EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

FOREST DEPLETION AND ITS RAMIFICATIONS IN THE CONTIGUOUS NGONGBAA-KILUM FOREST IN BUI DIVISION OF CAMEROON

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ABSTRACT ----------
Forest depletion (deforestation and forest degradation,) has occurred in indigenous homelands over several thousands of years, and it is ongoing in many forests. More than 1400 distinct indigenous peoples living in the world's tropical and sub-tropical ecosystems (Tauli-Corpuz, 2008 and 2009), most of whom are hunters, gatherers, and rotational agriculturalists or shifting cultivators encroach on forest for their agro-pastoral activities. The study investigates drivers of forest depletion and its consequences in the contiguous Ngongbaa-Kilum, forest area in Bui Division in the Northwest Region of Cameroon. Data was collected from 10% of the 8416 households of the 2005 census data (BUCREP, 2005) spread in 21 villages at the fringes of the contiguous Ngongbaa-Kilum forest Two sets of data were used for this study, primary and secondary data. Primary data comprises responses of respondents to questionnaires, interviews, focus group discussions, inferential and experimental data. We used the Base map of Nkambe, satellite images GPS survey data to evaluate spatial land cover change. Participatory mapping was carried out using GPS receivers to update topographic map and satellite data.

The findings show that the depletion the Contiguous Ngongbaa-Kilum forests between 1963 and 1987 was caused by exploitation of Prunus africana, coffee and food crop farming, invasive eucalyptus, the fall in coffee prices in the 1980s; and the Irish potato boom. This led to the reduction of the Ngongbaa forest from 5780.6 hectares in 1963 to 2977.6 hectares in 1987 (reduction of 48.5%) while the Kilum section reduced from 19119.3 hectares to 8127.9 hectares (reduction of 61.4%). Consequently, the density, heights and sizes of trees also reduced. Larger mammals like leopards, buffalos, gorillas etc. are extinct. The depletion of this forest also engendered climate change, reductions in volumes of streams, migration of organisms, fluctuation of weather, and decaying of crops. This obliged the Cameroon Government in collaboration with international partners to create the KMFP in 1987 to conserve the contiguous Ngongbaa-Kilum forest. This project that was later renamed Kilum-Ijim forest project in 1992 took over the management of the forests from the Nso and Oku people, delimited the forest boundary, conserved the forest, raised local peoples' capacities and conservation concerns, carved the forest into 5 community forests and transferred their management to FMIs in 2004. Deforestation and forest degradation have reduced to their lowest ebb with minor cases of encroachment into the forests by frontline farmers.

To maintain the forest limits, study recommends that, the state in collaboration with the local communities should replace the Prunnus africana tress that withered after illegal exploitation with non-economic trees that develop thick canopies that can inhibit undergrowth, resist fire and discourage frontline farmers from encroaching into the forest. Also, alternative resources should be icreated through agro-forestry. Furthermore, a reforestation program should be established in order to restore degraded portions of the reserve area

KEY WORDS: *Forest, depletion, Ngongbaa, Kilum, encroachment, anthropogenic activities.----------*

INTRODUCTION

Population's pressure and anthropogenic activities of indigenous and exogenous groups eventually lead to intensive depletion and exhaustion of irreplaceable resources that constitute the base for their livelihood. This article investigates the impact of anthropogenic activities on the Ngongbaa and Kilum forests on the ecological systems and the wellbeing of forest Nso and Oku populations' resident in this area. Two main groups of people depend on the Ngongbaa and Kilum forests for livelihood, the indigenous Nso and Oku Semi-Bantu clans and the exogenous nomadic Fulani (Mbororo) herdsmen of the Jaffren tribe. The settlement of people on the slopes of the Oku mountain dates back to the periods of Bani (Fulani) raids, tribal wars of conquest and German expeditions in the Bamenda grassfields which forced some people to seek refuge in inaccessible areas of the Ngongbaa and Kilum forests. Later on, the search for new space and family conflicts obliged some of the people from large family groupings in Nso, Ndzeendev, Yuuwar, Tsenla, Nso Palace and Mbiame palaces etc. to migrate west and settled on the slopes of the Oku Mountain where they established farmsteads that later developed into villages.

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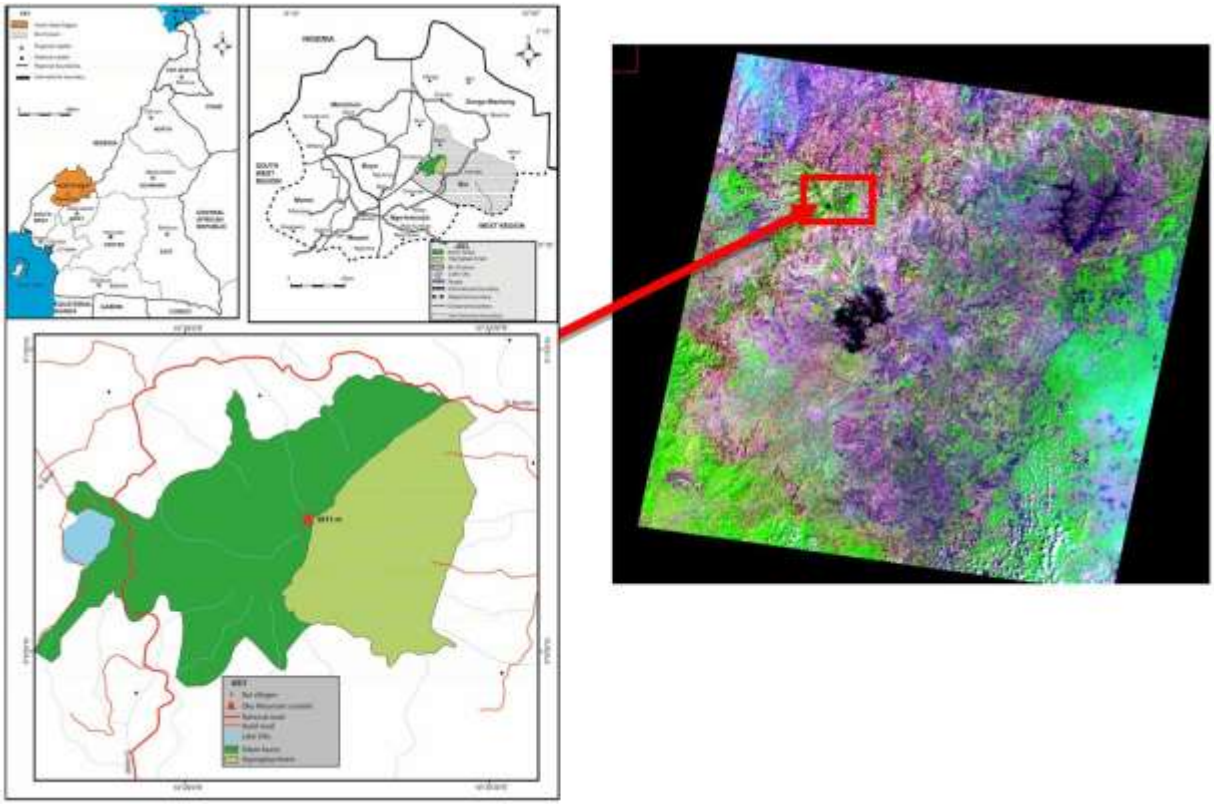
From the Oku traditional administrative capital at Elak, Oku has developed from the exploitation of resources on the slopes of the Oku Mountain into villages and what is now referred to as Oku Subdivision. The Mbororo of the Jeffren tribe entered the Ngongbaa and Kilum sides of the Oku Mountain during the late 19th century when the whole of the Bamenda highlands was affected by the fulani raids from the north and west Later on, with agreement with the fon of Nso, the Mbororos settled on the Banso Plateau (Nkum and Mbiame hills), on the hills of Banten, Jakiri, Simonkov, Mbonyar, Tadu, Vekovi and Ntur). By the late 1920s the Mbororo overcame the obstacles posed by the rugged relief and with agreement with the Fon of Oku, they acquired grazing land on the Oku Mountain. Due to pressure on land for agriculture and settlement from the indigenous populations, the Mbororos and their animals have been confined in grassland enclaves (hilltops) on rock outcrops in the forest. Njibairu and Asahn were pioneer Fulani graziers who raised their animals in Ngongbaa Forest before 1957(Deinis Mborong, pers.com. The study falls within the framework of population pressure, migration and landscape dynamics".

1.The location of the study area

The Ngongbaa and Kilum Forests are located on the west of Bui Division in the Bamenda Highlands of Cameroon. Ngongbaa Forest known locally as Ngongbaa Kov is located on the east-facing slopes of Mount Oku between latitudes N6˚11' and N6˚14' north of the equator and between longitudes E 10˚31' and E 10˚35'50" east of the Greenwich meridian. The Kilum (Oku section of the Oku Mountain Forest) is found on the western half of the Mountain between latitude 6˚10'0"N and N 6˚14'0"N. of the Equator and between longitudes 10˚28'0"E and 10˚34'0" east of the Greenwich meridian as depicted on Figure 1. The Ngongbaa Forest parallels the Kilum Forest and from their lower slopes, they culminate to their common summit at (3011 m). According to Banadzem (2008) and Shey Ghanghanin (2012), the Ngongbaa Forest covers a surface area of about 3234 hectares. From the map of Nkambe 32-XVII, and LANDSAT Image of 1988, Geo Image 2015 and Google Image 2015, the Ngongbaa Forest covers a surface area of 2977.6 hectares, while the Kilum section extends for 5150.3 hectares, making a total surface area of 8127.9 remnant Oku montane forest.



Source: National Institute of Cartography, LANDSAT Image 2019 and GPS data, 2015.

Figure 1. Location of the Ngonbaa and Kilum Forest

2.METHODOLOGY

Data was collected from 10% of the 8435 households of the 2005 census data (BUCREP, 2005) sspread over 21 villages at the fringes of the forest. Two sets of data were used for this study, primary and secondary data. Secondary data was secured from the Ministry of Forestry and Wildlife (MINFOF), Ministry of Environment and

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Nature Protection (MINEP), archives of the defunct Kilum and Ijim Projects libraries, Cameroon Biodiversity and Conservation Society, (CBCS), Bird Life International, archives of Forest Management Institutions (FMIs), archives of the delegations of Agriculture, Forestry and Wildlife, and of the Fisheries and Animals Husbandry Bui, internet and so on. Analytical data on household numbers and human population in the 21 villages of the study area was gleaned from the census reports of BUCREP (*Bureau Central de Recensements et Des Etudes de La Population* for 1969, 1976, 1987 and 2005). Xerox copies of analytical data on crop and animal production in Bui Division and the study area was acquired from the annual reports of the divisional delegations of agriculture, livestock, fisheries and animal industries and from Plan and Regional Development in Kumbo. The base map of Nkambe 1/200.000, NB-32-XVII (1963-1964) was secured from National Institute of Cartography in Yaounde. The map was used to calculation the surface area of the contiguous Ngongbaa-Kilum Forests for the period 1963-1964. The, LANDSAT images of 1988, 2001 and SPOT 6 Image 2015 and participatory mapping with GPS receivers were used to draw the spatial evolution maps of Ngongbaa and Kilum Forest. We used adobe illustrator software programme and exported the final map into useable JPG format. The LANDSAT satellite images of 1988, and spot 6 Image of 2015 were superposed on the topographic maps of Nkambe 1963 to evaluate the evolution of the contiguous Ngongbaa-Kilum forest. We used Satellite photographs and the UTM Zone 32 analysed map prepared by the Ecological Monitoring Programme of KIFP from the Base map of Nkambe series and ground survey with GPS receivers complemented information from topographic map, aerial photos and satellite images in evaluating spatial land cover change (quantitative forest cover change. Participatory mapping was carried out using GPS receivers to supplement and/or update topographic map and satellite data.

Primary data comprise responses of respondents to questionnaires, interviews, and focus group discussions, inferential and experimental data. The research team also interviewed landlords of Ngongbaa area including ShuFaay Mbolong, ShuFaay Yungnkuiy, and Faay Tanini. We also interviewed village heads, *faays*, *ashuufaay*, *manjong* group leaders, forest management groups, Forest Management Officers (FMOs), former-workers of the defunct Kilum Mountain Forest Project (KMFP). *Representatives of* Oku immigrant's resident in the study area were also interviewed. Forestry authorities in Bui were also interviewed to better understand how the policies of KMFP and KIFP were implemented in Ngongbaa area. We also interviewed forest users including Beekeepers, carvers, hunters, mushroom harvesters, and wild honey harvesters Information was also procured through personal communication (pers.com.) from informants identified to possess specific information. Focus group discussions were done with members of three community forest groups of the Ngongbaa Forest area including Bihkov, Mbai, Nchiiy, Emfii Meiy, Ijim and upper Shinga, to gather information on the causes and consequences of the destruction and degradation of the Ngongbaa-Kilum contiguous forest.

3.RESERCH FIDINGS AND DISCUSSIONS

1. Drivers of the depletion of contiguous Ngongbaa-Kilum forest

From field Survey, the depletion of t Ngongbaa and Kilum forests dates back to the time of earliest settlements on the lower slopes of the Oku Mountain about in the early 17th century. And a number of other factors including population pressure, insecurity, conflicts, settlement, farming, hunting, commercial exploitation of *Prunus africana*, the slump in the coffee prices (coffee crise) in the I980s and, the Irish potatoes boom in the 1980s as depicted on Table 1.

Table 1: The Cumulative responses of residents of the Ngongbaa and Kilum forest area vis-à-vis drivers of forest depletion

Forest area	Village	Number of respondents	In your opinion what are the cause of the depletion of Ngongbaa and Kilum forest?				
			Population growth	Farming and settlement Irish potatoes farming	Fires	Commercial exploitation of Prunus africana	Hunting
Ngongbaa	Ntur	2	2	2	1	0	2
	Vekovi	100	100	100	45	30	45
	Wvem	45	45	45	25	0	18
	Taashem	2	2	2	0	1	2
	Shuukov	2	2	2	2	1	2
	Fonmboh (Tankiy)	5	5	5	5	3	5

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	Tadu	35	35	35	25	3	30
	Simonkov	28	28	28	20	25	20
	Buh	25	25	25	15	0	20
	Mbontovi	6	6	6	0	0	6
	Mbonyar	8	8	8	8	8	8
Kilum	Mbockevu	30	30	30	25	10	25
	Lang,	35	35	35	25	11	28
	Mbockejikijem	30	30	30	10	13	15
	Jikijem	50	50	50	10	0	23
	Ngashie	11	11	11	3	5	5
	Keyon	35	35	35	18	0	16
	Manchok	45	45	45	10	5	25
	Ngvenkei 11	22	22	22	5	0	10
Total		**516**	**516**	**516**	**252**	**115**	**305**
Percentage		**100**	**100**	**100**	**48.8**	**22.3**	**59.1**

Source: Field Survey 2012-2014 by Tatah Jean-Louis Banadzem

1.1 Population Growth and the depletion of Ngongbaa and Kilum forests

From table 1, there is unanimity in Ngongbaa and Oku areas that population growth has increased the demand for forest resources, settlement and farming space. The rich forest soils attracted farmers who opened farms for the cultivation of coffee and food crops resulting in the depletion of the above forests from the 1920s to 1987. 48.8% of respondents gave the view that farming/grazing-related fires also ravaged the forest. Meanwhile, 22.3% expressed the view that commercial exploitation of *Prunus africana trees* has led to the depletion of the forests. Hunting also affected the population of wildlife negatively. In addition, human and animal population also contributed to the depletion of Ngongbaa and Kilum forest. Population pressure in Kimbo and Elak areas obliged people to migrate in search of virgin land on the slopes of the Oku Mountain increasing increased pressure on land and forest resources as depicted census data of 1969, 1976, 1987 and 2005 on (Table 2).

Table 2: The evolution population in the ngongbaa and kilum forests area (1969-2015)

Name of village	Population 1969	Population 1976	Population 1987	Population 2005	Number of households 1969/1976	Number of households 1987	Number of households 2005	Projected population 20015
Kai	107	-	200	1861	13	20	367	2387
Ntur	324	394	262	102	23	38	12	35
Vekovi	3075	1994	3833	6648	409	662	1080	7720
Wvem	1443	1319	1120	2626	125	290	512	2981
Taashem	-	15	62	80	4	16	20	104
Shuukov	23	-	50	80	8	15	18	97
Fonmboh (Tankiy)	31	-	64	354	10	17	54	451
Tadu	-	1469	1370	2753	-	245	480	3579
Simonkov	1309	657	1596	2985	160	145	414	3488
Buh	-	1363	1557	1824	-	278	374	2371
Mbontovi	25	-	313	835	29	49	92	1078
Mbonyar (Mbockeghas)	410	-	476	1005	33	60	109	1184
Ngvenkei 11	50	-	80	2191	14	23	249	2833
Manchok,	2399	-	2898	4052	246	367	541	4548
Elak	1622	-	3853	6799	258	464	820	8352
Keyon	594	-	1303	2495	103	148	370	3065
Ngashie	2016	-	2963	1042	173	272	106	750
Jiyane	1024	-	2293	2820	156	229	270	3359
Mboh	423	-	1106	395	87	131	50	387
Kisottin	973	-	2963	1700	197	272	197	1918
Jikijem,	2709	-	2634	4500	193	250	587	5037
Mbockejikijem	531	-	912	4475	70	110	461	5658

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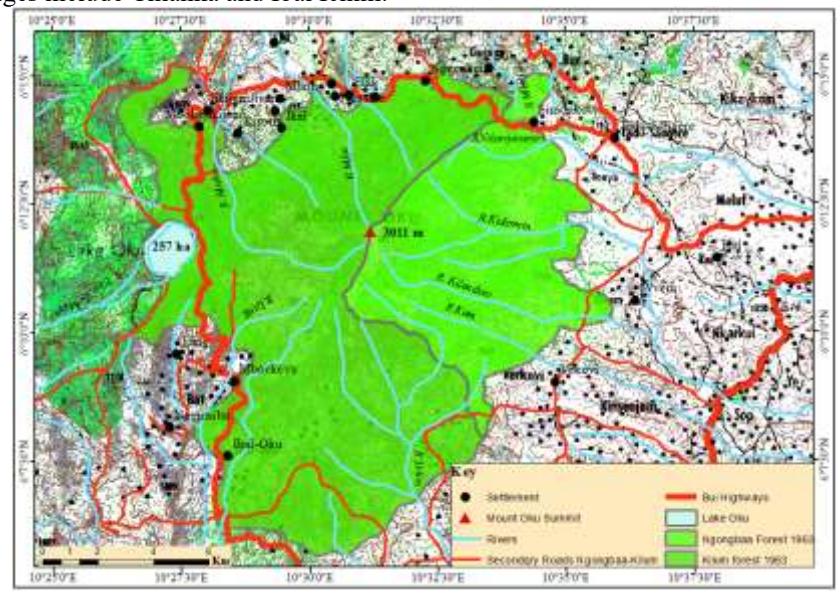
Ichim	2228	-	4492	6403	223	319	612	7656
Lang,	804	-	1658	3900	100	174	553	4829
Mbockevu	1309	-	1868	3146	160	400	441	3697
Ibal	2000	-	2769	1646	210	271	339	1540
Ngemsiba	1085	-	1895	2086	98	148	294	2386
Total	26 514	7 211	44 590	68803	3 102	5 297	9422	81490
Percentage change[1]	100	-72.8	518.4	54.3	100	70.8	41.25	18.4

Source: National Data for the 1969, 1976, 1987 and 20005 Census secured from the National Office

From table 2, the population of the Nso and Oku people resident on the slopes of the Oku Mountain more than doubled between 1969 and 1987, representing 68.2% growth rate. This corresponds to the period when agro-silvo-pastoral activities intensified in the Ngongbaa and Kilum forest areas. From 26514 people in 1969, the population depending on these forests rose to close to 70 000 in 2005 corresponding increase in the demand for land for farming, settlement, and forest products.

The link between Settlement and the depletion of the Ngongbaa and Kilum forests

We gathered in the field that before the Germans took control of Oku in 1905 and subdued the Nso in 1906, very few settlements existed on the Slopes of the Oku Mountain. Most settlements in Ngongbaa date back to the late 19th century. These Villages include Kai, Buh, Tadu- Sangere, Mbonyar (Mbockenghas), Wvem and Vekovi. Meanwhile, on the Oku side (Kilum), the pioneer villages include Bô Gwenkei II, Oku (Elak), Mbam, Nkfei, Ngham, Jikijem and Jiyane as depicted on clip image on figure 2. From table 2, some 7 211 people depended on the Oku Mountain for livelihood by 1976. By 1987 the number had risen six folds to 44 590 inhabitants and more. According to Mbinkar (1990), over 100.000 people depended on the Oku Mountain Forest by 1983 mostly farmers who came from villages in the interior of Nso. Field information indicates that villages like Taashem, Simonkov, Tankiy, Ntur, Ntovi and Keri that were earlier quarters of these mother villages attained the status of villages when the settlements and populations increased considerably. Meanwhile in Oku during the same period, villages like Manchok, Keyon, Ngashie, Mboh, Jiyane, Lii, Kisotin, Mbockejikijem Lang and Mbockevu grew from agricultural hamlets to villages between 1975 and 1987. Some hamlets that are likely to grow into future villages in the Ngongbaa forest area include Semti and Mbo-Shimawir and Shuukov. Meanwhile in Oku, hamlets like to become full villages include Chianka and Ibal Ichim.



Source: National Institute of Cartography, LANDSAT Image 2019 and GPS data, 2015.

Figure 2: The Aerial coverage of Ngongbaa and Kilum forests and adjoining settlements in 1963

Based on the facts gathered in the field these villages can be categorised into four main categories, mother (pioneer) villages, satellite villages, secondary (Irish Potato-induced) villages and prospective villages. By 2015,

[1] % Change $= \left(\frac{Pop_{B-Pop_A}}{Pop_A}\right) \times 100$

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some 81490 people will directly and indirectly depend on the Ngongbaa and Kilum forest and thus increased the rates of depletion of these forests (Enchaw, 2009). The above pioneer (mother) villages were founded by pioneer settlers long before the arrival of the Germans in Cameroon (Table 3). The first people settled in these mother villages in search of refuge from tribal wars and Fulani raids in the 17th century while some migrated because of succession conflicts. For instance, the Oku Princes who migrated from Oku angered by their inability to succeed the throne of Oku. (Faay Tawaiy, pers.com), established the Mbiseiy and Taawaiy compounds in Buh and Ntur respectively. Satellite villages developed in the early 20th century as people moved out from mother villages due to population growth and the search for space to settled and farm. Secondary villages developed in the 1980s when people cleared forest to create farmlands. This is the case of villages like Shuukov

Table 3: Development of settlements in the Ngongbaa and Kilum forest areas

Forest zone	Pioneer Villages	Period of emergence	Satellite village	Period of emergence	Secondary or Irish potatoes boom villages	Period of emergence	Prospective villages	Period of emergence
Ngongbaa	Buh	17th century	Ntovi	1920s	Taashem	1980s	Semti	1980s
	Wvem	17th century			Shuukov	1980s	Shimawir	1980s
	Vekovi	17th century	Simonkov	1920s	Tankiy (Fonmboh)	1997	Chianka	1980s
	Kai	17th century	Ntur	1920s				
	Tadu Sangere	Late 17th century	Keri	1920s				
Kilum	Ngwenkei 11	17th century	Keyon	Before 1920s				
	Elak	17th century			Mbockejikijem	1980s	Ibal-Ichim	1970s
	Manchok	17th century						
	Ngashie	17th century			Mbokevu	1950s		
	Jiyane	17th century						
	Bô	17th century			Lang	1950s		
	Jikijem	17th century			Ibal	1920s		
	Ichim	17th century						
	Lui	17th century						
	Mbam	17th century						
	Mboh	17th century						
	Nkfeiy	17th century						

Source: Topographic Map of Nkambe NB-32-XVII, census *data for 1969, 1976, 1987 and 2005 and Fieldwork 2012-2015*

Taashem, Mbockejikijem, Mbockevu, Kissotin etc. Prospective villages like Semti, Mbohshimawir, Chianka, and Ibal-Ichim are farmsteads that were created in the 1980s by farmers on the slopes of the Oku Mountain. We gathered in the field those anthropogenic activities intensified in the Oku Mountain in the 1980s. The absence of industries in Bui Division and non-timber forest products such as Eru (*Gnetum africana*), Bush Mango (*Ervingia gabonensis*), Plum (*Dacyodes elulis*), and Bitter cola (*Garcinia cola*) that could generate income for the local people, has made people to use forest for crop cultivation, hunting, grazing, extraction of honey etc. These activities led to the reduction in the size and quality of the contiguous Ngongbaa and Kilum forests. The increase in the number of graziers and animals also increased the demand for forestland (Tables 4 and 5).

Table 4: Animal population in Bui Division (1998/99)

Subdivisional Delegation *of MINEPIA*	Type of animal species		
	Bovine (cattle)	**Ovine (goats)**	**Caprine (sheep)**
Kumbo, Noni and Oku	45200	41300	27100
Jakiri	1500	5000	5200
Total	**56700**	**46000**	**32000**
Divisional total	**72885**	**54025**	**44000**

Source: Annual Report of the Bui Divisional Delegation of MINEPIA, No. 61, 1998.

Animals are raised on rock outcrops with prairies that constitute source of pasture for animals. These parries include *Woohyewiyi*, *Woohyetereeh*, *Kilum*, *WoohMbai* etc. From table 4, there were 56700 cattle, 46000 goats

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and, 32000 sheep in Kumbo, Noni, Oku and Jakiri with a considerable proportion of these animals grazed in the Ngongbaa and Kilum forest.

The goats and sheep population fell from 98.125 in 1999 to 69.125 in the year 2000. For cattle, the population fell from 72885 in 1999 to 56340 cattle. This fall in animal number is due to the non-inclusion of animal figures of Noni Subdivision and the inability of the livestock department to register all the animals according to workers of MINEPIA, Kumbo. Of recent, some Mbororos and Oku elite rear cattle on a large scale on the hills at Mbockevu and Ibal respectively, thus further increasing the animal population. From informants in the field, the Mbororos graze their cattle on the Kilum plateau since the 1920s.

Table 5: Estimated Animal population in Bui Division (2003)

Subdivision	Locality	Animal species		
		Bovine (cattle)	Ovine (goats)	Caprine (sheep)
Kumbo	Kumbo	4415	4732	8497
	Tatum	3227	973	926
	Tadu	2510	1545	1331
Jakiri	Jakiri	7500	2000	2600
	Vekovi	4726	3000	2800
Oku	Elak-Oku	2500	5000	4500
Total		**24748**	**17250**	**20054**
Divisional total		**56340**	**30824**	**28208**

Source: Annual Report of the Bui Divisional Delegation of MINEPIA, 1st-31st January 2003

3.1 Impact of commercial exploitation of *Prunus africana on* the Ngongbaa and Kilum forests

Information gathered in the field show that an inextricably link exists between commercial exploitation of *Prunus africana between* 1976 and 1986, and the depletion of Ngongbaa and Kilum forests. The initiation of the exploitation of *Prunus africana* constituted the initial phase of the infiltration of an exogenous forest management system in the above forests. According to ex-workers of PLANTECAM contacted in the field, the authorisation of the exploitation *Prunus africana in* the Oku Mountain Forest ignited large-scale human activities in the Oku Montane Forest. Before the introduction of commercial exploitation of *Prunus*, only small-scale livelihood activities were carried out on the lower slopes and fringes of the Forest. These small-scale activities included beekeeping, hunting, extraction of medicinal plants, firewood extraction, and limited subsistence agricultural activities. According to Hans Joachim (2000) until the 1970s, many people earned their living by gathering the bark of the hardwood tree (*Pygaeum africanum,* an activity that contributed to the destruction of the forests (Photo 1).

Photo 1: The piles of *Prunus africana barks* extracted from Ngongbaa Forest
Photos by Mbinkar J.B, 28 March 1991

Large-scale exploitation of *Prunus africana also* engendered large-scale agro-pastoral activities in the Ngongbaa and Kilum forests in the 1980s that further contributed to the death of *Prunus africana and* other trees. Before the conservation of the Oku Mountain Forest in 1987, the Ngongbaa and Kilum forests had lost 80% of mature *Pygaeum* trees due to farming. (Parrot and Parrot, 1990) and Mbenkum and Fisiy (1991) estimated that close to 8000 *Pygaeum* trees were lost in the 1980s. Plate 1 depicts some workers of PLANTECAM transporting bundles of reddish *Prunus africana barks* on their backs destined for collection and evacuation points. In a discussion with one of the ex-employees of PLANTECAM, the informant explained that the back transport system was the only method of transporting *Prunus africana from* the forest because access routes to the forest was through narrow foot paths created by graziers, carvers, bee keepers and hunters. This is due to the rugged nature of the relief of the Oku Mountain. The *Prunus africana barks* were assembled at collection points where the barks were loaded into heavy trucks and transported to head office of PLANTECAM in Buea. Plate 1 depicts

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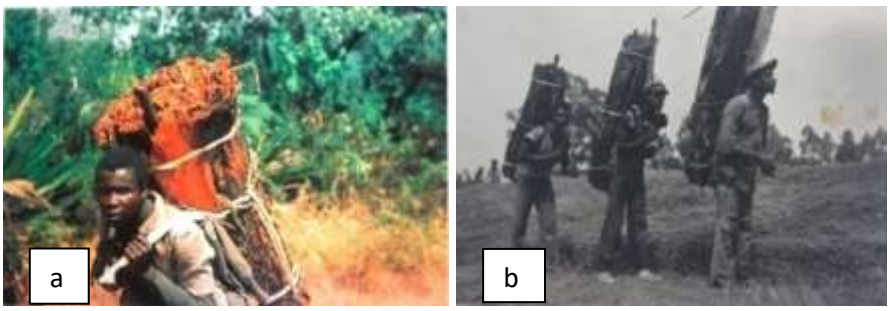


Plate 1: Workers of PLANTECAM transporting bundles of Prunus africana barks harvested in the Ngongbaa and Oku areas of the Oku Mountain Forest on their backs

Plate 1a: PLANTECAM worker transporting Prunus africana extracted from the Oku mountain forest on his backs. Photos by Hans Joachim, January 20. 1977.
Plate 1b: PLANTECAM workers transporting Prunus africana extracted from the Oku Mountain Forest on their backs. Photos by Renaissance Little Sammy Photo, Lii-Oku, January 16, 1978.

Plate 2 depicts a pile of *Prunus africana barks* and transporting trucks at one of PLANTECAM's collection points at Simonkov village. In October 1986, PLANTECAM withdrew from the Oku Mountain with the conviction that Pygaeum population had been fully exploited.

Plate 2: *Prunus africana* barks piles and transport trucks at the Simonkov village at the *Prunus africana* collection points

Plate 2a: A pile of dried Prunus africana Barks extracted from Ngongbaa forest at the collection point at Simonkov village.
Plate 2b: Trucks used for the transportation of Prunus africana barks to PLANTECAM head office in Buea
Photos by B.A New Combe's High Elementary Photos, Lum-Oku, February 12, 1978.

Although PLANTECAM stopped the exploitation of *Pygaeum africana* in 1986 to allow the *Prunus africana* trees exploited to heal, the forestry Department of the Cameroon Ministry still issued exploitation licences to individual contractors who continued with the exploitation of *the tree.* From 1987 to date, these individual contractors and illicit exploiters carry out the exploitation of *Prunus Africana in* the Ngongbaa and Kilum Forest in violation of traditional harvesting norms. Some of these local exploiters at times felled *Prunus africana* trees before removing the barks. Some of the exploiters of the tree also trip off completely barks from immature *Prunus Africana* trees that caused the trees to wither and die as portrayed on Plate 3. In spite of the conservation of the mountain forest by the KMFP in 1987 and KIFP in 1995 and the imposition of a ban on exploitation of *Pygaeum africana*, illegal exploitation resumed in 2002 when management was handed to Community Forest Groups (CFGs) including Bihkov, Nchiiy and Mbai.

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

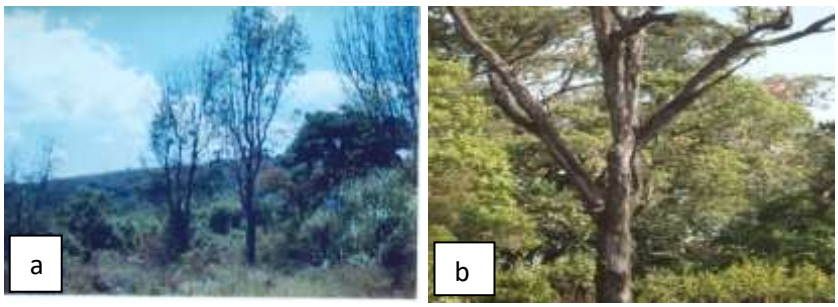


Plate 3: Dry *Pygaeum africana* trees due to violation of harvesting norm resulting from violation of exploitation norms in the Ngongbaa and Kilum forests

Photos by Tatah Jean-Louis Banadzem2004 and 2010

These illegal exploiters harvested young trees less than 30 cm in diameter, the authorised size (mature tree). A network of forest crimes has developed characterised by felling of trees, ring- barking of *Prunus africana trees*. Illegal exploiters display fake licences to FMOs to exploit in the forest. The worst case of wanton exploitation of *Prunus africana* was observed in the Nchiiy community forest where hundreds of *Prunus africana* trees have died due to ring barking and/or felling of the trees. In 2002, following the issuing of fake exploitation licences to AFRIMED (*Societé Africaine de Medicaments*) by a MINEF official, there was a rapid return to illegal exploitation. This phenomenon has continued to date. Ironically, this illegal exploitation takes place with the complicity of FMOs entrusted with the management of the forests according to forest users. This illegal practice has led to the killing of *Prunus Africana* trees planted at forest boundary line. The situation of other trees in the forest is not any better as some FMOs are exploiters themselves. To curb this illegal exploitation, the authorities of the delegation of MINEF for Bui Division seized 21 bundles of Pygaeum bark illegally harvested from Oku Mountain Forest (Plate 4).

Plate 4: Illegal exploitation of Prunus Africana and other non-timber forest products in the Ngongbaa and Kilum forests

Plate 4a: Bundles of illegally harvested Prunus africana seized and stored in the divisional Delegation of Former MINEF, Bui. Photo by Tatah Jean-Louis Banadzem, 2004
Plate 4b &C: Bundles of Illegally Harvested Prunus africana and lichen Seized and Stored in the Divisional Delegation of MINFOF-Mbockevu. Photo by Tatah Jean-Louis Banadzem, February 28, 2015

According to the members of the Association of Oku Forest Management Institutions (ASSOFOMI), licensed buyers of *Prunus Africana* come by day and buy *Prunus* from FMIs, but in the night, they buy from illegal exploiters. The local people also blame forest officials for unilaterally authorising buyers of *Prunus africana* in violation of the Management Agreement (MA) which requires that exploitation inventory be carried out before any exploitation to ensure its sustainability. Regrettably, only partial inventory of Prunus Africana has been carried out in the three community forests of Ngongbaa and Oku areas. Furthermore, unsustainable exploitation took place in Nchiiy because licensed buyers employed illegal exploiters with little formal training on harvesting norms. In spite of the fact that Bihkov FMI has reported persons guilty of violating forest laws, little or no action has been taken against defaulters by forestry authorities. This has encouraged other people to violate the laws. The study shows that lichen is a new non-timber forest product that is illegally exploited in Upper Shinga Community Forest. The product is bagged and exported for drugs-production in Saudi Arabia.

3.2 Impact of Agro-Pastoral Activities on Ngongbaa and Kilum Forests

Information from the local people in the Ngongbaa and Kilum show that agriculture on the slopes of the Oku Mountain began around pioneer settlements that cropped up on the lower slopes of the Oku Mountain shown on table 46. Farming was introduced in Bui in general and the slopes of the Oku Mountain in the early 18th century

especially during the period of German colonial rule (1905-1916) when the Nso and Oku people started a sedentary lifestyle thanks to the security against tribal and Fulani raids provided by the colonial administration. Before the introduction of coffee in the 1960s as a cash crop, agriculture was practiced mainly by women for subsistence and involved the cultivation of crops like maize, beans, cocoyam, Irish potatoes, yams, local carrots and huckleberry. Meanwhile, men practiced mainly hunting, keeping of bees, tapping of palm wine, cultivation of tobacco as well as the rearing of small ruminants such as goats, sheep and fowls. When the Fulani introduced cattle in the 1920s some indigenes latter got involved in the rearing of this animal species. Agro-pastoral activities were practiced close to settlement while beekeeping and hunting were carried out in the forest. Increase in population in the mother led to expansion into new areas of the Ngongbaa and Kilum for the creation of new settlement and opening of new farms. This resulted in deforestation and forest degradation in the 1920s. The fact that A.T. Johnstone was appointed an assistant conservator for the Oku Mountain in 1929 (Mbenkum,1991and 1993), is an indication that forest depletion was already rife in the Ngongbaa and Kilum forest areas before 1929.

3.2.1 Impact of coffee cultivation on Ngongbaa and Kilum forest

In order to appraise the impact of coffee on the Ngongbaa and Kilum forest, it is important to trace the coffee history in Africa in general and Cameroon in particular.The native (undomesticated) origin of the coffee plant is thought to have been first discovered in East Africa, specifically in Ethiopia in the 11th Century (Wikipedia, the free encyclopedia.htm#cite-note-meyer-3 and Wikipedia, the free encyclopaedia.htm#p-search).According to an Ethiopian popular coffee history legend, coffee was discovered by an Arabian goat herder (shepherd) named Kaldi, who found his goats dancing joyously around a dark green leafed shrub with bright red cherries and frolicking it in the southern tip of the Arabian Peninsula. He found his and full of energy after eating the red berries of the coffee shrub. Kaldi soon determined that it was the bright red cherries on the shrub that were causing the peculiar euphoria and after trying the cherries himself, he learned of the similar powerful reaction of the coffee. After witnessing their strange behaviour, a monk took some of the berries back to his fellow monks who after taking the coffee also spent the night awake and alert. From then, monks at a local monastery exploited the stimulating effect of coffee to stay awake during extended hours of prayer and distributed to other monasteries around the world. As the fame of the coffee plant spread to other lands, its centuries-long voyage was about to begin. Arabs may have first cultivated coffee in the 14th century, but the earliest substantiated evidence of either coffee drinking or knowledge of the coffee tree appears to have been in the middle of the 15th century, in the Sufi monasteries of Yemen. By the 16th century, it had reached the rest of the Middle East, Persia Turkey and northern Africa. Coffee then spread to the Balkans, Italy and to the rest of Europe, to Indonesia, to America and then to southern Africa during the colonial period.

In Africa during the colonial period, coffee and other commercial crops like cocoa, tea, oil palm, banana and rubber were grown in large plantations. During German Rule in Cameroon, (1884-1916) export crops were cultivated using forced indigenous labour. Starting 1916, Cameroon was ruled simultaneously up to 1960 by the French and the British. Both powers initially concentrated on developing and expanding the export crops (including coffee) through vast plantations using indigenous labour. The French emphasis was later shifted to peasant production areas to expand exports. With this goal in view, several agricultural institutions were created for extension and marketing purposes. The French established the *Secteurs de Modernisation* that provided crop-focused extension advice, and other services including seed production, pest control, and agro processing. Also, research institutes were established to cover cotton, cocoa, coffee and palm oil. The British, however, continued the private large-scale plantations for which research and the Department of Agriculture, Cooperatives and Community Development provided extension services. As the extension staff was mainly used for promotion of export crops during the colonial period, it had little knowledge of food crops and smallholder agriculture until Cameroon achieved independence in 1960.

1n 1973, President Amadou Adhidjo launched the Green Revolution which encouraged peasant farmers and youths to open coffee farms and produce coffee for export. The cultivation of coffee replicated in Bui division in general and Ngongbaa-Kilum forests zone in particular. Lon Kongnyuy (1979), Ghangha (1988), Tumi (1992), Fogwe (1997) and Enchaw (2009) contend that the early colonisation of the slopes of the Oku Mountain is due to the early introduction and adoption of the coffee culture in Bui Division confirm this view. These authors add that Reverend Father Fugil introduced coffee in Bui Division as far back as 1933 and the innovation later diffused into Kom area in the late 1940s. Deforestation intensified on the lower slopes of the Ngongbaa and Kilum in the 1960s when the Cameroon Government was promoting the cultivation of commercial coffee tea, rubber, oil palm, cocoa etc. for export. During field Survey, we observed that most compounds in the villages in the lower slopes of the Oku Mountain had large coffee farms in their backyards.

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

3.2.2 The Effects of the Slump in Coffee Prices of the 1980s on the Ngongbaa and Kilum forests

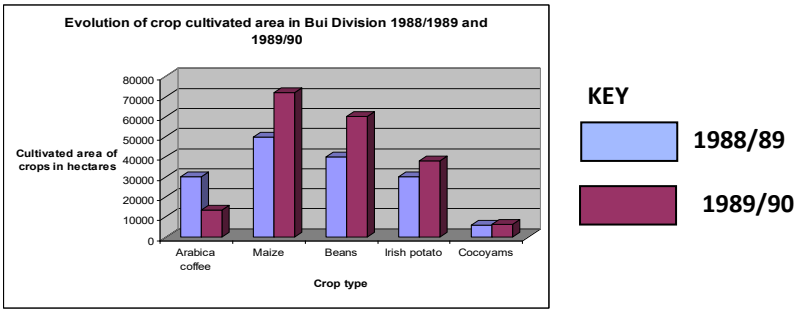
We gathered in the field that the fall in coffee prices in the 1980s had contributed enormously to the depletion that the Ngongbaa and KilumForest underwent in the 1980s. The economic crisis in Cameroon and the slump in the world coffee prices caused a drop in the prices of coffee in Cameroon. Informants in the Ngongbaa and Kilum are explained that due to the fall in coffee prices, the men employed the youths to open their farm in the Forest to cultivate food crops as substitutes to coffee. The economic crisis also forced urban dwellers, particularly those who lost jobs to retire to villages. Durang (2000) and Kaffo (2006) emphasised that the economic crisis had reconverted the youths to undertake agricultural activities. The local people explained that when men realised that incomes derived by women from the sales of food crops like beans, Irish potatoes and maize were increasing exponentially, men were encouraged to clear forest and open new farms Because of this new found financial power, the women were progressively taking over the roles of men as family heads. This comparative financial advantage of women over men has led some women to disrespect their husbands. For this reason, divorce became rife in the area in the1980s. Some of these divorced women began constructing their own homes. Kaffo (2003) gave the view that, "*on assite progressivement à la modification des rapports sociaux dans les ménages tant monogamiques que polygamique au sein des quels les femmes sont devenues des véritables homes*". In order to improve upon their financial situations and to regain their lost authority, the men decided to abandon coffee and food crops for cash. Table 6 shows how crop production and surface area cultivated had increased in the 1988/89 and 1989/90 crop seasons. Because of the comparative advantage of food crops over coffee, some abandoned their coffee farms while some cut down coffee and replaced it with food crops.

Nevertheless, some farmers who did not cut their coffee farms associated the crop with food crops. The coffee crisis culminated in a fall in production of more than 50% during the 1980-1992 decade. Similarly, tobacco farmers abandon the crop in favour ofIrish potato that was in high demand and consumed locally. Tumi (1992) explained that low prices resulting from over-production and late payments led to a large-scale abandonment of coffee plantations in favour of food crop production. He added that the loss of credibility by the institutions charged with the marketing of coffee also contributed to the abandonment of the coffee culture (Figures 2 and 3)

Table 6: Crop Production in Bui Division (1988/1989 and 1989/1990) in tonnes

Crops Type	Period			
	1988/89		1989/90	
	Cultivated area in hectares	Production in tons	Cultivated area in hectares	Production in tons
Arabica coffee	30150	712513	13500	684591
Robusta coffee	55	3300	56	10836
Maize	50000	88000	72000	120000
Beans	40000	37000	60000	58000
Irish potato	30000	150000	38000	190000
Cocoyam	6000	2100	6400	2240
Tomatoe	6.5	25	6.5	26
Cabbage	11	55	13	71
Huckleberry	100	110	137	154
Pears	20	2180	28	2300
Total	**156342.5**	**995183**	**910140.5**	**1068218**

Source: Annual Report of the divisional delegation of MINPAT, Kumbo, 19888-1990



Source: From Table 48

Figure 2: The Effects of Crop Cultivation in Bui Division on the Ngongbaa and Kilum Forests

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ISSN: 2321-6247
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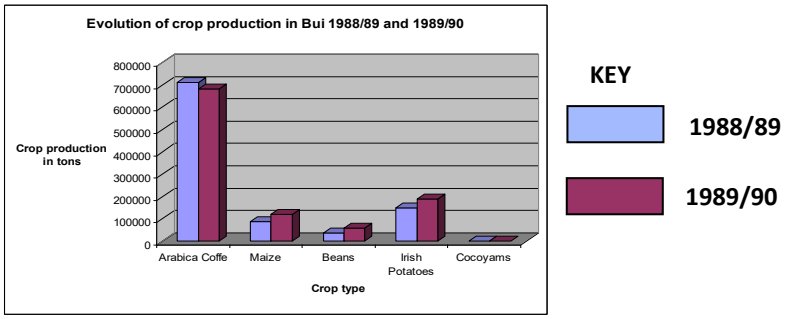
From Figure 2, while the cultivated area for coffee dropped to less than 50% of its 1988/89 size, in the 1989/90 crop season, that of food crops (maize, beans, Irish potatoes, and cocoyam) almost doubled. Consequently, the production of coffee dropped while that of food crops increase in the same period as shown on Figure 3.



Source: Table 48

Figure 3: Relationship Between Crop Production in Bui Division and the Depletion of the Ngongbaa and Kilum Forests

3.3 Impact of the 1980s Irish Potato Boom on Ngongbaa and Kilum Forests

The general opinion held by most of the people contacted in the field is that Irish potato is the main crop that motivated people to seek farmland in the forest. Before introducing crops like maize and beans in the forest, farmers cultivated Irish potatoes in the first three years. This was because Irish potato is in high demand compared to other crops. According to Pa Musa Tatah,[2] (pers.com.) farmers were attracted to the forest by the thick fertile forest soils. He pointed out that as pioneer commercial Irish potato farmer; people learned from him that Irish potato was very productive in the forest. Upon trial of the crop in his forest tobacco farm at Shuusha'a in Fonmboh-Tadu, he discovered that yields in the forest had doubled those on land outside the forest.

This encouraged him to abandon coffee and tobacco cultivation for commercial cultivation of Irish potatoes. His successes spurred people to seek farms in the forest for the cultivation of Irish potato as on (Plate 5). The farmers came from villages like Tobin, Shisong, Kumbo, Meluf, Kikaikom, Melim, Nkfeiy, Oku etc. This influx of farmers led to deforestation that devastated extensive portions of Forests between 1981 and 1986. Because of the desire to commercialise Irish potatoes, nobody even the landlords who ensure sustainable management of land were ready to forfeit their living standards for the protection of the forest. Landlords who earlier were contented with the tributes they received from forest users in the past, received huge sums of money from people demanding farm land in the forest. This resulted in the violation of customary forest laws. Irish potato now constitutes the main cash and food crop in Bui Division.

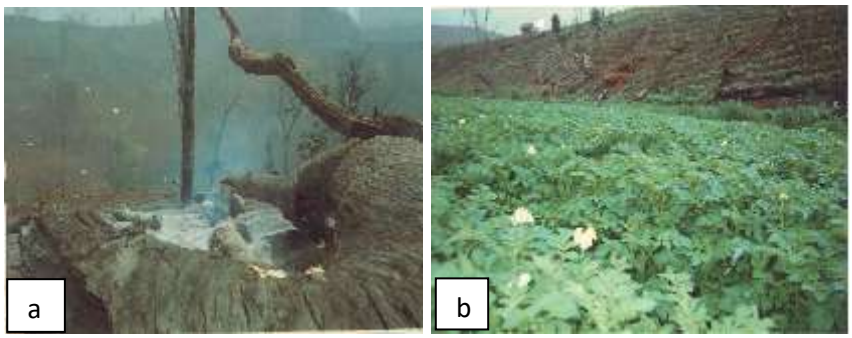


Plate 5: Slash and Burn Farming System and Transformation of Ngongbaa and Kilum Forests into Irish Potatoes Farms and Farmsteads (1980-1986)

Plate 43: A huge tree fell by burning. Plate 43b: One of the many green and fluorescent Irish potatoes (Solanum tuberosum) farm in the Ngongbaa forest. Photos by Mbinkar Julius B., 12 and 18, March 1991respectively.

[2] *Musa Tatah Mbinkar (Alias Alahji Tuuh (Alaji potato) is the pioneer Irish potatoes farmer in Ngongbaa forest who owns a farm at Shuusha'a in Fonmboh locality where he first cultivated tobacco in the 1970s.. in the early 1980s he substituted tobacco with Irish potatoes production.*

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ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

3.4 Effects of Fires on the Ngongbaa and Kilum Forests

Informants in Ngongbaa Oku areas revealed that in spite of the efforts to conserve the entire Oku montane forest, including Ngongbaa, there has been persistent depletion of the forest by fire (Table 7).

Table 7: Resource Depletion in Ngongbaa Forest

Forest zone	Number of respondents	Causes of fire in the forest		
		Attack on forest by indigenes	Negligence of forestry and government officials	Absence of forest guards
Bihkov	83	83	30	42
Nchiiy	6	6	2	2
Mbai	51	51	12	19
Total	**140**	**100**	**44**	**63**

Source: Field Survey, 2011-2015

The cumulative responses of the respondents on table 7 show that the depletion of the Ngongbaa Forest is also due to fire from three main sources, attack from the local people, the nonchalant attitude of forestry and administrative officials in Bui, and the absence of forest guards. All respondents were of the view that the spirit of neglect and deprivation in the Nso people by the Kilum Ijim Forest Project (KIFP) engendered clientelism and brutality to forest resources. Vandalism to forest resources is done through deliberate setting of forest fires and wanton extraction of Pygaeum. The issue of fires in the Ngongbaa and Kilum Forest is quite complex. Forest fires originate from explicable and non-explicable sources. For explicit fires, their cause is known. These include accidental fires from farms at the edge of the forest such as the one that occurred in Nchiiy community forest on 11th February 2015 and ravaged an area estimated at 12 hectares of forest where Cameroon Gender and Environmental Watch (CAMGEW) had planted trees in 2014 as depicted on Photo 2. Graziers and honey harvesters set other fires. Inexplicable fires are originated from unknown sources whose explanation is based on speculations. Persons who disapprove of the KIFP's policies set these unknown fires according to the local people deliberately. Among these disgruntled people are the landlords whose right of tenure and management have been seized by the project and transferred to FMIS. For this reason, the indigenous people prefer to destroy the forest so that both parties can lose. According to Richard Menang of Mbonyar village (pers.com.), the landlords are disappointed because their tenure rights have been lost and some have invoked forest spirits to fight their course. For instance, a resident of Mbonyar village died in 2003 when a vehicle transporting *Prunus africana* from Ngongbaa forest overturned. His death was attributed to forest spirits against the violation of the rights of Shuufaay Mbolong who is the land custodian of part of Nchiiy Community Forest. According to one messenger of the Fon of Oku, these fires at times occur in several spots in the forest and at the same time in the night.

Photo 2: The Takiyah Compartment of Nchiiy Community Forest Ravaged by Fire from Forest Boundary farm

Photo by Tatah Jean- Louis Banadzem, March 2015

The fire according to residents of Mbonyar occurred on the 11th February 2015. The local people suspect that X-workers of KIFP set the fires to cause government believe that forest is under permanent threat, in order to sustain government funding for the conservation of the forest. In spite of great efforts put in place by the Mbai and Nchiiy Fire Fighting Team (MANFIFIT) and the local people to prevent fires in the forest, fire continues to ravage the forest This is because the forest and the administration authorities rarely punished persons who set fires or exploits Prunus as result of the cycle of bribery and corruption that has marred the forestry sector. 43.8% of the population hold the view that the depletion of the forest is due to the absence of forest guards. In a group discussion with the members of Bihkov FMI, we gathered that unpaid and unarmed local patrollers have the duty to guard forest against illegal hunters who have guns putting patrollers at risk.

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

3.5 Eucalyptus Invasive and Its Effects on Ngongbaa and Kilum Forests

We gathered in the field that eucalyptus is one of the main causes of the degradation of Ngongbaa and Kilum forests at present. Farmers introduced eucalyptus in these forests in the 1980s. When farmers were evicted from these forests since 1987, they abandoned their eucalyptus forests in the reserve area. It is multiplied in the forest through wild fires that burn forest and facilitate the germination of eucalyptus seeds. Eucalyptus forests now occupied vast portions of some forest compartments of Ngongbaa and Kilum forest as depicted on Plate 6

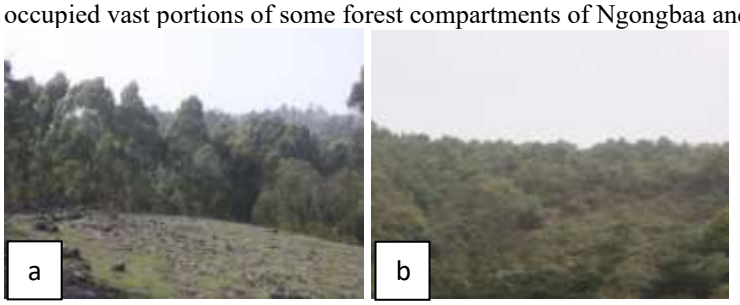

Plate 6: Eucalyptus Forest that replaced indigenous trees since the early 1980s
Plate 44a: Eucalyptus Forest in Tahkiyah compartments of the Ngongbaa
Plate 44b: Eucalyptus Forest in Embdzee compartment in Kilum forest
Photos by Tatah Jean-Louis Banadzem, April 16, 2015 at 8:30 A.M. and February 27, 2015 at 10:39 A.M

3.6 Effects of the Depletion of Ngongbaa and Kilum Forest on Climate and the Drainage System

From residents of Ngongbaa and Kilum forest area, the depletion of the have is contributing to climate change in the past 34 years ago. The depletion of these forests has exposed surfaces, water channels and consequently increased evaporation and transpiration. From the year 2002, the rainy season that formally started in mid-March is fluctuating and mostly starts later in April. The late start of the rainy season during the 2005-2006 cropping season led to poor crops harvest personnel of the delegation of agriculture. Increase in the temperatures has led to the migration of new species of flora from hotter areas of Noni to the Ngongbaa and Kilum forest zone. These migratory new species include black ants, crickets, lizards etc. Due to increase in temperatures corn which in the past matured in mid-September now matures in July and August. Meanwhile, *Colocascias* locally known as *Ibo cocoyam* now matures in July instead of September as in the past. The locals observed that the output of red beans has also increased due to climate change. However, due to climate change termites are gradually disappearing in the Ngongbaa-Kilum forest. Acid rain is causing the decay of Irish potatoes and cocoyam.

Due to the depletion of the forest, the volume of rivers in the Ngongbaa and Kilum area have dropped by more than 60% of their pre-1980 level. According to residents of the area, when the forest was little modified in the 1960s, river valleys had trees and thick grass cover that reduced evaporation of water in streams. The depletion of forest and valleys agriculture has exposed the valleys and water catchments to direct solar radiation and increased the rate of evapo-transpiration and drop in the water table. The forest fires of 2003 that burnt the Mbai community forest aggravated the situation in the Ngongbaa forest. The results of measurements carried out on Kidzemen, Ndzevyeseniri and Tolon streams (Plate 7) show that the volumes of streams 2004 had dropped compared to the situation in1963 (Table 8).

Table 8: The Evolution of River Regimes in the Ngongbaa and Kilum Forest Areas

River	Average Volume of river in the Months of July by 1963		Hydraulic radius (m) by1963	Average Volume of river in July 2014		Hydraulic radius (2014)	Difference (1963 and 2014
	Average Width of river (m)	Depth of River(m)		Average Width of river (m)	Depth of River(m)		
Kidzemin	15.7	1	1	8	0.6	0.6	-0.4
Kilendzev	12.8	2	2	9.7	1.1	1.1	-0.9
Lang	8	0.2	0.2	4.4	0.5	0.6	0.4
Ndzevyesenin	40	2.3	2.3	2.8	1.2	1.2	-1.1
Mfonkov	3.9	1.4	1.4	3.2	0.8	0.8	-0.6
Tolon	18	1.3	1.3	7.3	0.8	0.8	-0.5

Source: Field Work, 2012- 2015

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
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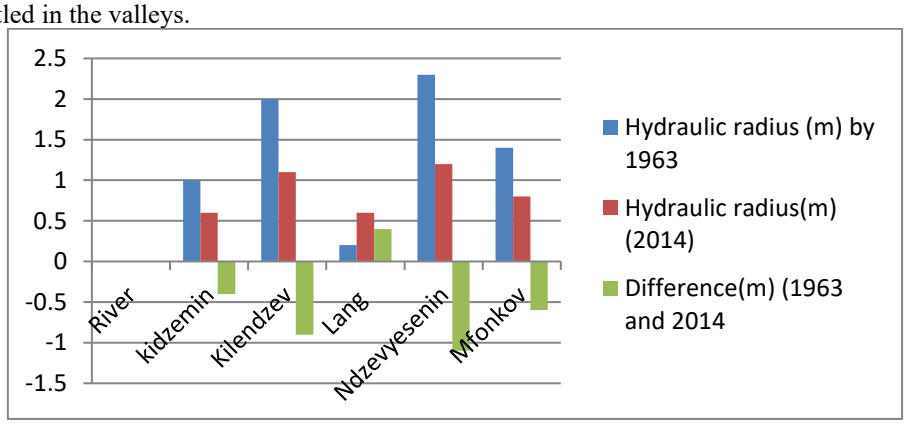
From table 9, the shapes of the valleys of the above streams are rectangular with breaths 3-20 times greater than the depths. The sizes of rivers and valleys were greater in 1963 than in 2014 due to the depletion of Ngongbaa and Kilum forest. The drop in the water table has led to the disappearance of some subsequent streams (tributaries) engendering a reduction in the volume of streams which have retreated to the middle of former large river valleys. This has caused a reduction in their (HRs) to between 1.2 and 00.6m representing 40-50 percent of their 1963 sizes in 2014 as shown on Figure 4. This has resulted in a corresponding Stream Energy and efficiency (ability of streams to overcome friction erode their bank and transport their load) drop of 40-50 percent. We observed in the field that forest depletion and cultivation of river valleys has exposed the valleys and increased the intensity of river erosion activity during thunderstorms than before. The increased erosive activities in the Ngongbaa and Kilum forest areas has resulted in the formation of two storey valleys (valley in valley profile) in the middle courses of most streams wherein another smaller and deeper valley is formed in the middle of a former shallow valley as depicted on Figure 5.

Plate 7: Evaluating Changes in Wetted Perimeters and Depths of Streams between the 1960s and 2014

Plate 9a: Dr. Enchaw Gabriel (on the left bank) and Bony (on the right bank) of Kidzemin stream assisting the researcher measurement. Photos by Tatah Jean-Louis BanadzemJuly 2004
Plate 9b: Eric Chin (on the left bank) and Buba Sumnso (on the right bank) of Ndzevyeseniri stream assisting the researcher in measuring width and depth of the stream. Photos by Tatah Jean-Louis Banadzem, July 2014.
Plate 9c: Madam Kati Beatrice (research student (left) and researcher(right)measuring the volume of River Tolon. Photo by Bah Peter on July 2, 2015 at 11.05 a.m

It is described as polycyclic valley formed in two different phases of erosion. In the case of the Ngongbaa and Kilum forest area, the old valleys were formed during a long period of geomorphic processes on the Oku Mountain while the new valleys were formed during the period of intense deforestation (1975-1987) and cultivation of river flood plains (1988-20150. Due to the drop in river volume rocks deposited by these rivers during flood are exposed on the valley floor with water trickling through the rocks. In some rivers, huge alluvial deposits eroded from the hill sides have settled in the valleys.



Source: Table 8

Figure 4: The Comparison of the Efficiency of Streams in Ngongbaa and Kilum Forest Areas (1963 and 2014

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
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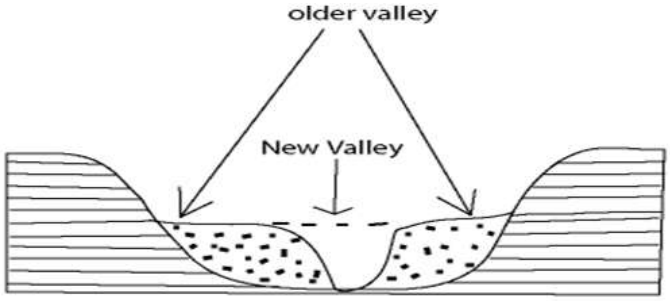


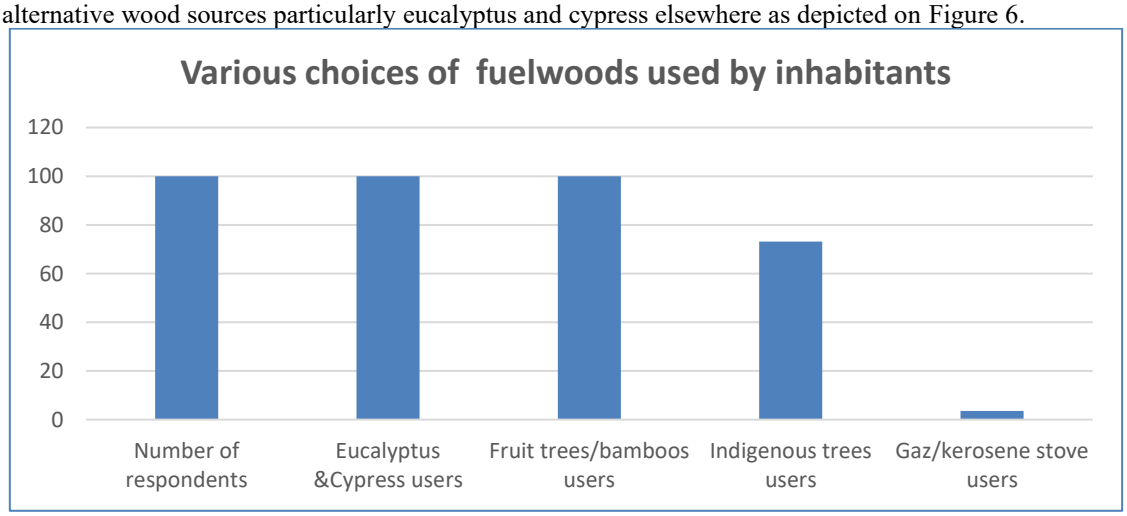
Source: Conceived from field observations by Tatah Jean-Louis Banadzeem

Figure 5: Valley in Valley Profile (Two Storey Valleys) Rejuvenated by Deforestation and Cultivation of River Flood Plains in Ngongbaa and Kilum Forest Areas

According to bah peter, stream volumes at present are about one tenth of the stream sizes in 1963. We observed that the recently formed valleys were by far deeper than their widths due to renewed intensive erosion of the old valley.

3.7 Effects of the Depletion of Ngongbaa and Kilum Forest on Biodiversity

The depletion of forest has also affected the population, density, and sizes of *Prunus africana* trees. Following the method used by Whyte (1977) to measure the degree of threat on man and biosphere, we observed, listened and interviewed forest. Due to farming and bush fires, a greater part of Ngongbaa and Kilum forests have been reduced to an open secondary forest, characterised by thick under growth with abundance of bracken fern, grass, shrubs and herbs Through farming people encroached into sacred places, water catchment areas and valleys. These farmers used the slash and burn method, which resulted in the elimination of trees, herbs, animals and the disappearance of these sacred places. Some of this depleted biodiversity include *Polycius fulva, Schefflera mannii, Albizia gummifera*, which are all critically endangered, and *Croton macrostachyus, Prunus africana, Atagium chinense, Ficus oreodryadum* and *Podocarpus latifolius* that are rare species. These informants gave the view that before the 1980s, the Ngongbaa and Kilum forests constituted the main sources of fuelwood, carving wood, timber etc. Due to the depletion of these forests tree population has reduced forcing carvers and other wood users to seek for alternative wood sources particularly eucalyptus and cypress elsewhere as depicted on Figure 6.



Source: Fieldwork in the Ngongbaa and Kilumforest areas 2012-2015

Figure 6: Types of Fuel Wood Used by the Local People in the Ngongbaa and Kilum Forest Area

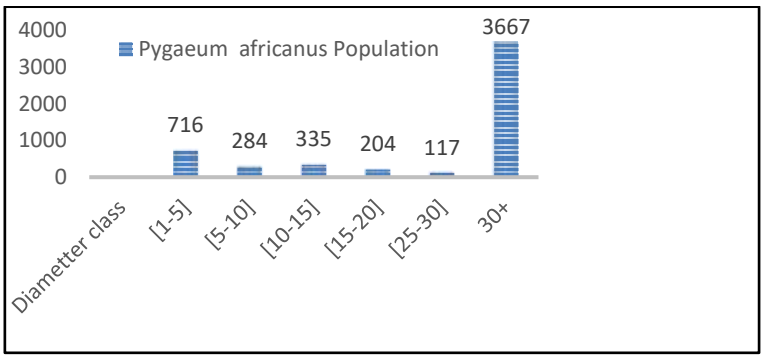
From the responses on Figure 6, the entire households of Ngongbaa depend on eucalyptus, cypress, fruit trees and indigenous for fuel wood. We gathered in the field that before the conservation of Ngongbaa and Kilum forests, the forest was the main source of fuel wood. Due to the depletion of forest and a reduction in the population of indigenous trees in the forest, 26.9 % of the population no longer depend on the forest. The bulk of people who depend on forest are in Oku because the settlements are very close to the forest unlike in the Ngongbaa where major settlements are far from forest. To solve the problem of low supply of indigenous trees, carvers use alternative sources of wood like eucalyptus, Cypress, pears, oranges, kola nuts etc. 3.5% of respondents use kerosene for cooking. Exotic trees particularly eucalyptus and cypress have replaced endemic trees as timber.

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 14 | Issue: 2 | February 2026 | Journal DOI: 10.36713/epra0713 | SJIF Impact Factor (2026): 8.844

Wood for carving has become scarce due to forest depletion; According to Tangu Francis with a 40-year experience in carving in Oku, very limited carving wood exist in Kilum Forest, (the Managers, No 11, of April 2000). This problem has been compounded by the ban on exploitation of fresh wood for carving. Due to limited high quality carving wood in the forest, carvers now depend on domesticated trees species. Carvers complained that Objects carved from young trees are susceptible to weevil attack, crack easily and not attractive to buyers. Some carvers go far, to places like Mbiim, Ber, Djottin, and Bamti to buy domesticated trees.

3.7 Effects of the Depletion of Ngongbaa and Kilum on Population Density, Size and Height of Trees

In spite of the depletion of the Ngongbaa and Kilum forests, no tree species is extinct. However, the tree population density, size and height of trees in areas where farming took place have reduced. For the case of *Prunus africana*, its population has drop considerably as depicted on Tables 9 and 10. From table 9 mature and exploitable Pygaeum trees (diameter class 30+) has the highest population of *Prunus africana* trees in the Ngongbaa (71.1%) as summarised on Figure 7. The high population of exploitable *Prunus Africana is* attributed to the fact that PLANTECAM suspended the exploitation of *Prunus Africana* in 1986, to allow the exploited parts of the tree to heal. In addition, when KMFP (later KIFP) took over the management of the Oku Mountain between 1987 and 2004, the exploitation of forest resources including *Prunus africana* was prohibited. The 10 years of suspension of exploitation of *Prunus africana helped* the trees to heal. Also, during the 17-years of management of the forest by KIFP, the trees that germinated grow to maturity. The trees in lower diameter classes (1-22 cm) are trees that germinated during the period when the forest was managed by the KIFP. The bulk of trees are found in the diameter class, (1-5). Given that there are 5323 *Prunus africana* trees in surface of 649 hectares, the extrapolated population of *Prunus Africana* in the Ngongbaa forest is 26525 trees. This means that the population density of *Prunus africana in* the Ngongbaa Forest is 8 trees per hectare. The high population of exploitable *Prunus Africana is* attributed to the fact that PLANTECAM suspended the exploitation of *Prunus africana* in 1986, to allow the exploited parts of the tree to heal. In addition, when KMFP (later KIFP) took over the management of the Oku Mountain between 1987 and 2004, the exploitation of forest resources including *Prunus africana* was prohibited



Source: Source: Divisional Delegation, MINEF, Kumbo

Figure 7: The Present State of Pygaeum africana Population in Ngongbaa

Following inventories carried out in the degraded Takiyah at (site N06°13′08.4″, E010°33′29.1″ and Mbai compartment (site N06°13′21.5″, E010°33′26.0″and intact compartments at Mbohkifom in Mbai (site N06°13′41.3″, E010°33′01.6″and lake Oku Plantlife Sanctuary (site N06°12′05.9″, E010°27′34.1″), we found out that trees heights in degraded compartments are 20-30 percent of trees in intact compartments as depicted on Tables 9. From Table 9, 5 tree species with a population of 126 trees are found on a surface of 4800 square metres. In areas where farming took place, trees are young and scanty. We observed that trees in the Tehjav compartment fall within the height class of 0-5m. These trees are sparsely distributed with thick undergrowth comprised mainly grasses and ephemeral species. These species include *Psorospermum densipunctatum* (*shebang*) and the ubiquitous *Pteridium aquilinum*(*fern*) species. The bulk of the trees in the height class 16-19 dominate in Mbai consisting of trees that germinated after the evicted of farmers in 1987. Trees in the height class 6-9m are mostly *ephemeral* species such as *Maesa lanceolataand Gnidia glauca.* In sections of forest where perennial trees are absent, ephemeral species become perennial trees. We also observed that the trees in the above compartments are smaller in size compared to those in areas of the forest that were farmed

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Table 9: Tree Diversity, Population, Density and Height in Degraded Tehjav and Mbai Compartments

Species Type			Total Number	Number of trees per range of Height (meters)			
Nso Name	Oku name	Scientific Name		0-5	6-9	10-15	16-19
Kiwuv /kijooh	fewum	Albizia gummeferous	25	0	0	7	18
Dzeng	diing	Gnidia glauca	67	0	0	0	67
Kira	eblaa	Prunus africana	01	0	0	1	0
Sem	sem	Maesa lanceolata	30	16	5	7	2
Shuay	ebfian	Nuxia congesta	3	3	0	0	0
Total			**126**	**19**	**5**	**15**	**87**
Percentage			**100**	**15**	**4**	**11.9**	**69**

Source: Field inventory conducted by Tatah Jean-Louis Banadzemin August 2012

We observed that trees in the diameter class of 0-5 are found mostly in the Tahkiyah-Mawir compartments of Nchiiy Community Forest that have been burnt wild fires in 2002 and 2015.In contrast, the Mbai compartment that has not suffered from wildfires has recovered considerably since 1987. Only the rocky areas of Mbai compartment with skeletal soils have trees in the 0-5 diameter class and thick under growth. In areas with thicker soils, most trees are found in the diameter class range 6-30+ where the undergrowth is near absent due to shade from thick canopies of trees. We observed that in the intact compartments (portions of the forest where farming has never occurred) of Mbohhifom and the vicinity of Lake Oku, trees are taller and larger than those in areas where farming took place in the 1980s as portrayed by tree diameter characteristics on Tables 10 and 11.

Table 10: Tree Diameter Characteristic in Degraded Tehjav and Mbai Compartments in Ngongbaa forest

Species type			Total Number	Number of trees per range of diameter in centimetres				
Nso Name	Oku name	Scientific Name		0-10	10-20	20-25	25-30	30+
Kiwuv/ kijooh	**Fewum**	**Albizia gummeferous**	25	0	11	5	5	4
Dzeng	**Diing**	**Gnidia glauca**	67	0	10	20	25	12
Kira	**Eblaa**	**Prunus africana**	01	0	0	1	0	0
Sem	**Sem**	**Maesa lanceolata**	30	17	12	0	0	0
Shuay	**Ebfian**	**Nuxia congesta**	3	3		0	0	0
Total			**126**	**21**	**33**	**26**	**30**	**16**
Percentage			**100**	**16.6**	**26.2**	**20.6**	**23.8**	**12.7**

Source: Field Inventory conducted by Tatah Jean-Louis Banadzemin August 2012

From tables 10, the bulk of the large trees (30-90m in diameter) in the intact compartments are perennial species such as *Albizia gummefera*, Croten *macrostachyus*, *Prunus africana*, *Scheflera abyssinica*, *Bamendae* (*ebwey* in Oku) which form the top layer.In this category are very large tree found in the diameters class range of (90-161cm) such as *Schefflera manni (Ebwos in Oku),* and *schefflera abyssinica* (*kirarah* in Nso and *djia* in Oku) etc. The middle layer comprises short and small trees like *Crassocephelium manni) (Kimbuuchum* in Nso and *Ngangang* in Oku*), Clausena anisata (Livf* in Nso, *fii* in Oku). The floor of the forest is characterised by soft stem shrubs like *Glrardinia heterophlla=condensate* (*kibin* in Nso) (kembiiy) in Oku), "*Jooh" and Chasalia laikomensis.*

Table 11: Tree Diameter Characteristics in Intact Mbohkjifom and Lake Oku Forest Compartments

Scientific name	Types of trees per range of diameter in centimetres						
	Total Number	0-10	10-20	20-39	40-50	50-70	80-90+
Crassocephelium manni	20	5	5	0	0	0	0
Prunus africana	6	0	0	0	0	3	0
Prunus africana	6	0	0	0	0	0	0
Schefflera abyssinica	4	0	0	0	0	0	7

Schefflera manni	6	0	0	0		0	6
Maesa lanceolata	20	10	8	3	0	0	0
Clausena anisata	3	3	0	0	0	0	0
Nuxia congesta	8	0	0	0	3	5	
Syzygium guineense ssp. Bamendae	5	0	0	0	0	0	5
Total	**78**	**18**	**13**	**5**	**8**	**13**	**9**
Percentages	**100**	**23.1**	**16.7**	**6.4**	**10.3**	**16.7**	**23**

Source: Field inventory conducted by Tatah Jean-Louis Banadzem in August 2012

3.8 Effects of the Depletion of Ngongbaa and Kilum Forest on Wildlife

The bulk of the population of large mammals such as elephants, leopards, buffalo and deer are extinct Ngongbaa and Kilum forests due to hunting and farming. Traditional hunting known as *Ngwa-a* in Nso (*Eybume fon* in Okucontributed much to the killing of large mammals. Hunters who killed large were considered as brave and strong men in Nso and Oku and were decorated with the red feather of *Tauraco bannermani*) by affixingthe feather on their traditional cap (*Gham*). Today for conservation motives, the artificial painted or synthetic red feather is used as an alternative for decoration in in Oku (Bah Peter, pers.com.). The implication of this practice is that in the search for recognition and decoration killed large mammals and *Tauroco bannermani*. The increase in population of forest users also scared away animals and obliged them to migrate and seek refuge elsewhere (Pa Ndze, pers. com.). This has affected the pollination and dispersal of plants seeds that depend on animals such as bats, gorillas, birds or insects (Cyrille de Klemn, IIUCN, 1990). According to MINEF (2004), only a small number of small mammals and 15 of bird species are found presently in the Oku Mountain Forest.

CONCLUSION

The study shows that the depletion of the Contiguous Ngongbaa-Kilum forests between 1963 and 1987 was caused by commercial exploitation of *Prunus africana,* coffee and food crop farmers, invasive eucalyptus, the fall in coffee prices in the 1980s; and the Irish potato boom. The depletion of the above forests that started in the late 19th century intensified in the period 1975 and 1987. This led to the reduction of the Ngongbaa forest from 5780.6 hectares in 1963 to 2977.6 hectares in 1987 (reduction of 48.5%) while the Kilum section reduced from 19119.3 hectares to 8127.9 hectares (reduction of 61.4%). Larger mammals like leopards, buffalos, gorillas etc. Are extinct. The depletion of this forest also engendered climate change, reductions in volumes of streams, migration of organisms, fluctuation of weather. This obliged the Cameroon Government in collaboration with international partners to create the KMFP in 1987 to conserve the contiguous Ngongbaa-Kilum forest. This project that was later renamed Kilum-Ijim forest project in 1992 took over the management of the above forests from the Nso and Oku people, delimited the forest boundary, conserved the forest, raised local peoples' capacities and conservation concerns, carved the forest into 5 community forests and transferred their management to FMIs in 2004. Deforestation and forest degradation have reduced to their lowest ebb with minor cases of encroachment by frontline farmers. The study recommends that, to maintain the forest limits, the state in collaboration with the local communities should replace the *Prunnus africana* tress that withered after exploitation with trees which non-economic trees that develop thick canopies that can inhibit undergrowth, resist fire and discourage frontline farmers from encroaching into the forest. Also, alternative resources should be introduced to reduce over-dependence on forest including domestication of indigenous trees through Agro-forestry for carving, and beekeeping etc. Furthermore, a reforestation program should be established in order to restore portions of the reserve area where trees were replaced with farmland.

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