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Making hard choices: balancing indigenous communities livelihood and Cross River gorilla conservation in the Lebialem–Mone Forest landscape, Cameroon

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Abstract This study evaluates the choices indigenous communities living adjacent areas of conservation interest face when the resources are under conservation consideration. These resources have been their main source of livelihood for decades, and it is often a hard decision to accept access restriction to what has previously been a common pool resource. Using the proposed Tofalla Hill Wildlife Sanctuary (THWS) in Southwest Cameroon, we evaluate in what ways the conservation of the critically endangered Cross River gorilla (*Gorilla gorilla diehli*) has affected local livelihood and vice versa. Data for this study were collected through questionnaires, interviews, focus group discussions and field observations. Descriptive and inferential statistical methods were used to analyse and explain quantitative data while content analysis was used to analysed qualitative data. The results revealed that strong ancestral and cultural attachment of indigenous communities to forest and forest resources makes it difficult for them to welcome activities that will restrict access to forest resources. Further analysis also shows that forest-dependent activities had an added value to local livelihood when combine with off forest activities. The added value that off forest activities contribute to local livelihood presents an opportunity for conservationists to design innovative solutions that balance conservation objectives and the livelihood aspiration of the communities. This could be a reasonable entry point to address existing negative local perception on gorilla conservation approaches in the THWS.

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1 Introduction

Forest resources could satisfy multiple demands for goods and services both for present and future generations if sustainably managed (Guariguata et al. 2010). However, conflicts of exploiting the common good arise among users. Across the tropics, integrated approaches to natural forest management remain elusive and conflicts of use are widespread especially in Central Africa (Mugabe et al. 2010). The contribution of conservation objectives to local livelihood needs will depend on how well programmes are embedded in sociocultural context, politics, resource needs and landscape changes (Dressler et al. 2010). In addition, settings for human-environment interactions are complex because they consist of diverse ecological systems as well as human engineered systems (Ostrom and Cox 2010). Thus, for natural resource management to be sustainable, there is a need to consider fully it ecological, financial and social impacts (Wollenberg and Ingles 1998). Adding to this, natural resource management requires concerted effort at multiple levels and local actors in the protection of ecological resources, both in the short term and long term (Agrawal et al. 2008; Mugabe et al. 2010). The use of a participatory approach in forest resource management can contribute to sustainable management (Nyaupane and Thapa 2006). To reduce biodiversity and forest loss, natural resources deserve integrated management approaches that will take into consideration environmental and social justice in implementation (Büscher and Dressler 2007; Dressler et al. 2010). To ensure this, a "people-cantered approached is needed" (Yanggen 2010; Ashley and Hussein 2000). This approach recognises that conservation efforts will only be successful if local people find viable alternative to current natural resource use pattern that degrade the environment (De Herdt et al. 2004; Boersema et al. 2009). Failure to meet sustainable natural resource management is often attributed to inadequate human sociopolitical and socioeconomic institutions that shape the human behaviours in an ecosystem (Büscher and Dressler 2007).

With 22 million hectares of forest, Cameroon has the second largest forest estate among African countries after the Democratic Republic of Congo (Djeumo 2001; Jum et al. 2007; Ndjom and Nemb 2008; Sayer et al. 1992; Yufanyi Movuh 2012). Unfortunately, throughout Cameroon these valuable resources are being lost at an unprecedented rate, estimated to be at about 220,000 ha per year (Epule et al. 2011). Cameroon's forests are at the centre of the demographic challenges and issues related to food security in Cameroon (Fraticelli 2012; Willcox and Nambu 2007). Forestry operations in Cameroon employ between 45,000 and 70,000 people and account for more than 10 % of the country's GDP (Alemagi 2011). Apart from the economic importance of forest at the national level, it also has a variety of other complementary functions: for the people living adjacent, it plays a social, cultural and an economic role (Djeumo 2001; Etiendem et al. 2011). Local people are often highly dependent on forest natural resources to meet both development and basic livelihood needs (Nkemnyi et al. 2011).

The Lebialem–Mone Forest landscape (LMFL), Southwest Cameroon, is make up of six forest blocks, one of which has been proposed for inclusion in a Wildlife Sanctuary—Tofala Hill Wildlife Sanctuary (THWS). The proposed statuary is recognised as a hotspot of wildlife species from recent assessments (Nkemnyi et al. 2012). This study evaluates the choices indigenous communities living adjacent the THWS are opened to given that the

proposed sanctuary has been their main source of livelihood for decades. The critically endangered Cross River gorilla (*Gorilla gorilla diehli*) and the endangered Nigeria–Cameroon chimpanzee (*Pan troglodytes ellioti*) live sympatrically in this forest site, in addition to other wildlife species (Appendix 1). This makes the area an important sit for biodiversity conservation. The CRG has a total population of <300 individuals living in the wild (Mittermeier et al. 2010; Oates et al. 2007; Bergl 2006). There are 19 village communities living adjacent this forest site with an estimated total population of about 35,000 inhabitants (Ajabji et al. 2008). In most of these communities, poverty is severe and most households live below 1 $/day (Nkembi et al. 2008). Poaching and nontimber forest products (NTFPs) harvesting constitute significant proportions of household annual income (Etiendem et al. 2011; Nkemnyi et al. 2011; Wright and Priston 2010). In this line, different forest resource users and interests should be made explicit in order to work towards co-operative solutions in relation to local development (McShane et al. 2011; Ribot 2003). It is also argued that developing an active negotiation framework that will work towards sustainable forest resource utilisation is imperative for conservation actions to succeed (Bastiaensen et al. 2002; Berkes et al. 2009). The aim of this study was to understand indigenous community dependence on forest resources for livelihood and how the CRG conservation project in the THWS has influence livelihood activities since it initiation in 2003.

2 Materials and methods

2.1 Study area and location

The study was conducted in the adjacent communities of the THWS, located in the LMFL, Southwest Region of Cameroon. The THWS is located specifically between 5°37′ and 5°42′ latitude and 9°53′–9°58′ longitude. The area is characterised by an undulated landscape from Bechati community (260 m) in the lower altitudes to Fossimondi community (2,400 m) in the higher altitudes, with a chain of peaks notably the Tofala Hill (866 m) from which the proposed sanctuary takes its name. This area is situated within the Wabane Sub-Division in the North and Alou Sub-Division in the south, in Lebialem Division and adjacent to the Forest Management Unit 11-002 and the Mone Forest Reserve (Fig. 1).

The LMFL covers a surface area of approximately 800 km^2 with the THWS making up approximately 15 km^2 of the 800 km^2. Apart from it biodiversity importance, the area is also an important watershed with many fast flowing streams that jointly form the Manyu River and run to the Cross River in the Nigerian–Cameroonian boarders. The forest landscape is within the equatorial rainforest zone characterised by two major seasons: the dry season (November–February) and the wet season (March–October). The annual rainfall recorded in the area is as high as 3,500 mm (Gartlan 1989). The climate is characterised at high altitudes by low temperatures, low rainfalls, high relative humidity and mountains often covered in clouds. Daily temperatures vary between 20 and 35 °C, with the peak in March. It varies from the lowland rainforest, through submontane to montane forest with the lowland and submontane forests dominating. The variation in altitude (260–2,400 m above sea level) accounts for the variation in forest types, which in turn accounts for the huge floristic variety of the area.

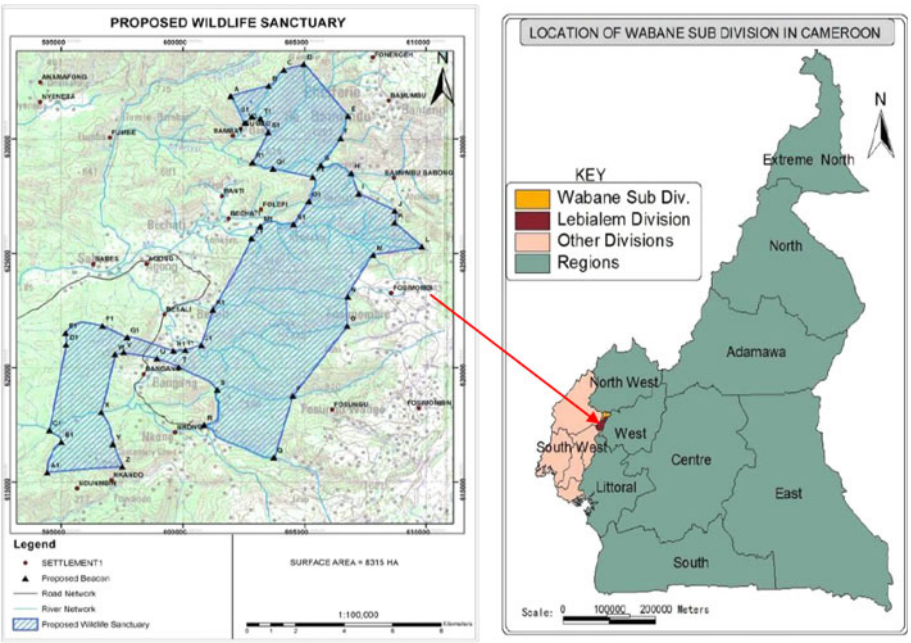

Fig. 1 Location of the proposed THWS in Cameroon (*source*: ERuDeF and ACF 2007)

2.2 Data collection approach and instruments

2.2.1 Primary sources of data

2.2.1.1 Training of field assistants and pilot study Prior to the field data collection, a 1-day training workshop was organised to acquaint the field assistants with the content and purpose of the study. This gave them a good knowledge of the study and allowed them to collect other information not stated in the questionnaires that could be important for the study. This session also educated the field assistants on techniques they could apply in the field to avoid respondent bias during questionnaires administration. Following this, a pilot survey was conducted to test the consistency of the questionnaires by administering 8 questionnaires 1 week before the study started. This helped to correct inconsistency and to eliminate words that might have lead to misunderstanding of the questions by respondents. These answered questionnaires were not used in the final analysis.

2.2.1.2 Data collection techniques Data were collected from July to September 2010 from three main communities (Bechati, Fossimondi and Besali) from the study area. Data collection made use of two sampling methods: purposive sampling and simple random sampling. Purposive sampling was used to allocate communities which will take part in the study (Tongco 2007). The three communities were selected from the 10 communities in the study area for this study. These communities have been assessed to be among the communities having the greatest human influence on the forest resources of the study area due to their relative high population size, household size and proximity to forest resources (Ajabji et al. 2008). A systematic random sampling approach (Helmut 2008) was used to select participants for the questionnaire survey. Questionnaires administration was

supplemented by focus group discussions, interviews, field observations and a video documentary. A planning meeting was organised in each of the target communities prior to the beginning of the study to explain the aims of the study. This facilitated the clarity and purpose of the study and encouraged respondents to open up during questionnaire administration.

The questionnaire survey was conducted by face-to-face interview in which the interviewer filled in the questionnaire based on the respondent answer. We sampled 112 households from the 3 selected communities, selected randomly from 1,220 households, making a sample size of 9.2 %. The study population was further divided into 3 subpopulations based on the three different communities selected. We sampled 9.2 % of households from each subpopulation. Three focus group discussions were held, one in each community. Focal group discussions involved representatives from all age groups. The discussions enabled the researchers to get a general view of all livelihood needs and conservation values in the respective communities. The discussion sessions empowered participants to reveal self-directed debates about their knowledge practices and values (Kvale and Brinkmann 2009). The focus group discussion was chaired by the principal investigator while two field assistants took minutes of the discussion. The discussion sessions were also recorded using a tape recorder which facilitated the analysis of unclear notes taking during the discussion. The maximum numbers of participants per session were limited to 12 to reduce rowdiness during discussions sessions. In addition to focus group discussions, semi-structured interviews were used to obtain information from conservation promoters and the local government officials on their perceptions and views on livelihood needs and conservation strategies in the study area. Comparing different perceptions among stakeholders gave a good opportunity to evaluate and discuss the subject under study.

Field observations were also an integral part of the study. Field observations enabled the researcher to attain an entirely familiar presence in the lives of the people being studied and to collect information without affecting feelings, attitudes and behaviour (Kvale and Brinkmann 2009). Important insights into the everyday life of the communities' members relevant to the research were recorded. The researchers participated in local people activities by assisting in their daily tasks. This enabled the collection of valuable data through "participant observation" that otherwise would be impossible to collect. These activities included participation in community meetings and campaigns, accompanying some community members to their farms and job sites and taking part in socialisation activities. A video documentary was used to document the major community livelihood activities, opinions on conservation values and livelihood needs and conservation promoters' views on conservation strategies and livelihood needs. This instrument was introduced to capture more participation from the untargeted population. Important community figures like chiefs who will normally not give in for questionnaires survey place often high value on video interviews and easily give in for participation. They usually consider participating in questionnaire survey as an under-privileged activity which should be done by the commons and not by highly respected traditional officials ("notables") like them. They will often refer the interviewer to their subordinates if asked to participate in questionnaire survey (pers. obs.).

2.2.2 Data sorting and analysis

Preliminary data sorting for questionnaires were done during and immediately after the field studies. All validated questionnaires were entered into spreadsheets for later qualitatively and quantitative analysis. Data obtained from interviews, focus group discussions,

field observations and the video documentary were analysed using content analysis. The content of the data was evaluated based on the objective of the study and relevant information incorporated in the results obtained during questionnaire survey. Questionnaire data analysis was carried out using Excel spreadsheets and SPSS software package (version 16.0) for descriptive statistics, correlations, chi-square test (χ^2) and regression. Descriptive statistics was used to explore the data to reveal the demography characteristics of respondents and other relevant data. This also helped to produce charts (bar and pie) explaining this data. Pearson correlation analysis helped to establish the relationship between dependent variables, while χ^2 was used to established relationship between independent and dependent variables. We used linear multiple regression analysis to determine the contribution of forest resources to household income. We estimated the contribution of forest resources to household income by using three main variables: labour force (the number of individuals in a household that are within the working age—above 10 and below 80—with regard to the custom of the studied population), forest-dependent activities (all activities that directly use forest resources) and educational level (the qualification attained in formal education). Based on the setting of the communities (culture and household structure) and the socioeconomic activities of the study population, these variables among others were considered the most important variables that may determine community member dependence on forest resources. These variables were shortlisted after a statistical check for multicollinearity. A check for multicollinearity enabled us to choose the best predictors and to reduce redundancy. Expert consultation and reviews contributed in data analysis and in drawing conclusions and recommendations for the study.

3 Results

We found 86 % of livelihood activity to be forest-dependent. These activities include hunting and trapping, subsistence farming, cocoa and palm plantations, fuel wood collection, small scale lodging, NTFP harvesting (other products not listed separately here as forest activities) and forest products harvested for traditional medicine. Most households depend directly on forest resources and forest land for livelihood with very few alternatives available. All forest-dependent livelihood activities (farming, hunting, harvesting of NTFPs among others) were evaluated inferentially to have a negative impact on gorillas. Livelihood activities not directly dependent on the forest resources included the small businesses ("petit business"), teaching and other jobs offered by the public and private sector. However, those involved in the later sectors still depend on forest resource in one way or the other.

3.1 Forest resources consumption and Cross River gorilla conservation

All large mammals with the THWS forest range are hunted either for household consumption or for the bush meat market with the exception of the CRG and the Nigerian–Cameroon chimpanzee (great apes) as we understood during our household survey. However, in a cross-interview on the same subject with the local nongovernmental organisation (NGO)—the Environment and Rural Development Foundation (ERUDeF) promoting conservation effort in this forest area—they attest that the hunting of great apes has not stop. Notwithstanding, the number of cases reported for hunting has subsided by approximately 70 % over the past 10 years. Our analysis of farming activities showed that

farming takes up a great proportion of the forest yearly as shifting cultivation (slash and burn) is the principal method of farming. Farm products included cash crops and noncash crops. Cash crops (Cocoa and palm oil production) contribute considerably to household income while noncash crops (cassava, plantain, banana, cocoyam, maize and groundnut) are mainly for household consumption and only excess sold to contribute to household income. Subsistence farming is the most practised form of farming. Hunting is a common practice in the area and provides fast and ready income for household support. It is generally practised by men with the help of dogs (hunting dogs). Hunting is increasingly promoted by bush meat buyers who make advanced payment to hunters for the delivery of the product. Although the CRG hunting pressure is lower, human activities in the forest area may significantly influence their distribution. The method of farming also constitutes a big threat to the CRG habitat and survival. We recorded 5 cases were great apes have been a major threat (destroying crops) on farm lands situated within the THWS. This causes retaliations from farm owners bringing about human–wildlife conflict. NTFP harvesting contributes to raising household income and is practised by both men and women. *Gnetum africanum* (Eru) is the most common and widely harvested NTFP. It is usually transported to urban centres and exported to neighbouring countries like Gabon and Equatorial Guinea for consumption as a vegetable food. The availability of *G. africanum* in the forest has dropped drastically compared to previous years due to unsustainable harvesting. As shown by our field analysis, most NTFPs are seasonal and do not provide a steady means of income to household. Harvesting of forest plants (slashing of tree barks and collection of herbs) for traditional medicine remains a small but significant proportion of forest product usage which is very important to the local community members. Our field report also shows that up to 80 % of the local community members rely mostly on traditional medicine for health care as alternative health facilities are limited and when available, underequipped and unaffordable. The local believes on the healing power of traditional medicine couple to it affordability also contribute to the fact that local usage is high.

3.2 Measuring the dependence of respondents to forest activities

To measure the dependence of respondents to forest activities, we asked the question "Which livelihood activities contribute the most to their livelihood needs?" The forest-dependent activities were ranked into subsistence farming (43 %), Cocoa and palm oil production (17 %–cash crops), hunting and trapping (17 %), NTFPs harvesting (5.4%), forest products collected for traditional medicine (5.4 %) (Appendix 2). There was no significant difference in the main livelihood generating activities across the three studied communities ($\chi^2 = 27.131$, $p \geq 0.05$, $df = 14$).

The average household annual income was estimated in francs CFA and converted to Euros (€) for easy referencing. Individual annual income was estimated by asking the respondent how much they earn averagely in a week from all income generating activities. Most respondents could track back their weekly income for more than 5 weeks behind. The ease in tracking weekly income was because most of their goods are usually sold in their local market which comes up after every 8 calendar days. Thus, they could easily recall how much money the made from their sales. Average weekly income calculated and extrapolated to annual income taking into consideration off and peak seasons of all forest-dependent activities. The following results were obtained from our linear regression analysis:

$$I_a = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$$
$$(I_a = 0.646 + 0.422X_1 + 0.158X_2 + 0.279X_3 + e)$$

where I_a household annual income, B_0 Y intercept, X_1 labour force, X_2 forest-dependent activity, X_3 educational level, e random error term.

The regression had a good fit ($R^2_{\text{adj}} = 58$ %), and the overall relationship was significant ($F_{3,\ 108} = 14.614$, $p < 0.05$). Household annual income was highly related to labour force, forest-dependent activities and educational level of the respondent ($r = 0.57$). The summary of the results of the analysis are presented in Appendix 3.

The results of the analysis showed that the average household annual income will increase by a factor of 0.422€ with an increase in labour force by 1 unit, by 0.115€ with an increase in forest livelihood activities by 1 and by 0.279€ with an increase in educational level by 1 unit. Labour force had the highest predictor impact on individual annual income. There was a strong positive Pearson correlation ($r = 0.90$) between household size and the labour force of a household. The number of individuals who have reached working age in a household determines the labour force for that household. The average household size recorded was 10, and the household size among the three studied communities was quite even ($\chi^2 = 29.106$, $p \geq 0.05$, $df = 28$).

3.3 Local believes and perceptions affecting the Cross River gorilla conservation project

The CRG conservation initiative is confronted with challenges from the local community which need a special attention addressing them. Farmers believe that farming deep in the forest (primary forest) will produce high yields compared to secondary forest because the land in the primary forest is more fertile compared to land in the secondary forest. Community members also believe the forest is where their ancestors live and they are not required to live far from their ancestors. On the GRG, they believed it possesses extraordinary powers and that it act totems for herbalists in particular in collecting medicinal plants from the forest. Do to this believe, some community members do not hunt nor eat the CRG. However, despite the belief and values placed on the CRG, the studied population does not strongly uphold conservation initiatives. They attest that they do not feel committed to the conservation project because the project does not take into consideration their views. In a focal group discussion with community members, one of them noted "We have no option to say no or yes to conservation activities in our communities because we cannot stand the government neither can we stand the NGO promoting the activities". Most local community members do not feel committed to the project because they were not fully involved in the development of the conservation strategy in use. In a questionnaire survey, all respondents said they did not take part in the development of the conservation strategy. As of this study, 79 % of the studied population feels conservation strategies are solely driven by the local NGO concerned for its own benefits and interests. The close collaboration the local NGO establishes with the local community heads (Chiefs) in order to have access to their forest area raise community members perceptions that they also partake in benefit of the conservation objectives. Eleven per cent of the studied population hinted that there is a possibility that chiefs and conservation promoters share benefits generated through conservation. In regard to this ideology, most local community members have continued hunting and farming in the gorilla habitat despite the present

conservation strategies to reduce human encroachment since they do not find any incentive to support conservation.

4 Discussions

4.1 Understanding forest resources usage in the THWS

Subsistence farming (43 %) is a threat to primary forest and subsequently to the CRG habitat because of the farming method (slash and burn and bush fallowing). Fallowed land is re-used only after about 5 years and most often not more than twice in 10 years. This is because the farming methods encourage the washing away of the top soil by runoff which renders the soil more and more infertile as it is re-used. This pushes subsistence farmers to move to relatively fertile virgin forest to open up new farming land. This has been one of their main reasons against conservation actions as they consider that the conservation of the CRG will take away "their land", and their children will have no farming land in future. Cash crops (palm oil and cocoa production) also require large portions of forest land for establishment, and this is also resulting in a constant shrinking of forest habitat in this area. Harvesting of NTFPs (5 %) and collection of plants (5 %) for traditional medicine also contribute to forest resources degradation as sustainable harvesting practices are not commonly used during the harvest. Collection of NTFPs opens up new tracks in the forest area. Many forest tracks may affect the moving pattern of the CRG and provide more routes for other forest activities like hunting (Blom et al. 2004). Hunting (17 %) constitutes a major threat to animal species abundance and to the biodiversity of the forest area. Many hunters confirmed during the focal group discussions, and the video interviews that the abundance and availability of animals has drastically dropped during the past 10 years. They attest that it now takes at least three hunting days to gather the quantity of bush meat that could previously be obtained in a 1-day hunting trip. "We practiced hunting mainly to generate income for our household, it is one of the most affordable ways we can easily raise money to solve our problems", they said. Money generated through hunting enable hunters to pay their children school fees and take care of their families. Hunters also confirmed during focal group discussions that they are aware of the fact that hunting threatens the existence of the CRG. However, they cannot stop hunting because it is one of the fastest means they can raise income as there is a market for bush meat. In an interview (video) with a bush meat vendor in one of the local restaurants in the study area, she said, "bush meat is highly demanded by all of my customers, most especially by visitors. They are ready to pay any price for a plate of food prepared with bush meat. They do not like to eat fish". In this line, we can conclude that bush meat hunters and vendors have not yet find enough incentive to enable give off hunting/trading because of the benefit attached. On the other hand, small scale logging was not listed among the forest activities considered to be important to household livelihood. This was explained by the fact that local/traditional laws do not permit individuals to directly explore timber for marketing. Community members have access to log assigned tree stand to enable them construct houses and furniture for noncommercial purpose. However, this permission to log must be obtained from the local traditional council headed by the chief after a request is being made. Though local community members do not considered small scale logging as an important livelihood activity, we evaluated it to have a negative impact on the CRG and it habitat. This is because local community heads are gradually taking the advantage of power to

commercialise timber logging in their various communities given that they are not often accountable to community members.

4.2 Analysing household income from the forest

We understood from the regression analysis that the labour force of a household and the educational level of the respondent significantly ($p < 0.05$) contribute to household income. Livelihood activities in the study area are manual labour intensive. An increase in household size contributes to household income in the sense that there are more people available to work and the labour force increases. Also given that farming land by tradition is owned by the entire community under the custody of the chief and not by individual, except in very few cases, the amount of land cultivated by a household largely depends on the labour they can put in. Educational level has the second highest predictor impact on household annual income. Individuals who have achieved a higher qualification in education can offer skilled services to community members and visitors. This includes teaching in local schools (mostly managed by Parent Teachers Associations—PTA) and representing community interest when needed. They most often also act as field guides or assistants to visiting researchers playing a role of a translators (from the local dialect to English or Pidgin English). These activities generate higher income compared to forest-dependent activities given that they earn averagely €5/day acting as field assistants or guides. Forest educational activities such as tour guides are absent at the community level. This activity is mainly carry out by the local NGO piloting conservation activities in the forest area. Community members most of the times only act as porters, camp guides and also as field assistants during surveys and CRG tracking. In addition, we found out that, when forest-dependent activities are combined with off forest activities, the combine impact to household income was more significant. This argument presents an entry point for conservation practitioners to come in and lobby to win conservation mines. In this line, they must be able to design strategies that provide incentives and capacity that will improve community livelihood. Furthermore, it will also be an added advantage for conservation strategies to explore the ways in which local institutions can mediate relationships between people, natural resources and society (Cleaver 2001, 2002; De Koning and Cleaver 2012). This requires the understanding of institutions as key mechanisms which channel societal resources into outcomes by refurbishing and re-arranging of existing relationships and classifications.

4.3 Bridging the gaps between local community livelihood needs and Cross River gorilla conservation

The reliance of indigenous communities on forest resources for livelihood makes it very difficult for them to give off forest resources in the name of biodiversity conservation. They evaluate the opportunity cost as not worth it. Local community members see conservation as a hindrance to development, most especially when they are restricted from exploring resources from the conserved area (Dondeyne et al. 2012). Notwithstanding, practitioners have always found ways to move on with conservation objectives with or without indigenous community concerns. The increasing recognition of community participation in conservation projects often remains in theory with little or no implementation in the field (Büscher and Dietz 2005; Dressler et al. 2010). In a video interview with some local community members on their perceptions on the CRG conservation project, one of them responded "when the project started, we were happy because they promised us 'a lot

of development' but up till now we have not seen any change. They come every day and give new promises. We are tired of promises, if they want us to continue supporting conservation, they should do something". Many respondents also stress the fact that they have been better off without conservation activities and that forest resources have serve their ancestors for many years. Thus, they see no need why they should be restricted from using what (forest resources) their ancestors left for them. In the word of a community head, he said, "our lives are in the forest, we have our ancestors there, if they want us to give off the forest for conservation, they should be ready to pay 'the price'. Moreover, we cannot leave the forest because we cannot transfer our ancestors to a different land or forest. We will always need the forest despite any circumstances". In line with this, our analysis from interviews with the local NGO staff promoting the conservation of the CRG in the THWS shows that, though they have been able to provide some level of support to a few communities targeting mostly key hunters and farmers, they are aware that this support has not impacting the people way of live and thus do not represent enough incentives to take them out of the forest. The failure of the support to meets its objectives was attributed to limited funds to an extent and largely due to poor pre-assessments of the selected and target support coupled with poor monitoring and evaluation after implementation. Community members were not also considered as major stakeholders in the planning phase.

5 Conclusion and recommendations

5.1 Conclusion

Environmental sustainability and hence biodiversity conservation remains one of the top discussions on contemporary world's agenda on sustainable development. It is clear that in as much as we need to conserve the environment for its value; we also need to make sure that we maintain a balance between conservation values and human livelihood needs. When these align it is a matter of communication, when they are in conflict mitigation must be sought. For conservation initiatives to succeed, the livelihood of the population depending on the resources to be conserved needs to be put as one of the main priority objectives of the conservation strategy. Community perceptions remain a major issue to be dealt with to ensure sustainable conservation initiatives. These perceptions need to be studied and their impact on conservation values assessed in order to adapt these perceptions to target conservation objectives positively. Conservation promoters need to carefully draw conservation strategies to suit and target the community's values and expectations. The gap between community expectation and conservation promoters' objectives can be bridged by making the community members to be major stakeholders of the project from the onset of the project. This will play a major role in influence their choice on whether or not they should buy conservation objectives. Engaging local community members will enable them feel more secure and helpful during the implementation of the project. Local communities' involvement and capability in the CRG conservation project is still lacking. This has been one of the main drawbacks to sustainable conservation actions. Drawing up sustainable conservation actions requires a conceptual framework which enables the understanding of the linkages between threats and actions. For this study, Fig. 2 below present a conceptual model which summarises the livelihood threats to conservation, why livelihood may be a threat to conservation, what this study proposed should be done, constrains involved and recommendation to meet sustainable CRG conservation in the Bechati forest area.

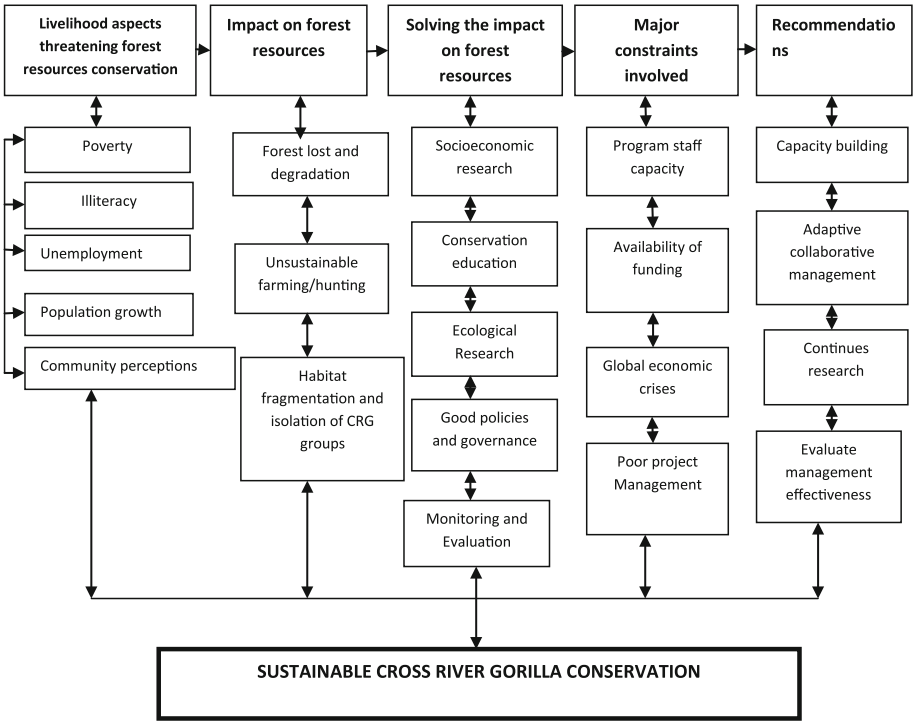

Fig. 2 Proposed conceptual model for harmonising conservation and livelihood (*source*: this study)

5.2 Recommendations

From this study and based on Fig. 2, the following recommendations can be elaborated:

1. Forest management in the study area should be re-addressed in a bottom-up management approach where community members are empowered to play leading roles in managing the forest resources, with only a supervision role from conservation practitioners. Improving local involvement will increase the level of trust and confidence of the communities involved on conservation actions. This can also serve as initial incentives to encourage local participation in conservation.
2. In order to reduce the dependence of forest adjacent communities on forest resources, incentives are needed to subsidise the local communities' need for forest resources. The creation and development of alternative livelihood support activities and micro financial institution to support these activities are imperative. These will include the encouragement and support of intensive organic farming of vegetable, legume and live stocks to replace NTFPs and bush meat harvesting. The design and implementation should properly consider local needs, community perceptions and enable local community participation at all stages. Cultural and ethical issues that may arise alongside effective monitoring and evaluation are also needed for successful implementation.
3. Further studies are needed to explore how community needs for the forest, and conservation objectives can collaborate sustainably with the integration of all stakeholders. Investigating how poverty alleviation objectives can be incorporated

into conservation programs will also enhance the implementation of the project. Research is also needed on the development of innovations, and models that will assist in the effective management of conservation actions. The development of actions that will help to mitigate forest fragmentation and to promote the conservation of the CRG in a milieu that will give room for sustainable conservation activities is also needed.

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Appendix 1

See Table 1.

Table 1 List of large mammals' species hunted in the Bechati forest area

S. no.	Local name	Common name
		Class A species[a]
1	Njimageng	Gorilla
2	Bokob/Boa	Chimpanzee
3	Bush baby	Potto
4	Water beef	Water chevrotain
5	Shumbo	Drill
6	Flying squirrel	Flying squirrel
		Class B species[b]
7	Bush pig	African wild pig
8	Red deer	Red duiker
9	Mboma	African python
10	Bush cow	Buffalo
		Class C species[c]
11	Frutambo	Blue duiker
12	White-nose monkey	Putty-nose monkey
13	Red ear monkey	Red ear monkey
14	Bush dog	Pale Fox
15	Catta beef	Pangolin
16	Rat mole	Rat mole
17	Chukuchuku beef	Brush-tail porcupine
18	Cutting grass	Cane rat
19	Bush fowls	Francolin
20	Short snake	Viper
21	Black snake	Black mamba
22	Stone beef	Rock hyrax
23	Bush cat	African civet
24	Ngombe	Iguana
25	Birds	Birds (many common species)
26	White monkey	–

Table 1 continued

S. no.	Local name	Common name
26	Antelope	–
27	Sleeping deer	Bay duiker
38	Horn bird	Horn bird
29	Tortoise	Tortoise
30	White-chest monkey	Mona Monkey
31	Ngoh beef	–

Source: Field survey, 2010

[a] Class A species are animals totally protected and may on no occasion be killed except as provided for in sections 82 and 83 of the Cameroon wildlife law

[b] Class B species are animals protected and may be hunted, captured or killed subject to the grant of a hunting permit

[c] Class C species are animals partially protected, and their capture or killing is regulated by conditions laid down by order of the Minister in charge of wildlife

Appendix 2

See Table 2.

Table 2 Percentage distribution of the most important livelihood activities to respondents

Activity	Frequency	%
Subsistence farming	48	42.9
Hunting and trapping	19	17.0
Palm oil production	19	17.0
Small business	5	4.5
Traditional medicine	6	5.4
NTFP harvesting	6	5.4
Teaching	7	6.2
Public sector	2	1.8
Total	112	100.0

Appendix 3

See Table 3.

Table 3 Linear regression model indicating factors contributing to household income

Model	Unstandardised coefficients		Standardised coefficients	Sig.
	B	SE	β	
(Constant)	0.646	0.308		0.038
Labour force of a household	0.138	0.027	0.422	0.000
Educational level	0.365	0.115	0.279	0.002
Main income source	0.065	0.036	0.158	0.076

Source: SPSS version 16: calculated from field survey data, 2010

References

Agrawal, A., Chhatre, A., & Hardin, R. (2008). Changing governance of the world's forests. *Science, 320*(5882), 1460–1462. doi:10.1126/science.1155369.

Ajabji, S., Tendem, P., & Nkembi, L. (2008). *A socio-economic report for the Bechati–Fossimondi–Besali forest adjacent villages*. Buea, Cameroon: Environment and Rural Development Foundation.

Alemagi, D. (2011). Sustainable development in Cameroon's forestry sector: Progress, challenges, and strategies for improvement. *African Journal of Environmental Science and Technology, 5*(2), 65–72.

Ashley, C., & Hussein, K. (2000). *Developing methodologies for livelihood impact assessment: Experience of the African Wildlife Foundation in East Africa*. London, UK: ODI.

Bastiaensen, J., De Herdt, T., & Vaessen, J. (2002). *Poverty, institutions and interventions. A framework for an institutional analysis of poverty and local anti-poverty interventions*. Antwerp: Institute of Development Policy and Management.

Bergl, R. A. (2006). *Conservation biology of the Cross River gorilla* (*Gorilla gorilla diehli*). The City University of New York. Retrieved from http://data.cameroun-foret.com/system/files/11_03_380.pdf.

Berkes, F., Kofinas, G. P., & Chapin, F. S. (2009). Conservation, community, and livelihoods: Sustaining, renewing, and adapting cultural connections to the land. In C. Folke, G. P. Kofinas, & F. S. Chapin III (Eds.), *Principles of ecosystem stewardship* (Vol. 2, pp. 129–147). New York, NY: Springer. doi:10.1007/978-0-387-73033-2.

Blom, A., Van Zalinge, R., Mbea, E., Heitkönig, I. M. A., & Prins, H. H. T. (2004). Human impact on wildlife populations within a protected Central African forest. *African Journal of Ecology, 42*(1), 23–31.

Boersema, J., Blowers, A., & Adrians, M. (2009). Biodiversity loss, poverty and climate change: Can one solution fit all? *Journal of Integrative Environmental Sciences, 6*(4), 239–245.

Büscher, B., & Dietz, T. (2005). Conjunctions of governance: The State and the Conservation-development Nexus in Southern Africa. *Transdisciplinary Environmental Studies, 4*(2).

Büscher, B., & Dressler, W. (2007). Linking neoprotectionism and environmental governance: On the rapidly increasing tensions between actors in the environment-development nexus. *Conservation and Society, 5*(4), 586–611.

Cleaver, F. (2001). Institutional bricolage, conflict and cooperation in Usangu, Tanzania. *Institute of Development Studies Bulletin, 32*(4), 26–35. doi:10.1111/j.1759-5436.2001.mp32004004.x.

Cleaver, F. (2002). Reinventing institutions: Bricolage and the social embeddedness of natural resource management. *The European Journal of Development Reinventing Institutions, 14*(2), 11–30.

De Herdt, T., Bastiaensen, J., & D'Exelle, B. (2004). *Towards a local socio-institutional analysis of anti-poverty interventions: A critical review of methods and researchers*. Antwerp: Institute of Development Policy and Management.

De Koning, J., & Cleaver, F. (2012). Institutional bricolage in community forestry: An agenda for future research. In B. Arts, S. V. Bommel, M. Ros-Tonen, & G. Verschoor (Eds.), *Forest-people interfaces: Understanding community forestry and bio-cultural diversity* (p. 292). Wageningen, The Netherlands: Wageningen Academic Publishers.

Djeumo, A. (2001). *The development of community forests in Cameroon: Origins, current situation and constraints*. London, UK: Rural Development Forestry Network.

Dondeyne, S., Kaarhus, R., & Allison, G. (2012). Nature conservation, rural development and ecotourism in central Mozambique: Which space do local community get? In I. Convery, G. Corsane, & P. Davis (Eds.), *Making sense of place: Multidisciplinary perspectives* (pp. 291–301). Woodbridge: The Boydell Press.

Dressler, W., Büscher, B., Schoon, M., Brockington, D., Hayes, T., Kull, C. A., et al. (2010). From hope to crisis and back again? A critical history of the global CBNRM narrative. *Environmental Conservation, 37*(01), 5–15. doi:10.1017/S0376892910000044.

Epule, E. T., Peng, C., Lepage, L., & Chen, Z. (2011). Forest loss triggers in Cameroon: A quantitative assessment using multiple linear regression approach. *Journal of Geography and Geology, 3*(1), 30–41. doi:10.5539/jgg.v3n1p30.

Etiendem, D. N., Hens, L., & Pereboom, Z. (2011). Traditional knowledge systems and the conservation of Cross River gorillas: A case study of Bechati, Fossimondi, Besali, Cameroon. *Ecology and Society*, *16*(3). doi:10.5751/ES-04182-160322.

Fraticelli, M. (2012). *Problématique générale*: *les enjeux de la gouvernance des forêts*. Resource document. aGter, http://www.agter.asso.fr/spip.php?page=article&id_article=755&lang=fr. Accessed January 10, 2012.

Gartlan, S. (1989). *La conservation des ecosystèmes foréstier du Cameroun*. Gland, Suisse: IUCN.

Guariguata, M. R., García-Fernández, C., Sheil, D., Nasi, R., Herrero-Jáuregui, C., Cronkleton, P., et al. (2010). Compatibility of timber and non-timber forest product management in natural tropical forests: Perspectives, challenges, and opportunities. *Forest Ecology and Management, 259*(3), 237–245. doi:10.1016/j.foreco.2009.11.013.

Helmut, F. V. E. (2008). *Statistics for terrified biologists*. Oxford, England: Blackwell.

Jum, C., Diaw, M. C., Nguiebouri, J., & Zoa, M. (2007). Enhancing sustainable forest management in Cameroon through a model forest based approach. *International Forestry Review, 9*(4), 892–900.

Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing* (p. 233). Los Angeles, London, New Delhi, Singapore: Sage.

McShane, T. O., Hirsch, P. D., Trung, T. C., Songorwa, A. N., Kinzig, A., Monteferri, B., et al. (2011). Hard choices: Making trade-offs between biodiversity conservation and human well-being. *Biological Conservation, 144*(3), 966–972. doi:10.1016/j.biocon.2010.04.038.

Mittermeier, R. A., Wallis, J., Rylands, A. B., Ganzhorn, J. U., Oates, J. F., Williamson, E. A., et al. (2010). Primates in peril: The world's 25 most endangered primates 2008–2010. *Africa, 24*, 1–57.

Mugabe, P. H., Ochola, W. O., & Yemshaw, Y. (2010). Research in natural resource management. In W. O. Ochola, P. C. Sanginga, & I. Bekalo (Eds.), *Managing natural resources for development in Africa: A resource book* (p. 571). Nairobi, Kenya: International Institute of Rural Reconstruction.

Ndjom, M. N., & Nemb, P. (2008). Forestry and criteria of sustainability: The case of Cameroon. *Journal of Sustainable Development in Africa, 10*(3), 70–87.

Nkembi, L., Nkemnyi, M. F., & Nkemanteh, A. E. (2008). *The status and distribution of Cross River gorillas in the Lebialem–Mone Forest landscape, SW Cameroon*. Buea, Cameroon: Environment and Rural Development Foundation.

Nkemnyi, F. M., Koedam, N., & Rik, D. V. (2011). *Livelihood and conservation: Reconciling community livelihood needs and conservation strategies in the Bechati Forest area, Western Cameroon*. Saarbrucken, Germany: Lambert Academic.

Nkemnyi, M. F., Nkembi, L., Nkemanteh, A. E., & Nku, E. M. (2012). The Cross River gorilla and large mammals species diversity in the in the. *Journal of Biodiversity and Ecological Sciences, 2*(1), 73–79.

Nyaupane, G. P., & Thapa, B. (2006). Perceptions of environmental impacts of tourism: A case study at ACAP, Nepal. *The International Journal of Sustainable Development and World Ecology, 13*, 51–61.

Oates, J. F., Sunderland-Groves, J., Bergl, R., Dunn, A., Nicholas, A., Takang, E., et al. (2007). *Regional action plan for the conservation of the Cross River gorilla* (*Gorilla gorilla diehli*). Arlington, VA, USA: IUCN/SSC Primate Specialist Group and Conservation International. http://www.primate-sg.org/action.plans.htm (accessed June 10, 2011).

Ostrom, E., & Cox, M. (2010). Moving beyond panaceas: A multi-tiered diagnostic approach for social-ecological analysis. *Environmental Conservation, 37*(4), 451–463.

Ribot, J. C. (2003). Democratic decentralisation of natural resources: Institutional choice and discretionary power transfers in Sub-Saharan Africa. *Public Administration and Development, 23*(1), 53–65. doi:10.1002/pad.259.

Sayer, J. A., Harcourt, C. S., & Mark, N. C. (1992). The conservation atlas of tropical forests Africa. *IUCN, 1992*, 110–118.

Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research and Applications, 5*, 147–158.

Willcox, A., & Nambu, D. (2007). Wildlife hunting practices and bushmeat dynamics of the Banyangi and Mbo people of Southwestern Cameroon. *Biological Conservation, 134*(2), 251–261. doi:10.1016/j.biocon.2006.08.016.

Wollenberg, E., & Ingles, A. (Eds.). (1998). *Incomes from the forest: Method for the development and conservation of forest products for local communities. Forestry* (p. 227). Bogor, Indonesia: Center for International Forest Research.

Wright, J., & Priston, N. (2010). Hunting and trapping in Lebialem Division, Cameroon: Bushmeat harvesting practices and human reliance. *Endangered Species Research, 11*, 1–12. doi:10.3354/esr00244.

Yanggen, D. (2010). The role of alternative livelihood in achieving a people-centered approach to conservation: Lesson learned from the CARPE Program. In D. Yanggen, K. Angu, & N. Tchamou (Eds.), *Landscape-scale conservation in the Congo Basin: Lessons learned from the Central Africa regional program for the environment (CARPE)*. Gland, Switzerland: IUCN.

Yufanyi Movuh, M. C. (2012). The Colonial heritage and post-Colonial influence, entanglements and implications of the concept of community forestry by the example of Cameroon. *Forest Policy and Economics, 15*, 70–77. doi:10.1016/j.forpol.2011.05.004.