

DRAFT ENVIRONMENTAL PROFILE

OF THE

UNITED REPUBLIC OF CAMEROON

prepared by

Peter T. Hazlêwood  
U.S. Man and the Biosphere Program  
Department of State

and

Douglas F. Stotz  
Arid Lands Information Center  
Office of Arid Lands Studies  
University of Arizona  
Tucson, Arizona 85721

January 1981

AID Contract No. SA/TOA 1-77  
Department of State  
Washington, D.C.

## Table of Contents

### Summary

1.0	Introduction	1
2.0	General Description	2
2.1	Geography and Climate	2
2.1.1	Major Geographic Regions and Features	
2.1.2	Climate	
2.2	Social Characteristics	12
2.3	Economic Characteristics	15
3.0	Environmental Resources	20
3.1	Soils	20
3.2	Vegetation	21
3.2.1	Vegetative Associations	
3.2.2	Status of Native Flora	
3.2.3	Range Resources	
3.2.4	Forests	
3.3	Water Resources	37
3.3.1	Mandara Mountains Water Resources Projects	
3.4	Fauna	39
3.5	National Parks and Reserves	43
3.5.1	Review of Parks and Reserves	
3.5.2	Conservation Issues	
4.0	Environmental Problems	47
4.1	Forest Destruction	47
4.2	Range Degradation	47
4.3	Water-borne Diseases	48
4.4	Protection of Montane Forests	49



## 1.0 Introduction

This draft environmental profile is the result of an eight week review of information in the United States on the natural resources and environment of the United Republic of Cameroon. This is the first step in the process of developing an environmental profile for use by the U.S. Agency for International Development and government officials of Cameroon. The next step in this process should be a field study to evaluate the information in this draft, obtain additional information, define issues, problems, and priorities, and provide direction for future efforts in the management, conservation and rehabilitation of environmental resources in Cameroon.

The information and interpretations presented in this report are preliminary and are not intended to be sufficiently detailed or accurate for development planning. Most of the background documents for this survey were gathered in Washington, D.C. by Peter Hazlewood. Additional information was gathered in Tucson, Arizona, by Douglas Stotz through the resources of the Arid Lands Information Center. Analysis and writing were done by Peter Hazlewood and Douglas Stotz. The Arid Lands Information Center also provided editorial and secretarial services; particular thanks to Susan A. Parker, Director of the Center, who provided invaluable cooperation and assistance. The cooperation of personnel at AID and the National Park Service is gratefully acknowledged.



chevron-shaped coast occurring between the mouth of the Sanaga River and north of Kribi. The other is irregular mangrove coast occurring between the mouth of the Sanaga River and Douala, and in the western part of Mt. Cameroon. The marked differences between both areas may be determined by the size of the drainage areas. The third is a rocky coast consisting principally of basement complex rocks. This area stretches from Kribi southward to Campo for about 80 km (Kadamura 1977).

Along its seaward edges the central segment of the coastal zone is a series of many adjoining deltas. Numerous fast-flowing rivers continue to expand the deltas with erosional debris. Various estuaries are formed near the mouths of the major rivers where they divide into numerous sluggish channels.

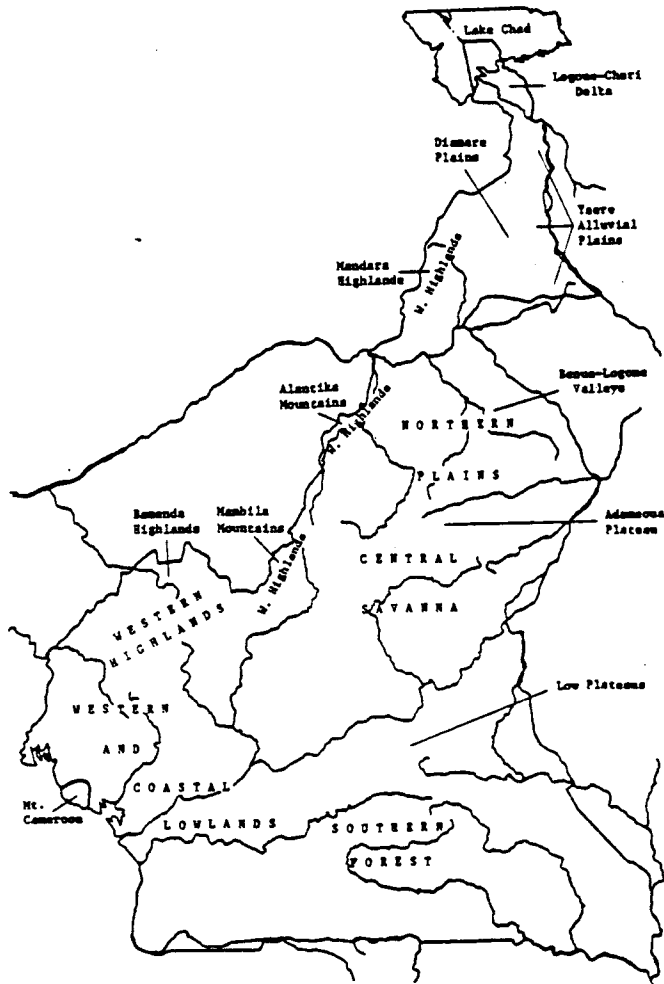


Figure 2. Major Geographic Regions and Features



Table 1. Geomorphological Regions and Erosion Surfaces of Cameroon

<u>Geomorphological Regions</u>	<u>Erosion Surfaces</u>	
	<u>Surfaces</u>	<u>Ages Proposed</u>
Adamaoua Plateau	Gondwana Post-Gondwana	Pre-Cretaceous Cretaceous
High Plateau of West Comeroon	Gondwana Post-Gondwana	Pre-Cretaceous Cretaceous
Mandara Mountains	Post-Gondwana	Cretaceous
Southern Plateau	African I	Eocene
Benoue Basin	African II Late Tertiary- Quaternary	Late Tertiary Late Tertiary- Quaternary
Coastal Lowland	Late Tertiary- Quaternary	Late Tertiary- Quaternary

Source: Kadamura. 1979.

Western Highlands. The western highlands are the result of a volcanic rift that trends northeastward from the island of Fernando Po along the western border of Cameroon. This tectonic line, known as the "Cameroon Direction," consists of several volcanic peaks, such as Mt. Cameroon (the highest elevation in West Africa at 4095 meters), Rumpi Hills (1,764 meters), Mt. Koupe (2,050 meters), Mt. Manengouba (2,396 meters), Mts. Bambouto (2,740 meters), Mandara (1,442 meters), and a number of others. The major mountain range and the upland areas on its eastern and western slopes were built up by volcanic activity associated with a series of faults in the granite substructures underlying the African continent.

Mount Cameroon is the only active volcano in Cameroon, having been active in 1909, 1922, 1954, and 1959. In 1922 and 1959 molten lava flowed several miles, destroying plantations on the lower slopes. The mountain is a complex of several connected fissures and cones.





of the Logone River and Vina River watersheds, consist primarily of broad uplands of low relief characterized by a series of crests between rivers and some shallow shales (a low-lying or depressed, and often wet stretch of land). Low hills and associated broad valleys are also extensive. The middle Benoue Valley consists of low hills, valleys, gently sloping and gently rolling uplands, and lowlands. Almost all the landforms are erosional surfaces, with elevations ranging from 300-600 meters. The lower Benoue Valley on either side of the lower reaches of the Benoue River is mainly lowlands and long gentle slopes extending to the surrounding more rolling uplands and rocky hills. Elevation here ranges from 160-300 meters.

Between the Mandara Highlands to the southwest and the flood plain of the Logone River to the east occur the Diamare Plains. This area is mostly plains, lowlands, and foot slopes adjacent to granitic hills and mountains. Landforms are mainly erosional surfaces of low relief, but dunes and interdune depressions occur in parts of the area. Elevation ranges from 320-600 meters.

To the east of the Diamare Plains and stretching northward are the Yaere Alluvial Plains, which include the flood plain of the Logone River between Kousseri and the Chad border south of Yagoua. From July to October the Yaere is flooded to a depth of 80-120 cm, except for high spots. Elevation ranges from 300-320 meters including nearly level lowlands, floodways of the Logone River, and wet depressions of the Danai-Fianga river system. Landforms are mainly alluvial deposits.

Extending northward to Lake Chad is the Logone-Chari Delta, an area of low relief consisting of the gentle slopes of the Lake Chad shore and the channeled delta of the Logone and Chad Rivers. Elevation ranges from 280-300 meters, and landforms consist mainly of shoreline or alluvial deposits. The Lake Chad shoreline can vary laterally as much as 20 km, depending on annual rainfall and the season of the year. The Chad basin is the largest inland drainage basin of the sub-Saharan region. The permanent drainage of the basin comes mainly from the Ubangi-Chari plateau via the Chari and Logone River systems.

- 2.1.2 Extending over 11 degrees of latitude, Cameroon has a marked south-north gradation of both climate and vegetation types. Generally, these include an equatorial climate in the south under which dense lowland rain forest grows, through the Guinea and Sudan type climates over woodland/savannas, to a drier climate of the Sahel type, the zone of wooded steppe in the far north.







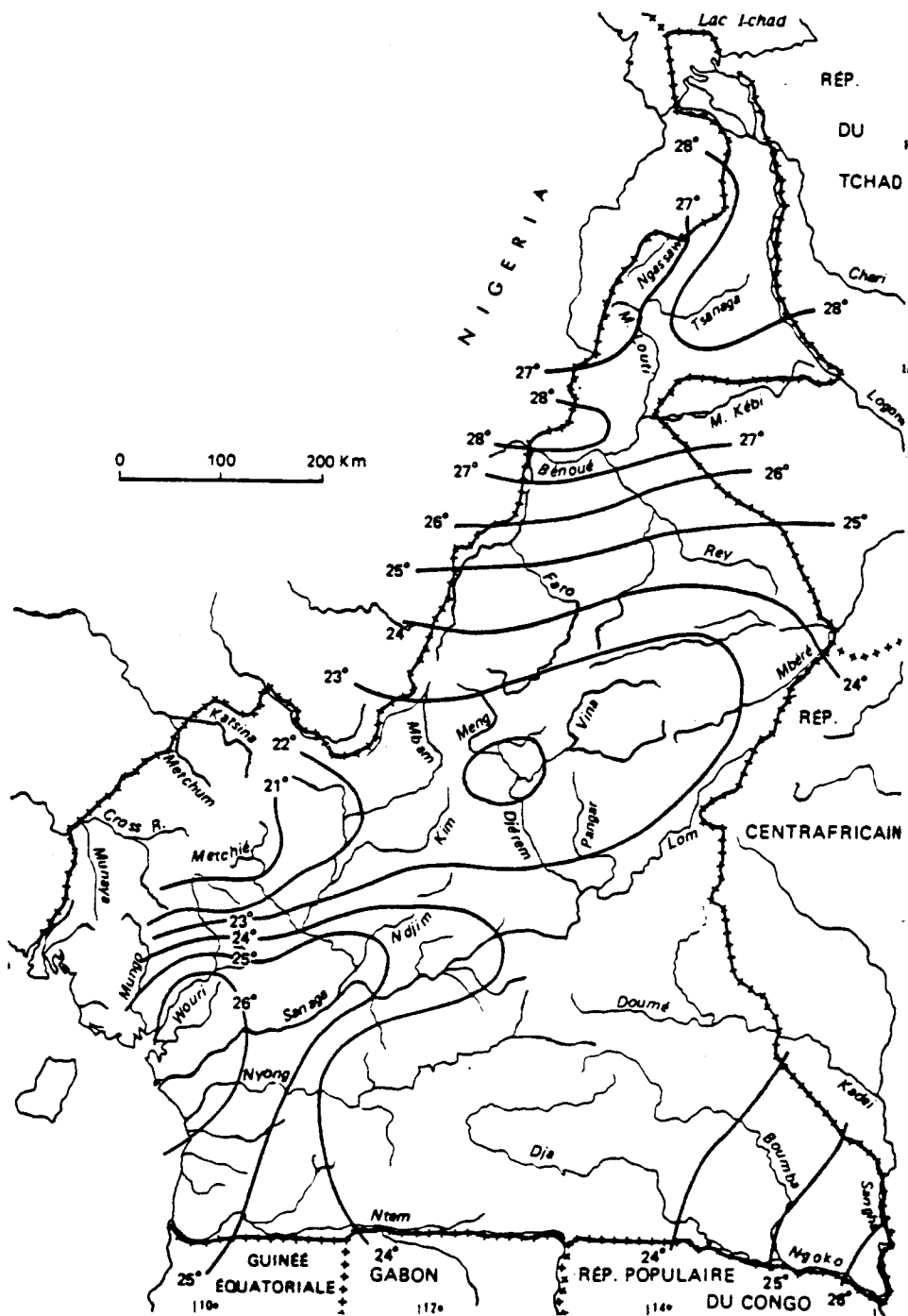


Figure 5. Average annual temperatures, °C.



Table 4. Agricultural Population, 1972/73

<u>Province and Department</u>	<u>Number of Agricultural Households</u>	<u>Agricultural Population</u>	<u>Agricultural Labor Force</u>	<u>Cultivated area (ha)</u>
<u>Northern Province</u>	312,003	1,401,508	808,097	511,483
Adamaoua	36,696	171,689	93,077	44,011
Benoue	60,779	260,085	150,975	100,927
Diamare	81,750	366,445	219,239	177,569
Logone and Chari	22,020	88,486	50,854	34,838
Margui-Wandala	71,865	339,954	195,150	114,787
Mayo Danai	38,893	174,849	98,796	39,351
<u>Eastern Province</u>	56,269	279,319	155,366	102,149
Haut Nyong Lom and Djerem	23,079	114,702	64,841	49,797
Kadei	11,935	57,818	34,323	16,289
Loumba Ngoko	12,835	63,519	33,679	16,924
	8,420	43,280	22,523	19,138
<u>South Central Province</u>	189,108	983,400	513,722	381,446
Mefou	27,435	125,944	69,640	36,319
Mbam	25,366	139,888	64,977	47,433
Ntem	21,710	112,562	62,571	76,958
Dja and Lobo	16,195	82,543	44,147	47,540
Nyong and Soo	11,585	62,726	31,362	17,440
Nyong and Foumou	17,070	70,840	41,034	35,363
Haute Sanaga	10,360	53,033	33,573	19,658
Kribi	10,995	56,067	28,167	28,906
Lekie	33,895	201,037	97,718	49,986
Nyong and Kelle	14,497	78,760	40,533	21,841





The life expectancy for a Cameroonian at birth is 41 years. The adult literacy rate is 44 percent. This rate varies widely regionally and is highest in the relatively urban areas and lowest among the pastoralists of the north. The enrollment statistics of children aged 5-14 are good for Africa with about 65 percent receiving primary education. The same regional pattern of school attendance exists as that for literacy.

The ethnic composition of Cameroon is very diverse. There are about 200 different ethnic groups in all. In the south Bantu stock predominates, while in the northern pastoral zones Hamitic Fulani, Arab Choas and Sudanese Negroes are the main groups. A Bantu group, the Bamileke have historically dominated the cultural and economic life of the country. French and English are the official languages of Cameroon with French the dominant one, but a large variety of local languages are used in day-to-day activities. Islam, Christianity, and animism are about equally observed in Cameroon with Christianity predominating in the south and Islam in the north.

There is approximately one physician for every 26,000 people in Cameroon making Cameroon 110th among nations in that statistic. The infant mortality rate is 142 per 1000 children. Health care is generally better in urban areas than in rural areas. Malaria is considered the most critical health problem in the country. No area of the country is entirely free from it, although its incidence varies greatly regionally. Tuberculosis is the second most serious health problem. Other serious health problems include schistosomiasis, onchocerciasis and tyrrpanosomiasis. Nutritional deficiencies and insufficient medical care have contributed to health problems in Cameroon.

Malnutrition of children is a severe problem in Cameroon with nearly a quarter of all children affected. Incidence is highest in rural areas, particularly the western and northern provinces. Nearly forty percent of Cameroon's children are anemic. However, there is no evidence of a significant amount of acute malnutrition in Cameroon.

### 2.3 Economic Characteristics <sup>2/</sup>

The gross domestic product (GDP) of Cameroon in 1977 was 2.65 billion and has been growing at an annual rate of 2.9 percent.

---

<sup>2</sup>Sources: Europa. 1980.  
U.S. AID. 1975a.  
U.S. Bureau of Mines. 1975.  
World Bank. 1980.



Agriculture is the dominant activity in Cameroon. 32 percent of the GDP is from agricultural production, a figure which has remained nearly constant over the past two decades. Nearly three-quarters of the population are engaged in agricultural activity. Agriculture also provides about 75 percent of Cameroon's exports. Agricultural production is almost entirely on small family-owned farms. The average holding is about 2.5 hectares. Traditional farming methods are largely still in use. In these small holdings, there is virtually no mechanization. About 5 percent of the cropland under cultivation is in large plantations producing such crops as tea, rubber, bananas, cocoa and sugar.

The major crop grown by small farmers for export is coffee. About two-thirds of the coffee is *robusta* and one-third *arabica*. Cotton is the second major crop grown for export by small farmers. Bananas and cocoa are grown in smaller quantities, but the export market is controlled by the large plantations and has been declining for both crops.

Cameroon is judged to be essentially self-sufficient in food. The primary staple foods are root and tuber crops and cereals such as millet and maize. About 80 percent of the daily per capita caloric intake is from these sources.

Table 7. Principal Crops

	AREA HARVESTED ('000 ha.)			PRODUCTION ('000 metric tons)		
	1976*	1977*	1978*	1976*	1977*	1978*
Rice (paddy)	20	20	20	19†	20	20
Maize	340	300	350	355†	300	350
Millet and sorghum	430	430	435	390	360	370
Potatoes	15	15	15	40	41	41
Sweet potatoes	49	49	49	160	160	160
Cassava (Manioc)	190	191	196	500	610	631
Other roots and tubers	303	320	336	1,009	1,039	1,058
Dry beans	125	130	130	76	50	51
Groundnuts (in shell)	205	205	219	170	150	164
Sesame seed	10	10	11	6	6	7
Seedcotton				48†	41	60
Cotton seed	60†	53†	61†	23†	24	35
Cotton lint				15†	15	23
Palm kernels	n.a.	n.a.	n.a.	45	47	45.5
Sugar cane	30	40	41	300	467	500
Coffee (green)	290	304	300	80†	60	60
Cocoa beans	330	330	330	52†	105	100
Tobacco (leaves)	6	6	6	3	3	3
Natural rubber	n.a.	n.a.	n.a.	13	13	19

Source: Europa. 1980.

The major governmental instruments for agricultural development are the Secteurs de Modernisation, agencies divided by crop and region that provide assistance to farmers. Zones Agricoles de Priority Integrees have been set up to facilitate activities to increase



Industrial activities employ about 15 percent of the labor force and contribute about 10 percent of the GDP. This sector has two divisions, a traditional, labor-intensive, mainly small-scale section of artisan workshops and a modern section processing raw materials and assembling imported components. There has been considerable recent expansion in this sector under the Third Five-Year Plan (1971-1976).

Table 10. Industry, Selected Products

		1973	1974	1975	1976	1977
Palm oil . . . . .	'ooo metric tons	69.3	72.2	79.9	80*	77
Raw sugar . . . . .	" " "	12*	14*	25	32*	35
Cocoa butter . . . . .	" " "	6.6	5.6	7.9	6.6	n.a.
Beer . . . . .	'ooo hectolitres	979*	1,242	1,005	1,145	1,526
Soft drinks . . . . .	" " "	459*	475*	500*	430	n.a.
Cigarettes . . . . .	million	1,450*	1,515	1,535	1,533	1,755
Soap . . . . .	'ooo metric tons	n.a.	n.a.	6.6	14	n.a.
Cement . . . . .	" " "	122	125	192	210	273
Aluminium (unwrought)† . . . . .	" " "	44.1	46.3	51.9	54.3	50.0
Radio receivers . . . . .	'ooo	85*	85*	60	51	30
Leather footwear . . . . .	'ooo pairs	n.a.	4,432	2,933	4,215	n.a.
Electric energy . . . . .	million kWh.	1,122	1,132	1,316	1,336	1,340

Source: Europa. 1980.

The mineral industry in Cameroon is small and at present constitutes less than one percent of the GDP. The only minerals with sufficient reserves to be economically extractable are tin and aluminum. Bauxite with reserves estimated at 1 billion tons at Minim-Martap has the potential of becoming more important. In addition, in 1976, the first commercial oilfield was located near the Nigerian border. Further finds have followed. By 1979, oil output reached 1.7 million tons. Annual output is expected to reach 5 million tons within a few years. Cameroon should become self-sufficient in petroleum and able to export small quantities. When the bauxite and petroleum resources are under full production, the mining sector may contribute as much as 5 percent of the GDP.



Seagalen, P. and Vallerie, M. 1963. Carte Pedologique du Nord Cameroun au 1:100,000 (Mokolo). Yaounde: ORSTOM.

Sieffermann, G. 1963. Carte Pedologique du Nord Cameroun au 1:100,000 (Kalfou). Yaounde: ORSTOM.

Sieffermann, G. and Vallerie, M. 1963. Carte Pedologique du Nord Cameroun au 1:100,000 (Yagoua). Yaounde: ORSTOM.

## 3.2 Vegetation

### 3.2.1 Vegetational Associations <sup>4/</sup>

Cameroon stretches from Lake Chad in the north, a semi-desert region, to the rainforests of the Congo basin. Figure 6 shows the location of the major vegetational associations, which are described in the following text.

#### Tropical Rain Forest

The tropical lowland rain forest of southern Cameroon forms part of the Guineo-Congolian floristic region, a belt of tropical rain forest stretching from Sierra Leone to the Rift Valley and occurring on drained sites throughout most of the region. The annual rainfall is between 200 mm for the drier types up to more than 3000 mm for the wetter types. The tropical rain forest belt consists of a continuous stand of trees of several strata, including an upper stratum of large trees which may be 50-60 meters high. Although it shows differences in its floristic composition and certain variations in structure, its most remarkable feature is its floristic and physiognomic uniformity.

Tropical rain forests are most generally mixed forests. Single dominant forests cover a small area, but they are widely scattered; nearly all are dominated by members of the Caesalpinioideae, which is also very well represented in mixed forest. Wetter types of rain forest are evergreen throughout the year but deciduous species appear in disturbed wetter types and gradually increase in numbers with decreasing rainfall. However, tropical rain forest always shows an evergreen nature rather than a deciduous one.

---

<sup>4</sup>Sources: FAO. 1977.  
IUCN. 1979.  
U.S. Department of Agriculture. 1978.





coastal strip is probably one of the richest because it has been one of the few refuges where evergreen rain forests were able to persist during the climatic vicissitudes of the late Pleistocene. Very few endemics occur throughout, but *Sacoglottis gabonensis* is one of them. This is an area of great scientific value as it is a living fossil holding clues to the theory of the continental drift, to the patterns of climatic change, and to the evolution, diversification, and radiation of primates.

#### 1b. Guineo-Congolian moist evergreen lowland rain forest

This forest type is scattered in small islands throughout the moist semi-evergreen lowland rain forest in a broad aureole surrounding the Zaire River basin. It is usually dominated by the Leguminosae (Cesalpiniodeae). *Gilbertiodendron dewevrei* forests are common in southeastern Cameroon. This species is able to regenerate in its own shade and can also invade moist semi-evergreen lowland rain forest which is usually deficient in regeneration of its own dominant species.

#### 2. Guineo-Congolian semi-evergreen lowland rain forest

This consists of both moist and dry semi-evergreen lowland rain forest. The moist type occurs in areas with annual rainfall between 1600 and 2000 mm, well distributed or with a dry season tempered with moist air from the sea. This is a rich flora with tropical large tree species of: Meliaceae (*Entandrophragma angolense*, *E. candollei*, *E. utile*, *Guarea cedrata*, *G. thompsonii*, and *Lova trichiliodes*); Myristicaceae (*Coelocaryon preussii*), and Chrysobalanaceae (*Maranthes glabra*). It is possible that all the semi-evergreen rain forest is secondary.

Dry semi-evergreen lowland rain forest occurs in areas with annual rainfall between 1600 and 2000 mm with high humidity in the dry season. Most individuals of larger trees are deciduous, but often only 1 to 2 weeks in the dry season. Individuals of the same species shed their leaves at different times so that the forest continues to show an evergreen nature. This type of forest occurs north of the moister type. Frequent species include *Azelia africana*, *Aningeria altissima*, *A. robusta*, *Chrysophyllum perpulchrum*, *Cola gigantea*, and *Khaya grandifoliola*. *Terminalia superba*, a fast growing and valuable timber species, has deeply penetrated into moist semi-evergreen and wet evergreen rain forests after the clearing of forest for agriculture.

#### 3. Mosaic of types 1 and 2



#### 6. Montane forest - secondary grassland mosaic

This rather heterogeneous formation is composed almost entirely of species that also occur in lowland rain forest (though they may be of restricted occurrence there), as well as *Podocarpus* and *Olea* spp., woodland associations of trees and shrubs, the tree fern *Cyathea dregei*, and thickets of the bamboo *Arundinaria alpina*.

Also found in this formation are grasslands. Among the grasslands common at lower altitudes are *Themada triandra*, *Pennisetum clandestinum*, *P. schimperi*, *Loudetia simplex*, and *Andropogon distachyus*. At higher altitudes occur *Festuca abyssinica*, *Agrostis isopholis*, and *Pentaschistis manni*.

Montane evergreen forest (6a) occurs on Mt. Cameroon above about 1300 meters altitude. This differs from its lowland counterpart in floristic composition, in the abundance of epiphytic bryophytes, and in the smaller height of the trees. *Olea*, *Ocotea*, *Juniperus*, *Podocarpus*, *Schefflera*, and *Pittosporum* are among the many genera characteristic of this type. Above about 300 meters on Mt. Cameroon occur afro-alpine communities (6b). Arborescent species of *Senecio* and *Lobelia*, and shrubby species of *Alchemilla* and *Helichrysum* are typical of the afro-alpine communities.

#### Woodland

Trees occur in open stands with the canopy from 8-20 meters over at least 40 percent of the surface. Most species are deciduous or semi-deciduous. The dominance of trees combined with a light open canopy and the presence of heliophilous grasses distinguish woodland from the other vegetation types. The ground cover includes mostly herbaceous geophytes, hemicryptophytes, and chamaephytes. This woodland is the most extensive vegetation type in Africa and is very variable in height, density, deciduousness, and thorniness. Due to extensive degradation, this woodland is often referred to as savanna.

#### 7. Sudanian woodland with abundant *Isoberlinia* (relatively moist type)

This vegetation type marks the transition from the Guinean to the Sudanian ecological zone. Stages range from woodland to grassy savanna. Tree cover density varies greatly with edaphic conditions and the nature and extent of human activity. This woodland is physiognomically similar to the miombo woodland (though floristically poorer) and is dominated by *Isoberlinia*. *Brachystegia* and *Julbernardia* genera, other characteristic features of the woodlands of tropical Africa, are absent. *Isoberlinia* is represented by two



#### 10. Wooded steppe with abundant *Acacia*

This vegetation belt, part of the Sahelian ecological zone, is a transition zone between the desert and subdesert types to the north and the savanna/woodlands to the south. The abundance of the trees and shrubs. In some places the trees, mostly species of *Acacia*, form open or closed woodland or thickets; in other places the trees are widely scattered. Most of the trees are deciduous, fine-leaved and thorny.

The stoney loamy slopes of the hills and mountains rising out of the plains form a natural savanna on which the potential plant community is characterized by *Hyperrhenia rufa*, *Andropogon gayanus*, *Pennisetum* species *Acacia senegal*, and *Balanites aegyptica*. The present plant community has been significantly modified by intense grazing and annual burning.

On the alluvial flood plain, the potential plant community of the natural savanna is characterized by *Andropogon gayanus*, *Hyperrhenia rufa*, *Setaria pallidifusca*, *Setaria cummunis*, and scattered *Acacia* and other trees. The present plant community is primarily annual grasses. Trees and shrubs have increased in density.

On the deep sands and sandy loams on windformed terraces and sloping uplands, the potential plant community is *Hyperrhenia rufa*, *Pennisetum pedicellatum*, *Andropogon gayanus*, *Ctenium canesiens*, *Acacia* species, *Ficus* species, *Commiphora africana*, and *Scleracarya bicoene*. The present plant community is mainly annual grasses and *Acacia* trees.

#### Edaphic Grassland Mosaics

Vegetation classified under this heading covers large tracts across Africa between the desert and subdesert types on the one side and moister woodland types on the other. These grasslands occur on seasonally or permanently waterlogged soils (anaerobic grasslands).

#### 11. Mosaics of edaphic grassland and communities of *Acacia* and broad-leaved trees

This vegetation zone occurs in the flood plains of the Logone River. An unusual feature of this area is the Yaere flood plain, which is flooded to a depth of 80-120 cm, except for high spots. There are three major potential plant communities in this area. An open savanna on the sandy ridges adjacent to the Logone River is characterized by *Andropogon gayanus*, *Pennisetum* spp., and *Ctenium* spp. *Acacia* predom-



*Chloris gayana*, *Ischaemum afrum*, and *Setaria palustris*.

#### 14. Mangrove

This forest vegetation is confined to marine and fluvial intertidal areas along Cameroon's coast that are regularly flooded with salt or brackish water. Dominating species of trees include *Rhizophora racemosa*, *R. harrisonii*, and *R. mangle*, with *Avicennia nitida* sometimes occurring behind areas of *Rhizophora*.

#### 3.2.2 Status of Native Flora

Cameroon includes areas representative of nearly every major habitat type in Africa, except for arid habitats. As a result there is a rich and varied flora. This flora has not been completely catalogued, but some families and regions of Cameroon have been effectively surveyed. In addition, *Flora of West Tropical Africa* includes Cameroon. There are a considerable number of endemic taxa in Cameroon, particularly in the montane forests of the western highlands and on Mt. Cameroon. These montane areas are unique in West Africa. Most of the plants considered in need of protection in Cameroon are found in the montane areas (see Table 11).

Table 11. Plant Species Recommended for Protection

Species	Location on Biogeographical Map
<i>Podocarpus milanjanus</i>	Montane formations (6)
<i>Glossocalyx brevipes</i>	Forest on Mt. Koupe (2)
<i>Pararistolochia goldieana</i>	Mts. Roumpi
<i>Phyllobotrym soyauxianum</i>	Biafran forest (1a)
<i>Cylicomorpha solmsii</i>	Western Highlands (6)
<i>Crateranthus talbotii</i>	Southern Coastal Formation (1a)
<i>Tetraphyllaster rosaceum</i>	Mt. Cameroon (6)
<i>Poga oleosa</i>	Biafran forest (1a)
<i>Endodesmia calophylloides</i>	Biafran forest (1a)
<i>Oldfieldia africana</i>	Southern Coastal Formation (1a)
<i>Pentabrachion reticulatum</i>	Forest on Mt. Koupe (2)
<i>Cultia kamerunica</i>	Mts. Bamboutos (11)
<i>Hamilcoa zenkeri</i>	Forest on Mt. Koupe (2)
<i>Tapura africana</i>	Southern Coastal Formation (1a)
<i>Zenkerella citrina</i>	Biafran forest (1a)
<i>Eurypetalum unijugum</i>	Forest on Mt. Koupe (2)
<i>Microberlinia bisulcata</i>	Yabassi-Edea (1a)
<i>Paraberlinia bifoliolata</i>	Yabassi-Edea (1a)
<i>Myrica arborea</i>	Mt. Cameroon (6)
<i>Scyphosyce manniana</i>	Biafran forest (2)





Table 11, continued

Species	Location on Biogeographical Map
<i>Oreacanthus mannii</i>	Mt. Cameroon (6)
<i>Pycnostachys pallidicaerulea</i>	Mts. Bamboutos (11)
<i>Sciaphila ledermannii</i>	Southern coastal formation (1a)
<i>Forrestia preussii</i>	Mt. Cameroon (6)
<i>Notosceptrum reflexum</i>	Mts. Bamboutos (11)
<i>Wurmbea tenuis</i>	Mt. Cameroon (6)
<i>Cynastrum cordifolium</i>	Southern coastal formation (1a)
<i>Aristea maitlandii</i>	Mt. Cameroon (6)
<i>Romulea camerooniana</i>	Mt. Cameroon (6)
<i>Acidanthera divina</i>	Mts. Bamboutos (11)
<i>Hesperantha alpina</i>	Mt. Cameroon (6)
<i>Podococcus barteri</i>	Biafran forest (1a)
<i>Raphia regalis</i>	Congolian forest (1b)
<i>Sclerosperma mannii</i>	Biafran forest ( <u><i>Gilbertiodendron deweyrei</i></u> ) (1a)
<i>Hypoxis recurva</i>	Mt. Cameroon (6)
<i>Hypoxis camerooniana</i>	Mt. Cameroon (6)
<i>Gymnosiphon usambaricus</i>	Congolian forest (1b)
<i>Afrothismia winkleri</i>	Mt. Cameroon (6)
<i>Afrothismia polyantha</i>	Mt. Cameroon (6)
<i>Oxygyne triandra</i>	Mt. Cameroon (6)
<i>Holothrix tridentata</i>	Mt. Cameroon (6)
<i>Deroemera ledermannii</i>	Mts. Bamboutos (11)
<i>Cynorchis debilis</i>	Mt. Cameroon (6)
<i>Brownleea alpina</i>	Mt. Cameroon (6)
<i>Sarcorrhynchus polyanthus</i>	Mts. Bamboutos (11)
<i>Barombia gracillima</i>	Forest on Mt. Koupe (2)
<i>Cephalangraecum braunii</i>	Mt. Cameroon (6)
<i>Angraecopsis tridens</i>	Mt. Cameroon (6)
<i>Angraecopsis ischnopus</i>	Mt. Cameroon (6)
<i>Microdracoides squamosus</i>	Yaounde (2)
<i>Guaduella macrostachys</i>	Biafran forest (1a)
<i>Guaduella ledermannii</i>	Forest on Mt. Koupe (2)
<i>Puelia acuminata</i>	Forest on Mt. Koupe (2)
<i>Isoetes biafrana</i>	Mts. Bamboutos (11)
<i>Oleandra annetii</i>	Southern coastal formation (1a)
<i>Antrophyum annetii</i>	Southern coastal formation (1a)
<i>Vittaria schaeferi</i>	Southern coastal formation (1a)
<i>Athyrium ammifolium</i>	Mt. Cameroon (6)
<i>Hypodematum crenatum</i>	Mts. Mandara (9)
<i>Polystichum fuscopalaceum</i>	Mt. Cameroon (6)
<i>Elaphoglossum isabelense</i>	Southern coastal formation (1a)
<i>Elaphoglossum preussii</i>	Mt. Cameroon (6)
<i>Elaphoglossum cinnamomeum</i>	Mt. Cameroon (6)
<i>Ctenopteris zenkeri</i>	Yaounde (2)
<i>Stenochlaena mildbraedii</i>	Congolian forest (1b)

Source: Hedberg. 1968.



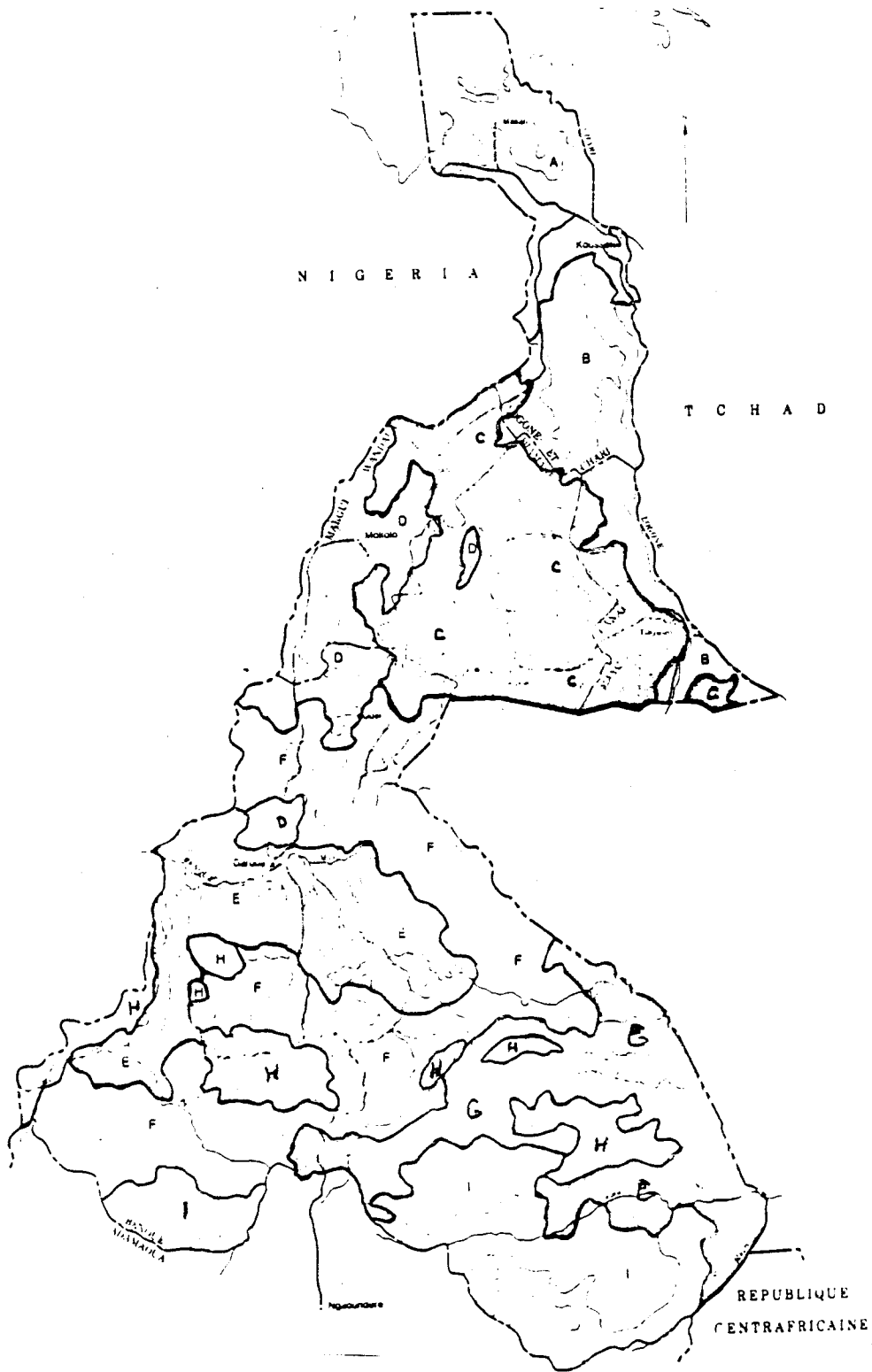


Figure 7. Range Resource Areas of Northern Cameroon.  
 Source: U.S. Dept. of Agriculture. 1978.



### Southern Cameroon

The livestock raising areas in central and southern Cameroon are separated from northern Cameroon by a narrow *cordon sanitaire* which is maintained free of cattle to prevent the spread of contagious bovine pleuropneumonia from the north, where it is endemic, to the south which is free of the disease. The Adamaoua plateau is the major sector for cattle in the south, with lesser numbers in the western highlands and in the lower elevations of eastern Cameroon near the border with the Central African Republic. The quality of the range of these areas is generally better than in northern Cameroon. In large part, this is due to more rainfall and the tsetse fly. The danger of typanosomiasis has helped keep cattle numbers low in proportion to the resource. Livestock numbers are increasing at the rate of one or two percent annually. It is believed that the increase will not cause a degradation in the resource, except in scattered areas near human population centers, for some time to come.

#### 3.2.4 Forests <sup>6/</sup>

In Cameroon, much of the southern area is still covered with moist forests. The southern forest is largely evergreen. In central Cameroon the forests are largely semi-evergreen. It appears that more of this forest type has been cut to accommodate agriculture than of the rainforest.

#### Status of Information on Forest Resources

There is very little information on forests in Cameroon. In 1967 a limited forest inventory was conducted, but none since. The estimates of remaining forest range from 175,000 sq. km to 65,000 sq. km. This would suggest that from half to a quarter of the original forest resource remains. In addition to the dearth of survey information, there is also little information available on plans for conservation and exploitation of forests.

#### Description of the Resource

---

<sup>6</sup>Sources: Europa. 1980.  
FAO and World Bank. 1979.  
Meggers et al. 1973.  
Myers. 1980.  
Schmithüsen. 1979.  
Unesco. 1978.



### 3.3 Water Resources <sup>7/</sup>

There are four major drainage basins in Cameroon. The Sanaga basin occupies the central portion of the country. The two major cities of Cameroon, Douala and Yaounde, are within this basin. It is generally heavily populated. The Benoue basin is in the north central part of the country between the Adamaoua Plateau on the south and the Mandara Mountains in the north. The Congo basin drains the southeastern part of the country through the Dja and Kadei Rivers. North of the Mandara Mountains is the Chad basin in which such rivers as the Logone and Chari take water to Lake Chad.

Although Lake Chad has no outlet, it is not saline. As a result, fish are plentiful and the land around the lake is fertile. The surface area of Lake Chad is about 16,000 sq. km. It has been increasing in size slowly in the recent past. Its volume is about 75 billion cubic meters. Its depth varies from 3 to 7 meters with a mean of about 4 meters.

There are three major reservoirs in Cameroon: Bamendjin on the Noun river with a reservoir capacity of 1.8 million cubic meters; Edea on the Sanaga River; and Mbakou on the Djerm River with a capacity of 2.2 million cubic meters. Several hydroelectric projects are under construction or study with a total capacity of 670 megawatts. The only project in operation is the Edea Complex producing 192 megawatts.

Community water supplies serve 32 percent of the population, however only 26 percent of the population is considered to have access to a safe water supply. Sewage systems are practically non-existent. The supply system is very fragmented. The Ministry of Agriculture is responsible for the rural water supply, while the Ministry of Mines and Energy, the Société Nationale des Eaux du Cameroun and local municipalities operate the water systems in the various urban areas.

Groundwater resources are very poorly known in Cameroon and have not been heavily exploited. There are approximately 2000 wells and yields are generally small. Use of groundwater and surface water for irrigation is virtually non-existent and is apparently

---

<sup>7</sup> Sources: Balek. 1977.  
Beadle. 1974.  
Ekobo et al. 1978.  
Franklin. 1979.  
U.S. AID. 1975a.  
U.S. AID. 1979a.  
World Health Organization and World Bank. 1975.





and Christians, but some have become Muslims and "Fulbéisés" once settled in the plains. The "saré" constitutes the family unit and the social cell. It is composed by a number of houses surrounded by a wall. Housing is scattered in the mountains, but grouped in the plains.

#### B. The Project

A total of fifty-seven small dams with 47 to be financed by AID and the remaining 10 by the World Bank, will be constructed in the Mandara Mountains of North Cameroon. These dams are designed to provide potable water for human and animal consumption and water to be used for increasing the production of small gardens during the 7-month season.

The proposed dams will be constructed in narrow mountain valleys of reinforced concrete, varying from 4.5 to 10 meters in height, and they would have a water retention volume ranging from 10,000 to 60,000 cubic meters.

### 3.4 Fauna <sup>8/</sup>

Because Cameroon stretches from humid tropical rainforest to semidesert, it has an impressive array of animals. As is usual in tropical regions, information on groups other than birds and mammals is fragmentary, often no more than the original description of a species. This is unfortunate as these groups are often very susceptible to disturbance and extinctions of the more specialized species are undoubtedly widespread in tropical regions. Out of necessity, this discussion will be largely limited to birds and mammals, particularly the large mammals, but the status of these groups is probably indicative of the status of the fauna as a whole.

Nearly all of the genera of mammals in West and Central Africa are represented in Cameroon, primarily because it contains virtually every habitat present in West and Central Africa. The major habitat types are savanna and tropical rainforest.

---

<sup>8</sup> Sources: Balinga. 1978.  
FAO. 1979.  
Hall and Moreau. 1970.  
IUCN. 1976.  
Moreau. 1944.  
de Vos. 1978.  
Walker. 1968.



Gorilla (western), continued.

Status: Vulnerable; due to constantly shrinking range and harassment from an increasing human population.

Habitat: The gorilla inhabits several major types of forests; the lowland rain forests, montane rain forests, and bamboo forests. It frequents floristically diverse types of forests which range in altitude from near sea level to more than 3000 m. The habitats utilized are similar in being lush and damp with an abundance of forage near ground level throughout the year.

Common name: Cameroon clawless otter.

Scientific name: *Aonyx microdon*

Status: Endangered; occurs in Cameroon (and Nigeria) where its range and populations have declined seriously as a result of uncontrolled hunting for the fur trade. An ecological survey is urgently required to determine its range and status, and to formulate effective measures for its conservation, including reservation of representative samples of its habitat.

Habitat: Inhabits rivers, but is probably more terrestrial in its habits than related species. It feeds mainly on relatively soft matter, such as small land vertebrates, eggs, and frogs rather than on fish. Deterioration of its habitat is not believed to have been instrumental in its decline.

Common name: African wild dog.

Scientific name: *Lycaon pictus*

Status: Depleted throughout its range; vulnerable to continued persecution; shrinkage of range and reduction in numbers of natural prey.

Habitat: Open or wooded savanna. They are primarily diurnal and commonly regarded as harmful to game and domestic stock, but they play an important role in the balance of their environment.

Common name: Leopard.

Scientific name: *Panthera pardus*

Status: Vulnerable; exterminated from large parts of its former range and depleted elsewhere.

Habitat: A wide variety of biomes. One important factor is cover, both for hunting and for lying-up to feed and rest. Human modification of savanna ecotypes tends to the removal of trees and bush, although the leopard has proved to be exceptionally resilient and tolerant of changes to its habitat.

Common name: West African manatee.

Scientific name: *Trichechus senegalensis*

Status: Vulnerable; seriously depleted throughout most of its range in rivers and coastal areas of western Africa. New attempts are required to define its present status and distribution as a basis for the establishment of effective sanctuaries.

Habitat: Occurs in both coastal and riverine areas, where it feeds on aquatic plants and terrestrial plant material. There is no conclusive evidence of regular or extensive migration. The possible effects of modification of habitat on populations through pollution, water impoundment or increased human disturbance, have not been ascertained.



## Amphibians

Common name: Cameroon toad.

Scientific name: *Bufo superciliaris*

No further information given.

In general, Cameroon has been interested in conserving its wild-life resources. This interest is based on a recognition of the value of game as a traditional food source and wildlife as an agent to get more income through tourism and sport hunting. The demand for game meat is generally high in Cameroon and as a result poaching can be a severe problem. The staff to control poaching is generally not sufficient, but efforts are being made to improve and expand the game guards. The Ecole de Faune in Garoua stands out in this regard. The school began operation in 1970 and trains wildlife management personnel for all of Francophone Africa.

### 3.5 National Parks and Reserves <sup>9/</sup>

The thirteen national parks and equivalent reserves of Cameroon cover approximately 2.5 million ha, about 5 percent of the country. In West and Central Africa, only Chad and Zaire have more land under comparable protection. Nearly forty percent of the protected area is in dense tropical rain-forest. Most of the rest is in savanna and transition between savannah and Guinean forest. The montane forest of the Western Highlands has no parks or equivalent reserves and is the only major ecological zone with no protection. Presently, the protected areas in the rainforest have little access and are not managed for tourism. However, the savanna tourism is an important activity. The national parks are administered by the General Delegation for Tourism which is under the Ministry of Economy and Plan. The reserves are administered by the Forestry Department of the Ministry of Agriculture.

#### 3.5.1 Review of Parks and Reserves

- 1) Kala-Maloué National Park. 4,500 ha. Grassland with thorny scrub, grassland and swampy grasslands. Large mammals include Kob (*Kobus defassa*), topi (*Damaliscus*

---

<sup>9</sup>Sources: Allo. 1979.  
IUCN. 1976.  
IUCN. 1977.  
IUCN. 1979.  
Ngog Nje. 1975.



*korrigum*) bushbuck (*Tragelaphus scriptus*), and red-fronted gazelle (*Gazella rufifrons*). A few leopards (*Panthera pardus*), listed as vulnerable in the Red Data Book, are present. Monitor lizards, pythons and crocodiles are also present, although it is uncertain whether they are *Crocodylus cataphractus* or *C. niloticus* or both. Both species are listed in the Red Data Book. Birds are typical of grassland-savanna regions.

- 2) Waza National Park. 170,000 ha. Savanna dominated by *Acacia seyal* and grassland that is periodically flooded. Waza is a MAB Biosphere Reserve. However, the reserve may be too small to be viable. A number of important dry season watering places and grazing lands are outside the park and are controlled by pastoral tribes. The park is managed for tourism with a hotel just outside the park, about 400 kilometers of roads, and a system of tours. The park is open to tourists only during the dry season from November to April. There are large numbers of large mammals in the park including striped hyena (*Hyaena hyaena*) lion (*Panthera leo*), elephant (*Loxodonta africana*), warthog (*Phacochoerus aethiopicus*), giraffe (*Giraffa camelopardalis*) and a variety of antelopes. Two species, leopard and cheetah (*Acinonyx jubatus*), listed in the Red Data Book were historically present, but may have been extirpated in this region. The avifauna is impressive both in numbers of species and individuals, but no particularly rare species are present.
- 3) Mozogo-Gokore National Park. 1,400 ha. This area was protected for its flora. The general habitat is similar to the savanna elsewhere in the north.
- 4) Boubandjidah National Park. 220,000 ha. *Isoberlina* woodland. Large mammals similar to those in Waza National Park, but without the high densities. The avifauna contains a higher proportion of woodland species and fewer waterbirds and savanna zone birds.
- 5) Benoue National Park. 180,000 ha. *Isoberlina* woodland. Very similar to Boubandjidah National Park.
- 6) Faro Fauna Reserve. 330,000 ha. *Isoberlina* woodland. Large mammals include giraffe, buffalo (*Syncerus caffer*), black rhinoceros (*Diceros bicornis*) in addition to a number of primates and antelopes. A bad poaching problem exists.
- 7) Kimbi Reserve. 47,500 ha. Transition between rain forest and woodland; mainly gallery forest. Large mammals include kob, striped hyena, warthog, pangolins (*Manis* spp.), and hyrax (*Procavia* spp.).





#### 4.0 Environmental Problems

##### 4.1 Forest Destruction

Destruction of the forest resource in Cameroon continues at an impressive rate. Most of the forest may already be gone. There are several issues associated with this destruction. The lowland forests are a very important habitat for wildlife in Cameroon and its loss has affected the forest wildlife already. Cameroon needs to develop a survey of the forests so that the extent of the destruction can be accurately assessed. Presently, estimates vary as to the amount of remaining forest by 200 percent. An effective survey of the forests will help Cameroon to formulate a coherent policy for effective conservation and exploitation of its forest resource. Although many policies have been instituted in Cameroon, their effectiveness has been negligible because of the lack of well-defined goals. The formulation and implementation of an integrated forest policy should be considered an environmental priority.

There are a number of forestry reserves that have been set aside. However, several have logging concessions within their boundaries and have lost their integrity. More areas need to be protected. Logging and poaching within the reserves is a continuing problem. It appears to be most severe in the reserves in the coastal forests.

##### 4.2 Range Degradation <sup>10/</sup>

The range in the semi-arid region of Northern Cameroon has been severely degraded. There are two major causes of this degradation. First, both drought and a large number of stock animals have placed severe pressure on the range. It is considered unlikely that without protection that this range can recover. Second, much of the resource is underutilized. This has forced larger numbers of stock to be crowded into a smaller area. The underutilized areas are generally those infested by the tsetse fly (*Glossina* spp.). In order to develop these regions some form of control of trypanosomiasis in cattle must be developed.

Projects have been formulated to try to deal with both parts of the problem. A management plan which would protect severely degraded lands in grazing reserves has been developed. It is suggested that areas in the Chari Delta near Lake Chad and on the Diamaré Plain be used as pilots to develop the system since these

---

<sup>10</sup> Source: U.S. Department of Agriculture. 1978.



#### 4.4 Protection of Montane Forests <sup>11/</sup>

The western highlands of Cameroon contain the only large area of montane habitats in West Africa. A unique flora and fauna exists in these forests with numerous endemics, particularly among the vascular plants and birds. In Cameroon, this area is also the most heavily populated part of the country. It has been heavily cultivated for a long period and much of the native vegetation is already gone. Protection of areas of forest in the highlands is considered the most critical preservation need in Cameroon today.

---

<sup>11</sup>Source: IUCN. 1979.

## Literature Cited

- Abercrombie, F. D. 1974. Range Development and Management in Africa. Washington, D.C.: U.S. AID. 59 pp.
- Allo, A. A. 1979. National Parks and Equivalent Reserves as a Form of Land Use in Francophone Africa. Fourteenth International Seminar on National Parks and Equivalent Reserves, USA and Canada, July 31-August 28, 1979. 8 pp.
- Balek, J. 1977. Hydrology and Water Resources in Tropical Africa. Amsterdam: Elsevier.
- Balinga, V. S. 1978. Competitive uses of food. Unasyuva 29(116): 22-25.
- Beadle, L. C. 1974. The Inland Waters of Tropical Africa: An Introduction to Tropical Limnology. New York: Longman, Inc.
- Economic Commission for Africa. 1972. Directory of Inter-governmental Co-operation Organizations in Africa. New York: United Nations. 97 pp.
- Ekobo, S., D. Palmer, and C. Ripert. 1978. Environmental Assessment: The Potential Health Impact of the Construction of Fifty-Seven Dams in the Mandara Mountains (North Cameroon). Washington, D.C.: U.S. AID.
- Europa Publications Ltd. 1980. Africa South of the Sahara, 1980-81, 10th ed. London: Europa, pp. 221-248.
- Food and Agricultural Organization, Council. 1979. UN Joint Inspection Unit on Regional Training Programmes in African Wildlife Management at Mweka and Garoua: Seventy-Sixth Session, Rome, 6-8 November 1979. Rome: FAO; JIU REP/79/1.
- Food and Agriculture Organization and Unesco. 1977. Soil Map of the World, Volume VI: Africa. Paris: Unesco.
- Food and Agriculture Organization and World Bank. 1979. Republic Unie du Cameroun: Etude de Secteur Forestier. (2 vols.) 21/79 CMR.7. Rome: FAO.
- Franklin, T. 1979. Cameroon: Rural Water Sector. Yaounde: U.S. AID. Project 631-0017 - National Planning for Community Development.
- Hall, B. P. and R. E. Moreau. 1970. An Atlas of Speciation in African Passerine Birds. London: British Museum. 423 pp.



- Unesco. 1966. Scientific Research in Africa: National Policies, Research Institutions. Paris: Unesco. 214 pp.
- . 1978. Tropical Forest Ecosystems: A State of Knowledge Report. Paris: Unesco/UNEP/FAO.
- U.S. Agency for International Development. 1975a. Central West. Africa Region Development Assistance Program. Washington, D.C.
- . 1975b. Project Paper - North Cameroon Livestock and Agriculture Development. Washington, D.C.: U.S. AID.AFR/CAWA Project No. 631-004.
- . 1978. United Republic of Cameroon National Nutrition Survey. Washington, D.C.: U.S. AID; DS/N.
- . 1979a. Project Paper: Mandara Mountains Water Resources. Washington, D.C.: U.S. AID. AFR/CAWA Project No. 631-0012.
- . 1979b. ALDATA Report on Cameroon. Washington, D.C.: U.S. AID. Compiled from the Economic and Social Data Bank, PPC/PDPR/ESDS, AID.
- . 1980. Cameroon Country Strategy Statement-FY 1982. Washington, D.C.: U.S. AID.
- U.S. Bureau of Mines. 1975(?). Mineral Industries of Africa. Washington, D.C.: U.S. Bureau of Mines. 77 pp.
- United States Department of Agriculture, Soil Conservation Service and Fonds d'Aide et de Cooperation, France. 1978. Resource Inventory of Northern Cameroon. Washington, D.C.: U.S. AID.
- de Vos, A. 1978. Game as Food - A Report on its Significance in Africa and Latin America. Unasyuva 29(116): 2-12.
- Walker, E. P. 1968. Mammals of the World. 2nd ed. Baltimore: Johns Hopkins. 1500 pp.
- World Bank. 1980. United Republic of Cameroon Economic Memorandum. Washington, D.C.: World Bank. Report No. 2877-CM.
- World Health Organization and World Bank. 1975. Cameroon: Water Supply and Sewerage Sector Study. (2 vols.). Washington, D.C.: World Bank. Report No. 902-CM.





Appendix I

Organizations and Institutions with Environmental  
Interests or Responsibilities<sup>12/</sup>

- A. Governmental
- B. Educational Institutions
- C. Non-governmental
- D. International
- E. Inter-governmental

---

<sup>12</sup>Sources: Economic Commission for Africa. 1972.  
Europa. 1980.  
Sierra Club. 1976.  
Unesco. 1966.



## B. Educational Institutions

1. College of Arts, Science and Technology  
Buea, Western Cameroon  
Private institution.
2. Ecole Federale Superieure D'Agriculture  
B.P. 138, Yaounde
3. Ecole pour la Formation des Specialistes de la Faune  
(School for the Training of Wildlife Specialists)  
B.P. 271, Garoua, Cameroon  
Affiliated with FAO and the College of African Wildlife Management, Mweka, Tanzania. Studies in general ecology, animal biology, veterinary science, and park and reserve management.
4. Forestry School M'Balmayo  
M'Balmayo, Cameroon
5. Universite Federale Du Cameroun (UFC)  
B.P. 337, Yaounde
  - a. Faculty of Science
  - b. Faculty of Law and Economics
  - c. Faculty of Arts and Social Science
  - d. Affiliated Institutes
    - 1) Centre Universitaire des Sciences de la Sante  
B.P. 1364, Yaounde
    - 2) Ecole Nationale Superieure Polytechnique  
B.P. 337, Yaounde
    - 3) Ecole Normale Superieure  
B.P. 47, Yaounde
    - 4) Institut d'Administration des Entreprises  
B.P. 337, Yaounde
    - 5) Institut des Relations Internationales du Cameroun  
B.P. 1365, Yaounde



13. Mission de Developpement d'Ombessa  
B.P. 152, Bafia  
Extension and marketing service for local produce.
14. Organisation de Coordination Et De Cooperation Pour La Lutte  
Contre Les Grandes Endemies En Afrique Centrale (OCCGAC)  
Yaounde
15. Societe Camerounaise d'Exploitation Forestiere (SCEF)  
B.P. 671, Douala  
Exploitation of forests and production of wood.
16. Societe Camerounaise de Promotion (Promocam)  
Yaounde  
Cultural, commercial and industrial promotion.
17. Societe de Developpement de la Riziculture dans la plaine des Mbo  
(SODERIM)  
B.P. 160, Dschang  
Expansion of rice-growing and processing.
18. Societe de Developpement du Cacao (SODECAO)  
B.P. 4083, Yaounde  
Development of cocoa production in the Centre-Sud province.
19. Societe de Developpement du Coton (SODECOTON)  
B.P. 302, Garoua  
Development of cotton and other agricultural production in the  
north; marketing and processing of cotton.
20. Societe de Developpement du Perimetre de Mise en Valeur Agricole  
Yambassi-Bafang (SODENKAM)  
B.P. 02, Nkondjock, Yambassi-Bafang  
Development of northern area by improving infrastructure and in-  
creasing production.
21. Societe de Developpement pour la Culture et la Transformation du  
Ble (SODEBLE)  
B.P. 41, Ngaoundere  
Development of wheat-growing and flour-milling in the Adamaoua  
region.
22. Societe de Developpement et d'Exploitation des Produits Animaux  
(SODEPA)  
B.P. 1410, Yaounde  
Development of livestock raising and livestock products.
23. Societe d'Etudes des Bauxites du Cameroun (SEBECAM)  
B.P. 1090, Douala  
Feasibility studies for the exploitation of bauxite reserves at  
Minim-Martap.



#### D. International

1. Bureau de Recherches Geologiques et Minieres (BRGM)  
B.P. 343, Yaounde
2. Centre Technique Forestier Tropical (CTFT)  
B.P. 832, Douala  
Forestry research.
3. Compagnie Francaise pour le Developpement des Fibres Textiles (CFDT)  
B.P. 302, Garoua  
Textile research.
4. Development of Forests and Forest Industries Project  
B.P. 309, Yaounde, Cameroon  
Joint project of the Cameroon Government and the Food and Agriculture Organization of the UN for research and training for rational exploitation of forests and development of forest industries.
5. Institut de Formation et de Recherches Demographiques  
Yaounde  
Basic research on demographic trends and their links with economic and social factors.
6. Institut de Recherches du Coton et des Textiles Exotiques-IRCT  
Section Experimentation Cotonniere du Cameroun  
B.P. 22, Maroua  
Genetics, agronomy and phyto-sanitary defence  
a) Station de Maroua
7. Institut de Recherches pour les Huiles et Oleagineux (IRHO)  
B.P. 243, Douala
8. Institut Francais de Recherches Fruitieres Outre-Mer  
Paris, France  
a. Station des Cultures Fruitieres de la Republique de Cameroun
9. Institut Pasteur du Cameroun  
B.P. 888, Yaounde
10. Office de la Recherche Scientifique et Technique Outre-Mer  
B.P. 1857, Yaounde  
Pedology, hydrology, nutrition, psycho-sociology, demography, economics, geography, archaeology, botany and vegetal biology, and medical entomology.  
a. Institut de Recherches du Cameroun  
B.P. 193, Yaounde





Appendix II

National Committee for the Man and the Biosphere Program



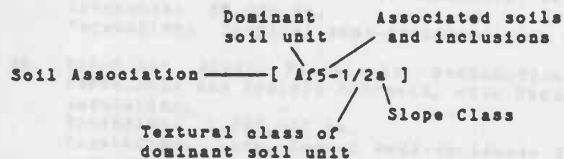
Appendix III

FAO Soil Map and Key



Key to Soil Map

Example: Af5-1/2a



For each soil association symbol, the dominant soil unit is given first, followed by the textural class of the dominant soil unit, any associated soils and inclusions, and the slope class.

**Associated soils:** Subdominant soils with an extension of more than 20% of the mapping unit.

**Inclusions:** Inclusions of important soils occupying less than 20% of the mapping unit.

**Slope class:** Topography in which a soil association occurs:

- a: slope of 0-8% (level to undulating);
- b: slope of 8-30% (rolling to hilly);
- c: slope of more than 30% (steeply dissected to mountainous).

**Phases:** A subdivision of the soil association having characteristics that affect the use and management of the soil but which do not vary sufficiently to differentiate it as a separate species.

**petric and petroferric:** shows the presence of indurated layers (concretionary horizons and petroferric horizons respectively) within 100 cm. of the surface.

**saline:** shows that certain soils of the association (not necessarily the dominant) are affected by salt to the extent that they have a conductivity greater than 4mmhos/cm in some parts of the soil within 125 cm. of the surface for some part of the year. The phase is intended to mark present or potential salinization.

**sodic:** soils which have more than 6% saturation with sodium in some part of the soil within 125 cm. of the surface.

**stony:** areas where the presence of gravels, stones, boulders or rock outcrops makes the use of mechanized agricultural equipment impracticable.

Acrisols (2,524,000 ha.)

1. Af1 (petric phase): Ferric Acrisols.  
Extension: 75,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
2. A01-2b (petric phase): Orthic Acrisols, medium textured; rolling to hilly.  
Extension: 438,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
3. A07: Orthic Acrisols; Orthic Ferralsols.  
Extension: 1,062,000 ha.  
Vegetation: Tropical lowland rain forest, tropical semi-deciduous rain forest, large-leaved semi-deciduous tree savanna, moist savanna.
4. A07-a: Orthic Acrisols; Orthic Ferralsols; level to undulating.  
Extension: 89,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
5. A07-2a: Orthic Acrisols, medium textured; Orthic Ferralsols; level to undulating.  
Extension: 572,000 ha.  
Vegetation: Tropical lowland rain forest.
6. A030-a: Orthic Acrisols; Ferralic Cambisols; level to undulating.  
Extension: 288,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.



23. Fp35-3ab: Orthic Ferralsols, fine textured; Dystric Histosols; level to undulating and rolling to hilly.  
Extension: 240,000 ha.  
Vegetation: Tropical lowland rain forest.
24. Fp2-a: Plinthic Ferralsols; Lithosols; level to undulating.  
Extension: 58,000 ha.  
Vegetation: Tropical semi-deciduous rain forest.
25. Fr6-2/3a: Rhodic Ferralsols, medium-fine textured; orthic Ferralsols and Dystric Nitisols, with Humic Ferralsols; level to undulating.  
Extension: 1,038,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
26. Fx1-1a: Xanthic Ferralsols, coarse textured; level to undulating.  
Extension: 705,000 ha.  
Vegetation: Tropical lowland rain forest.
27. Fx8-1a: Xanthic Ferralsols, coarse textured; Orthic Acrisols and Dystric Nitisols, with Gleysols and Humic Podzols; level to undulating.  
Extension: 205,000 ha.  
Vegetation: Tropical lowland rain forest.

Gleysols (1,401,000 ha.)

28. G2-a: Gleysols; Fluvisols; level to undulating.  
Extension: 99,000 ha.  
Vegetation: Tropical semi-deciduous rain forest.
29. Gd16-2/3a (sodic/saline phase): Dystric Gleysols, medium-fine textured; Dystric Fluvisols, Thionic Fluvisols and Gleyic Solonchaks; level to undulating.  
Extension: 192,000 ha.  
Vegetation: Mangroves.
30. Ge1-2/3a: Eutric Gleysols, medium-fine textured; level to undulating.  
Extension: 69,000 ha.  
Vegetation: Reed Swamps.
31. Ge16: Eutric Gleysols; Cambic Arenosols and Pellic Vertisols.  
Extension: 41,000 ha.  
Vegetation: Dry savanna.
32. Gh1-3a: Humic Gleysols, fine textured; level to undulating.  
Extension: 325,000 ha.  
Vegetation: Reed swamps.
33. Gh4: Humic Gleysols; Dystric Gleysols and Dystric Histosols, with Dystric Fluvisols.  
Extension: 65,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna.
34. Gh4-a: Humic Gleysols; Dystric Gleysols and Dystric Histosols, with Dystric Fluvisols.  
Extension: 432,000 ha.  
Vegetation: Reed swamps.
35. Gh8-b: Humic Gleysols; Dystric Nitisols; rolling to hilly.  
Extension: 178,000 ha.  
Vegetation: Tropical semi-deciduous rain forest.

Lithosols (839,000 ha.)

36. I: Lithosols.  
Extension: 243,000 ha.  
Vegetation: Tropical semi-deciduous rain forest, moist savanna, dry savanna.
37. I-Lf (petric phase): Lithosols; Ferric Luvisols.  
Extension: 82,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
38. I-Lf-bc (stony phase): Lithosols; Ferric Luvisols; rolling to hilly and steeply dissected to mountainous.  
Extension: 120,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.





Nitosols (7,354,000 ha.)

55. Nd1: Dystric Nitosols.  
Extension: 2,109,000 ha.  
Vegetation: Tropical semi-deciduous rain forest, large-leaved semi-deciduous tree savanna, moist savanna.
56. Nd1-2a: Dystric Nitosols, medium textured; level to undulating.  
Extension: 339,000 ha.  
Vegetation: Tropical lowland rain forest.
57. Nd6-3a (petric phase): Dystric Nitosols, fine textured; Rhodic Ferralsols, with Plinthic Ferralsols and Lithosols; level to undulating.  
Extension: 818,000 ha.  
Vegetation: Tropical semi-deciduous rain forest.
58. Nd6-3ab (petric phase): Dystric Nitosols, fine textured; Rhodic Ferralsols, with Plinthic Ferralsols and Lithosols; level to undulating and rolling to hilly.  
Extension: 1,603,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna, moist savanna.
59. Nd8: Dystric Nitosols; Orthic Acrisols with Lithosols.  
Extension: 366,000 ha.  
Vegetation: Tropical semi-deciduous rain forest.
60. Nd10-b: Dystric Nitosols; Orthic Ferralsols and Rhodic Ferralsols; rolling to hilly.  
Extension: 69,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna.
61. Nd10-3b: Dystric Nitosols, fine textured; Orthic Ferralsols and Rhodic Ferralsols; rolling to hilly.  
Extension: 438,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna.
62. Nd16-2/3a: Dystric Nitosols, medium-fine textured; gleyic Acrisols and Orthic Acrisols; level to undulating.  
Extension: 212,000 ha.  
Vegetation: Tropical lowland rain forest.
63. Ne1: Eutric Nitosols.  
Extension: 27,000 ha.  
Vegetation: Tropical lowland rain forest.
64. Ne3-b: Eutric Nitosols; Orthic Ferralsols and Lithosols; rolling to hilly.  
Extension: 301,000 ha.  
Vegetation: Tropical lowland rain forest.
65. Ne16-a: Eutric Nitosols; Orthic Ferralsols and Dystric Nitosols; level to undulating.  
Extension: 103,000 ha.  
Vegetation: Tropical lowland rain forest.
66. Ne17: Eutric Nitosols; Dystric Nitosols, with Lithosols.  
Extension: 757,000 ha.  
Vegetation: Tropical lowland rain forest.
67. Nh3: Humic Nitosols; Humic Ferralsols and Lithosols.  
Extension: 171,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna.
68. Nh3-ac: Humic Nitosols; Humic Ferralsols and Lithosols; level to undulating and steeply dissected to mountainous.  
Extension: 41,000 ha.  
Vegetation: Large-leaved semi-deciduous tree savanna.

Arenosols (189,000 ha.)

69. Qc1: Cambic Arenosols.  
Extension: 79,000 ha.  
Vegetation: Dry savanna.
70. Qc10-1a: Cambic Arenosols, coarse textured; Lithosols; level to undulating.  
Extension: 110,000 ha.  
Vegetation: Dry savanna.



Planosols (579,000 ha.)

86. Ws2: Solodic Planosols; Gleyic Luvisols.  
Extension: 127,000 ha.  
Vegetation: Thornbush savanna.
87. Ws10-a: Solodic Planosols; Pellic Vertisols; level to undulating.  
Extension: 322,000 ha.  
Vegetation: Thornbush savanna.
88. Ws11-a: Solodic Planosols; Eutric Fluvisols; level to undulating.  
Extension: 130,000 ha.  
Vegetation: Thornbush savanna.



## Appendix IV

### Bibliography

- A. Soil Resources
- B. Forest Resources
- C. Water Resources and Climate



- Lasserre, M. 1961. Carte geologique de reconnaissance du Cameroun au 1:500,000, feuilles Ngaoundere-Est et Bossangoa-Ouest (Partie Cameroun) avec notice explicative. Yaounde: Dir. Mines et Geol. 50 pp.
- Lyon Associates, Inc. 1970. Laterite Soils Study, Phase II. Quarterly Report No. 6. Kumasi, Ghana: Building and Road Research Institute.
- Manistre, B. E. 1973. Photogeological mapping of part of the Republic of Cameroon. Toronto: Kentry Exploration Service for Canadian International Development Agency. 203 pp.
- Martin, D. 1960. Pedological Study of the Logone Plain at 1:20,000. Yaounde: IRCAM. 8 pp.
- 1961. Pedological Map of the North Cameroon. Scale 1:100,000. Mora page. Yaounde: IRCAM.
- 1962. Pedological Study of the Cameroon Banks of Lake Chad. Yaounde: IRCAM.
- 1963. Pedological map of the North Cameroon. Scale 1:100,000. Kaele page. Yaounde: IRCAM.
- 1966. Etudes Pedologiques dans le Centre-Cameroun (Nanga-Eboko a Bertoua). Mem. O.R.S.T.O.M., 19, 92 p.
- 1967. Geomorphologie et sols ferrallitiques dans le Centre-Cameroun. Cah. O.R.S.T.O.M. ser. Pedol., 5(2), 189-218.
- 1968-1969. Hydromorphic Soils with Pseudo-gley Lithomorphes in the North Cameroon. Yaounde: IRCAM. Pedology Vol. VII No. 2 & 3.
- Martin, D. and P. Segalen. 1966. Notice Explicative de la Carte Pedologique du Cameroun Oriental au 1:1,000,000. Yaounde: ORSTOM. 134 pp.
- Martin, D., G. Sieffermann, and M. Vallerie. 1966. Red soil of the North Cameroon. Pedol. Series 4(3):3-28. Paris: ORSTOM.
- Pedological and Soil Mapping Commission. 1967. Soil Classification. ENSA of Crignon geological laboratory. Ecole Nationale Superieur d'Agriculture.
- Pias, J. and E. Guichard. 1957. Pedological Map of the Alluvial Basin of Logone and Chari (North Cameroon). Pages: Mora, Yagoua, Maroua, Fort Foureau. Yaounde: ORSTOM.
- Roch, E. 1952. Les relief residuels, ou inselbergs, du bassin de la Benoue (Nord-Cameroun). C.R. Acad. Sc. 234:117-119.





## B. Forest Resources

- Auer, C. 1975. Route Lourde Portant de Yokadouma-Moloundou vers Campo-Kribi (Douala). Yaounde: FAO, Document No. PNUD/FAO (FO/CMR/73/008).
- Cousens, J. E. 1970. Forest and Forest Industries Development-Cameroon: Forest Management and Silviculture. Rome: FAO. Technical Report 2. Document no. UNDP/FAO (FO/SF/CMR 6).
- Deveson, J. B. 1970. Forest and Forest Industries Development - Cameroon: The Handling and Transportation of Forest Products within and from Cameroon. Rome: FAO. Technical Report 1. Document no. UNDP/FAO (FO/SF/CMR 6).
- Dietz, P. 1970. Rapport sur les Routes Forestieres (Foret de Deng-Deng). Rapport Provisoire. Yaounde: FAO. Document no. PNUD/FAO (FO/SF/CMR/72/008).
- Hughes, J. F. 1968. Forest Industries Development. Provisional Report. Yaounde: FAO. Document no. UNDP/FAO (FO/SF/CMR/72/008).
- Lanly, J. P. 1970. Plan d'inventaire Forestier Complementaire pour la region de Deng-Deng. Document no. PNUD/FAO (CMR6).
- Lawrre, J. J. 1971. Projet de developpement des Forets et des Industries Forestieres. Rapport Provisoire. Yaounde: FAO Document no. PNUD/FAO (FO/SF/CMR/72/008).
- Le Ray, J. 1971. Forest and forest industries development-Cameroon: forest development. Rome: FAO. Document no UNDP/FAO (FO/SF/CMR6). Technical Report 3.
- Legris, P. 1976. Compte Rendu Mission au Cameroon sur l'enseignement Forestier (ingenieurs). Paris: FAC-CTFT.
- Schirle, A. 1975. Etude de Prix de Revient des Plantations Papetieres (sur defrichement de foret dense humide). Paris: FAC-CTFT.
- Taylor, C. J. 1972. Mise en Valeur des Forets de Developpement des Industries Forestieres-Cameroon: Politique, Legislation et Administration Forestieres. Rome: FAO. Document no. PNUD/FAO (FO/SF/CMR6). Rapport Technique 4.
- Venet, J. M. 1973. Mise en Route d'un Departement de Foresterie a l'Ecole Nationale Superieure Agronomique de Yaounde 'N' Kolbisson (Cameroon). Paris: FAC-CTFT.