



Socio-economic and ecological characteristics of deforestation around the PNKB, Kabare chiefdom

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ABSTRACT: This study, which presents the socio-economic and ecological characteristics of deforestation around the PNKB in the chiefdom of Kabare in South Kivu in the east of the DRC, started from the facts of deforestation directly observed on the socio-economic life of the population in the study area. Several methods were used, including direct observation and documentary method, survey questionnaire and semi-structured interview (intensive indirect observation) as well as remote sensing and mapping. The results of the study show the needs that weigh on deforestation in this area where more than half of the population of the entire chiefdom lives and the consequences of this deforestation on the vegetation cover of the area.

KEYWORDS: Deforestation, Ecosystem, Forest, Population, Household, Needs, Life

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I. INTRODUCTION

Now, faced with the global deterioration of the environment through deforestation, pollution and other nuisances, I would like to address each person who inhabits the planet [1]. The protection of people and that of ecosystems are intimately inseparable. This means in particular that where "the forest is not a resource to be exploited, it is a being or several beings with whom to enter into a relationship" Document Bolivia (2019) quoted by [2]. One of the major constraints that weighs on the environmental governance of the responsible management of ecosystems in general and forests in particular, lies in deforestation and land pressure in the difficult reconciliation between the imperatives of sustainable development, conservation of nature, unsatisfied needs and modes of action of life sometimes centered on the habitus and the traditions of the population in wood-energy, in ligneous resources for the construction of the habitat and in charcoal. This last constraint is a fundamental issue for the sustainability of existing forests with regard to the growth of crying energy needs [3].

Considering the importance of forests on the planet, [4] and [5] informs that forests cover the needs of the population by emphasizing that at all spatial scales, from local to global, forests and trees play an essential role in the means of subsistence of human populations as well as in the proper functioning of ecosystems. [6] also alerts everyone by showing that every second that passes; the equivalent of a football field is destroyed in the tropical forests while causing the disappearance of hundreds of birds, mammals and other populations of biodiversity whose biotope is thus destroyed.

In the Congo Basin - the second largest forest area in the tropical zone after the Amazon - the rate of net deforestation fell from 0.09% between 1990 and 2000 to 0.17% between 2000 and 2005. This increase was driven upwards by the DRC, where the rate of deforestation doubled between the two periods, from 0.11% between 1990 and 2000 to 0.22% between 2000 and 2005. The contribution of the forestry sector to GDP and economies of countries generally shows a downward trend [7].

On the other hand, deforestation in the DRC is worrying and would reach 12 to 13 million ha by 2030, and degradation 21 to 22 million ha. The associated emissions would then be 390 to 400 million tons (Mt) of

CO₂e in 2030, which represents an annual growth in emissions of between 3 and 4% over the period 2010 to 2030[8].

For other authors such as [9] and [10], calling on environmentalists, point out that forests in the DRC cover an area estimated at 155.5 million hectares and also represent almost half of the tropical rainforests of Africa. The annual rate of deforestation in the DRC is 0.25% and the rate of forest degradation between 1990-2000 was 5.4%. To this end, other authors such as [11] and [12] go further by adding that in the East of the DRC in the province of South Kivu in the PNKB and in its surrounding villages; deforestation is done on a daily basis following the population explosion, the search for land, the carbonization of wood for energy needs, the search for building materials, the proliferation of clandestine sawmills for wood labor and the illicit exploitation of minerals, which is also dominant. This situation is more catastrophic the closer you get to the city of Bukavu, the more the carbonization and the cutting of wood for energy needs and the construction of houses or the firing of bricks increase their impact on deforestation.

In addition, others also point out that with the highest population growth rate in Central Africa of 3.3%, the human population in the DRC already represents a future threat to the forests, which could be subjected to an increase in deforestation and degradation [13].

Through a study carried out by the Ministry in charge of the environment and forests in the DRC, the Congolese government has identified and prioritized the causes of deforestation and forest degradation in this country with significant ecological potential and possible solution to the problems of global warming[8]. In this regard, Pope Francis draws everyone's attention to the safeguarding of the planet as a common home, recalling that the deterioration of the environment and that of society affect in a special way the weakest of this planet: "Both the common experience of ordinary life and scientific investigation demonstrate that it is the poor who suffer most from the most serious effects of all environmental aggressions" [1]. For his part, the study on deforestation ... by the Ministry of the Environment, Nature Conservation and Tourism of the DRC retains as the main direct causes: slash-and-burn agriculture, artisanal exploitation of trees either as lumber or wood -energy and artisanal mining. The indirect causes are multiple, including population growth, the poverty of the peasant masses and the administrative deficit [8].

This paper is analyzed the socio-economic and ecological characteristics of deforestation around the PNKB in the Kabare chiefdom.

II. MATERIAL AND METHOD

2.1 STUDY MATERIAL

The study focused on 7 groups (Bugobe, Cirunga, Bushwira, Mudaka, Miti, Bugorhe and Irhambi-Katana) out of 14 groups that make up the Kabare chiefdom. It lies between Longitudes 28° 55' and 28°45' E to Latitude 2°27' and 2°19' S. The area covers 1265 km², with an elevation between 1460 and 3000 m above the sea level on top of the high mountains at Mulume Munene. The average altitude is 2230 m. Its 14 groups are Bugobe (90 km²), Bugorhe (108 km²), Bushwira (100 km²), Bushumba (98 km²), Cirunga (102 km²), Miti (80 km²), Mudaka (93 km²), Mudusa (91 km²), Mumosho (87 km²), Kagabi (83 km²), Irhambi-Katana (117 km²), Luhihi (86 km²), Lugendo (85 km²), Ishungu (45 km²) (Kabare Chiefdom Office, 2019). The neighboring villages of PNKB that were the subject of this study are Karhwa/Kalulu (Bugobe), Munguzi/Cibingu (Cirunga), Bibanda/Bushwira center (Bushwira), Mugangane/Cibumbiro (Mudaka), Kamalyongo/Cibinda (Miti), Cisirhu/Kamakombe (Bugorhe) and Maziba/Kahungu (Irhambi-Katana). Participant observation and survey were carried out from January 7, 2019 to October 18, 2021. Figure 1 represents the sampling sites in the seven groups of the study area.

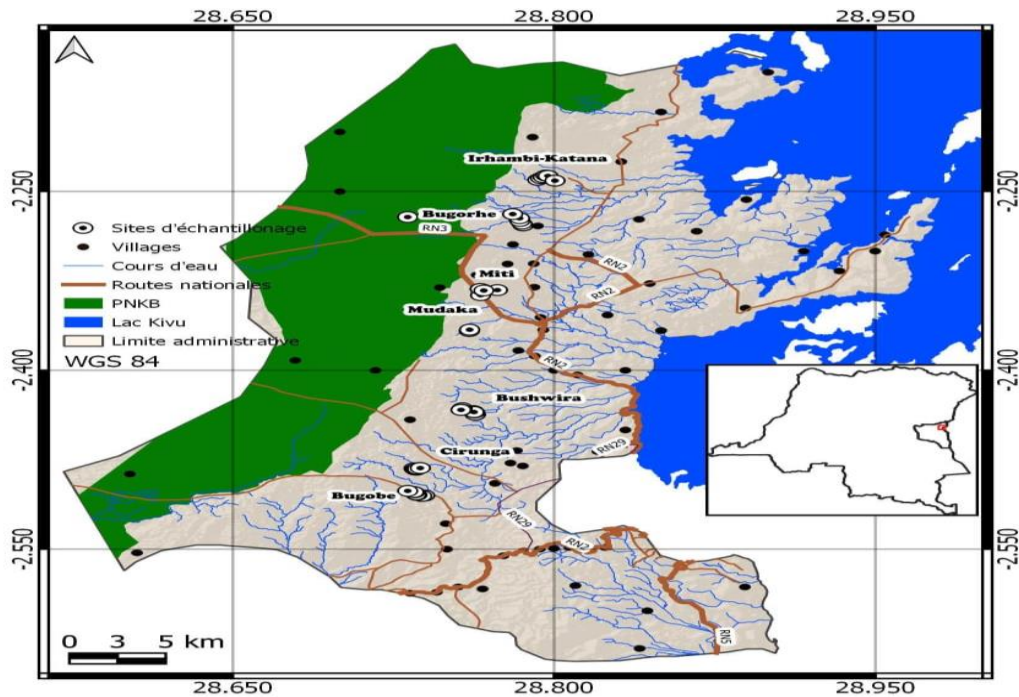


Figure 1: Sampling sites in seven groups of the Kabare chiefdom

This study area located west of the former province of Kivu, the chiefdom of Kabare (Figure 2) is limited:

- To the north by the Nyabarongo river which separates it from the territory of Kalehe,
- To the south by the chiefdom of Ngweshe in Walungu territory,
- To the west by the Kahuzi Biega National Park (PNKB) and by the Lushanja River which separates it from the Nindja chiefdom, the Kalonge group (Buhavu community in Kalehe territory),
- To the east by the city of Bukavu, by the Ruzizi river towards Rwanda and by Lake Kivu.

This chiefdom extends over an area of 1265Km² with a population of 824418 inhabitants in 2020 and a density of 686 inhabitants/Km² (Kabare Chiefdom, Local Development Plan 2021-2025)



Figure 2: Geographic location map of Kabare chiefdom (GIZ, 2020)

2.2 SAMPLING AND ANALYSES

2.2.1. Direct observation method

This method of participant observation consisted in this study in carrying out field investigations with households, with actors involved in forestry in the study area. It was also used to observe the effects of deforestation on the real life of respondents in the field through their lifestyles. Then she helped us stay (live) in the study area for the duration of the research. This allowed us to familiarize ourselves with the respondents, to easily collect data on deforestation and then also to discuss with the respondents in their environment to deepen the information received, the observations made directly on the phenomena of deforestation which underlie their socio-economic life in this part of the Kabare chiefdom.

2.2.2. Documentary method

Documentary research as an indirect observation consisted in identifying and clearly defining the problem related to deforestation in the study area. To do this, documentary research related to deforestation in the study area was linked in a critical approach to the contents of linear documents (books, encyclopedias, electronic sites, articles, activity reports, maps, plans development of the Kabare chiefdom,...); with particular attention to writings that emphasize aspects of the socio-economic life of the population of the study area.

2.2.3. Remote sensing and mapping

Remote sensing by uploading images to the USGS site and mapping were carried out to obtain maps of the evolution of plant cover and land occupancy rates in the study area from 1990 to 2020. To do this, the Landsat satellite images and the shapefile of the study area were exploited in the WGS 84 geographic coordinate system from the website: <https://earthexplorer.usgs.gov/>. Then, these images were visualized and analyzed with the QGIS 3.22.8 software in order to allow this study to define the different classes of land cover in the study area. Through the SCP extension (Semi-automatic classification plugin) of this QGIS 3.22.8 software, the classes of vegetation, buildings, watercourses and soils have been used as objective classes or macro-classes. The classes of forests, plantations, crops, swamps, dwellings, bare soil and water have also been used as subclasses or spectral classes.

2.2.4. Survey Questionnaire

The survey questionnaire technique was used in the field to collect data from the sample of respondents drawn from households and staff members working in the study area. This technique allowed us to obtain reliable information thanks to the questions posed directly to the respondents involved (households and stakeholders) in deforestation and/or in its effects across the study area. The answers obtained were directly recorded in the notebooks in the field before being entered on the computer in the data matrix.

2.2.5. Semi-structured interview (intensive indirect observation)

The collection of data in the field through participant observation coupled with a semi-structured interview nourished by exchanges with the respondents was carried out using the questionnaire (with open and in-depth questions) serving as an interview guide. in 7 groups in the study area (Bugobe, Cirunga, Bushwira, Mudaka, Miti, Bugorhe and Irhambi-Katana). This interview was conducted as an individual interview in order to deepen the understanding, opinions and positions of the respondents regarding the object of study. This phase allowed us to build the socio-economic events of deforestation activities on the life of the population surveyed in the chiefdom of Kabare on the edge of the PNKB.

2.2.6. Sampling

The sample was considered to be a segment or part of the studied community that bears the characteristics of this community and represents it with regard to the object of the research [14]. In this regard and given the difficulty of being able to reach all households in the Kabare chiefdom, the study focused on 7 groups (Bugobe, Cirunga, Bushwira, Mudaka, Miti, Bugorhe and Irhambi-Katana) out of 14 groups which make up the chiefdom of Kabare.

Households and institutions in villages close to the PNKB, i.e. on the direct border with the PNKB, were taken into account. The distribution of the probabilistic sample for the survey was carried out taking into account

the two categories (households living around the PNKB forest and development actors engaged in the fight against deforestation who work directly with the households around the PNKB) to obtain useful information on the perception and alternative of the population and stakeholders (PNKB and partners) in reducing deforestation in the study area.

To do this, the probability sampling technique has been chosen for its ability to give each element of the parent population the same chance of participating directly in this survey with a degree of precision of 5% and confidence of 95% [15] and [16]. The sample was calculated based on the degree of confidence of 95% and that of precision of 5% obtained using the table for estimating the size of a probability sample as proposed by [15]. This sample must represent at least 10% of the size of the parent population and must consist of a minimum of 30 units [15]. Moreover, the sample calculation as done at this level in this study is also confirmed by the Raosoft formula online [16]. In terms of the numbers we have selected below, the sample size (n) and the margin of error (E) are given by

$$x = Z \left(\frac{c}{100} \right)^2 r(100 - r), \quad n = \frac{x}{((N - 1)E^2 + x)}, \quad E = Sqrt \left[\frac{(N - n)x}{n(N - 1)} \right]$$

Where N is the population size, r is the fraction of responses you are interested in, and $Z \left(\frac{c}{100} \right)$ is the critical value for the confidence level.

The sample is 19.7% or 307 households drawn from a parent population of 1560 households bordering the PNKB and from a sample of 52.2% of staff members of institutions working in the fight against deforestation on the edge of the PNKB i.e. 58 agents taken from a parent population of 111 staff members involved in the field of deforestation in the study area. Hence the sample of 307 households and 58 local development actors was chosen to provide information and other data for this study.

2.2.7. Statistical analysis

This technique was then used in the collection of data in the study area, through the linking of information obtained from the respondents and in the assessment of the relationships between the different variables chosen for study. The data obtained during the surveys were encoded on Microsoft Excel (2010) sheets. And the descriptive analysis of the data was done using IBM SPSS Statistics 25 software and pie charts by Microsoft Excel (2010).

III. RESULT AND DISCUSSION

3.1. Distribution of the population according to group

Figure 3 below presents the population of the Kabare chiefdom by group and according to whether it is located far or around the PNKB over a period of five years (20015 to 2020).

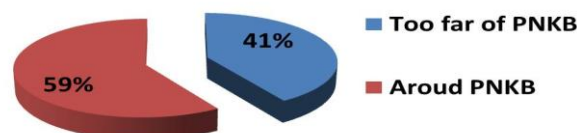


Figure 3: Population distribution in Kabare Chiefdom from 2015 to 2020

The distribution of the population in the chiefdom of Kabare shows that the majority of the population is grouped around the forest of the Kahuzi Biega National Park. There are 7 groups around the PNKB or 59% (2636721 people) of the total population (Cirunga: 463975 people, Bugobe: 268860 people, Bushwira: 335302 people, Mudaka: 296618 people, Miti: 169915 people, Bugorhe: 570087 people and Irhambi-Katana: 531,964

people; and 7 other groups far from the PNKB, i.e. 41% (1850,751 people) of the total population (Kagabi: 259,809 people, Bushumba: 340,033 people, Lugendo: 133,331 people, Ishungu: 58,208 people, Luhihi: 194,995 people, Mudusa: 591,527 people and Mumoshu: 272,848 people). This demographic presence of the majority of the population of the chiefdom, i.e. 59% around the PNKB, naturally constitutes a population center or a worrying demographic factor with regard to the pressure on the forest formations. This result also shows that most of the population of this chiefdom is concentrated more on the edge of PNKB or around the World Heritage. This is explained by the fact that the population of this chiefdom is mainly poor and does not have remunerative work. To do this, the forest or the park constitutes for her, a sure source of income for survival (in search of wood energy, charcoal, arable and farm land, medicinal plants, food, income, ...) without taking into account what this entails as deforestation and degradation of the forest, threat to biodiversity and ecosystems by anthropogenic activities. This result is naturally in line with [18], who report that at the end of the 1980s, we repeatedly find that the idea of poverty is one of the sources of environmental problems. This idea is also conveyed in the Brundtland report, Our common future, where we can read from the introduction to the first chapter that "the poor are forced to overuse environmental resources to survive from day to day, and the impoverishment of their environment impoverishes them even more; making their survival always difficult and uncertain" [17]. By concurring with these results, [18] through the factors that distort rural poverty, adds by emphasizing that in developing countries, the poorest are forced to survive to leave densely populated areas that are better served, to go to establish in forests, savannahs and more remote areas in Brazil, Kenya, Zambia (far from the railway line), central India and the mountains of Nepal. Lukombe Nghenda (2004) quoted [19] agrees with our results by recalling that in the DRC, subject to the rights of forest use recognized for local communities, agricultural activities are prohibited in any site or protected area. This measure, although having the merit of wanting to protect the environmental framework, constitutes a real challenge to the rights of local communities and therefore to the protection of the environment with regard to their survival and population growth.

3.2. Profile of surveyed households

3.2.1. Size of surveyed households

Table 1 below shows the minimum, average and maximum household size of the marital status of households surveyed by a group in the study area.

Table 1: Household size by the group in Kabare Chiefdom

Group	Minimum	Average	Maximum
Bugobe	3	12	23
Bugorhe	4	11	17
Bushwira	6	11	15
Cirunga	11	13	14
Irhambi-Katana	8	14	18
Miti	2	12	22
Mudaka	5	11	18

In this Table 1, it emerges that in the households of seven Kabare chiefdom groupings around the PNKB, the minimum number of people per household varies between 2 and 11 (with the highest minimum in Cirunga followed by Irhambi-Katana with 8 people per household). The average also varies between 11 and 14 persons per household (with the highest average in Irhambi-Katana followed by Cirunga with 13 persons per household). The maximum varies, however, between 14 and 23 persons per household (with the highest maximum in Bugobe followed by the Miti grouping with 22 persons per household). This average of 11 household members around the KBNP forest is worrying about population growth and the pressure that already exists on the forests as a result of human activities. Furthermore, in this environment, children are an investment for the household, a free labour force and a social value in the community. This encourages each household to build up its strength through its children. Referring to the population growth rate in the DRC according to the [20], which is 3.2%, by 2030; the current population of 824078 inhabitants of this Kabare chiefdom of 1265 km² could normally reach the number of 1087788 inhabitants. Consequently, its density will increase from 652 inhabitants/km² to 860 inhabitants/km². In any case, this ever-growing population remains and continues to be a threat to natural resources and a real challenge for forest management in this chiefdom. This result naturally meets the analysis of the MEDD, which stresses that demography is one of the seven main factors of deforestation in the DRC, alongside governance, energy, land management, land tenure, land use planning and agriculture [21]. The FAO also concurs with this finding by confirming that the increasing dependence on forest-based products (energy, food and other products,

from medicinal plants to household items) threatens the physical integrity, richness, biological diversity and productivity of forests and woodlands. Concerning the organisation and planning of responses to these problems, FAO maintains that there is an urgent need for detailed knowledge of available resources, including forests and woodlands, and for their planning and management for the sustainable development of communities. The assessment and sustainable management of natural resources is the basis for sustainable rural development in sub-Saharan Africa to limit population growth and its impacts on the environment [22]. This also applies to the number of people per plot in this study area, as shown in Figure 4 below. It should be added that this number of people constitutes human capital involved in deforestation within each household because of the increasing demand for charcoal and wood energy. Secondly, the tree has increased its economic value within the households in the study area as trees are cut before they mature. Deforestation has become an attractive business and income-generating unit for households in the study area. It is the safest economic activity for households in this area, leading economically to the replacement of the banana plantation - decimated almost everywhere - by the tree. In all respects, this result is consistent with [23] who report that despite their historically low rates of deforestation, the countries of the Congo Basin may be entering a new phase of economic development that will increase pressure on forests over the next 20-30 years. Growing urban centres are creating new dynamics and needs for food and energy supply (mainly charcoal), which are likely to be met only by increasing pressure on forest areas with many environmental consequences [23]. [24] adds that in the early 1980s, USAID through CEPAL, using the tools of economic anthropology to analyse the problem of reforestation, concluded that 'the market orientation and social organisation of Haitian peasant society, coupled with the growing demand for wood to meet energy needs, suggest that the time has come to consider the feasibility of cash-cropping of wood' [25]. This approach is in line with that of French-speaking critics of land management projects who develop the concept of 'development logic', a vision that emphasises that priority should be given in land management to increasing agricultural productivity and that 'the control of erosion and runoff appears to be one of the components of the restoration of soil fertility' (Lilin, 1987) quoted by [24].

3.2.2. Number of people per plot in surveyed households

Figure 4 below shows the number of people per plot in the households surveyed in the Kabare chieftaincy study area on the edge of the PNKB. The number of people per household in the respondents' plots varies from 1 to 5 people per plot for 13 households or 4% of respondents; from 6 to 10 people for 88 households surveyed or 29%; from 11 to 15 people for 155 households surveyed or 51%; from 16 to 20 people for 44 households surveyed or 14% and from 21 to 25 people for 7 households surveyed or 2%. This result shows that there is more agglomeration of households around the PNKB as confirmed by the result in Figure 1 above on the distribution of the population in Kabare Chiefdom 2015 to 2020. The majority of plots in the surveyed households, 51%, contain 11 to 15 people in the plot. This result is also supported by [24] who point out that the annual rate of clearing in the dense forest is strongly correlated with rural population density. In the DRC, [8] goes on to point out that when looking at the gradient and phasing in the process of vegetation cover change as cleared by the population, it is noticeable that peasant activities and population density are cited first and foremost, and the allusion to industrial timber exploitation is sometimes elided or treated by preterit. The same author, referring to the province of North Kivu, stresses that the high human density in this province generates very strong pressure on forest resources as a whole in easily accessible areas. This result is also in line with that of [24], who states that the density of woodland cover varies according to a set of factors relating to the physical characteristics of the environment and the economic conditions specific to the environment or specific types of exploitation.

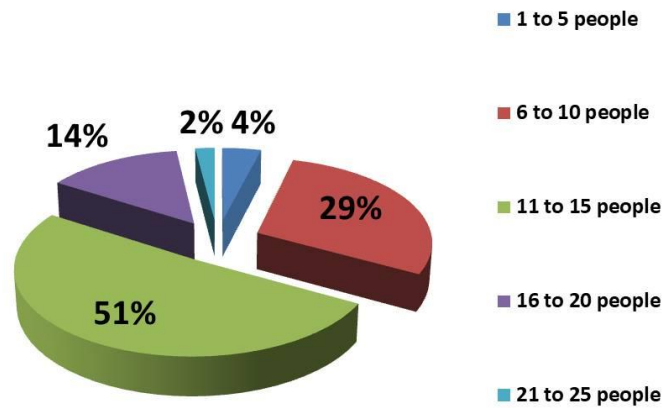


Figure 4: Number of people per plot in surveyed households

3.3. Relationship between Deforestation and household consumption

3.3.1. Needs underlying deforestation according to stakeholders in the environment

Figure 5 below provides information on the needs that drive the households surveyed to engage in deforestation activities in their villages and Kahuzi Biega National Park, according to household stakeholders in the study area. The results for the development actors supporting households in the fight against deforestation and/or in other areas in the study area: household food takes first place with 41% of the needs that drive households to deforestation to organize household survival. This is followed by the search for building materials for houses with 21%; the schooling of children in the household with 17%; the search for income for the marriage of children, for savings (likilimba), for contributions to social events, etc with 14%; and the sale of charcoal with 7%. These results are in line with those of [26], who states that, about forest-related activities, the harvesting and collection of forest products are carried out around the houses and in the depths of the forest. The products harvested are intended to meet the needs of the population for food, medicines, handicrafts, energy production and wood for building houses (huts), improving their habitat, building other structures such as schools and health centers, etc [26]. In line with these findings, [24] also adds that the deforestation of the country is often presented as a contemporary phenomenon that is particularly the result of the accelerated cutting of wood for charcoal production. This view does not stand up to historical analysis, which shows a much older process in which the commercial exploitation of wood is combined with progressive colonization of the territory, under the effect of demographic pressure, to create a space where the perennial cover changes in nature and only occupies limited areas.

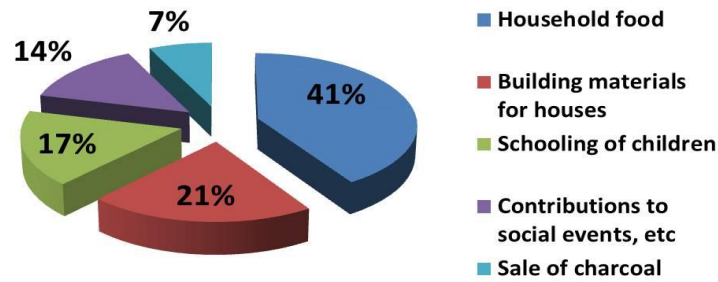


Figure 5: Basic needs of deforestation according to household supporters

For the households surveyed, the needs at the root of deforestation are food for the family, which continues to occupy the first place with 45%. This is followed by other needs such as schooling for children (17%), the sale of charcoal (13%), the search for construction materials (12%), the search for wood energy (5%), the search for arable land and farms (4%) and the search for income (3%). These results support the results presented by the actors involved in reducing deforestation in the study area (figure 6) and agree with [27], the ecological and social crises throughout the world require a return to the concept of basic human needs and a re-examination of the limits of the two major dominant institutions of the 20th century, the market on the one hand and planning on the other, which claim to provide a satisfactory response to their coverage. Frankfurt (2017) quoted by [27] adds that basic needs must be covered as a priority by the sufficient provision of goods and services, insisting on the strengthening of resilience to climate change for food security.

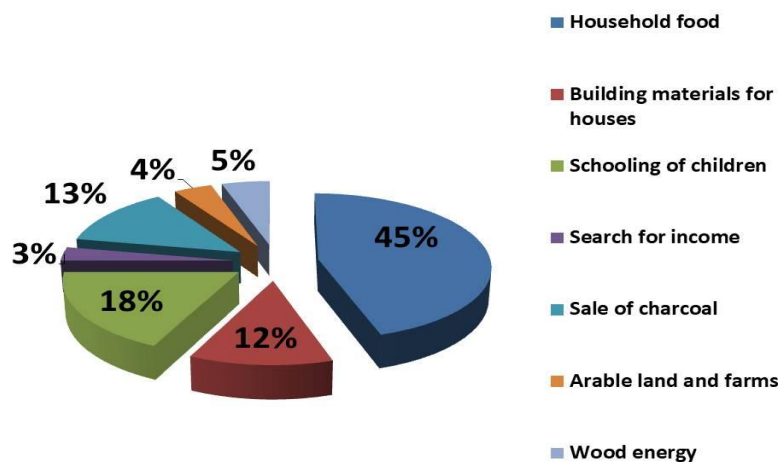


Figure 6: Basic needs of deforestation according to surveyed households

3.2 Impact of deforestation activities on Land Cover

3.2.1. Land Use and Land Cover in Kabare Chiefdom

Figures 7a, 7b, 7c, 7d, 7e, 7f and 7g show the Land Use and Land Cover also the bare soil (figure 8) of Kabare Chiefdom for seven years (1990, 1994, 2000, 2005, 2010, 2015 and 2020).

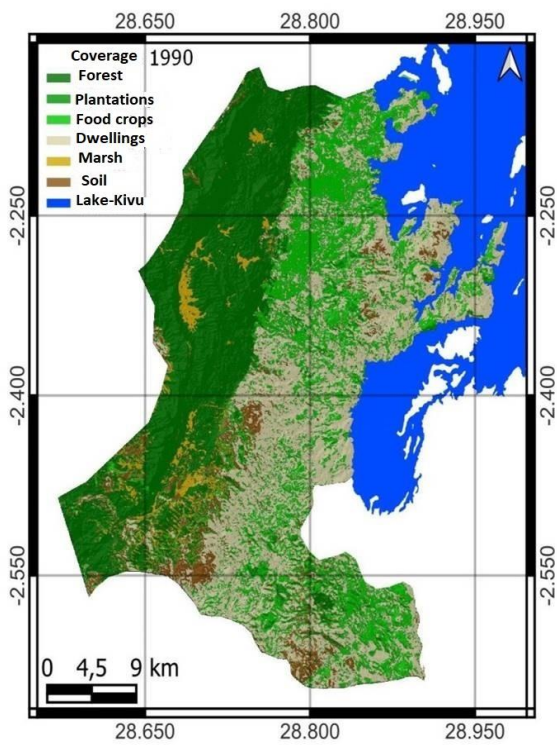


Figure 7a: Land Use and Land Cover (1990)

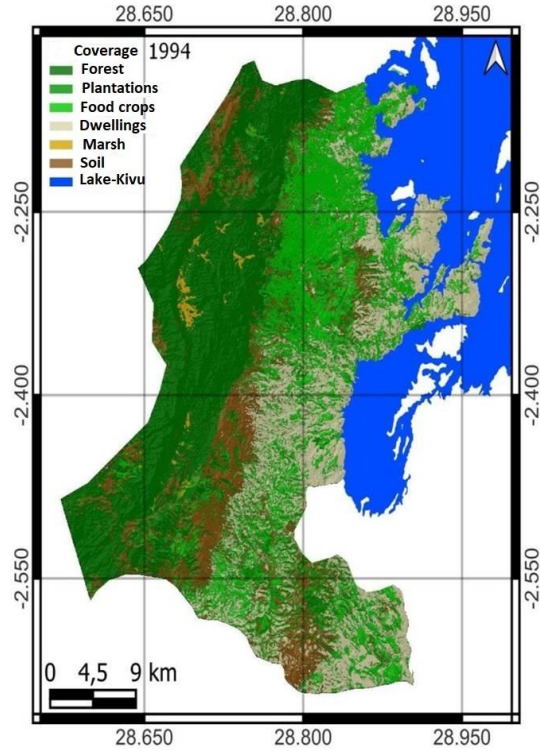


Figure 7b: Land Use and Land Cover (1994)

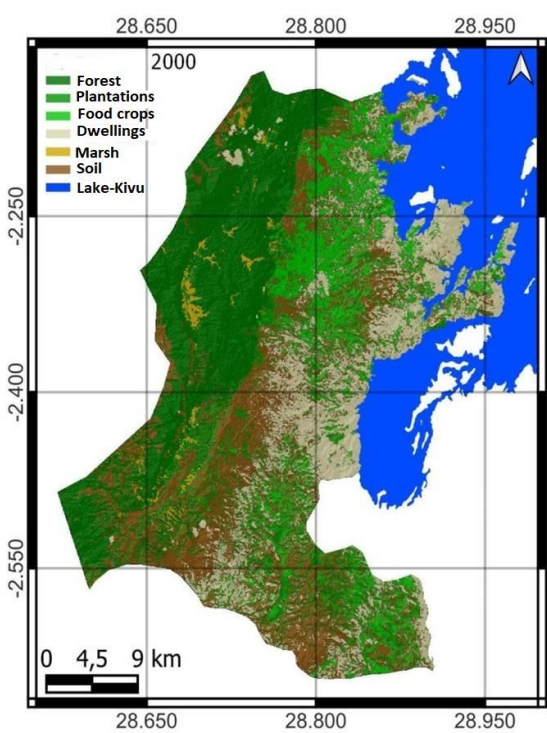


Figure 7c: Land Use and Land Cover (2000)

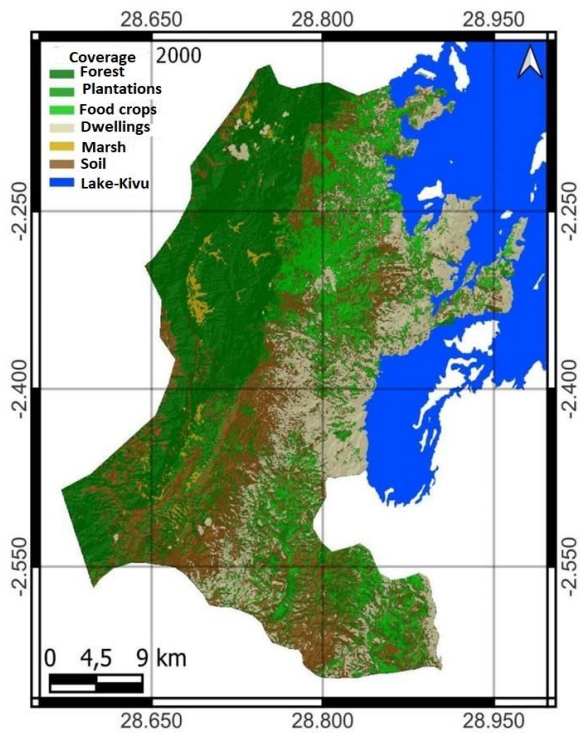


Figure 7d: Land Use and Land Cover (2005)

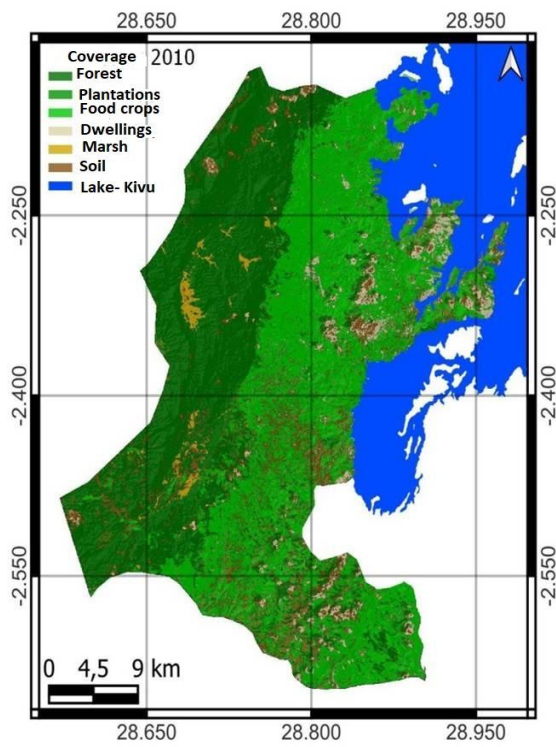


Figure 7e: Land Use and Land Cover (2010)

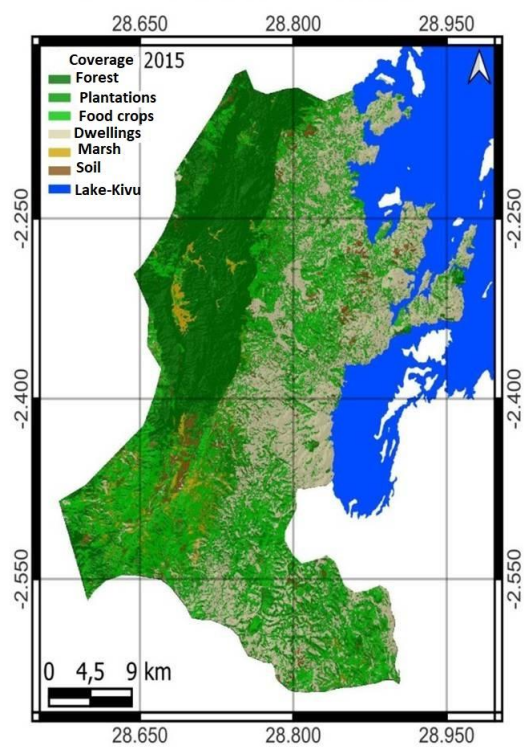


Figure 7f: Land Use and Land Cover (2015)

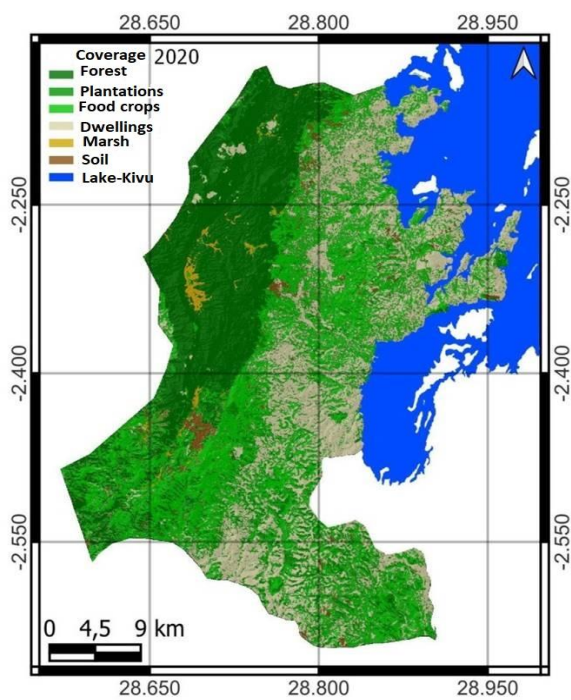


Figure 7g: Land Use and Land Cover (2020)

Figure 7: Land User and Land Cover for the years 1990, 1994, 2000, 2005, 2010, 2015 and 2020.

Figure 8 shows the annual land cover rate of either food crops, water, forest, dwellings, swamp(marsh), plantations and/or bare soil due to depletion from over-exploitation or inappropriate use in this Kabare Chiefdom in 1990, 1994, 2000, 2010, 2020

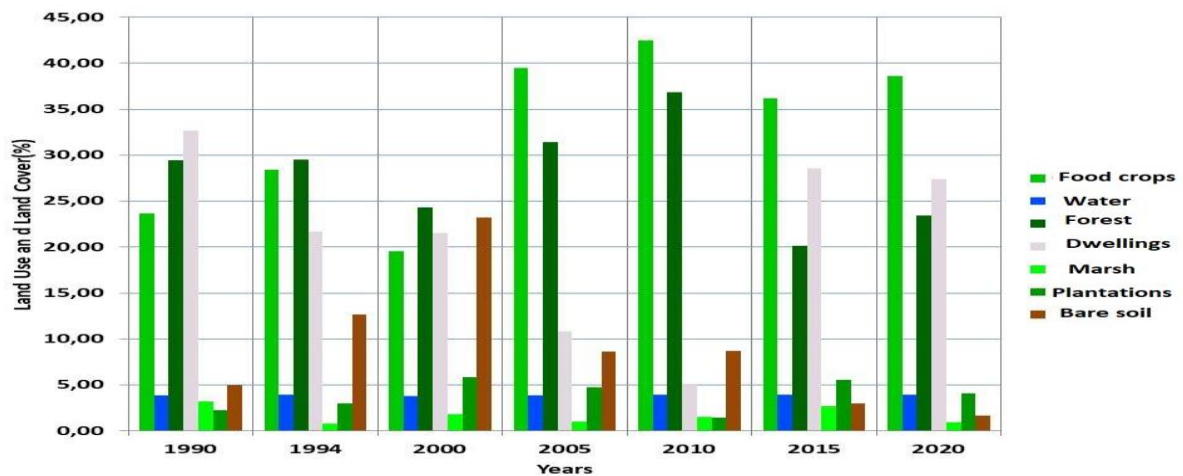


Figure 8: Annual Land Use and Land Cover in Kabare Chiefdom (1990, 1994, 2000, 2005, 2010, and 2020)

Given the equatorial and tropical climate in the study area and the mountainous terrain that characterizes this environment, the Kabare chiefdom should remain naturally dominated by forest vegetation. However, as a result of constant deforestation, the permanent search for land and the demographic explosion, the natural forest vegetation has disappeared in some places as observed in figures 7 to 13 above. Overall, anthropogenic actions on the vegetation cover (overgrazing, deforestation, agriculture unsuited to the relief and overexploitation of the soil by crops that follow one another without fallow for decades, draining of marshes to grow crops, etc.) are responsible for this situation presented in figures 7(a,b,c,d and e) and 8.

However, in general, the vegetation of this chiefdom is part of the relics of a secondary forest hosting species such as *Neoboutonia macro-calyx*, *Albizia gummifera*, *Jasminum abyssinicum*, *Jasminum dichotomum*, *Myrica salicifolia*, *Polyscias fulva*, *Bridelia micrantha*, *Maesa lanceolata*, *Maytenus arguta* etc. In addition to these species, there are ruderal plants, vegetable plants, exotic plants, cultivated plants and post-cultivated plants that are increasing and invading the area to the detriment of the natural vegetation. Other species have been introduced into the area. They are being cultivated in this chiefdom to compensate for the catastrophic deforestation while providing energy wood and construction trees to the owners of the concessions in the woodlands, which are scattered here and there, mostly on the hills. These species generally belong to the genera *Podocarpus*, *Eucalyptus*, *Cupressus*, *Grevillea*, *Pinus*, *Calliandra*, *Cedrella*, *Markhamia*, ... and to some exogenous species that have been introduced in this study area for the economic purpose with the agro-industrial of multinationals. These include cinchona, tea and coffee, which are often grown by households in banana plantations throughout the villages. In all respects, most of the vegetation in this chiefdom is savannah with natural vegetation often consisting of wild grasses. In the villages of the chiefdom, the vegetation was dominated by the banana plantation (a source of food and household economy). This banana plantation - a vegetation cover in the region - has been systematically ravaged by bacterial wilt and is currently being replaced in the villages by sugar canes next to the houses. In the past, however, sugar cane cultivation was reserved for the lowlands in the marshes, far from the houses, because the population considered them to be a habitat for insects (mosquitoes) that are harmful to humans and domestic animals in the villages. On the plateaus, such as at Mulume Munene towards the PNKB and inside the PNKB, west of this chiefdom, there is a layered forest of bamboo, forest species and shrubs as well as primary forest grasses; but it should be noted that this vegetation is also under serious threat from deforestation and the consequent degradation that follows. In the marshy valleys, there is sedge vegetation (Cyperaceae) (raw material for hut construction) and wetland vegetation cover. However, this vegetation is disappearing because of the infertility of the soil in the villages: everyone is trying to get a field in the marsh by chasing the sedge (a vegetation cover that some generations may not see any more in this environment).

Cyperaceae vegetation still exists in the marshes that have not yet been fully exploited, and Poaceae reed vegetation can be found along the lakes and large rivers, serving as spawning and fry production areas. There are also a few forest galleries on the shores of Lake Kivu and around some rivers. These findings are consistent with [28] who, in discussing prospects for sustainable environmental governance, note that there are no longer any fields to cultivate in this part of Kabare chiefdom as fields are being converted into housing plots and few remunerative public services are offering average monthly salaries of US\$100 in this area.

These results also meet those of the MECNT, which indicate that for Congolese civil society, when looking at the gradient and staggering in the process of change in vegetation cover released by peasant activities and population density, which are often cited first, the allusion to industrial timber exploitation is sometimes elided or treated by pretense. In Bandundu province, the steppe zone extends over the southern highlands of the province, except for the Kikwit-Feshi-Gungu triangle where there are open forests, mixed with savannahs and steppes; the province's vegetation cover is continually threatened by degradation resulting from human behavior characterized by bushfires, wood cutting and forest burning in search of resources to ensure survival [8].

IV. CONCLUSION

This study has attempted to examine the explanatory factors of deforestation at the edge of the KBNP in the chiefdom of Kabare in South Kivu in Eastern DRC. In light of the different aspects analyzed, we realize that the majority of the population of this chiefdom lives around the KBNP with essential household needs centred on deforestation in this environment where the forest is progressively being replaced by savannah or by bare ground next to the world heritage site which is already in danger. This situation calls for a clear collective ecological awareness of the protection of the forests and biodiversity by reinforcing the well-being of the population living next to the forests to reduce the disappearance of the ecosystem. Deforestation in the vicinity of the PNKB requires the implementation of policies that protect humans by providing a rational response to the needs of current households surrounding the park without compromising the ability of future generations to meet their own needs.

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