Ecosystem Services 40 (2019) 101000

Contents lists available at ScienceDirect

Ecosystem Services

journal homepage: www.elsevier.com/locate/ecoser

The importance of livelihood strategy and ethnicity in forest ecosystem services' perceptions by local communities in north-western Cameroon

Aida Cuni-Sanchez[a,b,*], Alain Senghor K. Ngute[c], Bonaventure Sonké[d], Moses Nsanyi Sainge[e], Neil D. Burgess[f,g], Julia A. Klein[b], Rob Marchant[a]

[a] York Institute for Tropical Ecosystems, Department of Environment and Geography, Wentworth Way, University of York, Heslington, York YO10 5NG, UK
[b] Department of Ecosystem Science and Sustainability, Colorado State University, Campus Delivery 1476, Fort Collins, CO 80523, USA
[c] Applied Biology and Ecology Research Unit, Dschang School of Sciences and Technology, University of Dschang, Cameroon
[d] Plant Systematic and Ecology Laboratory, Department of Biology, Higher Teachers' Training College, University of Yaoundé I, Yaoundé, Cameroon
[e] Tropical Plant Exploration Group (TroPEG) Cameroon, P.O. Box 18, Mundemba, Cameroon
[f] Center for Macroecology, Evolution and Climate, University of Copenhagen, Universitetsparken 15, Copenhagen DK-2100, Denmark
[g] UN Environment World Conservation Monitoring Center (UNEP-WCMC), 219 Huntingdon Road, Cambridge, UK

ARTICLE INFO

Keywords:
Socio-cultural assessment
Montane forests
Place attachment
Forest use
Forest management

ABSTRACT

Human culture has an important influence on how forests are utilised, yet its influence on ecosystem service (ES) use and valuation remains underexplored. We address this gap by investigating how livelihood strategy and ethnicity affect local peoples' perceptions of forest ES in Cameroon. Data were collected through 20 focus-group discussions in villages of farmers (Oku and Banso) and pastoralists (Fulani) in two mountains.

Pastoralists identified fewer ES than farmers, and used some ES differently (e.g. wildlife was only valued for aesthetics instead of as food). Some differences were also observed between farmer groups (e.g. identity link with the forest unique to Oku farmers). While water availability was perceived as the most important forest ES for all groups, the second most important was fodder for pastoralists and medicine resources for farmers. Pastoralists also identified fewer useful forest species, most likely related to their origin in the lowlands.

Our findings help highlight trade-offs in important ES for different groups (fodder vs. medicine resources), and in access to certain ES (e.g. Fulani pastoralists' unequitable access to tourism and forest income). We show that locals dependent on provisioning ES are not a homogenous group and that the wider socio-cultural context has to be taken into account for conservation and development projects to be successful.

1. Introduction

There is an increasing recognition of the importance of including socio-cultural evaluation criteria on the assessment of ecosystem services (ES) (Scholte et al., 2015), particularly, as a strategy for sustainable development (Chan et al., 2012; Martín-López et al., 2012; Cáceres et al., 2015) and for conservation projects to be successful (Kari and Korhonen-Kurki, 2013; Kovács et al., 2015). Socio-cultural approaches apply research methods from the social sciences (e.g. interviews), value ES in non-monetary terms (e.g. perceptions) and explicitly make stakeholders the focal point of the research (Orenstein and Groner, 2014). These socio-cultural approaches can complement and increase the value of traditional economic and ecological approaches, as they have advantages that can help: (a) value cultural services, (b) understand complex socio-ecological systems, (c) assure social relevance and provide legitimacy of the ES assessment process, and (d) strengthen the policy relevance of the assessment (Orenstein and Groner, 2014). For instance, Tilahun et al. (2016) estimated the economic value of Ankasa Forest (Ghana) in terms of e.g. carbon storage, timber, non-timber forest products and soil nutrients ($379.5 million, $19.1 million, $2.8 million, $0.63 million, respectively), but did not consider cultural services.

Socio-cultural ES valuation can also help identify differences in perceptions within and between stakeholder groups, e.g. local farmers and conservationists (Cebrián-Piqueras et al., 2017). Exploring the trade-offs between ES and linking them with stakeholders can help reveal the potential losers/winners of land use changes or conservation interventions (Kari and Korhonen-Kurki 2013; Kovács et al., 2015). For example, Kari and Korhonen-Kurki (2013) showed that if regulating services (e.g. habitat services) are given higher importance for

* Corresponding author.
E-mail address: a.cunisanchez@york.ac.uk (A. Cuni-Sanchez).

https://doi.org/10.1016/j.ecoser.2019.101000
Received 27 September 2018; Received in revised form 17 August 2019; Accepted 22 August 2019

conservation purposes, conflicts might occur between conservation bodies and local farmers dependent on provisioning ES.

Several factors affect stakeholders' values of ES, related to: (i) social context (e.g. cultural background, social network), (ii) their personal characteristics (e.g. income, age, gender, education, location of residence), and (iii) the interactions between stakeholders and ES, which are associated with use, perception and information of ES (see Scholte et al., 2015 for details). For instance, in several Southeast Asian countries poor people, educated people and communities living in close vicinity to forests tend to identify a greater number of forest ES than younger, non-educated and people living far from the forest (Sodhi et al., 2010). Similarly, in Rwanda, long-term residents identify more forest ES than newcomers (Dawson and Martin, 2015).

One important stakeholder group in ES assessments is locals dependent on provisioning ES such as residents of a study area whose jobs and livelihoods are strongly related to small-scale farming, herding or forestry (Iniesta-Arandia et al., 2014). Often, studies on stakeholders' perceptions of ES consider locals dependent on provisioning ES as a homogenous group (e.g. Kari and Korhonen-Kurki, 2013), although this group can best be seen as an assembly of subcultures, all with distinct livelihood practices, social institutions, values, identities and interrelationships (Lakerveld et al., 2015). Recent work from India and Nepal has highlighted the importance of considering ethnicity and cast when assessing the differences in ES identification and use among this stakeholder group (Lakerveld et al., 2015; Chaudhary et al., 2018).

Different ethnic groups can have very distinct livelihood strategies (e.g. farming, herding, fishing, hunter-gathering), which on its own might explain some differences in ES perceptions and use. Livelihood strategy is known to play a significant role in determining natural resource use patterns and the economic relevance of different income sources. For example, in northern Benin, pastoralists depend more on wild foods than farmers (Heubach et al., 2011); and in Ethiopia, pastoralists are more dependent on forest products for income than agro-pastoralists (Worku et al., 2014). Pastoralists and farmers also use different climate change adaptation strategies (e.g. Cuni-Sanchez et al., 2012, 2018). A growing number of assessments have focused on locals dependent on provisioning ES in Africa, especially with regard to forest resources and the implications for conservation/reforestation projects (e.g. Kari and Korhonen-Kurki, 2013; Willemen et al., 2013; Mutoko et al., 2015; Byg et al., 2017; Dave et al., 2017; Guerbois and Fritz, 2017; Ward et al., 2018). However, only one of these studies investigated the effects that ethnicity or livelihood strategy has on ES perceptions within this group of locals dependent on provisioning ES (Cuni-Sanchez et al., 2016).

One important way in which ethnicity affects ES valuation is through the feeling of 'place attachment'. Place attachment is broadly defined as the bond between people and a specific place (Altman and Low, 1992; Williams et al., 1992) and can be conceptualized as having two components: place identity and place dependence (Raymond et al., 2010). Key aspects of place identity might be cultural practices such as certain ceremonies, social cohesion and responsibility, the sense of 'home' for a claimed land, and the link of claimed land to family history and individual identity (Cundill et al., 2017). Place dependence is more related to the opportunities that the 'attached' place provides to meet people's needs, in terms of food security, physical security, livelihood strategy, and other aspects of material well-being. Lakerveld et al. (2015) pointed out at the importance of specific settlement history when studying forest ES use by local communities in India.

Socio-cultural preferences toward plant species have been long studied in the field of wild plant utilisation (ethnobotany, ethnomedicine, wild edible fruits and vegetables) (e.g. Assogbadjo et al., 2012; Sop et al., 2012). It has also been shown that communities who establish in a new environment (e.g. groups of people who live in the mountains but who originated in the lowlands), decades later still prefer to use the medicinal plants found in their original environment (e.g. Delbanco et al., 2017). Determining patterns of plant use with regard to certain provisioning ES (e.g. medicine resources, wild fruits) can help complement ES assessments, as they help identify potential alternative livelihood strategies for communities living near protected areas (e.g. honey production) and which species could be used in future reforestation programs (e.g. Cuni-Sanchez et al., 2016).

Understanding forest ES perceptions and use among locals dependent on provisioning ES is particularly important in the Bamenda Highlands of Cameroon, a region known internationally for its rich flora and fauna (including numerous endemics), both highly threatened by human activities (Myers et al., 2000; Onana and Cheek, 2011). An analysis of forest ES perceptions by the different ethnic groups co-exiting here could provide useful insights for the design of conservation and development projects so that they are successful and can contribute to the wellbeing of all, farmers and pastoralists. The main objectives of this study, focused on the Bamenda Highlands of Cameroon, were: (i) to investigate how local communities perceive and utilize forest ES, and if these differ according to livelihood and ethnic differences; and (ii) to assess if livelihood and ethnic differences affect the selection of most important plant species used for different provisioning ES. Given the greater dependency of pastoralists on forest products reported elsewhere (Heubach et al., 2011; Worku et al., 2014), we hypothesise that pastoralists would identify more forest ES, and a greater number of plant species for provisioning ES, than local farmers. We also hypothesise that fodder would be the most important ES for pastoralists. However, as the Fulani pastoralists moved to these mountains in the past three to six decades (Mbih et al., 2018), we hypothesise that their sense of place identity would be lower than that of local farmers.

2. Materials and methods

2.1. The case study area

This study focused on the communities living adjacent to two montane forests of the Bamenda Highlands located in north-western Cameroon: Mt Oku (3011 m) and Mt Mbam (2335 m) (located about 30 km apart, Fig. 1). Mt Oku is also known as Kilum Mountain and Mt Mbam forest is also known as the Mbar Hill Forest. These mountains receive more rainfall than the surrounding lowlands and are commonly covered in mist/fog during the rainy season, which allows the existence of montane forests. Annual rainfall is over 2400 mm per year in Mt Oku (Forboseh et al., 2003). There are no field measurements of rainfall for Mt Mbam.

While the forest in Mt Oku covers an area of about 9500 ha, that of Mt Mbam is only 2000 ha (Njabo and Languy, 2000; Momo-Solefack et al., 2012). On both mountains, similar vegetation can be found along an altitudinal gradient (from top to bottom): (1) grasslands dominated by *Sporobolus africanus* (Poir.) Robyns & Tournay and *Pteridium aquilinum* (L.) Kuhn, (2) montane forests with abundant *Carapa grandiflora* Sprague (crab nut), *Syzygium guineense* (Willd.) DC. (water berry), *Prunus africana* (Hook.f.) Kalkman (African cherry), *Schefflera abyssinica* (Hochst. ex A.Rich.) Harms, *S. manni* (Hook.f.) Harms (and bamboo *Yushania alpina* (K.Schum.) W.C.L on Mt Oku), (3) shrub savanna dominated by *Annona senegalensis* Pers. (African custard-apple), *Bridelia ferruginea* Benth. and *Terminalia glaucescens* Planch. ex Benth.; and (4) farmland (see Njabo and Languy, 2000; Forboseh et al., 2003). On Mt Oku most bushland has been converted to farmland.

Several rare species (plant, bird, mammal, chameleon and amphibian), endemic to Mt Oku or the Bamenda Highlands, can be found in these two forests, including the Lake Oku Clawed Frog (*Xenopus longipes*) (CR, only known from Lake Oku), and the Bannerman's Turaco (*Tauraco bannermani*) (EN, Mt Oku forest being its largest refuge) (CR: critically endangered, EN: endangered see www.redlist.org) (Njabo and Languy, 2000; Forboseh et al., 2003; Gonwouo et al., 2006; Doherty-Bone and Gvoždík, 2017). While most large mammals have been lost in Mt Oku (Maisels et al., 2001), several large mammal species can still be found in Mt Mbam, including: Preuss's monkey (*Allochrocebus preussi)*

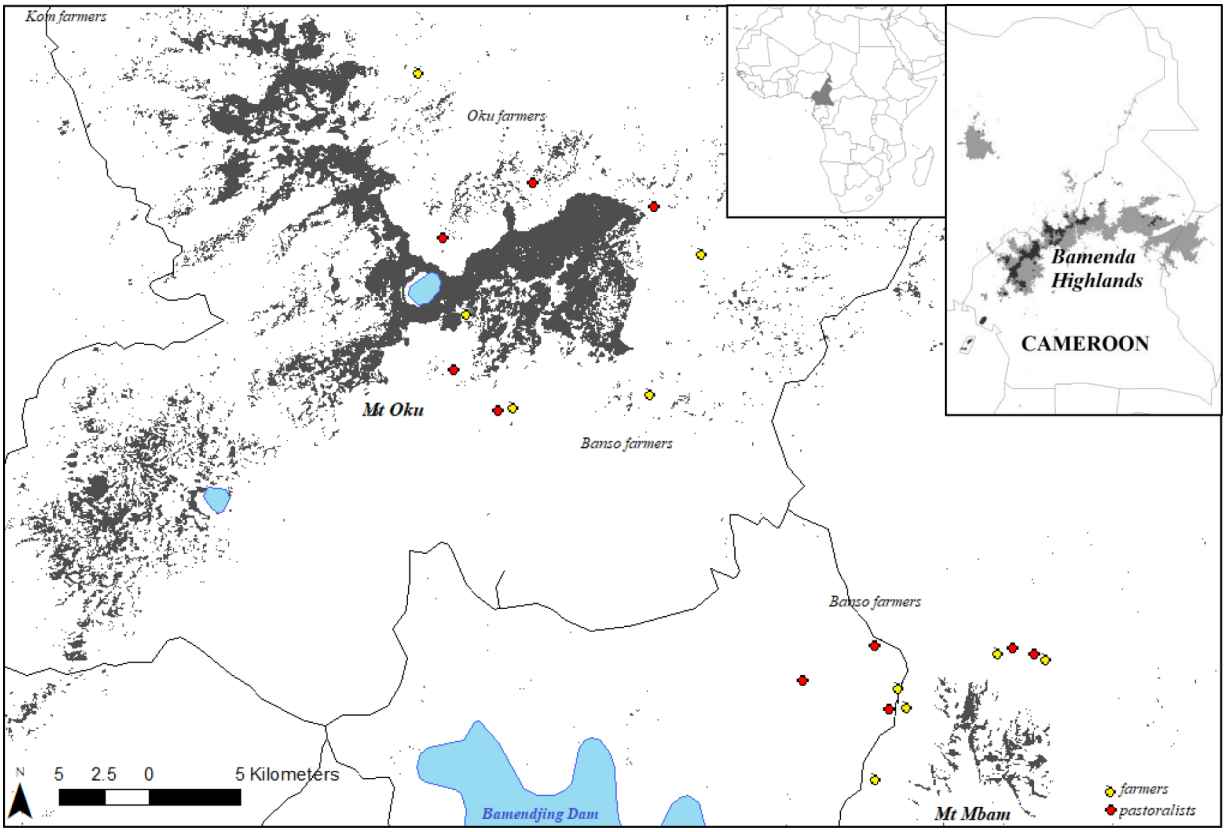

Fig. 1. Map of the study area in north-western Cameroon (each dot is one village or focus-group discussion: farmers are red, pastoralists are yellow). Grey shading in main map represents areas with > 70% tree cover (Hansen et al., 2013). Bamenda Highlands: black: > 1500 m above sea level and grey > 1000 m above sea level.

(EN), Olive baboons (*Papio anubis*) and bushbucks (*Tragelaphus scriptus*) (Njabo and Languy, 2000).

Both forests are community forests in which extraction activities are regulated using customary laws (e.g. firewood collection of dead trees only). Traditional authorities in the area hold considerable power and command local respect (Hakizumwami and Fuchi, 2000). Two conservation projects organised by BirdLife International operated in Mt Oku between 1987 and 2004, which helped delimit forest boundaries, grazing areas, plant trees and promote forest conservation (Abbot et al., 2001). The alternative livelihood programs of these two conservation projects (e.g. white honey production) considered very successful in changing attitudes towards forest conservation, did not include the Fulani (Abbot et al., 2001). Despite the success of these two conservation projects, illegal grazing, fire and unsustainable exploitation of *Prunus africana* bark remain major threats to Mt Oku forest (Stewart, 2009; Sunjo, 2015). Nowadays, forest degradation remains a greater issue than deforestation (Momo-Solefack et al., 2012). In Mt Oku, over 300,000 people live within a day's walk of the forest (FAO, 2002), population density is 114 people/km^2 in the north-west region (http://www.citypopulation.de). No conservation project has ever taken place in Mt Mbam. Fire (set up by pastoralists to promote grass growth or by hunters) is a major threat to Mt Mbam forest (Njabo and Languy, 2000). We were unable to find estimates of population numbers around this forest, but the population density is 140 people/km^2 in the west region (http://www.citypopulation.de).

Both mountains are populated by farmers and pastoralists. While pastoralists on both mountains are Fulani, farmers on Mt Oku are Oku, Banso and Kom, those in Mt Mbam are Banso and Bamoun. We studied the largest farmer communities living near the forest on these two mountains: Oku farmers on Mt Oku and Banso farmers on Mt Mbam. Banso (also called Nso) and Oku ethnic groups are from the Grassfields' Bantoid Group which claims Tykar ancestry, the Oku chiefdom being founded by a Nso prince (Nfi, 2014). Both ethnic groups are ruled by a divine king called Fon, both respected by his people and the government. Both groups are mostly Christian, although animism and traditional ceremonies still play a major role in their everyday lives. They are renowned for their chiefdoms, masquerades, use of traditional magic and agricultural production. Banso consist of about 240,000 individuals (2005 census, available at http://www.bucrep.cm) relatively widespread in the northwest region of Cameroon from Bamenda to Kumbo. Oku people, estimated at 87,000 (2005 census available at http://www.bucrep.cm), are mostly confined to Mt Oku and its surroundings (see www.ethnologue.com). Both groups mostly practice subsistence rain-fed farming and have secure land titles, but some also engage with off-farm labour. In Mt Oku the major crops are maize and beans (subsistence) and Irish potatoes (subsistence and traded at local markets). On Mt Mbam the major crops are maize, beans, cassava and groundnuts, all for subsistence (no Irish potatoes are grown as villages are located at relatively low altitudes).

The Fulani people (also called Fula or Fulbe), noted for the size of their cattle herds, are the largest nomadic pastoral ethnic group in Sub-Saharan Africa (20 million according to Ayodele et al., 2014; or 25 million according to Danver, 2015). Widely distributed across the Sahel and the Sudanian zone, from Mauritania to Cameroon and South Sudan, they generally do not own land but have rights to graze their animals on communal lands of their 'host' farming communities (Mbih et al., 2018). In addition to fully nomadic groups, there are also semi-sedentary Fulani who practice small-scale farming (although some have previously argued that '*they do so out of necessity, not choice*', see Levinson, 1996). Over the past few decades, Fulani have become increasingly sedenterised, due to population growth, climate change, environmental degradation, farmer-herder conflicts and continued marginalisation of pastoralists (Moritz, 2010; Ayodele et al., 2014). In our study area, as in most of the Bamenda Highlands, most Fulani have

now adopted a more sedentary community lifestyle that only involves seasonal movement of cattle during dry periods (Mbih et al., 2018). In Mt Oku and Mt Mbam, most Fulani families spend the rainy season near the top of the mountains, to benefit from the fresh grass; they migrate to lower altitudes during the dry season, so that their cows can eat the residues from the farmers' fields (and drink water from Bamendjing Dam in Mt Mbam). The majority of Fulani are Muslim. We were unable to find estimates of population numbers of Fulani in the Bamenda Highlands.

Some authors have argued that 'a significant feature of farmer-herder relations in the Cameroon Grassfields [which include Mt Oku and Mt Mbam] is the apparent disjunction of corresponding discourses and practices, and the general tendency to frame economic conflict in ethnic terms' (Pelican, 2015). In both mountains, the number of Fulani pastoralists is much smaller than that of local farmers. In general, they co-exist rather peacefully, although there have been some small disputes over land or water resources (participants' comments during fieldwork campaign). Access to health care, education and urban markets is better around Mt Oku than Mt Mbam (e.g. there is a tarmac road to Elak-Oku). These two mountains were selected because (i) they are isolated forest systems with a similar range of vegetation types and (ii) local communities have similar livelihood strategies which rely on these forest systems.

2.2. Data collection

Focus-group discussions (FGDs) were organised in five farmers' and five pastoralists' villages located around each of the two montane forests (in total 20, Fig. 1) in January-February 2018. This encompassed all major permanent villages in these two mountains for Fulani and Banso. For Oku, we randomly selected five villages from different access routes (footpaths) to the forest. Each FGD involved 4–8 village elders (all male), including the village chief (as it is a custom in the area). After we explained the aim of the study to the village chief, he explained it to the elders available in the village that day, who decided to participate on a voluntary basis. There were no differences in the organization of the FGDs between villages. The FGDs were facilitated and translated by a native speaker of the same ethnicity of each FGD.

We are aware that by only including male elders in the FGDs our results represent a partial sample of local viewpoints. To correct this bias we would have needed to organise separate female groups due to cultural norms in the region. In our study area males (farmer and pastoralist) spend considerably more time in the forest than females, because of e.g. hunting, looking after animals, beekeeping, and collecting construction materials, mushrooms or medicinal resources. Therefore, they can provide a good overview of forest use and value. However, we acknowledge this limitation of our study design and recommend future work with female respondents (see discussion).

First, participants were informed that the aim of the study was to better understand the importance of montane forests for local communities. Secondly, informal discussions centred on assessing the importance of the forest by mentioning all benefits (open question, no limit of benefits to select, see Appendix A). We also asked to clarify the definition of some benefits (e.g. wildlife for food or for tourism, or just existence value). Thirdly, they were asked to identify the first and second most important benefit for their village, stating the reasons behind. Participants identified forest benefits using their own terminology which was then grouped according to a modification of the Millennium Ecosystem Assessment's division to types of ES and subcategories (Millennium Ecosystem Assessment, 2005); e.g. the forest attracts rains became micro-climate regulation. Transcription was not prepared, only notes were taken during the FGDs. After discussing forest benefits, participants were asked to select the three tree species they considered the most important for firewood, construction, medicine resources, fodder and honey. These five provisioning services were selected to help identify tree species for future re-forestation programs in degraded parts of the forest. Indigenous fruit trees were initially included in the guiding questionnaire but as participants only mentioned edible *Rubus* sp. (which is not a tree), this question was removed from the final guiding questionnaire. See Appendix A for details on the final guiding questionnaire used. The FGD facilitator guided the groups to reach consensus, therefore, comments made in a single FGD were considered to be a general opinion in the FGD. Consensus was reached for all responses except on second most important ES in some farmers FGDs, which is why we kept two answers for this specific question.

All species mentioned in the FGD were collected for identification and verification of their local name at the Herbarium of Yaoundé, Limbe Botanical Garden and Tropical Plant Exploration Group (TroPEG). Field observations of the tree species were also made in each forest, to determine (i) if the species mentioned in the FGDs were present, (ii) if they were relatively abundant (easy to find) and (iii) how they were being collected. Species' presence in a mountain and their conservation status was also checked with the literature (e.g. Cheek et al., 2000 for presence in Mt Oku, the IUCN Red List for conservation status www.iucnredlist.org). Species mentioned were classified into 'montane forest specialist' or not (following Cheek et al., 2000; Sainge, 2017). Plant nomenclature follows The Plant List (www.theplantlist.org). Eight species are reported using their local name, as their samples were sterile, of poor quality, and could not be identified.

2.3. Data analysis

In order to determine the effects of livelihood strategy, ethnicity and location (e.g. mountain) on ES valuation, the data from all FGDs from one ethnic group and mountain were pooled together: Oku farmers, Banso farmers, Fulani-O pastoralists (which refers to Fulani FGDs in Mt Oku), and Fulani-M pastoralists (which refers to Fulani FGDs in Mt Mbam). Therefore, we had three combinations: (a) different livelihood strategy and ethnicity but same location (Oku vs Fulani-O and Banso vs Fulani-M); (b) same livelihood strategy and ethnicity but different location (Fulani-O vs Fulani-M) and (c) same livelihood strategy but different ethnicity and location (Oku vs Banso).

As abovementioned, place attachment has two components namely place identity and place dependence. With regard to place identity, we considered that the greater the number of key aspects of place identity mentioned, the higher the rating of 'place identity' by a given group, as done by Cundill et al. (2017). Key aspects could include e.g. ceremonies only carried out in the forest; connections between social cohesion and responsibility with the forest; the sense of 'home' in the forest; and the link of the forest to family history. With regard to place dependence, all groups noted numerous provisioning services from the forest, and therefore, we considered that place dependence was relatively high in all groups studied (see results).

To compare the similarity between plant species mentioned by the groups, we computed the Jaccard similarity coefficient (J), defined as the size of the intersection divided by the size of the union of the sample sets (Jaccard, 1901):

$$J(A, B) = \frac{A \cap B}{A \cup B}$$

where A and B are the binary descriptions of species presence/absence in different groups (in our case, as mentioned by different ethnic groups). A value of 1 indicates complete similarity, while 0 indicates complete dissimilarity. As Fulani were not involved in honey production and Banso in animal rearing, they could not identify three important trees used for honey or fodder, respectively. Therefore, when calculating J between groups, we only used the ES provisioning categories mentioned in both groups being compared (e.g. excluding trees mentioned for honey when Fulani was one of the groups compared). For each species mentioned, we also calculated the number of times mentioned in a mountain and the number of important uses. The species mentioned more times for a given ES was considered the most

Table 1
The number of forest ecosystem services mentioned in the focus-group discussions (FGDs) by the different groups studied, the name of the ecosystem services considered most important by each group and a list of all ecosystem services mentioned by each group. Values refer to number of FGDs citing an ecosystem service (n = 5 for each ethnic group). Fulani-O refers to Fulani in Mt Oku and Fulani-M refers to Fulani in Mt Mbam.

			Mt Oku		Mt Mbam	
			Oku farmers	Fulani-O pastoralists	Banso farmers	Fulani-M pastoralists
No. ES mentioned			24	15	15	13
First most important ES			water	water	water	water
Second most important ES (some mentioned 2)			honey, medicine resources	fodder	medicine resources, fresh air	fodder
Provisioning	**food**	fodder for cows/goats	1	5	1	5
		mushrooms	5	3	5	4
		wild fruits			2	5
		wild vegetables		1		
		honey	5	5	5	5
		bush meat	5 (rodents)		5	
	energy	firewood	5	5	5	5
	raw materials	poles for construction	4	5	5	5
		bamboo for construction	5	5		
		wood for carving	2		3	
		wood for hoe	1			
		baskets, ropes, etc				
	medicinal resources	wild plants and honey for humans	5		5	
		wild plants for humans/animals		5		5
	water	water availability	5	5	5	5
	shelter	shelter for humans	2	1		
		shelter for animals		3		1
	income	income from *Prunus* bark	3		2	
		income from *Gnidia* bark	1			
		income from white honey	5			
		income from lichens	1			
		income from baskets	1			
		income from stones	2			
		income from *Beilschmiedia*				1
regulating	**micro-climate regulation**	rainfall		3	3	2
		temperatures		2		
	air purification	fresh air	5		1	2
	diseases regulation	diseases	1	1		
supporting	**soil formation**	for agriculture		2		
cultural	**tradition**	ceremonies	5		3	
		Turaco feathers	5		5	
	tourism	tourism	2			
	aesthetics	wildlife existence		1		1
	sense of place	identity with the forest	2			

Beilschmiedia: Beilschmiedia mannii fruits; *Prunus*: *Prunus africana* (its bark is traded for export as it used by pharmaceutical companies against benign prostatic hyperplasia, Stewart, 2009); *Gnidia*: *Gnidia glauca* (its bark is used to make paper, see Momo-Solefack et al., 2017); Turaco: *Tauraco bannermani* feathers used for decoration of royal hats by local royalty

important while the most important species overall was the species with more uses and mentioned more times.

3. Results

3.1. Ecosystem service identification, use and importance

Water (defined as water availability by study participants) was the *first* most important forest ES for all groups studied (Table 1), highlighting how essential it is for both farmers and pastoralists. The *second* most important ES differed: pastoralists mentioned fodder and farmers honey, medicine resources and fresh air (farmers did not always agree on one second most important ES, see Table 1).

The total number of ES mentioned varied between farmers and pastoralists, and mountains: 24 ES were mentioned by the Oku, 16 by Fulani-O, 15 by Banso and 13 by Fulani-M (Table 1). Seven ES were cited by all ethnic groups: water, poles, firewood, medicine resources, wild honey, mushrooms and fodder. Some ES were only cited by farmers (e.g. Turaco feathers, ceremonies), while some ES were only cited by pastoralists (e.g. aesthetic value of wildlife, shelter for animals). Similarly, some ES were only mentioned in Mt Oku (e.g. bamboo, disease regulation) and one only in Mt Mbam (income from *Beilschmiedia mannii*). Most of the seven most cited ES were also cited by all FGDs in that livelihood strategy and location, with very few differences between groups (Fig. 2); the one exception was fodder, which was cited only in one farmer FGD per mountain (indicating that fodder is less important for farmers). Banso, Fulani-O and Fulani-M mainly reported provisioning services for their basic needs while Oku highlighted the use of six forest products for income generation (Table 1).

Significantly, the ES mentioned in this study included not only provisioning ES, but also regulating services (microclimate regulation, disease regulation) and supporting services (soil formation). Interestingly, soil formation was only mentioned by Fulani-O pastoralists. This can be explained by the fact that Oku no longer practice slash-and-burn agriculture; moreover, farming in the forest is prohibited. On the contrary, some Fulani settlers have recently started farming (illegally) in the forest and practice slash-and-burn agriculture – they acknowledged that the land which was previously forested is

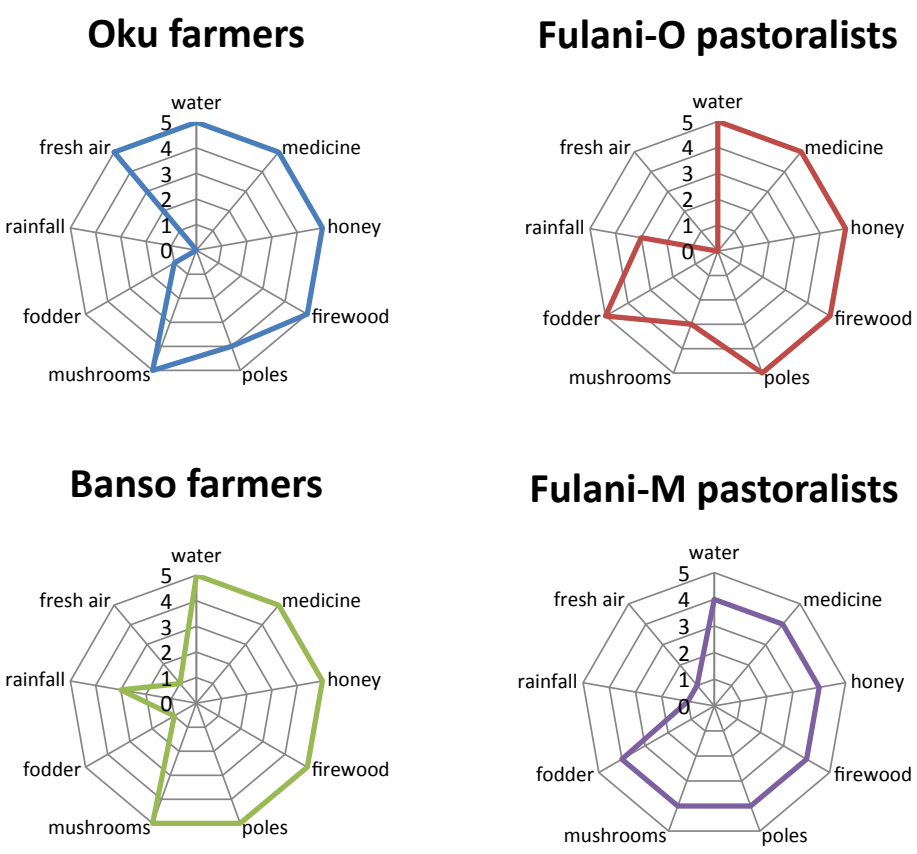

Fig. 2. Number of times an ecosystem service (ES) was mentioned by each ethnic group studied (five focus-group discussions were organised per ethnic group and location). Only the nine ES mentioned by all ethnic groups are included in this figure. Water refers to water availability and medicine to medicine resources (see detailed definitions in Table 1). Fulani-O refers to Fulani in Mt Oku and Fulani-M refers to Fulani in Mt Mbam.

better than grasslands for farming.

The specific use of several ES also varied between livelihood strategies (Table 1). For example pastoralists did not separate the use of medicine resources for humans to that used for veterinary purposes, while farmers did make this distinction. For farmers, wildlife was perceived as a source of protein (bush meat) and cultural ornaments (Turaco feathers), while the pastoralists acknowledged the aesthetic value of the wildlife, but did not identify a direct use for it (bush meat is taboo to Fulani people and they do not eat it).

3.2. Place identity and place dependence

Place identity with the forest was greater for Oku, followed by Banso and then Fulani. Oku highlighted three aspects of place identity: (1) the link between the forest and their identity and culture as Oku people, (2) the use of Turaco feathers as a symbol of high status in their society and (3) the fact that several ceremonies can only be carried out in the forest (e.g. funerals and coronation of their chief-king). For instance, they mentioned that *'water that comes from the forest is a gift from gods'* or that *'our gods have put some important medicines for us in the forest'* (comments made during FGDs). Banso mentioned two aspects: (1) the use of Turaco feathers as a symbol of high status, and (2) some ceremonies which can only be carried out in the forest. Fulani did not mention any aspect of place identity. With regard to place dependence, related to the opportunities that the 'attached' place provides to meet people's needs, all groups (including the Fulani) showed place dependence as the forest was crucial for numerous provisioning services they use, e.g. medicinal resources.

3.3. Preferred tree species

In total, 23 tree species were mentioned as being important for different provisioning services by Oku, 27 by Banso, 28 by Fulani-O and 25 by Fulani-M (Table 2). Notably, Banso, Fulani-O and Fulani-M mentioned several trees which are not found in the montane forest but grow at rather lower altitudes in the savanna (e.g. *Khaya anthotheca,* Table B1 Appendix). Therefore, if only montane forest specialist trees are considered, Oku mentioned more species than the other groups (Table 2).

The different Jaccard indexes of similarity (J) were quite low (< 0.2) highlighting the strong differences (and specializations) among preferred species between the different livelihood communities in the two mountain locations (see Table 3). Several species were only mentioned by one ethnic group or only in one mountain (see Table B1 Appendix). Fulani-O also mentioned one liana species as important for 'construction', because they are used as ropes to tighten fences or traditional huts.

Most species mentioned in one mountain can be found in the other, except for bamboo (*Yushania alpina*) and *Podocarpus latifolius* which cannot be found in Mt Mbam, and *Beilschmiedia mannii* which does not seem to be present in Mt Oku (unpublished data). As the forest in Mt Mbam is located over five hours walk from the villages, Banso and Fulani-M people prefer using species nearby their homes, which are not 'montane forest species' but 'savanna species' (e.g. *Khaya anthotheca, Terminalia glaucescens* and *Combretum* spp.). Fulani-O also mentioned numerous savanna tree species despite being located near the forest. Notably, seven species mentioned as important for provisioning services are of conservation concern: *Dombeya ledermannii* (CR), *Prunus africana* (VU), *Allophylus bullatus* (VU), *Khaya anthotheca* (VU), *Vitellaria paradoxa* (VU), *Embelia mildbraedii* (NT) and *Milicia excelsa* (NT).

4. Discussion

4.1. Ecosystem service identification, use and importance

Our results demonstrate that both livelihood strategy and ethnicity affect the identification, the use and the importance ranking of forest ES. With regard to total number of ES identified by the different groups

Table 2
The most preferred species and the total number of species (spp.) reported for different provisioning ecosystem services, and the most important species overall. Fulani-O refers to Fulani in Mt Oku and Fulani-M refers to Fulani in Mt Mbam. Note that all species cited in this table from Mt Oku (by Oku farmers or Fulani-O pastoralists) can be found in Mt Mbam, and all species cited in this table from Mt Mbam (by Banso farmers or Fulani-M pastoralists) can be found in Mt Oku.

	Medicine Resources	Firewood	Construction materials	Honey (flowers)	Fodder	Overall
Oku farmers	*Prunus africana*	*Carapa grandiflora*	*Embelia mildbraedii*	*Nuxia congesta, Schefflera mannii*	*Ficus sp.*	*Nuxia congesta, Prunus africana*
	10 spp.	4 spp.	10 spp.	5 spp.	8 spp.	23 spp. (all forest spp.)
Fulani-O pastoralists	*Khaya anthotheca*	*Vernonia blumeoides*	*Raphia farinifera*	*na*	*Ficus thonningii*	*Khaya anthotheca, Prunus africana*
	9 spp.	11 spp.	10 spp.		11 spp.	28 spp. (forest spp. = 18)
Banso farmers	*Prunus africana*	*Rothmannia hispida*	*Khaya anthotheca*	*Syzygium staudtii, Croton macrostachyus*		*Khaya anthotheca, Prunus africana*
	8 spp.	9 spp.	11 spp.	7 spp.		27 spp. (forest spp. = 8)
Fulani-M pastoralists	*Khaya anthotheca, Rauvolfia vomitoria*	*Hymenocardia acida*	*Terminalia glaucescens*	*na*	*Bauhinia thonningii*	*Terminalia glaucescens*
	7 spp.	9 spp.	9 spp.		10 spp.	25 spp. (forest spp. = 7)

Table 3
The different Jaccard indexes of similarity in species mentioned by the different groups studied. Fulani-O refers to Fulani in Mt Oku and Fulani-M refers to Fulani in Mt Mbam.

	Fulani-O pastoralists	Banso farmers	Fulani-M pastoralists
Oku farmers	0.15	0.08	0.03
Fulani-O pastoralists		0.08	0.12
Banso farmers			0.09

studied, pastoralists identified fewer forest ES than farmers. Three factors explain this smaller number of forest ES mentioned by pastoralists: (i) farmers use the forests in ways pastoralists do not use (e.g. space for ceremonies, wood for carving, Turaco feathers), so that they identify a greater number of forest ES. (ii) The use of forests for fodder was not only mentioned by pastoralists but also by both farmer groups, as some have goats. (iii) Pastoralists combined ES in their use for humans and animals, thereby decreasing the total number of ES identified by them. This later finding is similar to Samburu pastoralists in Kenya who also combined human and veterinary medicine (Cuni-Sanchez et al., 2016).

Apart from mentioning a different number of ES, the use of some ES was clearly different between groups studied. Farmers used wildlife as food or cultural ornament, while pastoralists reported the 'existence' value of wildlife, with no direct use. Maasai pastoralists in Kenya and Tanzania also reported the 'existence' value of wildlife, with no direct use (Homewood et al., 2009). Similar to a study in Madagascar, which identified different uses of honey by different farmer groups (Dave et al., 2017), the farmers in the Bamenda Highlands use honey for income, food or medicine, but pastoralists use honey only for food. Other studies have documented how culture explained the different use of similar types of services. For example, Sagie et al. (2013) reported in their study that Israeli respondents enjoyed bird-watching (a cultural service), while several Jordanian respondents hunted birds (provisioning and recreational cultural service). The identification of these differences in uses was only possible because of the methodology used (open questions). Using open questions helps identify ES which might not be considered in mainstream ES assessments, e.g. forest as shelter during conflict (Cuni-Sanchez et al., 2016) or for identity, as we report here. As highlighted by Milcu et al. (2013), many ES assessments identify the services easiest to value with the established methods rather than identifying services truly valued by a given community. Overall, most forest ES mentioned in this study have been mentioned in other studies focused on local peoples' perceptions of forest ES in Africa, which also highlighted that local communities report not only provisioning but also regulating and supporting services (e.g. Hartter and Goldman, 2011; Kari and Korhonen-Kurki, 2013; Mutoko et al., 2015; Byg et al., 2017; Dave et al., 2017; Ward et al., 2018). Some ES such as 'identity with the forest' were only reported in one of these studies (Kari and Korhonen-Kurki, 2013), possibly, related to the way the questionnaires/research were designed (they did not include open questions).

In terms of important ES, livelihood strategy did not affect the selection of the *first* most important ES (water), but it did affect the selection of *second* most important ES. Fodder is key for Fulani pastoralists, who place high value on their cattle, which is why it was the second most important forest ES for them. Fodder was also identified as the second most important ES (after water) by pastoralists in northern Kenya (Cuni-Sanchez et al., 2016). Oku farmers identified medicine resources as the second most important forest ES, despite access to health care being relatively good around Mt Oku. This preference for medicine resources is likely to be explained by the high value Oku and Banso ethnic groups place on traditional healers and 'magic'. Both ethnic groups are well-known in Cameroon for their traditional healers: e.g. '*even if you have money, if western medicine cannot cure you, you go to*

visit a Banso healer' [but] *'if someone send you a bad spell, or you need to sort matters with a thief, you go to visit a Oku healer'* (comment made during FGDs).

The first ES mentioned by all groups studied was water. Some ES (such as water) are so vital that their valuation cuts across socio-cultural factors (Cuni-Sanchez et al., 2016). Water has also been reported as the most important ES mentioned in other areas, such as southwest China (Allendorf and Yang, 2013) and the desert in south Israel (Orenstein and Groner, 2014). Indeed, water is known to be one of the most important ES provided by African mountain ecosystems (UNEP, 2012). As mentioned in Mt Oku: *'water that comes from the forest is a gift from gods'* (comments made during FGDs).

Apart from livelihood strategy, location (e.g. no bamboo in Mt Mbam) and ethnicity (differences between Oku and Banso) also affected ES identification. *Nuxia congesta*, the main flowers used to produce white honey, can also be found in Mt Mbam, but '*Banso do not have the culture to keep bee hives in the forest for this purpose'* (participant comments during FGDs). If Banso harvest white honey, they mix it with brown honey from lowlands, which indicates that they do not place special value on the white one (pers. Obs.). Several studies have shown that location and ethnicity affect ES identification and valuing (e.g. Lakerveld et al., 2015; Cuni-Sanchez et al., 2016; Chaudhary et al., 2018).

Regarding place identity, pastoralists' place identity was lower than that of farmers, as we hypothesised, because Fulani pastoralists are not native to these mountains, but came there in the past three to six decades (Mbih et al., 2018). Interestingly, Oku and Banso place identity was not the same. While both highlighted the importance of forests for their culture (ceremonies, Turaco's feathers), Oku highlighted the importance of the forest for their ethnic identity, which Banso did not. Banso people also have a sacred forest that is important for their culture and identity; however, this is not the forest of Mt Mbam, it is in Kovifem (6°17′N, 10°47′E), close to the town of Kumbo, where the Nso chief-king's 'palace' is located (pers. Obs.). Regarding place dependence, all groups (including the Fulani) showed place dependence related to the opportunities that the 'attached' place (in this case the forest) provides to meet their needs and their well-being. Overall, it can be said that both livelihood strategy and ethnicity affect ES identification and use, including place identity link with the forest. However, in some cases, one ES is so vital that its value does not depend on these above-mentioned factors as was illustrated by the ubiquitous high value of water.

4.2. Preferred plant species for provisioning ES

We hypothesised that pastoralists would identify a greater number of tree species for provisioning ES, but they only identified a greater number of tree species within the fodder category. This is similar to results from Burkina Faso and Niger, in which Fulani identified more fodder species than nearby farmer communities (Sop et al., 2012; Ayantunde et al., 2008). Interestingly, Fulani in Mt Oku mentioned several tree species found in the savanna as 'preferred trees' for provisioning ES including e.g. *Khaya anthotheca* for medicine. This resonates with results from Kenya, showing that communities which established in a new environment (e.g. a mountain while coming from lowlands), still prefer to use the plants found in their original environment, decades after (Delbanco et al., 2017). As each group mentioned numerous trees not mentioned by other groups (including savanna trees), we found a low J index between groups. For instance, our J index values were even lower than those reported from different ethnic groups and mountains in northern Kenya (Cuni-Sanchez et al., 2016) indicating high specialization of plant use among studied groups.

Location also affected the selection of preferred tree species, as responses from Fulani-O and Fulani-M were slightly different. Several studies have shown that people generally use and value trees which are abundant (e.g. Lucena et al., 2007; Thomas et al., 2009). While most trees mentioned in this study are abundant in Oku montane forest (*Carapa grandiflora, Nuxia congesta* and *Schefflera mannii*) or in the savanna around the villages in Mt Mbam (*Hymenocardia acida, Terminalia glaucescens* and *Piliostigma thonningii*), some of the most important 'useful' trees are not: e.g. *Prunus africana* and *Khaya anthotheca*. It has been highlighted that multipurpose trees are at higher risk of over-exploitation (Gaoue and Ticktin, 2007; Houehanou et al., 2011). This seems to the case for *P. africana*, heavily harvested in the recent past for international bark trade (Stewart, 2009). *K. anthotheca* has been heavily exploited for its timber, and regeneration is poor in places, especially where parent trees are scarce (Hawthorne, 1998).

Most species mentioned by Oku people in this study have been previously documented (e.g. Neba, 2006), except for the use of *P. africana, Olea capensis, Schefflera manni* and *Embelia mildbraedii* for fodder. Several plants mentioned by Fulani people in this study have been documented: e.g. the use of *Crossopteryx febrifuga, Hymenocardia acida, Piliostigma thonningii* and *Vitex doniana* for fodder (Bayer et al., 1990) or the use of *P. africana, K. anthotheca* or *Terminalia glaucescens* for veterinary medicine (Nfi et al., 2001). However, most studies on the Fulani people have focused on drier lowland environments; which makes it difficult to compare with our findings. For instance, while several authors have reported the widespread use of *K. senegalensis* for fodder (e.g. Gaoue and Ticktin, 2007), we did not find any reference this type of use for *K. anthotheca*. It is possible that as the Fulani moved into these mountains where *K. senegalensis* cannot be found, they started using *K. anthotheca*. *K. grandifoliola* is also found in our study area, and it is often confused with *K. anthotheca* (Vivien and Faure, 1985). Several *Khaya* spp. might be used for fodder, which requires further investigation. With regard to Banso, we could not find any published report on the ethnobotanical uses of Banso people, which highlights the need to further study this particular ethnic group.

4.3. Implications for management

Our bottom-up approach helps assess trade-offs in ES. Trade-offs may occur when the provision of one ES is reduced as a consequence of increased use of another ES (Rodriguez et al., 2006). In our case, an increased use of fodder (preferred by pastoralists) would likely have a negative effect on medicine resources (preferred by farmers). Pastoralists use fire to promote grass growth, which negatively affects tree regeneration and, in some cases, adult tree survival (Stewart, 2009). This trade-off concerns two provisioning services, supporting recent findings from Turkelboom et al. (2018). These authors, based on 24 cases from around the world, highlighted that mostly provisioning and cultural ES choices are traded-off against each other. However, their finding contradicts previous studies which highlighted that the most common trade-offs were between provisioning and regulating ES (see Turkelboom et al., 2018 for a review). Taking into account why (and what) trade-offs occur is of key importance to achieve win-win situations (Howe et al., 2014).

Trade-offs may also occur when more of a particular ES is captured by one stakeholder at the expense of others (Rodriguez et al., 2006). This is the case of tourism in Mt Oku, only mentioned by Oku participants, indicating that Fulani do not benefit from tourism. Fulani did not mention any income from forest products, while Oku mentioned six. Clearly, both groups do not benefit from the forest in an equitable manner: power dynamics (Oku being land owners of the territory) influence Fulani's ability to gain access to certain forest benefits. Although negative perceptions of forest access fairness where not brought up in our FGDs with Fulani, greater inclusion of the Fulani in different conservation interventions is likely to benefit forest conservation outcomes. Fires set up by pastoralists remain an issue in Mt Oku (Sunjo, 2015), and we also observed that they clear land for farming within the forest. For farmers, involvement in white honey commercialisation significantly changed attitudes towards forest conservation (note that no pastoralists involved in that project, Abbot et al., 2001).

Our bottom-up approach also helps identify livelihood strategies

which could promote forest conservation. All ethnic groups mentioned honey as an important forest ES, but only Oku are currently involved in beekeeping and commercialising the expensive 'white honey' (now recognised internationally as a certified product, see Chabrol et al., 2017). We have documented that the trees whose flowers are used by bees to produce 'white honey' are also found in Mt Mbam. Therefore, commercial white honey production could also be promoted in Mt Mbam. Another benefit of our bottom-up approach is that it can help suggest preferred native species for reforestation programs in the region. One option could be to promote 'white honey bee-loving native trees' (*Prunus africana, Carapa grandiflora, Schefflera mannii*) or useful medicinal trees which are of conservation concern such as *K. anthotheca*.

One major limitation of our approach is that we only investigated the views of male participants. Several authors have highlighted that gender should be a major component of ES assessments and valuation studies (e.g. Yang et al., 2018; Cruz-Garcia et al., 2019). For instance, a recent study among indigenous peoples of the Colombian Amazon showed that both indigenous men and women identify a similar number of ES and value similarly most ES, but they identify some different ES and have different criteria for valuing ES importance (Cruz-Garcia et al., 2019). In our study area males (farmer and pastoralists) spend considerably more time in the forest than females, because of the activities they carry out (e.g. males spend long periods of time in hunting camps or in grazing camps with animals). However, to have a comprehensive view of all actors in place and make conservation and development interventions relevant to all groups, it is necessary to integrate female's views, which we recommend for future studies. Another methodological caveat is that we used solely FGDs. Although FGDs are recommended for the assessment of ES priorities and values (Poppy et al., 2014), FGDs might not be statistically representative samples of the whole population in a region, and results should not be generalized (Cruz-Garcia et al., 2019). In the future, FGDs could be combined with other complementary methods, e.g. individual interviews and individual ranking exercises.

The situation in the Bamenda Highlands, densely populated by different ethnic groups and ongoing infrastructural changes (e.g. tarmac of more roads), has strong parallels across African mountains. Site and livelihood specific investigations on forest use are necessary so that policy and management interventions targeted to support rural livelihoods and promote sustainable resource use can be tailor-made to suit intercommunity heterogeneity (Heubach et al., 2011). We show that 'locals dependent on provisioning ES' is not an homogenous group: locals identify, define and rank forest ES depending upon livelihood strategy, ethnicity and location, as it has been shown in Asia (Lakerveld et al., 2015; Chaudhary et al., 2018). Therefore, the heterogeneity of the population and their cultural nuances and preferences should be taken into account when developing conservation projects or local development planning in Africa, for these to be successful.

Acknowledgements

We are deeply grateful to our study participants, who graciously shared their time, energy, and stories. We are thankful to all village chiefs, our field assistants and translators D. Wultof, F. Keming, E. Bafon, J. Meyeih for making this research possible. We also thank the kind support given by T. K. Konsum (The Society for the Promotion of Initiatives in Sustainable Development and Welfare- SOPISDEW) and E.N. Litonga for helping with plant identification at Limbe Herbarium. This research was funded by Marie Skłodowska-Curie Actions Global Fellowships, Number 743569. We thank the contribution of three anonymous reviewers who helped improve the manuscript considerably.

Appendix A

Focus-group discussions guiding questionnaire

Part 1. The forest

1. Is the forest important for your community?
2. Why is it important? (List the benefits)
3. What other benefits does the forest provide to you?
4. Which of all these benefits that have been mentioned is the most important for your community and why?
5. Which is the second most important benefit, and why?
6. Do you feel 'attached' to this forest? For example, is your identity linked with this forest? (Give other examples).

Part 2. Preferred tree species

7. Which three tree species from the forest are the most important for your community for firewood?
8. Which three tree species from the forest are the most important for your community for construction materials?
9. Which three tree species from the forest are the most important for medicine?
10. Which three tree species from the forest are the most important for fodder?
11. Which three tree species from the forest are the most important for honey (flowers)?
12. Is there anything else you would like to add with regard to the importance of your forest and the trees found inside?

Appendix B

Table B1

Preferred plant species for different provisioning ecosystem services (medicine resources, firewood, construction materials, honey and fodder) with regard to livelihood strategy (farmer or pastoralist) and location (Mt Oku or Mt Mbam). 'Forest special' refers to montane forest specialist (following Cheek et al., 2000; Sainge et al., 2014; Sainge, 2016, 2017). Redlist status refers to CR: critically endangered, VU: vulnerable NT: near threatened (www.redlist.org). Banso (B), Oku (O), Fulani in Mt Oku (FO) and Fulani in Mt Mbam (FM). The last eight species are reported using their local name, as their samples could not be identified.

Scientific name	Forest species	Redlist	Medicine resources	Firewood	Construction materials	Honey (flowers)	Fodder
Acacia kamerunensis Gand.				FO			
Agarista salicifolia (Lam.) G.Don	yes		B				
Albizia gummifera (J.F.Gmel.) C.A.Sm.	yes		B		O		O
Alchornea cordiflora (Schumach. & Thonn.) Müll.Arg.						FO	FM
Allophylus bullatus Radlk.	yes	VU		FO	FO		
Antidesma venosum E.Mey. ex Tul.				FO	FO		
Baccharoides guineensis (Benth.) H.Rob.			FM				FM
Bauhinia thonningii Schum.	yes			B, FM			FM
Beilschmiedia mannii (Meisn.) Benth. & Hook.f. ex B.D.Jacks.							FM
Bridelia ferruginea Benth.					FM		
Bridelia speciosa Müll.Arg.					B		
Carapa grandiflora Sprague	yes			O	FO		
Cassipourea malosana (Baker) Alston	yes		O		O		
Clausena anisata (Willd.) Hook.f. ex Benth.	yes		O		FO		
Combretum sp.			B				
Cremaspora triflora (Thonn.) K.Schum.	yes				FO		
Crossopteryx febrifuga (Afzel. ex G.Don) Benth.							FO,FM
Croton macrostachyus Hochst. ex Delile	yes		FO	B	O	B	FO
Cuviera sp.	yes			B			
Dombeya ledermannii Engl.		CR	B			B	
Dracaena sp.					B		
Embelia mildbraedii Gilg & Schellenb.	yes	NT			O		O
Erica cf silvatica	yes		FO				FO
Erica mannii (Hook.f.) Beentje	yes		FO				
Ficus sur Forssk.			FO				FO,FM
Ficus sp. 1	yes						O
Ficus sp. 2			FO				FO
Ficus thonningii Blume	yes						FO
Globimetula oreophila (Hook.f.) Danser	yes						FO
Gnidia glauca (Fresen.) Gilg	yes		O	FO		B, O	
Gouania longispicata Engl.	yes		O				
Harungana madagascariensis Lam. ex Poir.					B, FM	FM	
Hymenocardia acida Tul.				B, FM		B	FM
Hypericum lanceolatum Lam.	yes						O
Khaya anthotheca (Welw.) C.DC.			B, FO, FM		B		FO
Kigelia africana (Lam.) Benth.			FO				
Lannea barteri (Oliv.) Engl.				FO,FM			FO
Macaranga occidentalis (Müll.Arg.) Müll.Arg.						B	
Maesa lanceolata Forssk.	yes			FM			
Memecylon sp.	yes				FO, FM		
Milicia excelsa (Welw.) C.C.Berg					B		
Neoboutonia melleri (Müll.Arg.) Prain			B		B		
Nuxia congesta R.Br. ex Fresen.	yes		O	O		O	O
Olea capensis L.	yes		O	O	O		O
Phyllanthus mannianus Müll.Arg.							FM
Podocarpus latifolius(Thunb.) R.Br. ex Mirb.	yes				O		
Polyscias fulva (Hiern) Harms			B				
Prunus africana (Hook.f.) Kalkman	yes	VU	B, FO, O	B, FO, O	FO	O	O
Psychotria sp.	yes		FM				FM
Psydrax dunlapii (Hutch. & Dalziel) Bridson	yes				O		
Rapanea melanophloeos (L.) Mez	yes				O		
Raphia sp.					B		
Raphia vinifera P.Beauv.					FO		
Rauvolfia vomitoria Afzel.	yes		FM, O				
Rothmannia hispida (K.Schum.) Fagerl.				B			
Rubiaceae indet	yes					B	
Schefflera mannii (Hook.f.) Harms	yes					O	O
Synsepalum stipulatum (Radlk.) Engl.	yes		O	FO			FO
Syzygium staudtii (Engl.) Mildbr.	yes			FM	B, FM	B	
*Terminalia glaucescens*Planch. ex Benth.			FM	B, FM	B, FM		FM
Terminalia laxiflora Engl.			FM				
Triumfetta tomentosa Bojer ex Bouton	yes			FO			
Vernonia blumeoides Hook.f.	yes		FO	FO			FM
Vitellaria paradoxa C.F.Gaertn.		VU		FM	FM		
Vitex doniana Sweet					B		FO, FM
Xymalos monospora (Harv.) Baill.	yes					O	
Yushania alpina (K.Schum.) W.C.L	yes				FO, O		
Zanthoxylum rubescens Planch. ex Hook.	yes		O				
barkelegi (Fulani)			FM				
jambarkeji (Fulani)					FM		
lamule (Banso)					B		
mbir (Banso)				B			
nchen (Oku)	yes				O		FO
pascaragi (liana, Fulani)	yes			FO	FO		
sem (Banso)					B		
siltaje (Fulani)				FM			

Table B2

Local names of the preferred plant species for different provisioning ecosystem services (medicine resources, firewood, construction materials, honey and fodder) mentioned in the previous table.

Scientific name	Oku	Banso	Fulani
Acacia kamerunensis Gand.			peluahi
Agarista salicifolia (Lam.) G.Don		mbaiti	
Albizia gummifera (J.F.Gmel.) C.A.Sm.	owun	tivun	
Alchornea cordiflora (Schumach. & Thonn.) Müll.Arg.			bambamihi
Allophylus bullatus Radlk.			guiehi/guiewal
Antidesma venosum E.Mey. ex Tul.			bolegigei
Baccharoides guineensis (Benth.) H.Rob.			ibielese
Bauhinia thonningii Schum.		turunian	barkehi
Beilschmiedia mannii (Meisn.)Benth. & Hook.f. ex B.D.Jacks.			konkoli
Bridelia ferruginea Benth.			bududi
Bridelia speciosa Müll.Arg.		kirum	
Carapa grandiflora Sprague	evun		gorogi
Cassipourea malosana (Baker) Alston	ebtum		
Clausena anisata (Willd.) Hook.f. ex Benth.	fii		balegi
Combretum spp.		fuenkir	
Cremaspora triflora (Thonn.) K.Schum.			buruhali
Crossopteryx febrifuga (Afzel. ex G.Don) Benth.			rimajogohi
Croton macrostachyus Hochst. ex Delile	abjam	kijam	njokolos
Cuviera sp.		mbashif	
Dombeya ledermannii Engl.		kibai	
Dracaena sp.		fungo	
Embelia mildbraedii Gilg & Schellenb.	ntoh		
Erica cf silvatica			keledi
Erica mannii (Hook.f.) Beentje			sokal
Ficus sur Forssk.			guelobahi
Ficus sp. 1	kevem		
Ficus sp. 2			ilmoadihi
Ficus thonningii Blume			biskegei
Globimetula oreophila (Hook.f.) Danser			sotore
Gnidia glauca (Fresen.) Gilg	nding	dren	borokonje
Gouania longispicata Engl.	nguf		
Harungana madagascariensis Lam. ex Poir.		tapipi	rugalhi
Hymenocardia acida Tul.		koko	yamasetoje
Hypericum lanceolatum Lam.	fembanlon		
Khaya anthotheca (Welw.) C.DC.		faa	kahi
Kigelia africana (Lam.) Benth.			dgilahi
Lannea barteri (Oliv.) Engl.			sakatahi
Macaranga occidentalis (Müll.Arg.) Müll.Arg.		pimfan	
Maesa lanceolata Forssk.			belahi jamhi
Memecylon sp.			kandihi
Milicia excelsa (Welw.) C.C.Berg		iroko*	
Neoboutonia melleri (Müll.Arg.) Prain		liv	
Nuxia congesta R.Br. ex Fresen.	fian		
Olea capensis L.	ewin		
Phyllanthus mannianus Müll.Arg.			dipruki
Podocarpus latifolius (Thunb.) R.Br. ex Mirb.	shia		
Polyscias fulva (Hiern) Harms		mofofengi	
Prunus africana (Hook.f.) Kalkman	ablah	kirah	kirah
Psychotria sp.			albarkahi
Psydrax dunlapii (Hutch. & Dalziel) Bridson	bamfon beseh		
Rapanea melanophloeos (L.) Mez	toko		
Raphia sp.		raphia*	
Raphia vinifera P.Beauv.			bahi, page
Rauvolfia vomitoria Afzel.	obtong		kapki, kaki
Rothmannia hispida (K.Schum.) Fagerl.		kisap	
Rubiaceae indet		timekan	
Schefflera mannii (Hook.f.) Harms	jiah		
Synsepalum stipulatum (Radlk.) Engl.	ieies		behiwal
Syzygium staudtii (Engl.) Mildbr.		djai	perki
*Terminalia glaucescens*Planch. ex Benth.		saranga	bodhi
Terminalia laxiflora Engl.			balehi nyamnyam
Triumfetta tomentosa Bojer ex Bouton			ngaluaje
Vernonia blumeoides Hook.f.			suaka
Vitellaria paradoxa C.F.Gaertn.			karehi
Vitex doniana Sweet		timbere	bumehi
Xymalos monospora (Harv.) Baill.	febei		
Yushania alpina (K.Schum.) W.C.L	bamboo*		kewe
Zanthoxylum rubescens Planch. ex Hook.	edjum		

*refers to names borrowed from English language. Note that Oku names have been documented in detail elsewhere (e.g. Cheek et al., 2000). In contrast, only some Fulani names are available from the literature, and sometimes the name reported elsewhere refers to a different species of the same genus in our study area. We were unable to find Banso names in the literature (apart from a short unpublished report). We report the spelling used by our native translator, but it is possible that this is not standardised.

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ecoser.2019.101000.

References

Abbot, J.I.O., Thomas, D.H.L., Gardener, A.A., Neba, S.E., Khen, M.W., 2001. Understanding the links between conservation and development in the Bamenda Highlands, Cameroon. World Develop. 29, 1115–1136.

Allendorf, T.D., Yang, J., 2013. The role of ecosystem services in park–people relationships: the case of Gaoligongshan Nature Reserve in southwest China. Biol. Conserv. 167, 187–193.

Altman, L.A., Low, S.M., 1992. Place Attachment. Plenum, New York.

Assogbadjo, A.E., Glèlè Kakaï, R., Vodouhê, F.G., Djagoun, C.A.M.S., Codjia, J.T.C., Sinsin, B., 2012. Biodiversity and socioeconomic factors supporting farmers' choice of wild edible trees in the agroforestry systems of Benin (West Africa). For. Pol. Econ. 14, 41–49.

Ayantunde, A.A., Briejer, M., Hiernaux, P., Udo, H.M.J., Tabo, R., 2008. Botanical knowledge and its differentiation by age, gender and ethnicity in southwestern Niger. Hum. Ecol. 36, 881–889.

Ayodele, M., Fajinmi, A., Dongkum, C., Shaw, A., Welburn, S., 2014. Pastoral livelihoods of the Fulani on the Jos Plateau of Nigeria. Pastoralism 4, 1–16.

Bayer, W., 1990. Use of native browse by Fulani cattle in central Nigeria. Agroforest. Syst. 12, 217–228.

Byg, A., Novo, P., Dinato, M., Moges, A., Tefera, T., Balana, B., Woldeamanuel, T., Back, H., 2017. Trees, soils and warthlogs – distribution of services and disservcies from reforestation areas in southern Ethiopia. For. Pol. Econ. 84, 112–119.

Cáceres, D.M., Tapella, E., Quétier, F., Díaz, S., 2015. The social value of biodiversity and ecosystem services from the perspectives of different social actors. Ecol. Soc. 20 (1), 62.

Cebrián-Piqueras, M.A., Karrasch, L., Kleyer, M., 2017. Coupling stakeholder assessments of ecosystem services with biophysical ecosystem properties reveals importance of social contexts. Ecosyst. Serv. 23, 108–115.

Chabrol, D., Mariani, M., Sautier, D., 2017. Establishing Geographical Indications without state involvement? Learning from case studies in Central and West Africa. World Dev. 98, 68–81.

Chan, K.M., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B.S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J., Woodside, U., 2012. Where are cultural and social in ecosystem services? A framework for constructive engagement. BioScience 62, 744–756.

Chaudhary, S., McGregor, A., Houston, D., Chettri, N., 2018. Environmental justice and ecosystem services: a disaggregated analysis of community access to forest benefits in Nepal. Ecosyst. Serv. 29, 99–115.

Cheek, M., Onana, J.-M., Pollard, B.J., 2000. The Plants of Mount Oku and the Ijim Ridge, Cameroon. RBG Kew.

Cruz-Garcia, G.S., Cubillos, M.V., Torres-Vitolas, C., Harvey, C.A., et al., 2019. He says, she says: ecosystem services and gender among indigenous communities in the Colombian Amazon. Ecosyst. Serv. 37, 100921.

Cundill, G., Bezerra, J.C., De Vos, A., Ntingana, N., 2017. Beyond benefit sharing: place attachment and the importance of access to protected areas for surrounding communities. Ecosyst. Serv. 28, 140–148.

Cuni-Sanchez, A., Pfeifer, M., Marchant, R., Burgess, N.D., 2016. Ethnic and locational differences in ecosystem service values: insights from the communities in forest islands in the desert. Ecosyst. Serv. 19, 42–50.

Cuni-Sanchez, A., Fandohan, B., Assogbadjo, A., Sinsin, B., 2012. A countrywide multiethnic assessment of local communities' perception of climate change in Benin (West Africa). Climate Dev. 4, 114–128.

Cuni-Sanchez, A., Omeny, P., Pfeifer, M., Olaka, L., Mamo, M.B., Marchant, R., Burgess, N.D., 2018. Climate change and pastoralists: perceptions and adaptation in montane Kenya. Climate Dev. https://doi.org/10.1080/17565529.2018.1454880.

Danver, S.L., 2015. Native Peoples of the World: An Encyclopaedia of Groups, Cultures and Contemporary Issues. Routledge, New York, USA.

Dave, R., Tompkins, E.L., Schreckenberg, K., 2017. Forest ecosystem services derived by smallholder farmers in north-western Madagascar: storm hazard mitigation and participation in forest management. For. Pol. Econ. 84, 72–82.

Dawson, N., Martin, A., 2015. Assessing the contribution of ecosystem services to human wellbeing: a disaggregated study in western Rwanda. Ecol. Econ. 117, 62–72.

Delbanco, A.S., Burgess, N.D., Cuni-Sanchez, A., 2017. Medicinal plant trade in northern Kenya: importance, uses and origin. Econ. Bot. 71, 13–31.

Doherty-Bone, T.M., Gvoždík, V., 2017. The Amphibians of Mount Oku, Cameroon: an updated species inventory and conservation review. ZooKeys 643, 109–139.

FAO, 2002. Case study of exemplary forest management in Central Africa: community forest management at the kilum-Ijim mountain forest region, Cameroon. Forest Management Working Papers, Working Paper FM/11. Forest Resources Development Service, Forest Resources Division. FAO, Rome.

Forboseh, P.F., Keming, E.C., Toh, C.L., Wutlof, I.N., 2003. Monitoring of Kilum-Ijim forest bird communities: initial findings. Bird Conserv. Int. 13, 255–271.

Gaoue, O.G., Ticktin, T., 2007. Patterns of harvesting foliage and bark from the multipurpose tree *Khaya senegalensis* in Benin: variation across ecological regions and its impacts on population structure. Biol. Conserv. 137, 424–436.

Guerbois, C., Fritz, H., 2017. Patterns and perceived sustainability of provisioning ecosystem services on the edge of a protected area in times of crisis. Ecosyst. Serv. 28, 196–206.

Gonwouo, L.N., LeBreton, M., Wild, C., Chirio, L., Ngassam, P., Tchamba, M.N., 2006. Geographic and ecological distribution of the endemic montane chameleons along the Cameroon mountain range. Salamandra 42, 213–230.

Hakizumwami, E., Fuchi, E., 2000. Laws and livelihoods: implementing the new forestry policy in Cameroon to promote conservation with development. IIED Promoting Partnerships: Managing Wildlife Resources in Central and West Africa. Evaluating Eden Series No. 4. London. International Institute for environment and Development, London, UK.

Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., et al., 2013. High-Resolution global maps of 21st-century forest cover change. Science 342, 850–853 Data available on-line from: http://earthenginepartners.appspot.com/science-2013-global-forest.

Hartter, J., Goldman, A., 2011. Local responses to a forest park in western Uganda: alternate narratives on fortress conservation. Oryx 45, 60–68.

Hawthorne, W., 1998. Khaya anthotheca. The IUCN Red List of Threatened Species 1998: e.T32235A9690061. https://doi.org/10.2305/IUCN.UK.1998.RLTS.T32235A9690061.en. Downloaded on 15 September 2018.

Heubach, K., Wittig, R., Nuppenau, E.-A., Hahn, K., 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural west African communities: a case study from northern Benin. Ecol. Econ. 70, 1991–2001.

Homewood, K., Kristjanson, P., Trench, P. (Eds.), 2009. Staying Maasai? Livelihoods, Conservation and Development in East African Rangelands. Springer Science & Business Media.

Houehanou, T.D., Assogbadjo, A.E., Kakaï, R.G., Houinato, M., Sinsin, B., 2011. Valuation of local preferred uses and traditional ecological knowledge in relation to three multipurpose tree species in Benin (West Africa). For. Pol. Econ. 13, 554–562.

Howe, C., Suich, H., Vira, B., Mace, G.M., 2014. Creating win-wins from trade-offs? Ecosystem services for human well-being: a meta-analysis of ecosystem service trade-offs and synergies in the real world. Global Environ. Chang. 28, 263–275.

Iniesta-Arandia, I., García-Llorente, M., Aguilera, P.A., Montes, C., Martín-López, B., 2014. Socio-cultural valuation of ecosystem services: uncovering the links between values, drivers of change and human well-being. Ecol. Econ. 108, 36–48.

Jaccard, P., 1901. Distribution de la flore alpine dans le bassin des Dranses et dans quelques régions voisines. Bulletin de la Société Vaudoise des Sciences Naturelles 37, 241–272.

Kari, S., Korhonen-Kurki, K., 2013. Framing local outcomes of biodiversity conservation through ecosystem services: a case study from Ranomafana. Madagascar. Ecosyst. Serv. 3, 32–39.

Kovács, E., Kelemen, E., Kaloczkai, A., Margoczi, K., Pataki, G., Gebert, J., Malovics, G., Balazs, B., Roboz, A., Kovacs, E.K., Mihok, B., 2015. Understanding the links between ecosystem service trade-offs and conflicts in protected areas. Ecosyst. Serv. 12, 117–127.

Lakerveld, R.P., Lele, S., Crane, T.A., Fortuin, K.P.J., Springate-Baginski, O., 2015. The social distribution of provisioning ecosystem services: evidence and insights from Odisha, India. Ecosyst. Serv. 14, 56–66.

Levinson, D., 1996. "Fulani". Encyclopaedia of World Cultures: Africa and the Middle East. Gale Group ISBN 978-0-8161-1808-3.

Lucena, R.F.P., Araújo, E.L., Albuquerque, U.P., 2007. Does the local availability of woody caatinga plants (Northeastern Brazil) explain their use value? Econ. Bot. 61, 347–361.

Maisels, F., Keming, E., Kemei, M., Toh, C., 2001. The extirpation of large mammals and implications for montane forest conservation: the case of the Kilum-Ijim Forest, North-west Province, Cameroon. Oryx 35, 322–331.

Martín-López, B., Iniesta-Arandia, I., García-Llorente, M., Palomo, I., Casado-Arzuaga, I., García del Amo, D., Gómez-Baggethun, E., Oteros-Rozas, E., Palacios-Agundez, I., Willarts, B., González, J.A., Santos-Martín, F., Onaindia, M., López-Santiago, C.A., Montes, C., 2012. Uncovering ecosystem services bundles through social preferences: experimental evidence from Spain. PLoS One 7, e38970.

Mbih, R.A., Driever, S.L., Ndzeidze, S.K., Mbuh, M.J., Bongadzem, C.S., Wirngo, H.M., 2018. Fulani pastoralists' transformation process: a sustainable development approach in the Western Highlands of Cameroon. In: Environment, Development and Sustainability: a Multidisciplinary Approach to the Theory and Practice of Sustainable Development. Springer, pp. 789–807.

Milcu, A.I., Hanspach, J., Abson, D., Fischer, J., 2013. Cultural ecosystem services: a literature review and prospects for future research. Ecol. Soc. 18, 44.

Millennium Ecosystem Assessment, 2005. Millennium Ecosystem Assessment. Ecosystems and Human Well-Being: Synthesis. Island Press, Washington, DC.

Momo-Solefack, M.C., Chabrerie, O., Gallet-Moron, E., Nkongmeneck, B.-A., Leumbe, O.N., Decocq, G., 2012. Analyse de la dynamique de déforestation par télédétection couplée aux modèles d'équations structurales: Exemple de la forêt néphéliphile du mont Oku (Cameroun). Acta Bot. Gall. 159, 451–466.

Momo-Solefack, M.C., Kamga, Y.B., Nguetsop, V.F., Tiokeng, B., Avana-Tientcheu, M.L., Kemeuze, V.A., 2017. Diversité floristique et variation altitudinale de la structure des formations *Gnidia glauca* (Fresen) Gilg. dans les forêts communautaires de Kilum-Ijim (nord-ouest Cameroun). Eur. Sci. J. 13, 1857–7881.

Moritz, M., 2010. Crop-livestock interactions in agricultural and pastoral systems of West Africa. Agri. Human Values 27, 119–128.

Mutoko, M., Hrin, L., Shisanya, C.A., 2015. Tropical forest conservation versus conversion trade-offs: insights from analysis of ecosystem services provided by Kakamega rainforest in Kenya. Ecosyst. Serv. 14, 1–11.
Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B., Kent, J., 2000. Biodiversity hotspots for conservation priorities. Nature 403, 853–858.
Neba, N.E., 2006. Degradation of useful plants in Oku tropical montane cloud forest, Cameroon. Int. J. Biodivers. Sci. Manage. 2, 73–86.
Nfi, J., 2014. Intercommunity relations and the politics of identity in the Nso Chiefdom, Bamenda Grassfields, Cameroon. J. Res. Peace Gender Dev. 4, 63–69.
Nfi, A.N., Mbanya, J.N., Ndi, C., Kameni, A., Vabi, M., Pingpoh, D., Yonkeu, S., Moussa, C., 2001. Ethnoveterinary medicine in the northern provinces of Cameroon. Veterinary Res. Commun. 25, 71–76.
Njabo, K., Languy, M., 2000. Surveys of Selected Montane and Submontane Areas of the Bamenda Highlands. Important Bird Areas Project. Birdlife International.
Onana, J.M., Cheek, M., 2011. The Red Data Book of the Flowering Plants of Cameroon. Royal Botanic Garden, Kew, United Kingdom.
Orenstein, D.E., Groner, E., 2014. In the eye of the stakeholder: changes in perceptions of ecosystem services across an international border. Ecosyst. Serv. 8, 185–196.
Pelican, M., 2015. Masks and Staffs: Identity Politics in the Cameroon Grassfields. Berghahn, New York, pp. 258.
Poppy, G.M., Chiotha, S., Eigenbrod, F., Harvey, C.A., Honzák, M., Hudson, M.D., Jarvis, A., Madise, N.J., Schreckenberg, K., Shackleton, C.M., Villa, F., Dawson, T.P., 2014. Food security in a perfect storm: using the ecosystem services framework to increase understanding. Philos. T. R. Soc. 369.
Raymond, C.M., Brown, G., Weber, D., 2010. The measurement of place attachment: personal, community and environmental connections. J. Environ. Psychol. 30, 422–434.
Rodriguez, J.P., Beard Jr., T.D., Bennett, E.M., Cumming, G.S., Cork, S.J., Agard, J., Dobson, A.P., Peterson, G.D., 2006. Trade-offs across space, time, and ecosystem services. Ecol. Soc. 11, 28.
Sainge M.N., 2016. Patterns of distribution and endemism of plants in the Cameroon Mountains: A case study of protected areas in Cameroon, Rumpi Hills Forest Reserve (RHFR) and the Kimbi Fungom National Park (KFNP), Final report to Rufford Small Grant Foundation, Tropical Plant Exploration Group (TroPEG), Buea, Cameroon, p. 171.
Sainge, M.N., 2017. Vegetation Patterns in Tropical Forests of the Rumpi Hills and Kimbi-Fungom National Park, Cameroon, West-Central Africa. Cape Peninsula University of Technology, Cape Town, South Africa, pp. 210 PhD Thesis.
Sainge M.N., Cooper J.C., 2014. Reconnaissance survey of the biodiversity of the Cameroon Mountains, Cameroon Mountains Research Project. Tropical Plant Exploration Group (TroPEG), Buea, Mundemba, Cameroon, p. 55.
Sagie, H., Morris, A., Rofe, Y., Orestein, D.E., Groner, E., 2013. Cross-cultural perceptions of ecosystem services: a social inquiry on both sides of the Israelie-Jordanian border of the Southern Arava Valley Desert. J. Arid Environ. 97, 1–11.
Scholte, S.S.K., Teeffelen, A.J.A., Verburg, 2015. Integrating socio-cultural perspectives into ecosystem service valuation: a review of concepts and methods. Ecol. Econ. 114, 67–78.
Sodhi, N.S., Lee, T.M., Sekercioglu, C.H., Webb, E.L., Prawiradilaga, D.M., Lohman, D.J., Pierce, N.E., Diesmos, A.C., Rao, M., Ehrlich, P.R., 2010. Local people value environmental services provided by forested parks. Biodivers. Conserv. 19, 1175–1188.
Sop, T.K., Oldeland, J., Bognounou, F., Schmiedel, U., Thiombiano, A., 2012. Ethnobotanical knowledge and valuation of woody plants species: a comparative analysis of three ethnic groups from the sub-Sahel of Burkina Faso. Environ. Dev. Sustain 14, 627–649.
Stewart, K., 2009. Effect of bark harvest and other human activities on populations of the African cherry (*Prunus africana*) on Mount Oku, Cameroon. For. Ecol. Manage. 258, 1121–1128.
Sunjo, T.E., 2015. Double decades of existence of the Kilum-Ijim community forest in Cameroon: what conservation lessons? J. Int. Wildlife Law Policy 18, 223–243.
Tilahun, M., Damnyag, L., Anglaaere, L.C.N., 2016. The Ankasa forest conservation area of Ghana: ecosystem service values and on-site REDD+ opportunity cost. For. Pol. Econ. 73, 168–176.
Thomas, E., Vanderbroek, I., Van Damme, P., 2009. Valuation of forests and plant species in Indigenous Territory and National Park Isiboro-Sécure, Bolivia. Econ. Bot. 63, 229–241.
Turkelboom, F., Leone, M., Jacobs, S., Kelemen, E., et al., 2018. When we cannot have it all: ecosystem services trade-offs in the context of spatial planning. Ecosyst. Serv. 29, 566–578.
United Nations Environment Programme (UNEP), 2012. The Role and Contribution of Montane Forests and Related Ecosystem Services to the Kenyan Economy. UNON/Publishing Services Section/Nairobi, Kenya.
Vivien, J., Fare, J.J., 1985. Arbres des forêts denses d'Afrique Centrale. Ministère de la Coopération. Agence de Coopération Culturelle et Technique, Paris, France, pp. 565.
Ward, C., Stringer, L., Holmes, G., 2018. Changing governance, changing inequalities: protected area co-management and access to forest ecosystem service: a Madagascar case study. Ecosyst. Serv. 30, 137–148.
Willemen, L., Drakou, E.G., Dunbar, M.B., Mayaux, P., Egoh, B.N., 2013. Safeguarding ecosystem services and livelihoods: understanding the impact of conservation strategies on benefit flows to society. Ecosyst. Serv. 4, 95–103.
Williams, D.R., Patterson, M.E., Roggenbuck, J.W., Watson, A.E., 1992. Beyond the commodity metaphor: examining emotional and symbolic attachment to place. Leisure Sci. 14, 29–46.
Worku, A., Pretzsch, J., Kassa, H., Auch, E., 2014. The significance of dry forest income for livelihood resilience: the case of the pastoralists and agro-pastoralists in the drylands of southeastern Ethiopia. For. Pol. Econ. 41, 51–59.
Yang, E.Y.C., Passarelli, S., Lovell, R.J., Ringler, C., 2018. Gendered perspectives of ecosystem services: a systematic review. Ecosyst. Serv. 31, 58–67.