https://dx.doi.org/10.22161/ijfaf.2.1.2 *ISSN: 2456-8791*

Participatory mapping as a tool to promote participation of local communities in forest resources management in Nguti Sub-Division, Cameroon

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Abstract— *This study was carried out with the aim to contribute to the sustainable management of natural resources through the production of participative maps within forest communities in the Nguti subdivision. Specifically this was to illustrate the existing occupation and traditional tenure of forest lands and identify where conflicts of use or rights already exist or could arise both for national government planning and private investors. Data was collected through focus group discussions, household interview and field data collection with the local population through the use of GPS tablets. Results show that 90.7% of the population have no idea on this participative mapping process; however, 35.19% of the population are very interested in this mapping process as it could serve as a tool to enhance land security while 28% of respondents think it could serve as a tool for boundary clarification. Also 18% consider participative mapping an interesting tool to get good knowledge of an area and plan land use. However, forest is principally used here for farming, hunting and gathering with an average household farm size of 0.35ha per year with just 30% of the non-Timber forest products in this area being exploited. The study also revealed that, conflicts of use and right exist due to government affectations, unclear boundaries and the creation of chiefdoms. Participative mapping has proven to be the better tool for decision making as other tools such as satellite images have caused overlaps in state affectations.*

Keywords— Cameroon, Communities, Forest resources, Participatory Mapping.

I. INTRODUCTION

Forest and tree-based agricultural systems contribute directly or indirectly to the livelihood of an estimates on billion people globally (Sunderland et al., 2013). Cameroon forests are used as economic resources to produce subsistence and industrial forest products (Eba'a Atyi et al., 2013). In Cameroon, forest ecosystem goods and services provide security portfolios for over 80% of the local populations. It is therefore highly crucial for poverty reduction and significantly contributes to national development (Nkem, 2010). The success and sustainability of forest management cannot be achieved without the participation of the population in the forest management process. The poor conservation outcomes that followed decades of intrusive resource management strategies and planned development have forced policy makers and scholars to reconsider the role of community in resource use and conservation (Arun & Clark, 1999).

One of 1994 Cameroon's forest and wildlife law concerns has been the involvement of the local communities to in the forest management to enable them to have a fair and equitable share of the proceeds from exploitation of forest resources (Temgoua et al., 2010). However, despite the idea of community participation in the management of forest is gaining popularity, much is not done in the field. Forest communities are largely invisible on official maps of the Congo Basin and have no formal rights to land. These land areas have been allocated to logging companies or designated as strict conservation areas (RFUK, 2014). In the Congo Basin, there are actually many threats such as the expansion of agro-industries, infrastructure development which are increasing pressure on forests, biodiversity, land and livelihoods (Same & Geenen, 2015; Joshua & Palkovizt, 2016). A key example is in the Nguti Sub-division in the South West region of Cameroon where over seven forest affectations (the Bayang-mbo Sanctuary, proposed Nkwende hills, a mine exploration, a council forest, Sithe Global Sustainable Oil Limited (SGSOC-Herakles), two community forests) cover more than 80% of its territory (AJESH, 2014). In november 2013, 19 843 ha of forest has been attributed to SGSOC for palm oil by the government in Nguti sub-division (Same & Geenen, 2015). If this expansion may, in theory, be synonymous to opportunities for the local economy, it can also endanger traditional lifestyles, local

https://dx.doi.org/10.22161/ijfaf.2.1.2 *ISSN: 2456-8791*

environment and the global climate (Greenpeace, 2013). All these affectations in the Nguti Sub-division create problems like the shortage of land for the population to carry out its principal activities of livelihood such as agriculture, the limited availability of natural resources to the community due to increasing population and limited access and conflicts between villages (Eyan, 2016).

Cameroon is currently experiencing a historical moment marked by the simultaneous brainstorming and launching of projects for the reform of key legislative texts governing the management of spaces and main resources of the country i.e. the Forestry Law, Land Law, Mining Law and Environmental Law are cases in point under review (CED, 2014). This unprecedented reform agenda provides an opportunity to harmonize these texts and is likely to provide the opportunity to enhance the effectiveness of the management of its natural resources and the implication of local community.

The past twenty years have witnessed an explosion of participatory mapping initiatives throughout the world, in both developing and developed countries (IFAD, 2009) Participatory mapping is the bottom-up approach that allows the masses to create maps for all, in contrast to the traditional top-down approach, relying on those with the power and resources to create maps that will benefit the masses either directly or indirectly (Warner, 2015). Maps created by local communities represent the place in which they live, showing those elements that communities themselves perceive as important such as customary land boundaries, traditional natural resource management practices and sacred areas (Corbett & Keller, 2006). Participatory mapping can be used to manage or avoid conflicts between a community and outsiders and to address internal conflicts (IFAD, 2009). Based on the above situations, the present research attempts to examine how participative mapping could act as a tool to secure and defend the rights of forest dwellers on the management of natural resources within the Nguti Sub-division. Specifically the study objective is to illustrate the existing occupation and traditional tenure of forest lands and identify where conflicts of use or rights already exist or could arise both for national government planning and private investors.

II. MATERIAL ANDS METHODS

2.1 Study area

Nguti subdivision is found in Kupe-Muanenguba Division of the Southwest Region of Cameroon (Fig. 1). Nguti sub-division is within the equatorial rain forest with a climate which is characterized by two distinct seasons; the rainy and the dry seasons. The dry season runs from October or November to March. The rainy season begins from March or April and ends in September or October. Topographically, the land is generally flat and raised 400m above sea level with gentle and steep hills dotted within the thick humid forest in the sub-division. It is host to several forest reserves including Bayang-Mbo and the Nguti Council Forest with timber resources, wildlife and medicinal plants. However, the upper Mbo and Nkongho mbo is dominated by a very hilly topography with very steep slopes that does not permit the exploitation of its forest. The area is primarily under the thick, humid equatorial rain forest. Three vegetation types can be identified. The evergreen forest that has seen little exploitation is immense, luxuriant and has a continuous canopy of leaves. This is home to several tree and animal species. There is a secondary type forest that has appeared as a result of human activity. Though of limited surface area there is grassland at the eastern outposts of the municipality (Nguti Council, 2009). The subdivision is endowed with valuable forest resources including Timber, Non-Timber Forest Products like Eru *Gnetum sp.*, *Ricinodendron heudelotii*, *Irvingia gabonensis*.

2.2 **Data collection and Analysis**

This area covers 54 villages divided into 8 clans. Three (03) of these clans (upper balong, lower Mbo and Nkongho mbo) were selected for this research due to their proximity to several affected zones and the inaccessibility to or inadequate use of natural resources in these areas. The number of villages per clans were chosen depending on the total number of villages for a clan. These villages were selected using the purposive sampling (Parton, 2000). This was to ease harmonization of the maps that will be produced per village. The sampling unit was households meanwhile a parent is interviewed principally the male or female. Yet the latter must be an indigene of the village haven stayed in the village for more than 10 years. This was to increase viability on information collected concerning land tenure system and land use over time. A total number of 125 households have been selected.

Data was collected using two approaches: the participative rural appraisal method with the establishment of participative maps and questionnaires and focus group discussions for socio-economic data from the local population. Focus group discussions and questionnaire interviews were used to the perception of the population on the mapping process, natural resources use and traditional tenure of forest in this areas. The Supporting local Communities in mapping traditional areas methodology was used for the participatory mapping process to get knowledge on the existing occupation of land and where conflicts of use or rights exist or could arise that could be useful both for national government planning and private investors. This method involved an Information meeting, Ground map

https://dx.doi.org/10.22161/ijfaf.2.1.2 *ISSN: 2456-8791*

elaboration, Training of local cartographers, Field data collection and observation, Data treatment and a validation process through which the population confirms the maps and stays with a copy.

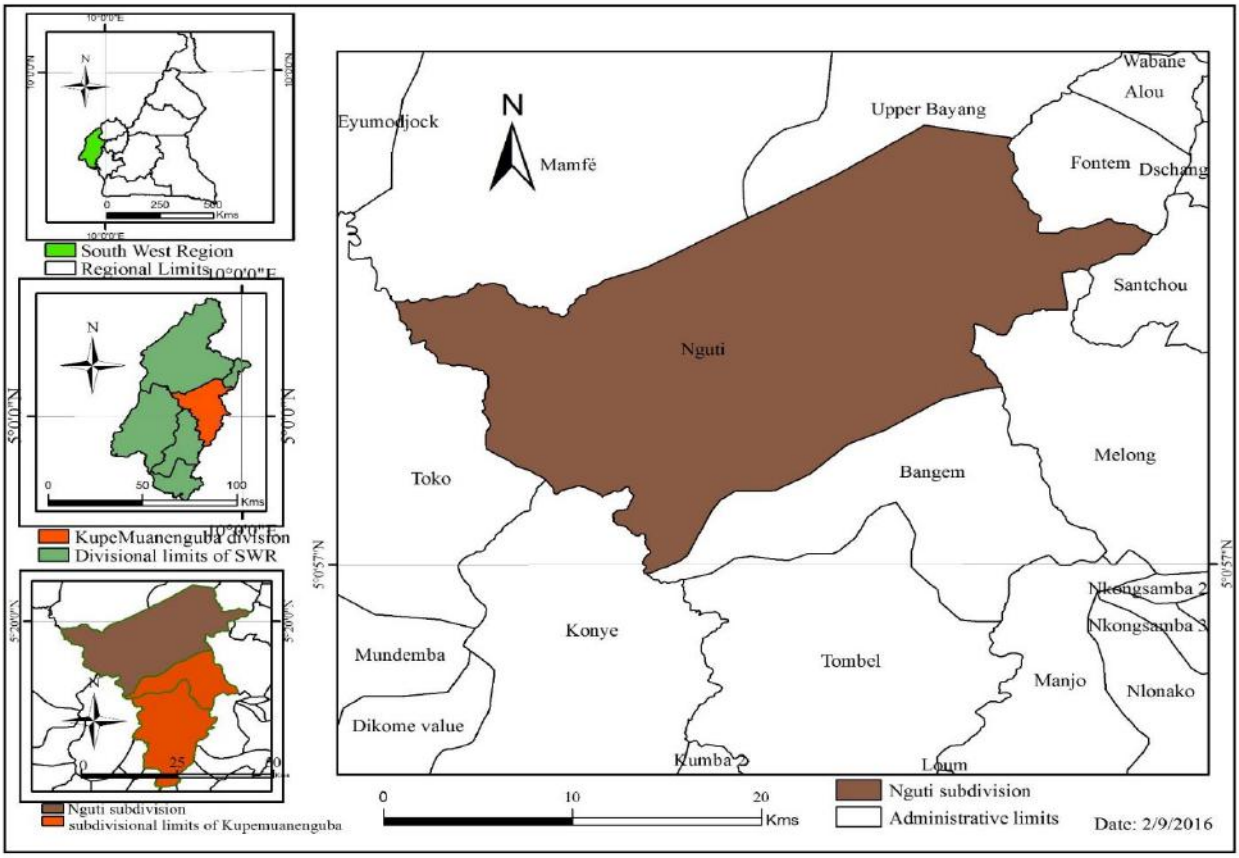

Fig. 1: Administrative location of the Nguti Sub-division

Two sets of data were analyzed in order to attain all expected results. These included data collected through the use of questionnaire, discussion guide and that collected on the field with the use of GPS tablets.

Data from questionnaires were coded and incorporated into the EXCEL 2013 software and then imported into the SPSS 12.0 software. Data from the GPS tablets was analyzed in the computer with the use of the QGIS 2.2.1 and arc-GIS Software to produce land use maps of the sampled villages showing areas of livelihood activities and important natural sites within each community.

III. RESULTS AND DISCUSSION

3.1 Perception of the population on the mapping process

Community knowledge and participation in participatory mapping was investigated to determine the level of knowledge and participation in similar processes. 90.7% of respondents had no idea on participative mapping while 9.3% confirmed having heard about the process from some radio stations present at the launching of the participative mapping project. The latter have an idea on the project but had never participated in any related process in the past. 100% of respondents saw this process of participative mapping as acceptable. However, the 100% acceptability of the project by the population came from different interests as can be seen in figure 2.

Fig. 2 shows that majority of the population are interested in this project with reasons that it could serve as a tool to secure their land (35.19%). This could be as a result of the fact that the main challenge of the local communities in the study area is assess to land title and land ownership. Most of the households interviewed live far below the national average income range (Nguti Council, 2009). As such they cannot afford or access land titles through the complicated and expensive channel put in place by the state. They therefore consider land security as a major challenge for which they need solutions. Another 27.78% are of the impression that participative mapping will help them in boundary clarification. This also confirms a study by Kyem (2005) were participative maps were used in conflicts management in Ghana. This is because several cases of conflicts of rights on land principally as a result of unclear boundaries do exist. This therefore forces each community to clear several small portions of the forest in order to secure lands. This could be a cause for great deforestation in the area. 100% of village Chiefs however had interest on land security. On the other hand, just

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1.85% are interested in it acting as tool to limit future disputes. Most of the later came from a few educated persons from the communities. Another 1.85% had no interest; with believe that it could turn out to be like every other project which has never benefited them.

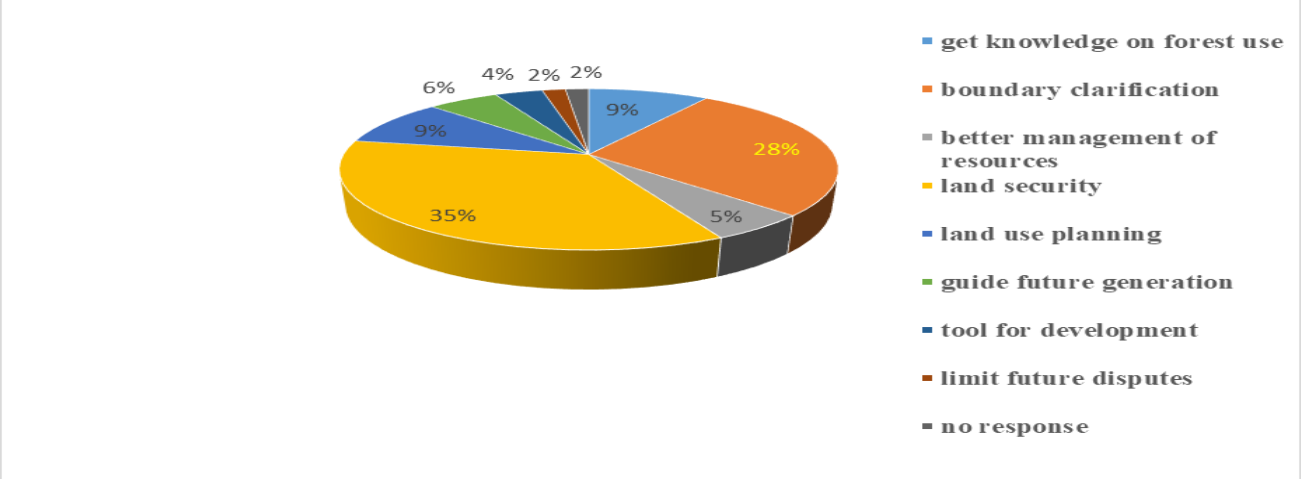

Fig. 2: Reasons for Community Interest in Participatory mapping

3.2 Forest usage in Nguti Sub-division

From the participative maps established with communities (Fig. 3), the Bayang-Mbo Sanctuary, the Nguti Council forest and SG-SOC are all affectations found or touching the clans under study. The Bayang-Mbo Sanctuary covering over 40% of the Nguti sub-division, cuts across the lower mbo clan occupying about 60% of its low land area living the population with a dominant of hilly topography that does not favour livelihood activities. The Nguti council forest under classification covers over 50% of the customary land of the directly impacted communities used for their livelihood. This decision is being taken however without considering the livelihood means of the population (subsistence agriculture and hunting). This is true because, from the participative map produced most of the hunting activities (source of protein and income) and gathering by the population is done within this portion of the forest. Also, the distance of the forest limit with the nearest farms within these communities, does not take into consideration farm expansion over time by the local dwellers.

With this form of land occupation, the population is left with little or no farming space or for expansion of existing farms. This therefore does not tie with the 2010–2020 Cameroon's Growth and Employment Strategic plan which has as objective to increase outputs and land surface areas by approximately 30% to ensure food security and strengthen growth by facilitating access to farmland for the establishment of medium and large farms (with particular emphasis on large-scale rice cultivation).

3.3 Land use by the population

Within this area, customary land ownership is classified into either family land or community land. Family heads control and distribute family land, while local leaders (chiefs) are administrators of community land. Family lands can either be borrowed or inherited (inheritance is transferable). Ancestors of these families cultivated forest land to gain right on customary land. Community land is sold, leased or allocated by traditional authorities. It can also be given to an indigene with a limit on the surface area in case a family land is exhausted.

Land is principally used here for farming, hunting and gathering of non-timber forest products (NTFPs). Fig. 4 gives a view of land use by the Mbo people. Agriculture is a major activity for over 55.6% of the population, 35.2% do both hunting and farming. However, hunting is and has always been a life style of the people.

Fig. 4 implies that 40.8% of the population interviewed are involved in hunting. It can also be noticed that besides farming and hunting, teaching is the only official activity for which the population is engaged in that has not a direct link with natural resources. Every one however is involved in the collection of NTFPs but not as a principal activity. There is therefore the need to diversify their economic activity to limit influence on biodiversity and natural resources.

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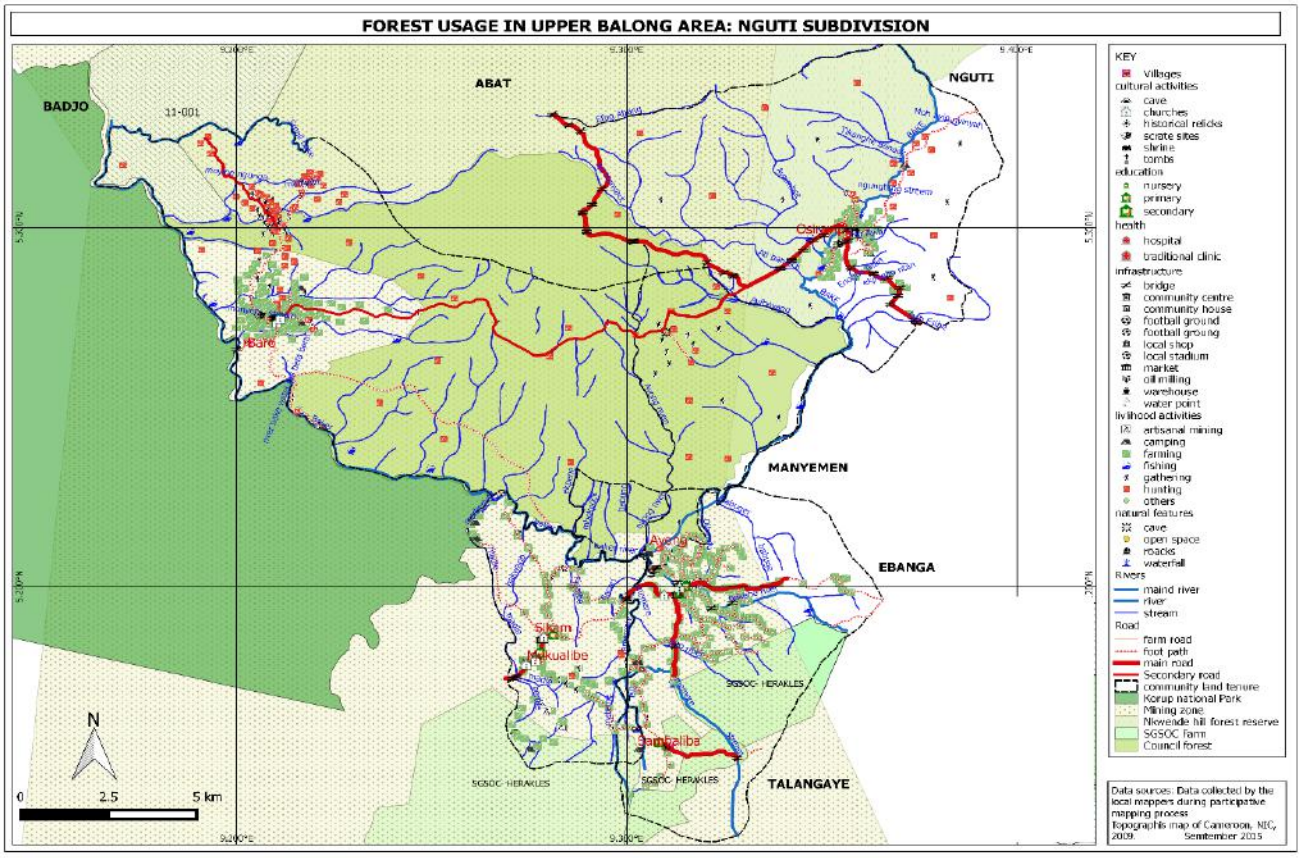

Fig.3: Forest usage and stakes in upper Balong

Fig. 4: Principal occupation of respondents

Also, it is noticed that over 60% of villages in the Mbo (Kamelumpe, Ehuyampe, Ekwenzo, Tabonkwa and Mbetta) live in an area with so many hills of steep and rough slopes. This can be seen from the difference in farm land distribution in the different villages. Areas with level landscape have an almost uniform and dispersed farm distribution unlike the former where most farm lands are found along foot paths linking the villages and more abundantly around households.

Farming is done around households while hunting and gathering is further where forest has not yet been cleared. The principal means of livelihood in this area is farming and hunting. For more than 50 years that these people have been practicing agriculture though subsistence, just about 25% or less of their customary land has been used so far for farming. However, due to land insecurity of indigenous populations following the Cameroon land law of 1974, traditional authorities in Upper Balong have been very much involved in selling out their lands to outsiders. It is observed that almost if not all of agricultural plantations found here are owned by outsiders.

With the principal farming system here being slash and burn, there will be a great destruction of the forest resources which will have a negative impact on the

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climate and also on wildlife resources. Further analysis proved that, diversifying the occupation of local population can reduce pressure on the forest for unsustainable agriculture and hunting which most households are involved. It was noticed that most households (50%) with farming as a principal livelihood activity have their farm sizes ranging from 5-9ha, those who do both farming and hunting (47.4%) have farm sizes between 3-7ha for most of them, while most hunters and those of other occupation (60%) have farms of between 1-3ha. In the Upper Balong clan, the topography of the area is level with surrounding forest, rich in wildlife which favors hunting. However, with the opening of secondary roads used by timber exploiters, the population had been encouraged to embark in agriculture due to easy access to the market. Nevertheless, this might no longer be the case as the Nguti council forest under creation covers more than 50% of the customary land its surrounding villages in this clan. This land is normally used for farm extension by the population. This therefore sends the population back to intense hunting.

3.4 Forest usage for gathering of non-timber forest products

Non-timber forest products (NTFP) could save this forest from degradation of its resources caused by subsistence farming and hunting. NTFPs is known to be a major source of income to many forest communities in Cameroon. Diverse NTFP species (*Gnetum africanum*, *Ricinodendron heudelotii*, *Irvingia gabonensis*, *Cola lepidota*, *Cola accuminata*, *Garcinia kola*, *Raphia Hookeri*, *Tetracarpidium canophorum*, *Bambusa vulgaris*, *Eremospatha spp)* are found in this zone, but only few are collected (30%). Nevertheless 44.6% of respondents report an increase in their rate of collection of NTFPs. The main reason for the increase in the NTFP collection in some areas is as a result of access to buyers or closeness to markets. Fig. 5 shows the various reasons for this rate of collection. Income generation (38%) is the principal reason which some communities continue to collect NTFPs. This could be as a result of the fact that besides farming where women are involved, NTFP collection is the only other activity where women are involved which acts as a source of income to this group of persons.

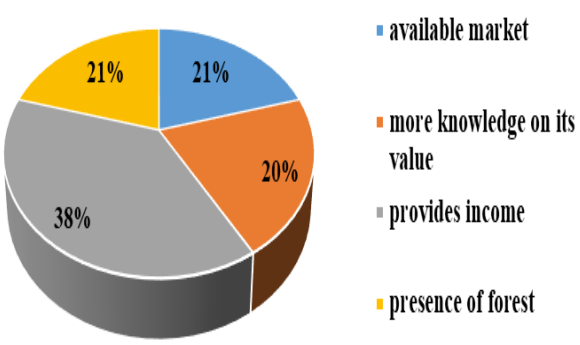

Fig.5: Reasons for increased rate of NTFP collection

On the other hand, 20% just increased their rate of collection due to their recent knowledge on the economic value of these products. The later got this knowledge from external elites who came into the village as a result of either retirement or to be engaged in agriculture. There is therefore the need for sensitization on the value of these products.

3.5 Conflicts

There exist some areas of conflicts either between the local population and private exploiters, local communities and the state or between the local populations themselves of the same tribe or different tribes. This is due to either the affectation of forest by the government without considering the livelihood of the population or as a result of unclear customary boundaries between communities sharing a common limit. Some areas however have evidence of subsequent conflicts which have either not been noticed or are being neglected.

3.5.1 Conflicts and subsequent conflicts due to affectation

Some areas within the lower Mbo clan such as Etabang, Nzoa, kamelumpe and Tangang were hunting had always been the principal economic activity, constantly face situations of conflicts with guards of the Bayang-mbo wildlife sanctuary who continue to seize their weapons and hunted animals. Considering the fact that these people have occupied almost every area of their land with farms, the sanctuary had always acted as their hunting zone both as a source of protein and livelihood. This justifies why some of these villages had refused the creation of this sanctuary. It is however impossible for this population to stop hunting within this protected area since no other source of protein was provided to them. From evidence of this mapping activity, it was also noticed that the agro-industry (SG-SOC) has a section of its apportioned land superposing with farm lands in Sikam and Ayong villages (Upper Balong). With this situation, the Ayong community does not permit the company to invest on that part of the forest. Such factors certainly does not encourage foreign investment into the country. Cameroon's wildlife regulations require local populations

https://dx.doi.org/10.22161/ijfaf.2.1.2 *ISSN: 2456-8791*

to be compensated for the temporary or permanent suspension of their rights by the creation or extension of a protected area. However, no signs of compensation or any social infrastructural development can be observed in communities (Tangang, Kamelumpe, Etawang) directly influenced by the creation of this sanctuary. The above mentioned villages have been able to benefit from the government just primary schools with a single teacher, being the head teacher. This can be termed the marginalization of indigenous peoples from social and educational services.

In the Upper Balong village, More than 90% of investigated villages are sitting on a mining exploration zone. On this same area, more than 70% is being occupied by a Council forest, SG-SOC plantation and the proposed Nkwende hills. Some of these affectations (SG-SOC plantation) touch farm lands out of the knowledge of the population while on others (Nkwende hills), the population is farming on unconsciously. These superposition of land use would definitely be sources of future conflicts. This affirms that the local population were not considered during such decision makings. This could also be due to the absence of a better tool for decision making in the management of natural resources. The absence of the above tool has led to the poor identification of the customary boundaries of each village. A precondition for the recognition of land ownership by villages shall be the determination/delimiting of their borders with neighboring villages. Participative mapping acts as better tool for such delimitation.

3.5.1 Intra tribal land conflicts and areas of subsequent conflict

Principally, conflicts in these areas come from boundary conflicts. These conflicts are however between indigenes within a community on farm lands or between two communities on customary boundaries. It is noticed that conflicts on farm lands come as a result of the boundary indicators used such as flowers, streams, marked trees, valleys and beacons. Flowers and beacons are reported to be the principal causes as a result of the ability to be off rooted and mobility respectively. Fig. 6 and Fig 7 show important possible conflict zones in the Mbo and Upper Balong areas. Fig. 6 indicates a forest section between the villages of Baro, Ossirayip and Ayong were limits of the three villages superpose. This zone could be an area of potential conflict especially coupled with the fact that this zone and its extension to the left is under classification as a council forest. The principal cause of conflicts is for boundary disputes in this area (67%). Also, in areas were limits are clear, non-respect of these limits is another cause for clashes. It was thus noticed that areas of unclear boundaries were marked by either hills, valleys, trees or rocks. Considering the fact that most local cartographers were youths, it could be said that these youths do not master their customary boundaries. There is therefore the need to use these maps together with the elders and chiefs of every village for boundary clarification. Clear boundaries which could avoid conflicts in this area are demarcated by streams. Nevertheless, due to the fact that most of these streams are small and some even dry up during the dry season, some individuals within communities take these as advantages and encroach into the forests of their neighbouring villages. There is therefore the need for better demarcation strategies within this area if rights on land must be respected.

3.6 Participative map as a tool for national land planning and zoning

Data analysis revealed that participative mapping is an effective tool for national land planning and zoning and improve decision making at the level of the government, the local council and the forest communities.

3.6.1 Importance of participatory mapping in national land planning and zoning

In Nguti Sub-division, participatory mapping can be used for:

- The identification of key areas for the creation of Community Zone. This will help regulate hunting activities within this zone;
- The establishment of protected areas or forest attributions for exploitation. This is possible as the maps give clear information on the manner and extent of forest usage in a particular area unlike conventional non-participative maps which represent communities as dots. This will avoid overlaps between state attributions and community used zones as is the case in some of these communities where satellite images are used;
- The amelioration of the national land tenure system. The participative maps produced during this study give information on the impact of the tenure system on land use in the study area. The land use pattern in some of these areas has a negative impact on the forest cover as can be seen in these maps. This is because the local population clear many small holdings to secure land for which they can be compensated in case it is destroyed during development projects according to the Cameroon land law.

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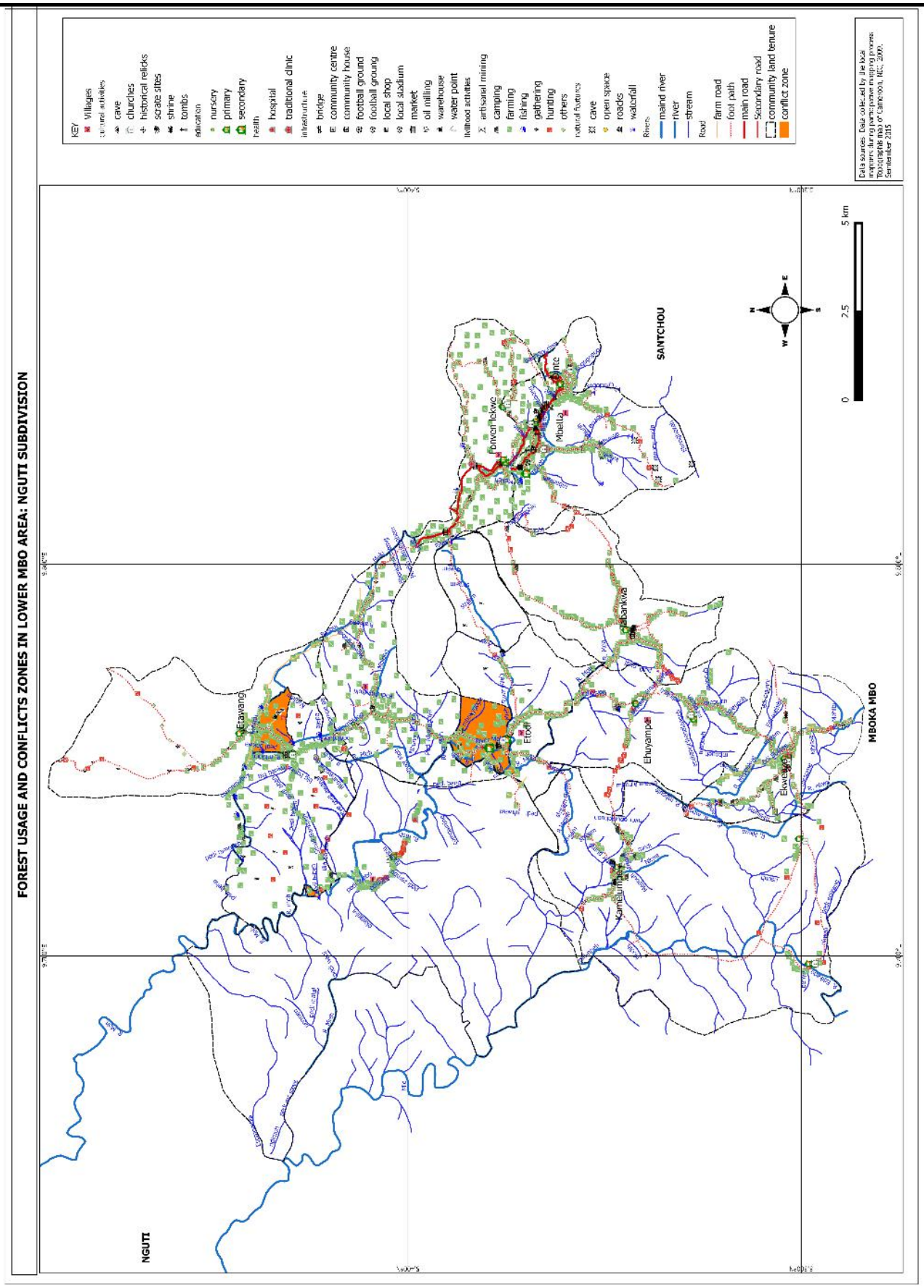

Fig. 6: Map of the Mbo clans indicating areas of conflicts

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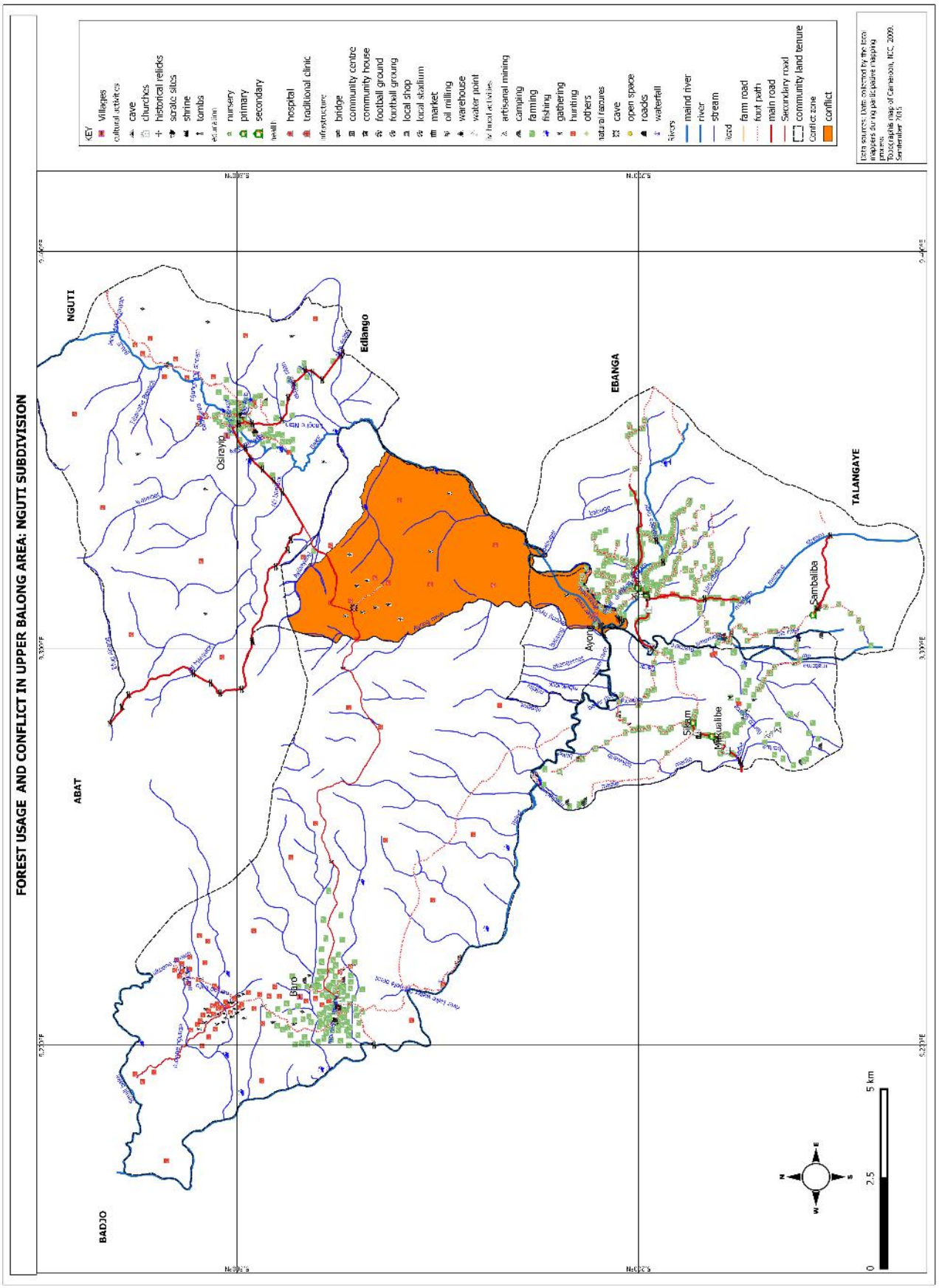

Fig. 7: Map of villages in the Upper Balong indicating a potential conflict zone

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- Risk reduction in the case of the establishment of great projects such as road networks. This will facilitate environmental impact assessments and the implementation of impact mitigation plans;
- The promotion of ecotourism within this council using data collected on potential eco touristic sites. Many interesting ecotourism sites such as water falls, caves not yet known were identified within the study sites. These, if developed could bring financial benefits to these communities and why not national development.
- Town planning: Participative maps produced during this study provided information on settlement patterns. Thus, to ameliorate land use systems, hygienic situations and to facilitate the implementation of some projects, these maps can be used to adjust the settlement pattern in this area.

3.6.2 Importance of participative mapping in decision making

To avoid conflicts : These maps give information on the limits between community used land and forest not yet used and so the government can decide to attribute forest for different purposes without affecting forest communities and thus evoking conflicts. Also conflicts between communities can avoid during the establishment of villages.

These maps would serve Indigenous and local communities the following purposes:

- To advocate for their rights in the use and management of natural resources. These maps contain information on protected and proposed protected areas without the knowledge or concern of the local population. This is the case for the Nkwende hills. It also provides information on protected areas created without considering areas of influence of the population on which they carry out their livelihood activities such as the Bayang-mbo wildlife sanctuary
- To negotiate with the state for more agricultural space by increasing the distance of some permanent forest estates within their customary limits which are very close to households or farm lands. This is the case of the Nguti council forest
- To negotiate with private exploiters or investors on community land. These maps help communities identify their area of activities and thus secure their right on resource use and cultural preservation. With this communities can know if they still have enough forest to give out for exploitation and which part of the forest cover. Also communities will be able to decide which quantity of forest to use or give out for a particular purpose. This will enhance control on forest use and thus reducing or avoiding deforestation.

IV. CONCLUSION

This study shows that adjustments need to be done at the level of decision making concerning forest delimitation, classifications and the respect of the right of local communities in the Nguti Council. The study proofs that such mapping process was very innovative in this area as the majority of the population had never heard or participated in such a process. Concerning land use, the population uses the forest mostly for agriculture, hunting, gathering and cultural activities. However, the topography of the area, the absence of road network and the various forms of forest affectations limit these communities from farm expansion, effective gathering and thus discouraging most of these livelihood activities. As concerns issues of conflicts, the local population continues to face conflicting situations with wildlife agents due to hunting within protected areas and the hunting of protected species even out of protected zones. This is principally caused by the absence of a substituent source of protein and livelihood. Also, forest affectations that do not consider the means of livelihood of the population area acting as potential conflict zones. More so, conflicts on land use between the communities themselves exist. This is principally caused by unclear limits established by ancestors and the establishment of villages from others without considering customary limits.

With respect to land use planning and zoning, the Cameroon forestry atlas and satellite images have not been the best basis for decision making in forestry as several overlaps are noticed in this area. This process of participative mapping stands therefore as a better basis for decision making on the management of natural resources in the Nguti sub-division.

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