**Influence of anthropogenic factors on forest resources exploitation and utilization in the Bakossi landscape**

**Abstract**

This study was carried out to investigate how human factors affect forest resources exploitation and utilization. The study therefore aimed at identifying the level of pressure put on different forest resources as a result of human activities. It was conducted in thirty-four (34) communities that share a direct boundary with the Bakossi National Park (BNP). Focus group discussions were held with selected resource users from each village within a cluster. Selected members were those who have lived in the area for a very long period of time, have adequate knowledge on the area especially on the exploitation of forest resources, and are actively exploiting forest resources in the area. Interviews were also done with key resource persons, and direct observations were conducted in the study areas. The participatory rural appraisal method as well as participatory diagnostic method were adopted to ease assessment of the collection and importance of NTFPs in the area. In 75% of the study area, it was noticed that a higher percentage of the NTFPs are harvested outside the park (NE 50%; SE 54% and SW 54.2%), followed by that exploited both inside and out of the park (NE 41.7%; SE 37.5% and SW 37.5%). Contrarily, in the NW cluster, a higher percentage of NTFPs are harvested both inside the park and out of the park (93.3%), whereas only 6.7% is exploited strictly out of the park alone. The NW cluster is the most enclaved of the four clusters, thus higher rate of NTFP exploitation in this area inside the and out of the park could be due to the fact that there is limited law enforcement and inadequate awareness of the people on activities prohibited in a protected area in this area. More than 80% of NTFPs exploited is for commercial purpose, due to limited alternative sources of income. The presence of bush meat markets makes poaching higher in the NW and SW clusters, while timber exploitation is higher in areas with good road network. The provision of alternative sources of livelihoods, and provision of improved varieties of forest resources to be cultivated in farmlands will reduce pressure on forest resources especially in protected areas. It is also imperative to develop and implement access rights strategy for forest resources with effective monitoring and evaluation. Also, disenclaving remote areas will ease law enforcement which will create conservation awareness in communities.

Keywords: Enclaved; livelihoods; non-permanent forest; non timber forest products; permanent forest; poaching

**1. Introduction**

Most rural people depend fully or partially on products derived from local forests for their livelihoods (Angelsen et al., 2014; Ingram, 2014; Oskamen and Mersmann 2003; Sunderlin & Pokam, 2002). This overdependence on forest resources has resulted to unsustainable management of the resources, especially non-timber forest products. Stakeholders in the forestry sector have now developed renewed and increasing interest in the contribution of natural forest to the environment, rural development and income ( Betti, 2002; Newton et al. 2016). The Convention for International Trade on Endangered Species (CITES) where many countries all over the world including Cameroon are signatories and fully support its objectives, has over the years brought together member states to develop and agree on strategies that orientates the sustainable management of forest resources. Due to this orientation, different forest resources have been classified into different categories/classes with those highly threatened by human pressure benefitting from restrictions that regulate their exploitation and commercialization.

There is a high diversity of non-timber forest products (NTFPs) in the forest of the Central African Subregion in general, and Cameroon in particular. The surrounding communities around these forests have over the years depended on the forest for NTFPs, and this has contributed greatly to their wellbeing (Arnold and Ruiz-Pérez 2001). However, despite the richness of forest resources in the vast Cameroon`s forest, unsustainable anthropogenic activities such as slash-and-burn agriculture and related activities such as uncontrolled harvesting, poaching and logging, has contributed to the degradation of these resources (Anonyme, 2005). The population often exploit these resources wherever they have reliable information on the availability, and this may either be in permanent forest (Protected areas) or non-permanent forest. The exploitation of NTFPs in permanent forest especially for commercial purposes can only be possible if it is done in legality such as the case of *Prunus africana* exploitation in the Mount Cameroon National Park (Eben 2014), where a simple management plan for the Prunus was developed and scrupulously respected. For subsistence, such collection is based on the putting in place of an access rights strategy which must be scrupulously monitored and respected.

Many studies have been carried out on the exploitation and commercialization of NTFPs (Nkwatoh et al. 2010; Fuashi et al. 2012), and on their importance (Dibong et al. 2011; Duguma & Mesele 2019; Jeanne 2007), but limited studies have been carried out to determine the legality in the exploitation of forest resources by the rural population, as well as quantifying the products in their natural environment. Section 6 (1) of Law No 2024/008 of 24 July 2024 to lay down Forestry and Wildlife regulations in Cameroon states that local populations shall enjoy rights of use on the forestry and wildlife products harvested on the national land located in their environment for their personal use. However, section 6 (2) clarifies that the State may, for public interest reasons, and after consultation with the populations concerned through their representative institutions, suspend or restrict the exercise of the rights of use when necessary. This study therefore aims at appraising the exploitation and utilization of forest resources in the Bakossi landscape.

**2. Materials and methods**

**2.1 Study area**

The study area is Kupe Muanenguba Division in the South West Region of Cameroon. This area hosts the Bakossi National Park (BNP) with peripheral and in-park communities depending on its resources for their wellbeing. The BNP is located exclusively in the Bangem and Tombel Sub Divisions of the Kupe Muanenguba Division in the South West Region. It was created by decree No 2007/1459/PM of 28th November 2007. It is located in UTM zone 32N between 558113 and 581748 E and 549097 and 569274 N with headquarters in Bangem.

BNP is a watershed with much of its drainage flowing to the west to form the Mungo River. To the north of the Park is the Bermin Lake and to the south is Lake Edib. The National Park forms part of the chain of Cameroon Highlands, an area which, due to a high concentration of biodiversity and endemism, its fascinating landscape and spectacular features, such as cliffs, rocks, caves, lakes, and waterfalls and its importance as a watershed, has been designated as a high priority conservation area.

**2.2 Stakeholder participation and data collection**

This study was conducted in thirty-four (34) communities that share a direct boundary with the BNP. In order to ease the management of the park via the collaborative management approach, these communities have been grouped into clusters; North East cluster (12 villages); South East cluster (8 villages); South West cluster (10 villages); North West cluster (4 villages). Focus group discussions were held with selected resource users from each village within a cluster. The selection of members for the focus group discussions was done in collaboration with the local traditional authorities, as well as with members of the Local Collaborative Management Committees (LCMC). In order to avoid bias, qualities for those selected were those who have lived in the area for a very long period of time, have adequate knowledge on the area especially on the exploitation of forest resources, and are actively exploiting forest resources in the area. The participation of women was also given great consideration since they represent an important group that exploits and use NTFPs regularly. Key forest resources users who actively took park included 26 people for the South East cluster, 30 people for the North East cluster, 33 people for the South West cluster, and 18 people for the North West cluster.

Interviews were also done with key resource persons, and direct observations were conducted in the study areas. The participatory rural appraisal method (Shillington, 2002) as well as participatory diagnostic method were adopted to ease assessment of the collection and importance of NTFPs in the area.

Samples of NTFPs were collected for proper study and identification.

**3. Results and discussions**

**Result**

**3.1 Demographic characteristics of respondents**

The gender ratio for the surveyed 107 people was 33% females and 67% males, whereas the most represented group was between 30 to 44 years (46.7%), followed by the age group between 45 to 59 years (32.7%). The least represented persons were those respondents whose age was between 60 and more than (11.2%) and 15 to 29 years (10.16%). This is in line with the report of Ndumbe et al. (2022) who had more than 55% of respondents being those between 31 to 50 years, with the least respondents being people from 61 years and above.

**3.2 Pressure on non-timber forest products**

The availability and collection of the different NTFPs vary from one cluster to the other. The North East (NE) cluster (Table 1) generally has a higher availability of most of the NTFPs in this area than the South East (SE) cluster (Table 2). The uses of the different NTFPs are similar for all the clusters.

**Table 1. NTFP and other resources present in the NE cluster and their uses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | NTFP local/common name | Scientific Name | Availability (1=Very low2=Low3=Average4=High5 very high) | Remarks (collectors), season/month |  Location |   Uses |
|  | In the Park (X) | Out of Park (Y) | Sale  | Food  | Medicine  |
| 1 | Njangsang  | *Ricinodendron heudeloti*i | 4 | Collected by children, women (Aug-Oct) | Yes | Yes | Yes | Yes | Yes |
| 2 | Bush pepper  | *Piper spp.* | 3 | Women/Men (Jan-Mar) | No | Yes | Yes | Yes | Yes |
| 3 | Mawum, Liana | *Condylocarpon guianens* | 4 | Men (Year round) | Yes | Yes | Yes | Yes | Yes |
| 4 | Nguh  | Garcinia lucida | 2 | All year round, Men and women  | Yes | Yes | Yes | Yes | Yes |
| 5 | Pebe (Monodora) |  | 1 | Rainy season (Jul-Sep) women and Men | No | Yes | Yes | Yes | No |
| 6 | 3 corner spice (*Tetraplera; Essessang* | *Erythrophleum suaveolens* | 1 |  Women (Oct-Mar) | No | Yes | Yes | Yes | No |
| 7 | Bitter cola  | *Garcinia kola* | 4 | All man, (Sept-Jan) | No |  Yes | Yes | Yes | Yes |
| 8 | Cashew  | *Anacardium occidentale* | 4 | Men & women and children (Rainy season) | Yes | Yes | Yes | Yes | No |
| 9 | Quinine  | *Cinchona pubescens* | 0 | (All year round )men and herbalist | Yes | Yes | No | No | Yes |
| 10 | Worm medicine  |  | 1 | (All year round) men | Yes | No | Yes | No | Yes |
| 11 | Contri onion  | *Afrostyrax lepidophyllus* | 3 | (Jul-Sept) Children and women | Yes | No | Yes | Yes | Yes |
| 12 | Ndume (contri stick) |  | 4 | All year round by men.  | No | Yes | Yes | No | Yes |
| 13 | Alligator pepper; Grain of paradise | *Aframomum melegueta* | 1 | (Nov-Mar), by children men and women | No | Yes | Yes | Yes | No |
| 14 | Cane/ rattan | *Eremospatha spp.* | 4 | All year round, by men | Yes | Yes | Yes | No | No |
| 15 | Wild coffee |  |  | All year round peak season (Nov, Dec, Jan), men and women | Yes | Yes | No | No | No |
| 16 | Borroshes (basket material) |  | 5 | All year round peak season (Nov, Dec, Jan), men  | No | Yes | Yes | No | No |
| 17 | Mushrooms |  | 4 | As need arises by women and children (Jul-Sep) | Yes | Yes | Yes | Yes | No |
| 18 | Chewing stick | *Garcinia mannii* | 4 | All year round, mostly men | No | Yes | Yes | No | No |
| 19 | Giant fend tree |  | 4 | All year round by men | Yes | Yes | Yes | No | No |
| 20 | Mat weaving stick (Wild Afromumum) |  | 4 | All year round by men | No | Y es | Yes | No | No |
| 21 | Achibe |  | 2 | (Aug-Oct) Wonen and children | No | Yes | Yes | Yes | No |
| 22 | Bush Mango | *Irvingia spp* | 2 | Aug-Oct by women | Yes | Yes | Yes | Yes | No |
| 23 | Date Palm | *Phoenix reclinata* | 2 | All year round by men | No | Yes | No | Yes | No |

41.7% of the NTFPs exploited in the NE cluster is done both in the Park and out of the park, 8.3% exploited only inside the park, and 50% done only out of the park. All the NTFPs harvested in the park are used for medicine and for sale, while only 50% (contri onion) is used for food (Table 2). 87.5% of the NTFPs harvested in the area are used for sale, 58.3% for food, while only 37.5% are used for medicine (Table 2).

**Table 2. NTFP present in the SE cluster and their uses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | NTFP local/common name | Scientific name | Availability (1=Very low2=Low3=Average4=High5 very high) | Remarks (collectors), season/month |  Location  |   Uses |
|  | In the Park (X) | Out of Park (Y) | Sale  | Food  | Medicine  |
| 1 | Njangsang | *Ricinodendron heudeloti*i | 2 | Collected by children, women (Aug-Oct) | No | Yes | No | Yes | No |
| 2 | Bush pepper | *Piper spp.* | 3 | Women/Men (Jan-Mar) | No | Yes | Yes | Yes | Yes |
| 3 | Mawum | *Condylocarpon guianens* | 3 | Men (Year round) | Yes | Yes | Yes | Yes | Yes |
| 4 | Nguh | *Garcinia lucida* | 2 | All year round, Men and women  | Yes | Yes | Yes | Yes | Yes |
| 5 | Pebe (Monodora) |  | 1 | Rainy season (Jul-Sep) women and Men | No | Yes | Yes | Yes | No |
| 6 | 3 corner spice (Tetraplera) Essesang | *Erythrophleum suaveolens* | 1 |  Women (Oct-Mar) | No | Yes | Yes | Yes | No |
| 7 | Bitter cola | *Garcinia kola* | 3 | All man, (Sept-Jan) | No |  Yes | Yes | Yes | Yes |
| 8 | Cashew | *Anacardium occidentale* | 2 | Men & women and children (Rainy season) | Yes | Yes | Yes | Yes | No |
| 9 | Quininine | *Cinchona pubescens* | 1 | (All year round )men and herbalist | Yes | Yes | No | No | Yes |
| 10 | Worm medicine |  | 0 | (All year round) men | Yes | No | Yes | No | Yes |
| 11 | Contri onion | *Afrostyrax lepidophyllus* | 1 | (Jul-Sept) Children and women | Yes | No | Yes | Yes | Yes |
| 12 | Ndume (contri stick) |  | 3 | All year round by men.  | No | Yes | Yes | No | Yes |
| 13 | Alligator pepper hot/ sweet | *Aframomum melegueta* | 1 | (Nov-Mar), by children men and women | No | Yes | Yes | Yes | No |
| 14 | Cane/ rattan | *Eremospatha spp.* | 4 | All year round, by men | Yes | Yes | Yes | No | No |
| 15 | Wild coffee |  |  | All year round peak season (Nov, Dec, Jan), men and women | Yes | Yes | No | No | No |
| 16 | Borroshes (basket material) |  | 5 | All year round peak season (Nov, Dec, Jan), men  | No | Yes | Yes | No | No |
| 17 | Mushrooms |  | 3 | As need arises by women and children (Jul-Sep) | Yes | Yes | Yes | Yes | No |
| 18 | Chewing stick | *Garcinia mannii* | 4 | All year round, mostly men | No | Yes | Yes | No | No |
| 19 | Giant fend tree |  | 4 | All year round by men | Yes | Yes | Yes | No | No |
| 20 | Mat weaving stick (Wild Afromumum) |  | 4 | All year round by men | No | Yes  | Yes | No | No |
| 21 | Achibe |  | 0 | (Aug-Oct) Wonen and children | No | Yes | Yes | Yes | No |
| 22 | Bush Mango |  | 0 | Aug-Oct by women | Yes | Yes | Yes | Yes | No |
| 23 | Date Palm |  | 3 | All year round by men | No | Yes | No | Yes | No |

37.5% of the NTFPs exploited in the SE cluster is done both in the Park and out of the park, 8.3% exploited only inside the park, and 54% done only out of the park. All the NTFPs harvested in the park are used for medicine and for sale, while only 50% (contri onion) is used for food (Table 3). 83.3% of the NTFPs harvested in the area are used for sale, 58.3% for food, while only 33.3% are used for medicine (Table 3).

Similar NTFPs are collected in the South West (SW) (Table 3) and North West (NW) (Table 4) clusters. 37.5% of the NTFPs exploited in the SW cluster is done both in the Park and out of the park, 20.8% exploited only inside the park, and 54.2% done only out of the park. 60% of the NTFPs harvested in the park are used for medicine and for sale, while only 60% are used for food (Table 4). 83.3% of the NTFPs harvested in the area are used for sale, 83.3% for food, while only 58.3% are used for medicine (Table 4).

**Table 3. NTFP and other resources present in the South West (SW) cluster and their uses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | NTFP local/common name | Scientific Name | Availability (1=Very low2=Low3=Average4=High5 very high) | Remarks (collectors), season/month |  Location |  Uses |
|  | In the Park (X) | Out of the Park (Y) | Sales | Food | Medicine |
| 1 | Njabe oil/Moabi oil | *Baillonella toxisperma* | 2 | Collected by women (Oct-Dec) | Yes | Yes | Yes | Yes | Yes |
| 2 | Njangsang | *Ricinodendron heudeloti*i | 4 | Collected by women (Oct-Feb) | No | Yes | Yes | Yes | Yes |
| 3 | Bush pepper | *Piper spp.* | 4 | Women/Men and youths (Nov-Feb) | Yes | Yes | Yes | Yes | Yes |
| 4 | Nguh  | *Garcinia lucida* | 4 | Men (July to Oct)  | No | Yes | Yes | Yes | Yes |
| 5 | Febe |  | 3 | Men (Oct-Dec) | Yes | No | Yes | Yes | Yes |
| 6 | Bush Onions |  | 2 | Men (Aug-Oct) | No | Yes | Yes | Yes | Yes |
| 7 | Cola (and local cola) | *Cola spp* | 3 | Men (June-Sept) | Yes | Yes | Yes | Yes | Yes |
| 8 | Lion cola | *Cola buchholzia* | 1 | Men (January and May-June) | No | Yes | No | Yes | Yes |
| 9 | Monkey Cola | *Cola spp* | 4 | Men and Youths | Yes | Yes | Yes | Yes | No |
| 10 | Essessang (Three corner spices) | *Erythrophleum suaveolens* | 2 | Women, men and Youth (oct-January) | No | Yes | Yes  | Yes | No |
| 11 | Awum |  | 5 | Women, men and Youth (All year round) | Yes | No | Yes | Yes | Yes |
| 12 | Bush Groundnut |  | 2 | Women (Sep-Dec) | Yes | No | No | Yes | No |
| 13 | Quinine | *Cinchona pubescens* | 3 | Men (All year round) | Yes | Yes | No | No | Yes |
| 14 | Awing |  | 2 |  Men and Women (All season) | No | Yes | Yes | Yes | Yes |
| 15 | Bitter cola |  | 2 | Men (Oct-Jan) |  No | Yes | Yes | Yes | Yes |
| 16 | Cashew |  | 5 | Men & women and children (June to Sept) | Yes | Yes | Yes | Yes | No |
| 17 | Alacata pepper hot/ sweet |  | 3 | Men (march and April),  | Yes | Yes | Yes | Yes | Yes |
| 18 | Cane/ rattan |  | 5 | All year round, by men | Yes | No | Yes | No | No |
| 19 | Bush Bombong |  | 3 | Men, Women and youth (July to August) | No | Yes | Yes | Yes | No |
| 20 | Mushrooms |  | 4 | Men, women and children (Year round) | Yes | Yes | Yes | Yes | No |
| 21 | Chewing stick |  | 3 | Men, All year round, mostly  | Yes | No | Yes | No | Yes |
| 22 | Ajehibe |  | 2 | Women (June to Aug) | Yes | Yes | No | Yes | No |
| 23 | Bush Mango |  | 3 | Collected by Women, Youth and Men (May –Aug) | No | Yes | Yes | Yes | No |
| 24 | Ngongo Leaf (*Maranthochloa spp.)* |  | 5 | Men, Women and Youth (Year round) | No | Yes | Yes | No | No |

93.3% of the NTFPs exploited in the NW cluster is done both in the Park and out of the park, 0% exploited only inside the park, and 6.7% done only out of the park. 56.7% of the NTFPs harvested in the area are used for sale, 76.7% for food, while only 60% are used for medicine (Table 4).

**Table 4. NTFP and other resources present in the North West (NW) cluster and their uses**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | NTFP local/common name | Scientific name | Availability (1=Very low2=Low3=Average4=High5 very high) | Remarks (collectors), season/month |  Location |  Uses |
|  | In the Park (X) | Out of the Park (Y) | Sales | Food | Medicine |
| 1 | Njabe oil | *Baillonella toxisperma* | 2 | Collected by women (Sep-Dec) | Yes | Yes | Yes | Yes | Yes |
| 2 | Njangsang | *Ricinodendron heudeloti*i | 4 | Collected by women (Jul-Feb) | No | Yes | Yes | Yes | Yes |
| 3 | Bush pepper | *Piper spp.* | 2 | Women and youths (Apr-May) | Yes | Yes | Yes | Yes | Yes |
| 4 | Nguh  | *Garcinia lucida* | 1 | Men (July to Sep)  | Yes | Yes | No | Yes | Yes |
| 5 | Pebe |  | 2 | Men and women (Sep-Nov) | Yes | Yes | Yes | Yes | Yes |
| 6 | Bush Onions |  | 3 | Men and women (Aug-Oct) | Yes | Yes | Yes | Yes | Yes |
| 7 | Cola (and local cola) | *Cola spp* | 4 | Men and women (May-Aug) | Yes | Yes | Yes | Yes | Yes |
| 8 | Lion cola | *Cola buchholzia* | 1 | Men (Feb-Mar) | No | Yes | No | Yes | Yes |
| 9 | Monkey Cola | *Cola spp* | 3 | Men, women and Youths | Yes | Yes | Yes | Yes | No |
| 10 | Essessang (Three corner) | *Erythrophleum suaveolens* | 2 | Women, men (May-Jun) | Yes | Yes | Yes | Yes | Yes |
| 11 | Mawum |  | 2 | Men and Youth (All year round) | Yes | Yes | Yes | No | Yes |
| 12 | Bush Groundnut |  | 1 | Women (Sep-Oct) | Yes | Yes | No | Yes | Yes |
| 13 | Quinine | *Cinchona pubescens* | 1 | Men (All year round) | Yes | Yes | No | No | Yes |
| 14 | Aweng (Soil Egussi) |  | 1 |  Men and Women (All season) | Yes | Yes | No | Yes | Yes |
| 15 | Bitter cola |  | 3 | Men and women (Aug-Sep) |  Yes | Yes | Yes | Yes | Yes |
| 16 | Cashew |  | 3 | Men & women and children (Jul to Sept) | Yes | Yes | Yes | Yes | No |
| 17 | Alacata pepper hot/ sweet |  | 3 | Men and women Sep-Oct),  | Yes | Yes | No  | Yes | Yes |
| 18 | Cane/ rattan |  | 5 | All year round, by men | Yes | Yes | Yes | No | No |
| 19 | Bush Bombong |  | 3 | Men, Women and youth (July to August) | Yes | Yes | No | Yes | No |
| 20 | Mushrooms |  | 3 | Men, women and children (Year round) | Yes | Yes | Yes | Yes | No |
| 21 | Chewing stick |  | 3 | Men and youths, All year round, mostly  | Yes | Yes | No | No | Yes |
| 22 | Achibe |  | 1 | Men and Women (June to Jul) | Yes | Yes | Yes | Yes | No |
| 23 | Bush Mango |  | 4 | Collected by Women, Youth and Men (Jul-Sep) | Yes | Yes | Yes | Yes | No |
| 24 | Ngongo Leaf |  | 4 | Men, Women and Youth (Year round) | Yes | Yes | Yes | No | No |
| 25 | Ndume |  | 3 | Men, (Year round) | Yes | Yes | No | No | Yes |
| 26 | Eru |  | 3 | Men, Women and Youth (Year round) | Yes | Yes | No | Yes | No |
| 27 | Raphia palms (Raphia spp.) |  | 3 | Men and Youth (Year round) | Yes | Yes | Yes | No | No |
| 28 | Belle food; Breadnut (*Artocarpus camansi*) |  | 3 | All (Year round) | Yes | Yes | No | Yes | No |
| 29 | Peh |  | 3 | Women and youths (Apr-May) | Yes | Yes | No | Yes | No |
| 30 | Bongo (Afromomum spp.) |  | 3 | Men and women (Jul-Sept) | Yes | Yes | No | Yes | Yes |

**3.3 Poaching activities**

Poaching occurs in all the villages of the Bakossi National Park. With the presence of potential bush meat markets in Konye and Manyemen, poaching done in the South West and North West clusters is both for commercial purpose and subsistence, whereas poaching in the North East and South East clusters is mostly for subsistence.

**3.4 Farm encroachment**

Farm encroachment varies from one cluster to the other. It is higher in the SE cluster as all the villages are involved, followed by the SW cluster (6 out of 10 villages), NW (02 out of 4 villages), and finally the NE (5 out of 12 villages). The SE cluster is more accessible than all the other clusters since all its eight villages are linked by a motor-able road, while many villages in the NE cluster cannot be assessed by road. Cocoa farming is high in the SW cluster.

**3.5 Timber exploitation**

NE cluster (all villages), SW (1 out of 10 villages), SE (all villages), NW cluster (zero out of 04 villages). The NE and SE clusters are closest to Bangem town, the Divisional Headquarters of Kupe Muanenguba with high demand for timber for construction, while the SE cluster is close to the fast growing Tombel town, the headquarters of Tombel Subdivision.

**3.5 Bush fires**

Bushfires are common in all the clusters as farmers use it as a means to prepare their farms for cultivation.

**3.6 River poisoning**

Only in NW (04 out of o4 villages) with lots of available flowing streams and rivers, and SW (02 out of 10 villages). River poisoning is not practiced in the NE and SE clusters

**4. Discussion**

In 75% of the study area, it was noticed that a higher percentage of the NTFPs are harvested outside the park (NE 50%; SE 54% and SW 54.2%), followed by that exploited both inside and out of the park (NE 41.7%; SE 37.5% and SW 37.5%). Contrarily, in the NW cluster, a higher percentage of NTFPs are harvested both inside the park and out of the park (93.3%), whereas only 6.7% is exploited strictly out of the park alone. The NW cluster is the most enclaved of the four clusters,, and so a high rate of NTFP exploitation in this area inside the park just as the case outside could be due to the fact that there is limited law enforcement and inadequate awareness of the people on activities prohibited in a protected area. In addition, this could be a deep rooted behaviour that they have lived with even before the creation of the park. In addition, for a long time after the creation of the park, the communities were not aware of the park boundary since it was not visible to them. This finding is similar to the report of Gray et al. (2018), who remarked that Law enforcement has been used as a strong tool in conservation and is a primary means for enhancing PAs, since it goes a long way to combat illegal activities and the uncontrolled exploitation of resources. It was also observed that, NTFP exploitation inside the park and outside still occurs at a significant level, even in the other clusters where there is a higher implementation of law enforcement. Phromma et al. (2019) argued that law enforcement alone is inadequate to ensure PA integrity and tends to be lax, especially in places where livelihoods rely on access to PA resources. Harish and Somveer (2022), Filippo (2020) remarked that conservation of biodiversity should go together with implementing community development projects that will increase livelihoods and motivate community members to reduce the pressure on forest resources. For all the clusters, a negligible percentage of the NTFPs are harvested only inside the park. This finding is similar to that obtained by Ndumbe et al. (2022) who reported that only a small proportion of NTFPs collected in the South West and Littoral regions of Cameroon is done in protected areas.

In the study area, it was noticed that more than 80% of NTFPs exploited is for commercial purpose, as this greatly contributes to household income. This finding corroborate with that of Ndumbe et al. (2022) who found out that in the South West region, thirteen NTFPs were named by collectors as being important in providing income, while Ingram *et. al* (2016) reported that bush mango incomes contribute on average to 31% of harvester’s annual income. It was remarked that a higher percentage of the NTFPs harvested in the more assessable clusters with better farm to market roads were sold (NE 87.5%; SE 83.3%, and SW 83.3%), followed by for home consumption, and lastly for medicinal purpose. Contrastingly, in the most enclaved cluster (NW), more of the NTFPs harvested are used for home consumption (76.7%), followed by for medicinal purpose (60%), and lastly for sale (60%). The high cost of transportation in enclaved areas could be a major reason why NTFP collectors prefer to use what they harvest locally. In addition, in the enclaved areas, with poor access to medical facilities, the use of local traditional medicine is usually higher and prioritized to modern medicine, which is relatively unavailable.

With respect to illegal activities, poaching occurs in all the clusters of BNP. Poaching is relatively small in the North East and South East clusters as it is mostly done for subsistence, whereas in the South West and North West clusters, poaching is higher. The presence of bush meat markets close to the North West and South West clusters promotes poaching for commercial purposes, thus encouraging the activity. Bushmeat is a primary source of animal protein for the majority of forest families (Wilkie et al., 2005), and also constitutes significantly as a source of income (Milner-Gulland et al., 2003), particularly where the trade is driven by increased bushmeat consumption in urban areas. For timber exploitation, it is higher in the more accessible clusters (South East and North East) than in the other clusters. These two clusters are closer to the main cities in the area (Bangem and Tombel). The presence of urban areas and better accessibility therefore could greatly promote timber exploitation due to the availability of a ready market and transportation route.

For river poisoning, it is widely practiced in all the villages of the NW cluster, and it is not practiced in the NE and SE clusters. The availability of rivers in the NW cluster has contributed to fishing being a major activity that contributes to the livelihood of the people, whereas the clusters with limited water (NE and SE) do not have a culture of fishing.

**Conclusion**

In this study, it was noticed that in more accessible areas, human pressure in protected areas is reduced since law enforcement is faster and easier in such areas, while in enclaved areas, the people tend more to exploit NTFPs and carry out other illegal activities in protected areas since they assume that their activities will go unnoticed. Also there is inadequate awareness of the people on activities prohibited in a protected area in very enclaved areas causing them to be ignorant of the law which is not the case in more accessible areas. Also, the presence of available markets promote the commercialization of exploited forest resources, due to limited alternative sources of income. The provision of alternative sources of livelihoods, and provision of improved varieties of forest resources to be cultivated in farmlands will reduce pressure on forest resources especially in protected areas. It is also imperative to develop and implement access rights strategy for forest resources with effective monitoring and evaluation. Also, disenclaving remote areas will ease law enforcement which will create conservation awareness in communities.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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