



# Local perception and attitude toward community forest concessions in the Democratic Republic of Congo

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## ABSTRACT

The effects of community forestry on biodiversity conservation and local development have been highlighted in Africa and elsewhere. However, little is known on the perception and attitude of local forest users toward community forestry programs. This study aimed to address this gap by identifying the factors that influence the perception and attitude of local forest users toward Local Community Forest Concessions (LCFCs) in the Democratic Republic of Congo (DRC). A survey of 138 households was conducted in three villages of the Bismulu LCFC in eastern DRC. The responses to the close-ended questions were analyzed with a multinomial Probit regression to determine the factors explaining LCFC perception. The results revealed that the key factors determining positive attitude toward the LCFC include education, age, occupation, knowledge of the legal framework and family size. However, challenges remain to the local acceptability of the LCFC, as government employees, elders, youth and larger households expressed negative attitudes. Awareness campaigns mobilizing civil society organizations that have higher level of trust in the communities may overcome some of the challenges. Administrative procedures and the associated costs were seen as major obstacles to LCFC implementation and operation. Procedure simplification and funding support to the LCFCs would thus be needed. The results of this study will contribute to the formulation of sustainable forestry policies to make LCFCs a lever for local development in the DRC and elsewhere.

## 1. Introduction

In recent decades, forest management efforts in Central Africa and elsewhere have focused on decentralization, political liberalization, and collective accountability (Ribot et al., 2006; Doucet and Vermeulen, 2011; Lescuyer et al., 2012). The main objective of this approach has been to promote the development of local communities that depend on natural resources by increasing their participation in natural resource governance (Borrini-Feyerabend et al., 2000; Anderson et al., 2015; Fapa Nanfack et al., 2020a). This logic highlights that local participation is essential, and that local interests and concerns need to be addressed in initiatives aimed at enhancing sustainable resource management outcomes (Ribot, 1995; Duguma et al., 2018; Kimengsi and Bhusal, 2021).

### 1.1. Legal framework of community forest management in the democratic Republic of Congo

In the Democratic Republic of Congo (DRC), important reforms have been initiated, breaking away from the colonial forest regime, notably with the promulgation of Law n° 01/2002 of 29 August 2002, on the country's forestry code (Baraka et al., 2021). Among the innovations of this new legal framework, local communities can obtain a forest concession by virtue of their customary rights (Article 22). Local community forest concessions (LCFCs) have been added to the Law by way of Decree 14/018 passed in August 2014. The rules for managing LCFCs and how small-scale logging must be carried out are stated in Ministerial Orders 25 (February 2016) and 84 (October 2016). This legal framework allowed the DRC to join other countries in the Congo Basin in

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recognizing a partnership-based forest management regime where local communities, governments and industrial operators work as active partners (Vermeulen and Karsenty, 2017; Baraka et al., 2021). The community-based model of forest management introduced in the DRC's legal framework aims to devolve more rights and responsibilities to local communities to undertake various development and conservation activities (Vermeulen and Karsenty, 2015). To date, more than 108 LCFCs, covering an area of about 2.5 million hectares, have been granted throughout the country (DFC, 2019).

The LCFC allocation process involves the contribution of various technical and financial partners, as well as civil society organizations, with different approaches and objectives (Lescuyer et al., 2019). Despite their promises, LCFCs have faced several shortcomings since their implementation: lack of local management capacity, competing interests between various stakeholders, uncertain environmental outcomes, etc. (Adebu et al., 2020). Moreover, community forests in Central Africa (including the DRC) have been heavily criticized for imposing high costs and administrative burden on local communities, and for the fact that central governments keep a stronghold on decision-making (Ott Duclaux-Monteil, 2016; Lescuyer et al., 2019).

### 1.2. Local perception and attitude toward community forest management

Perception is the ability to see, hear or become aware of something through the senses. Social perceptions are key indicators of the relations between people and the environment (Scholte et al., 2015). Indeed, people assign value to the environment based on experience, social relations, cultural practices and place attachment (Soini et al., 2012). Therefore, considering the local perceptions of LCFCs would increase the understanding of the impacts of forest policy implementation (Doucet and Vermeulen, 2011; Jones et al., 2012; Nilsson et al., 2016; Cuni-Sanchez et al., 2019). However, research in Africa has often focused on assessing socioeconomic or ecological effectiveness (Maryudi et al., 2012; Lescuyer et al., 2019), with less attention paid to the perceptions and attitudes of key user groups, including local communities (Fapa Nanfack et al., 2020a). It is equally valid for other regions of the world as well. This knowledge gap needs to be addressed to maximize the outcomes of community-based forest management in the DRC and elsewhere.

Different factors influence the perception of local people toward forests and forest management. These factors include the level of information flow and awareness (Jones et al., 2012), proximity to the forest (Chhetri et al., 2013; Aymoz et al., 2013), sectoral policy changes (Djogbenou, 2010; Blouch, 2010), tenure security (Simbizi et al., 2014), and power relations (Stiem and Krause, 2016; Rossi et al., 2019; Ramcilovic-Suominen and Kotilainen, 2020). Socio-demographic characteristics (e.g., marital status, number of children, education, occupation) and social capital also influence the perception of local stakeholders toward forest management (Djogbenou et al., 2011; Nilsson et al., 2016). Social capital is a multi-dimensional concept that very often refers to cognitive and structural elements, including social trust, institutional trust, social networks, and norms of reciprocity (Jones et al., 2011; Lee et al., 2017).

The way a phenomenon is perceived determines the attitude one adopts toward it (Tesfaye et al., 2012; Roy and Gow, 2015). Attitude is a negative or positive response toward a certain activity, for example LCFCs (Tadesse and Teketay, 2017). Negative or positive attitudes of local people toward forests and forest management will therefore have an impact on their contribution and participation in the governance of LCFCs. Attitude stems from one's judgment of a situation as favourable or otherwise (Albarracín et al., 2005). It can take the form of approval, refusal and lack of interaction or public protest (Brunson and Reiter, 1996). Local people's attitude toward environmental management will be positive if they perceive it as beneficial (Snyman, 2014). Attitudes are important to consider, as they influence people's behaviors toward management policies (St John et al., 2010; Coulibaly-Lingani et al.,

2011).

The objective of this study was to assess the perception and attitude of local community members toward LCFC as a new forest management initiative in the DRC. Specifically, the study aimed to: (i) document household knowledge of traditional (customary) and legal forest management rules; (ii) explore the attitude of community members toward the LCFC compared to the State's Forest management regime; and (iii) study the influence of social capital and other sociodemographic attributes on household and community perception of LCFC as a new forest management initiative.

## 2. Methods

### 2.1. Study area

The study was conducted in the Bisemulu LCFC, located in the Kailo territory of Maniema province in eastern DRC (Fig. 1). This LCFC was selected because it is the first one where logging has been experimented for collective benefits. With an area of 47,013 ha, this concession was officially granted to the community of Bisemulu under Provincial Order No. 01/062/CAB/GP-MMA/2018 on December 6, 2018. German Society for International Cooperation's program for biodiversity and sustainable forest management facilitated obtaining this LCFC. The population in the concession area is 11,506 and it is increasing in most villages. The most represented tribe is the Songola (considered Indigenous), followed by smaller groups of Boambo, Banganya, Lega and Komo. Swahili is the main spoken language, although each ethnic group has its own vernacular language, for example the Basongola, Bangengele, Balanga, Bakusu, Batetela, Mituku and Bazimba. Palm oil extraction, mining and forest logging were once the main activities supporting the region's economy. Today, these different productions are mainly artisanal, requiring significant physical work for little economic benefits.

### 2.2. Data collection

All the villages of the Bisemulu LCFC are socio-economically homogeneous. Survey respondents were selected from three villages using stratified random sampling (Table 1). Villages were selected according to time, financial and accessibility constraints (proximity to the main transportation routes, i.e. roads and rivers).

The Sample Size Solver 2.0 (Robitaille, 2005) was used to calculate the sample size:

$$n = \frac{Z^2 p(1-p)N}{Z^2 p(1-p) + (N-1)ET^2}$$

where:

$n$  = Required sample size, calculated separately for each village.

$N$  = Number (estimated or actual) of households in the village.

$ET$  = Acceptable margin of error (0.05).

$Z$  = Standard normal value of the confidence interval ( $Z \approx 1.96$  with  $\alpha = 0.05$ ).

$p$  = Estimated proportion of the population with the characteristic of interest being measured. The main characteristic considered was the household's connection to the forest, which accounted for 95% of households.

This research project was approved by the Ethics Review Board of Université Laval (certificate # 2017–223). Respondents were randomly selected within villages. The total sample size was 138 households with 41, 38, and 59 in the villages of Ngoli, Oléa, and Elila, respectively. A questionnaire was administered to the person in charge of the household, after they had consented to participate. The close-ended questions covered the profile of the respondents (age, ethnicity, marital status, level of education and gender); their knowledge of forest management rules (legal and traditional/customary); their level of involvement in

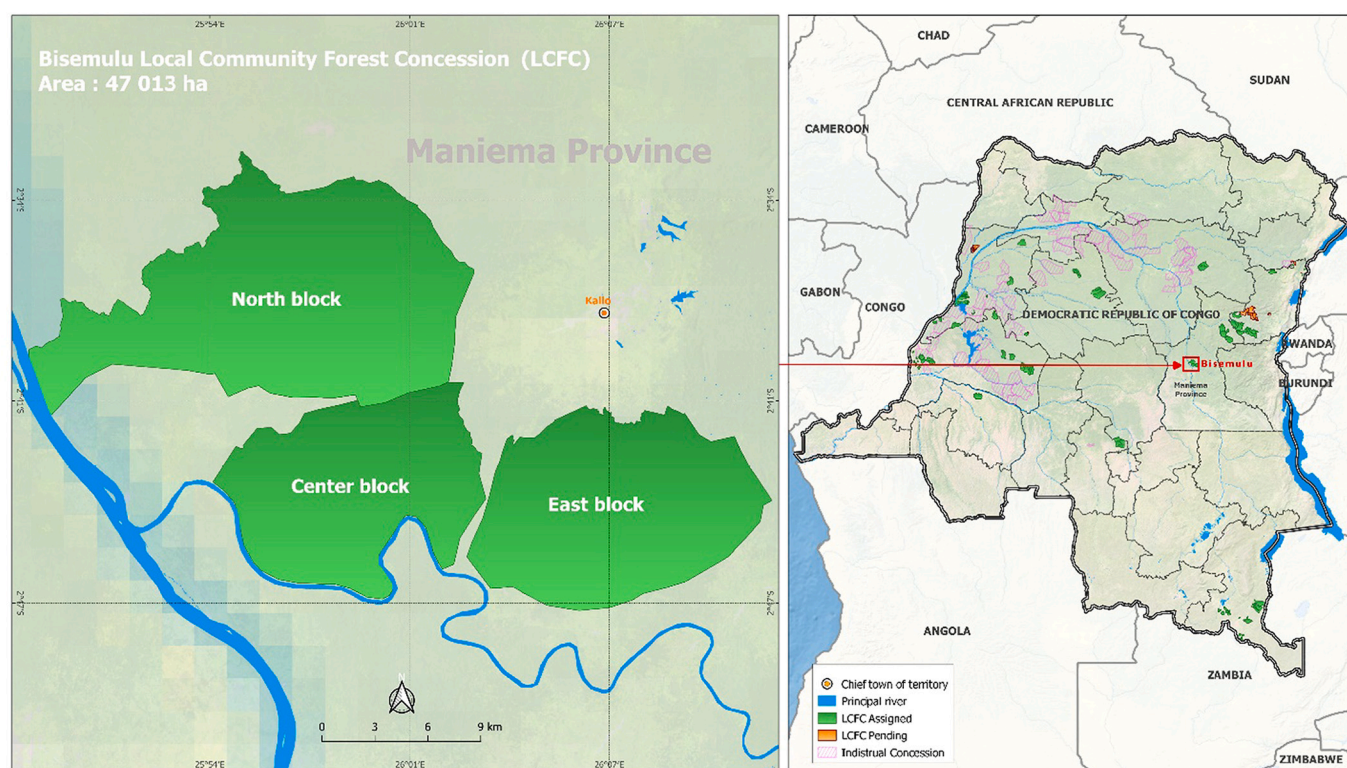


Fig. 1. Location of the Bisemulu LCFC in the east of the DRC.

Table 1

Distribution of households, men, women and total population (including children) in the three villages studied.

Villages	Number of households	Men	Women	Total population
Oléa	75	130	140	480
Elila	285	270	345	950
Ngoli	90	101	126	316
Total	450	501	611	1746

Source: Ambwe Sector Annual Report Demographics Database, 2013.

community activities and their perception and attitude toward the LCFC. Data on forest use was also collected. A pre-test of the questionnaire led to the reformulation of certain questions. Fieldwork was carried out between November 2018 and February 2019.

Utility, efficiency and perceived risks, as well as administrative formalities and associated costs were the factors used to measure the perception of local communities toward the LCFC. These factors, together with perceived (bureaucratic) costs and efficiency, have been used in previous studies to assess the adoption of innovations in various sectors such as information technology, education, and agriculture (Caffaro et al., 2020; Cokins et al., 2020; Kumari et al., 2021). Utility refers to the degree to which an individual believes that using a particular system would improve a given situation, while efficiency refers to the efforts needed to be put into the system to generate the expected improvements (Davis, 1989; Caffaro et al., 2020). Perceived risk is the evaluation of the consequences of adopting the new system. The items constituting each of these factors (Appendices 1, 2) were measured on a 5-level Likert scale ranging from 1 “strongly disagree” to 5 “strongly agree”.

### 2.3. Data analysis

As this is an exploratory study, a quantitative method was favored as

it allows to include a greater number of participants than would have been possible with a qualitative study. Furthermore, as the objective was to identify the influence of explanatory variables (sociodemographic attributes, social capital) on dependent variables (perception/attitude toward LCFC), quantitative analysis was particularly well-suited (Vogt et al., 2014). While future studies using qualitative methods will make it possible to explore the mechanisms explaining the relations in more details, it was necessary to first identify the relations.

Contingency tables were used to compare frequency distributions. When constructing the LCFC Perception Index and the Social Capital Index, items that had a Cronbach coefficient lower than 70% were removed (Hair et al., 2012). This data filtering made it possible to retain 17 out of the 30 initial items for LCFC perception and 6 out of the 14 initial items for social capital. Bartlett's sphericity test confirmed that the inter-item correlations were different from zero and the Kaiser-Meyer-Olkin index validated that the items provided acceptable factor solutions (Cubaka et al., 2019). The LCFC Perception Index and the Social Capital Index were calculated by averaging the scores of their constituent items (Jones et al., 2012; Nilsson et al., 2016).

A multinomial Probit regression analysis was performed to determine the factors explaining LCFC perception (dependent variable) (Table 2). The multinomial Probit regression is a modified version of the Probit regression when the dependent variable can take more than two values, which in the present case were: (1) strongly disagree, (2) agree, and (3) strongly agree with the LCFC as a mode of forest management. The multinomial Probit regression was based on the following model:

$$\begin{aligned}
 \text{prob}(y_i = J) &= \text{prob}(y_{ii}^* \geq c_{j-1}) \\
 &= \text{prob}(\beta X_i + \varepsilon_i \geq c_{j-1}) \\
 &= \text{prob}(\varepsilon_i \geq c_{j-1} - \beta X_i) \\
 &= 1 - \Phi(c_{j-1} - \beta X_i).
 \end{aligned}$$

where:  $\beta$  and  $c_i$  are parameters of the model. The  $c_i$  are non-observable thresholds that determine which value of  $y_i$  will correspond to a given



**Table 2**  
Synthesis of the variables used in the econometric model.

Variables	Measures
Education	1 = None, 2 = Elementary, 3 = High school, 4 = University
Marital status	1 = Single, 2 = Married, 3 = Widow, 4 = Divorced
Sex	1 = Male and 0 = Female
Occupation	1 = Unemployed, 2 = Farmer, 3 = Trader, 4 = Private employee, 5 = Civil servant, 6 = Hunter, 7 = Artisanal logging, 8 = Other
Age group	0 = Less than 20 years old, 1 = 20–30 years old, 2 = 31–40 years old, 3 = 41–50 years old, 4 = 51–60 years old, 5 = 61 years old and over
Member of an association in the village	1 = Yes and 0 = No
Knowledge of the legal framework	1 = Yes and 0 = No
Knowledge of the restrictions of governmental management	1 = Yes and 0 = No
Existence of traditional measures	1 = Yes and 0 = No
Mode of forest acquisition	1 = Purchase, 2 = Inheritance, 3 = Renting
Origin of the respondent	1 = Bisemulu and 0 = Outside
Size of the household	1 = Less than 5 members, 2 = Between 5 and 10, 3 = More than 10

value of  $y_i^*$  (observed variable).

Thus:

$$y_i = 1 \text{ if } y_i^* < c_1.$$

$$y_i = 2 \text{ if } c_1 \leq y_i^* < c_2$$

$$y_i = 3 \text{ if } c_2 \leq y_i^* < c_3$$

Therefore, the probability that an individual's perception of the LCFC is level 1 is:

$$\text{prob}(y_i = 1/X_i) = \text{prob}(y_{it}^* < c_1) = \text{prob}(\beta X_i + \varepsilon_i < c_1) = \Phi(\varepsilon_i < c_1 - \beta X_i)$$

### 3. Results

#### 3.1. Respondent's sociodemographic profile

Almost all respondents (93.4%) reported conducting activities in the forest, except for 9 women (Table 3). Of the respondents who were conducting activities in the forest, just under half (44.97%) were uneducated or had only completed elementary school and just over half (58.14%) were male. The majority were from Bisemulu (81.40%), married (82.17%), farmers (61.24%), belonged to an association (65.12%), knew the legal framework (58.91%), complied with traditional measures (87.60%) and had inherited the forest (65.89%). The age-group distribution was normal, with more respondents between 20 and 50 years of age (63.57%). Most households had between 5 and 10 members (72.87%).

The 9 respondents who did not conduct activities in the forest had certain characteristics that were different from the others. They were all external to Bisemulu, aged between 31 and 40, had high school education, belonged to associations and were mainly traders (55.56%). They were less likely to be familiar with the legal framework (22.22%) and belonged to smaller households (all with fewer than 10 members).

#### 3.2. Perception and attitude toward the LCFC

LCFC perception was calculated based on three components: (i) bureaucratic costs and administrative burden; (ii) efficiency and utility; and (3) motivation and risk. Respondents generally considered the bureaucratic procedures for obtaining the LCFC to be cumbersome and difficult to follow. For example, almost all of them considered that the management of the LCFC involves many restrictions (91%) and requires

**Table 3**  
Respondent characteristics according to forest frequentation (%).

Respondent characteristics		Forest dwellers		
		No (N = 9)	Yes (N = 129)	Total
Education	None		21.71	20.3
	Elementary		23.26	21.7
	High school	100.00	39.53	43.5
	University		15.50	14.5
Marital status	Single		11.63	10.9
	Married	77.78	82.17	81.9
	Widow	22.22	6.20	7.3
Sex	Male		58.14	54.4
	Female	100.00	41.86	45.6
	Unemployed		7.75	7.3
	Farmer	33.33	61.24	59.4
	Trader	55.56	6.20	9.4
Occupation	Private employee	11.11	5.43	5.8
	Civil servant		4.65	4.4
	Artisanal logging		9.30	8.7
	Other		5.43	5.1
	Less than 20		9.30	8.7
	20–30 years old		19.38	18.1
	31–40 years old	100.00	23.26	28.3
Age group	41–50 years old		20.93	19.6
	51–60 years old		12.40	11.6
	More than 61 years old		14.73	13.7
Member of an association in the village	No		34.88	32.6
	Yes	100.00	65.12	67.4
Knowledge of the legal framework	No	77.78	41.09	43.5
	Yes	22.22	58.91	56.5
Knowledge of the restrictions of governmental management	No	55.56	16.28	81.16
	Yes	44.44	83.72	18.84
Existence of traditional measures	Yes	100.00	87.60	88.4
	No		12.40	11.6
Mode of forest acquisition	Inheritance	66.67	65.89	65.9
	Renting	33.33	34.11	34.1
	Bisemulu		81.40	76.1
Origin of the respondent	Outside	100.00	18.60	23.9
	Less than 5	44.44	10.08	12.32
	5 to 10	55.56	72.87	71.74
Size of the household	More than 10		17.05	15.94

a lot of documentation (92%) (Fig. 2). In terms of the costs associated with obtaining the LCFC, 75% of respondents found them to be very high. Finally, 59% of respondents indicated that they would be able to continue using the forest without a LCFC.

Most respondents considered the LCFC to be a reliable model of forest management (62%) in which everyone can participate (80%), which helps to secure the forest (78%) and to detect fraudsters (62%) (Fig. 3). They also felt that they could manage the LCFC on their own (70%) while benefiting from advice on how to do so (78%). However, few respondents felt that the LCFC had allowed them to make more gains than before (38%) or that it could improve their forest activities (24%).

Most respondents (73%) mentioned that customary rules were better respected than laws. Many respondents (77%) reported a fear that external actors would benefit more from the operation of the LCFC than the local community (Fig. 4). It was also mentioned by most respondents (74%) that wealthier members of the community or those with some political influence could capture the benefits. A small proportion of respondents (11%) mentioned that the LCFC is another way to usurp their forests (almost 30% had a neutral opinion on the issue).

#### 3.3. Elements of social capital

Community members had more confidence in civil society (74%), customary authority (72%) and other community members (66%) and their means of appointment (59%) than in government services in

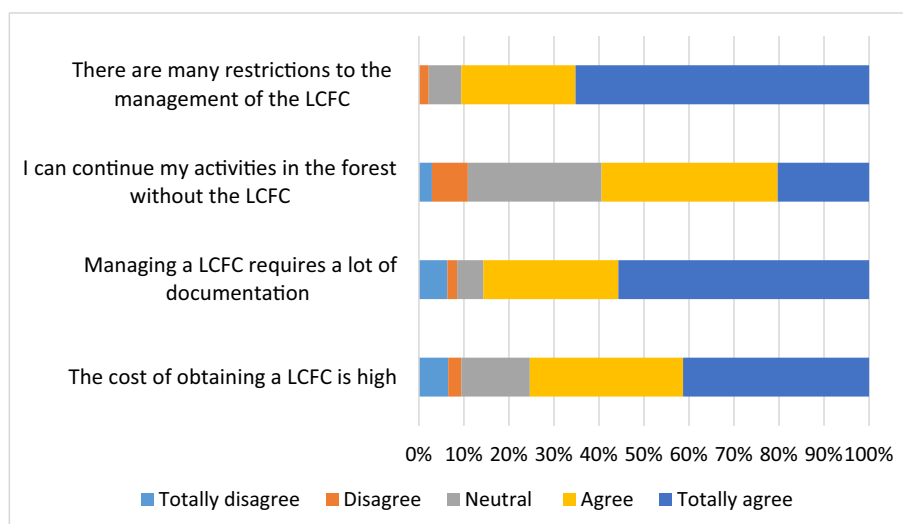


Fig. 2. Community perception of the bureaucratic costs and administrative burden of the LCFC.

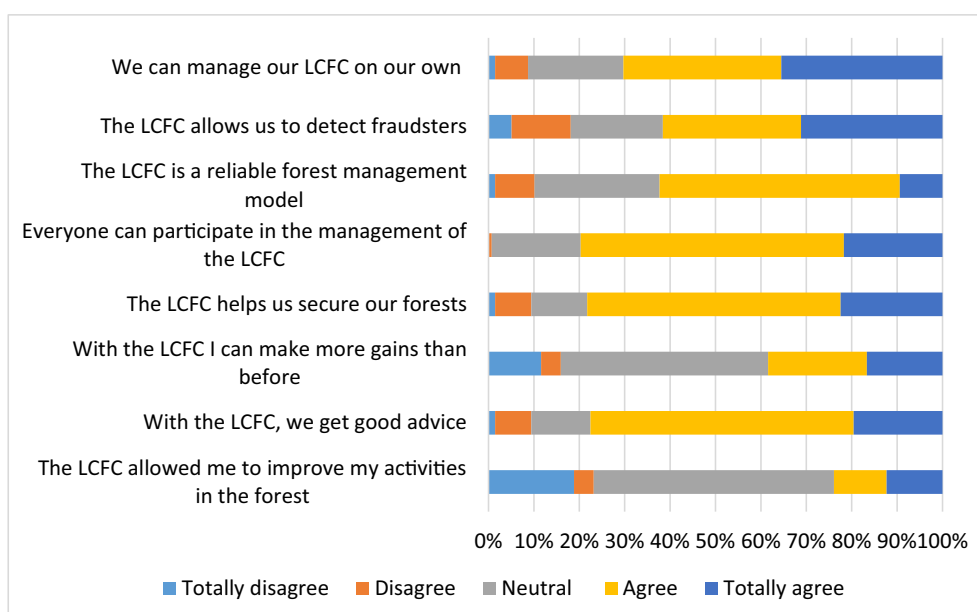


Fig. 3. Perceived usefulness and effectiveness of the LCFC.

general (44%) and forestry services (20%) (Fig. 5).

The average LCFC Perception Index and the average Social Capital Index were 3.6 and 3.4, respectively. The results (Table 4) are presented globally for the three villages since they did not differ among them.

### 3.4. Determinants of LCFC perception

The regression was overall significant ( $p < 0.01$ ) and explained 37% of the variability in LCFC perception (Table 5). Respondents with elementary, high school and university education all had a more positive perception of the LCFC than those with no education ( $p < 0.001$ ). Respondents with an occupation had a more negative perception of the LCFC than those without an occupation, but the difference was significant only for government employees ( $p < 0.001$ ). Respondents aged 20 to 50 tended to have a more favourable perception of the LCFC than younger and older respondents ( $p < 0.10$ ). Respondents who were aware of the legal framework tended to have a more favourable perception of the LCFC than those who were not aware of it ( $p < 0.10$ ). Respondents

from intermediate households (5–10 members) tended to have a more positive perception of the LCFC than those from smaller or larger households ( $p < 0.10$ ). Gender, marital status, membership in an association, the existence of traditional rules, the forest acquisition mode, the state restrictions on forest management and the Social Capital Index did not have a significant influence on LCFC perception.

## 4. Discussion

### 4.1. Perception and attitude toward the LCFC

Respondents mentioned that obtaining the LCFC designation and the management responsibility and authority that comes with it involves a lot of bureaucratic procedures and restrictions considering local capacity. This finding is consistent with Pulhin et al. (2007), who noted pitfalls in implementing a community forestry program in the Philippines, including red tape and costs that exceed the financial capacity of communities. Lescuyer et al. (2019) consider that the legal and

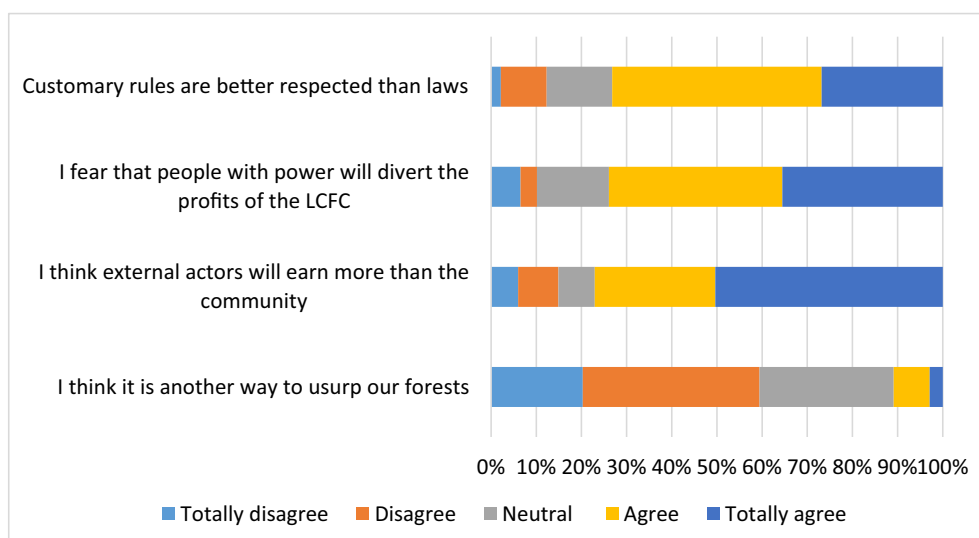


Fig. 4. Motivation and perceived risks.

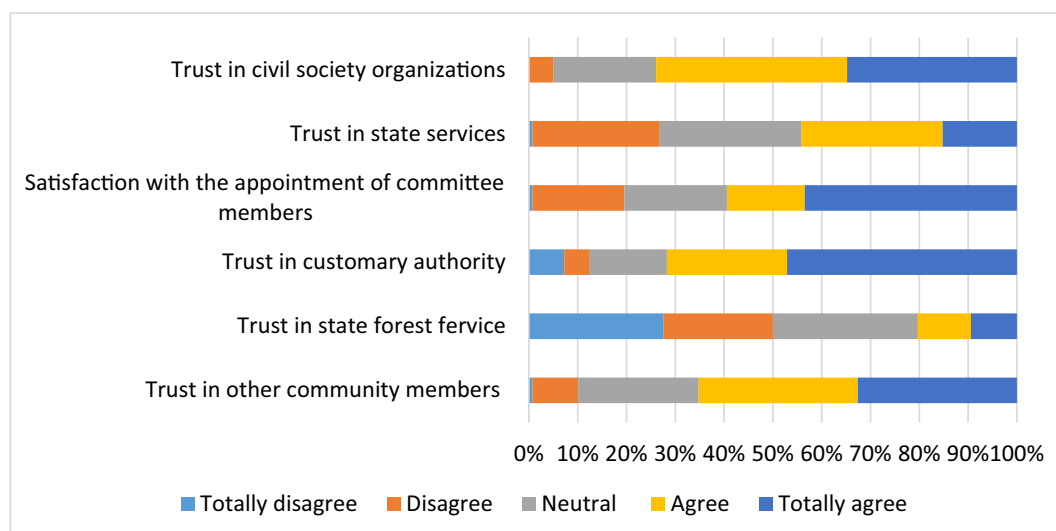


Fig. 5. Constituents of the Social Capital Index.

**Table 4**  
Average LCFC Perception and Social Capital indices.

Variable	N	Average	Standard deviation	Min	Max
LCFC Perception Index	138	3.6	0.275	3.1	4.3
Social Capital Index	138	3.4	0.459	2.1	4.7

regulatory framework for community forestry in the DRC is complex, and that this may limit the profitability of LCFCs. These authors consider that local communities do not have the capacity and resources to exploit LCFCs and advocate, among other things, for the simplification of the legal framework.

Some community members would like to continue conducting individual activities, probably because for them the LCFC is not a necessity, and they could continue to use the forests in other ways. This finding agrees with [Porter-Bolland et al. \(2012\)](#), who found that in Nepal major forest user groups tended to be suspicious of community forestry program. On the other hand, it is possible that the reluctance of some stakeholder groups and community members to join the LCFC may reflect a fear of losing some of the benefits and advantages derived from

the forest that they already have access to ([Andrade and Rhodes, 2012](#); [Buta et al., 2014](#)).

Nevertheless, the survey showed in general that, local communities adhere to the LCFC as a forest management mode. How local communities perceive community forestry programs influences their willingness to support them ([Pulhin et al., 2007](#)). Respondents see the LCFC as an opportunity for communities to secure their rights over forests. However, land tenure security alone is not sufficient for LCFC implementation to lead to sustainable forest management ([Lescuyer et al., 2019](#)). In addition to clarifying forest tenure and governance, the effective implementation of community forestry depends on its ability to meet the needs of local communities, including women and vulnerable segments of the population ([Kobbail, 2012](#); [Larson and Pulhin, 2012](#); [Ratsimbazafy et al., 2012](#); [Macqueen, 2013](#); [Baynes et al., 2015](#); [Macqueen and Demarsh, 2015](#); [Baraka Lucungu et al., 2022](#)).

Respondents mentioned that having control over access to forests under the LCFC made it easier for them to identify and report fraudsters. When monitoring is done by community members, it is more effective and less costly because it is based on rules negotiated by the community itself ([Yelkouni, 2005](#); [Wollenberg et al., 2006](#); [Ostrom and Baechler,](#)

**Table 5**

Probit multinomial regression analysis on determinants of perception and attitude toward the LCFC.

Determinants	Coefficient	Standard Error	z	P > z
<b>Education</b>				
None	1.571	0.481	3.26	0.001
Elementary	2.570	0.489	5.25	0.000
High school	2.030	0.515	3.94	0.000
<b>Marital Status</b>				
Married	-0.826	0.539	-1.53	0.126
Widow	-1.059	0.706	-1.50	0.134
<b>Sex</b>				
Female	-0.215	0.274	-0.79	0.432
<b>Occupation</b>				
Farmer	-0.684	0.546	-1.25	0.210
Trader	-0.199	0.607	-0.33	0.743
Private employee	-1.174	0.787	-1.49	0.136
Civil servant	-4.761	1.061	-4.49	0.000
Artisanal logging	-0.1073	0.666	-0.16	0.872
Other	-1.088	0.784	-1.39	0.166
<b>Age</b>				
20–30 years old	0.947	0.535	1.77	0.077
31–40 years old	1.070	0.616	1.74	0.082
41–50 years old	1.081	0.636	1.70	0.089
51–60 years old	-0.572	0.699	-0.82	0.413
61 years old and over	0.693	0.678	1.02	0.307
<b>Member of an association in the village</b>				
Yes	-0.193	0.299	-0.65	0.518
<b>Knowledge of the legal framework</b>				
Yes	1.504	0.283	1.78	0.075
<b>Existence of traditional measures</b>				
No	0.319	0.405	0.79	0.430
<b>Mode of forest acquisition</b>				
Location	-0.276	0.304	-0.91	0.364
<b>Origin of respondent</b>				
Outside	0.984	0.410	2.40	0.016
<b>Size of the household</b>				
5 to 10 persons	0.900	0.464	1.94	0.050
More than 10 persons	-0.314	0.634	-0.50	0.620
<b>State restrictions on management</b>				
Yes	0.686	0.426	1.61	0.107
<b>Number of observations</b>	138			
Prob > chi <sup>2</sup>	0.00			
Pseudo R <sup>2</sup>	0.37			

2010). Community members also indicated that they could manage the LCFC on their own. This position may be explained by the fear that external stakeholders, be they government services or civil society organizations, may take ownership of the benefits (Wollenberg et al., 2006). Finally, some respondents felt that the LCFC had enabled them to make collective or individual gains, notably by promoting forest activities. In a study in Nepal, KC et al. (2014) reported that local communities perceived community forestry as an opportunity for improved livelihoods. The benefits, actual or potential, that users can obtain are sometimes crucial for community support (Ratsimbazafy et al., 2012; Macqueen, 2013; Macqueen and Demarsh, 2015; De Jong et al., 2018).

Community adherence to the LCFC model could be the result of the positive information and messages received during the awareness campaigns carried out by different non-governmental organizations (NGOs) that accompany the community forestry process in the DRC. Contacts between communities and external actors during the development of community forestry programs can promote adherence (Agarwal, 2001; Gupta and Koontz, 2019). However, promises made by NGOs about the benefits and advantages of community forestry can lead to unrealistic expectations on the part of forest users (Agarwal, 2001; Sunderlin, 2006; Wulandari and Inoue, 2018; Gupta and Koontz, 2019). Therefore, community support for the LCFC depends on the effectiveness and long-term sustainability of the social and economic benefits

derived from it (Baynes et al., 2015; Lescuyer et al., 2016, 2019).

The implementation of the LCFC has had several effects within local communities, mainly capacity building and the establishment of local governance structures that enable different categories of actors (men, women, youth, and elders) to take part in forest management decisions. Previous studies reported that the development of new skills, as well as the potential for new business arrangements between the local community and artisanal foresters, are factors that can motivate local communities to adopt the LCFC as a forest management mode (Pulhin and Dressler, 2009; Lescuyer et al., 2019). Community forestry initiatives are mainly supported by external actors such as donors and technical partners, with little involvement of government agencies in funding on-the-ground initiatives (Lescuyer et al., 2019). However, for effective implementation, it is essential that these supporting agencies find a match between legal requirements and local practices of forest use and management (Fapa Nanfack et al., 2020b). Indeed, although local people can be intrinsically motivated to engage in community forestry (Kimengsi et al., 2019), motivation can decrease when technical and financial capacities are lacking, and in the face of regulations poorly adapted to local realities (Larson and Pulhin, 2012).

The LCFC as a forest management mode has raised some fears within the local community, particularly in relation to the risk of consolidating inequalities that would harm social cohesion. Indeed, it is important to consider the power relations within a community to avoid a minority elite taking the bulk of the benefits from natural resource management (Wilshusen, 2009; Lele et al., 2010; Porter-Bolland et al., 2012; Schwanen et al., 2015). Social cohesion within communities has been identified as an indispensable factor for good governance of community forests in most countries in Africa and elsewhere (Baynes et al., 2015; Gilmour, 2016). The elements that communities fear, and which could explain the low level of adherence of some respondents, are essentially related to benefit sharing. Forest-dependent communities fear that the LCFC could lead to the usurpation of their rights by outsiders. Considering these findings, and as suggested by Baynes et al. (2015), special attention should be paid to equity and social inclusion, to avoid conflicts that may arise when implementing community forestry (KC et al., 2014; Bullock and Hanna, 2012). Larson and Pulhin (2012) propose the promotion of simpler and more accessible regulations to ensure forest conservation while meeting the needs of local communities.

#### 4.2. Social capital

Community members had less trust in the State Forest Service agents than in local authorities. However, institutional trust between stakeholders influences local community perception of forest resource management policies and programs (Nilsson et al., 2016). Trust in others, especially state institutions, is one of the building blocks of social capital (Putnam, 2000; Narayan and Cassidy, 2001; Wilshusen, 2009), on which the success of environmental policies depends (Behera, 2009; Magno, 2001; Schwanen et al., 2015).

Social capital is a key determinant of ownership and leadership of development initiatives and programs (Pretty and Smith, 2004). It influences the perception and attitude of different user groups toward natural resource management policies (De Lopez, 2004; Nilsson et al., 2016). Communities with high social capital have more favourable reactions to forest management policies and, as a result, have greater ownership and participation in the actions implied by these policies (Nilsson et al., 2016). Community members expressed satisfaction with the way in which their representatives have been appointed to the various management bodies, which implies that their voices and views are well represented. Social capital refers to both cognitive and structural factors, emphasizing social trust, institutional trust, and the grouping or networking capacity of actors within a community (Jones et al., 2011; Jones et al., 2012). In a context of participatory management, trust between stakeholders significantly reduces the costs of cooperation and administrative control procedures (Ostrom, 1990;

Baraka et al., 2021).

#### 4.3. Determinants of perception and attitude toward the LCFC

Respondents with some level of education (elementary, high school, or university) were more supportive of the LCFC than those with no education. Lack of education or lack of adequate knowledge to appreciate an innovation in forest management can be a barrier to buy-in to community forestry (Ajayi et al., 2007; Kobbail, 2012). Thus, having a certain level of education could enable a better appreciation of the issues, challenges and opportunities arising from community forestry, particularly in the perspective of local development based on the use of forest resources (Ratsimbazafy et al., 2012).

Respondents who had an occupation (farmer, trader, private employee, artisanal miner) had a more negative perception of the LCFC, but the difference was significant only for government officials. This could be explained by the fact that people who depend on forests to generate their family income may consider that the LCFC gives more control over forests to community members, particularly by limiting access and use of forest resources by outsiders. On the other hand, a certain reluctance may be observed within the community, mainly for people who see their interests threatened (Agarwal, 2009; Ratsimbazafy et al., 2012). Awareness-raising actions seem necessary to counter this perception (Ratsimbazafy et al., 2012; Baynes et al., 2015).

Age had a significant positive effect on LCFC perception, with younger and older people being less supportive. The low interest observed among younger people in the LCFC, but also in forestry issues in general, could partly explain their migration from rural areas to the cities to continue their studies or seek employment to improve their financial situation (Makalamba and Oyono, 2015). Older people's mistrust of the LCFC may be due to their greater dependence on forests (Ratsimbazafy et al., 2012) and fear that access will be reduced. These findings are contrary to those of Ezebilo (2012) who, in a study around Cross River National Park, Nigeria, found that older people were more likely to have a positive view of community forestry. In the context of the DRC, the mistrust of elders may be due to their experience of the forest regime before the advent of the 2002 forestry code. Indeed, as reported by Baraka et al. (2021), for local communities, forestry projects and initiatives are often perceived as aiming at relocating communities in order to set up new protected areas. Here again, awareness campaigns would help to strengthen the adherence of older people to community forestry, which would benefit from the fact that they are well-respected and listened to, as they have important knowledge about culture and social values (Pokharel, 2009).

Respondents who had some knowledge of the legal framework governing forest management were more supportive of the LCFC, probably because this category of actors believes in the ability of legal and regulatory measures to limit the expansion of illegal activities. Indeed, knowledge of the legal framework and traditional forest management measures can influence perception and attitude toward community forestry (Upreti, 2001; Jones et al., 2012). The method of forestland acquisition influenced the perception of the LCFC. For example, those who used leased land were less supportive of the LCFC because the families or local leaders from whom they leased the land (Maindo and Kapa, 2014) might choose to lease it to someone else since external access to forests is now possible under established governance structures (Vermeulen and Karsenty, 2015; Lescuyer et al., 2019).

Some respondents from outside the community had a more favourable perception of the LCFC than those from Bisemulu. These were people who live outside the LCFC villages, mainly in the town of Kindu or in neighboring territories, but who have migrated to the LCFC area. Indeed, migration is common in rural Africa (Fall, 2004; Karambiri, 2015). In the DRC, because of migration, most of the populations are located on land over which they do not have customary rights (Vermeulen and Karsenty, 2015). Because community forestry is based on social inclusion (Baynes et al., 2015), people who come from outside to

settle in the community, and who have more means to invest in forest exploitation, could benefit more from the exploitation of LCFC products and services (Vermeulen and Karsenty, 2015). Furthermore, it is important to note that most of the respondents from outside the community were community members who had settled in the town of Kindu, but who continued their forestry activities in the LCFC. For example, all the artisanal loggers with the necessary means to carry out logging operations came mainly from the town of Kindu and used essentially local workforce. Thus, as Amacher et al. (1993) pointed out, the fact that respondents not living in the community may have higher incomes to invest in the exploitation of the LCFC may explain their adherence compared to some members living in the villages. In Cameroon, external actors had shown the same interest in community forests, to the point of financing the process of obtaining certain community forests, on condition that they would have the right to exploit the timber afterwards. Unfortunately, when logging in these community forests, external operators were not concerned about local development (Vermeulen et al., 2006; Lescuyer et al., 2016; Fapa Nanfack et al., 2020a).

Respondents from mid-sized households (5–10 people) had a more favourable perception of the LCFC. In an examination of attitudes toward conservation interventions in western Serengeti, Tanzania, Kideghesho et al. (2007) reported that larger households tended to be more supportive of the initiatives studied. As in previous studies (Adhikari et al., 2004; Mamo et al., 2007), they argued that the need for forest products increases with household size. In the present study, intermediate households had a more favourable perception than larger households. Further studies would be needed to explain what socio-economic factors explain this phenomenon.

The marital status of respondents did not have a significant effect on LCFC perception, although this factor is one of the socio-cultural characteristics often mentioned to explain the attitude of stakeholders, mainly women, toward community forestry projects (Upreti, 2001). Like membership in an association, the gender of the respondents also had no effect on LCFC perception, probably because in their efforts to ensure agricultural production and food security for their families, men and women perform different tasks and may therefore have different interests in forest use and management (Thomas-Slayter and Sodikoff, 2001; Agarwal, 2009). Torkelsson and Tassew (2008) argued that women in rural areas have less access to resources than men. This inequality needs to be considered and addressed if community forestry is to be a real tool for improving the well-being of all, including women (Doss et al., 2012).

Finally, knowledge of State restrictions on forest management had no significant influence on the perception of the LCFC. Long-term acceptance and ownership of community forestry programs depends on the information available to communities, but also on the knowledge that is acquired throughout the process of implementing the LCFC (Upreti, 2001). In many cases, the uncertainty and reluctance of communities toward community forestry programs has been reduced over time by adapting to the innovations and specificities of such programs (Kobbail, 2012; KC et al., 2014; Baynes et al., 2015; Gilmour, 2016).

## 5. Conclusion

This study aimed to (i) document household knowledge of traditional (customary) and legal forest management rules; (ii) explore the attitude of community members toward the LCFC compared to the State's forest management model; and (iii) study the influence of social capital and other sociodemographic attributes on household and community perception of LCFC. The results revealed that local communities have a positive perception of the LCFC and support this forest management model. The level of social capital is relatively high in the study area and positively affects local communities' perception of the LCFC. Communities trust local traditional institutions more than state institutions, which provides legitimacy to the LCFC management bodies. This high level of trust in local institutions translates into a positive



attitude about the perceived effectiveness and usefulness of the LCFC. These results support the need to consider the perceptions of local communities in developing forest management models. However, improving the living conditions of local communities is a necessary condition for the effective implementation of community forestry in the DRC. Furthermore, the regulatory framework should be adapted to lighten the procedures for obtaining and managing LCFCs. Awareness campaigns might help to address some of the negative perceptions of the LCFC. The results may contribute to the formulation of sustainable forestry policies to make LCFCs a lever for local development in the DRC and elsewhere. Further studies using qualitative methods will make it possible to better understand how the variables identified in the present study affect local adherence to community forestry.

#### Author statement

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#### Declaration of Competing Interest

Authors declare that there is no conflict of interest of any of the authors regarding this manuscript.

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#### Appendix 1. Factors and items measuring user groups' perceptions and attitudes toward local communities. Items with an asterisk are those selected for analysis

Bureaucratic costs and red tape	
Item 1	The creation of a LCFC goes through several steps that make us tired
*Item 2	The expenses of obtaining a LCFC are high
Item 3	The process of obtaining a LCFC is time consuming
*Item 4	Obtaining and managing a LCFC requires a lot of documentation
Item 5	Since they started telling us about LCFC, I don't see any benefit
*Item 6	The management of the LCFC is subject to many restrictions
*Item 7	I can continue my forest activities without the LCFC
Efficiency and usefulness	
*Item 1	With LCFC, community members can monitor their own forests
Item 2	It is difficult to respect or make respect the rules of management
*Item 3	LCFC is a reliable model for forest management
*Item 4	The LCFC allows the detection of fraudsters
Item 5	Thanks to the LCFC I receive useful advice and training related to forest management
*Item 6	My activities have improved since the CFL process began
*Item 7	The extensionists and guides give us some good advice
*Item 8	With the LCFC, I can make more money than before
Item 9	Since the LCFC process began, my contacts (relationships) with the outside world have multiplied
*Item 10	The LCFC allows us to secure our forests
Item 11	The LCFC is an opportunity for local development through the valorization of our forests
*Item 12	The LCFC allows everyone to participate in forest management
Motivation and risks	
Item 1	I can no longer conduct activities in the forest if it is not in a LCFC
Item 2	If the LCFC does not provide more benefits, I will go back to the old practices
Item 3	With the LCFC the situation will be improved
Item 4	The management and governance of LCFCs also seems to have many restrictions
Item 5	The members of our community respect the management rules defined by the law
*Item 6	Customary rules are better respected than laws
Item 7	We need laws to help us manage our forests, even without LCFC
*Item 8	Fear that the strongest will hijack the LCFC
Item 9	Only artisanal operators and the administration will benefit from the LCFC
*Item 10	Fear that the LCFC will only benefit certain groups and not the whole community
*Item 11	I think this is another way to divert our forests

## Appendix 2. Items measuring social capital. Items with an asterisk are those that were retained for the analyses

*Item 1	I can trust the other members of our community
*Item 2	In our community, I can trust the state's forestry services
*Item 3	In our community, I can trust the customary authority (village chief, group chief).
Item 4	Members of our community participate in decision-making processes for forest management
Item 5	I would like to participate in some meetings of the local committee for the management of our LCFC
Item 6	I belong to a socioprofessional or associative group within the village
Item 7	We have access to information about local council decisions
Item 8	I am aware of the creation of a LCFC
*Item 9	I am satisfied with the designation of the members appointed
Item 10	I trust our representatives in the management structures of our CFL
Item 11	I am satisfied with the role of the state structures in the management of our forest
*Item 12	We trust the state and/or administrative services that are involved in the management of the forests in our village
Item 13	I am satisfied with the role of civil society organizations in the management of our forest
*Item 14	We trust the civil society organizations involved in forest management in our village

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