Artisanal chainsaw milling to support decentralized management of timber in Central Africa? An analysis through the theory of access

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Introduction

In the second half of the 1970s, it became clear that the expected positive impacts of tropical forestry on rural livelihoods rarely materialized (Douglas 1983, FAO 1978). A major challenge was to integrate social issues into tropical forest management, as a way to improve the livelihoods options of the rural people living in or near the areas where forestry operations took place. Social forestry was thus proposed to promote forest management activities that closely involved local people in forestry and tree growing activities, for which they assumed (at least part of the) management responsibilities, and from which they should have derived a direct benefit through their own efforts (Cernea 1986, Wiersum 1999). By the beginning of the 1990s, the focus of social forestry had extended to decentralization of forest management (Ribot and Larson 2005).

In the countries of Central Africa, the objective of decentralizing forest management has been considered into the revision process of the respective forest laws that occurred during the latest two decades. The involvement of local people in forest management has been mainly promoted by two types of logging permits:

- the logging concession that must be managed according to the rules set into a forest management plan, in which local practices must be acknowledged and valorized. In Cameroon, Central Africa Republic (CAR), Gabon, Congo and the Democratic Republic of the Congo (DRC), logging concessions covered in 2008 more than 40 million ha over a total surface of lowland tropical forest of 140 million ha (de Wasseige et al. 2009). In practice, even if forest management plans provide for actions in support of the local populations, the fight against rural poverty is not one of their explicit targets (Nasi et al. 2006).
- the community forest, which is considered the most complete example of devolution of forest management to local people (Julve et al. 2007, Oyono et al. 2006). But despite CFs being included in all the legal frameworks of the region, implementation to date is still weak in most countries. In fact, in Central Africa, this management model has only been implemented in Cameroon: as of June 2011, there were 1.5 M ha officially granted as CFs, albeit only about 0.3 M ha were actually operational.

Data collected during the latest decade, mostly in Cameroon, show that these two main types of formal forest management in Central Africa present average or low results when assessed against major criteria of decentralized forest management (Table 1).

Table 1: Actual implementation of decentralized forest management in logging concession and community forest

Criteria to assess decentralized forest management	*Logging concession*	*Community forest*
1. Involvement of local people in forest management		
Respect of customary use rights and involvement of rural people in the choice of logged timber species and areas	Customary rights are mentioned in the Forest Management Plans, but little enforced in practice (Alden Wily 2011, Lescuyer et al. 2012a, Vandenhaute and Doucet 2006)	Customary rights are mentioned in the Simple Management Plans but their implementation is to be validated by the forestry administration (Lescuyer 2006, Oyono et al. 2006)
Involvement of rural population into timber harvesting activities	Most of the manpower is not recruited in the villages located around the concession (Counsell et al. 2007)	Most Community Forests in Cameroon are exploited through a sub-contract with a logging company (Cuny 2011)
Respect of arrangements made by loggers with local population	Recurrent conflicts between rural populations and logging companies (Collas de Chatelperron 2005, Counsell et al. 2007)	Recurrent conflits between customary right-holders and Community Forest managers (Etoungou 2003, Ezzine et al. 2011, Oyono 2004, Oyono 2005)
2. Socio-economic development at the		

local scale		
Employment	Many jobs, but mainly near the processing factories and less in the villages around the concessions (Molnar et al. 2010)	Very few permanents jobs (Cuny et al. 2004, Lescuyer 2012)
Rural incomes	Little direct impact on the incomes of rural households (Lescuyer et al. 2012a, Singer and Karsenty 2008)	Revenues accruing from logging are low when distributed among the community members (Beauchamp and Ingram 2011, Cuny 2011, Oyono et al. 2012)
Basic needs	Limited impact as the forestry-tax redistribution scheme – dedicated to collective infrastructure – does not work efficiently (Assembe 2006, Bigombe Logo 2004, Cerutti et al. 2010, Lescuyer et al. 2008)	Few investments funded by the logging revenues (Cuny 2011, Ezzine et al. 2008, Oyono et al. 2006, 2012)

Despite the recognition and vesting of formal use rights to local populations over forest resources, the powers to implement these rights remain inaccessible. Two types of constraints prevent the promotion of decentralized forest management for logging concessions and community forests. First, the legal framework of forest management decentralization includes a variety of limitations on livelihoods options, mainly regarding available logging areas, limits on use, and bureaucratic requirements (Larson and Pulhin 2012). Despite recent efforts to provide new and secure rights to local communities, government regulations are still founded on the scientific forest management tradition and the bureaucratic culture that has persisted in state forest agencies. As a consequence, formal initiatives of decentralized forest management are promoted and led by political, economic or military elites who have the powers to tackle these administrative hurdles and capture most of the benefits while local communities carry the costs (Oyono 2005, Ribot et al. 2010).

The failure of these two formal options of decentralized management of forest resources has not resulted in a rush of local populations to look for alternative sources of legal access to timber, such as small-scale logging permits. In fact, despite being included into every forestry law of the Congo basin countries, the actual application of these small-scale logging permits meets substantial challenges in Central Africa. First, the small-scale logging permits as identified by the current legal frameworks either lack implementation decrees needed to regulate their attribution and operations, as in the Central African Republic, or remain partially suspended, like in the Republic of the Congo. As an illustration, small-scale logging permits are not included in the Voluntary Partnership Agreements signed by the Cameroon, Congo and CAR with the European Union to promote production and export of legalized timber. Secondly, the administrative procedures to request a small-scale logging permit is complex and costly: in Cameroon for instance, the granting of permits is currently centralized in the capital city, where an inter-ministerial commission decides the attribution of each permit. Third, the legal framework, if implemented, is generally not suited to the needs of chainsaw millers on the ground, but small-scale logging permits are used to launder illegally harvested timber, like in the DRC and in Gabon (Global Witness 2012, Lescuyer et al. 2011a).

In total, despite the revision of forestry codes in favor of decentralized forest management and of individual logging permits, formal rights of local people to exploit forest resources were little exerted, mainly because of the resistance of forest administration. These barriers to the exercise of the legal rights of local people explain why domestic timber markets are currently supplied by informally produced sawnwood. Estimates of annual consumption of sawnwood in urban markets in Cameroon, CAR, Congo, DRC and Gabon are about 1 253 000m^3, of which 79% comes from informal sources (Lescuyer et al. 2012b). For comparison, formal sawnwood exportation was about 791 000m^3 in 2010 for the same countries. Although domestic markets are not monitored by national statistical systems, several recent reports (Cerutti and Lescuyer 2011, Global Witness 2012, Lescuyer et al. 2011a, Lescuyer

et al. 2011b, Lescuyer et al. 2013) show that the substantial development of this sector over the last decade has relied primarily on informal practices. In Cameroon, for example, the volume of timber traded on national markets has more than doubled between 2001 and 2009 (Cerutti and Lescuyer 2011, Plouvier et al. 2002).

The growth of domestic timber markets coupled with the difficulty of legally harvesting trees by local people has pushed the development or the extension of a decentralized but informal management of timber resources. Since rights-based schemes for decentralized resource management were not operational, local actors have developed alternative approaches to informally exploit timber resources, that are elaborated on new processes of access to resources and benefits with a view to provide the growing demand of the artisanal sawmilling sector. We rely on the "theory of access" (Ribot and Peluso, 2003) to understand how, without having legal ownership of these resources, local people have benefited from timber resources. In their seminal article, Ribot and Peluso (2003) mention eight common categories of access mechanism - access to technology, capital, markets, labor, knowledge, authority, identity and social relationships – that we use to understand the development of informal chainsaw milling (CSM) in rural societies of Central Africa. The article analyzes how the combination of these access mechanisms may vary according to national or local contexts, but also shows similar processes in a majority of cases. Based on the description of means, relations and processes that enable local actors to derive benefits from CSM in Central Africa, the article examines the contribution of theory of access to define the characteristics of a decentralized, democratic and sustainable management of timber resources.

The next part of the article describes the methods used in collecting quantitative information on the access mechanisms for informal CSM. Then, results are presented according to the various mechanisms of access to timber resources and CSM revenues. The discussion questions the ability of these access mechanisms to sustainably managing forest resources and discusses the relevance of formalizing CSM practices to improve the chance of a more equitable distribution of benefits and of lasting use of this resource.The conclusion summarizes the main issues to be considered in sustaining and developing CSM in Central Africa.

Research design and methods

The results presented in this article come from a broad campaign of surveys carried out between 2008 and 2011 in the forested areas of five countries of the Congo Basin: Cameroon, CAR, Congo, Gabon, and DRC. Data were collected by a two-phase survey, which relied mainly on face-to-face interviews with stakeholders.

The first phase of the survey focused on collecting basic data on the importance and characteristics of CSM in selected administrative regions where CSM was known to be present. These regions differed in scale from administrative village areas in CAR to Departments in Gabon. Except in CAR, the spatial range of these administrative unite is between 2 500km² and 15 000km². The respondents were purposefully sampled on the basis of expert information from sawn wood sellers in urban markets. In each study region, an individual and anonymous questionnaire was used to record the characteristics of CSM as indicated by local leaders, who have direct or indirect experience with informal timber operations, such as the mayor, the district officer, the representatives from the Ministry of Forest, the representatives of the Ministry of Finance and the village chief. These interviews focused on general trends, aggregated information and overall assessments at the district level. On this basis, a systematic overview was

prepared of the history of the area's informal timber sector, the people involved, the technical skills, the local tax system, and the sector's benefits and problems.

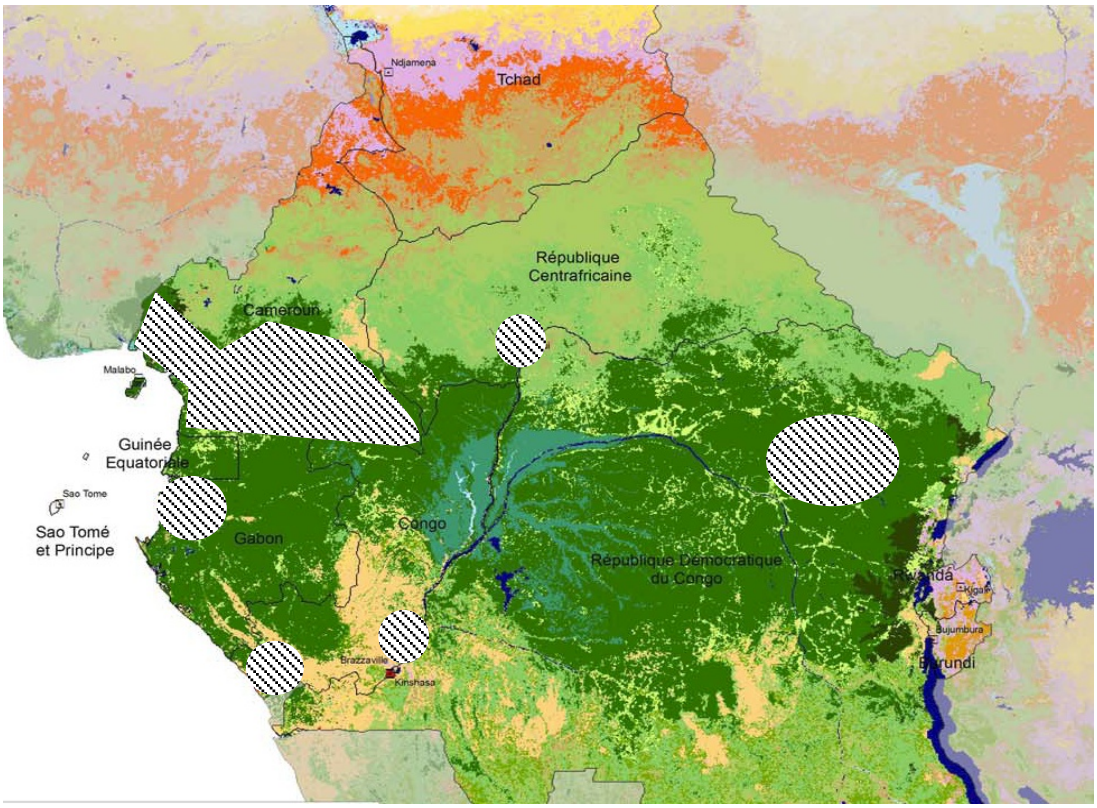
The second phase of the survey consisted of a series of individual and anonymous interviews with chainsaw millers, who were identified on the basis on the prior discussions with local leaders. This category of chainsaw millers indicated by local authorities constituted only 25% of the total sample of our respondents. The vast majority of respondents was selected by a snow ball approach, in which chainsaw millers indicated other colleagues to be interviewed. Most of the time, all available chainsaw millers were interviewed at the village scale by the survey team. Data were collected using a semi-structured interview grid that included questions on the sawyer's motivations, his targeted tree species, his use of the revenue earned from CSM, the difficulties and potential solutions. Each chainsaw miller was then asked to detail all costs and profits from his latest chainsaw operations. These data were further cross-checked with observations of CSM operations. Data collected during this second phase of survey were based on detailed individual experiences and complemented the overall picture of CSM previously provided by local elites.

Table 2 details the research design, including the number of surveyed administrative areas and the number of interviews held and number of operations observed. Figure 1 presents the location of the surveyed areas.

Table 2: Research design

	Cameroon (throughout the forest zone)	CAR (around Bangui)	Congo (around Pointe-Noire and Brazzaville)	DRC (in the Eastern Province)	Gabon (around Libreville)
Number of surveyed administrative areas	44 Councils	22 villages	4 Districts	3 Territories	4 Departments
Number of interviewed chainsaw millers	261	108	60	28	96
Number of reviewed CSM operations	340	151	60	35	212
Survey period	July 2008 - June 2009	July 2010 - June 2011	February 2009 - November 2009	May-June 2010	September 2008 - August 2009

Figure 1: Location of the surveyed areas (hachured)



(Background map: de Wasseige et al. 2009)

Surveys conducted in DRC were limited to the district of Ituri, which was very active in the production of informal sawnwood but was not considered representative of other areas of the country, like Kinshasa and the province of Equateur. Therefore, data collected in Ituri were not extrapolated to the national level, which explains the absence of DRC in Table 4 displaying macroeconomic data.
Data were analyzed with the basic statistics package of Windows Excel software.

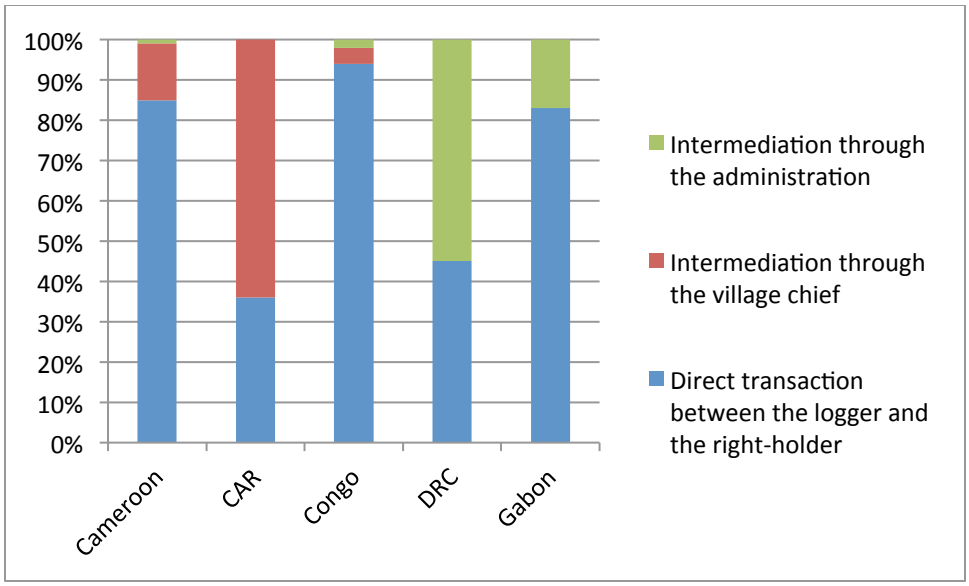
Results

Results are presented according to the 8 common categories of access to resources and benefits proposed by the theory of access, however with grouping access through social identity and access through legal authorities, due to their inter-dependence.

Access through social identity and through legal authorities

Access to timber resource for small-scale loggers mainly undergoes direct and individual transactions with customary right-holders, which end up in verbal agreements (Figure 2). Village chiefs are rarely involved in these transactions, except in CAR where 90% of the chiefs have established an informal taxation system: they identify sawyers who settle in their villages and impose this local taxation on them. Conversely, in DRC, artisanal loggers prefer the administration as the partner of choice to identify and acquire a preliminary right of access to operating areas, although after the approval by the administration, access is also negotiated with the heads of villages.

Figure 2: Types of transaction between customary right-holders and chainsaw millers



Except in DRC, the dominant model of transaction between loggers with right-holders is built on and strengthens the customary system of forest tenure in Central Africa, where valuable trees are customarily-owned by individuals who discovered them or increased their value by land improvement (Diaw 1997, Le Roy et al. 1996, Lescuyer 2006). The possibility of selling trees is therefore open to all customary owners, that is to say, a majority of adult men who live in the village. It is considered by local population as a means to re-confirm customary rights over forest resources, which are ignored in the official procedure of granting logging permits by the State. Illegal sale of trees by customary right-holders to small-scale loggers also appears as acts of resistance against unfair rules: both farmers and loggers are likely to perceive official tree tenure, and the way these rights are enforced, as unjust (Hansen 2011, Peluso 1992). CSM has become a way to resist oppressive management regimes on a resource that people believe it is legitimate to use.

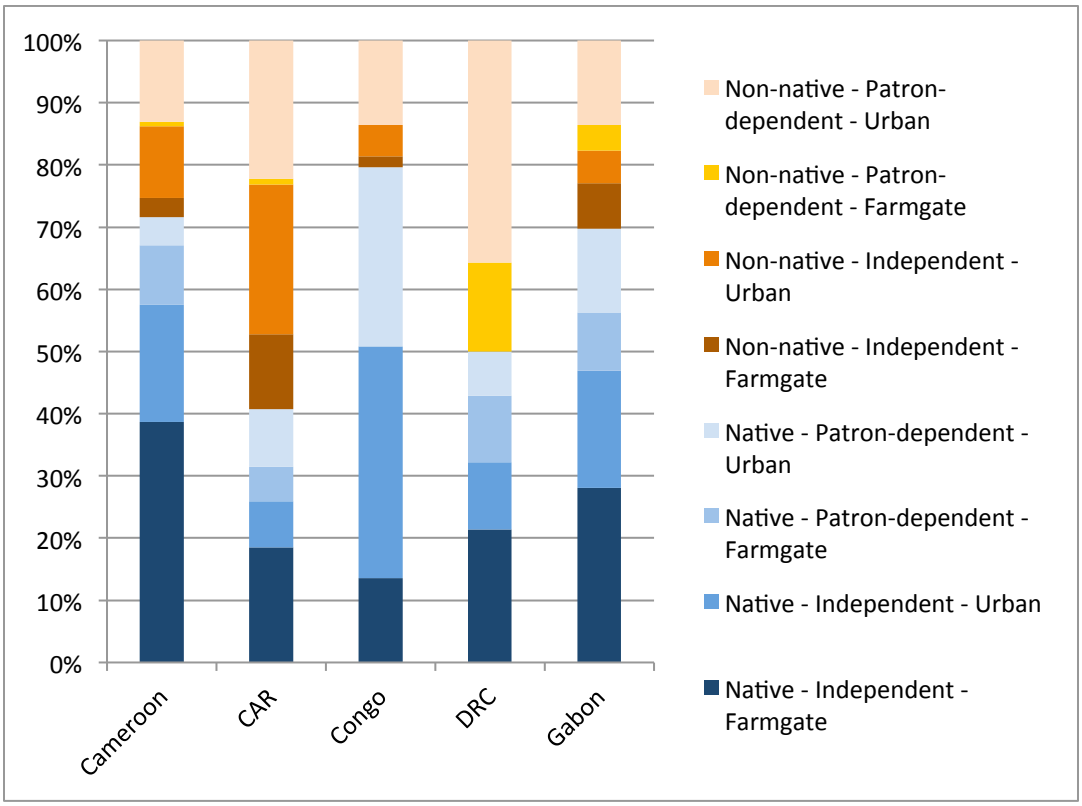
Access to markets

When considering activities from stump to market, chainsaw millers may be engaged in a variety of enterprise activities. At one extreme, there are the autonomous sawyers who do not wait for an order of products to start harvesting trees. They are based in their native villages, where they harvest trees and then look for a buyer. In such cases the sawn products are transported to urban markets without knowing whether the products meet a specific demand. At the other extreme, non-native chainsaw operators come from cities and work to fulfill a specific order obtained before they start harvesting. Native and non-native operators can work on a freelance basis or for the benefit of patron who usually lives in town. Patron-dependent operators are protected by their boss who can finance the harvesting operations as well as intervene with the authorities in case of difficulties.

A third criterion to discriminate chainsaw millers is the place where they sell their produce: (1) the sawn products are sold at a 'farm gate' price to local traders and users; or (2) the sawnwood is loaded onto a means of transport and conveyed to more distant markets, where it is sold at an urban market price to middlemen or consumers. In the last case, the transportation and related costs are covered by chainsaw millers, but can be recovered by the higher urban market price compared to the 'farm gate' price.

The combination of these three criteria – geographical origin, patron-dependence and place of transaction – describes to what extent and how local actors access domestic timber markets in each country (Figure 3).

Figure 3: Socio-economic profiles of the interviewed chainsaw millers



In Cameroon and in Gabon, the category of native and independent operators is the most important. This indicates a relatively easy access for these local operators to timber markets, even if most transactions occur in rural areas. In Congo, native operators are also most numerous but a significant portion of them access urban markets thanks to the support of their bosses. This finding is mainly due to the short distance between the harvesting sites and the urban markets, for instance in Pointe-Noire. The high proportion of chainsaw millers in CAR and DRC who are non-native operators can be explained by two factors. In CAR, timber resources are still available in the vicinity of Bangui and city-based chainsaw loggers can easily reach the logging sites. Contrary to Congo, timber markets in Bangui are supplied by non-native operators but who do not require the protection of a patron. This difference is explained by a lower technical background and a more difficult access to equipment for the CAR native operators in comparison to their Congolese colleagues.
In Eastern DRC, CSM is mostly in the hands of specific geographically defined groups: many patrons are natives of the Kivu provinces, where they control both domestic and export markets. Small-scale operators are recruited by Kivu patrons, who dispatch them to the main logging sites in Ituri district in the neighboring Eastern province. In this context, only 10% of the chainsaw millers are independent and able to reach urban markets.

These various types of access to sawnwood markets have an influence on the distribution of CSM revenues although operating modes follow similar patterns in all five countries: the sawyer buys the tree from a customary owner, sometimes after consultation with the village chief. The tree is cut and processed on site by the sawyer and his assistant. Sawn products are then carried to a road or a river by porters where it is either sold at a farm gate price or loaded on a vehicle to be sold in an urban market. Table 3 summarizes the various production costs and sawnwood prices in the five countries.

Table 3: Average operational costs of CSM in 5 Central African countries (in F.CFA/m^3 of sawnwood)

	Cameroon			CAR			Congo			DRC		
Categories of cost	Average	Farm-gate sale	Urban sale	Average	Farm-gate sale	Urban sale	Average	Farm-gate sale	Urban sale	Average	Farm-gate sale	Urban
		(n=180)	(n=160)		(n=64)	(n=87)		(n=5)	(n=55)		(n=16)	(n=1
Fee to customary owner and village chief	4.079 (σ=6.297)	2.472 (σ=4.211)	5.887 (σ=7.641)	3.911 (σ=4.032)	3.112 (σ=4.442)	4.498 (σ=6.257)	2.986 (σ=2.095)	3.567 (σ=1.026)	2.934 (σ=2.165)	1.317 (σ=2.769)	2.184 (σ=3.701)	(σ=1.
Local wages (sawyer, assistant, carrier, other)	27.362 (σ=29.426)	22.158 (σ=19.230)	33.127 (σ=36.942)	14.911 (σ=12.031)	13.389 (σ=11.052)	16.031 (σ=18.162)	30.148 (σ=14.368)	45.126 (σ=9.994)	28.787 (σ=13.982)	17.357 (σ=9.774)	16.650 (σ=10.687)	17 (σ=9.
Oil	10.533 (σ=7.596)	10.842 (σ=7.064)	10.186 (σ=8.163)	9.231 (σ=6.524)	8.758 (σ=4.757)	9.580 (σ=7.574)	5.371 (σ=2.287)	5.200 (σ=1.294)	5.387 (σ=2.364)	10.628 (σ=6.171)	12.991 (σ=7363)	8 (σ=4.
Informal taxes	5.713 (σ=12.069)	1.641 (σ=5.838)	10.294 (σ=15.242)	2.833 (σ=3.522)	1.543 (σ=1.711)	3.605 (σ=7.554)	11.792 (σ=8.145)	1.968 (σ=2.701)	12.686 (σ=7.887)	1.813 (σ=3.062)	1.077 (σ=1.927)	2 (σ=3.
Equipment and transportation	14.569 (σ=20.378)	7.185 (σ=10.817)	22.875 (σ=24.950)	14.159 (σ=13.854)	8.703 (σ=9.694)	18.173 (σ=21.581)	14.600 (σ=10.357)	713 (σ=205)	15.863 (σ=9.885)	15.687 (σ=14.819)	12.775 (σ=13.192)	18 (σ=16.
Sundries	2.436 (σ=5.286)	1.542 (σ=4.010)	3.441 (σ=6.289)	3.791 (σ=4.459)	2.950 (σ=2.015)	4.409 (σ =5.549)	0	0	0	3.472 (σ=2.694)	4.149 (σ=3.608)	2 (σ=1.
Total cost	64.692	45.841	85.900	48.836	38.455	56.296	64.899	56.574	65.655	50.273	49.826	50
Selling price	74.283 (σ=51.860)	60.765 (σ=38.788)	89.491 (σ=60.008)	55.924 (σ=25.440)	47.603 (σ=23.407)	62.045 (σ=48.896)	79.322 (σ=31.252)	81.700 (σ=28.467)	79.106 (σ=34.831)	57.974 (σ=21.268)	56.376 (σ=24.729)	58 (σ=17.
Profit	9.591	14.924	3.591	7.088	9.148	5.749	14.423	25.126	13.450	7.701	6.550	8

The direct income for rural people generated by CSM can be estimated by the aggregation of three income items: the income of customary owners through the sale of trees, the income of local assistants from wages, and the income from wages and profit for the native independent sawyers. These expenditures represent more than half of the total cost of CSM in Cameroon, Congo, and DRC. Table 4 presents an estimate of the total rural income; these estimates are based on the average unit costs of the three income items (see Table 3) and the estimated annual production of small-scale logging in Central African countries (Lescuyer et al. 2012b).

Table 4: Annual income flows from CSM to rural economies in 4 Central African countries

	Local income per m^3 (F.CFA)	Annual production of informal sawn wood (m^3)	Total annual income in rural economies (billion F.CFA)	Comparison with other forest revenues accruing to local people
Cameroon	42 194	662 000	25.287	Annual Forestry Fee redistributed to councils and communities in 2008 : 6.4 billion F.CFA
CAR	19 446	33 000	0.522	Annual bushmeat trade : 14 billion F.CFA
Congo	47 557	99 000	4.138	
Gabon	53 137	50 000	2.134	Annual bushmeat trade : 11.9 billion F.CFA

In rural areas, where economic opportunities are scarce, small-scale logging provides a relevant source of income. For instance, it is four times the amount expected to arrive in rural areas with the payment of the Annual Forestry Fee in Cameroon (Cerutti et al. 2010). If compared to the annual revenue generated

by hunting in CAR and Gabon, reported as 14 billion F.CFA in CAR (Billand et al. 2009) and almost 12 billion F.CFA in Gabon (Nasi et al. 2008), the contribution of CSM appears relatively small. However, the difference in contribution of CSM and hunting to rural economies is likely to be smaller than suggested by our tentative comparison: whereas CSM estimate relates to rural incomes only, the estimates of annual bushmeat trade refer to the entire sector, including urban traders. It is not known which portion of those revenues actually reaches the local population.

Access via the negotiation of other social relationships

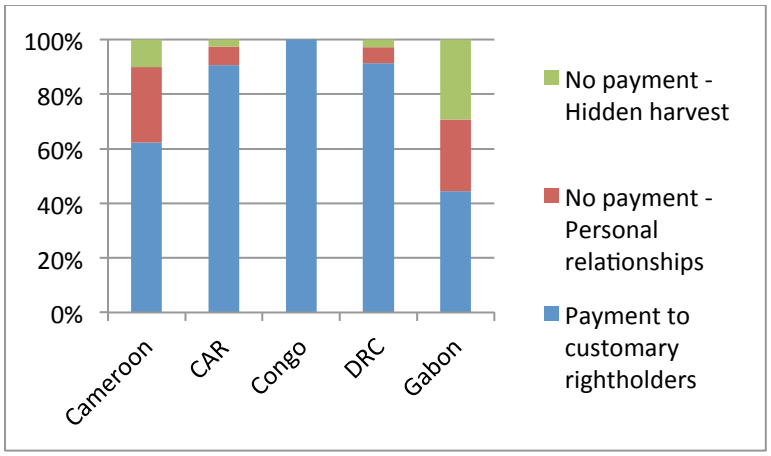
The development of an informal CSM sector in Central Africa has benefited from a tolerance, or even a support, by the authorities who were supposed fight illegal exploitation of forest resources. Informal taxes now account for between 2% and 18% of operating costs and are the guarantee of a normalized relationship between operators and many state officials.

CSM is responding to a urban demand that in the last couple of decades could be fulfilled neither by the too expensive, export-quality, timber provided by concessions, nor by the small volumes sourced in CFs. A "political" push for such timber to be sold on the domestic market, with a concurrent clamp-down on CSM, has also never been an option for the Government, because such measures would have increased the cost of the resource to the final buyers and displaced many people out of business: a political impossibility in a country where economic conditions remain dire. In fact, state officials, notably decentralised ones, opted for the more pragmatic solution of "using" the informal situation of CSM to extort money all along the chain from accessing the resource to trading it, while supporting in the meantime a political system on which they depend (Cerutti et al. In press).

Access to knowledge and natural capital

Irrespective of the possession of legal permits, operators have to request cutting authorizations from the customary right holders on forests or trees at local level. Beyond the acknowledgement of customary ownership on timber resources, chainsaw operators rely on local people's knowledge of the timber resources in the neighborhood of their village. Therefore, unlike in Ghana (Hansen 2011), it is rare that chainsaw operators enter forest areas without permission of the customary right-holders, whether the village chief, the head of the lineage or the individual owner. Three different situations occur: (1) the chainsaw miller has an ex ante or ex post agreement with the customary owner of the tree and pays a fee; (2) the chainsaw miller cuts trees to which he or his relatives hold customary rights, in the last case often in exchange of a small contribution in kind – some planks for instance; (3) the chainsaw miller cuts a tree without informing the customary owner and expects not to be caught. The first arrangement is the dominant mode of accessing timber resources (Figure 4).

Figure 4: Frequency of the payments to customary right holders (according to chainsaw millers' interviews)

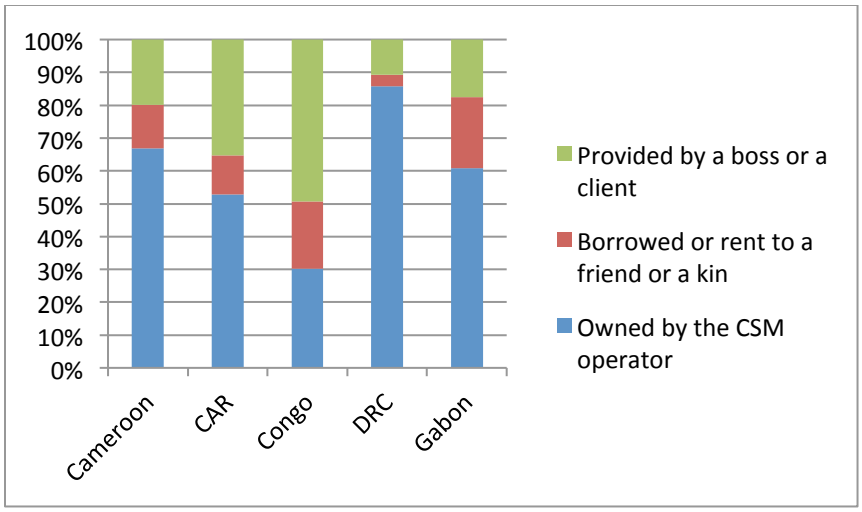


The ease of accessing trees for CSM operators depends on three factors:
(1) The social base of the operators: most freelance small-scale loggers operate in their native areas and depend on lineage or social relations for accessing the timber resources.
(2) The density of the local population impacts on the local enforcement capacity. A higher population density reduces the possibility for unscrupulous loggers to cut trees without informing customary owners.
(3) The distance between the human settlement areas – village and agricultural mosaics – and the logging sites. For instance, in Cameroon and CAR the short distance of valuable trees from local settlements prevents many hidden logging practices.
Another reason for chainsaw millers to access timber resources with prior consent of customary owners is the small cost of the transaction: as indicated in Table 3, the fee paid to customary owners is never more than 8% of the total operational cost. The small cost to spot and to access natural capital for chainsaw millers relates to, on one hand, the feeling of customary owners that timber resource is still plenty (Robiglio 2012) and, on the other hand, to the hardship for customary owners to find reliable information on the urban or international price of sawnwood.

Access to technology

Chainsaw is the major equipment of artisanal small-scale logging. This tool has been used for decades by industrial logging companies but it was dedicated to the only operation of tree felling. Chainsaws are easily accessible in Central African countries and their use has little requirements in terms of skills and capital (Pasiecznik 2010). As indicated in Figure 5, a majority of CSM operators own their chainsaw, except in Congo.

Figure 5: Ownership of the chainsaw (according to chainsaw millers' interviews)



Access to labor

CSM is not an activity requiring high technical capabilities but requires good physical shape. It offers a job opportunity to many men - often young - in search of regular income. As shown in Figure 3, most chainsaw millers are native to the area they operate and almost always use local labor for instance to carry sawn wood to routes. The Iruri region in DRC is an exception since half of the interviewed sawyers came from the neighboring province of Kivu. Moreover, these sawyers were almost always accompanied by their assistants and their porters, and relied little on local labor (Lescuyer 2010). The significant presence of immigrants workers in the CSM sector in Eastern Province is not explained by their technical abilities, but because they are imposed by the bosses who control access to the active markets of Kivu and to export to Uganda. The presence of these non-native workers is rather the consequence of a specific access to timber markets.

Discussion – Decentralized and sustainable management of timber resources: Are informal powers enough?

In attempting to describe the "bundle of powers" rather than the "bundle of rights" held by the actors, the theory of access helps understand the specific arrangements made between actors to access resources and their benefits. This analysis highlights the factors that have facilitated the growth of the informal sector of CSM in Central Africa for ten years, which has developed without property rights being granted to local populations. However, this analysis is incomplete to diagnose the presence of a local, sustainable and democratic management of timber resources. It does not address the accountability of resources managers or the ecological sustainability of the harvest. Considering these two concerns requires a formalization of CSM, which should happen without fundamentally calling into question the modes of access made by local actors.

CSM and decentralized forest management

Applying the theory of access to CSM in Central Africa can explain the mechanisms and processes that enabled the development of this informal sector over the latest a decade. It is the result of a combination of technical, social, economic and political factors found in the Congo Basin, although their relative importance may vary, depending on the country.

However, two types of access are of crucial importance to understand the growth of informal CSM. On the one hand, the traditional system of forest tenure has allowed chainsaw millers to operate with a

social legitimacy and at low cost to access a resource that was already known by the customary owners but little valued. Most operators are native to the area where they work and rely on kinship or friendship relationships to access the resource. On the other hand, domestic markets remain accessible to independent operators. Except in Eastern DRC and to some extent in Congo, CSM is not controlled by patrons who benefit from economic, political or military support.
These two access mechanisms explain a substantial part of CSM revenues reaches local communities. The distribution of this income within the beneficiary population and its use in order to increase collective well-being is not explicitly addressed by the theory of access. It is in other books that Ribot (2002, 2004) retains the notion of accountability – the exercise of counterpower to balance arbitrary action (Agrawal and Ribot 1999) – as a necessary element to transfer powers in order to elaborate a democratic decentralization of natural resources. Benefiting mainly to customary owners of trees - almost always men - and young men able to do physical work, informal CSM contributes at best indirectly to better collective well-being. In the absence of a mechanism of accountability on the use of timber resources and of this income that exceeds the lineage or family units, it is likely that certain social groups, such as women, indigenous people and migrants, are not involved in this local management of timber resources. In such a context, selling timber to small-scale loggers according to customary tenure rules does not necessarily performs critical social functions such as fostering community decision (Honey Rosés 2009).
An analysis based on the theory of access, which allows decipher the "bundle of powers" held by the actors rather than the "bundle of rights", deserves being complemented by a study of mechanisms of accountability regarding the exercise of these powers, if the final objective is a decentralized and democratic management of forest resources.

CSM and sustainable forest management
Ecological sustainability is not addressed by the theory of access. In this analytical approach, institutional arrangements may be agreed by all stakeholders but to the detriment of the resource. This issue is particularly important as illegal or informal logging is often considered an important factor in deforestation and degradation of tropical forests (XXX). This criticism is to be mitigated in Central Africa (Cerutti and Lescuyer 2011, Lescuyer 2010, Lescuyer et al. 2011a, Lescuyer et al. 2011b). First, chainsaw millers mainly work in degraded forest areas that are located at a close distance of evacuation routes. It is rare that artisanal sawyers enter the permanent forest estate, unlike in Ghana (Hansen and Treue 2008). Secondly, except for Congo, the average volume of sawn wood extracted from a tree is high: it indicates the preference of chainsaw millers for large-diameter trees for which productivity is maximized. In the other four countries, the abundance of such big trees in agroforests and degraded forests has so far been sufficient to support the growth of CSM.
However, in the Central Region of Cameroon, Robiglio et al. (2012) show the existence of an opportunistic association between small-scale logging and agricultural uses, determined mostly by the abundance of valuable species in fallows and cocoa farms, the easy accessibility and the low price of farmland timber. This context is not prone to a sustainable management of timber resources by rural population: when the timber resource seems still abundant and when tree tenure is not legally recognized, activities such as seed or seedling production are rare. At least for the forest areas located around main cities of Central Africa, current agricultural expansion and intensification trends associated to small-scale logging may jeopardize timber resources in the rural land over medium term.

Albeit favoured by customary landowners and supported by active urban markets, as described through the lens of the theory of access, CSM possibly remains an inequitable and unmanaged activity at the local scale, that risks being socially and ecologically unsustainable over the long-term. Using the theory of access is successful to understand how institutional arrangements were established, even in the

absence of property rights, to support the growth of the informal sector of chainsaw milling in Central Africa, but it is incomplete to demonstrate the existence of a sustainable, democratic, and decentralized management of forest resources. The need to consider accountability and long-term maintenance of resources requires a review of current patterns of CSM, including a reform of the legal and institutional context of this activity.

The challenge of combining regulatory standards, customary norms and economic incentives

The goal of a local, sustainable and democratic management of timber resources requires reducing uncertainties associated with small-scale exploitation and sale of sawn wood in domestic markets. The present uncertainty of this activity pushes customary owners to seize any offer made to them by the sawyers, selling their trees for a fraction of their commercial value. Also, the short-term vision of customary owners, often reportedly caused by their uncertain tenure rights over trees, is a major obstacle for the implementation of any long-term strategy aiming to foster the sustainable management of timber resources at the local scale. If formulated, such strategy should thus recognise that for an activity like CSM, which is practiced by thousands of people in thousands of scattered sites, only the local population is able to control access to timber resources around their villages. This would require the recognition of the legitimacy of local institutions and the authorisation to use certain forest resources in rural areas in accordance with customary rules and according to local social norms (Hansen and Treue 2008). While communities can handle internal management challenges without clear state laws, the latter are however needed to define the rules by which communities can interact with outsiders (e.g. logging companies, traders, etc.), to provide basic protections for individuals against the abuse of local power, and provide basic guidelines for protection of wider societal interests (Larson and Pulhin 2012, Scherr et al. 2003). A legal framework is needed to support local rules on timber management but also to frame their applications and to protect essential economic values of forests at all scales of society (Karsenty 1998, Ribot et al. 2010).
Some basic principles of timber management must also be met, for instance on the minimum cutting diameter, the preservation of endangered species, or the localization of the logging site outside the permanent forest domain, the other rules being defined and implemented according to local customary systems of access and use of forest resources.

Such a formalization of the local rules governing CSM's practices would cause an economic cost that would be reflected in the price of sawnwood on the domestic market and would reduce the comparative advantage of artisanal sawnwood compared to sawnwood coming from CFs or industrial sawmills. However, a moderate increase in price of artisanal sawnwood would have little effect on their market share, given the current difference between the production costs of these three sectors: for instance in Cameroon, the prices of products sold on the domestic market, albeit of a quality that is not comparable, are on average about 80% lower for timber sourced from CSM than the international prices applied for the industry (Cerutti and Lescuyer 2011). Similarly, even if the variable production costs are comparable between the artisanal and the CF sectors, the fixed costs of acquiring and maintaining a community forest weigh heavily on the total cost of a cubic meter produced by a CF, making it uncompetitive on the domestic market (Castadot 2007).

This combination of national standards and local rules to regulate CSM would face difficulties without the support of financial incentives, particularly among state officials and other actors who are currently deriving off-the-record incomes from this sector. The solution generally recommended is tighter control of state agents and strict punishments for embezzlement. This approach should be encouraged but may be insufficient, considering the present amounts of income generated by parafiscal charges. It would therefore be advisable to combine penalties with incentives (Cerutti et al. 2012). A payment mechanism

could be created, based on the performance of the government services responsible for promoting and implementing the regulations. At the department level for instance, such a mechanism could entail paying a bonus that would be proportionate to the number of small-scale logging permits issued, applied and controlled. The ultimate goal would be to replace private income from an informal activity with an official bonus pegged to the operationalisation of a legal logging entity. Although not easy to implement, we believe this type of mechanism is essential to achieve improvements in the governance of this sector.

Conclusion

Difficulties in applying the legal models of decentralized management of forest resources in Central Africa combined with a substantial increase in urban demands for timber explain that the CSM sector is today largely informal. This activity has developed independently of the legal rights granted to local people, who have therefore developed new "powers" to access timber resources and income from its use. The application of the theory of access shows that the development of this sector over the past ten years has relied mainly on easy access to domestic markets and on recognition of customary tenure. However this analysis does not allow concluding on the emergence of a decentralized, sustainable and democratic management model of timber resources, as it does not take into account the requirements of accountability and of ecological sustainability. Greater formalization of CSM practices should help to meet the challenges of accountability and sustainability, while not calling into question the fundamental modes of access made by local actors.

Today the regulatory and institutional requirements are not met to encourage local stakeholders to sustainably manage timber species. On one hand, it is necessary that micro-entrepreneurs are recognized as full participants in the forestry sector in Central Africa, which means in particular to facilitate the legalization and professionalization of their business. Reforming forestry regulations is needed in all Central African countries to facilitate access to legal CSM. On the other hand, the prerogatives of local population in controlling access to timber resources in rural areas must be strengthened and formalized since they constitute the only actor in direct and systematic contact with the thousands of chainsaw millers who operate throughout the forest areas of Central Africa.

The risk inherent in formalization of artisanal CSM, for small-scale loggers and customary right-holders, would be to change the distribution of profits at the expense of local actors. Community forestry is unfortunately a prime example of this trend, where most of the profits go to external actors. To what extent the legalisation of artisanal CSM could have negative impacts on local livelihoods remains a question that needs further research in the specific context of each country.

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