Socio-economic livelihood practices and forest cover dynamics in the eastern slopes of mount Cameroon national park, South West region of Cameroon

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Abstract :

This paper seeks to investigate if there is any significant relationship between anthropogenic activities and environmental dynamics in the Eastern slopes of the Mount Cameroon region? Our hypothesis was stated thus: crop farming practices, settlement, logging and other livelihood practices have significantly depleted the forest cover in the Eastern slopes of the Mount Cameroon region. Primary data were collected in the field and secondary data from libraries. Topographic maps and satellite images were used to locate the study area and determine some human activities practiced in the area. A 20% sample size (144) of the total households (720) was designed for the study; with an effective respondent's rate of 127 (88.1%), for the four sample villages (i.e., Bokwango, Bova 1, Bova 2, Likoko Membea).

The findings revealed that, there is a significant relationship between livelihood activities and forest cover loss in the Mount Cameroon region as 100% of the respondents affirmed that anthropogenic activities are depleting the forest ecosystem in the region. The chi square calculated value of 19.001 (used in testing the hypothesis) is far greater than the critical value of 7.815 stated on the statistical table (df=K-1= 4-1=3).

Keywords : Forest cover dynamics, Mount Cameroon, Socio-economic practices.

Résumé:

Cet article pose la question de savoir s'il existe une relation significative entre les activités anthropiques et la dynamique environnementale sur les pentes orientales de la région du Mont Cameroun. Notre hypothèse est la suivante : les pratiques culturales, la colonisation, l'exploitation forestière et d'autres pratiques de subsistance ont considérablement réduit le couvert forestier sur les pentes orientales de la région du Mont Cameroun. Les données primaires ont été collectées sur le terrain et les données secondaires dans les bibliothèques. Des cartes topographiques et des images satellites ont été utilisées pour localiser la zone d'étude et déterminer certaines activités humaines pratiquées dans la région. Un échantillon de 20 % (144) du total des ménages (720) a été conçu pour l'étude, avec un taux de réponse effectif de 127 (88,1 %), pour les quatre villages de l'échantillon (Bokwango, Bova 1, Bova 2, Likoko Membea).

Les résultats ont révélé qu'il existe une relation significative entre les activités de subsistance et la perte de couverture forestière dans la région du Mont Cameroun, puisque 100% des personnes interrogées ont affirmé que les activités anthropogéniques appauvrissent l'écosystème forestier dans la région. La valeur du chi carré de 19,001 (utilisée pour tester l'hypothèse) est bien supérieure à la valeur critique de 7,815 indiquée dans le tableau statistique (df=K-1= 4-1=3).

Mots-clés : Dynamique forestier, Mont Cameroun, Pratiques socio-économiques, moyens d›existence.

Introduction

According to the United Nations Environmental Programme (UNEP, 2011), Cameroon has experienced significant forest cover loss, with the South West region having the highest deforestation rate in the country (0.11% compared to the national rate of 0.03%). Between 1987 and 2010, about 46.2% of the natural forest in the area was converted into diverse socio-economic livelihood practices such as farming, settlement and timber exploitation. Land use practices in the Mount Cameroon region are seemingly driven by agricultural activities, which is the primary livelihood activity for both indigenous people and immigrants. The fertile soils and conducive climate make the region attractive for farming, leading to widespread deforestation. Other human activities observed in the region include logging, building construction, collection of non-timber forest products such as *Africana prunus*, njangsa, eru, bush mango and wild honey. The region is also seemingly victimized by crawling climate change. Rapid population increase (especially the influx of immigrants) seems to have aggravated the situation.

Undoubtedly, forest play an important role in carbon sequestration. Forests also have the capacity to regulate various ecosystem services including watershed protection, soil conservation and habitat provision for wildlife. Consequently, forest depletion can negatively impact global carbon cycles, leading to climate change and human-induced poverty (UNEP, 2015).

Mount Cameroon is a biodiversity hotspot and is the most diverse ecosystem in Cameroon (IUCN 1994). The area harbors several endemic forest/wildlife species.

The investigation was guided by the research question postulated thus: is there any significant relationship between anthropogenic activities and environmental dynamics in the eastern slopes of the Mt. Cameroon region?

Our corresponding hypothesis was postulated thus**:** crop farming practices, settlement, logging and other human livelihood practices have significantly depleted the forest cover in the Eastern slopes of the Mt. Cameroon region.

1. Presentation of the Mount Cameroon Ecoregion

Geographic Location: Mount Cameroon ecoregion is located between Latitudes 3˚57′- 4˚27′N and Longitudes 8˚58′-9˚24′ (www.latlong.net, 2025). It stretches from the Atlantic coastline to higher altitudes of about 4,090 meters; constituting the highest peak in Central and West Africa. It has fertile volcanic soils with montane climatic conditions.

Figure 1 presents the location of the Mt. Cameroon region.

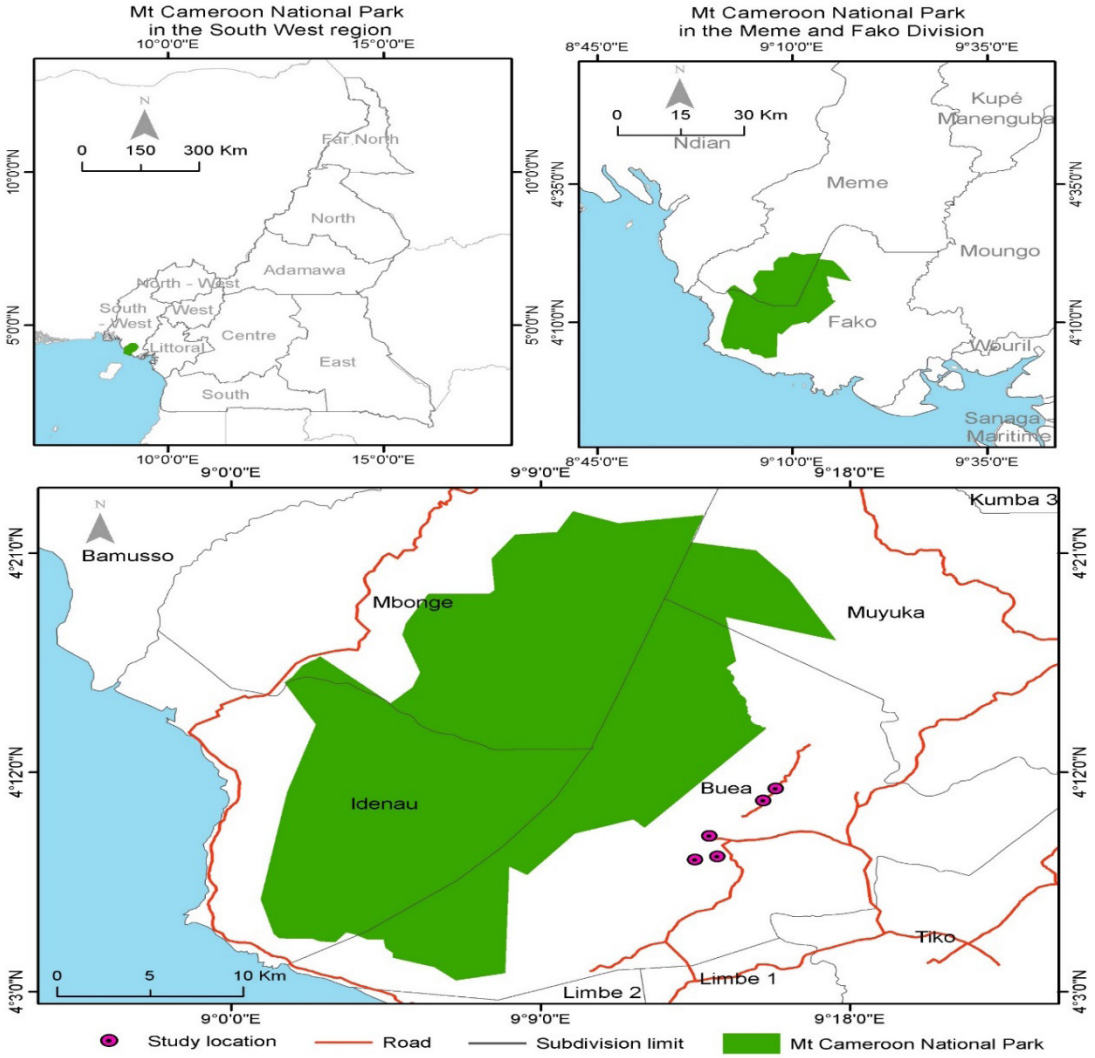


Figure 1: Location of the study area

Source: *Cameroon Forest Atlas, 2024*

The Mt. Cameroon region is hosting about 42 local communities that depend highly on neighboring natural resources for their survival. Figure 2 presents the various local communities (villages) that live in the Eastern slopes of the Mt. Cameroon region.

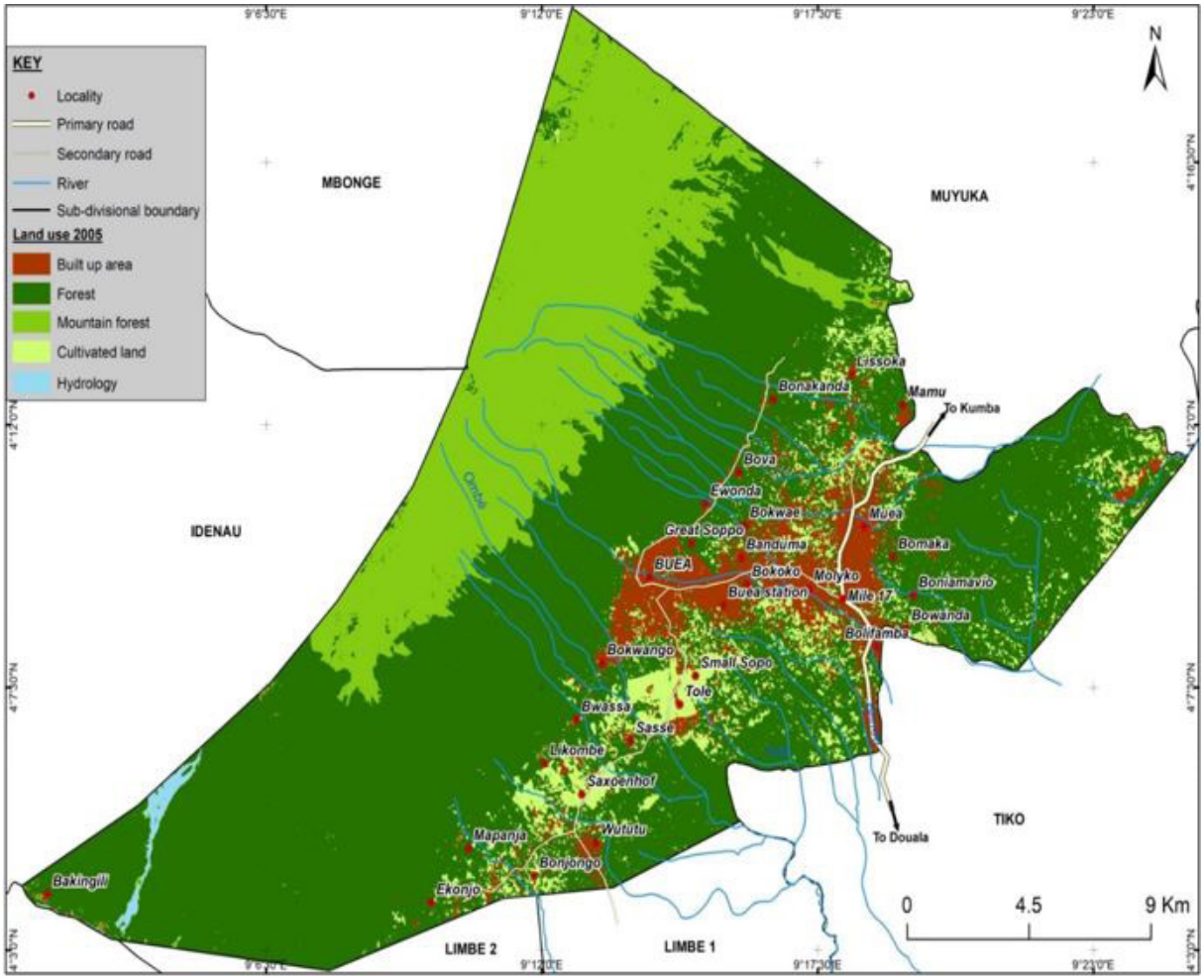


Figure 2: Local communities in the Eastern Slopes of the Mt. Cameroon region

Source: *Cameroon Forest Atlas, 2024*

A majority of the villages are inhabited by farmers who depend almost entirely on natural resources for their livelihood.

1.1. The Biodiversity Setting of the Mount Cameroon Region

Flora and Fauna: The Park is known for its luxuriant biodiversity including endemic species like the Mount Cameroon Francolin and Speirops. It's also home to various animals such as forest elephants, chimpanzees and monkeys.

Table1: Frequency and encounter rate of some wildlife species in the Mt. Cameroon region

Species	Wet season	Dry season	Total	Availability (in hrs.)
Chimpanzees	14	07	21	0.76
Mandrills	12	04	16	0.64
Duikers	15	08	23	0.71
Bush pig	07	07	14	0.48
Buffalos	03	01	04	0.13
Cobulus Monkey	36	16	52	1.2
Preuss's monkey	07	17	24	0.53
African civet	02	00	02	0.05
Putty-nosed monkey	14	11	25	0.61
Porcupine	06	02	08	0.17
Elephants	24	11	06	0.15
Total	140	86	226	5.43/0.4.4

Source: *WWF, 2021*

Some of the endemic species in the Mt. Cameroon jungle are presented in plate 1.

A= Mount Cameroon Francolin (*Pternistis camerunensis*)

B=African Forest Elephant (*Loxodonta cyclotis*)

C= Chimpanzee (*Pan troglodytes*)

D=Mandrill (*Mandrillus sphinx)*

Plate 1: Some endangered/endemic wildlife species in the Mt. Cameroon region

Source: *Courtesy of WWF, 2015*

The Mount Cameroon ecoregion is noted for its outstanding wildlife diversity. This mountain region is host to thousands of endemic/endangered wildlife species. The diverse vegetation characteristics of the region has favoured a luxuriant ecosystem.

A= Exploitation of Pygeum (*prunus Africana*). B= Repaired food crop farm

Plate 1: Some forest depletion practices in the Eastern slopes of Mt. Cameroon

Source: *Courtesy of the WWF, 2024*

The barks of Pygeum are extracted and used for the treatment of diverse health challenges (prostate cancer, urinary tract infections, malaria issues etc.). This explains why it is highly solicited. The fertile volcanic soils in the region have also accelerated the establishment of farms in the area by local people and internal migrants. Food crops such as plantains, cocoyam, beans, and maize are cultivated to sustain the food needs of the family. It is clearly observed that trees are often cut-down (and sometimes burnt) in order to establish farms. Such a practice has devastating effects on the functioning of the entire forest/wildlife ecosystem.

Table 1: Non-timber Forest Products in the Mount Cameroon region

English Name	Scientific Name	Local use (value)	Parts used (exploited
Bush Mango	*Ivingia gabonensis*	*Food, Medicine*	*Seeds*
Pygeum	*Africana prunus*	*Medicine*	*Barks, roots, seeds*
Country Onion	*Afrostyrax lepidophyllus*	*Food, Medicine*	*Seeds, roots*
Bush Pepper	*Piper guineensis*	*Food, Medicine*	*Fruits*
Bitter Kola	*Garcinia Kola*	*Food, Medicine*	*Seeds*
Kola Nut	*Cola nitida*	*Food, medicine*	*Fruits*
Njangsa	*Ricinodendron heudelotii*	*Food, Medicine*	*Seeds*
Cashew nut	*Tetracarpidium conophorum*	*Food*	*Seeds*
Eru	*Gnetum africana*	*Food*	*Leaves*
Rattan	*Eremosphatha Macrocarpa*	*Building material*	*Stem*
Mushroom	*Agricus bisporus*	*Food*	*Stem, pileus/gills*
Shell nut	*Poga deosa*	*Food, Medicine*	*Seeds*
Chewing stick	*Salvodora persica*	*Dental health*	*branches*
Honey	*Apis dorsata*	*Food, Medicine*	*Golden-brown liquid*

Source: *Courtesy of WWF, 2015*

Unsustainable harvest of non-timber forest products (NTFPs) can disrupt wildlife habitats and cause damage to the surrounding ecosystem. Unregulated exploitation of NTFPs can lead to loss of biodiversity, making ecosystems more vulnerable to climate change and other environmental threats. In the same vein, the harvesting of barks, leaves and roots of some tree such as Pygeum, can significantly cause damage, exposing them to diseases and pests.

2. Research Methodology

The approach employed in this study recognizes the complexity of analysis and understanding of environmental problems. Methods of data collection and analysis for environmental issues and challenges (especially wildlife and forest conservation) in Africa have often been criticized for being inadequate for the analysis of complex policy issues (Omondi, 1994).

The basic technique that was employed in this research included, extracting relevant existing secondary data from libraries, carrying out interviews, questionnaire administration and direct field observation. This falls under secondary and primary data collection. Asking questions targeting a multiplicity of stakeholders with the

intent to ensure data reliability. For the local community, a combination of structured questions were conceived in the form of a questionnaire that was tested and administered for a household survey. This was supplemented with interviews and focus group discussions. This was facilitated by using key informants and confidence builders at village level. Successive observations were also undertaken in the field and a digital camera was used to snap pictures of some relevant features in the study area.

This study adopted an interdisciplinary approach to analyse forest dynamics in the eastern slopes of the Mount Cameroon region. It uses a "multi-data approach" also referred to as a "multiple-subject survey" (Malleson et al., 2008)), described this approach as a "triangulation approach". The approach is suited for studies at a local or regional level, with the number of respondents ranging between 100 and 1000 (Leedy, 2015). The typology of data collection and analysis in the multiple subject survey is defined as "one in which data relating to several subjects are collected from the same respondents using an integrated questionnaire and the same basic framework'' (Leedy, 2015).

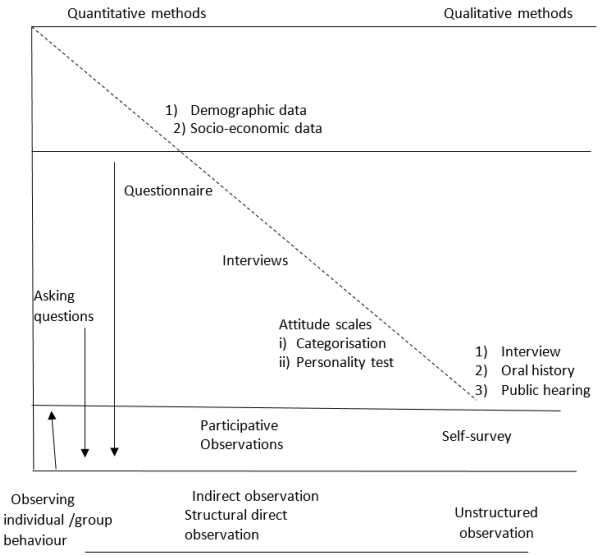


Figure 2: Socio-economic data collection methods

Source: *Adapted from Whyte (1977)*

The approach of Whyte as depicted in figure X inspired us more on how to collect Socio-economic data in the field. In this regard, questionnaire, interview, focused group discussions and direct field observations constituted the main research tools adopted in the collection of data.

2.1 Questionnaires Administration

Questionnaires (20% of the households) were designed and administered to the household heads of the various sampled villages. The focus was to size up the magnitude of anthropogenic activities carried out in the Eastern section of the Mt. Cameroon region. Interviews and focused group discussions were also

conducted in order to have an insight of the principal cause(s) of forest cover loss in the study area.

Table 2: Sampled villages for the administration of questionnaires

Source: *village chiefs and fieldwork, 2024*

Village	Estimated N° of HHs	N° of HHs[1] sampled (20%)	N° of questionnaires effectively administered	Percentage (%) of effective respondents
Bokwango	275	55	47	85.4
Bova 1	90	18	18	100
Bova 2	135	27	23	85.1
Likoko Membea	220	44	39	88.6
Total	**720**	**144**	**127**	**88.2**

Testing of Hypothesis

The Pearson's Chi-square test was used as an inferential technique in the testing of the hypothesis. The formula is stated thus:

$$x^2 = \sum \frac{(O-E)^2}{E} \quad \text{Or} \quad x^2 = Sum\ of\ (Observed - Expected)^2/Expected$$

Where x^2=Chi Square

$\sum$ = Summation

O = Observed Frequencies

E = Expected Frequencies

df = n-1

Alpha level = 0.05

3. Results/Analyses

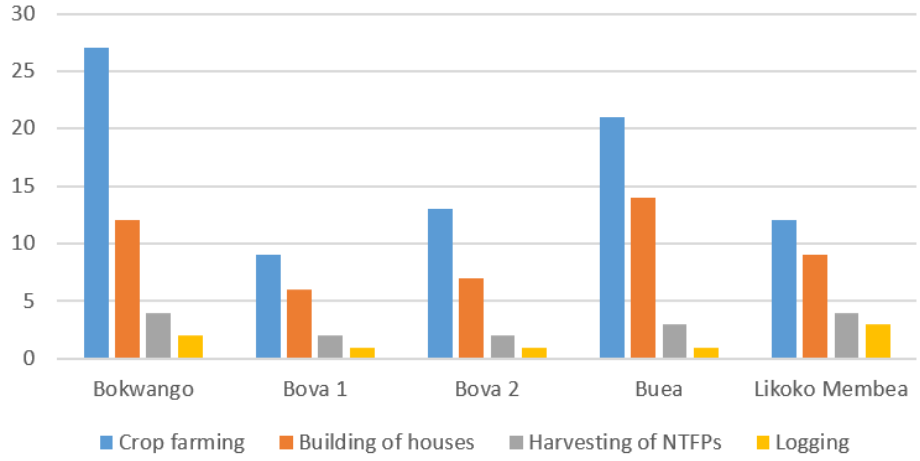
In order to seek reliable response to our research hypothesis, the following question was posed to the respondents: what is the main cause of forest cover loss in your locality? In this vein, the following responses were obtained.

1 A household comprises a person, or group of persons, generally bounded by ties of kinship, who live together under a single roof or within a single compound, and who share a community of life in that they are answerable to the same family head and share a common source of food (Leedy, 2015).

Figure 3: Respondent's perceptions livelihood activities in the Eastern slopes of Mt. Cameroon Forest

Questionnaire item	village	Crop farming	Building construction	harvesting of NTFPs	Logging
What is the main cause of forest cover loss in your locality?	Bokwango	27	12	4	2
	Bova 1	9	6	2	1
	Bova 2	13	7	2	1
	Buea	21	14	3	1
	Likoko Membea	12	9	4	3
Total	**---**	**70**	**39**	**13**	**5**

Figure 4: Trend of human activities in the study area

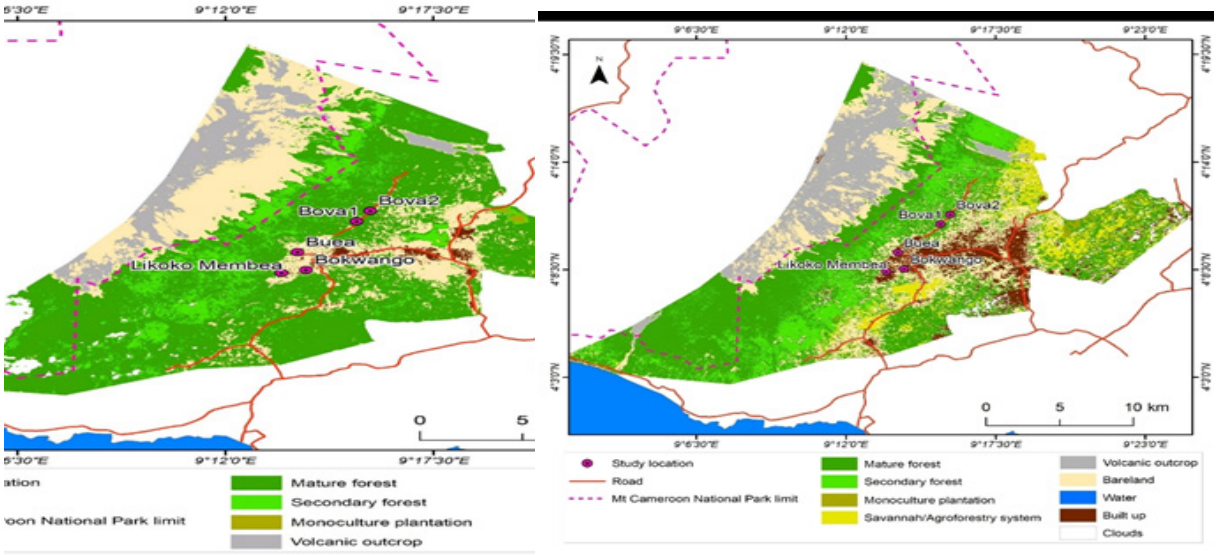


Source: computed from table 3

It's observed in figure 4 that farming activities consists of about 55.11% (n=70); closely followed by building construction practices (30.7%, n=127).

Information from satellite images reveal that the forest cover in the Easting fringes of Mount Cameroon have been significantly degraded by human activities. The satellite images in figure 5 give an insight on the man-

environment scenario in the region.



Class Name	Surface Area, 2008 (in ha)	Surface Area, 2024 (in ha)
Bareland	11577,27278	11340,50127
Built up	642,7653972	3613,578892
Clouds	2539,774798	498,0770996
Mature forest	29783,47037	21271,02503
Monoculture plantation	556,3342565	1043,781537
Secondary forest	4323,112658	3468,571953
Volcanic outcrop	3926,686747	6688,870353
Water	18,76478331	16,96730408

Figure 5: Forest cover change in the Eastern Slopes of Mt. Cameroon (2008 and 2024)

Source: *constructed by Ngoufo and Agri, 2024*

Between 2008 and 2024, more than 23.677 hectares of land was destroyed for agricultural practices. The destruction of the water shed around the mountain has also significantly led to the reduction of water bodies in the area.

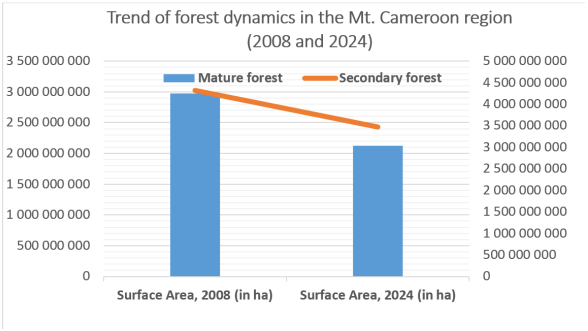


Figure 6: *Forest cover depletion in the Eastern Slopes of Mt. Cameroon*

Source: *derived from table 2*

About 23.877.111 hectares of the forest cover in the Eastern flanks of Mt. Cameroon have been lost since 2008. This implies that more than 50% of this montane forest may become extinct by 2075 if reversal strategies are not put in place.

Testing of hypothesis (x^2 statistical test)

Null hypothesis (H0): There is no significant relationship between human activities and forest cover loss on the Easting Slopes of Mount Cameroon.

Alternative hypothesis (H1): There is a significant relationship between human activities and biodiversity loss on the Easting Slopes of Mount Cameroon.

Table: Chi-square statistical test

Category	Observed	Expected	Obs.-Exp.	(Obs-Exp)²	(obs.-Exp.)²/Exp
Bokwangwo	47	31.75	15.25	232.5625	7.324803
Bova 1	18	31.75	-13.75	189.0625	2.41141
Bova 2	23	31.75	-8.75	76.5625	5.954724
Likoko Membea	39	31.75	7.25	52.5625	1.655511
$\sum n$	127	-	-	-	**19.001.959**

Source: *fieldwork, 2024*

The calculated value of 19.001 is far greater than the critical value of 7.815 stated on the x^2 statistical table (df=K-1= 4-1=3). This implies that there is a significant relationship between human activities such as crop farming, building construction, timber exploitation etc. and the depletion of forest resources in the study area. In this regard, the null hypothesis is discarded while the alternative hypothesis validated.

The effects of forest cover loss are diverse and include, biodiversity loss, climate change, accelerated soil erosion, human-induced socio-economic hardship and misery.

Recommendations and Conclusion

Based on our findings, the following recommendations have been made.

There is need to promote green and circular economy practices[2] in the Mt. Cameroon region. This involves the practice of afforestation/reforestation projects, the use of alternative sources of energy such as solar power and forest-oriented wastes management schemes in the area.

Competent government units should rethink on the concept of land tenure. There is urgent need to revisit the land ownership law in Cameroon. Natural capital is concentrated on land; hence a more adapted and holistic natural resource management approach be put in place wherein all the primary and secondary stakeholders involved in should be effectively

2 Green and circular economy practices seek to perverse the quality of the natural environment while at the same time ensuring socioeconomic livelihood practices (https//www.ellenmacarthurfoundation.org; https//www.europarl.europa.eu).

mobilized and mainstreamed in the management of forest/wildlife resources.

Capacity building of local people on environmentally livelihood projects such as agroforestry and the domestication of non-timber forest products should be reinforced in the region. The 'zero net deforestation concept'[3] echoed by environmental scientists should also be promulgated in the area.

Intensive farming practices such as market gardening should also be encouraged in the area in order to curb the massive destruction of the forest ecosystem; while safeguarding indigenous livelihood. In this vein, the management of the Mount Cameroon National Park (MCNP), has the responsibility to adopt flexible and well adapted strategies to effectively involve local people in the sustainable management of the forest wild.

The fertile volcanic soils in the Mt. Cameroon region will continue to attract farmers into the area. The rapid growth of population of about 2.8/ year is a clear indicator of pressure on forest resources in the area. Building construction is also inevitable in an area already fragile ecosystem suffering from limited land. Hence, environmental management experts, local authorities, regional and central government agents must work with the local communities in order to ensure that man and nature live in harmony (in a symbiotic relationship or mutualism).

3 Zero net deforestation occurs when each hectare deforested is compensated by reforestation or restoration of vegetation in another hectare (https//plenamata.eco).

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