be less complicated to implement.

Replication and scaling up require sustained support from national governments and, potentially, external support,

for example as part of efforts to achieve the Sustainable Development Goals and nationally determined contributions to climate-change mitigation under the Paris Agreement on climate change.

This analysis gives rise to the following six key findings for the sustainable sourcing of woodfuels:

- 1 **Multiple measures** involving structural changes – such as the devolution of forest management rights – combined with targeted regulatory measures have the most profound and lasting impacts.
- 2 **Secure tenure** appears to be particularly important. Depending on the context, such tenure may be over communally held woodland resources or individually held private lands.
- 3 Permit systems must be **simple and easy to enforce**, with quotas based on **simple management plans** developed with local participation. Systems under local management, with permits issued by communities or local authorities, function better than centralized systems, but communities must have recognized, enforceable rights over forest resources.
- 4 A successful targeted financial measure is **differential taxation** to reward harvesting from sustainably managed sources.
- 5 When taxes or permits are implemented, a substantial fraction of the **revenues must reach rural communities** to incentivize their participation and compliance.
- 6 **Transformations take time** and can easily be undone by shifts in policy. Efforts to bring about sustainable woodfuel sourcing need to be maintained for long periods and must not be undermined by contradictory policies.



Woodlot in Mubende, Uganda

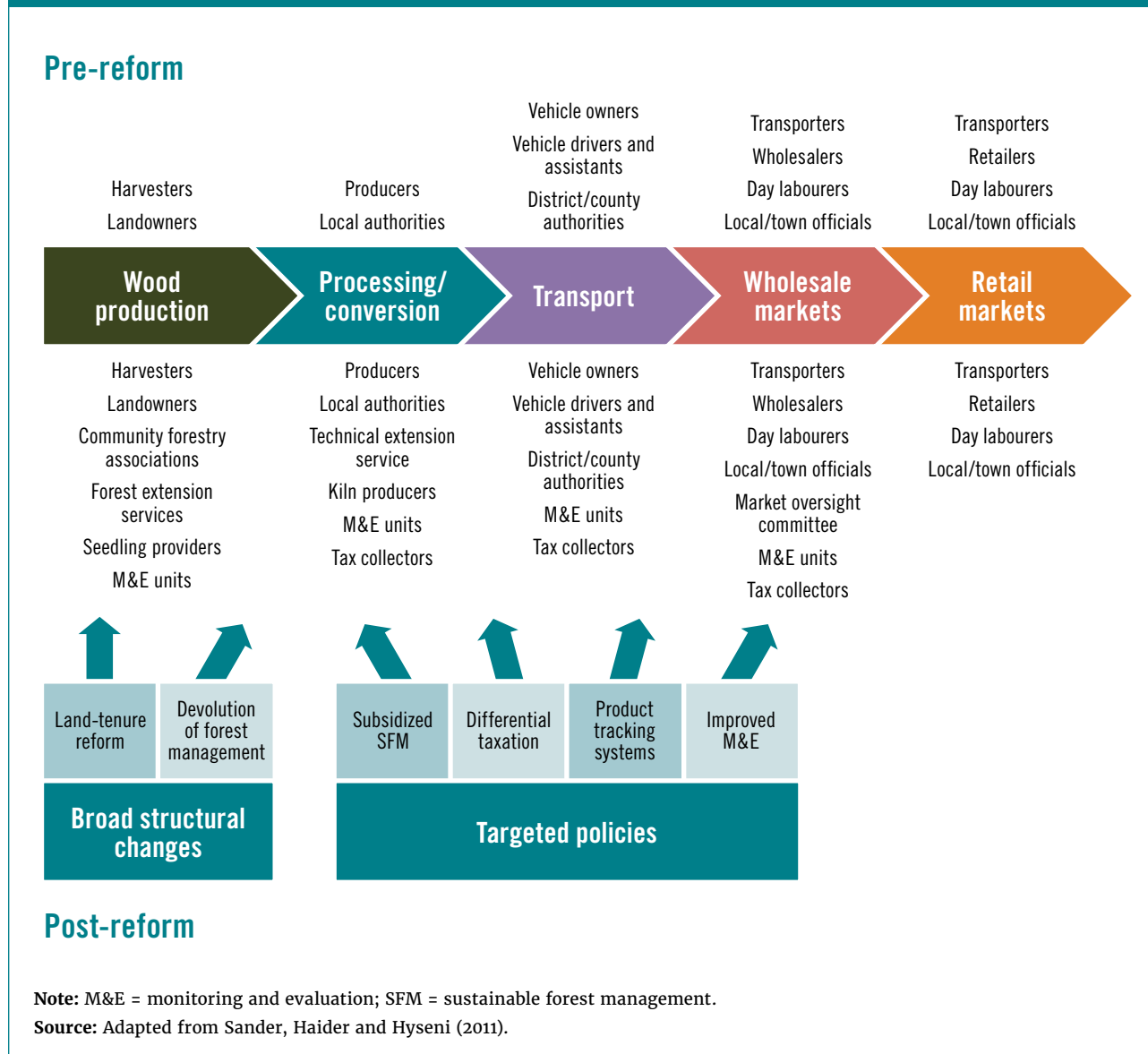


**TABLE 1. OVERVIEW OF POLICIES AND MEASURES IMPLEMENTED IN SUB-SAHARAN AFRICA TO SUPPORT SUSTAINABLE WOODFUEL VALUE CHAINS**

POLICY APPROACH	CHARACTERISTICS	EXAMPLES
Bans on woodfuel production or transportation	<ul style="list-style-type: none"> <li>▶ Difficult to enforce</li> <li>▶ Encourage corruption</li> <li>▶ Create a risk that consumers turn to lower-quality fuels</li> </ul>	Attempted in many countries, including <b>Cameroon, Chad, Ethiopia, Kenya, Malawi</b> and the <b>United Republic of Tanzania</b>
Land-tenure and forest management reforms	<ul style="list-style-type: none"> <li>▶ Important to ensure rights of access and control for woodfuel producers, as well as the right to exclude others from exploiting a given resource</li> <li>▶ Typically implemented as broader strategies, not necessarily linked to woodfuel value chains</li> <li>▶ Common to all examples of successful woodfuel value-chain development, but insufficient on their own to ensure success</li> </ul>	Tenure and forest management reforms: <ul style="list-style-type: none"> <li>▶ with some successful woodfuel value-chain development – <b>Burkina Faso, Chad, Madagascar, the Niger</b> (limited to specific projects) and <b>Senegal</b><sup>a,b,c</sup></li> <li>▶ without significant value-chain development – <b>Democratic Republic of the Congo</b> (private and community forestry), <b>Ethiopia</b> (participatory forest management), <b>Kenya</b> (community forest associations) and <b>Uganda</b> (district-level management)<sup>a,d,e,f</sup></li> </ul>
Licences, quotas and permits	<ul style="list-style-type: none"> <li>▶ Established as means to formalize, monitor and control resource flows</li> <li>▶ Under private or community forest management, licences and permits can channel revenue to individuals or communities</li> <li>▶ Often require forest management plans, which individuals and small communities can find difficult to develop and implement</li> <li>▶ Licences and permits are more effective when the application process is simple and decentralized</li> <li>▶ Complicated or costly permit systems can act as <i>de facto</i> bans, resulting in the same negative outcomes</li> </ul>	Use is widespread, with varied results: <ul style="list-style-type: none"> <li>▶ <b>Burkina Faso, the Niger, Senegal</b> – some degree of compliance with the permit/licensing system<sup>a</sup></li> <li>▶ <b>Congo, Democratic Republic of the Congo, United Republic of Tanzania</b> – permit systems are in place but obtained by only a small fraction of producers<sup>a,g</sup></li> <li>▶ <b>Mali</b> – permits are costly and often ignored<sup>a</sup></li> <li>▶ <b>Kenya, Malawi</b> – permits are required through a highly centralized application process; few permits are issued, leading to <i>de facto</i> bans<sup>h,i</sup></li> <li>▶ <b>Zambia</b> – permits are required; adherence to regulations varies with location<sup>l</sup></li> </ul>
Subsidies and taxes	<ul style="list-style-type: none"> <li>▶ Subsidies – common for electricity, kerosene and cooking gas but rarely applied to woodfuels</li> <li>▶ Taxes – frequently built into licence and permit fees and may be levied on extraction and transportation</li> <li>▶ Frequently circumvented, leading to lost tax revenues</li> <li>▶ Differential taxation – can encourage woodfuel production from community or privately managed resources</li> </ul>	<ul style="list-style-type: none"> <li>▶ Nearly every country mentioned in this brief has some woodfuel taxation system in place, but the systems vary greatly in detail and coverage</li> <li>▶ Differential taxation has been implemented with some success in <b>Chad</b> and the <b>Niger</b> and with less success in <b>Mali</b> and <b>Senegal</b><sup>a,l</sup></li> </ul>
Cooperatives and producer associations	<ul style="list-style-type: none"> <li>▶ Can provide officials with means to monitor who produces woodfuels and create clear pathways for communication and revenue flows</li> <li>▶ Allow members to pool resources and increase bargaining power in some market conditions</li> </ul>	<ul style="list-style-type: none"> <li>▶ Woodfuel producer cooperatives are common in <b>Senegal, the Niger</b> and <b>Mali</b><sup>i</sup></li> <li>▶ In <b>Kenya</b>, charcoal producers are required to form associations in order to obtain production permits. Many associations are registered but few permits, if any, are issued<sup>d,h</sup></li> <li>▶ <b>The Sudan</b> has had some success with producer cooperatives<sup>l</sup></li> </ul>

**Sources:** <sup>a</sup> Schure *et al.*, 2013; <sup>b</sup> van der Plas and Abdel-Hamid, 2005; <sup>c</sup> Etter *et al.*, 2014; <sup>d</sup> M. Iiyama, personal communication, 2016; <sup>e</sup> Shively *et al.*, 2010; <sup>f</sup> Ameha, Larsen and Lemenih, 2014; <sup>g</sup> World Bank, 2009; <sup>h</sup> Owen, 2016; <sup>i</sup> Zulu and Richardson, 2013; <sup>j</sup> Gumbo *et al.*, 2013; <sup>k</sup> GIZ, 2015a; <sup>l</sup> NL Agency, 2010.

**FIGURE 2. MULTIPLE POLICY INTERVENTIONS SUPPORTING THE SUSTAINABLE SOURCING OF WOODFUEL**



More information: [www.fao.org/forestry/energy](http://www.fao.org/forestry/energy)

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