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Formalisation of charcoal value chains and livelihood outcomes in Central- and West Africa

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ABSTRACT

This paper examines the link between formalisation of charcoal institutions and livelihood outcomes in Central- and West Africa. The woodfuel trade generally commenced informally, little controlled by legal or bureaucratic means. Developing formal institutions is often considered as a way of managing charcoal production more sustainably. However, formalisation can have adverse effects for charcoal producers and traders when this hinders their capacity to access the resource or markets. In order to assess the relations between the formalisation of charcoal institutions and socio-economic outcomes for those involved, this study combines a value chain and livelihoods perspective. A review of case studies and empirical data show that (1) West African countries, with a longer history of dealing with woodfuel issues, have more formal mechanisms in place to deal with charcoal management and these are more embedded into cross-sectorial energy and environmental policies; (2) Despite regulatory mechanisms dealing with woodfuel in all countries, institutions are mainly embedded in informal institutions and based upon customary rules, which allows large numbers of actors to be involved, but also leads to substantial unsustainable and unofficial production, corrupt practises and loss of tax revenues; (3) Formal mechanisms can have negative consequences, such as: conflicts of interests over tax revenues, difficulties in avoiding 'free riders' from sustainable management initiatives, and disproportional benefits reaped by more powerful urban-based actors. Comparing the West African countries with Central African countries where attention is relatively new, indicates that conditions for successful charcoal institutions are: devolving power and responsibilities for woodfuel management to a local level, monitoring woodfuel trade, (tax) incentives for sustainably produced charcoal and reinvesting taxes in social and environmental aims.

Introduction

Woodfuel[1] consumption is the major source of household energy in Sub-Saharan Africa: an estimated 93% of households in rural areas and 58% in towns and cities rely on it for daily cooking (IEA, 2006). Fuelwood is the main form of woodfuel in rural areas, while charcoal is widely used in urban households as a smokeless cooking fuel with high heat value. The production of fuelwood has remained relatively stable throughout the developing world, but charcoal production keeps increasing in many African urban households (Tomaselli, 2007). This increased charcoal demand puts pressure on peri-urban wood sources, especially in absence of management of the sector (Arnold et al., 2006). The environmental costs of charcoal production are often not internalized in the product price, which contributes to resource depletion and ultimately threatens the sustainability of the livelihood activity (Chidumayo and Gumbo, this issue; Luoga et al., 2000). However, in many cases woodfuel is considered unsustainable when in fact there is a considerable surplus of woody biomass (Openshaw, 2011). Charcoal does offer a sustainable scenario when it replaces fossil fuels and is managed as a 'renewable fuel', i.e. involves rotation growth (Marien and Mallet, 2004). Moreover, charcoal production provides employment to many rural poor suppliers of urban markets (Marien, 2009). The challenge is how these diverse outcomes can be best understood and managed; especially considering that production often takes place in the informal sector. This informal character causes constraints for sustainable management of charcoal exploitation (FAO, 2007).

Options for charcoal management can target different aspects of the value chain, such as agro-forestry, plantations, control of trade

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[1] Woodfuel is defined in this paper as all types of biofuels originating directly or indirectly from woody biomass. In this study this includes fuelwood and charcoal. Fuelwood is understood as woodfuel in which the original composition of the wood is preserved. This category includes wood in its natural state and residues from wood-processing industries. Charcoal is defined as the solid residue derived from carbonisation, distillation, pyrolysis and torrefaction of wood (FAO, 2004).

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and improved energy efficiency at producer and consumer level (Schure et al., 2012). Earlier studies on governance of forest products have criticized many government initiatives for being reactive and opportunistic with general weaknesses of: 1) inconsistent poorly coordinated laws; 2) regulation based on a limited understanding of the product; 3) insufficient consultation with harvesters and chain actors, and; 4) ineffective implementation (Laird et al., 2010b). Despite these weaknesses, as for other heavily traded forest products, building formal institutions is often considered as the path to manage charcoal production more sustainably. However, it can have adverse effects for charcoal producers when formal institutions hinder their capacity to access wood resources and markets, or when policies advantage more powerful urban actors (Ribot, 1995a). Moreover, as with many other forest products, access to and control over woodfuel resources are often managed by customary rules and practices. Recognition of these types of existing woodfuel management is crucial for any interventions in the charcoal sector (Bensel, 2008).

The objective of this study was to examine the link between the degree of formalisation of charcoal institutions and livelihood outcomes for actors involved in woodfuel chains in Central- and West African countries. Lessons are drawn by comparing countries where policy and regulatory attention to woodfuel exploitation and trade are relatively new, with those countries with a longer experience, allowing insights on the conditions necessary to support successful institutions that benefit the multiple actors in the value chains.

Linking formalisation of charcoal institutions to socio-economic benefits of value chain actors

To assess the relations between the formalization of the sector and socio-economic outcomes for those involved, the study combined institutional studies with a value chain analysis and a livelihoods approach. Value chain analysis (VCA) focuses on the actors and their relations at all levels and their often-complex networks. VCA offers a framework to analyse the activities and processes involved in taking a product from the forest, eventual production, transformation and processing to delivery to final consumers and ultimately disposal (Kaplinsky and Morris, 2001). The charcoal value chain starts where the tree grows and the wood is cut. It continues with transformation through carbonization of the wood, packing and transporting of the charcoal to urban markets, and ends with the consumption of the charcoal by households and businesses. The main actors involved in this process are the producers, traders, transporters and vendors. VCA assists the mapping and categorizing of the economic processes involved in charcoal production and trade, and understanding why, how and where states, institutions, organizations, households and individuals are positioned. Territoriality is an important factor in that activities, nodes and flows within a chain are geographically situated and have implications for actors and their livelihoods at different locations (Gereffi et al., 2005).

To relate value chain analysis and livelihoods, a multi-disciplinary conceptual framework for assessing charcoal institutions in Central- and West African countries was developed. This framework consists of two main variables: (1) the degree of formalisation, and (2) the socio-economic benefits for actors in the value chain.

Formalisation of charcoal institutions

Institutions can be understood as "regularized patterns of behaviour between individuals and groups in society" (Leach et al., 1999). "Diverse institutions, both formal and informal, and often acting in combination, shape the ways in which differentiated actors access, use and derive well-being from environmental resources and services and, in so doing, influence the course of ecological change" (Leach et al., 1999). Formal institutions can be considered as the rules enforced by an outside third party, such as the rule of law. Informal institutions are upheld by socially shared usually unwritten rules, created and enforced among the actors involved (Helmke and Levitsky, 2004; Leach et al., 1999). Key characteristics of the latter include their variety and flexible, dynamic spatial and temporal nature and weak voice in policy and government (Chambwera et al., 2011). In this paper 'charcoal institutions' are defined as the formal and informal regularized patterns of behaviour between different actors in society that shape access, rights and obligations related to charcoal production and trade. These patterns of behaviour that shape consequences of urban charcoal production take place both within the market and between the market and the state (Ribot, 1993).

Formalisation in the context of supply networks can be defined as "the degree to which the supply network is controlled by explicit rules, procedures, and norms that prescribe the rights and obligations of the individual [companies] that populate it" (Choi and Hong, 2002). The willingness of actors to operate in the formal sphere depends on the anticipated benefits and the levels of law enforcement (Hall and Haas, 1967; Ishengoma and Kappel, 2006). Property rights and formalised titles will motivate people to make longer-term investments, which contribute to sustainable behaviour (De Soto, 1993). For the woodfuel sector, the forestry code and land tenure law are important regulatory frameworks. However, it is also important to focus on policies in other sectors, such as trade, structural adjustment, poverty reduction, debt, agriculture, infrastructure, energy and mining that often intervene with forest policy objectives (Sizer et al., 2005). Statutory control of forest product value chains takes three main forms: 1) controlling the trade by defining quotas, fixing prices, licensing the traders and levying taxes or other fees; 2) controlling the access to land and granting harvesting rights to private entities; 3) controlling harvest by licensing harvesters (Pierce and Burgener, 2010).

Formalisation of forest products can have adverse consequences when new regulations criminalise extraction practises, marginalise harvesters, enable or promote corruption, and obstruct effective customary laws (Arnold and Perez, 2001; Laird et al., 2010b). Ribot (1995a) presented an example of these unintended outcomes in Senegal, where forest policies facilitate the access to resources by powerful traders leading to highly unequal benefit distribution between rural charcoal producers and urban traders. However, operating informally also carries its costs, mainly in the form of penalties and bribes (Ingram et al., 2012; Ishengoma and Kappel, 2006). Informality has been linked to dependence—the degree of authority an actor in a chain has over aspects of their work and the share of work-related risks that they absorb in a chain (Change, 2009; Chen et al., 2004). Moreover, under high commercial pressure local customary laws may become less effective in mitigating negative environmental outcomes or ensuring social equity (Laird et al., 2010a). In these situations formal institutions can help to shape better outcomes, especially when actors gain a voice and incentive to enter the formal sector (Ishengoma and Kappel, 2006). Participation in resource management and decision-making can co-determine positive outcomes of woodfuel management (Park, 1997; Ribot, 2009).

Socio-economic benefits to actors in the woodfuel value chain

Woodfuel production and trade are part of strategies that actors in chains use to sustain their livelihoods. A livelihood is defined as "the control an individual, family or other social group has over an income and/or a package of sources that can be used or changed to maintain a living" (Blaikie et al., 1994). The strategies used depend on personal skills and characteristics, access and use of different tangible and non-tangible capitals (social, physical, financial, economic, political and natural) and combining of different activities (Chambers, 1997).

Although it is generally believed that woodfuel provides important benefits to households, there are few quantitative studies about the exact contribution in terms of income and other livelihood benefits (Arnold et al., 2006). Ribot's (1993) study of charcoal in Senegal argues that problems and solutions are often described for urban woodfuel

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supply and commercialisation and that the recognition of the threats for rural households is minimal. These urban-oriented policies tend to favour the position of urban traders and wholesalers who make substantial profits, whereas villagers and producers gain a small proportion of the end price (Ribot, 1998). The extent to which the sector provides employment is often not reflected in national statistics due to production and trade taking place mainly in the informal sector. In Sub-Saharan Africa it is estimated that 13 million people are employed in the biomass (mostly wood-) energy sector (Openshaw, 2010). The benefits acquired from this depend on access to the resource, labour and markets and control over the price (Ribot, 1998) Access to and distribution of benefits and enduring of risks are often unequally divided depending on social ties and financial means (Ribot, 2009; Sizer et al., 2005).

Analytical framework and research questions

Guided by the conceptual framework, two analytical hypotheses were distilled to guide the research:

1. Formalisation is likely to primarily advance urban actors further along the chain.
2. In countries with formalised charcoal institutions rural actors gain more benefits than in countries with informal institutions.

An analytical framework was developed consisting of two variables and six indicators to assess the nature and impact of charcoal institutions (Table 1).

On the basis of this analytical framework, the research hypotheses were operationalised into two empirical research questions:

1. What is the status of formalisation of charcoal institutions in Central- and West Africa?
2. Who benefits from the charcoal trade and how is this related to the process of formalization?

Research methodology

A literature review was conducted for the charcoal value chains of the selected cities and countries. Scientific literature was complemented with reports and policy documents. Case studies and empirical data on charcoal value chains in Central- and West Africa were selected from this literature. This database was complemented by cases from surveys by CIFOR in Kinshasa, Kisangani and Yaoundé. Overall, nine cases covered charcoal value chains to large urban centres with high charcoal demand, mostly capital cities, and their supply zones (Table 2). In Central Africa the cities included were: Bangui (capital of Central African Republic—CAR), Brazzaville (capital of Republic of Congo), Kinshasa (capital of the Democratic Republic of Congo—DRC), Kisangani (capital of the Oriental Province in the DRC), and Yaoundé (capital of Cameroon). In West Africa the cities included Bamako (capital of Mali), Dakar (capital of Senegal), Niamey (capital of Niger) and Ouagadougou (capital of Burkina Faso) (Fig. 1).

Empirical data from all cases were analysed with respect to formalisation and livelihood outcomes of actors. Data from the literature review and surveys was categorized according to the pre-defined variables and indicators (Table 1). As relatively limited data exist on the charcoal sector due to its informal character, data analysis was semi-quantitative. Indicators were scored on a 5-point scale (1 = very low, 2 = low, 3 = medium, 4 = high, 5 = very high) when possible. The remaining indicators were labelled with short descriptions. This scoring (Table 5) was done in an iterative process by the researchers. The comparative analysis was based on logical deduction.

Table 1
Analytical framework for analysing main characteristics of charcoal value chains in Central- and West Africa: formalisation and socio-economic benefits.

Variable	Indicator
Formalisation	1. Existence of written rules, and policies dealing with (cross-sectorial aspects of) charcoal value chains[a]
	2. Degree to which penalties for rule violations are clearly stipulated and enforced according to written rules and policies[a]
	3. Ease and accessibility of formalising[b,c]
Socio-economic benefits to value chain actors	4. Number of actors involved in charcoal sector[d]
	5. Net revenues gained in the charcoal value chain (as part of overall household income)[e,d]
	6. Extent and equity of benefit distribution amongst actors[d]

[a] Inspired by: Hall and Haas (1967).
[b] Inspired by: Ishengoma and Kappel (2006).
[c] Inspired by: Helmke and Levitsky (2004).
[d] Inspired by: Ribot (1998).
[e] Inspired by: Belcher (2005).

Results

Formalisation of charcoal institutions

Central Africa

Although the woodfuel sector in Central Africa has mostly an informal character, formal policies and rules do exist in all four countries.

In Cameroon, management of the woodfuel sector is prescribed in the 1994 forest law. Non-commercial use of woodfuel falls under users' rights. Commercial production of woodfuel is regulated by the 1995 Decree on forest regime implementation modalities under two types of permits: 1) for the exploitation of special forestry products, which includes charcoal, and; 2) for fuelwood exploitation (Cerutti et al., 2009). Some woodfuel has been produced under community forestry arrangements (Minang et al., 2007). Regarding the energy sector, the national Energy Policy recognizes the role of biomass and renewable energy but the role of woodfuel is hardly discussed in the national energy strategy (Ministère de l'Energie et de l'Eau, 2008).

In Congo, a permit system for woodfuel is applied for transport and retailing. The recently endorsed 'National Reforestation Plan' (*Programme National d'afforestation et de reboisement (PRONAR)*) promotes the development of woodfuel plantations and is considered an important initiative towards guaranteeing future urban supply. It builds upon the experiences of the eucalyptus plantations near the economic capital Pointe-Noire that have been supplying woodfuel since 1994 (Nkoua and Gazull, 2011). There is no national strategy for wood-fuel substitutes (Schure et al., 2012).

The CAR has recently given more prominence to woodfuel in national policy. The 2008 forest law grants a sectorial focus to woodfuel. The Strategy on Urban and Peri-urban Forestry, a participatory decision making document accepted by a ministerial board in 2008, includes the woodfuel sector as a key policy objective. A legislative platform was introduced to optimize the wood energy sector and a new action plan introduced woodfuel-oriented forestry and agroforestry initiatives. Timber concessions within Bangui's wood supply zone are now considering woodfuel production for Bangui as a specific objective, which also helps to prevent uncontrolled harvesting (Salbitano, 2009). At the level of household consumption, the Ministry of Forest, Fisheries and Environment started a campaign to introduce kerosene as an alternative energy, but without a clear subsidy program (Schure et al., 2012).

The DRC has regulations to manage woodfuel exploitation in the forest and land codes. Legal options for managing woodfuel production are: (1) public plantations; (2) private plantations; (3) reforestation of agricultural parcels; (4) permits for felling and carbonization; and (5) community forestry. The national Reducing Emissions from Deforestation and Degradation (REDD) programme creates momentum for improved management, as the recently endorsed Forest Investment Programme (FIP) grants an important place to the potential production

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Table 2
Key data for selected cities and their woodfuel supply zones.

Key data	Central Africa					West Africa			
	Cameroon Yaoundé[c]	DRC Kinshasa [a]	DRC Kisangani [a]	Congo Brazzaville[b]	CAR Bangui [d]	Burkina Faso Ouagadougou	Senegal r·	Niger Niamey[l]	Mali Bamako
Year of data	2009	2010	2010	1994	2010	*2006	*2006	*2006	*2007 **1994
Dependence upon woodfuel by urban consumers (%)	–	87%	95%	90%	92%	95%[h]	84%[k*]	95%[l*]	97%[m*]
Volume charcoal sector (1000 tons per year)	(214)	490	16	(25)	30	(23)[g*]	150[f]	(200)[i]	38[e**]
Value woodfuel sector (million USD)	(380)	143	2.5	(16)	6	(425)[h]	60[f]	15[i]	30[j]

Sources: [a](Schure et al., 2011a), [b](Lamouroux and Boundzanga, 1994); figure for four main cities together (Brazzaville, Pointe-Noire, Dolisie and Nkayi), [c](Ministère de l'Energie et de l'Eau, 2010); figure for the entire country, [d](Drigo, 2009), [e](Hautdidier, 2007), [f](Denton, 2004), [g](DURADEVE Consulting Group, 2011), [h] (Ministère de l'Environnement et du Cadre de Vie, 2010), [i]Matly, 2003 cited by (Ichaou, 2004); figure is for entire woodfuel volume, [j](Heuraux et al., 2011), [k](Ministère de l'Energie, 2007), [l](Ministère des Mines et de l'Energie, 2007), [m](Ministère de l'Energie et de l'Eau, 2007).

and consumption efficiencies to be gained in the woodfuel sector. However, woodfuel, the major household energy source, plays virtually no role in the national energy policy (Schure et al., 2011b).

While all four countries have woodfuel policies, a large gap exists in practice. Commercial charcoal production in Bangui is largely unrecorded, there is very little control and virtually no one pays taxes (Salbitano, 2009). In Brazzaville, it was estimated that only 10% of the quantity of woodfuel that entered the city was officially registered. This is mainly due to the fact that control by the forest services only takes place at the city's entry points during office hours, while many transport takes place at night to avoid paying taxes (Gibert, 1978, Nkoua, personal communication). The practical outcomes of regulations are minimal due to the poor implementation of the permit system and reforestation. Between 2009 and 2011, less than 3% of the charcoal produced for Kinshasa has been produced with an official permit. Despite the legal options for woodfuel plantations, most wood is sourced from (newly slashed) agricultural land and (degraded) forests. A partial shift of responsibility from the Environment Service to the Energy Department in the Province of Kinshasa has led to fragmented and increased taxes. Most of these taxes collected do not reach the province's coffers. In Kisangani a myriad of institutions (Mines and Energy, Environment, Rural Development, Small and Medium Enterprises, General Direction of Migration, Marine Police, Market Administration, Local Police, etc.) are present at trading points, levying (often informal) taxes, increasing costs for traders and vendors (Schure et al., 2011a). In Cameroon, less than 1% of the estimated charcoal production is captured by Special Forestry Product permits (Schure et al., 2012). None of the producers interviewed around Yaoundé possessed a permit and as in the other countries, producers and transporters negotiate bribes when passing Forestry service checkpoints.

The fact that much of the woodfuel production and trade is informal and few formal producer groups exist does not mean that the activity itself is unorganized. At the local level there are rules about who can access and under what conditions, mainly dictated by customary practices. In the DRC, only 3.5% of the producers supplying Kinshasa and Kisangani own an official forest concession and access is commonly secured by renting land or buying trees from the customary landowner or village chief. For producers in the supply zone of Yaoundé, access is also mainly (78%) under customary rules and only around a fifth of the producers possess official land titles. Especially in the areas where there is more pressure on the resource, an increase of conflicts between villagers, private landowners and forest concession holders has been noted (Salbitano, 2009; Schure et al., 2011b).

The large quantities of charcoal produced without official permits illustrate the predominantly informal and illegal character of the sector and the difficulties in accessing the formal system. Producers have few incentives or disincentives to comply with formal systems and customary rules define access to the resource. The costs of obtaining a permit, lack of information and distance to the issuing entities are the main obstacles for producers. Moreover, they are not assured that a permit would bring them benefits in terms of less 'unofficial tax levying' along the road. The vested interests of informal taxing with officials and controlling entities at road blocks and markets are deeply embedded in most Central African countries, which impede the commitment of these actors to support any changes of the system (Schure et al., 2011a). Table 4 highlights how governance issues affecting business in general are particularly unfavourable in Central Africa, with only small improvements noted in Cameroon and DRC over the past few years. The four Central African countries all score poorly on the corruption index. This shows that, not only the charcoal sector, but the entire business environment still has a long way to go before formal practises are well embedded.

West Africa

In the four studied West African countries—Burkina Faso, Mali, Niger and Senegal—policies and strategies related to the energy sector were developed to regulate the growing woodfuel demand and increasing scarcity of supply. The participation of local people in the sustainable management of forest resources was promoted as an important aspect of sustainable woodfuel supply.

In Burkina Faso, the sustainable production of woodfuel takes place within dedicated forest management areas (*Chantier d'Aménagement Forestier* (CAF)) through participatory management of forest resources. Decree 98-306/PRESS/PM/MEE/MCIA regulates the exploitation and marketing of forest products, defines the actors involved in the commercial exploitation and describes the taxes and fees payable for these products. In addition to the taxes that need to be paid for cutting, storage and transport permits, a forest fee is due to finance the forest management fund and the village investment fund.

In Mali, the 95-003 forestry law regulates the exploitation, commerce and transport of wood and defines rural management structures and rural woodfuel markets. The commercial exploitation of woodfuel requires a cutting permit and since 1995 differential taxation has been applied depending on the character of the production zone; whether it is through controlled rural woodfuel markets, oriented rural woodfuel markets or uncontrolled exploitation (Gazull et al., 2006). The different tax regimes according to the sustainability of production zones are key tools in promoting the sustainable exploitation of forest resources. Local communities can gain rights to exploit forest resources via rural woodfuel markets, based on a sustainable management plan.

Niger also imposes differential taxation determined by the distance from urban centres and the status of the supply zone (uncontrolled exploitation, controlled or oriented rural woodfuel market) (CILSS-PREDAS, 2005). Compared to Mali, the differential tax system seems to be more efficient in Niger because, in addition to the status of the woodfuel production zone, the distance is taken into account. The 92-037 forestry law in Niger sets the legal framework for the management of natural forests, the exploitation,

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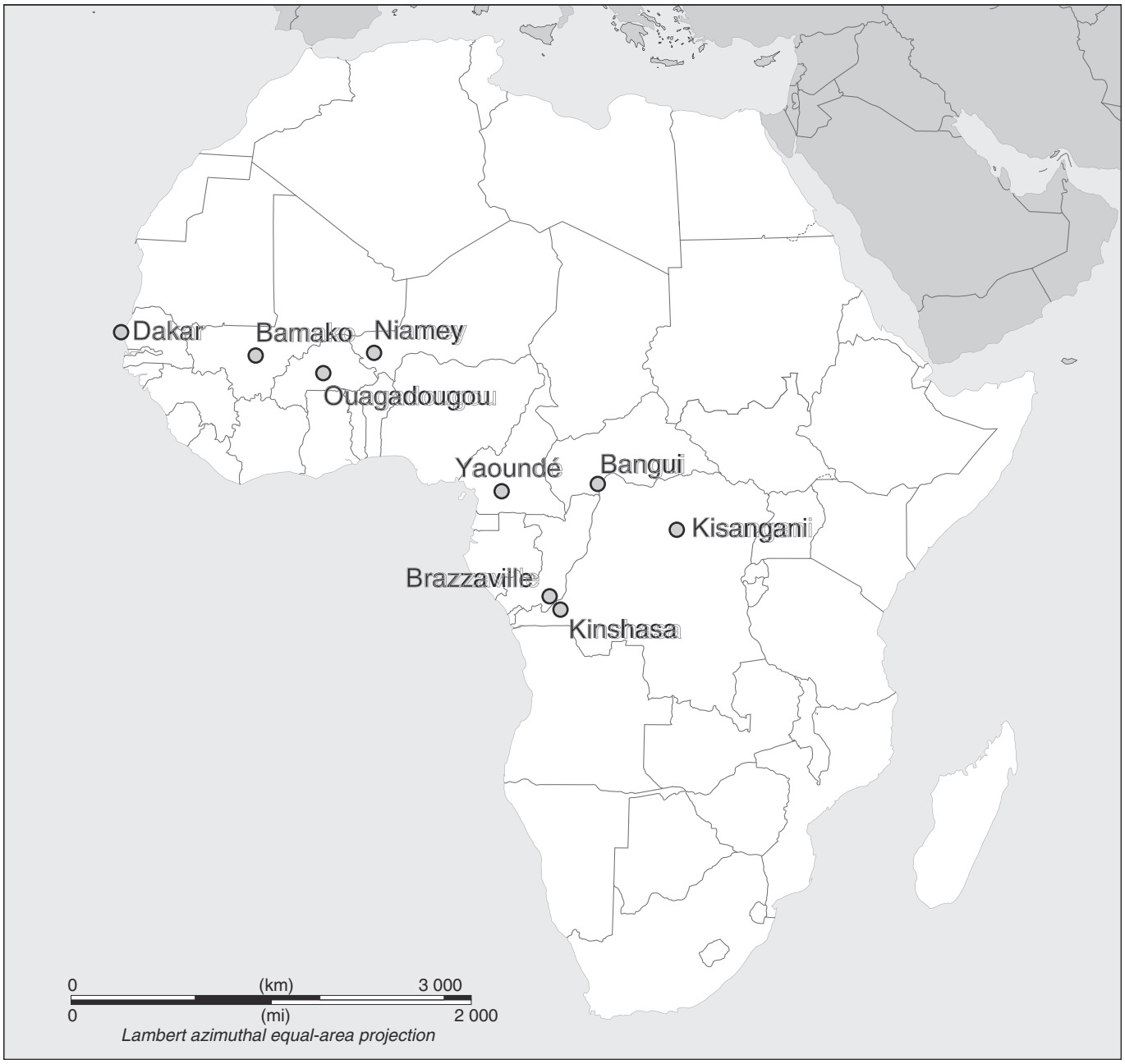

Fig. 1. Selected urban centres for study on formalisation of charcoal institutions. "Africa Map," © 2008 Eric Saga, used under a Creative Commons Attribution-ShareAlike license: http://creativecommons.org/licenses/by-sa/3.0/.

commercialisation and transport of woodfuel, the conditions for the rural woodfuel markets and the mechanisms for redistribution of woodfuel tax revenues (CILSS-PREDAS, 2006). In both Mali and Niger, domestic energy strategies for improving wood energy supply of major cities refer to sustainable management of forest resources with participation of local people (SED, 2000a,2000b).

Also in Senegal the involvement of local people in managing forest resources has been formalised. The 1996 national decentralization law allows rural communities to control the extraction of forest products gathered inside of their territorial boundaries. The Ministry of Environment annually defines the charcoal production quotas, the regions where the production can take place and the production season. The 1998 forestry code requires the Forest Service to gain permission from the rural council before any commercial production takes place (Ribot, 2009).

Specifically in participatory forest management programs, inequities associated with charcoal production could be reduced and converted into local benefits (Post and Snel, 2003). For instance, an appropriate use of woodfuel revenues by the forest management fund and village investment fund can assist to rehabilitate forest resources and build infrastructures for local development. Positive results from local participation in resource management have been reported in Niger and Senegal where there has been a considerable annual increase in the forest stock following decentralisation of forest management (De Miranda et al., 2010). In Burkina Faso, specifically in the Centre-West region, participatory management of natural forest has contributed through the village investment fund (worth about 47,000 USD annually between 1990 and 2010) to strengthening socio-economic infrastructure at the local level, i.e. by contributing to the construction of schools, cereals banks, water pumps, etc.

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(Ministère de l'Environnement et du Développement Durable, 2012). Also in Niger there have been positive impacts on people's livelihoods because of better access to social infrastructure for health and education, forest resources and decision-making mechanisms (Alio, 2004). In Senegal, villagers who participated in forest-management projects, supported by donors such as USAID and the World Bank, earned substantially higher incomes from charcoal production (Poteete and Ribot, 2011).

Despite these positive impacts of participatory forest management and the existence of legal frameworks for charcoal production and trade a low level of enforcement still characterizes the woodfuel sector in West Africa. Consumption of woodfuel is much higher than the legally produced quantities, showing the high proportion of informal, illegal and uncontrolled production. This also represents a loss of potential tax revenues (Table 3). A recent study in Burkina Faso, Mali and Niger emphasized the lack of forest control at all levels in the woodfuel value chain due to the weak capacities of the Forest Services (Bodian et al., 2012). In Senegal, there is an incomplete implementation of differential taxation with consequences on the competitiveness of the product according to where it is harvested (PROGEDE, 2009). The forest law in Senegal, intended to decentralize power, share the profits of charcoal production and limit the negative impacts of charcoal production, never materialized (Faye, 2006; Ribot, 2009; Wurster, 2010). The central Forest Service continues to fix and allocate quotas for regulating the charcoal production, maintaining their powerful position and withholding real rights from rural councils (Bâ, 2005; Poteete and Ribot, 2011; Ribot, 2009). In Mali, it is more profitable to risk the payment of a tax penalty than to pay for cutting permits because of the weak forest control (Heuraux et al., 2011); and in Burkina Faso, woodcutters show free riding behaviour instead of contributing to the Forest Management and Village Investment Funds (Delnooz, 2003). The Forest Management Fund that should pay for the regeneration of the resource, serves rather to support salaries and administrative costs—about 80% of this fund according to a forest agent (interview with a forest agent, 2012). Military personnel in Burkina Faso are involved in exploiting and selling of illegal woodfuel from areas without sustainable forest management (CEEF/ Burkina Faso, 2001; Ouedraogo, 2002).

Entry barriers to the woodfuel sector are not only formal ones. Even when all the required permits are obtained and financial resources are available; difficulties entering the market remain if the trader lacks the proper connections. Economically and politically powerful actors, mainly merchants and wholesalers hold the power in the chain. If the president of the rural council in Senegal refuses to sign off for charcoal production, he becomes a victim of pressure, threats and bribes until he agrees (Ribot, 2009). Charcoal producers often lack the information and level of organization to counterbalance this pressure by external urban-based actors (Yameogo, 2008). The overall ease and accessibility of formalising businesses remains challenging in the West African region despite a slow progress in the regulatory business environment over the past decade (Mo Ibrahim Foundation, 2011) (Table 4). Corruption remains a major issue complicating business (Transparency International, 2012).

Livelihood outcomes: who benefits?

Central Africa

As the woodfuel markets in the urban centres comprise considerable volumes and values, the question is, what are the livelihood outcomes of this trade? One of the key questions is who benefits and where in the chain? Work creation and supplementing household income for actors is often presented as one of the major impacts of the trade. Although exact and contemporary data on the benefits and their distribution are scarce, at least an estimated 350,000 people in Central Africa and 90,000 in West Africa are involved along the chains, and probably many more (Table 5). In Brazzaville, in the 1970s it was estimated that 800 to 1200 people (mainly women) were retailers. Profits for women retailers in Brazzaville were very small after paying for costs of wood, transport and labour. Those few involved in wholesale and transport made considerably higher profits (Gibert, 1978). However, Nkoua and Gazull (2011) recently described the relatively equal distribution of revenues between actors in the woodfuel chain in Congo's economic capital Pointe-Noire, especially between producers and wholesalers. Unequal distribution occurs among the rural actors because of their varying distances to the market and unequal costs of access to the resource and to investment capital. In the DRC, the large demand in Kinshasa provides important income opportunities for production (290,000 people), transport (900) and sales (21,000) of charcoal for the largest number of people in any of the countries studied. The numbers involved in the sector far exceed the 15,000 people working in the formal forestry sector nationally (Eba'a Atyi and Bayol, 2009), a more highly regulated sector. The largest numbers of people benefitting from the cash-generating opportunities in woodfuel are at production level. Most producers (80%) sell the charcoal themselves at the urban market and on average they receive 60% to 70% of the final market price. Charcoal income contributes to 75% of total household income for producers in the Kinshasa region. Around 24,000 people (10,000 producers, 1600 transporters and 12,100 retailers) are involved in informal woodfuel chain supplying Kisangani, where charcoal income of producers contributes on average to 38% of household income. This income provides households with capital to pay for basic needs and particularly also to invest in other activities (mainly in agriculture and some in petty trade, livestock and fishing). The investment of charcoal revenues into other activities by producers in DRC suggests that charcoal contributes to household income diversification and possibly reduces poverty. Overall, however, the producers' income is low, with over half earning less than 50 USD a month, reflecting the country's high poverty levels (Schure et al., Unpublished results). In the supply zone of Bangui an estimated 15,000 producers, 3,400 transporters and 4250 retailers work in the sector (Drigo, 2009). The volatile nature of the woodfuel sector creates uncertainty for all those involved: a broken vehicle can halt transport and a price increase at a wholesaler level can leave many retailers with less profits or losses (Gibert, 1978). This is compounded by the seasonal nature of supply and demand. The data suggest that producers are generally the most numerous group in the chains, followed by retailers, with transporters and wholesalers numerically the smallest groups of actors.

Table 3
Official woodfuel production and value of lost tax revenues.

	Burkina Faso	Senegal	Mali	Niger
Official controlled production as proportion of overall production	6% of woodfuel demand from forest management areas[a]	41% in average of charcoal consumption from official production[b]	10% of woodfuel officially controlled[d]	13% of woodfuel demand from rural woodfuel markets[c]
Estimated value of lost tax revenues (million USD)	2.0[e]	–	1.8[f]	1.7[g]

Sources: [a](Ministère de l'Environnement et du Cadre de Vie, 2004), [b](Bâ, 2006), [c]Ministère des Mines et de l'Energie, 2007), [d] Haseer 1997, cited by Gazull, 2009, [e] (Ouedraogo, 2006), [f](Hautdidier, 2007), [g](Ichaou, 2004).

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Table 4
Formal business environment.

	Central Africa				West Africa			
Ranking	Cameroon	DRC	Congo	CAR	Burkina Faso	Senegal	Niger	Mali
Ease of doing business[a]	161	178	181	182	150	154	173	146
Improvement 2006–2011[b]	+0.08	+0.13	−0.02	+0.01	+0.25	+0.18	+0.11	
Reforms[a]	Y	Y	N	N	Y	Y	N	Y
Corruption ranking[c]	134	168	154	154	100	112	134	118
Corruption score[d]	2.4	2	2.2	2.2	3	2.9	2.5	2.8
Governance[e]	45.0	32.4	42.4	32.6	51.1	57.5	44.2	53.6
Sustainable economic opportunity[e]	47.5	28.9	40.5	35.8	58.6	53.1	44.6	46.9

[a] Source: (World Bank/IFC, 2012): global ranking out of 183 countries, with 183 lowest.
[b] Source: Score of the regulatory environment for local entrepreneurs measured by 9 Doing Business indicator sets over a 5-year period.
[c] Source: Transparency International 2011 ranking of 183 countries.
[d] Sources: Transparency International 2011 score indicates perceived level of public sector corruption on a scale of 0–10, 0 indicates a country is perceived as highly corrupt and 10 as very clean.
[e] Source: Mo Ibrahim Foundation 2011 scoring of 100 where 0 is lowest.

West Africa

Also in West Africa the woodfuel sector provides substantial employment for those involved in its production and commercialization. In Niger, surveys in 2003 indicate that the sector provides direct incomes for approximately 15,000 people in rural areas (CILSS-PREDAS, 2006). In 1997, a similar number of rural-based people (14,300) are engaged in the charcoal value chain of Senegal where there were around 10,000 labourers, 300 foremen and 4000 producers, while the other actors such as transporters (1000), wholesalers (1000) and retailers (3000) are mostly based in urban areas (GEFME, 2004). According to Ribot (1998), the charcoal market includes roughly 11,000 migrant woodcutters, 2900 merchants, 300 wholesalers and 2000 retail vendors. The total number of people implicated in the charcoal value chain in Senegal is estimated between 19,300 (GEFME, 2004) and 16,200 people (Ribot, 1998). In Mali, it is estimated that 13,500 people are engaged in charcoal production to supply Bamako (Gazull, 2009). For Burkina Faso, the number of woodcutters supplying Ouagadougou is considerably higher than in the other West African countries, estimated at 50,000 in 2000 (Ouedraogo, 2002).

In terms of revenues generated, these are significant in forest management areas in Burkina Faso and Senegal. In Burkina Faso, managed forests generated more than 1.4 million USD in 2009 (DURADEVE Consulting Group, 2011). A woodcutter earns between 50.9 and 254.5 USD per campaign from woodfuel production (Kaboré, 2002), which contributes on average 83% to the producers' overall income (Ouedraogo, 2009). The monthly profit for wholesalers supplying Ouagadougou is considerably higher and lies between 61 and 1014 USD (Ministère de l'Environnement et du Cadre de Vie, 2004). In Senegal, revenues gained from charcoal production within participatory management zones alone were estimated at 7.9 million USD in 2007 (PROGEDE, 2009). Sustainable forest management facilitated by a project generally showed positive impacts on incomes of the people engaged. For instance in Senegal, six charcoal producer groups supported by a USAID project that organized collective sales, earned a profit of 4.64 USD per bag compared to the 1.20 USD per bag normally earned (USAID, 2008). In Burkina Faso it was estimated that forest management has led to an increase of annual income of 29.3 USD per person (Thiam, 1998b in Kaboré, 2002).

Benefits are unevenly distributed among stakeholders in woodfuel chains in Burkina Faso, Mali, Niger and Senegal, with wholesalers and transporters making the greatest profits (about 30 to 40% of the revenues (Bodian et al., 2012).

In Senegal, 10% of the net profits remain with woodcutters—mainly Guinean migrant labourers—and only 4% of the woodfuel gross revenues accrue to village institutions (Ribot, 1998). The woodfuel sector in Burkina Faso was valued at 425 million USD: around 76 million USD earned by woodfuel local producers, 79 million USD by transporters, 47 million USD by retailers, 7.7 million USD by the government and decentralized communities via taxes and the remaining amount shared between other actors (Ministère de l'Environnement et du Cadre de Vie, 2010). Forest management projects generate significant incomes and highest profits are gained by wholesaler, transporters and the state (Sawadogo, 2006). In Mali, revenues for charcoal producers were a quarter of the value of wholesaler revenues (Gazull, 2009).

In Niger and Senegal, the distribution of benefits is due to the power of wholesalers and transporters and their ability to fix prices, and the weak market access of producers (De Miranda et al., 2010). In Senegal, differences are attributed to the better access of merchants to credit arrangements, information and social relations

Table 5
Overview of formalisation in charcoal value chains in Central and West Africa.

		Central Africa				West Africa			
Variable	Indicator	Cameroon Yaoundé	DRC Kinshasa/ Kisangani	Congo Brazzaville	CAR Bangui	Burkina Faso Ouagadougou	Senegal Dakar	Niger Niamey	Mali Bamako
Formalisation	1) Written rules, and policies	3	3	3	4	4	4	4	3
	2) Degree to which penalties for rule violations stipulated and enforced	1	1	2	2	3	3	3	3
	3) Ease and accessibility of formalising	1	1	2	2	4		4	4
Socio-economic benefits to actors	1) Number of actors involved	–	>324,000	>1200 traders	>22,650	>50,000	Between 16,200 and 19,300	>15,000	13,500
	2) Net revenues from charcoal (% of producers household income)		Kinshasa: 75% Kisangani: 38%			83%			
	3) Extent and equity of benefit distribution (n° of actors)	Relatively equal	Relatively equal	Unequal (rural) Relatively equal	Unequal	Unequal	Unequal	Unequal	Unequal

Score: 1 = very low 2 = low 3 = medium 4 = high 5 = very high.

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(Ribot, 1998). In all the West African countries the urban-based woodfuel actors, such as wholesalers and transporters, are numerically the smallest groups of actors in the chains and also those gaining the highest benefits.

Discussion and conclusion

The analysis of charcoal institutions and outcomes for the livelihoods of actors in the value chains in Central- and West African countries provides insights about the main characteristics of formalisation in different countries and the trends in the two regions (Table 5). These empirical findings allow a further assessment of two research hypotheses.

The status of formalisation of charcoal institutions in Central- and West Africa

In both regions, clear tendencies to formalise institutions governing the chains have been observed. In Central Africa, formal policies and rules regarding the charcoal sector are mainly embedded in forest policies and figure hardly in any other sectorial policies. There is a notable absence of woodfuel strategies in national energy plans. The formal mechanisms involve different coercive forms of statutory control, mainly targeting harvest and trade of charcoal by a system of permits. CAR seems to be the most advanced with its recent integrated woodfuel approach, perceiving woodfuel supply as part of the peri-urban forestry planning, strongly linked to agriculture and urban consumption patterns. Despite these existing legal options in the region, large gaps with practise remain when it comes to implementation of woodfuel policies. These reflect general problems with forest product governance, such as poorly coordinated laws, little consultation with chain actors, and ineffective implementation (Laird et al., 2010b). Charcoal production and trade are largely unrecorded and uncontrolled. In Cameroon and DRC, less than 3% of total charcoal production for urban centres is permitted. Producers and transporters generally have to negotiate bribes when passing Forestry and other official checkpoints. Informal charcoal institutions thrive in the absence of functioning formal institutions. Access to the resource is organized amongst the various actors, often based upon customary rules, varying according to the local circumstances. Retailers in markets often are subject to local trading regulations. Although the existence of these informal types of institutions shows that the sector is organized and local rules of access have an important function in dividing and protecting resources, their effectiveness is insufficient to counterbalance environmental impacts or internalise environmental costs in regions where charcoal has become a lucrative good. In Central Africa, there is less control and power by urban-based actors compared to West Africa, which may partly be explained by the absence of functioning permit systems and much lower level of scarcity, except for Kinshasa (Schure et al., 2012). Producers often bring their own charcoal to the market and although costs of transport weight heavily, they still reap the greatest proportion of revenues per bag of charcoal. The study in Congo confirms that the distribution of benefits depends not on the type of actor, but intra-group differences among producers depend on the distance to the markets (Nkoua and Gazull, 2011).

There is a higher degree of formalisation in West Africa than in Central Africa, likely as a result of a longer history of regulating woodfuel and forest management decentralisation. However, as in Central Africa, even with regulations in place, rules are often only partially enforced and implementation is often ineffective. This can be explained by weak institutional capacities and low levels of financial and human resources. These factors also explain the levels of corruption encountered, particularly during transport, as large-scale makes the product an easy, visible target. This leads to high rates of unofficial production and a loss of tax revenues for State coffers. Urban-based actors in both regions gain higher profits, compared to rural producers who are often not well organized and lack economic and political power. This low level of collective action among producers is particularly noticeable outside of the organised forest management areas. Some producers in Burkina Faso free ride to avoid paying taxes that could benefit their communities. Nevertheless, the existence of dedicated forest management areas, with a participatory approach in Senegal encouraging charcoal producers to organize and to contribute to taxes with local social and environmental aims, illustrate that increases in income and associated benefits for producers is possible. These producers achieved higher profits after organising their own charcoal marketing. The rural woodfuel markets of Mali and Niger also highlight the positive impact of devolving responsibilities to local communities of managing woodfuel production. Differentiation in taxing products from controlled areas as implemented in Niger, appears a good incentive for more sustainable production. However, difficulties remain in 'fair' distribution of rights related to the power relations among actors and related interests in tax collection and expenditure.

Who benefits from charcoal trade and how is this related to the process of formalization?

Positive outcomes for villagers and the resource base resulting from formalised and decentralised woodfuel chain governance include the reinvestment of taxes in local social and environmental projects, and lower, more attractive taxing of controlled charcoal production and community woodfuel plantations. Negative unintended consequences of formal mechanisms also have occurred, such as conflicts of interests over tax revenues, continued difficulties in monitoring and permitting trade, sustainable production, free riders, and rich or powerful and urban actors dominating access to permit systems.

Work creation in the form of many jobs in production and trade is one of the greatest socio-economic benefits for actors in the woodfuel value chains. Another major impact of the trade is that it provides a more-or-less continuous main source of energy for the populations of major urban areas in Central and West Africa. The informal character of the sector makes it an accessible but not particularly high status source of income for tens of thousands of people. The low entry barriers for producers, wholesalers, transporters and retailers are largely not determined by regulation, apart from the exceptions of managed forests in West Africa, but by the business environment (i.e. access to capital) and distance to markets. The trade in woodfuel provides an important source of cash and household revenues for all actors, particularly for the groups with lowest incomes, the producers and retailers. For these actors the trade is also fairly low risk: being non-perishable, an undifferentiated product, having slightly seasonally fluctuating but general stable and continuous demand and prices with a large number of consumers.

The evidence from the literature review confirms the first hypothesis that formalisation is more likely to advance urban actors further along the value chain. Higher profits ensue from risk taking, investing in infrastructure and information, and adding value through bulking, transport and distribution, often over long distances in difficult terrain, which restrict the number of actors able to operate in the transport and wholesale part of the chains. Classical economics and value chain theories (Kaplinsky and Morris, 2001) hold that higher levels of risk are rewarded with higher profits. In the business value chain literature distributional equity of profits is an outcome of competiveness and risk management (Grey and Shi, 2005; Porter, 1988). In contrast, in the development-focused value chain literature, unequal distribution of benefits is viewed as a development issue (Helmsing and Vellema, 2011; KIT, IIRR, 2008). These diverging views highlight that the aim of formalisation of the woodfuel sector has primarily not been development, but managing and controlling economically valuable resources. More pro-poor focused policies are apparent in West Africa. For example in Burkina Faso, Niger and Senegal, the proceeds of woodfuel from dedicated forest management areas are invested in social and environmental programs from which communities benefit. However distributional equity among actors in the chain does not appear to have been tackled. The implementation of woodfuel regulations is generally

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weak, large proportions of potential tax revenues are not collected, or when they are collected, the costs weight heavily on actors, particularly those with the lowest profit margins.

The evidence points to a partial affirmation of the second hypothesis, that countries with more formalised charcoal institutions, such as those in West Africa, have systems in place to distribute benefits to rural actors. However, the implementation of this and the actual benefits for these rural citizens remain low. Within the four studied West African countries, charcoal institutions are more formalized in Senegal compared to Burkina Faso, Mali and Niger. High levels of scarcity and pressure on resources have largely stimulated formalisation of institutions. Through formalisation, more of the actors, particularly urban-based actors, involved in the chain have gained and used their voice to ensure that the policies and institutions governing the sector ensured beneficial outcomes in terms of access to and control of charcoal resources along the chain. Rural actors have received less attention as they are generally unorganised and lack power to access benefits and are less visible to policy makers and regulators. This finding indicates that as well as facilitating access through formal mechanisms, hierarchies and effective decentralisation processes at the village level need to be addressed (Ribot, 1995b).

Conclusion

Considering the hypotheses, it can be concluded that despite the existence of legal mechanisms, the charcoal value chains in Central- and West African countries are mostly characterised by lack of formal governance or incomplete implementation, and a predominance of informal rules and market-led arrangements. West-African countries have stronger formal charcoal institutions and these are more embedded into cross-sectorial national energy and environmental policies. Conversely, in Central Africa this coherence with energy policies has been mostly lacking and as a result there exist little coordination between sectors and few incentives to actors in the chain to operate sustainably. There are many vested interests in the informal systems with producers and rent-seeking actors along the chain and few motivations or disincentives to change. Formalisation only occurs once the pressure on the resource is acute enough that government intervention is required. Especially the West African countries with higher levels of overexploitation of woodfuel resources and decentralisation of forest management show some enabling formal mechanisms that might counter the status quo.

The charcoal permit systems highlight the barriers to create meaningful, effective, sustainable and inclusive systems for woodfuel management. Permits need to be accessible by the rural producers who are frequently located long distances from urban areas. Distance, procedures and costs are obstacles for functioning systems. Systems of corruption, paying euphemistically named “informal” taxes are deeply embedded. This operating environment adds significant costs and risks and is an important part of the chain context that needs to be considered in formalisation. Failure to do so could add additional costs and burdens and create more difficulties to control black markets. Another theme is the lack of transparency and apparent large discrepancies between receipts of revenues from permits and taxes and reinvestment in woodfuel resources and communities. Participative approaches with the actors and sectors of the woodfuel chain, building upon enabling formalisation practices in West African countries could assist to improve outcomes for both livelihoods and the resource base. These experiences suggest that devolving responsibilities of woodfuel management to more local level, taking account of functioning customary systems, reinvesting taxes in social and environmental outcomes, monitoring woodfuel trade, and providing incentives for sustainably produced charcoal, can provide enabling mechanisms to formalise and create more sustainable value chains that continue to provide positive livelihood benefits to thousands of people in the chains and millions of consumers. Caution should be exercised given the possible unintended outcomes related to power and distribution of benefits among the actors.

These conclusions can only be considered as tentative. The cases highlight the lack of quantifiable knowledge about livelihood outcomes along the charcoal value chain. The paucity of data is partly because of the mostly informal character of charcoal production and trade. In order to further assess possible benefits and constraints of formalisation as these processes develop, more empirical studies are needed about the organisation and governance of charcoal production and trade as an integrated value chain process.

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