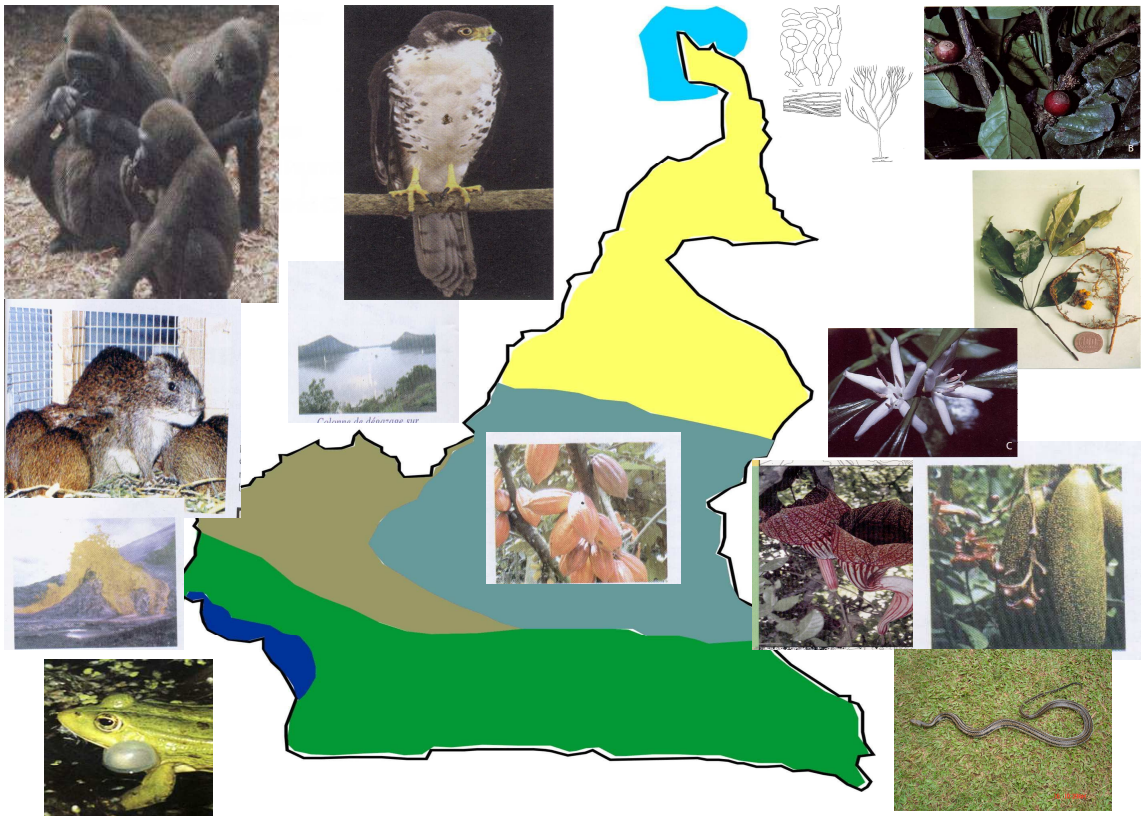
**REPUBLIC OF CAMEROON**

# *CAMEROON FOURTH NATIONAL REPORT*

## TO THE

## CONVENTION ON BIOLOGICAL DIVERSITY



UNEP

GEF

CBD

## *Pictures on cover page:*

From left to right

Left : Taiping four gorilla, frog type, *Accipiter tachiro*;
Middle: Cameroon map divided into the various ecosystems
*Right: Gnetum spp* and E*ctomycorriza* (Scleroderma), *Coffea montekupensis* (Cheek, 1998); *Aphelariopsis, coffee bakossi (Gosline 1999) kupemontis* (Roberts) a fungi , a new snake species (unidentified);
Cameroon mapwith the various ecosystems

All information contained in this Report has been examined and certified by the Ministry of Environment and protection of Nature, Cameroon. The responsibility and authenticity of the information lies solely on the sources who supplied the information, and they are been cited acknowledged.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES



# LIST OF BOXES

# ACKNOWLEDGEMENTS

This report is the contribution of individuals and institutions associated with biodiversity activities in Cameroon. The Ministry of the Environment and Protection of Nature recognises their contributions and endeavour in building up this report. All the individuals and institutions mentioned in the list of contributions to the report have therefore been acknowledged**.**

Special mention and gratitude is made to institutions who have devoted their time and resources in their bid to study the status and trend in Cameroon's biological resources some of whom have contributed to build up the list of case studies used in this report. Among these are: The Ministry of Agriculture and Rural Development for their useful information on crop production, The Ministry of Fisheries and Animal Industries including its associated Project on Non-conventional breeding; the National Herbarium Cameroon; Kew Botanic Gardens; The Heifer Project Cameroon; Birdlife International, World Wildlife Fund for Nature; the International Union for the Conservation of Nature in Cameroon; the Cameroon Academy of Science, the Cameroon Bioscience Society; Bio-resources Development and Conservation Programme- Cameroon; University of Yaoundé I, the Limbe Botanic and Zoological Garden ; The Centre for Biodiversity and Sustainable Development - Cameroon; l'Organistaion et Centre d'Appui Agro-Ecologique du Cameroun, .

Cameroon is extremely grateful for the financial support provided by the Global Environment Facility (GEF) through a medium-sized project jointly managed by UNDP and UNEP.

The Institute of Agricultural Research for Development (IRAD) particularly the Animal Production and Fishery Department as well as the Central Entomology Laboratory have provided useful information which has largely contributed towards updating animal and insect diversity information in Cameroon.

# *FOREWORD*

*It is with great honour that the Government of Cameroon is submitting the present 4th National Report on the Convention on Biological Diversity in fulfilment of its obligations on reporting as requested by the Secretariat of the Convention, and raising awareness as contained in the provisions of Article 74 of the 1996 (National) Framework Law on Environmental Management. The Report provides an opportunity for various stakeholders at the national level to take stock of the achievements made towards conservation and sustainable use of the nation's biodiversity. It also affords a new spirit and reconfirmed commitment to meet the 2010 Biodiversity Loss Reduction Target. This collective commitment was demonstrated by the cross-section of biodiversity stake-holders representatives attending the consultative workshop on the elaboration of this report held at the Chamber of Agriculture, Livestock, Fisheries and Forestry from 17 to 18 August 2008.*

*In counting our gains, we equally made a critical analysis of the situation on biodiversity loss and discovered a number of main drivers of biodiversity loss as being: unsustainable agricultural practices, continued illegal exploitation of forest resources, unsustainable continental and marine fishing, desert encroachment, pollution from diverse sources and unsustainable land use, natural disasters or catastrophes such as floods, erosion and landslides. All these factors have had serious negative impacts on biodiversity conservation, accelerating the vulnerability of several species, increased poverty and the negative impact on human health and the environment. The Congo Basin ecosystem which serves as a global carbon sink continues to be degraded while waters of Lake Chad and other inland lakes continue to dwindle.*

*A series of events registered during the period covered in the report have contributed to raise awareness and produced concrete results towards curbing biodiversity loss. Among some major activities to which Cameroon participated, hosted or initiated are:*

- *Hosting of the Sub-regional Conference on National Biodiversity Strategies and Action Plans for Central African countires*
- *The hosting by Cameroon of the African Preparatory Meeting to COP12 to the Ramsar Convention on Wetlands,*
- *Sub-regional meetings of the Commission on Forest for the Central African Sub-region (COMIFAC),*
- *The African Regional Children's Summit on the Environment,*
- *The return to Cameroon of the Four smuggled Cameroonian Gorillas-"The Taiping Four",*
- *Organisation of GEF National Dialogue on identifying national priorities for funding amongst others.*

- *The adoption of National Commitments for the implementation of Principle 10 of the Rio Declaration promoting public access to environmental information, Participation of the public in environmental decision making and public access to justice in the field of environment,*
- *Launching of the Operation Green Sahel Initiative in the Far North Province with the planting of several thousand trees by youth and local communities,(this initiative ties with the UNEP Billion Tree Campaign and the Sahara Green belt);*
- *The identification of national wetland sites of international importance,*
- *The institution of Awards to various Divisions in the country in support of environmental protection competition activities (with special emphasis placed on the conservation of biodiversity);*
- *And the creation of the Department of Biodiversity in the University of Yaounde I and Biodiversity Research Centre(IRAD)*

*Greater emphasis is placed on biodiversity criteria during environment impact assessments for major projects to be realised in Cameroon in a truly participatory manner. Several steps have been taken to improve communication, education and public awareness in the field of the environment in general and biodiversity in particular. The role played by other stakeholder ministries, city councils, NGOs, Nature Clubs in educational institutions in order to create awareness on biodiversity has been considerable. The implementation of the National Biodiversity Strategy and Action Plan (NBSAP) suffered from several institutional lapses resulting from institutional and other changes.*

*Government is grateful to all donors that have provided targeted support to programmes and projects relating to biodiversity conservation and environmental management particularly the Global Environment Facility who continue to provide support to priority programmes. Synergies now exist in the implementation of multilateral agreements on the environment in particular the three Rio Conventions – CBD, UNCCD and UNFCCC.*

*The major double challenges presently being faced by Cameroon involves working out strategic plans towards conserving the resources of the Congo Basin Ecosystem and enabling local communities to effectively participate in the equitable sharing of benefits resulting from the exploitation of the resources they have contributed in conserving.*

*The two remaining years to 2010 require that Cameroonians and their well-wishers combine their efforts towards meeting these challenges. It is in this wise that the Millennium Development Goals (MDGs) notably Goal N°7 will be fulfilled at the national level.*

*In my capacity as Minister in charge of the Environment and Protection of Nature, I do urge each and everyone,*

*especially the private sector, to join hands in the ongoing efforts, so that together, we can face these challenges and ensure a better future for our children who will also need the same biological resources for their own survival.*

***The Minister of Environment***
***And Protection of Nature***

***HELE Pierre***

# EXECUTIVE SUMMARY

The Fourth National Report of the Convention on Biological Diversity Cameroon (CBD) has been prepared with contributions from biodiversity stakeholders in Cameroon, following guidelines from the Secretariat of the CBD. The importance of the Report to Cameroon has been expressed because it will assist to improve information on the countries biodiversity. It will enable biodiversity stakeholders to become acquainted with the status, trends of the country's biodiversity and the level of implementing the CBD in Cameroon. It contains five parts namely: Introduction and background; Status, Trends and Threats on Biodiversity; the National Biodiversity Strategy and Action Plan (NBSAP implementation; Biodiversity integration to other sectors of the economy and The Conclusion regarding progress in the 2010 target.

The introduction and background describe the land, population and Cameroon's economy. Chapter One examines Cameroon's biodiversity under ecosystems, habitats, species and shows the six ecosystems as identified during the biodiversity studies and planning. It emphasizes the exceptional characteristics of Cameroon's biodiversity. The importance of biodiversity to health, animal life, to the economy and to the environment have also been shown. *The Status and Trend* show that ecosystems and habitats are being degraded with resultant loss of species, mostly by man's economic activities. New discoveries have been reported on plant and insect species, habitats and ecosystems are being restored in some parts by the creation of Protected Areas.

The Second Chapter describes Cameroon's NBSAP activities as a measure towards the CBD implementation. Most of the 228 actions have been followed in accordance with the 209 decisions of the Conference of Parties. Concrete results, lessons and advantages have been obtained as illustrated with the Heifer Project's influence on community-based biodiversity conservation activities in relation to animal production in five provinces. Lessons include new management techniques, sharing knowledge and experiences and handling international issues particularly on cross border resource management. Major obstacles like financial difficulties for monitoring and reporting have been highlighted and should be obtained through special budgetary allocations. Most stakeholders need to be sensitized on the existence of the NBSAP.

The Third Chapter shows the successful integration of Cameroon's biodiversity into the country's economic and social activities as well as its involvement in other national strategies and programmes. Section 3.2.2 summarizes actions undertaken by Cameroon towards achieving "The Millennium Development Goals and specifies Government's concrete actions for achieving each of the twelve principal goals". In reviewing other Conventions' processes, Cameroon has signed over 32-biodiversity related conventions, and about fourteen (44%) are currently operational.
This notwithstanding, the government of Cameroon has participated in all the Conferences of Parties as shown in Section 2.5.1.

The last chapter concludes with a summary of the progress made towards attaining "The 2010 Biodiversity Loss Reduction Target including the implementation of the CBD's Strategic Plan in accordance with the Decision VII/30 of the COP of the CBD. The goals, national targets and implementation of the NBSAP all feature in Annex III. The lessons learnt and successes achieved have been summarized. Major setbacks include poor infrastructure, neglect and poor management of biodiversity hot spots as well as insufficient budgetary provisions. The national endeavour to combat the set backs will be to cooperate with national and international organizations working on biodiversity and to re-enforce the status of the

National Focal Point who should be adequately and regularly equipped. There is need for activating biodiversity inventory, monitoring and regular reporting.

Some incentives have been provided by the government towards encouraging the involvement of indigenous people and local communities in conservation initiatives, such as the redistribution of benefits from forest and wildlife exploitation, involvement of representatives of local communities in steering committees of conservation projects and in the implementation of various components of the Rio Declaration Principle 10. However, the adoption of a national policy and legislation on Access to genetic resources and the equitable sharing of Benefits resulting from the exploitation os such resources (ABS), the conservation and sustainable use of the biological resources of the congo basin ecosystem as well as a national policy on biotechnology are still major concerns of the Government of Cameroon.

# ABBREVIATIONS AND ACRONYMS

ANAFOR…… Agency for Forest Regeneration and Management
ASL…… Above Sea Level
ATO…… African Timber Organization
BCH…… …… Bio-safety Clearing House
BDCPC…… Bio-resources Development & Conservation Programme.
CARPE…… Central African Regional Programme for the
CAS……. …… Cameroon Academy of Sciences
CBD…… Convention on Biological Diversity
CBSD-C…… Centre for Biodiversity and Sustainable Development
UNCCD…… Conversion to Combat Desertification
CDC…… Cameroon Development Cooperation
CEFAI……Centre for Environmental, Forestry and Agric Information
CEMAC…… Economic and Monitoring Union of Central Africa
CENADEFOR……Centre for National Forest Management
CHM…… Clearing House Mechanism
COMIFAC……Commission for Central African Forests
GDP…… Gross Domestic Product
COP…… Conference of Parties
DFID…… Department for International Development
ECOFAC……Central African Ecosystems
EEZ…… Exclusive Economic Zone
EU…… European Union
FAO……Food and Agricultural Organization
FIMAC…… Fond d'Investissement des Micro projet Agricoles du Cam.
GEF……Global Environment Facility
GMO…… Genetically Modified Organisms
GTZ……German Technical Assistance
IAS…… Invasive Alien Species
IPRs…… Intellectual Property Rights
IRAD…… Institute of Agricultural Research for Development
IRZV…… Institute of Animal and Veterinary Research
IITA…… International Institute of Tropical Agriculture
ITTO…… International Tropical Timber Organization
IUCN…… International Union for the Conservation of Nature
MIFED…… Ministry of Finance & Economic Development
MINADER…… Ministry of Agriculture and Rural Development
MINEPIA…… Ministry of Livestock, Fisheries and Animal Industries
MINFOF…… Ministry of Forestry and Wildlife.
MINEP…… Ministry of Environment and Protection of Nature
NBSAP…… National Biodiversity Strategy and Action Plan
NEPAD…… New Partnership for African Development
NTFPs……. Non Timber Forest Products
OCACAM…… Organisation et Centre d'Appui Agro-Ecologique du Cameroun
OMS……Organisation Mondial de la Santé
PADC…… Programme d'Appui au Développement Communautaire
PAU…… Programme d'Action d'Urgence
PFBC…… Congo Basin Forest Partnership

PNDP…… Programme National de Développement Participatif
PNGE…… Programme National de Gestion de l'Environnement
PSFE…… Programme Secteur Foret Environnement
RBG…… Royal Botanic Garden, Kew
SBSTTA…… Subsidiary Body for Scientific Technical & Technol. Adv.
SNV…… Organization Nelandaise de Developpement
UK…… United Kingdom
UNCC…… United Nations Convention on Climate Change
UNCLOS ……United Nation Convention on the Law of the Sea
UNDP…… United Nations Development Programme
UNEP…… United Nations Environmental Programme
UNESCO…… United Nations Educational, Scientific & Cultural Organization
UNWTO…… United Nations World Tourist Organization
USAID…… United States Agency for International Development
WB…… World Bank
WCMC…… World Conservation and Monitoring Centre
WOAH…….. World Organization of Animal Health
WCS…… Wildlife Conservation Society
WRI…… World Resource Institute
WWF…… World Wildlife Fund

# PROCEDURE USED FOR DEVELOPING THE REPORT

The following process was followed to develop the Fourth National Report for Cameroon:

- On receiving the instruction letter N°SCBD/ITS/NR/LC/59515 of 12 November 2007 for the 4th National Report, the format was retrieved from the CBD Secretariat website. The 29-page format document containing the guidelines for developing the Fourth National Report was read by the CBD National Focal Point in order to master what was expected by the CBD secretariat.
- It was discovered that emphasis was placed on the status, trends on the country's biodiversity and the CBD's level of implementation especially in accordance with the Plan of Action of the National Biodiversity Strategy and Action Plan document.
- The Ministry, through the CBD Focal Point, called for National consultants.
- A leading consultant was assigned to outline all that was necessary; his terms of reference were laid down. Resource persons were identified following various diversity classifications. Resource persons were those considered as national experts in the various fields of biodiversity. They were expected to be well acquainted with the provisions of the CBD and its implementation stages in Cameroon.

Both the lead consultant and the resource persons contacted the major biodiversity stake-holders some areas of biodiversity in order to:

  - Obtain current information on the status and trends on biodiversity;
  - Assess the CBD implementation in the various areas of biodiversity especially with reference to conservation, sustainable use, access to genetic resources, and benefit sharing;
  - The national realities and activities in the thematic areas and other cross-cutting issues related to the country's biological resources;
  - Update all previous information on the country's biodiversity.

- All the information obtained was pooled into producing a comprehensive draft report edited under the CBD Secretariat Guidelines.
- All resource persons were expected to study and comment on the draft report to ensure that their respective contributions were genuinely reported.
- A stakeholder consultative workshop was held and the time frame for further inputs into the draft report.
- A write up committee was setup to edit and correct the existing draft in order to produce the final draft.
- A final meeting comprising experts and some key stake-holders was held for the write up the report. At the end of the workshop, the report was approved and finally submitted to the Ministry of Environment and the Protection of Nature forappreciation and dissemination.
- The final document was signed by the Honourable Minister of Environment and Protection of Nature.
- The final report was sent for translation.
- Copies of documents were produced in English and French for distribution to major stakeholders through the national territory with copies sent to the CBD Secretariat, the UNDP and UNEP.

# BACKGROUND INFORMATION ON CAMEROON

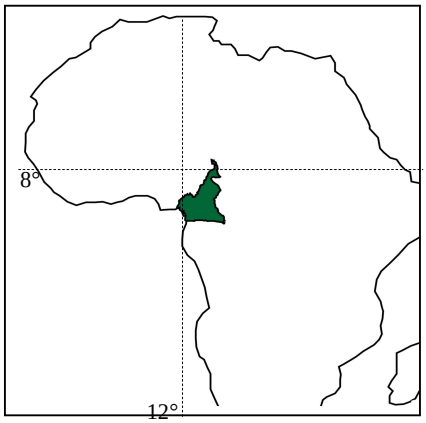



Fig. 1**: Cameroon Geographical Position & Extent**

## Position and Extent

The Republic of Cameroon extends from 2° N to 13° N latitude and between 8° 25° East and 16° 20° West longitude. The Country has a total area of 475 446 km² and is bordered by Chad to the North, Nigeria to the West, To the South by Congo, Gabon and Equatorial Guinea to the East by Central African Republic and a 350 km stretch of Atlantic Ocean coast line.

| **Land Reclassification** | **Area (km²)** | |
|---|---|---|
| Area of Territory …… | 475.446… | 100% |
| Total Land Area ……. | 465.412… | 97.9% |
| Semi Arid ……. | 102.068……. | 21.2% |
| Wooded Savannah ……. | 101.992……. | 21.0% |
| Coastal & Maritime Zone ….. | 9.670…… | 1.0%… |
| Tropical Forest Zone …….. | 394.700…….. | 82.5% |
| Land under Cultivation …… | 19.668…….. | 3.0% |
| Stretch of Coastline…… | 402 | |
| Protected Area Coverage …… | 115000…….. | 24.2% |
| Rate of Deforestation (1996) | 200.000/year | |
| EEZ…… | 40km | |

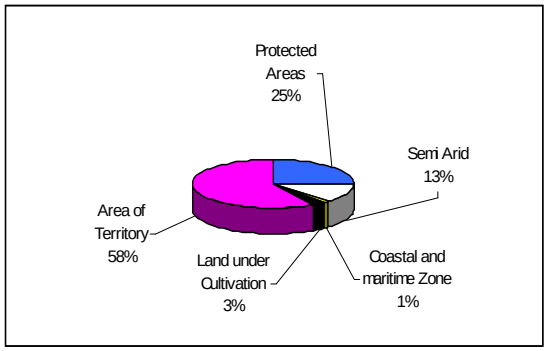



**Fig 2**: Distribution of Land Use in Cameroon

**Demographic Situation**

Total Population (2007) ……16.087.000 inhabs
Population Density …….. 34 inhabs/km²
Population Growth 1995-2000……..… 27%
Urban Population 2005 ……50%
Population Engaged in Agriculture …….. 70%
Population Engaged in Tertiary Sector … 21%
Population Engaged in Industries …… 9%
**Biodiversity Contribution to GDP (2007) 40.6%**

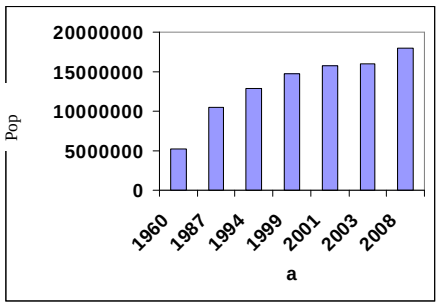



**Fig 3: Population Evolution in Cameroon**
**Source :** National Office of Statistics, Yaounde

**Main Cash Crops Products in 2005**

Coffee Arabica…..... .....5083 tons..
**Coffee Robusta…….41385 „**
Cocoa …… 174288 „
Banana ……248840 „
Cotton …… 306000 „
Palm Oil …… 288800 „
Tea……?
Groundnuts…… 353 953 „
Rubber…… 41214 „…….
Timber (2007)…… 2 086.244. $m^3$

**Source:**MINADER, MINFOF, MINEFI 200

**FISHERY SECTOR**

Industrial fishing …….. 9 700tons
Artisan Maritime fishing …….. 63 000 tons
Artisan inland fishing ……50 000 tons

**Source :** MINEPIA 2004

# INTRODUCTION

Cameroon's Fourth National Report on the Convention on Biological Diversity (CBD) is required in fulfilment of the objectives of Article 26 of the CBD and in conformity with Decision VIII/14 of the Conference of Parties (COP) to the CBD. Cameroon has regularly fulfilled the reporting obligations through its timely submissions of the First, Second and Third National Reports and effort has been made to submit the Fourth National Report on schedule. From the nature of the report format, the report will embody implementation processes from the ratification through the adoption of national policies and legislation to the 213 decisions of the Eighth Conference of Parties to the CBD.

Cameroon Government is conscious of the nation's rich biological wealth and is making every endeavour to keep up with all processes and directives on the implementation of the CBD, which involves the judicious management and sustainable use of the country's biological resources. To meet the biological resources requirement of Cameroon's growing population, care is taken to maintain the country's relationship with the CBD organs – the Secretariat, the COP, the SBSTTA, and all relevant panels. This is why the government of Cameroon has endeavoured to participate in all COP meetings (those of the related organs) and sign all the treaties and protocols related to biodiversity at sub-regional and global levels.

Achievement towards the implementation of the CBD has been carefully considered in the three chapters using the guidelines for the report as provided by the secretariat of the CBD. The progress made towards achieving the 2010 Biodiversity target at the National level is encouraging. Many national policies, legal and institutional reforms have been made in accordance with the objectives of CBD. Considerable effort has been made over the years to involve and coordinate the biodiversity institutions and other stakeholders. Goods and services have been shifting from extending biodiversity land-based activities to intensive land use activities. The focus has been converting forest, agricultural, livestock and fishery resources into finished products which should be marketed within and out of Africa. The level of implementation of the CBD has been summarised in section 2.5.1.

Cameroon's foreign policy includes the establishment of strong cooperation ties with other member countries in the CEMAC sub-region, other African countries, friendly countries and international organisations. As a peace loving country, this has contributed to ensure peace and stability among the rural masses who live and work with biodiversity. They also contribute to the valorisation of indigenous knowledge and do organise acceptable systems of access to genetic resources and benefit-sharing. Traditional administration is used to complement government's policy and the improvement of the rural economy. International cooperation and signing of the Cartagena Protocol to the CBD makes Cameroon benefit from funding to adopt National biodiversity control measures notably biosafety norms and use of advances in modern biotechnology. Currently, the country is evaluating the synergies and capacities for implementing the three Rio conventions related to the environment CBD, UNFCCC, UNCCD.

While admitting that the CBD implementation has not been without problems, the challenges arising from any difficulties linked to communication, education, public awareness, funding are gradually being overcome.

This report provides an opportunity for reporting on CBD's implementation activities in Cameroon as they are seen in the field. Efforts have been made to ensure that information on all forms of Cameroon's biodiversity is real and current. Contributors to this 4$^{th}$ National Report have been carefully selected and represent stakeholders from the main areas of Cameroon's biodiversity. They are convinced that the information they have supplied is a true reflection of what actually obtains and the information can be taken as authentic and could be used for planning and management.

# CHAPTER 1

# BIODIVERSITY STATUS, TRENDS AND THREATS

## 1.1 OVERVIEW OF NATIONAL BIODIVERSITY

Cameroon is endowed with rich biodiversity both in variety and in quantity. This is explained from the country's geographic position and climatic variations. The rich volcanic soils in most of the South West and Littoral regions and the maritime influence account for luxuriant vegetations which harbour flora and fauna and encourage considerable agricultural, forestry and fishing activities. In the African Continent, Cameroon ranks fourth in floral richness and fifth in faunal diversity (UNEP, 1997). Most African ecosystems (92%) are represented in Cameroon. There is a high degree of diversity of ecosystems and genetic resources (species breeds, varieties) which all relate to the character of the environment with corresponding effects on human and animal life and effects to the national economy. Although species inventories have not been carried out during the period under review, data from specific target studies indicate that Cameroon's biodiversity is characterised by abundance, high degree of endemism, great diversity, highly threatened, understudies, invasiveness, new discoveries, over-exploitation, and some attempts of domestication (Fig 4).

**Characteristics of Cameroon Biodiversity**

Cameroon's biodiversity is characterised by the features shown in Figure 4

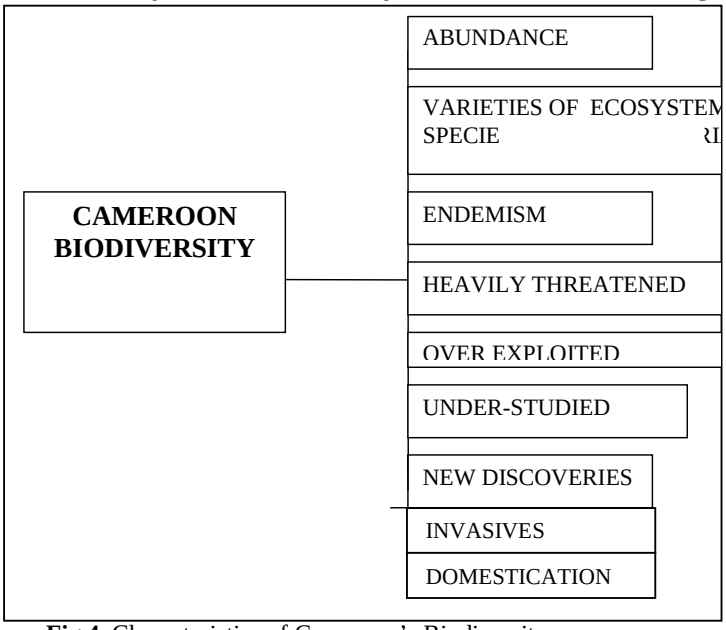



**Fig 4.** Characteristics of Cameroon's Biodiversity.

i) **Abundance**: The variety of life forms actually demonstrates its abundance. The various product distributions in 1998 and their contribution to the GDP are shown below:

The abundance is also illustrated by the occurrence of a great variety of wildlife species. Within Cameroon there are a considerable proportion of mammals, fish species, amphibians, reptiles, birds and a large variety of insects. There are also considerable varieties of plants such as Asteraceae, Orchidaceae, Legumes, Rubiaceae. Most micro-organisms in the country are still to be assessed for the discovery of species.

The six mega-ecosystems (Fig 5) contain mosaic layers of plant, animal and micro-organisms diversity. Many of the habitats, particularly dense tropical forest ecosystems are still pristine such as Korup National Park, Dja Reserve forest has been reported to contain the oldest tropical rain forest in the world, with some organisms reported to be about 60 million years old, (UNEP, 1995).

**Endemism:** The pristine nature of some of Cameroon's habitats confers endemism on many of its species. Table 46 shows the degree of endemism in the country's species.

**Threats:** Most Cameroonians depend on biological resources for their sustainable livelihood especially as the economy is based on agriculture. Many species are threatened (see Table 1), and the threats keep increasing. It should be noted that the degree of threat on most of the species increases greatly with the high demand for products from biological resources. Table 1 shows the status of some threatened species in Cameroon.

**Under-studied:** Recent investigations show new information regularly appearing about habitats, ecosystems, species, breeds and varieties. Ethno-botanical studies, phyto-analyses and recent discoveries have shown the need to intensify studies on Cameroon biodiversity. Studying the habitats and plants of Bali-Ngemba Forest Reserve 10 km² John De Marco (2004) said, 'In the case of this fascinating landscape called Bamenda Highland, each hill and valley, while being similar to the next one may well contain something new and different. In the course of a month's gathering between Nyassoso and the summit of Kupe, 98 plant specimens were collected, of which ***ten were new to science and only two of them have been published***. The investigator gathered about 14 novelties for every hundred specimens, (Cheek 2004). Who would have guessed that even dedicated botanists would find not less than 39 plant species of special conservation interest and at least 25 described taxa and for this degraded forest remnant to produce as many as 12 species not detected in the course of intensive searching by many of the same trained eyes in the latter, much larger sites. This is evidenced by the description of a new species called *Magnistipula Butayei-*_subsp. *Balingembaensis*.

**Over-Exploitation:**. There are records of what is exploited but no accurate records of what is remaining of the exploitable biological resources. There is the case study of a Central and West African vegetable delicacy, *Gnetum africanum* commonly called "Eru" or 'Okok' exploited from the Central and Southern provinces of Cameroon and embarked at the Idenau Port through Nigeria to Europe and America (MINEF 1994). The inventory of *Gnetum* species is on–going, exploitation is actually increasing and even its production does not provide enough quantities for exportation. The last timber resource inventories were carried out by CENEDEFOR in 1984 and only in the southern western and south-eastern part of the country. Moreover in the Cameroon NBSAP the first activity in the Action Plan within ecosystems recommends identification and inventory for each resource. Multi-resource inventories were planned for each ecosystem but not achieved to date.

Examples of species considered to be over-exploited in Cameroon are shown in Table 1

**Table 1. Some threatened genetic resources in Cameroon**

| Species | Habitat/Species | Nature Of Threat |
|---|---|---|
| *Gnetum africanum* (leaves) *Prunus africanum (Pygeum)* | Central, South, South West, South West, North West | Over-exploitation without replacement |
| Timber | *Pycnanthus angolensis, Chlorophora excelca, baillonaila toxisperma, Afzelia spp* | Over-exploitation with low rate of regeneration |
| Wildlife (parrots, lions, elephants) | Parrots, elephants, some insect species, rodents | Over-exploitation |
| Fish (all species) | All species | Over-fishing, use of improper fishing techniques, industrial pollution, loss of habitat |

**Invasiveness**

Some ecosystems are facing the challenge of invasive alien species. Invasive species are found in pasture lands, in mangrove habitats, fresh water, farmlands. This include *Striga* species parasitizing cereals and legumes in the northern part of the country and *Nipa* palm in mangrove habitat, in addition to *Pteridium*, *Chromonaela*, Mimosa, Water Hyacinth and Nypa species. However their intensity is not known and no attention has yet been paid to the identification of ports of entry, methods of prevention, introduction, control management and eradication.

**Domestication**

Some attempts at domestication of wild species of plants and animals are currently being undertaken both by government institutions and private initiatives. For example,the Limbe Botanic Garden on *Gnetum spp*, ICRAF on Agro-forestry. The domestication of cane rats is currently being carried out both by some government institutions and private individuals but these are mostly from species imported into Cameroon according to the NBSAP. It is unfortunate that much effort is not yet done in the field of animal domestication.

**Biodiversity Conservation Efforts**

Despite the great contribution of biological resources to the sustainable livelihoods of a majority of Cameroonian population and to national income as a whole, the importance of conservation has not yet been widely perceived or understood by all biodiversity stakeholders. There is therefore a dying need for constant and continued communication, education, information and creation of awareness notably amongst the public and policy makers.

However, some efforts in sustaining the resources are centered along the adoption and implementation of policies, legislation, programmes and activities geared towards biological resource conservation.

**Policy and Legislation**

Government has adopted specific policies and appropriate laws for managing biological resources in a sustainable manner. The agricultural, forestry, wildlife, fisheries, land and environment policies including their corresponding laws are being implemented to safeguard the resources. This is shown by the existence of external services and law-enforcement personnel especially in the Forestry and Wildlife sectors. Enforcement measures are weak, and there is still room for illegal exploitation of biological resources. According to an assessment carried out within the framework of implementing principle10 in Cameroon it has been revealed that despite the gamut of legislation and regulations existing within the environmental fields, there is weak implementation.

**Good Governance Programme**

Corruption exists in the area of the management of natural resources sector in Cameroon. In 2006 the country hosted the African Forest Law Enforcement and governance (AFLEG) conference which aimed at curbing corruption and poor governance in the forest sector and the environment as a whole. However, the Minister in charge of Forestry and Wild life in collaboration with some NGOs, has recently taken severe measures to sanction defaulters in Forestry and Wildlife resources. The Minister of State Lands equally shut down some clandestine land occupants, but the farmer grazer problem remains a headache till today,(Nyamnshi et al, 2008).

**Restoration and Creation of Protected Areas**

Over the past ten years Government has embarked on a programme of improving the Protected Area coverage by:

- Recovering the PAs which had been lost through encroachment by the population. Bafut-Ngemba, Bali-Ngemba Forestry reserve, Bomboko, Ndoko, Ototomo Forest Reserves, Loum , Santcho and many others are among the reserves encroached by the population.

- The creation of new PAs in many parts of the country including proposed Marine PAs – Bakassi Peninsula Mangroves, Douala Edea Fauna Reserve, Rio del Rey. The creation of marine Protected Areas has been a national priority since 1995 (WB, IUCN 1995). In Kupe Mwanenguba alone, about 230000 hectares have been earmarked for new creation, (Wild & Ekobe 2003). As a whole from 1996 to 2008, the total area of PA has doubled from 1164842 to 3482741 hectares.

**Agricultural Technologies and Techniques**

Modern technologies and techniques in agriculture are being adopted in a timid manner. Gene banks meant to conserve displaced varieties and breeds are in a poor state. However, new genebanks are planned, but human and financial resources will be key to the improvement of the trend. Technology use is still weak given the disappearance of the national agricultural extensions and research projects. Better land-use principles are being applied and extension services now reach the farmer, grazer and the fisherman to sensitize them on the need to foster the principle of conservation and sustainable use. However traditional farming systems are still the mainstay of agriculture.

**Regeneration Methods**

The emphasis now on biodiversity conservation and use is to:

- Create new plantations for forest products poles, fuel wood and timber.
- Promote aqua-culture and introduction of new species, breed or varieties for strategic commodities and services.

**International Conventions**

The implementation of biodiversity related conventions is Cameroon's priority in the biodiversity conservation agenda. Institutional arrangements are indicative of this good will. There is a Ministry of the Environment and Protection of Nature (MINEP) distinct from the Ministry of Forestry and Wildlife (MINFOF). Other administrations are in charge of agriculture while the MINEP ensures that all regulations related to the implementation and management of the forest and wildlife resources are strictly applied. It is the Focal Point Ministry of the CBD, UNFCCC, and UNCCD. However coordination with other key administrations is weak.

### *1.1.1 Ecosystems*

An "Ecosystem" has been defined as "a dynamic complex of plants, animals, fungal, and micro-organisms and their associated non-living environment inter acting as an ecological unit; the organisms living in a given environment such as a tropical forest or a lake and a physical part of the environment that impinges on them.

Studies on Cameroon's biodiversity have been based on the "Ecosystem Approach". Within the NBSAP analysis, the six broad ecosystems are: Marine and Coastal, Tropical Humid Dense forest, Montane, Tropical Wooded Savannah, Fresh Water and Semi-arid ecosystem, see Fig. 5, (UNEP/MINEF 1998). Other classifications based on vegetation types, have been proposed, (Achoundung 2006). The stability or degradation of ecosystems has largely resulted from pressure from human activities and management methods of the resources under use. Plantation and subsistence agriculture, logging, grazing, bush fires and, to some extent infrastructure (road building and urbanization), have contributed to ecosystem degradation. Hunting for game, forest clearing to establish farms and the quest for new pastures as fodder for cattle are mostly achieved through bush fires. The mountain, tropical woodland savannah and semi arid ecosystems are the zones affected by these practices.

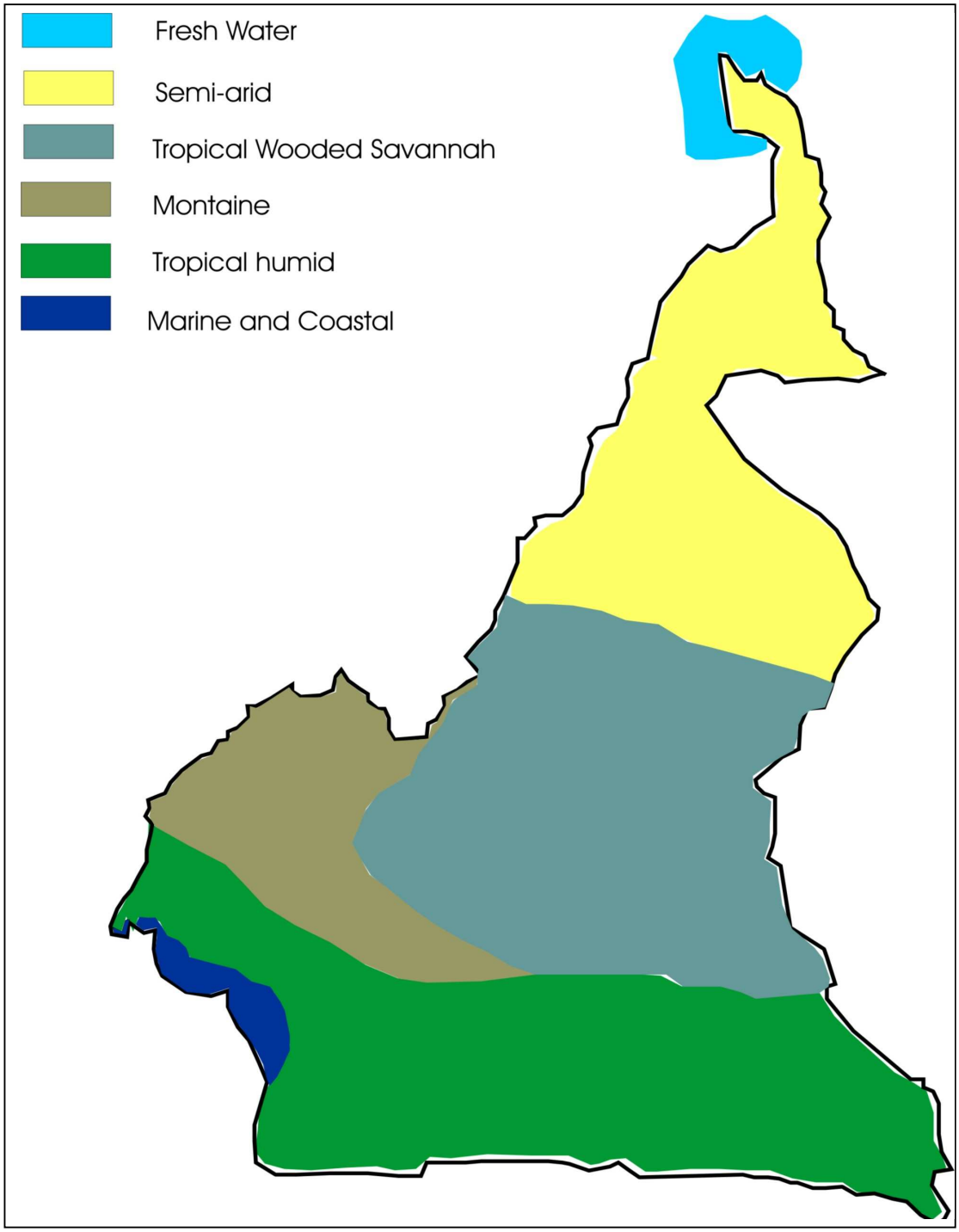



**Fig 5:** Cameroon's Main Ecosystems
**Source:** MINEF 1998

Ecosystem classification as seen in Figure 5 above, more or less corresponds with the vegetation and the agro-ecological zones.

**Ecosystem Case Study**

Martin Cheek (2003) identified eleven vegetation types in the Bakossi area (2.390 km2). Analytical studies for each zone have been classified in. The studies were undertaken within an altitude between 150 to 2.000 metres (see Table 2 below).

**Table 2: Findings of Eleven Vegetation Types in the Kupe Mwanenguba Highlands**

| Veg Unit | Vegetation Type | Altitude (M) | Vegetation Characteristics | Threats | Conservation Priorities |
|---|---|---|---|---|---|
| 1 | Lowland evergreen forest | 150-800 | Emergent, pioneer trees, lianas common herbs | Agriculture, logging<br>Road infrastructure, | 77 Red data taxa, 2 species for conservation *Acanthuses* and *osciculum* |
| 2 | Semi-deciduous forest | 300 | Two taxas, *Triplochito*n and *Celtis* spp | Clearance for cocoa farms Regular cultivation of cocoyams *Microberlinia bisulcala* is critically endangered | *Khaya ivorensis* and *Entrandrophragma* spp favoured *Microberlinia bisulcata* is critically threatened |
| 3 | Fresh water swamp lowland river side | 150-800 | Lowland river bank taxas notable *Spondicathus, Ficus*, ***homalium*** annual herbs, *Oxystima gilberti* | Two specis threatened *Crateranthus talbotii floscopa mannii* | Conservation of a timber tree *Havea stipulosa* |
| 4 | Sub-montane forest | 200-1900 | Trees > 10 m dbh with 5 common families Sapotaceae, Myrtaceae, burseraseae, Olosacee, Euphorbiaceae Epiphytes: Begonia, peperomia | Grass land dry season fires.<br>Clearing for agricultural lands.<br>Small scale timber and wood. | Proposed national park for the area. |
| 5 | Sub- montane grass land | 1000-1600 | All species are herbs<br>Taxas are post cultivation pioneers.<br>***Neonotonia wightii*.**<br>*Chromonella odorota*<br>*Urenallobata* | Cleaning for agriculture<br>Earlier over-grazing by Bakossi cattle | Fences used to keep animals out of food plots. |
| 6 | Rock Faces of cliffs | 600-1500 | Taxa- Begonia Duncan thomasii<br>Cercestis kamerunensis<br>Culeasia spp<br>Selaginella | Lithophytes are classified into shade demanding and sun-demanding | |
| 7 | Rheophytic vegetation of upland streams and rivers | 400-1400 | Rheophytes 15 species adapted to fast flowing water.<br>Ladermanniella species.<br>Brillantaisie lanci fdia.<br>Achyranthes talbotii.<br>Anubias barteri | a)Increased turbidity of water due to sediments run-off after logging.<br>b)Pollution of water courses by sewage or surfactant. | |
| 8 | Crater Lakes | 1150-1900 | Most complicated ecosystem invaded with Sphagnum planifolium and Nymphaea lotus climbers, epiphytes. | No threats to lake vegetation except female lake Mwanengumba used for cattle watering . | Proposed introduction of exotic fish. |
| 9 | Montane Forest and Forest | 1900-2050 | No true Montane species except Syzyium standtii Carapa grandiflora Forest in Mount | Cattle grazing, fires set by cattle grazers to graze cattle and horses. | Need to survey the extent of the Pristine nature of Mount Kupe and put it under |

| | | | | | |
|---|---|---|---|---|---|
| | Grassland | | Kupe is "Pristine" | | protected area status. |
| 10 | Montane Grassland | 1900-2050 | Dominated with Sporobolus africanus Hyparrhenia : Radiola linioides, Wahlenbergia ramosissima and Antherotoma naudinii | Man made threats absent lightening-induced fires and land-slides are common; contains highest proportion of threatened species. | Need to protect zone from land slides |
| 11 | Anthropic Vegetation | 200-1900 | Vegetation generally replaced with farms of cocoa( Theobroma cocoa) and (coffee canephora) and other crop and fruit trees | Repeated burning for cultivation, slash and burn. | Natural vegetation<br>Replacement with economic agricultural crops. |

**Source:** Adapted by CBSD-Cameroon from Martin Cheek et al (2003).

Comparative studies in the CEMAC region showed that Cameroon registered 59% habitat loss in 1986 (see Table 7). It has been estimated that 96.5% of the original forest cover of the Bamenda Highlands above 1.500 metres altitude has been lost (Cheek et al, 2000).

## *1.1.2 HABITATS*

### *1.1.2.1 OVERVIEW:*

As seen in Section 1.1 on the general treatment of biodiversity, the large variety of ecosystems also indicates a high variety of habitats. Each habitat is characterized by those conditions which favor the presence of specific types of organisms. Several factors that affect ecosystem existence affect habitats and their species. Biodiversity managers in Cameroon are concerned with habitat management that should lead to ecological stability and prevent species decline.

Studies in Cameroon's biodiversity have shown that habitat classification is subjective and depends on the investigator's objectives. In most cases, classifications will depend on the terrestrial, aquatic and soils types. One site can serve as habitat for several species. Thus plants and animals can benefit from the same habitat given their complementary roles in the ecosystem. Of the 26 resident bird species in Bali-Ngemba, Cheek et al (2004), recorded 22 different micro-habitats, see Table 4 below.

. The African elephant *Loxodonta africana africana* (4000-6000 kg) has adapted itself to the savannah habitat while the *Loxodonta africana cyclotis* (2500-3000 kg) is used to the forest habitat. A plant genus, *Lophira* has adapted itself in the Tropical Rain Forest as *Lophira alata* and in the Savannah environment as *L. lanceolata.* From the analysis of the vegetation of the Bamenda highlands, Hawkins and Brunt (1965), it is concluded that grassland and savannah species migrated from lower altitudes.Consideration on the habitat examination will be treated under: Habitat types, changes in habitat quality, habitat loss and habitat recovery.

### 1.1.2.2. HABITAT TYPES:

According to the NBSAP (2002), habitat types have been classified into four main categories: Aquatic, Forests Savannah, Montane and soil habitats. See table 3 below.

**Table 3. Habitat Classification in Cameroon**

| N° | Major Group | Habitat Type | Corresponding Ecosystem | Location in Cameroon |
|---|---|---|---|---|
| 1 | Aquatic | Marine water, brackish water, Fresh water: lakes, rivers artificial ponds, swamps | Marine &Coastal, Fresh water | South West Province, southern and Littoral |
| 2 | Forest and savannah | Natural forest, Artificial forests, Agriculture lands, Savannah Desert, | Tropical humid forest Artificial forests Artificial forests | Adamawa, South, North, Far north, North West, Western provinces. |
| 3 | Montane | Mountain forests Highland forests, rocks | Montane Woodland Savannah | South West province North West province Adamawa. |
| 4 | Soils | Forest soils, Agricultural soils Marine soils lake soils Savannah soils Desert soils Mountain\volcanic soils | All Ecosystems | All Provinces |

**Source:** Compiled using information from NBSAP Cameroon.

**Table 4. Habitat Types for Bird Species in Cameroon**

| Species | Habitat | Observations In April 2004 |
|---|---|---|
| Cameroon Olive Pigeon* *Columba Siostedji* | Montane Forest and forested gullies | Not seen |
| Bar-tailed Trogon *Apaloderma vittatum* | Moist Montane forest | Not seen: this species is highly unobtrusive, thus was likely overlooked. |
| Western green tinker bird *Pogoniuslus coryphaeus* | Montane forest and forest patches | Not seen: many Tinker birds were heard but those seen belong to the much commoner *P bilineatus* |
| Grey Cuckoo-shrike *Coracina caesia* | Montane forest and forest patches | Seen near the lower edge of the reserve in disturbed forest, and in remnant gulley forest immediately southwest of the reserve |
| Cameroon Olive Greenbul* *Phyllastrephus poensis* | Montane forest and forested ravines | Not seen |
| Yellow breasted Boubou* *Laniarius atroflavus* | Dense undergrowth of Montane forest clearing and forest patches | Two birds seen in disturbed forest at 1700-1800 m alt, several heard here and at the nearby Baba II community forest, probably not locally uncommon. |
| Mountain Boubou* *Laniarus Poensis* | Dense undergrowth of Montane forest margins and clearing | Not seen: this species is secretive and easily overlooked. |
| Mountain Robin-Chat* *Cossypha isabellae* | Montane and submonatne forest | Not seen |
| Abyssinian Hill-babbler *Pseudoalcippe abyssinica* | Dense undergrowth of Montane forest and clearing | Not seen: this species is shy and unobtrusive, thus easily overlooked |
| Grey-chested Illadopsis *Kokamege poloithorax* | Ground level of Montane forest | Not seen: again shy and obtrusive, thus easily overlooked |
| Brown-backed Cisticola* *Cisticola (chubby) discolor* | Dense undergrowth of forest edges, clearing and abandoned cultivation | One seen on the edge of cultivation near Mantum village *C discolor* is often considered a subspecies of Chubb's *Cisticola C Chubbi* |
| Green longtail* *Urolais epichlora* | Montane and submontane forest | Several seen in closed-canopy forest at c. 1450-1550 m alt, where it is possibly locally numerous. |
| Black-collared Apalis *Apalis pulchra* | Dense undergrowth of Montane forest and forest edges | Not seen |
| Bamenda Apalis *Apalis bamendae* | Forest canopy | One seen in disturbed forest at c. 1450 m alt near the lower limit of the reserve |
| Black-capped woodland Warbler *Phylloscopus herberti* | Wet montane and submontane forest and forest edges | Notseen |
| White bellied crested Flycatcher *Trchocercus albiventris* | Montane forest usually undergrowth | One recorded in open forest at c. 1700 m alt |
| Cameroon sunbird *Nectorinia oritus* | Undergrowth of mid elevation and montane forest | Not seen: this is usually in view of the fact that sunbird species are active and conspicuous and that it was recorded during a brief stay in Bamenda. |
| Northern double collared sunbird *Nectarinia preussii* | Open montane forest clearing and secondary bushland | Frequently recorded within the reserve at Mantum village, particularly at forest /woodland edhges. |
| Thick billed seedeater *Serinus burtoni* | Edges of montane forest and in patches of scrub at higher elevations | Not seen at Bali Ngemba but recorded in the nearby Baba II village at the lower edge of the community forest. |
| Oriole Finch *Linurgus olivaseus* | Montane forest edges and abandoned farmland. | Not seen |
| Fernando Po Olive back* *Nesocharis shelleyi* | Montane forest edges clearings plantations | Not seen |
| Red faced Crimson wing *Cryptospiza reichnovii* | Dense undergrowth and edges of Montane forest | Not seen : this species is again secretive and easily overlooked. |

| | | |
|---|---|---|
| Baglafecht weaver *Ploceus baglafecht* | Edges of montane forest | Fairly common in cultivation at forest edges and clearings in reserve. Note this species is common in E Africa but is much more local in W Africa were it is confined to the Cameroon mountains EBA |
| Black billed weaver *Ploceus melanogater* | Dense undergrowth of montane forest and clearing | Not seen |
| Brown capped weaver *Ploceus insignis* | Canopy and mid-levels of montane and mid- elevation forest | One female recorded in open woodland on the edge of Mantum village near the lower limits of the reserve |
| Waller's starling *Onychognathus walleri* | Canopy of montane forest | Small flocks believed to be of this species, seen flying into the reserve from the west in the early mornings and evenings. |

**Source:** Borrow and Semey (2001)

The key species of birds highlighted in the designation of the Bali Ngemba Forest Reserve as an important bird area (IUCN 2003) with records of their occurrence and abundance noted during the 2004 botanic expedition designates restricted range species of the Cameroon Mountains EBA. Habitat information is derived from Borrow and Demey (2001).

In the domain of wildlife conservation, Cameroon has endeavored to protect over 3482741 hectares of habitats in 2008 under National Parks, Forest Reserves, Sanctuaries, Botanical and Zoological gardens. Table 5 shows the evolution of Protected Areas from 1996 to 2008 while Table 6 summarizes the current situation on protected areas in the country. The total area under protection is 11 % of the National territory. If the 18 % of the area under Safari hunting zones is regarded as "protected", this makes the figure 30 % of National area under protection. The actual state of every P.A. needs to be reviewed to come up with the true figure.

**Table 5: Evolution of Protected Areas 1996 - 2008**

| No | Protected Areas | Surface Area (Ha) | Date Of Creation | Ecosystem Type |
|---|---|---|---|---|
| 1 | Mpem and Djim National Park | 97,480 | 2004 | Tropical Wooded Savanna |
| 2 | Mbere Valley National Park | 77,760 | 2004 | // // // |
| 3 | Boumba Bek National Park | 238,255 | 2005 | Tropical humid Savanna |
| 4 | Nki National Park | 309,362 | 2005 | // // // |
| 5 | Bakossi National Park | 29,320 | 2007 | Montane Ecosystem |
| 6 | Mbanyang-Mbo Sanctuary | 66,000 | 1996 | Tropical Humid Dense Forest |
| 7 | Lobeke National Park | 217,854 | 2001 | // // // // |
| 8 | Mount Oku Sanctuary | 1,000 | 2005 | Montane Ecosystem |
| 9 | Mengane Sanctuary | 26,711 | 2008 | // // |
| 10 | Kangwene Sanctuary | 1,100 | 2008 | ? |
| | TOTAL | 1,164,842 | | |

**Source:** Department of Wildlife Protected Areas – Cameroon 2008

**Table 6: General Status of Protected Areas in Cameroon - 2008**

| Status | National Coverage ( Ha ) | % Of National Land Area |
|---|---|---|
| Protected Areas IUCN rating<br>Forest reserves ……<br>Under creation | 3,482,741<br>920,0.00<br>975,091 | 7.00<br>1.90<br>2.10 |
| Total Area Under Protection<br>Safari Hunting Zones | 5.377,830<br><br>8.138,800 | 11.00<br>18.00 |
| Total Area under Protection & Management | 13,516,632 | 29.00 |

**Source:** Department of Wildlife Protected Areas – Cameroon 2008

### 1.1.2.3 HABITAT LOSS

The factors which account for ecosystem degradation also account to habitat loss. Habitat losses have in many cases affected the status of various forms of biodiversity.The rate of wildlife habitat loss in forest ecosystems in five african countries indicates that Cameroon registered a 59 % habitat loss (Source Mackinnon 1986) (Table 7).

**Table 7. Comparative Forest Habitat Loss in Five Central African Countries.**

| Country | Original Wildlife Habitat $Km^2$ | Amount Remaining $Km^2$ | Habitat Loss% |
|---|---|---|---|
| Cameroon | 469 400 | 192 454 | 59 |
| Angola | 1 246 700 | 760 847 | 39 |
| Central Africa Republic | 623 000 | 274 120 | 56 |
| Chad | 720 800 | 172 992 | 76 |
| Congo | 340 000 | 172 420 | 49 |

**Source:** Mackinnon, 1986

Factors that contribute to habitat loss in general are summarized in Table 8.

**Table 8. Estimated Habitat Change and Habitat Loss Activities in General***

| Capital Activity | Corresponding Ecosystem | % Habitat Loss* |
|---|---|---|
| Exploitation of wildlife resources | Marine and Coastal, Tropical Forest, Fresh Water, Woodland Savanna, mountains | 40-50 |
| Expansion of agriculture, forestry and aquaculture | Marine, Coastal, Tropical Forest Woodland Savannah | 30-40 |
| Effects of species introduced naturally or by humans (invasive alien species) | Mostly in habitats of terrestrial ecosystems | 10-15 |
| Pollution of soils, water and atmosphere | In all six ecosystems | 60 |
| Global Climate Change | In all six ecosystems | Difficult to Estimate |
| Urban and road infrastructure | Terrestrial ecosystems | 30 |
| Petroleum and mining industries | Aquatic and terrestrial | 40 |

**Source:** Bokwe (2008) Estimates calculated from various land –use reports

It should be noted that since about 70% of the rural population depend on agriculture. Forest clearing for both plantation and peasant agriculture account for about 30- 40% of the forest cover of all terrestrial ecosystems in the country, while pollution of soils water and atmosphere account for about 60 % habitat loss, (Table 9). Fuel wood harvesting constitutes a great threat to biodiversity conservation in the Savannah and Sahel Regions. Activities that contribute to habitat change which consequently affect biodiversity have been summarised in Table 9.

**Loss of Logging Intensty:**

Loss of biodiversity and therefore loss of habitat has been observed in Cameroon through logging activities. Studies undertaken in selected African countries including Cameroon showed that damage to residual trees in conventional logging is excessive and can range from 33 -70% in areas with highly logging intensity (Nicolson 1958 b). even with careful felling, (Weidelt 1996) recorded about $200m^3$ of forest area damaged by felling of one tree.

**Logging Intensity and Wood Waste**

Wood waste studies done in Cameroon and Ghana found that on the average, 55.5% of the tree was extracted: of the remaining volume, 4.6% was stump, 5.2% was buttress, 10.4% was stem off cuts, 23% were parts of the crown with diameter more than 20cm, (Noack,1995) logging waste in Cameroon has also been due to bucked trees which are not found during skidding; Mattsson-marn and Jonkers (1981) found that $11m^3$/ha (20% of extracted volume of

logs could not be found by the skidder in current operations. Poor felling and buckling techniques also account for logging waste. Estimated volume of waste due to felling and buckling losses is about 6.5 – 8.5% of the utilisable volume. (FAO 1989a, Winkler 1997).

### 1.1.2.4 HABITAT QUALITY ACTIVITIES

**Table 9. Habitat Change Activities**

| Activities Provoking Habitat Change | Nature of Change | Effect on Biodiversity |
|---|---|---|
| Forest Clearing for Agriculture | Flora and fauna vegetation lost, introduction of new species, e.g. cocoa, rubber, oil palm, etc | Loss of biodiversity in quality and quantity<br>Many species under threat |
| Logging | Upset of ecological balance wildlife habitat removed | Reduced flora composition<br>Threat to wildlife population |
| Uncontrolled Hunting Poaching | Disturbance of wildlife management programme | Reduction of wild life population, ecosystem modification |
| Bush Fires | Elimination of animal and plant species<br>Destruction of soil microbes | Loss of plant and microbial species.<br>Introduction of new species |
| Pesticides | Habitat pollution by chemicals | Reduction of flora and fauna |
| Urbanisation | Upset of ecological equilibrium | Loss of biodiversity. |
| Climate Change | Floods, sea level rise, erosion, droughts and landslide | Reduced biodiversity through water and soil erosion, re-adaptation of biodiversity, disappearance of some species, appearance of new species, destruction and modification of ecosystem |
| Fuel wood | Habitat destruction | Destruction of vegetation, erosion |
| Fishing channels | | Reduction of fishing population, creation of dangerous trenches |
| Off /onshore oil exploitation | Disturbance of the ecosystem, pollution | Biodiversity loss, migration of biodiversity |
| Mining and quary extractions | Disturbance, destruction and modification of ecosystem | Biodiversity loss |
| Over grazing | Modification of ecosystem | Loss of several species of forage, death of several cattle's food species. |

**Source:** MINFOF, MINEPIA 2008

### 1.1.2.5 HABITAT RECOVERY

Government is aware of the loss of habitat in all ecosystems. The policy and legal measures adopted are centred on conservation of species and recovery of lost and degraded sites (NBSAP). In 2005, when the organisational chart of MINEP was created, the Department of Restoration of Nature was formed. So far, the department has achieved the following habitat restoration measures:

- Operation Green Cities
- Green Sahel
- Mangrove restoration programmes

While specific recovery measures are going on in the marine coastal ecosystem, there are

**National Measures:**

National measures towards habitat recovery include: policy, legislative, forest regeneration modern agricultural practices, creation, recovery and management of Protected Areas as well as regional cooperation, (Table 10).

**Table 10. National Measures for Habitat Recovery**

| Practical Measures | Actual User Practices | Habitat Location |
|---|---|---|
| Policy and legislations | - Forestry, Fishery, wildlife policies and laws on conservation of biodiversity<br>- New forestry legislation adopt the "ufa" system where exploited forest is guaranteed management | In all aquatic and terrestrial habitats.<br><br>In the tropical humid dense forest ecosystem habitats |
| Forest regeneration | - ANAFOR ensures regeneration and management.<br>- Private forest plantations. | Mostly in the Tropical Woodland Savanna Ecosystem e.g.<br>- ANAFOR national regeneration campaign had in August 2008 21451 nursery seedlings for the dry savanna region<br>- 106000 seedlings in seven nurseries for Maroua Kaélé, Mokolo, Kouseri, Yagoua, Maga and Garoua (MINFOF 2008) |
| Agricultural practices | Agro-industrial establishments habitually renew crop habitats though replanting, combating pests and diseases and the use of fertilizes to improve habitat conditions | Plantations of CDC, HEVECAM, PAMOL, SODECOTTON, SODERIX |
| Creation of Protected Areas in compensation of lost areas | About 11% of national territory is under P.A. management – Forest reserves, National Parks, Animal Sanctuaries (Table 6) | In Tropical Humid Forests,<br>In Tropical woodland savanna,<br>In Montane ecosystem |
| Sub-regional cooperation | - CEMAC countries signed the "Yaounde Declaration" on the conservation of the Tropical forest of the Congo Basin.<br>- Chad Basin Commission | In tropical Humid forest<br>Tropical woodland savannah Fresh Water Ecosystem. |
| Sacred forests | Creation and maintenance of sacred forests<br>- For cultural practices<br>- For traditional practices | - Nation wide<br><br>- Traditional healers |
| Monitoring and evaluation | - Setting up of National Observatory for Climate Change (President Biya's proposal and appeal to the UN General Assembly, 2008)<br>- Creation of Sub Department of Monitoring MINEP | Found on diplomatic and policy statements MINEP planning |
| Communication, education and public awareness | Most of the activities in forestry, wildlife, agriculture and environment have been subjects of regular radio and TV programmes on main country TV and radio stations. | Information is diffused nationawide |
| International agreements | Government endeavours to be party to the international agreements related to biodiversity – CBD | CBD, UNFCCC, UNCLOS, UNCCD, Ramsar and others. |

**Source:** Compiled from Ministerial Reports

## International Cooperation:

The following practical measures are going on in Cameroon to improve and protect biodiversity-rich areas. Examples of some of the many areas are around protected areas (Table 11). Implementation of most conventions is done through projects with the technical and financial assistance of international NGO's in Cameroon aimed at recovering threatened habitats.

**Table 11. Practical Measures for Habitat Recovery around Protected Areas in Cameroon**

| Habitat Type | Conservation Priority | Intervener | Action Taken/Ongoing |
|---|---|---|---|
| Campo Ma'an | Highest | WWF, Tropenbos Int. | Reinforce existing PA's management activities.<br>Reinforce collaboration with Logging industries |
| Mount Cameroon. | Highest | DFID, GTZ | Create new core PA's<br>Reinforce existing protected areas, management activities.<br>Develop target management plans. |
| Douala Edea. | Highest | Cameroon Government | Reinforce existing PA's management activities. |
| Rumpi Hills | Highest | Cameroon Government | Reinforce existing PA's management activities. |
| Kupe Mwanenguba | Highest | WWF, RBG Kew | Reinforce existing PA's management activities.<br>Establish sustainable funding mechanisms. |
| Nki Bouba Bek | Highest | WWF/ USAID | Reinforce existing PA's management activities. |
| Bamenda Banso Highlands | High | Cameroon Government | Sensitizes populations on best conservation participation activities. |
| Dja Faunal Reserve | High | ECOFAC, EU, USAID, WWF | Reinforce existing PA's management activities. |
| Rio Del Ray | Moderate | FAO | Mangrove /Fish protection |
| Takamanda Forest resources | High | WU | Reinforce existing PA's management activities. |
| Banyang Mbo | High | WCS | Wildlife conservation measures |
| Limbe botanic Zoologica Garden | Highest | Cameroon government, DFID, RBG, Kew | Conservation, Education, Research, Domestication, GIS, Survey systems. |

**Source:** Compiled from Ministerial reports

#### 1.1.2.6.1 PROTECTED AREAS

In Cameroon, there are six categories of Protected Areas. These are National Parks, Zoological Gardens, Wildlife Sanctuaries, Fauna Reserves, Safari Hunting zones, Community Management Hunting Zones. To this, IUCN categories of protected areas should be added, forest reserves, sacred forests, botanical gardens. Table 6 summarizes the situation of protected areas in Cameroon. Up to 2008, total area under protection has been estimated to cover about 13.5million hectares which amount to 30% of the national territory. This includes the 18 % which is under safari hunting zones. Protected areas actually cover 11 % of the national territory. Between 1996 and 2008 considerable conservation measures were taken to add 1.164.842ha (2.38%) to the existing Protected Areas coverage.

Protected Areas creation, recovery and management have been used as habitat recovery measures. Several new protected areas have been created to compensate portions of protected areas which have been lost to the population. This is the case with Ejagham Forest Reserve in Manyu Division in the South West Province.

## 1.1.3 SPECIES

### 1.1.3.1 DIVERSITY AND ABUNDANCE

Cameroon has been reported to be comparatively rich in floral, faunal and microbial diversity (UNEP/MINEF 1999), (GEF 2008). In floral biodiversity Cameroon is second in Central Africa and fourth in Africa while she ranks fifth in faunal richness in Africa. It is known to contain 84% of known African primates, 68% of African passerine birds and 66% of African butterflies, (Groom, Bridge and Jenkins, 2000) and 9050 plants (Onana, 2008), 160 of them being endemic (WCMC, 1994). This makes the Guinea – Congolean Rainforest an important focal point for conservation in Africa.

### 1.1.3.2 VULNERABILITY

Several investigators working in different parts of Cameroon have shown that plant and animal species in the country are highly vulnerable. Cheek et al (2004) working on the plants in the Kupe Mwaneguba and Bakossi Mountains categorized the 2412 taxa into 6 categories as shown below.

. **IUCN Classification on Species Vulnerability in Kupe Mwaneguba and Bakossi**

| **CATEGORY** | **CR** | **EN** | **VU** | **NT** | **LC** | **DD** |
|---|---|---|---|---|---|---|
| **NUMBER OF TAXA** | 33 | 52 | 147 | 296 | 1497 | 1 |

**CR:** Critically Endangered **NT**: Near threatened
**EN :** Endangered **LC**: Least Concerned
**VU:** Vulnerable **DD:** Data Deficient

**Source:** Cheek, M.( 2004)

### 1.1.3.3 INTRODUCTIONS AND MIGRATIONS

Characteristically plants and animal species in Cameroon are of particular interest because of their specificities - abundance, diversity, adaptations, endemism, wide distribution, new discoveries, threats and recently extinctions. Ecological conditions have contributed to the survival of new plant and animal species which had been and are being introduced as exotics in the fields of agriculture, forestry, horticulture, arboriculture, animal husbandry and pisciculture. Several mechanisms lead to the introduction of species which can include Invasive Alien Species and other introductions by ships and planes, by wind, by water.


1. Filming of the Taiping Four chimpanzees on their return from South Africa;
2. Welcoming the "Taiping Four" on their arrival to Cameroon;
3. One of the Taiping Four feasting on arrival back home.

**Fig 6:** The stolen chimpanzees "Taiping Four" arrived Cameroon from South Africa (Photo courtesy of Last Great Ape Foundation)

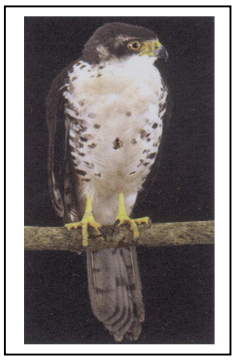


**Fig7.** African Goshawk (*Accipiter tachiro)*

While domesticated animals, insects and cultivable plants have been man introduced, bird, animal and insect species have found themselves in Cameroon through migratory habits. Birds have been recorded to escape the European winter for tropical Africa. Species of birds have been recorded as "rare" and "threatened" in Cameroon. The African Goshawk (*Accipiter tachiro)*(Fig 7) is threatened in the Takamanda Forest Reserve in the South West Province.. Wildlife species notably elephants in the Waza National Park of Cameroon have been found in neighboring Chad. Hunted antelopes and deers in the Korup National Park have been bound to escape into the neighbouring Cross River Park in Nigeria. Poachers from neighbouring countries have in many occasions been caught in Cameroon Protected Areas. Exploiters of non-timber products from Nigeria have been seen in Cameroon national territory. Huge quantities of chewing sticks species and the cattle sticks *Carpolobia spp* are regularly and clandestinely taken to Nigeria from the Takamanda Reserve, see Fig 8(Comiskey et al 2003)

**Fig 8:** Hausa Cattle sticks (*Carpolobia spp*) from Takamanda Forest Reserve being unloaded at Ikom, Nigeria

Photo courtsy of Terry Sunderland

### 1.1.3.4 MANAGEMENT FOR SUSTAINABLE USE

Species stability, exploitation and control are usually subjected to international norms and regulations. Biodiversity managers have long been faced with the problem of regulating (especially products under exploitation) trans-boundary movements of such products. Among some of the reasons are trans-border village communities, usually sharing public facilities like markets, worship facilities, education establishments, and ceremonies.

### 1.1.3.5. CROSS-BOUNDARY ILLEGAL TRADE;

The porosity of the boundaries with the neighboring countries leads to interaction and cross border trade in a lot of animals and poachers leave from one area to the other very easily. Several cross border trans-boundary protected areas have been created Tri-National, Sanga, Bouba-Bek, Tchabal are examples. In the feudal north of Cameroon, adjacent villages between Nigeria and Cameroon, Intermarry and even share homes with blood relations. Similarities in ecological zones with neighboring countries usually have the same species of plants and animals. Cott and Pooley 1972 attributed the low number of crocodile species in the Takamanda Forest Reserve to the hunting for meat and export of skins; the practice which they report contributes to habitat degradation.

Partial remedial measures to these irregularities have depended on:

- International regulations and the CBD's emphasis on the responsibility of every nation managing its biodiversity in a manner to make the resources available to the population.
- Ensure national legal and institutional arrangements
- Bilateral cooperation and assistance on the management of biological resources.
- Improvement of capacities to enforce national regulations towards resource management and sustainable use. Figure 8 shows the trade on cattle sticks from a dominant species (*Capolabia spp*) in the Takamanda Forest reserve. It can become threatened if not properly managed.

### 1.1.3.5 NEW AREAS ON SPECIES DIVERSITY

Soil micro-biology is a very important aspect of Cameroon's species diversity. With an economy based on agriculture the soil micro-fauna and micro-flora should be given prominence.. Soil bacteria, fungi and viruses greatly influence the Cameroon economy, particularly with regards to soil fertility and plant pathology.

Studying the impact of land use system on microbial biomass and *endomycorrhizal* diversity in humid forests in South Cameroon, Nwaga et al (1998) found that *microbial biomes* is highest in the primary forest. *Glomus spores* were most abundant followed by *Gigaspora spores.*

Since the First National Report in 1997, the new development on species in Cameroon has been in areas of Biosafety and Modern Bio-technology, including biodiversity on health, the economy and the environment. Mention is made on Genetically Living Modified Organisms (GMO's) and Invasive Alien Species (IAS). New institutions, appropriate legislations and greater focus are being made on species, races, adaptations and strains essentially to improve yields.

There is still considerable work by the National Herberium and universities is going on species type, composition, characteristics and other qualities of species in Cameroon.


Fig 9: *Coffea bakossi* (Gosline, 1999)


**Fig 10:** *Coffea montekupensis* (Cheek, 1998)

Two new species of coffee have been described in the Bakossi and Kupe Mwanenguba high lands, *Coffea bakossi* (*Rubiaceae*) Ngomboaku, 1999(Fig 9) and *Coffea montekupensis (Rubiaceae)* Cheek, 1998 ( Fig 10).

### 1.1.4 GENETIC DIVERSITY

The diversity of plants, animals and microbes (in plant and animal), reflects the diversity of genetic resources in the country. Two major classifications on genetic resources have been examined, (Mbah 2007).. While the resources are seemingly abundant, they are getting limited in relation to the demands of the constantly growing population.

Considerable effort is being made towards conservation and sustainable use of genetic resources in Cameroon through the revision of policies and regulations (MINEF 1994). Measures being taken include:

- regulating the exploitation of genetic resources in a sustainable manner,
- adherence to international conventions on resources conservation and management,
- national inventories and research on indigenous plant and animal species
- Improvement of national capacities, formulation of appropriate policy and appropriate legislation on genetic resource management.
- Existence of gene banks for some agricultural species.

Since the signing of the Cartagena Protocol (2000) by Cameroon, greater emphasis is paid to the management of genetic materials through the promotion of modern biotechnology.

Of the 40 biotechnology establishments in Cameroon, 24 were identified for handling main techniques in modern biotechnology (Bokwe & Ngwa 2005). The need for the training of staff on GMO monitoring standard procedure was expressed. The training and research being undertaken on modern biotechnology indicated that Cameroon is on the right path towards the mastery and management of her genetic resources as well as fulfilling her obligations towards the implementation of the CBD provided the enforcement of the regulations is made.

Quite interesting is the cooperation that exists between the national research bodies and the universities that handle genetic resource programmes. There is regular exchange of ideas among the biodiversity – related Ministries - MINFOF, MINEP, MINEPIA, the research institutes and institutions of higher learning. The Ministry of Scientific Research and Innovation has a policy of making research results available to the public to enable the rural population (who live and work with biodiversity) benefit from research. Since its creation 1990 the Cameroon Academy of Science has been very keen in helping Cameroon fulfill her obligation to the CBD. This is why the Academy plays a sensitization and training role by informing[1] the academia and the public about the importance of genetic resources within the context of the CBD. Other national scientific associations and NGOs have been playing their role in educating the Cameroonian mass and engage themselves in sharing their experiences. The Cameroon Biosciences Society is one of such.[2]

Among the problems associated with genetic resource management are:

- Insufficient qualified human resources,
- High cost of maintenance of equipments for modern Biotechnology,
- Absence of policies and appropriate regulations,

[1] CAS devoted a Scientific publication on :Biodiversity Conservation - Conserving and Managing Biodiversity in Central Africa . Workshop on Modern Biotechnology dealing in crops, food and feed of the African Sub-region on Biodiversity

[2] see Bioscience Proceedings:
. Vol 5 1998 – Biosciences and Biodiversity
. Vol 6 1999 - Biosciences and Biotechnology for Sustainable Development.

- Lack of funding.

There is still considerable work in progress on species type, composition, characteristics and other qualities. In this Fourth National Report, every effort has been done to provide the current state and trends on species biodiversity in Cameroon. ( Table 46)

A comparison of total species in 6 areas in Cameroon show that Kupe-Mwanenguba (1.01 taxa/km²) has a very high level density of plant taxa (Table 12).

**Table 12. Taxa vs Area Comparism in 4 Sites in Cameroon**

| Checklist Site | Area (km²) | No of Taxa | Taxa/km² |
|---|---|---|---|
| Korup Project Area | 2510 | 1693 | 0.67 |
| Mt Cameroon Area | 2700 | 2435 | 0.90 |
| Kupe Mwanenguba-Bakossi | 2390 | 2412 | 1.01 |
| Mount Oku and Ijim Ridge | 1550 | 920 | 0.59 |

**Source:** From the results obtained by Cheek, Pollard, Debyshire, Onana, Chris Wild, 2004.

**Case Studies on Abundance of Cameroon's Biodiversity**

The relative richness of the Cameroon tropical humid forest can be seen from the comparative studies done in two sites by Chuyong, Kenfack, Songwe and Dunkan (1998) in the Korup National Park and Sunderland Groves et al (2004) in Takamanda Forest Reserve;-

1- Chuyong et al (1994) working in Korup National Park found 6,580 stems belonging to 243 taxa of the 45 families represented within the first hectare, the most representative was Violaceae and Sterculiaceae with 1,264 and 1,143 respectively identified.

## *1.1.5 IMPORTANCE OF BIODIVERSITY COMPONENTS TO HUMAN HEALTH*

An important consideration of biodiversity components is their use in human health. This is reflected on various medicinal properties of some of plants and animal species**.** It is estimated that 80% of the rural population in Cameroon depend on traditional medicine, a practice that has lasted for over a century and quite common to the Central and West African rural communities. Inhabitants of biodiversity rich areas are endowed with indigenous knowledge associated with plants and animals.

In each of the six ecosystems, there are some aspects of traditional knowledge related to some plant and animal species. The use of plants and animals for healing in Cameroon is so common that government, in cooperation with the African Union (OAU 1996), has developed a pharmacopoeia based on the common medicinal plants. The need for medicinal plant materials for drug manufacture has been to a greater extent, the subject of Access and Benefit-sharing of the resource.

Microbial diversity (bacteria, fungi, viruses) has been associated with a number of diseases either directly affecting human health or indirectly as pathogens to floral biodiversity. Microbial invasives have been reported to be responsible for about 19 plant diseases in Cameroon and *Aspergillus flarus* (Nwaga 2007) from groundnuts or maize seeds is reported to cause liver cancer in humans. Many of the components are also involved in immerging infectious diseases – "Ebola". It is important that Cameroon deposits its instruments of ratification of the Convention on Biological and ToxinWeapons**.**

Considerable research is underway to isolate the active ingredients from plants for use in the manufacture of drugs. The Institute of Medical and Medicinal Plant Studies (Research) in Yaounde, the Baptist Health Board in Mutengene are pharmaceutical industries based on plants. Biotechnology institutions in Cameroon using established techniques and equipment have come up with useful products like recombinant antigens, vaccines, specific antibodies, etc. One of the areas of extensive research in Cameroon is in the natural products but this has rarely been developed into products and services. The recent collaboration between Traditional Medicine and Western Medicine is all based on components of biodiversity

especially on the emphasis on traditional knowledge and cultural practices. The importance of this collaboration is illustrated in the ethno-botanical surveys undertaken in the biodiversity hot spots in Cameroon: Table 13, OAU/STRC (1996)

**Table 13. Some Ethno-botanical Surveys undertaken in Cameroon (1996 -2004)**

| | Zone | Coverage $Km^2$ | Year | Medicinal Plants | Surveyors |
|---|---|---|---|---|---|
| 1 | **KORUP NATIONAL PARK** | 2,510 | 1989 | 550 | Duncan Thomas, Jane McCauley Thomas, Wendy Ann Bromley, Fonki Tobias |
| 2 | **KUPE MWANENGUBA** | 2,390 | 2004 | 125 | Benedict John Pollard |
| 3 | **TAKAMANDA** | 67,599 | 2003 | | Terry Sunderland and others |
| 4 | **SOUTHERN BAKUNDU FOREST RESERVE** | 18,100 ha | 1998 | 6 | Bokwe Augustine |
| 5 | **CAMEROON MOUNTAIN** | 30,000 | 1998 | | Nkwantoh Anthanasius Ferdinand Weh |
| 6 | **NATION WIDE** | 475,000 | 1996 | 406 | 22 Cameroonian and Nigerian Authors |
| 7 | **BALI-NGEMBA** | 10 | 2004 | | Benedict John Pollard |

**Source:** Complied from various survey reports

## 1.1.6 IMPORTANCE OF COMPONENTS TO ANIMAL LIFE

Animals are an important component to the ecosystem. The relationship of biodiversity to animal and plant life in Cameroon is of great importance particularly on the role of plants animals to the individuals and community as a whole. In addition to being among the highest faunal diversity. Cameroon has several classes of domesticated groups of animals and a rich flora and fauna.

The main areas that biodiversity influences animal life is summarized in table 14.

**Table 14. Importance of Biodiversity Components to Plant and Animal Life in Cameroon**

| Component/ Activity | Impact On Animal Life |
|---|---|
| Plants<br>Forest/Savannah environment<br>Animals<br>Plants and Animals<br>Plankton and other sea foods | - Food, shelter, of wildlife, Protection against predators<br>- Habitat for wildlife, territory for breeding and defense<br>- Food material for carnivorous species<br>- Contribute to sustain habitat<br>- Inter-dependence of animals on plants - parasites and symbioses e.g. The ant species which live in the stem of the plant- *Barteria fistolosa*<br>- Source of foods for fish and other aquatic habitats |
| Pests Control<br>Habitat Protection | - Plant and animal pests for disease control help to restore biodiversity and improve degraded ecosystems.<br>- Habitat suitability emphasis for wildlife management |
| Need for Research | Appropriate habitats are required for animal species, territory, reproduction and nutrition. |
| Resource Inventories | - Best means being sought for improvement of those components of biodiversity which are necessary for upkeep of animal life:- In Cameroon this is done through research. |
| Conservation Measures | - Survey and inventories of single species or multiple resource to the population level of biodiversity actions.<br>- Appropriate actions will improve the level of biodiversity of the region. |
| Raising capacities | - Qualified staff will educate and sensitize local population on the best way of understanding biodiversity on which their life depends. |

The interaction of biodiversity components on plant and animal life in Cameroon is extremely important because Government endeavors to prioritize resource conservation through financing and encouragement of conservation initiatives.

Discussions on the Environment are restricted to the maintenance of the kind of environment which is expected to sustain biodiversity - its rate of degradation or upkeep.

### *1.1.7 IMPORTANCE TO THE ENVIRONMENT*

The principal interactions from properties of ecosystems are in the form of energy flow, nutrient cycling and interactions. Each organism interacts directly with only a limited number of other organisms through processes like interference, competition, predation and mutualism. There are basic principles associated with species behaviour and interactivity particularly in natural environments. Some of these principles and mechanisms are mentioned in Box 1 and are also characteristics in Cameroon biodiversity

**Box 1: Functions of Ecosystem Components**

As additional source of mortality, predation has direct negative effects on prey population and hence increases risk of population extinction.If two prey species share the same predator, consumption of one species contributes to the increase of predator population and hence the predator pressure on other species. In arguing that exploitation can enhance species diversity, Darwin (1885) showed that mowing of a lawn or its browsing by large herbivores maintained a higher richness of plants than occurred in its absence like *Musanga, Cecropioides, Trema guinensis, Harungana madagascariensis*

In tropical forests of Cameroon, light-demanding pioneer species tend to germinate, establish and grow to maturity only in gaps while non pioneer or climax species tend to germinate and establish primarily in the shade.

Plant pests increase plant diversity when they attack a superior competitor and this prevents competitive dominance. This principle accounts for ecosystem degradation especially in the Tropical Woodland Savanna Ecosystem.

Grazing by sheep has long been known to maintain high plant species diversity and prevent the conversion of grasslands into forests (Bobbink and William1998).

Species other than predators can play the role of keystone species and can contribute to the maintenance of species diversity[3]. ( Power and Mills 1995)

In plant-insect systems, insects feeding at different times or on different parts of a plant may have a substantial effect on the quantity or quality of the available resources.

The ecosystem and its component communities is the more appropriate target for conservation because they implicitly consider many ecological interactions between organisms and their biotic and a-biotic natural environment. Cameroon NBSAP was developed following the “Ecosystem Approach”.

Within the Cameroon context, biodiversity has over the years brought the following influences:-

- **Plants and animals:**

Co-existence between plants and animals – symbiosis;

The relationship of plants and animals especially in their natural forms ;

Contributes to environmental stability in both forest and soil environment.

- **Water regulators:**

Wooded and forest lands are known to be reliable inland water regulators. Streams, water catchments are sustained effectively under forest cover. Vegetation covers prevent run-off and promote stem flow and infiltration.

- **Migration of solar effects:**

Forest cover reduces impact of solar radiation on the ground and so reduces evaporation from the soil and inland water environments.

[3] A key stone species is one whose impact on it’s community or ecosystem are much lager than would expect from it’s abundance.

**- Climate change:**

The climatic influence within the Cameroon territory is quite noticeable and the effects of climate change has been seen among Cameroonians who have been complaining of sun's rays becoming stronger than before as well as constant and disastrous floods. Rainfall patterns have changed drastically to the detriment of farming communities. Cameroon is reported to have 4,144,000 metric tons of Carbon dioxide emissions in 1995 (WRI 1998).

**- Fight Against Desertification:**

Cameroon's northern border is partly influenced by the Sahara Desert which is advancing rapidly southwards. The Cameroon Government has since 1998 initiated the programme to combat the advancing desert and its influence against biodiversity.[4]

**- Soil Fertility:**

Where there is good vegetation cover the leaf litter, microbes and nitrogen fixing within the soil environment, all contribute to improve on the fertility of the soil. The Biotechnology Centre of the University of Yaounde I has developed bio-fertilizers that can be packaged and used to improve soil fertility and increase plant production

**- Ecosystem services**

Carbon sequestration (air quality and purification), water supply, regulation of climate, leisure etc are some experiences in Cameroon.

### 1.1.8 IMPORTANCE TO NATIONAL ECONOMY

Cameroon's economy is based on biodiversity related activities and products. In 1997, biodiversity contribution to the GDP was 40.6 %of which forests occupy70% of the national territory totaling about 26 million hectares and contributed more than 3% of the GDP and 7% of exports (Tchoungi et al 1996; ADB 1995). The economic sectors based on biodiversity activities are Agriculture, Forestry, Fisheries, Livestock, Hunting, Tourism and Research. About 80% of the rural population is engaged on biodiversity based activities and their livelihood depends on the products of biodiversity . in Takamanda Forest Reserve, Ayeni and Mdaihli (2001) concluded a survey of non timber forest products and estimates showed that income was in the order of 500milllion CFA about 850000$ dollars. In mount Cameroon, a survey conducted in six villages around the mount Cameroon project area (Ikata, Bavenga, Bafia, Lykoko Lyale, Munyenge) on the source, production and marketing of NTFPs showed that 27 products were identified but only five served as the main source of women's income (Nkwatoh et al 1998). A list of NTFPs is included in Appendix.

The two case studies of economic importance of biodiversity are illustrated with the Takamanda Forest Reserve and the Mount Cameroon NTFPs survey.

From the species variety, there are food and cash crops which make Cameroon's food sufficiency. It has been established that Cameroon's food sufficiency is largely sustained by the rural women with no government subsidies. Cameroon's food is exported to neighbouring countries of the Central African sub-region. Export of biodiversity products in 2006 from Cameroon stood at the form shown in Table 15 below.

[4] Operation « Sahel Vert » is a Sahel regeneration programme financed by the Government in the Far North Province of Cameroon.

**Table 15. Market Destination of Biodiversity Products**

| Products From Biodiversity | Market Destination | Remarks |
|---|---|---|
| **Agricultural Products** | Local Markets, | |
| Oil palm product | Europe, USA | Mostly informal |
| Rubber | Europe | ,, |
| Banana | Europe, USA, Japan | ,, |
| Cocoa | Europe, USA, Japan | |
| Coffee | Local markets, Europe | |
| Cotton | Gabon, Central African Republic | |
| Cassava | Gabon, Equatorial Guinea | |
| Plantains | Gabon, Equatorial Guinea | ,, |
| Yams | Europe, Gabon Equatorial Guinnea, | |
| Cocoyams | Nigeria | |
| Maize | Local markets, Gabon | |
| Fruits, Vegetables | Local markets, Gabon, Nigeria | |
| | Europe, Asia, USA | |
| **Forestry/ Wildlife Products** | Nigeria, USA, Asia, | |
| Poles for building | Europe, USA | |
| Timber-logs are processed | Europe, Niogeria | ,, |
| NTFPs including medicinal plants | | |
| Animal trophies | | |
| Birds ( parrots) | Local market | |
| | Local market | |
| **Livestock Products** | Nigeria, Europe | |
| Goats, sheep, chicken | Local markets | ,, |
| Meat | Nigeria, Local market | |
| milk | Local market | |
| Hides and skins | | |
| Smoked fish | | |
| Fresh fish | Traditional healers | ,, |
| | Traditional healers | |
| **Traditional Products** | | |
| Plants for healing | | |
| Animals for healing | | |
| Cultural/Sacred products | | |

**Source:** Compiled by Bokwe from Markets and External trade information 2008

**Box 2: Importance of Biodiversity to Cameroon Economy**

- ecosystems services, species, varieties/breeds are of particular importance to the nation.
- Biodiversity contributed to 34% of the GDP in 1994
- Biodiversity employs directly 82% of the country's working population.
- 65% are engaged in crop production
- 30% are engaged in animal husbandry
- 79.8 % of all house-hold use plant products for domestic energy

**Source:** MINEF (1997)

Important areas of biodiversity to the Cameroon economy contained include the following:

1. A source of raw materials for the country's industries in agriculture, forestry, animal industries, fisheries; ( see Box 2).
2. Contributes to the balance of payments in state budgets, ensuring the country's food security and generates foreign and budgetary resources;
3. A measure for alleviating poverty through direct and indirect employment especially with the rural population;
4. For building with local materials, and energy supplies;
   At regional level, large agro - industries working with genetic resources in Cameroon

employ many people at a large scale. C.D.C alone employs about 15000 Cameroonians next to government. Other agro-industrial complexes that employs are: SOCAPALM, PAMOL

**Table 16. Employment Rate of Some Biodiversity- Based Activities**

| Structure | Crop/Sector | Workers |
|---|---|---|
| C.D.C | Oil palm, Rubber | 15000 |
| SOCAPALM | Oil palm industry | unavailable |
| PAMOL | Oil palm | ,, |
| UNVDA | Rice | ,, |
| SOSUCAM | Sugar cane | ,, |
| SEMRY | Rice | ,, |
| HEVECAM | Rubber | 5.000 |
| CHOCOCAM | Cocoa | ? |
| CAMEROON TEA ESTATE | Tea | 2.500 |
| DEL MONTE | Banana | 2.000 |
| FORMALLY: INFORMALLY | Forestry | 300 000 jobs |
| FISHING COMPANIES | Fishery | 240 000 jobs |
| SAFARI HUNTING/ARTISANAL | Hunting Carving, Weaving | |
| ANIMAL HUSBANDRY | Cattle breeding | 30 % of population |

**Source:** MINADER 2008

Still from the economic perspective, Cameroon's biodiversity has made the country derive the following advantages:

- Foreign assistance: Financial and technical assistance has continued to come to Cameroon.

Cameroon through multilateral and international cooperation, technical and financial assistance for the management of biological resources. The main agencies and organizations have demonstrated this concern in the various sectoral domains (Table 16).

**Table 17. Financial Institutions Attracted to Biodiversity Activities**

| Nº | Biodiversity Sector | Financial Institutions | Technical Assistance Body |
|---|---|---|---|
| 1 | AGRICULTURE | World Bank, ADB, First Bank | FAO, WFP |
| 2 | FORESTRY | World Bank | GTZ, WWF, IUCN, ITTO, ATO EU, SNV, COMIFAC |
| 3 | WILDLIFE | World Bank | WCI, WWF,IUCN, OMS, Birdlife International |
| 4 | FISHERIES | World Bank | FAO |
| 5 | LIVESTOCK | Islamic Bank | FAO |
| 6 | TOURISM ( Ecotourism ) | | WTO |
| 7 | ENVIRONMENT | World Bank | UNEP, GEF, FAO, UNDP, UNESCO, CARPE, IUCN |
| 8 | TRADITIONAL MEDICINE | Cooperative Societies Banks - | Unity Cooperative society Bank |
| 9 | CULTURE | Government | |
| 10 | BIODIVERSITY EDUCATION | UNDP, UNEP, UNESCO, GEF | UNEP, UNDP, IUCN |
| 11 | RESEARCH | GEF | IRAD, IITA |
| 12 | BIOTECHNOLOGY/ BIOSAFETY | GEF | UNIVERSITIES, MONSANTO |

**Source:** Bokwe, Information from various stakeholders.

From the information in Table 17. Cameroon's biodiversity has continued to attract huge technical assistance and financial investments.

**Box 3: Conservation and Governance**

Our community must get better at demonstrating the relevance of biodiversity to the rural poor, and how the world's poorest people are vulnerable to the effects of environmental degradation and disasters. We need to prove how an investment in the conservation of ecosystem goods and service can yield concrete ways of eradicating poverty and improving health.

**Source:** Biodiversity and Governance, 2005

Cameroon's 5 Agro – Ecological Zones (Fig.11) justify the crop and animal diversity and the dependence of the Cameroon population on products from biodiversity


**Fig 11: Cameroon's Agro-Ecologicial Zone**
**Source**: IRAD Yaoundé 2007

### 1.1.8.1 CAMEROON'S HYDROLOGY

Inland waters cover an area of 35 000 km$^2$ representing 7.4 % of national territory.
The main zones are:

- Forest zones covering the Nyong, Ntem and Sanaga.
- Northern zone with Lake Chad,flood zones (Yaere), Ladge and Magba dams (see also Fig. 11, Map of Cameroon Hydrology

**Central zone covering the Sanaga, and its three dams (Bamendjin, Mepé and Mbakou**

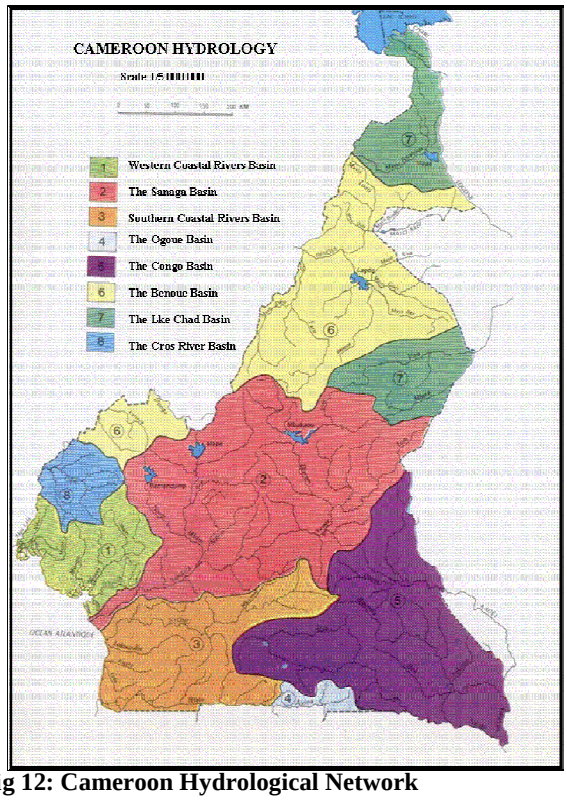



**Fig 12: Cameroon Hydrological Network**
**Source:** Vivien (1991)

## 1.2 STATUS AND TRENDS

### *1.2.1 GENERAL OUTLOOK*

Since more than 80% of the Cameroonian population depends on biodiversity related activities such as agriculture, fishery, livestock, forestry, shelter, medicine and energy, the ever increasing population rate is impacting negatively on the status of biodiversity. Estimates on the use of the various biodiversity components clearly indicate the downward trend of biological resources.

#### 1.2.1.1 POPULATION TRENDS AFFECT BIODIVERSITY

From 1998 to 2010, the country's population would almost be doubled. The demand on the use of biodiversity products would be much higher. On the ground, this would mean ecosystem degradation, habitat destruction, species threat and eventual extinctions. Generally the urban and rural populations trends (Table 18) are indicating that there will be corresponding loss of various forms of biodiversity with increase in population.

**Table 18. National Rural and Urban Population Trends : from 1998 - 2020**

| AREA | 1998 | 2000 | 2005 | 2010 | 2020 |
|---|---|---|---|---|---|
| Cameroon | 13.7 | 15.1 | 19.9 | 25.7 | 31.33 |
| Urban | 6.3 | 7.6 | 11.9 | 17.5 | 24.6 |
| Rural | 7.4 | 7.4 | 8.0 | 8.2 | 6.73 |
| Growth Rate | 2.8% | ← | | | → |

***Source:*** *MINEF 2001*

### 1.2.1.2 CLIMATE CHANGE AND BIOMASS LOSS

Under the implementation of the United Nation's Convention on Climate Change, Cameroon is expected to master the trend of biomass transformation and loss because these phenomena affect the regional and global climate patterns. These patterns ought to be foreseen and appropriate measures taken to revise the impact that could lead to the reduction of several forms of biodiversity notably crop losses, animal number reduction, climatic irregularities with destructive effects on human health.

Climate change is manifested in Cameroon through various phenomena like rising sea level in coastal towns causing disasters, heavier rainfall in coastal and forest ecosystem floods in all ecosystems, droughts in Sahel Savannah, erosion and landslides in all ecosystems, vegetative adaptability, extinctions and successions. Examining the effect of sea level rise on habitat availability and shrimp yield, (Youmbi et al 1999) observed that above 50m of sea level rise area loss becomes important with negative impact on habitat availability and shrimp yield. These natural phenomena have negative repercussion on biodiversity depending on the ecosystem concerned. In order to adapt to the impact of climate change, the population in most of the ecosystems mentioned above exercise a lot of pressure on the biological resources within these ecosystems. Activities which affect biomass loss have been associated to various human activities as analysed in Table 19. Again, depending on the ecological zone, agriculture and cattle grazing also contribute largely to biodiversity loss.

**Table 19. Rate of Plant Biomass Loss in Cameroon in 2000**

| Vegetation Type | Land Area Km² | Biomass Reduction Activity | % Loss |
|---|---|---|---|
| Tropical Moist Forest with short dry season | 42.525 | Annual perennial agriculture<br>Timber exploitation<br>Fuel wood collection<br>Urbanisation<br>Decomposition of stumps and branches | 52<br>13<br>25<br>5<br>5 |
| Tropical Moist Forest with long dry season | 148.180 | Annual perennial agriculture<br>Timber exploitation<br>Fuel wood collection<br>Grazing by cattle<br>Wild fires<br>On site decomposition<br>Urbanisation | 40<br>2<br>20<br>15<br>15<br>3<br>5 |
| Tropical Dry Vegetation | 49.428 | Agriculture<br>Fuel wood collection<br>Grazing by cattle<br>Wild fires | 3<br>5<br>40<br>20 |
| Montane Forest | 1.500 | Agriculture<br>Fuel wood<br>Grazing<br>Wild fires | 60<br>25<br>5<br>10 |

**Source :**MINEF, 2001

Recent climate change adaptability measures by the population include; harvesting of wild vegetables as substitute to loss domesticated vegetables. The government is getting involved in the carbon credit market which will serve as an incentive to mitigate climate change through biomass production.Table 19, it is seen that the rate of biomass reduction by agricultural activities is relatively high in Cameroon. In implementing the UNFCCC, Government is requested to adopt the following strategic measures to mitigate the effects of biomass losses.

- Reduce emission from forest grassland conversion and biomass and soil consumptions.
- Expand related sinks to sequential emissions from forest and grassland conversion.
- Strengthen and expand the climate change unit.
- Facilitate the coordinating role of the Focal Point on climate change.

- Articulate the coordinating role of MINEP on matters of climate change
- Appropriate measures should be taken to counter effects caused by climate change notably within coastal towns which are highly prone to floods and landslides resulting from sea level rise.

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### *1.2.2 ECOSYSTEMS:*

An "Ecosystem" has been defined as "a dynamic complex of plants, animals, fungal, and micro-organisms and their associated non-living environment inter acting as an ecological unit; the organisms living in a given environment such as a tropical forest or a lake and a physical part of the environment that impinges on them.

Human activities are determined by the ecosystem in which they find themselves. The ecosystem services differ from one ecosystem to another.

The (NBSAP classifies Cameroon into six main ecosystems (Table 20).

**Table 20. Characteristics of Cameroon's Ecosystems**

| **Priority Ecosystems** | **Major Composition** | **Location** | **Climate And Soils** | **Observation** |
|---|---|---|---|---|
| **MARINE AND COASTAL ECOSYSTEM** | **Continental Shelf**<br><br>**Mangrove Zone**<br><br>**Continental Coast** | i Geographical<br>The coast is 402 km long beginning from the Akwayafe river on the south eastern end of Nigeria, latitude 4°40' N and descends to the border with Equatorial Guinea at the River Campo, Latitude 2° 20' N. The ecosystem is between Longitudes 8°30' and 10°20' E.<br>ii Administrative<br>Ndian, Fako, Meme, Moungo, Sanaga Maritime, Wouri and Ocean Divisions. | Climate<br>The climate is warm and humid with annual water surface and air temperatures averaging 24°C and 26.5° C, respectively. The area obeys a mono-modal rainfall pattern with an average of 5.000 mm per year.<br>Soils<br>The soils are volcanic, while the clays have a colour ranging from grey to yellow. The beaches are sandy .the northern and central parts of the ecosystem lie on sedimentary soils. | Continental shelf<br><br>The northern section of the continental shelf is wide. 25 nautical miles and 99% trawlable while the southern part is narrow. 15 nautical miles and 70% trawlable.<br><br>Continental Coast<br>The northern and Central parts are dissected by rivers carrying large quantities of alluvial deposits and hence the prevalence of mangrove species. The coastal mount Cameroon slopes and the extreme south of the ecosystem lie on hard rocks, and hence little deposits and few mangroves |
| **TROPIAL HUMID DENSE FOREST ECOSYSYTEM** | Littoral or Atlantic Humid Forest Biafran Forest Guinea Congolian Forest Swamp /Food Forest | Geographica<br>It is situated between latitudes 2° and 6° 30' N, and longitudes 10° 20' and 16° 20'E<br><br>Administrative<br>South west (tendency), Littoral, Centre, South and East provinces. | The rain fall obeys 2 patterns: Cameroonian; mono-modal with more rain, and Guinean; bi-modal with less rain. Ex Douala = 4,028 mm, Yaoundé = 1,597 mm. mean annual temperatures are between 32° C and 23.5°C.<br>Soils<br>Volcanic in the West Granitic and Variously metamorphic | The Atlantic variant is made Of 3 levels: tree, shrub and herbs, with a lot of *Lophira alata.* The Atlantic type gives way to the biafran and then to the mixed forest of *Gilberriodendron dewevrei* which further gives way to the *sterculia subviolacea* marsh and raffia swamp forest |

| | | | | |
|---|---|---|---|---|
| **TROPICAL WOODED SAVANNAH ECOSYSTEM** | Tree and woodland Savannah<br><br>Shrub Savannah<br><br>Grassland savannah | Geographical<br><br>Latitudes 5° and 8° 20' N and longitudes 9° 30' and 15° 40' E.<br><br>Administrative<br>N. West and Adamawa Provinces. | The mean altitude is between 1.000 m and 1.600 m a.s.l. The average annual temperature is 19.4°C and the mean annual rainfall is 2.000 mm.<br>Soils<br>Volcanic in the Western half, granitic in the S/E Adamawa. | Tree and woodland savannah is found in the south and west of the ecosystem. Progressing to shrub savannah of *Daniella oblonga* and *Lophira Ianceolata* and then to grass savannah of *imperata cylindricum* and *pennissetum purpureum*. |
| **SEMI-ARID ECOSYSTEM** | Steppe or large open land.<br>Savannah and shrub land<br>Prairie pastures<br>Yaeres and Boves<br><br>Flooded lands | Geographical<br><br>Latitudes 8° 20'and 13° 10' N and longitudes 12° 30' and 15° 40' E.<br><br>Administrative<br>North and far North provinces. | The climate is severe with clear differences between the daytime and night-time temperatures.<br>Maximum temperatures vary between 40 and 42°C: end April and the minimum temperature is 17°C: Dec/Jan. Rainfall drops from south: 1.00 mm to 900 mm.to North: 900 to 400 mm per year.<br>Soils<br>The eastern plain lie on sedimentary soils. The Western soils are volcanic around the Mandara mountain and granitic north and south of the Mandara | Three major features include the Benoue plain in the South/East littered by small hills, the dry Mandara region and the flood vegetation on the west known as the Boves and Yaérés.<br>A special and unique vegetation of thorny scrubland occurs in the Mozogo Gogoko reserve of the Mayo Tsanga Division.<br><br>Characteristic activities include fishing in the eastern flood plains: February – April as the waters recede. |
| **FRESH WATER ECOSYSTEM** | Limnogical (continental lakes)<br><br>Lithological (continental rivers) | Geographical<br>Rivers traverse several . ecosystems due to the modification effect of water on micro-climate and vegetation. | | The lakes are classified in two categories namely;<br>i. Craters or volcanic reservoirs<br>ii. Subsistence or lowland Lakes<br>iii. Basin Lakes i.e lake Chad<br>iv. Artificial Lakes i.e. Lagdo |
| **MONTANE ECOSYSTEM** | Subalpine or Ericaceous belt (3.00-4.000m a.s.l)<br>Afromontane belt (1.600m-3.000m a.s.l)<br>Submotane (1200-1600m) | Geographical<br><br>The mountains are mostly located on the western half of the country's continental plate. | Mountains are coole,r their altitude eg Mt. Cameroon 4.095m has a temperature of 4) C but at Limbe (100masl . temperature is 32°C. soils are mainly volcanic.micro-climate is more humid, | The country's mountains are noted for volcanic activity. the most recent was in 1999 on Mt Cameroon.<br><br>Some flora lichens and orchids strive on recent mountain larva. |

**Source: UNEP/MINEF 1998**

### 1.2.3 SPECIES

The status and trend of species diversity is of great importance to biodiversity stakeholders in Cameroon. In spite of the many changes which result from several activities on the plant and animal species, the users and managers of biodiversity hardly notice the changes. A new breed of fish, cattle or sorghum may be developed within a species population completely un-noticed until a systematic species analysis is made from an existing base-data. . Also, most of the ecosystems do contain various species of microorganism which if sustainably managed can contribute to the richness of Cameroon biodiversity.

#### 1.2.3.1 FLORAL BIODIVERSITY

About 400 botanists have prospected the flora of Cameroon between 1861 and 2006. So far there are 235 families, 1779 genera and about 8500 species, among which are 410 exotic species (Onana, 2007) Table 21 summarizes the state of the Cameroon flora. The family of grasses alone comprises 7000 species

**Table 21 State of Cameroon Flora - 2008**

| Nature | Number | Remarks |
|---|---|---|
| Families | 235 | |
| Genera | 1179 | |
| Species | 8500-10000 | Grasses 7000spp |
| Exotics | 411 | |
| Endemics | 808 | |
| Useful | 3000 | |
| Endangered | 176 | IUCN classification |
| Invasive Species | 11 | |

**Source:** Onana 2007, Van der zon 1992

The following families which show relative abundance are:

- Rubiaceae …….. 200 species
- Leguminousae
- Orchidaceae
- Compositae
- Craminae ……. 7000 species

A huge number of plants in Cameroon have been put in the following uses:
Local vegetables ……..150
Local spices …… 50
Edible fruits …….300
Oil producing species …….. 7
Natural drinks ……24 including 3 feast liana
Stimulants/beverage ……. 5

Forage …… 300
Local fibre production …….. 70
Colouring/dying……?
Public health and hygiene…….?
Construction of houses ……about 300
Environment (ornamentals) ……40
Energy……...?
Medicinal plants …….820 (Nkongmenek 2007)

*Englerondendion korupense* Burgt (leguminosae) has been declared "Critically Endangered" by IUCN because less than 50 trees are now found in Korup – its unique habitat. *Gleuma korupensis* Burgt (Sapotaceae) is rare and unique to Korup; a natural wonder to the Korup National Park. It can be 42m high with a trunk diameter of 2.4m. It is classified as "Endangered" by IUCN classification list.

#### 1.2.3.1.1 WILD FLORA DIVERSITY

While food and cash crop farming have been used as measures of conserving and using biodiversity in a sustainable manner, forest production has been responsible for great losses in biodiversity. It is reported that 80% of Cameroon forests are exploitable, (MINFOF 2008). Timber production has been going on in five provinces – the Eastern, Central, South, Western, Littoral and lightly in the Western. About 100 concessions over an area of about 6.5 milliion hectares; 45% of the concession are awarded to nationals and 55% to expatriates. Production in 2006 stood at 2 296 $254^{m}3$. The evolution of timber production since 1998 is shown in Annex III

It is shown in 2007 and 2008 that the first two species (*Triplochiton* and Tali) make up 68% of the timber export volume in Cameroon and 80% of the wood products are exported to Asia (China and Vietnam) (MINFOF 2008)

#### 1.2.3.1.2 CROP DIVERSITY

The crop diversity in Cameroon is very rich, impressive and contributes to the country's food security. The large varieties of ecosystems support a wide range of crop diversity. The diversity includes main food-stuffs, fruits, vegetables, spices and medicinal plants.

Although the main food items are generalized, there is a wide range on the choice food items particularly the vegetables and spice food items. In the Cameroon tradition, every ethnic group identifies itself with a range of foods and vegetable crops. Mbah (2008) reports that in his Moghamo Clan, there are over 7 vegetable species and 9 yam species while Bokwe (2008) outlined 15 generalized vegetables and 7 locally used for various Oroko dishes. Much of the wild food and spices like the country onions, Bush Pepper and *Eru* which are originally collected from the wild, are now under cultivation in some rural communities.

Production estimates on Cameroon crop diversity particularly in the food sector are not very reliable. The cash crops estimates however, are fairly reliable because almost all the production and sales pass through organized co-operative societies. Annex II. summarizes the important cash and food crops in the various ecosystems. It is observed that the progressive annual production increases result from increases in corresponding increases in cultivated areas (e.g maize, cassava, plantains and palm oil) at least. The implication is that the impact of agriculture on the environment and biodiversity is increasing. Adaptation measures must be sought to put the situation under control.

#### 1.2.3.1.3 THE RED DATA ON CAMEROON PLANTS

A Red Data List information of nine species was provided by the National Herbarium of Cameroon in 2007 (Cheeck et al 2007). Table 22

**Table 22: Red Data List on Cameroon Plants**

| Nº | Species | Collections | locations | IUCN Status |
|---|---|---|---|---|
| 1 | Schefflera mannii | 14 | 13 | Possible new threated |
| 2 | Achyranthes talbotii | 13 | 12 | Possible new threated |
| 3 | Afrothismia ameti | 1 | 1 | Data deficient |
| 4 | Afrothismia gesnerioides | 1 | 1 | Data deficient |
| 5 | Afrothismia pachyanta | 3 | 2 | Endangered |
| 6 | Amphiblema monticola | 6 | 6 | Endangered |
| 7 | Ancistrocladus korupensis | 21 | 21 | Endangered |
| 8 | Malouetia barbata | 3 | 2 | Endangered |
| 9 | Petchia africana | 8 | 4 | Endangered |

**Source:** Check et al 2007

### 1.2.3.2 FAUNAL BIODIVERSITY

The Status and Trend of the Cameroon faunal diversity as summarized in table 23 shows that it is generally diminishing particularly with reference to wildlife species.
Studies in the Bakossi Highlands show an extraordinary rich fauna. Table 23 shows some information on the richness of some faunal species. This downward trend is due to its impact on wildlife habitats through various activities like agriculture, logging, infrastructure, bush fires and climate change.

**Table 23 State of Cameroon's Faunal Biodiversity 2008**

| Nature | Nº of Species | Endemic | Endangered | Extinct | New Discoveries |
|---|---|---|---|---|---|
| **WILD FAUNA** | | | | | |
| Mammals | 409 | 11 | 40 | | 20 (rotifera) |
| Reptiles | 230 | | | | |
| Snakes | 150 | | | | |
| Amphibians | 381 | | | | |
| **AQUATIC** | | | | | |
| Fishes | 451 | 57 | | | |
| Ophidians | | | 9 species of | | |
| Birds | 850 | | turtles | | Korup 57 familes |
| Insects | 2084 | | | | 389sp |
| Crustaceans | 3 genera | | | | 67 spp of termites |
| Mollusks | 25 species | | | | |
| **DOMESTICATED FAUNA** | | | | | |
| Cattle breeds | 6.000.000 | 4 kapsiki/3Namdi | | 1 (Bamiliki) | 4 |
| Horses breeds | 17.438 | | | | |
| Donkey breeds | 45.277 | | | | |
| Sheep breeds | 3.500.000 | | 1 Blackbelly | | |
| Goats breeds | 3.500.000 | | | | |
| Dogs breeds | ? | | | | |
| Pigs breeds | 1.700.000 | | | | |
| Poultry | 14.000.000 | | | | |
| Cane rats breeds | ? | | | | |
| Rabbits | 47.277 | | | | |

**Source:** Department of wildlife, Ministry of Livestock 2008, IRAD

It has been noted that insect diversity information has greatly improved by about 100% with the work done by the Central Entomology laboratory in IRAD, Nkolbisson: A total of 2084 insect species have been described under the following orders, families and species groups:

Coleoptera ……. 11 families …… 1214 species
Orthoptera …… 4 families ……... 42 species
Isoptera/Dictoptera… 4 families ……..248 species
Hymenoptera …… 1 family …… …116 species
Lepidoptera …….. 7 families ……...237 species
Hemiptera …… 7 families ……...219 species
Diptera ……. 4 families ……...8 species
**TOTAL…… 38 Families ……..2084 species**
**Source:** Dibog 2008

Molluscs form an important category of small food animals and their breeding is carried out in some parts of the country (e.g the Centre and South West Provinces).

**Table 24 Faunal Richness of Lake Beme in the Bakossi Highlands**

| Species Type | Total Nº (Species) | Endemic | Strict Endemic | New Discovery |
|---|---|---|---|---|
| **Fish** | 132 | | | |
| **Mammals** | 110 | | | |
| **Birds** | 330 | | | |
| **Reptiles** | 105 | 351 lizards spp<br>62 snakes spp<br>9 Chameleons spp<br>3 Crocodiles spp | | |
| **Amphibians** | 113 | 50% | 10 spp | 6 spp |

**Source:** Chris Wild, Berthan Morgan, Roger Fotso

Lake Beme in the Bakossi highland is the richest fresh water site for fish species worldwide (Box 4 and Table 24)

**Box 4**: Biodiversity Treasures in Lake Beme-Cameroon

Lake Beme (60ha) is the richest fresh water site for fish species worldwide

- It has an intact micro flock of *Tilapia* comprising nine endemic cichlid species
  *Tilapia bakossiorum* *Tilapia gutturosa*
  *Tilapia bemini* *Tilapia imbriferna*
  *Tilapia bythiobates* *Tilapia spogotroktis*
  *Tilapia flava* *Tilapia synderae*
  *Tilapia thysi*
- The Lake Beme species are a biparental custodial substrata-spawning community;
- The endemic species include phytoplankton and sponge-eating representatives;

Small seasonal forest pools and streams throughout Bakossi lowlands support at least five species of killifish *(Aphyosemion spp*) which is endemic to Bakossi and the adjacent Rumpi Hills;

- The worlds largest frog, the Goliath frog (*Conrauna goliath*) is present up to 700m in the eastern tributaries of Kupe and Mwanenguba;
- Mwanenguba and Bakossi host the richest assemblage of Chameleon species in Africa, with 9 species being endemic

**Source:** Chris Wild, Berthan Morgan, Roger Fotso

Of the 23 endemic taxa listed in Bali-Ngemba, 12 are considered as strict endemics i.e. only known from Bali-Ngemba and 11 as near endemic (Cheek et al 2004)

The highlands of Western Cameroon are considered an Endemic, Bird Area containing 30 restricted range species, 10 of which are recognized as vulnerable.

At least 10 species of amphibians are considered to be strictly endemic to the Bakossi Mountains.

The Takamanda Forest Reserve (only 67.6 $km^2$) has a great diversity of plants and animals (Table 25).

**Table 25: Biodiversity Richness of the Takamanda Forest Reserve**

| Species | Total Number | Endangered | Newly Recorded |
|---|---|---|---|
| Plants | 950 (351 trees) | ? | |
| Birds | 313 | ? | 2 |
| Reptiles | 81 | ? | 3 |
| Butterflies | 111 | ? | |
| Dragon flies | 67 | ? | |
| Fishes | 166 | ? | |

**Source:** Sunderland et al 2004

The Tree Fern *Cyathea camerooniana* Fig 13 is heavily threatened with extinction because it has long been used as a traditional fencing and building materials and other artisan works by rural communities of the tropical dense forest and tropical wooded savannah. It's common habitats are forest and stream banks: 1200 to 1450 metres ASL.

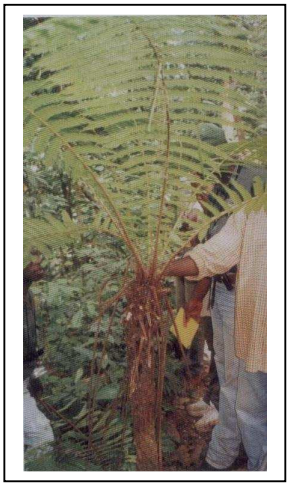


**Fig 13:** *Tree Fern Cyathea camerooniana*
*Photo curtsy of Christo Van de Rheede*

**Table 26. Species Vulnerability in Cameroon Highlands.**

| Area Km² | Mammals | | Birds | | Reptiles | | Amphibians | | Butterfies | | Plants | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R | E | R | E | R | E | R | E | R | E | R | E |
| **Mt. Cameroon 1.100** | 126 | 2 | 403 | 3 | 55 | 0 | 81 | 5 | 36 | 2 | 3500 | |
| **Highlands Forest 38.000** | 138 | 11 | 573 | 7 | 38 | 9 | 89 | 15 | 47 | 5 | 3700 | |

**Source:** Cheek, 2004.

**Red List of Some Animal Species in Cameroon**
(*from wildlife sources in Takamanda Forest Reserve)*

The Terrestrial Tortoises ……..*Kinixys homeana*
*Kinixys erosa*
Dwarf Crocodile ……...*Osteolaemus tetraspis*

### 1.2.3.3 DOMESTICATED ANIMAL DIVERSITY

Animal breeding in Cameroon is classified into formal animal breeding involving ruminants and small ruminants and then informal breeding involving lower animal species (reptiles, birds, amphibians and smaller rodents).

### 1.2.3.3(a) Conventional Animal Breeding

So far, 10 species of animal species are reared nationwide .From a generalized assessment, it should be noted that within the species there are many breeds or varieties. Table 27 summarizes the current livestock situation in Cameroon in 2008.

Cameroon has an important diversity of cattle species. Sixteen (16) species have been identified as shown on table 27 (a) below.

**Table 27 (a) Various breeds of domesticated animals in Cameroon.**

| A ) Cattle Breeds | Number of Heads | Year of Survey | Characteristics |
|---|---|---|---|
| Bakossi | 1000-1300 | 1984 | Short horn in the Menengouba mountain regions of the South West Province. |
| Bakweri | Unknown | | Foot of Mount Cameroon |
| Bamileke | Extinct | 0 | |
| Banyo or Adamawa Gudali | 1060000 | 1999 | Composite species of the Gudali in the Adamawa and Bororo with the red collar , in the Adamawa Province |
| Shuwa or Arab Choa | 50000 | 1992 | |
| Kapsiki or Kidri | 3289 | 1985 | Far North Province at Mokolo, Mandara |
| Kuri | 2350 | 1993 | Long horn of the Lake Chad Basin |
| Mbororo with white collar (white fulani, Akou, Bonanji) | 140000 | 1999 | North west and Adamawa provinces |
| Mbororo with red collar (red Mbororo, Djafoun) | 1570000 | 1999 | Long horn, North Cameroon |
| Doayo (Namchi) | 6960 | 1992 | Poli, North Cameroon |
| Ndama (Futa, Fouta jallon) | 2000-2500 | 1992 | Palm plantations in the Littoral and South West |
| Ngaoundéré, Foulbé, Peuhl | 140420 | 1993 | |
| Préwakwa | 0 | 0 | Brahmanx Adamawa, originates from Wakwa, |
| | 5800 | 1993 | |
| Yola (Foulbe of Yola) | 0 | 0 | Gudali blood of the Adamawa and Muturu |

**Source:**Les bovins du Cameroun : http://dad.fao.org/

According to FAO, eight (8) sheep species varieties have been summarized on table 27 (b) below while seven (7) goat species appear on table 27 (c)

**Table 27 (b) Various breeds of sheep in Cameroon.**

| Sheep Breeds | Number | Characteristics |
|---|---|---|
| Bornu (balani) | Unknown | Fualni variety in North Cameroon for meat production |
| Dorset | Unknown | Imported from USA to the Mankon station Bamenda for Wool production. |
| Katahdin | Unknown | Imported from USA to the Mankon station Bamenda for Wool production. |
| Kirdi/Massa | Unknown | African *naine* variety from the West in the northern provinces for meat production. |
| Nain from West Africa or Djallonké | Unknown | Indegenous species in the Savanna areas for meat production. |
| Peuhl or foulbe (fulan) | Unknown | Indegenous species in the North and Adamawa for meat production. |
| Suffolk | Unknown | Imported from USA to the Mankon station Bamenda for Wool production. |
| Uda or felleta or louda | Unknown | Fulani variety for the production of meat |
| Woila | | Fulani variety |

**Table 27(c) Various breeds of goats in Cameroon.**

| Goat Breeds | Number | Characteristics |
|---|---|---|
| Desert or Sahel goats | Unknown | Importted from Chad to Cameroon |
| Kirdi goats | Unknown | *Nain* varieties from West Africa are found in North Cameroon. |
| Red Sokoto or Maradi goats | Unknown | Imported from Chad |
| West African or Djallonké *Nain* | Less than 2535000 in 1990 | |
| nubian | Unknown | Imported for milk |
| Saanen | Unknown | Imported for milk |
| Toggenburg | Unknown | Imported for milk |

Sourcee: MINEPIA, Yaounde 2008

Of the more than 16 cattle types, 3 are vulnerable or endangered (*muturu* – which is *Bakweri*, *Bakossi; namchi*, the *kapsik*i and the *kuri*.) some of the causes of the threats include the drying up and dwindling of its habitat(lake Chad Basin ecosystem), random cross-breeding by farmers. Cross breeding for dairy production goes on at a limited scale.
One breed of cattle called the *Bamileke* is known to be totally extinct in Cameroon
One breed of sheep called the *Black Belly* is actually endangered.

## 1.2.3.3(b). Non Conventional Breeding

This is a completely new area of animal breeding which focuses on small animal species (cane rats, snails, Guinea pigs, quails, frogs, rabbits, etc (See figure 14)

**Fig 14:** Selected animal species used for non Conventional breeding
With courtesy from PAPENOC 2007

Within the programme of the Ministry of Livestock and fisheries, this breeding programme is managed under a project called "PROJET D'APPUI AUX ELEVAGES NON CONVENTIONNELS". This project has extended its influence since 2007 to about nine provinces and has promoted income generating activities as well as encouraging self employment to the rural masses. It has recently been reported that products from some of the species used for this form of breeding are of great demand in markets even out of Cameroon. One genus of snails *Achatina genus* constitute a major source of proteins for some tribes in Cameroon. Some species of Cameroonian snails possess medicinal and comestique virtues. (MINEPIA 2008)

Some information on non conventional breeding appears on Tables 28.and 29 below.

**Table 28: Summarized situation of non conventional breeders surveyed in 2007**

| Provinces | | Centre | East | West | South-West | Total | Average |
|---|---|---|---|---|---|---|---|
| Species Inform-ation | cane rats | 8947 | 104 | 1042 | 308 | 10401 | 2600,25 |
| | guinea pigs | 4168 | 127 | 2543 | 56 | 6894 | 1723,5 |
| | snails | 3940 | 150 | 4 218 | over 30000 | + 40 000 | + 10 000 |

**Source:** MINEPIA - PAPENOC, Yaounde 2008

**Table 29 Cane rat culture information in cameroon 2002 - 2007**

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|
| **Number** | 720 | 1200 | 4500 | 8000 | 9000 | **10401** |
| **Variation** | - | + 480 | + 3300 | + 3500 | + 1000 | + 1401 |
| **Active Breeders** | 48 | 79 | 300 | 500 | 600 | **472** |
| **Provinces Covered** | 02 | 05 | 09 | 09 | 09 | **04** |

**Source:** MINEPIA - PAPENOC, Yaounde 2008

The great variety of edible insects within the inhabitants of the various ecosystems is shown in Table 30

**Table 30: Diversity of Edible Insects**

| Local names | Ecosystem |
|---|---|
| Locusts | Savanna and Sahel |
| Green grasshoppers | Sahel, Savanna and Forest |
| Termites (large) | Savanna and forest |
| Raffia palm beetles | Savanna and forest |
| Caterpillars | Savanna and forest |
| Elephant grass stocks beetles | Savanna |
| Crickets (one type) | Savanna |

Source: Personal information Mbankenkhu M. .F. 2008

### 1.2.3.4 AQUATIC DIVERSITY

The marine and Coastal Environment in Cameroon has four main Characteristic areas:-

- From Campo to the mouth of River Nyong
- From River Nyong to Limbe
- From Limbe to Idenau
- From Idenau to Nigerian boarder.

Fish production is about 75 000 tons/ year which is about 42 % of national production(180 000 tons). So far 38 species of fish have been identified in Cameroon's continental waters, (Hamidou, 2008).Loss of aquatic diversity has been attributed to: various forms of pollution, over-exploitation, habitats degradation, poor capacity building, non-optimization of use of traditional knowledge.

### 1.2.3.5 MICROBIAL BIODIVERSITY

Microbial diversity in Cameroon has been classified under bacteria, fungi and viruses. These three classes influence the Cameroon economy in the areas of agriculture, forestry, health, commerce and industries. Reporting on microbial biodiversity Nwaga (1998) they are a potential which is unexploited in Cameroon and can be useful to produce many products such as beverages, food, proteins, solvents, bio-fertilizers, bio-pesticides and minerals. The Identifications carried out so far resulted to the summary outlined below (see inventory of mycorrhizal mushrooms and Fig15)

The main microbial groups reported are:-
Mushrooms:

- Basidiomycotina (Boletus, Edible, Mycorrhizal)
- Glomeromycotina (Mycorhizas, Biofertilizers including 45 identified species, )
- Deuteromycotina (Pathogens for bio-control or food technology) Trichoderma
- Mastigomycotina (pathogens, Saprophytes; Phytophthora, Agent causing black pod disease in cocoa)
- Ascomycotina (Saccharomyces) used in beer and alcohol manufacture
- Lichens (101 species identified)

**Species of Mycorrhizal fungi found in forest soils of the Tropical Dense Forest Ecosystem**

*Acalauspora scrobiculata* Trappe
- *Acalauspora mellea* Spain &Schenk
- *Acalauspora rugosa* Morton
- *Acalauspora denticulata* Sieverding & Toro
- *Entrophospora Columbiana* Spain
- *Scutellospora calospora* (Nil. & Gerd.) Walker & Sanders
- Scutellospora pellucida (Nicol & Schenk) Walker and Sander.
- *Gigaspora gigantea* Nicol& Gerd.) Gerd.& Trappe
- *Gigaspora decipiens* Hall & Abott
- *Sclerocystis pachycaulis* Wu & Chen
- *Glomus microaaggregatum* Koske Gemma & Olexia
- *Glomus caledenium* Nicol. & Gerdemann
- *Glomus geosporum* Nicol. & Gerdemann
- *Glomus intraradices Schenk & Smith*
- *Glomus nanolume*n Koske & Gemma
- *Paraglomus occultum Walker*
- *Glomus claroideum* Schenk & Smith
- *Glomus manihotis* Howeler, Sieverding & Schenk
- *Glomus clarum* Nil. & Schenk
- *Glomus mossae (*Nicol. & Gerd.) Gerd. & Trappe

**Source:** Nwaga 2007

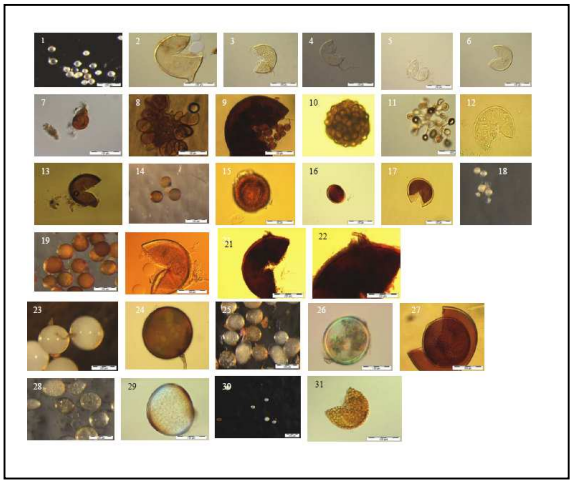
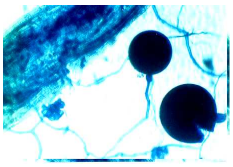


**Fig. 15;** Mycorrhizal Fungal diversity in Cameroon

Through the correct use of mushrooms and bacteria, it is possible to produce a variety of products which can be useful for domestic purposes and for the improvement of the economy as evidenced from the use of bio-fertilizers from mycorrhizal fungi, legume nodulating bacteria and phosphorus solubilizing bacteria, fig 16.

Mycorrhizal

Root nodules



**2 products developed**

1-Mycorrhizal fertilizer for all crops
2- Rhizobia:fertilizer for legumes
3- MSP: on-going bio-stimulant.
These bio-fertilizers have been tested in farms since 1996 in collaboration with IRAD, IITA and CARBAP in the Northern provinces, in the Western and Southern provinces of Cameroon; they have been recommended by the Cameroon committee Bio-science since 2001 and have been proved to improve yield from 50 to 200% according to the particular crop and the soil.

**Fig.16: Biofertilizers developed from mycorrhizal fungi and legume nodulating bacteria**

However, it has been noticed that the use of microbial diversity has not been fully maximized in Cameroon as is the case of nitrogen fixing bacteria for legumes and the control of banana plantain nematodes.

**Forestry Biodiversity Underexploited**

Root nodules of a Nitrogen fixing tree Species – *Eythrophleum spp*

Nitrogen fixing site and natural soil fertilization

Fig 17: Legume Nodulating Bacteria Bemonstration

**Agricultural Biodiversity Underexploited**

Greenhouse plants of plantain and banana mycorrhizal increasing tolerance to nematodes, diseases and water stress

Fig 18: Banana/Plantain torerence to drought demonstration using mycorrhizal fungi

**Bacteria**

Rhizobia: fertilizers for legumes (groundnuts, beans); Pseudomonade, Bacillus; bio-control agents of crop pests and diseases; Lactobacillus: for milk technology

-Cyanobacteria (bio-fertilizer for rice)

- Bacteria wilt of tomato and Irish potato

-Other bacteria (actinomycetes : production of antibiotics).

**Viruses:**

-Human and Animal (Hepatitis, HIV, Ebola, cattle and pork pest, emerging diseases… )

-Crops (for crops like cassava and rice)

Within the framework of microbial diversity, the following considerations have to be made

- Microbes are important elements to be considered in biosafety in Cameroon at the level of risk assessments.
- mycorrhizal fungi are associated in about 90% of the world crop species in agriculture, livestock, forestry and carbon fixation and accounts for improvement crop yield from 50 to 200% in Cameroon. (Nwaga, 2008)
- There is already an inventory of mushrooms.(Onguene, 2000)
- The nitrogen fixing bacteria are used for legumes, for soils fertility and results of 40 to 100% yield improvement have been obtained on groundnuts, soybeans (Nwaga, 2008)
- Aquatic bacteria (*Spirulina* in Lake Chad, Cyanobacteria) have been identified.

Two case studies of fungi from Cameroon (one from the Mbalmayo Forest Reserve and the other from Campo Rain Forest Areas) have been mentioned here below. These case studies show that 271 distinct species of fungi belonging to 110 general in 58 families have been recorded in Mbalmayo (Douanla – meli, 2007) while more that 125 species of ectomycorrhizal fungi were identified in the Campo Forest. (Onguene, 2000)

**Case study: Fungi from Mbalmayo Forest Reserve**

Douanla-Meli, C. 2007. Fungi of Cameroon: Ecological diversity with emphasis on the taxonomy of Non-gilled Hymenomycetes from the Mbalmayo forest reserve 2007. VIII, 410 p., ***Bibliotheca Mycologica,*** Band 202. J Cramer, Stutgart. Fungi of Cameroon is a contribution towards assessing the current macrofungal diversity associated with the ecosystems of Cameroon's southern forests, and evaluates the impact of deforestation and slash-and-burn on fungal communities and tracks the occurrence and changes to the fungal communities through the seasonal climatic variations. ***The identification of specimens with modern techniques has yielded a total of 271 distinct species, belonging to 110 genera in 58 families.*** The overall recorded species were new to the Mbalmayo forest reserve, while 75 of the described species were new to Cameroon, and 11 new mycobiota were described. 140 species of Aphyllophorales, Gasteromycetes and heterobasidiomycetes are included: 11 gasteromycetes, 10 heterobasidiomycetes, 9 clavarioid fungi, 19 steroid fungi, 10 lentinoid fungi, 6 ganodermoid fungi, 14 Hymenochaetaceae and 61 Polyporaceae are documented.

**Case study: Mycorrhizal Association in Rain Forest of Campo**

This work deals with mycorrhizal associations in rain forests of south Cameroon under various disturbance regimes and stages in order to provide essential information on the roles of mycorrhizas (arbuscular mycorrhiza and ectomycorrhiza) in tree establishment and forest recovery. How disturbances affect the biodiversity of arbuscular and ectomycorrhizal fungi. ***More than 125 species of ectomycorrhizal fungi were identified***, mainly from near pristine forests in ectomycorrhizal clumps, either near the stem base of *Uapaca* species or those of the Caesalpiniaceae, while one further fungal species was found in association with *Gnetum*. Among the ectomycorrhizal fungi, the Amanitaceae, Russulaceae, Boletaceae, and Cantharellaceae were well represented, whereas only a few species of Cortinariaceae, Sclerodermataceae, Gomphaceae, Clavulinaceae, and Hymenochaetaceae were observed fungi within the Tropenbos Campo Program (TCP) area. The same ectomycorrhizal fungi (and the same ectomycorrhizal trees) also occur in Korup National Park, Cameroon, even though soils and climate are very different between Korup and the forests of the TCP area. When Tetraberlinia bifoliolata.

### 1.2.3.6 GENETIC DIVERSITY

The diversity of plant and animal life reflects the diversity of genetic resources in Cameroon.

a) **Plant Genetic Resources** are threatened by agriculture, logging, hunting, climate change, and sea level rise. Genebanks exist for the following agricultural species

| | |
|---|---|
| Cassava gene banks IRAD Ekona | Potato gene banks IRAD Bambui |
| Sweet potato gene bank IRAD Bambui | Maize gene bank IRAD Nkolbisson |
| Cocoa gene bank IRAD Nkoavon | Cocoa gene bank IRAD Barombi Kang |
| Coffee gene bank IRAD Nkolbisson | Arabica coffee gene bank IRAD Foumbot |

Gene banks being setup:

Vegetable gene bank IRAD Foumbot, the Limbe Botanic Gardens.
The Green gene bank IRAD Dschang, Bertoua
Oil palm gene bank IRAD la Dibamba
Rubber gene bank IRAD Ekona
Sorghum and millet – Maroua
Maize and groundnuts – Sangeari Garoua
Forage gene bank (grasses, legumes) IRAD Wakwa, Garoua, Nkolbisson.

b) **Animal genetic resources** are grouped into wildlife and domesticated animals. For wildlife species, there are plans to cover 30% of the national territory to protected areas. For domesticated animals, action includes collection and multiplication of endangered species. An animal genetic resource committee exists within the Ministry of Life Stock and fisheries. Mbah (2007) recommends more investment for the maintenance and creation of more genebanks, putting up of proper infrastructure and development of human resources at all levels.

## 1.2.4 INVASIVE ALIEN SPECIES

In Cameroon, species considered as invasive have been studied in isolation by research bodies and project organizations. Nwaga(2007) examines some common microbial crop pests and invasives and classifies them under fungi, bacteria and viruses, while Bokwe (2007) examines plants, animals, insects, fish invasive alien species and attributes some biodiversity habitat destruction and ecosystem degradation to uncontrolled behaviour of invasive species. Cheek (2004) studying the plants of Kupe Mwanenguba classified invasive species into wild habitat invasives, Crop Aliens and Weedy Aliens. He identified four crop

aliens and over 25 weedy aliens in Kupe, Mwanenguba and the Bakossi Mountains. In Bali Ngemba, Cheek (2004) identified two taxa of invasive species, four alien taxa and 25 native weeds. Several IAS of wetlands have been reported to cause considerable damage to Cameroon Wetlands. Howard et al (2003), outlined the following wetland invasive aliens which have been identified in Cameroon as well.

plants
- *Eichhornia crassipes*…….. Water Hyacinth
- *Azolla filiculoides* Red water fern
- Nypa palm
- *Pistia stratoites* …….Water Lettuce
- *Mimosa Pigra*……Giant Sensitive Plant

fish
- *Procambarus clarkia*…….Lousiana Crayfish
- *Cyprinus carpio*…….Common Carp

Greater attention is now paid in the domain of IAS in Cameroon particularly with the planned GEF-Cameroon Project on the Development and Implementation of a National Monitoring and Control System Framework for Living Modified Organisms and invasive alien species under the GEF biosafty programme (UNEP).

### 1.2.4.1 INVASIVE ALIEN MICROBIAL SPECIES

Some attempt has been made on identifying and inventoring microbial Invasive Alien Species. Major common Invasive Microbial Species have been listed on Table.31

**Table 31: Some Major Common Invasive Crop Pests and Diseases in Cameroon**

| Name | Scientific name | Symptoms or damages |
|---|---|---|
| Striga (Pl) | Striga sp. | Sorghum, cowpea are the main hosts |
| Fusariose disease (Fu) | Fusarium oxysporum | Oil palm hearth (30-50% incidence) |
| Black pod disease of cocoa (Fu) | Phytophthora megakarya | Reduce cocoa yield (50-70%), chemical controls have failed |
| Cocoyam root rot disease (Fu) | Pythium myriotylum | Tuber yield reduction from 50-70% |
| Coffee berry disease (Fu) | Colletotrichum coffeanum | More severe on Arabica coffee |
| Leaf spot (Fu) | Mycosphaerella sp. | Banana/plantain |
| Aspergillose (Fu) | Aspergillus flavus | Chicken nanism, cancer in humans from groundnuts or maize feeds |
| Anthracnose diseases, Egussi (Fu) | Colletotrichum lagenarium | Diseases incidence may reach 100% |
| Cercosporiose disease, grapes (Fu) | Phaeoramularia angolensis | Fruits and leaf diseases |
| Late blight of Irish potato (Fu) | Phytophthora infestans | May cause severe losses on tubers |
| Leaf blight of cowpea (Fu) | Ascochyta phaseolorum | Defoliation and pod spots causing 30-100% losses on cowpea |
| Flat pod disease of groundnuts (Fu) | Pythium myriotylum | May cause empty pod of groundnut in humid forest zones |
| Bacterial wilt (Ba) | Ralstonia solanacearum | Tomato and Solanaceae wilt |
| Tuber rot of cassava (Ba) | Xanthomonas manihotis | More severe in humid forest zones |
| Rosette disease of groundnut (Vi) | Groundnut Common Rosette Virus | Groundnut stunting, mosaic, reduce growth and yield |
| Cassava mosaic disease (Vi) | African cassava mosaic virus | Leaf growth reduction, distortion, yellowing |
| Mosaic disease of cowpea (Vi) | Cowpea aphid-borne mosaic (Vi) | Leaf distortion, mosaic, yellowing |
| Mosaic disease of cowpea and bean (Vi) | Bean Common Mosaic Virus | Leaf distortion, mosaic, yellowing |
| Root rot of banana/plantain (Ne) | Radopholus similis | Root destruction and severe plant growth reduction |
| Root-knot nematodes of vegetables (Ne) | Meloidogyne spp. | Wilting, yellowing, and stunting of tomatoes, peppers and egg plants |

Source: Nwaga 2007 **Ba:** Bacteria**, Fu: fungi, Vi:** Virus**, Pl:** plant, **Ne**: Nematode

## 1.2.5. NEW DISCOVERIES

Cameroon's biodiversity is characterised with new discoveries of plants, animal and microbial species. A study of Floral, Faunal and microbial species has shown new additions in the various species list. The new discoveries in floral biodiversity between 2002 and 2006 are outlined in Table 32 (Onana 2008)

**Table 32 New Discoveries in Floral Biodiversity in Cameroon**

| Year | Family | Scientific Name | Plant Discoverer |
|---|---|---|---|
| 2002 | BALSAMINACEAE | *Impatients frithii* | Cheek |
| | DICHAPETALACEAE | *Tapura tchoutoi* | Breteler |
| | ORCHIDACEAE | *Angraecum sanfordii* | P.J. Cribb & B.J. Pollard |
| | | *Bulbophyllum kupense* | ,, |
| | PALAMAE …….. | *Eremosptha barendii.* | Sunderland ,, |
| | | *Oncocalamus tuleyi* | Sunderland |
| | RUBIACEAE …… | *Coffea bakossi…..* | Cheeek and Bridson |
| | | *Psychotria moliwensis* | « « |
| | | *Stelechantha arcuala* | « « S.E. Dawson |
| | | *Tricalysia lejolyana* | Robbr Sonke & Kenfack |
| | | | Sonke & Céeck |
| | SCYTOPETALACEAE | *Rhaptopetalum geophylax* | Check & Gasline |
| | STERCULIACEAE | *Tricalysia achoundongiana* | Check |
| | | *Cola cecidiifolia…* | Check |
| | | *Cola metallica…..* | Check |
| | | *Cola subopositifolia* | Litt & Check |
| | | *Korupodendron songwean* | |
| | VOCHYSIACEAE | | |
| 2003 | ANNONACEAE | *Uvariopsis korupensis* | Geraud & Kenfack |
| | BURMANIACEAE | *Afrothisma gesnerioides* | Maas – Van de Kramer |
| | MIMOSOIDEAE | *Newtonia duncathomasil* | Machinder & Check |
| | MORACEAE | *Dorstenia poinsettiifolia* | Eng. Var. achoudongiana, « « |
| | | *Dorstenia poinsettifolia* | etugeana, B.J Pllard |
| | PALMAE ……. | *Laccosperma korupensis…* | Sunderland |
| | PHYLLANTHACEAE | *Hyllanthus caesiifolius* | Hoffm & Cheek |
| | | *Phyllanthus nyale* | ,, ,, |
| | PODOSTEMACEAE …. | *Ledemanniella onanae..* | Cheek |
| | TRIURDACEAE | *Kupea martinetuguei* | Cheek & Williams |
| | VIOLACEAE | *Rinorea fansteana* | Achoungong & Cheek |
| | | *Rinorea thomasil* | Achoundong |
| 2004 | ACANTHACEAE | *Justicia leucoxiphus* | Vollesen Check & Ghogue |
| | APIACEAE | *Pecendanum kupense* | 1.Darbysh & Check |
| | BORANGINACEAE | *Afrothismia foertheriana* | Th. Franke, Sainge & Agerer |
| | | *Afrothismia saingel* | T. Francke |
| | CHRYSOBALANACEAE | *Magnistipula butuyei subsp. Balingembaensis* | Sosthers, Prance & B.J. Pollard |
| | DRYOPTERIDACEAE | *Dryopteris glandulopsopaloata* | |
| | | *Bulbophyllum kupense* | J.P. Rocux |
| | ORCHIDACEAE | *Coffea fotsoana* | P.J. Gribb & B.J. Pollard stoffelen |
| | RUBIACEAE | | & Sonké |
| 2005 | BRUMANIACEAE | *Afrothismia hydra…..* | Sainge & Franké |
| | | *Afrothismia korupensis* | ,, ,, |
| | CYOERACEAE | *Hypdytrum unispicatum…* | Sosef & D.A. Simpson |
| | RUBIACEAE | *Aulacocalyx camerooniana* | Sonke & E. Darvon |
| | | *Bartiera heterophylla* | Sonke & Ngenbou |
| | | *Psychotria bakossiensis* | Ckeck & sonke |
| | | *Phychotria geophylax* | Check & Sonke |
| | SAPOTACEAE | *Manilkara lososiana* | Kenfack & Ewango |
| 2006 | LAMIACEAE | *Clerodendron attanticum* | Jongkind |
| | RHIZOPHORACEA | *Cassipourea korupensis* | Kenfack & Sainge |
| | RUBLACEAE | *Coffea mapiana….* | Sonke, Ngembou & A.P. Davis |
| | VIOLACEAE | *Rinorea letuzeyi* | Achoundong |
| | | *Rinorea mezilii* | Achoundong |

**Source :** Onana J.M 2006 – les Nouvelle découvertes de l'herbier National.

### 1.2.5.1. NEW MICROBIAL DISCOVERIES

Characteristically, new species of micro organisms have been described in Cameroon. *Aphelariopsis kupemontis* a new species of fungus (Fig19) has newly been described in the Kupe Mwanenguba Mountain by Peter Roberts of the Kew Botanic Gardens. (Roberts 2001)

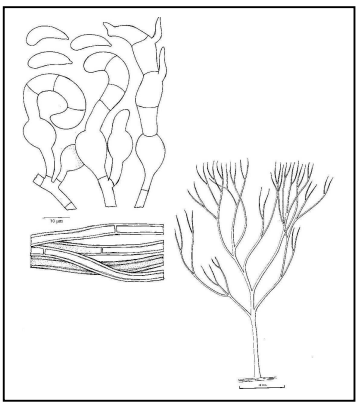


**Fig 19:** *Aphelariopsis kupemontis Courtesy by Peter Roberts (2001)*

### 1.2.5.2. NEW DISCOVERIES IN CAMEROON FAUNA

New fauna species have been described in Cameroon, among which is a recently discovered species of snake (unidentified) in the North West Province (fig 20)

Fig 20: **New Species of Snake (unidentified)**

## 1.3 MAJOR THREATS TO BIODIVERSITY COMPONENTS

The major threats of biodiversity components in Cameroon result from direct and indirect activities of man and the impact of climate change.

**The direct activities include;**

- Habitat loss – destruction of vegetation
- Land conversion to agriculture
- Logging,
- Industrial mining,
- Road construction and urbanization
- Pollution from chemicals

**The major indirect cause is climate change which leads to**

- increase in temperature, desertification ,drought, floods,erosion, landslide

**Within the Marine and Coastal Ecosystems:**

- Problems of pollution from petroleum, mining companies and agricultural Chemicals
- Unsustainable exploitation of biodiversity resources in particular;
- Population pressure on mangroves and over harvesting of aquatic resources
- Uncontrolled implantation of plantations and construction of infrastructure.
- Climate change - floods

**Within the Tropical Humid Dense Forests:**

- unsustainable harvesting of timber and non-timber products;

- lack of care and proper value of forests;
- uncontrolled forest fires;
- unplanned occupation of forest reserve for extra forestry activities;
- Pressure on forest resources for daily subsistence.
- Climate change
- Agriculture

**Within the Tropical Wooded Savannah Ecosystem**

- Uncontrolled fires;
- Insufficient structures of conservation;
- Inadequate knowledge of biological resources and their socio-economic importance;
- Exotic breeds inadequate to local conditions due to stress, nutrition and illness;
- Farmer-grazier conflict
- Climate change
- Agriculture

**Within the Semi Arid Ecosystem**

- Uncontrolled bush fires;
- Unsustainable harvesting of fuel wood and fauna;
- Insufficient structures of conservation methods;
- Farmer /grazer conflict;
- Inadequate knowledge of biological resources and their socio-economic importance;
- Draught and desertification
- Climate change
- Agriculture

**Within the Montane Ecosystem**

- Over exploitation;
- Impaired ecosystem function;
- Inappropriate agro-pastoral techniques;
- Inadequate management of ecosystems and the zone of influence.
- Climate change
- Agriculture

**Within the Fresh Water Ecosystem**

- Inadequate knowledge of biological resources;
- Unsustainable exploitation of ecosystem and components
- Water pollution
- Increased vulnerability of ecosystem
- Climate change
- Agriculture
- Drought, floods.

## 1.3.2 THREATS TO BIODIVERSITY COMPONENTS

The major threats and their causes within the various forms of biodiversity are outlined in Table 33.

**Table 33. Major Threats and their causes in Cameroon's Biodiversity**

| Biodiversity Type | Main Threats | Causes Of Threats |
|---|---|---|
| **Ecosystems** | - Poor land-use systems<br>- Loss of Rangelands<br>- Ecosystem services and characterization | - Unplanned land uses<br>- Haphazard uses of land<br>- Poor agricultural methods<br>- Burning of grazing areas, over grazing<br>- Soil compaction, Pollution<br>- Soil erosion, flooding<br>- unsustainable agricultural practices<br>- Deforestation |
| **Floral biodiversity** | - Threats of species<br>- Exposure of surface soils<br>- Heavy loss of species | - Pests and diseases, over Exploitation<br>- Uncontrolled hunting<br>- Overpopulation of Wildlife<br>- Human encroachment in PA |
| **Faunal Biodiversity** | - Threats to faunal species<br>- habitat destruction<br>- Protected Areas encroachment | - Pests and diseases<br>- Poor farming methods<br>- Pre and post harvest losses |
| **Agricultural Biodiversity** | - Introduction of invasive species<br>- Poor yields<br>- Food insufficiency | - Pollution of water courses<br>- Draught of water masses |
| **Aquatic Biodiversity** | - Reduction of certain fish species<br>- Loss of freshwater biodiversity<br>- Loss of aquatic habitat<br>- Introduction of wetland Invasive species | - Pollution<br>- Soil water erosion<br>- Mining<br>- Herbicides, Fungicides |
| **Microbial Diversity** | - Loss of microbial biodiversity<br>- Loss of agricultural soils<br>- Epidermis on plant animal vectors | |

Compiled from departmental reports (MINFOF, MINEPIA, MINADER) 2008

### *1.3.3 Implications of observed changes*

From the previous analysis, the various changes in the status of biodiversity in Cameroon have resulted in some implications which can be clearly observed. The logical implication of the above situation is that, if some of the of the causes of the prevailing threats, provoking the vulnerability of various species are not addressed, Cameroon may meet with considerable difficulties the 2010 Biodiversity Loss Reduction Targets. Under the aggressive leadership of the Focal Point Institution, serious measures need to be taken to address the change rapidly, in particular positive actions against the factors that have lead to the classification of the vulnerability and threats. In some cases where direct remedy of the situation cannot be done for instance in rehabilitating a national park, compensation measures can be done by creating an equivalent reserve like in the case of the CAMPO-MAAN National Park which was created to compensate for the Chad Cameroon Pipeline.

It is true that Cameroon biodiversity in general has not been quantitatively and qualitatively valuated nor has its importance been clearly understood by the major

stakeholders. It will be important for the government to incorporate the importance of biodiversity in all its sectoral policies. Biodiversity employs several categories of people in Cameroon. Many of them are authors and victims of biodiversity degradation notably women whose role in various biodiversity related activities is understudied. The rate of ecosystem degradation, threats, extinctions and discovery of some new animal and plant species has not yet been properly understood. Observations made from localized studies on project and research stations will give us an indication of what results from a general trend. Table 34 summarizes the major implications from changes in biodiversity components.

**Table 34. Implications from Changes in Biodiversity Components**

| Changes In Biodiversity Components | Major Implications |
|---|---|
| **Ecosystems** | - No observance of land management regulations<br>- Destruction of vegetation cover and poor land-use systems. |
| **Floral Biodiversity** | - Scarcity of over-used plant species<br>- Threats and eventual extinction of many plant species especially those that thrive in association or are symbiotic to others. |
| **Faunal Biodiversity** | - Disappearance of wildlife species<br>- Wildlife habitat destruction<br>- Reduction of wildlife biodiversity<br>- Increased wildlife population will encourage ecotourism but reduce wildlife variety which will eventually reduce the tourism industry<br>- Migration of bird species |
| **On the environment** | - Increased run-off of rain water due to no vegetation cover<br>- Increased soil erosion through floods<br>- The micro-climatic pattern will change due to the role that the vegetation was playing. |
| **On health** | - Lack of vegetation especially in P A will affect the health and eventually the number of faunal species<br>- Soil erosion and floods can badly affect food production |
| **Socio-Economy** | - Cameroon's economy which has for long depended on biodiversity is drastically affected by destructive practices on biodiversity components |

# CHAPTER II

# CURRENT STATUS OF NATIONAL BIODIVERSITY STRATEGY AND ACTION PLAN

## 2.1 BRIEF DESCRIPTION OF THE NBSAP

The objectives of the NBSAP were to provide analysis of the status and trends in Cameroon biodiversity, examine its problems and then make proposals on the strategies and actions for addressing the problems.

The NBSAP was based on the "Ecosystem Approach" and the following six ecosystems were retained:

1. Marine and Coastal
2. Tropical Humid Dense Forest
3. Tropical Woodland Savannah
4. Semi Arid
5. Montane
6. Fresh Water

There are five main sections namely:

a) The background and rational including the methodologies used in developing the NBSAP.
b) Section II describes the current status of biodiversity in Cameroon
c) Section III is the Problem Analysis
d) Section IV contains the National Strategy, Cameroon's vision and the guiding principles, strategic goals including specific objectives.
e) Section V is the Action Plan which spells out specific actions to be undertaken in each ecosystem and the monitoring and evaluating system. The Action Plan contains a total of 28 objectives and 228 actions in all the ecosystem. There are executors and partners for every action, (Table 34).

### 2.1.1 PRIORITY ACTIVITIES

Important activities were prioritized in the NBSAP document. Within all the ecosystems, some activities were given VHP, HP and were expected to be executed within a specific period followed by a corresponding monitoring programme. In Table-35 VHP objectives with their corresponding actions (only numbers – see NBSAP document) are given in this report for the sake of the brevity.

**Table 35 Priority Activities Outlined in the Cameroon NBSAP**

| Objectives | Priority Level | Actions Per Objective | Focal Point | Duration (Yrs) |
|---|---|---|---|---|
| **I Marine and Coastal Ecosystem**<br>1. Promote activities and policies that ensure the sustainable and cleaner exploitation of biodiversity and reduce the vulnerability of the ecosystems | VHP | 13 | MINEF | 5 |
| 2. To build, develop and strengthen capacities at all levels for the management and protection of marine and coastal ecosystems | VHP | 10 | MINRET | 3 |
| 3. To check uncontrolled implementation of plantations and construction of infrastructure | VHP | 3 | MINEF | continuous |
| 4. Promote traditional knowledge of the use and value of marine and coastal biodiversity | VHP | 3 | MINREST | continuous |
| 5. Reduce man-made pollution of marine and coastal ecosystems | VHP | 5 | MINEF | continuous |
| 6. Promote biodiversity prospecting | VHP | 4 | MINEF | continuous |
| **II Tropical Dense Forest**<br>1. Promote sustainable management and exploitation of tropical dense forests and resources | VHP | 14 | MINEF | continuous |
| 2. To build development and strengthen capacity at all levels of sustainable management and the protection of forest ecosystems | VHP | 10 | MINREST | continuous |
| 3. To promote traditional knowledge of forest biodiversity and its socio-economic importance | HP | 8 | MINEF | continuous |
| 4. To promote biodiversity prospecting | VHP | 5 | MINEF | |
| **III Tropical Wooded Savannah**<br>1. To promote sustainable management and exploitation of tropical wooded savannah ecosystems resources | VHP | 15 | MINEF | continuous |
| 2. To build, develop and strengthen capacities at all levels to manage Protected tropical wooded savannah ecosystem | HP | 10 | MINREST | continuous |
| 3. To promote traditional knowledge of the ecosystem | HP | 6 | MINEF | continuous |
| 4. Promote biodiversity prospecting | HP | 4 | MINREST | continuous |
| **IV Semi-Arid Ecosystem**<br>1. To promote sustainable management and exploitation of semi-arid ecosystem resources | VHP | 21 | MINEF | continuous |
| 2. To build develop and strengthen capacity at all levels to manage and protect semi-arid ecosystems biodiversity and its components | HP | 9 | MINREST | continuous |
| 3.To promote traditional knowledge of biodiversity and its socio-economic importance in the semi-arid ecosystem | HP | 6 | MINEF | continuous |
| 4. To promote biodiversity prospecting | HP | 5 | MINREST | continuous |
| **V Montane Ecosystems**<br>1. To promote sustainable management and exploitation of montane flora and fauna resources | VHP | 14 | MINEF | continuous |
| 2. To build develop and strengthen capacity at all levels to manage and protect montane forest ecosystem biodiversity and its components | HP | 7 | MINREST | continuous |
| 3. Promote traditional knowledge of montane biodiversity and its component parts and their socio-economic importance and values | HP | 8 | MINEF | continuous |
| 4. To promote biodiversity prospecting | HP | 5 | MINEF | continuous |
| **VI Fresh Water Ecosystems**<br>1. To promote sustainable exploitation of fresh water resources | HP | 11 | MINEF | continuous |
| 2. To reduce man-made pollution of fresh water ecosystem | VHP | 5 | MINREST | continuous |
| 3. To stop degradation of fresh water ecosystem | HP | 6 | MINEF | continuous |
| 4. To build, develop and strengthen capacity at all levels of the sustainable management of the protection of fresh water ecosystem | VHP | 7 | MINREST | continuous |
| 5. To promote traditional knowledge of fresh water resources | HP | 8 | MINREST | continuous |
| 6. To promote biodiversity prospecting | HP | 4 | MINREST | 3 |

**Source:** Adapted from Cameroon NBSAP Document for the 4th National Report on Biodiversity

## 2.1.2 NATIONAL TARGETS AND INDICATORS

### 2.1.2.1 THE NATIONAL TARGETS

Mostly built up in the policies and the method of achieving national targets are envisaged in the policies, legal and institutional arrangements.. Main biodiversity policies, legislations and institutions are outlined in Table 36.

**Table 36: Policy, Legislation and Institutional Arrangements**

| **Biodiversity Sector** | **Policy** | **Legal Framework** | **Corresponding Institutions** |
|---|---|---|---|
| **Agriculture** | Agricultural policy | Agric law, Law of Seed, Planting materials, Phytosanitary Law | MINADER, IRAD |
| Fishery | Fishery Policy | Law on Fisheries | Ministry of Fisheries and Livestock |
| Livestock | Livestock Policy | | Ministry of Fisheries and Livestock |
| Forestry | Forestry Policy | | Ministry of forestry and Wildlife |
| Wildlife | Wildlife Policy | Wildlife Law of 1994 | Ministry of forestry and Wildlife |
| Research | Research Policy | Research Regulations | Ministry of Research and Innovations |
| Water | Water Policy * | Water Regulations | Ministry of Water and Energy |
| Genetic Resources, GMOs and IAS | International Conventions | CBD, Cartagena Protocol, CITES | Ministry of Environ. & Protection of Nature |
| Environment | Environment Policy | Environmental Law 1996 | Ministry of Environ. & Protection of Nature |

*****Water Policy under adoption

### 2.1.2.2 THE NATIONAL INDICATORS

National indicators have been summarized in the NBSAP document for each ecosystem Table36 (NBSAP, Section5.4). These have been examined and tabulated under objectives, criteria, indicators and means of verification.

**Table 37: Objectives and Means of Verification on Activities in the NBSAP**

| **Ecosystem** | **Number Of Objectives** | **Number Of Indicators** | **Means Of Verification** |
|---|---|---|---|
| 1. Marine Coastal | 6 | 29 | 25 |
| 2.Tropical Humid Dense | 4 | 21 | 21 |
| 3.Tropical Wooded Savannah | 4 | 21 | 23 |
| 4. Semi Arid | 4 | 21 | 22 |
| 5. Montane | 4 | 21 | 16 |
| 6.Fresh Water | 5 | 26 | 24 |
| **TOTAL FOR ECOSYSTEM** | **28** | **139** | **131** |

## 2.1.3 GLOBAL TARGETS AND INDICATORS

Global Targets and indicators will be measured on the country's involvement and implementation of bilateral agreements and international conventions related to biodiversity

Already, Cameroon has ratified about 36 sub regional and international agreements related to biodiversity: Table 38 summarizes the various agreements and indicators.

**Table 38: International Agreements and Indicators**

| Agreement/Convention | Objective | Implementation Indicator |
|---|---|---|
| **Regional Agreements** | | |
| ATO | A united agreement on the marketing of wood products from Africa. | Cameroon is a member |
| Chad Basin Commission | Sustainable use of the lake Chad fishing products | Cameroon is an active member |
| Commonwealth Association of West African Traditional Healers | Sharing experiences on traditional knowledge among tradi-practitioners | There is a Cameroon chapter |
| **International** | | |
| UNFCC | Implement the UNFCC at national level | Cameroon has its UN representation and fully implements the convention |
| CCD | To arrest the advancement of the Sahara desert. | Cameroon is a member and implements the CCD |
| UNCLOS | For sustainable management of fishing products | Cameroon is a member of FAO and UNCLOS |
| CITES | Ensures protection of Endangered plant and animal species | Cameroon is a member of the CITES Convention |
| OMS | Coordinates health problems world wide | Cameroon abides to OMS principles |
| WTO | Regulates international trade | Cameroon is a member |
| Organization of Tourism | Sets out tourism regulations | The Gov't of Cameroon applies them |
| RAMSAR | Protection of Wetlands species | Cameroon signed the Ramsar Convention |
| ITTO | Regulation of timber trade | Cameroon abides by ITTO principles |
| IITA | Stream-lining agricultural principles internationally | There is full representation in Cameroon |

It should be noted that Cameroon is very advanced in the building of capacities and synergies for the implementation of the three related conventions of the CBD, CCC, UNCD

## 2.2 ACTIVITIES IN THE NBSAP

### 2.2.1 THEMATIC PROGRAMMES

Activities within the main thematic programmes have been built in the NBSAP through programmes in Agriculture, Forestry, Grazing, Fishery, hunting etc. This planning has been done in all the ecosystems. Illustrations are shown on Table 39 with mention on some examples taken from the Action Plan of the NBSAP

**Table 39. Examples of Activities on Thematic Programmes**

| Thematic Area | Corresponding Activity In Nbsap | In What Ecosystem |
|---|---|---|
| Wildlife and fisheries | Establish protected areas and develop management plans | Coastal Marine |
| Wildlife, Forestry, Fisheries and livestock, Agriculture | Identify/Survey components of biodiversity<br>Assure special planning of exploitation and prevent/control soil erosion | All ecosystems |
| Forestry | Reinforce and/or establish tree planting projects | All ecosystems |
| Fisheries | Restore/rehabilitate degraded marine and coastal ecosystem and recover 35 threatened species of fish | Semi Arid Tropical Wooded SavannahCoastal and Marine |

***Source**: NBSAP Cameroon 1999*

## 2.2.2: ON CROSS-CUTTING ISSUES ADOPTED IN CBD

Most of the cross-cutting issues adopted in CBD are mentioned in the COP decisions, See Table 40.

**Table 40: Cross Cutting Issues and References on Cameroon NBSAP**

| Cross Cutting Issues | Corresponding Activity In NBSAP | CBD Adopted Reference |
|---|---|---|
| 1. Inventorying Biodiversity components | Objective 1 /Action 1 in all ecosystems: Identify/Survey components of biodiversity for conservation | Art 7: |
| 2. Information Sharing | Objective 2/ Action 2 Semi Arid Ecosystem: Encourage research on conservation and sustainable use of biodiversity and creation of data bank on semi-arid biodiversity. | Art 12/ UNEP Technical Guidelines |
| 3. Education | Objective 2/Action7 Marine Coastal Ecosystem: Strengthen education awareness programmes | Art 13 |
| 4. Sensitization of Rural Communities | Objective3/Action5. Semi-Arid Ecosystems: Sensitize the local communities on the sustainable utilization of semi-arid resources | Art 13 |
| 5.Capacity Building | Objective 2 Action 1. Resource development and capacity building for technical education and Empowerment of local communities. | Art 12 |
| 6. Bio-safety Regulations | Objective 2/Action 10 of Marine coastal, Tropical Dense Forest, Tropical wooded savannah and Objective 2/Action 9 of Semi-Arid Ecosystems | Decision II/5 of COP |
| 7.Clean Technologies | Objective 2/Action 4, Dense Forest Ecosystem: Build/ strengthen bodies for research technology acquisition | Art 16 |
| 8. Conservation Policies | Objective 1/Action 2: Marine Coastal Ecosystems: Establish Protected areas to protect species, habitats. | Art 8 a-e |
| 9 Invasive Alien Species/GMO | Objective1/Action 4: Describe and monitor impact of exotic species and genetically modified organisms | Art 8, GMO Technical Guidelines |
| 10 Climate Change and Combating Desertification | Objective 2/Action 8 of Semi-Arid Ecosystem: Develop early warming systems for adverse natural factors especially climate change desertification, drought and other catastrophic incidents. | |
| 11. Traditional Knowledge | Objective1/Action 7 in Marine Coastal Ecosystem Promote relevant traditional know-how and practices | Article 8(i) |
| 12. International Cooperation | Objective 1/Action 8 of Semi-Arid Ecosystem: Promote international cooperation on regional issues and benefits from other countries' experience, expertise and exchange of information | Art 18 |
| 13. Taxonomic Development | Objective 2/Action 5 Tropical Dense Forest Ecosystem: Strengthen national taxonomic capacity | Art 7a |

## 2.2.3 SPECIAL CASE STUDIES

### 2.2.3.1 ON ACCESS TO INFORMATION:

It is worth noting that twenty special case studies (using 148 indicators) by TAI-Cameroon where conducted under the "Access Initiative Concept" aimed at achieving "Sustainable Development in Cameroon (Njamnshi et al 2008). "The Access Initiative" closely tied up with many principles of the CBD implementation in Cameroon is based on

"Principle 10" which asserts that access to information, participation in decision-making and access to justice in environmental matters empowers citizens to share in sustainable development their main findings were:-

- The need to establish a national committee on "Principle 10"
- The need to put up the text of application on all laws which have not been covered by their text of application.
- The enforcement of environmental legal instruments for the effective environmental democracy in Cameroon.
- The strengthening of national capacities of various information sharing mechanisms in Cameroon particularly the CHM and BCH implementation.

## 2.2.4 EFFORTS BY SPECIALIZED BODIES.

### 2.2.4.1 THE CAMEROON ACADEMY OF SCIENCES (CAS):

Founded in 1990, this national organisation of distinguished scientists has been making encouraging strides in implementing the CBD in Cameroon. Their efforts have been exceptionally demonstrative in the areas of information, education, research, the valorisation of biodiversity components and regional cooperation. In 1999, CAS organised a Central African Conference under the theme "Biodiversity Conservation" in which scientists of the Central African sub-region made contributions to the challenges on biodiversity resource management in Central Africa. "The Journal of the Cameroon Academy of Sciences is regularly published and highlights information on biological resources, biotechnology. sustainable development and biochemical research on ecology, plant and animal species.

### 2.2.4.2 THE BIORESOURCES DEVELOPMENT AND CONSERVATION PROGRAM-CAMEROON (BDCP-C)/CENTRE FOR BIODIVERSITY AND SUSTAINABLE DEVELOPMENT-CAMEROON (CBSD-C)

Since 1994, this NGO has been working on Cameroon's biodiversity with special reference on its flora and factors that affect its sustainable use. Emphasis has been on inventory, forest dynamics, ethno-botany, research on the 50-hectare plot in the Korup National Park involving tree mapping is an indication of BDCP-C's commitment in the knowledge of the resource base and as a measure of implementation Article 7 of the CBD.
The Centre for Biodiversity and Sustainable Development-Cameroon (CBSD-C) has been functioning since 1999 with special interest on the protection, sustainable management use of biodiversity and its components. In their main focus in recent years, activities have been:-
Preparation of projects and participation in activities involving conservation of biodiversity.
Collaborating with public and private sectors on sensitizing Cameroonians on the management of genetic resources for sustainable development. These have been achieved through education of youths, information sharing with biodiversity stake-holders. Very recently they appeared on the national media to announce their innovation on "e-learning programs" which will facilitate biodiversity education especially in institutions.

### 2.2.4.3 The OCACAM

OCACAM is an agro-ecological establishment working seriously in promoting the cultivation of mushrooms, and a species of birds commonly known as Quail scientifically called *Coturnix japoma* whose eggs are largely used in Cameroon. This establishment works more with rural women and youths of the Centre Province. It affords alternative activities which forest dwellers engage themselves and has interesting programmes to alleviate poverty.

The rural masses in the Mbam Division of the Central Province are now taking mushroom cultivation as an economic activity which is seen to be spreading, (Okotiko, 2008)

#### 2.2.4.4 THE BETTER WORLD ORGANISATION

This was set up in 1996 on the principles of training for employment and sustainable development. Their program on Urban Agriculture is aimed at

- Improvement of productivity
- Protect the environment
- Save biodiversity

Their future plans involve: - agro-forestry, protection of endangered species, energy for conservation practices and capacity building especially the rural communities.

## *2.3 PROGRESS IN IMPLEMENTING PRIORITY ACTIVITIES*

### 2.3.1 PROGRESS ON PRIORITY ACTIONS

Priority actions aimed at the implementation of the NBSAP have been outlined in Table 41. The measure of achievements has not been properly studied and therefore accurate scores are not known.

It will summarize whether the objectives in the six ecosystems have been attained. Field actions or policies will be mentioned where possible. The Progress of Priority Actions is found in NBSAP document.

**Table 41: Concrete Results of Priority Actions and Activities**

| Ecosystem | Main Objectives | Priority Actions | Degree Of Achievements |
|---|---|---|---|
| 1. Marine and Coastal | 6 | 38 | No information |
| 2. Tropical Dense Forest | 4 | 37 | " |
| 3. Tropical Wooded Savanna | 4 | 35 | " |
| 4. Semi Arid | 4 | 41 | " |
| 5. Montane | 4 | 34 | " |
| 6. Fresh Water | 6 | 41 | " |
| **TOTAL** | **28** | **226** | |

Table 41 shows that the degree of achievement of the 226 "Priority Actions" expected to be undertaken in the six ecosystems is not known. This is because the Monitoring System recommended in the NBSAP has not been applied. The common action in all ecosystems is "To Promote Biodiversity Prospection". This is being achieved on a number of biodiversity components – plants, animals, insects, birds, fishes, micro-organisms as is evidenced in new discoveries of plants and insects (see Table 44). A total of 139 indicators and 131 means of verification have been programmed in the monitoring system, (Table 33).

### 2.3.2 CONCRETE RESULTS ACHIEVED

Information on "Results Achieved" has been contributions from various stakeholders in biodiversity with a variety of executors in the various domains as seen in the column of executing partners. Their contributions have been the current information received from field observations and reports from their field monitors.

## 2.4 FUNDING DEDICATED TO PRIORITY ACTIVITIES

### 2.4.1 DOMESTIC FUNDING:

Domestic funding can be seen through:

- Government activities through various ministries which are: MINFOF, MINFOP, MINADER, MINEPIA, MINREST.
- Private Enterprises on Biodiversity - Agriculture
  - Logging enterprises
  - Fishing companies
  - Grazers
  - Hunting
- Agro-industrial Groups : CDC, HEVECAM, PAMOL, SOCAPALM.
- Research Bodies - Plant Pathology
- Universities - Education programmes on Biodiversity
  - Training on Biotechnology
  - Discoveries on new species
  - Findings in micro-biology

## 2.5 PROGRESS IN THE CBD IMPLEMENTATION

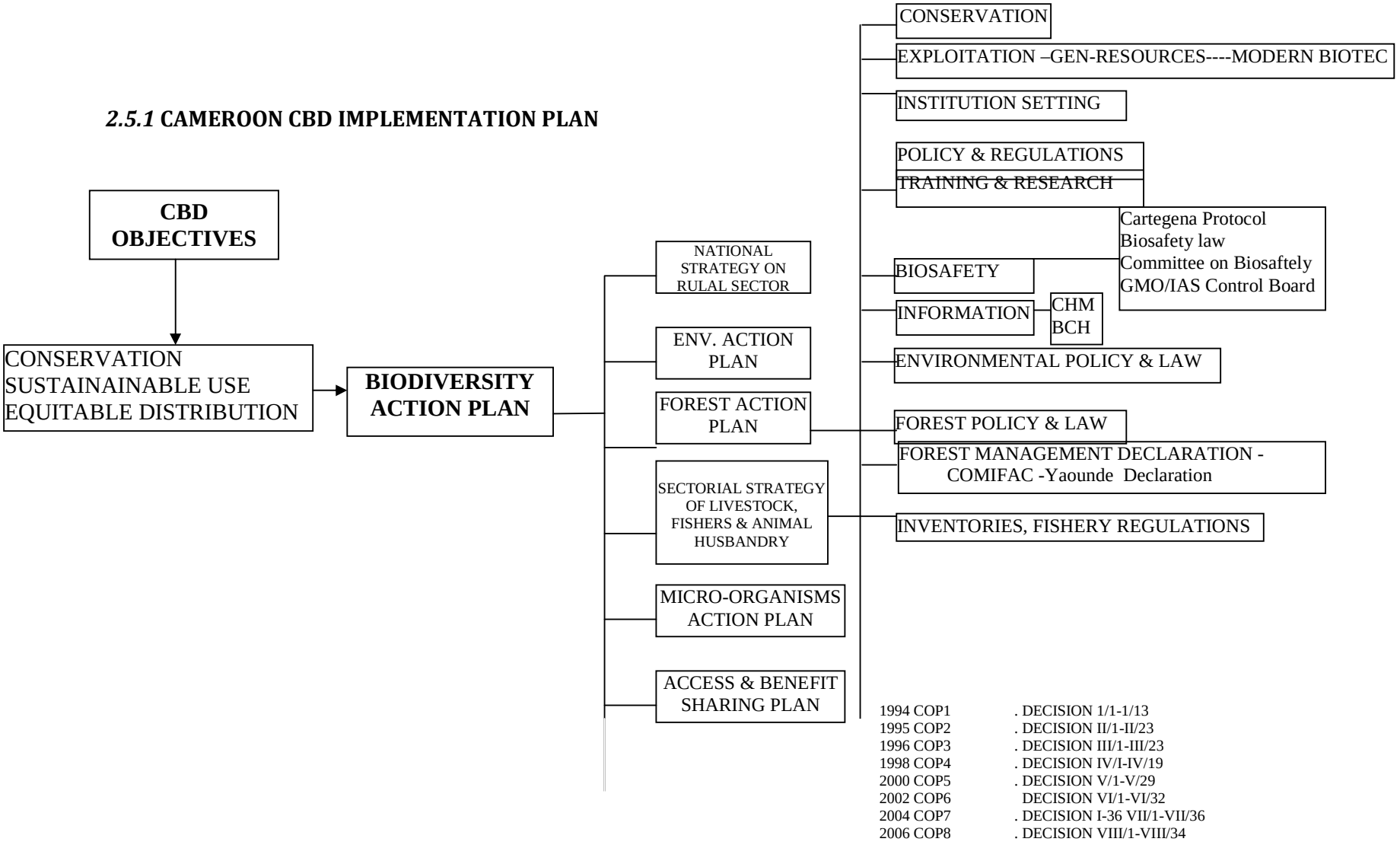
The implementation and the monitoring of the CBD activities in Cameroon has been an important consideration to Cameroon's resources management priorities. Biodiversity stake-holders have been collaborating with Government institutions to ensure the effective implementation of the CBD in Cameroon. Bokwe (2000) in a survey of the implementation rate of the CBD in Cameroon found that considerable effort was deployed by Government and civil society in implementing the CBD in Cameroon. This was achieved through the revised policies, the legal framework and the remodeling biodiversity- related institutions.

After Cameroon ratified the CBD in 1994,

- Laws in some biodiversity domain (forestry, fishery, wildlife and environment) were revised
- The Ministry of Environment and Forestry was created
- Strategic Action Plans were put up

In the area of biosafety, Mbantenkhu (2007) shows in a comprehensive report, that Cameroon is implementing the Cartagena Protocol as required. The important area in CBD implementation appear in Section 2.5.1.

### *2.5.1* CAMEROON CBD IMPLEMENTATION PLAN



## 2.5.2 SUCCESS IN IMPLEMENTING THE CBD

Cameroon's success in implementing the CBD can be assessed from the following achievements

**A . UNEP Implementation Obligations**

- Submitting the First, National Report …Submitted……..…1998
- Submitting the Second National Report …….. 2003
- Submitting the Third National Report …… 2006
- Adoption of NBSAP using the Ecosystem Approach……..……2002
- Preparation of the National Biosafety Guidelines…….2003
- Ratification of the Cartagena Protocol on Biosafety.……...…….2003
- Enacting the National Law on Biosafety…… 2003
- First National report on Biosafety for Cameroon……..2007

**B. CBD Implementation-Related National Programmes**

Creation of an enabling environment for CBD implementation

- Revision of Forestry, Fishery, Wildlife law……1994
- Designation of the Ministry of Environment and Forestry as Focal Point CBD……. 1994
- Creation of the Ministry of Environment and Protection of Nature –Focal Point CBD …… 2004
- Creation of the Ministry of Forestry and Wildlife …… 2004
- Revised system of granting logging concession to '*ufa*' [5] type
- Fisheries, Livestock - Sectoral Stategy for livestock, fishery and Animal Industry
- Agriculture – Emergency Agricultural Plan, Rural Sector Development Strategy
- National Forestry Regeneration Programme of MINFOF
- Programme "Villes Vertes" Ministry of Environment and Protection of Nature working with Local councils in promoting the planting of Environmentally Friendly trees within cities and towns.
- Competition for clean cities and towns programme where biodiversity conservation is the principal criteria and MINEP provides incentives to the winners . 59 Divisions are involved.
- Implementation of Principle 10 on Public Access to Environmental Information, Public participation in Decision Making in Environmental matters and Acess to Environmental Justice. (MOU signed with a coalition of national NGOs and some publications done.

**C. Public Awareness**

National Institutions are helping to disseminate the importance of biodiversity

- Cameroon Academy of Science Workshops and publications on biodiversity
- BDCP-C
- CBSD-C
- Enviro-Protect
- LANEC
- AEPE
- NESDA-CA
- BETTERWORLD
- Musee Ecologique du Millenaire, Yaounde
- Botanic and Zoological Gardens-Limbe, Mvog-Betsi, Saboga, etc

[5] *ufa* is the forest management unit term used to award logging concessions

- Many national NGOs on biodiversity programmes
- Media: Radio Environment, TV programmes

**D. Bio-Prospection**

- IMPM
- BDCP-C with Pharmaceutical Companies abroad
- MOCAP (Mount Cameroon Prunus Management Common Initiative Group)
- National Cancer Institute USA
- AIDS Free Africa

**E. Educational and Research Programmes**

Environmental Education

- Built in school Curricular,
- University of Buea has a Department of Environmental Sciences,
- Development and research in Biotechnology-University of Yaounde I, University of Buea
- Department of Plant Biology (Forestry-Biodiversity Unit), exists in the University of Yaounde I
- University of Ngouandere – Faculty of food and Nutrition, Food Processing.
- University of Dschang- Faculty of Agriculture, Forestry, Soil Science and Animal sciences.
- IRAD – Research Unit for Biodiversity
- Technical Institutions related to biodiversity
    - Colleges of Agriculture.
    - The School of Forestry Mbalmayo.
    - College of Wildlife Garoua
    - Schools of Veterinary and Animal Sciences

**F. Information Sharing**

- CHM of CBD created since 2000
- BCH 2003

**G. Bilateral and Regional Cooperation**

- Lake Chad Basin Commission
- Yaounde Declaration
- COMIFAC
- Economic and Monitary Community for Central African States
- Economic Community of Central African States
- AU Interstate phytosanitary council
- Others

**H. NGOs and other Stake-holder participation**

- National NGOs on biodiversity…
- International NGOs on biodiversity….

**I. Conservation and Measures to Combat Desertification**

- Operation ***Sahel Vert*** ……
- Heifer Project farmers have planted 46,436 fodder trees in the North West Province

**J. Project Activities**

Several projects related to biodiversity are being undertaken in Cameroon. Some have been completed, others are on-going while others are planned.(see information on table… on Nations projects on Biodiversity

## K. Assistance to CBD Meetings

Cameroon has regularly participated in the following CBD meetings:

- All meetings of Conference of Parties - All meetings of SBSTTA;
- All meetings of special panels and groups; Specific meetings

## L. Concrete CBD Historical Land Marks

As a result of the implementation of the CBD in Cameroon the following structures / Organisations now exist:

- A CBD Focal Point ministry delegated with a focal point recognized by UNEP.
- A national Biodiversity Committee, a National Biosafety Committee.
- A Clearing House Mechanism containing all national information on biodiversity and the CBD Processes.
- A Biosafety Clearing House containing National information on biosafety and modern biotechnology:
- The Law of Biosafety and its text of application.
- The GMO/ IAS Movement Control Board (to be created).
- Several studies on ethno-botany and biodiversity issues
- Cameroon Biosafety Report for the Period 2003-2007

Box 5: Heifer Project Capacity Building

**Project slogan: "**Living Hope for Hungry World''

Began since 1974 Heifer Cameroon operates in 5 provinces in the Republic. It has practically demonstrated at community level the appropriate techniques for conserving and managing various forms of biodiversity to achieve sustainable development livestock production. In 2003 they succeeded in assisting over 10 000 resource limited families through placements of various species of livestock (dairy cattle, pigs, goats, sheep, rabbits, poultry, snails, bees and fish), training, production material and technical support, the building of and educating grassroots organisations. Their activities are summarised in five main compartments:Hiefer Cameroon 2003

**Table 42 Summary of Heifer Project Activities in Cameroon**

| Training in Animal Farming | Technical training | Socio-Economic Development Training | Administrative Educational Project Partners/Collaborators | Local Collaboration |
|---|---|---|---|---|
| Rabbits | Participative self evaluation | Marketing | The Ministry of Livestock Fishery and Animal Industries | Traditional Councils |
| Poultry | Record keeping | Basic accounting techniques | The Ministry of Agriculture | Traditional Rulers |
| Goats | Use of manure | Pig marketing | The Ministry of Scientific Research and Innovation | Mayor |
| Sheep | Agro-Forestry | Micro-economic dev't | INADES Formation | S.D.O |
| Animal traction | Community Animal Health | Gardening | Institute of Agric research for development IRAD | Government Delegates and Urban Councils, |
| Bee farming (happiculture) | Leadership Ethno-veterinary Medicine uses. | Fruit tree Margotting and Grafting. Cocoyam treatment Plantain planting. Food storage and post harvest loss | SIRDEP Bamenda. Voluntary service oversears. Pan African Institute for Rural Development Buea,University of Dschang,University of Buea, Catholic University of Central Africa. The American Peace Corps, Cameroon | |
| Diary cattle | gender | HIV-AIDS Education | | |

**Source:** Heifer Cameroon 2003

**Participation of Local Population: In Implementation the CBD**

Under the programme of Biodiversity Conservation in Cameroon: 1995-2003 the local population was involved in the management of biological resources through the following programmes:

- Formation of mix-control teams comprising state Eco-guards and representatives of the local communities
- Formation of Vigilance Committees as the case in Kupe, South-East, Kilim Ijim
- Creation of the committee of Valorisation of Wildlife Resources (COVAREF) and Wildlife Village Committees for the management of the exploitation of *Prunus*
- Creation of the "l'Union de Comités Villageois de Faune" (UCVF) for the joint management of the hunting zone in the savannas, the groups for exploitation of *Prunus* in Mount Cameroon and the management of community forests.
- BetterWorld Cameroon is a strategic youth framework programme meant to be used for improving capacities and provide environmental education among youth groups with a view to reversing biodiversity loss.

***Promotion of best practices and standards that emerge from sustainable development programmes through the use of communication, case studies brochures, advocacy and study visits.***

## 2.5.3 CONTRIBUTION BY SCIENTIFIC COMMUNITY ON CBD IMPLEMENTATION

The Cameroon Scientific community has shown a lot of interest in the implementation of the CBD and has demonstrated this through various publications as outlined in Table 43

BOX 6: Contribution by the Cameroon Scientific Community on CBD implementation

| **Title of Document** | **Scientific Community** | **N°of Scientific Articles.** |
|---|---|---|
| 1. Bio-science and Biodiversity Vol.5, 1998 | Cameroon Bio-science Society | 58 |
| 2. Bioscience and Biotechnology for Sustainable Development Vol.6,1999 | Cameroon Bio-science Society | 58 |
| 3. Conserving and Managing Biodiversity in Central Africa: Global Challenges and Local Solutions. | Cameroon Academy of Sciences | 18 |
| 4. Towards a Bio-safety Policy, Framework for Cameroon, States and Perspectives | Cameroon Bio-safety Committee. | 12 |
| 5. Quatrième Conférence Technique Internationale sur le Ressource Phytogenetiques. | J.M. Fondoum | 1 |
| 6. **PROJECT REPORTS ON** : | | |
| 7. AGRICULTURAL BIODIVERSITY. | | |
| 8 FOREST BIODIVERSITY | | |
| 9.WILDLIFE BIODIVERSITY | | |
| 10.FISHERY.BIODIVERSITY | | |
| 11.MICROBIAL DIVERSITY | International network on plant Biotechnology (BIOVEG) | 45 |

BOX 7: The Limbe Botanic and Zoological Garden (LBG)

Established in 1892, this "Biodiversity Hot Spot" near Mount Cameroon serves as Cameroon's Conservation, Education and Research Centre in biodiversity. In a widened vision in 2006, it now promotes biodiversity education, information, research and extensive services. Presently, LBG focuses and responds to national biodiversity concerns and has been instrumental in the implementation of the CBD objectives in Cameroon. Their conference hall and a library are facilities where national biodiversity issues are examined. Actions of the NBSAP can be identified in the Garden's mission through its programs on plant and animal surveys, horticulture, landscaping, conservation technology, development and extension services. Case studies on technology conservation are seen through their Snail Farming Demonstration, Bee Farming and the Gene bank on *Gnetum spp* from 36 provenances within five provinces in Cameroon.

The Garden's extension services on *Prunus africanum* also demonstrates their special emphasis on the sustainable management even at the level of species particularly those threatened with extinction. LBG's new dimension envisages its expansion as a modern biodiversity education and research centre capable of handling and intervening on biodiversity issues in Cameroon while benefiting from its traditional synergies and cooperation with similar institutions world over. LBG's GIS/Mapping and Spatial Analysis Database has rendered services like providing information for land-use coverage and the 'ufa' limitation in the nation's logging zones, (Mbome et al 2005).

## *2*.5.4 MAIN OBSTACLES IN IMPLEMENTING THE CBD

The following are among the main obstacles in implementing the CBD in Cameroon.

**Insufficient financial allocations**

Although CBD implementation is expected to be country driven, Government does not allocate sufficient finances for implementing the CBD. This greatly affects the level of response and attention required by the CBD organs.

**Operational Unit for Information at local level**

Due to several factors amongst which figure the lack of capacity, the young nature of the ministry, the national biodiversity focal point institution has experienced difficulties within the reporting period to coordinate and monitor other biodiversity stake-holders especially for the regular flow of information nation wide.

**Old Traditional Methods**

In many rural areas, old traditions and taboos in biodiversity-related activities have slowed down even impeded CBD implementation e.g. slash and burn farming method, shifting cultivation, farming along contours, etc.

**Insufficient capacities**

There is gross shortage of appropriate personnel in specialized domains like taxonomy, ecology, entomology, sylviculture, oceanography, molecular biology, malacology, etc. For the available fields, the working conditions are not encouraging. Due to economic crisis in the country and related adaptation measures, recruitment into the public sector was halted, leading to the non replacement of retiring staff. Most infrastructures deteriorated. Lack of funding impeded the realizations of the implementation of biodiversity and related activities (NBSAP). There was also insufficient public sensitization on biodiversity. For example in the National Herbarium, IRAD and some key institutions many retired staff was not replaced. For two years now, recruitment into the public service has resumed.

**Biodiversity Inventory**

Biodiversity inventory is crucial for baseline data establishment for its status and trends monitoring. The NBSAP of Cameroon recommended that inventory should be done on

regularly basis, very few inventories have been carried out during the reporting period (Sunderland et al 2004, Cheek and Onana 2007). However, there is need to carry out nation wide inventories in the different ecological zones and fields.

### 2.5.5 LESSONS LEARNT

Among the many lessons learnt from the CBD implementation are:

I. The need to collaborate with other nations and institutions for better principles in resource management.
II. Cameroon learnt many lessons on biological resource management principles (especially through UNEP Guidelines) in preparation of important document-NBSAP, National reports, Biosafety Guidelines including the preparation and revision of policies and laws (sect 2.1.2, table 34).
III. The CBD implementation activities like inventories of species show the true state of biodiversity in the country, the state of ecosystem, species, their habitats, rates of threats and new discoveries. Under-exploitation of biodiversity potentials have been shown in the areas of bio-fertilizers and bio-stimulants.
IV. Coordination of stakeholder organizations\administrations is difficult due to overlapping roles and functions.
V. Champions are needed within each administration/organisation
VI. Problems of implementing the CBD have a global dimension e.g.
    - Several issues are handled at UN level through the UNEP
    - Rich countries are made to provide financial assistance notably in developing important activities.
    - Development of new products- bio-fertilizer as nitrogen fixing and green housing.
VII. Important lessons have been learnt on the safe and peaceful ways of handling cross-boarder biodiversity issues including delicate issues like LMO's and IAS.
VIII. The Convention has shown that national regulations on the management of biological resources are complementary to the international regulations.
IX. The involvement of several experts at the national and international levels has led to exchange and sharing of experience in the field of biodiversity.
X. There has been the creation of several civil society organizations dealing specifically with biodiversity in Cameroon.

## 2.6 EFFECTIVENESS OF THE NBSAP

The NBSAP came up with a comprehension assessment of the country's biodiversity. The vision and the rational are being achieved because:

- The processes expressed in the objectives and Action Plan are built on the existing national policies, laws and corresponding texts of application in various biodiversity domains in agriculture, fisheries, health, industry, livestock, etc.
- The 9 objectives of the NBSAP Report (Section1.4, NBSAP) and the Importance of biodiversity (Section 1.5, NBSAP) are meant to inform the public on what exists, their expectations as well as individual and collective roles towards conservation and sustainable use of biological resources.
- Through the NBSAP, all sectors in biodiversity are expected to be involved in management and sustainable use of their biodiversity components. The

fishermen, herdsmen, hunters, exploiters, farmers… know what to expect if they do not conform to the regulations involving the correct use of resources.

### 2.6.1 MEASURES TAKEN TO IMPLEMENT THE NBSAP

Implementation of the NBSAP is implied in the execution of the activities in the "Action Plan" (Section 5.2 NBSAP). Section 2.3 of this Report, specifies the progress made in implementing the priority activities. However, most stakeholders are not yet aware of the existence of the NBSAP and their respective roles therein. This affects the implementation of the plan and conseaquently its effectiveness.

### 2.6.2 CAN CURRENT NBSAP ADEQUATELY ADDRESS THREATS?

The current NBSAP can adequately address threats in Cameroon's biodiversity and has actually succeeded in doing that since:

- The Ecosystem Approach was the underlying principle, activities in the Action Plan were recommended for each ecosystem.
- It was built on a participatory approach, involving various biodiversity stakeholders.
- The objectives of the CBD have been embedded in national policies, laws and regulations on biological resources management (fishery, forestry, wildlife, agriculture, livestock, etc).
- There were appropriate amendments on biodiversity related laws immediately Cameroon ratified the CBD.
- At sub-regional level there are cooperation ties with neighboring countries on rules and regulations on conservation of biodiversity especially as member countries have common shared resources, economic and monetary ties belong to regional biodiversity related conventions and are all parties to the CBD.
- The existence of Commission on Forest for Central Africa regrouping countries of the Congo Basin Forest Ecosystems serves as an impulse for implementing the NBSAP.

### 2.6.3 NEED TO REVISE PORTIONS OF THE NBSAP

Ten years after the NBSAP was conceived, there is need to revise the NBSAP. The biodiversity status and trend and the "Action Plan" should be revised because:

- Periods of some actions have expired;
- Some actors in the "Action Plan" have changed titles/names and attributions;
- Some correspondent government policies have been revised;
- Financial allocations are not made as expected; their allocations have to be reconsidered especially considering Cameroon's obligation to implement the CBD
- In many ecosystems, priorities have changed, while COP decisions and Recommendations have to be adjusted to the actual situation.
- Societal changes and economic adjustments require that some actions which were absolutely necessary at the time its adoption be completely revised.
- The state of knowledge has evolved thus need for update revision.

#### 2.6.3.1 SUGGESTIONS TO REVISE NBSAP

The following considerations should be made while revising the NBSAP:

- Adaptation measures to negative trends and inclusion of new knowledge.
- There is need to evaluate the implementation of the NBSAP by key sectors. A performance above 80% per sector will lead to its revision.
- The participation of Grass-root organizations should be encouraged.

- New policies and decisions on biodiversity management should be included.
- Current demand drives and market trends of biodiversity products should be considered. Emphasis should be laid on need to fill up the gaps created by the lack of capacities.
- Revisit actions which were not fully implemented and see how they could be fully implemented.

### 2.6.3.2 SUGGESTIONS TO OVERCOME OBSTACLES

Since obstacles on the execution of the NBSAP revolve on the lack of finances, adequate and suitable personnel, the following considerations should be made:

- Increase budgeting allocations in all the areas of spending in biodiversity;
- A policy statement to emphasis on the importance and need to implement all the activities in the NBSAP;
- Members of Parliament should be sensitized on the importance of the involvement of grass-root organization and the need for corresponding budgetary allocation for NBSAP execution issues;
- There is need to create a biodiversity committee separate structure which will be reporting to the CBD Focal Point Ministry and will be responsible in ensuring that the following areas are implemented:
    - NBSAP and CBD processes and decisions;
    - Monitoring, evaluating, review and reporting activities of the NBSAP/CBD and related services;
    - Identify any problems, gaps and propose solutions
    - Recommend on the best way of executing the NBSAP;
    - The structure should be equipped in finances and personnel

# CHAPTER III
# BIODIVERSITY CONSERVATION
# INTEGRATIONINTO OTHER SECTORS

In Cameroon, Biodiversity conservation is integrated into eleven sectors and their relationship is summarised in Table 43 below:

Operators in each sector have been sensitized on the need to sustain the services in each domain by:-

- Operating in a manner to conserve or assist in sustaining the resource base.
- Use the resource in a manner beneficial to the community

**Table 43. Biodiversity Conservation Integration into other Sectors**

| Sector | Integrated Activity Of Biodiversity | Form ofIntegration |
|---|---|---|
| **Agriculture** | Cameroon has five agro-ecological zones (Fig 11) Plantation agriculture in coastal marine ecosystems-rubber, banana, oil palm,<br>- Peasant farming – Cocoa, coffee, food crops, vegetables in all ecosystems<br>- Agricultural research- Five research stations<br>- Microbial species and soil fertility-*Mycorrhiza, Rhizobuim* species | Use of environmentally sound technologies |
| **Health** | Ethno-botanical studies - Korup, Bali Ngemba, Kupe Mwanenguba, Bakossi Pharmacopea Cameroon. Microbial species.<br>Traditional medicine - used mostly in rural communities | Use of hygienic and safe health practices |
| **Rural Development** | - Rural economy from sales of biodiversity products: fish, food, wood and medicine<br>- Royalties from logging communities: benefits from community forestry<br>- Housing and furniture manufacture, infrastructure from forest materials, mat, grass for roofing. | Use of environmentally sound technologies |
| **Forestry** | - Logging in the marine coastal, tropical dense humid forest ecosystems<br>- Firewood and NTFPs<br>- Conservation through regeneration and creation of PAs<br>- Sustainable use through forest management | Use of sustainable forest resource management methods |
| **Fisheries** | - Industrial activities in the marine coastal, fresh water ecosystems – Conservation through application of UNCLOS and FAO Code of conduct for responsible fisheries<br>- Destruction of Mangrove vegetation of Douala Estuary and Rio del Ray by drying fish, Construction and drying. | Use of sustainable fishery resource management practices |

| | | |
|---|---|---|
| **Mining** | - Destruction of biodiversity of the coastal and marine biodiversity<br>- Destruction of vegetation along the 1500km Cameroon Chadian Pipeline<br>- EIA programme before mining operations<br>- Pollution in the coastal marine ecosystem | Use of land restoration mining practices |
| **Tourism** | - Biodiversity attractions-Wildlife in parks, beaches, landscape, botanic gardens,<br>Ecotourism in all the ecosystems<br>- Endemic and newly discovered species.<br>- Safari hunting in the Woodland Savannah Ecosystem | Development and maintenance of touristic sites for continues and sustainable exploitation |
| **Finance** | Domestic finances into biodiversity activities - Agriculture, forestry, fisheries livestock.<br>- Finance in biodiversity related projects by foreign NGOs in Cameroon, WWF, GTZ, SNV, CARPE<br>- Banks- ADB, Islamic Bank, WB processing and commercialising biodiversity<br>Products-cash crops, timber. | Financial investments towards environmental conservation projects |
| **Trade &Industry** | - Home-based industries on agriculture forests commodities<br>- Wood industries, Agro-industries | Respect of environmental legislations in internal and external trade |
| **Research** | - Research in agronomy - IITA<br>- Veterinary research – IRZV<br>- Forest research, Research in biotechnology – University of Yaounde, University of Buea | Research programmes aimed at sustainable use of environmental resources e.g. biodiversity research |
| **Education** | Professional schools on biodiversity related courses<br>- University of Yaounde, University of Dschang, University of Buea;<br>- School of Agriculture, Bambui;<br>- Schools of Agriculture and Forestry, Mbalmayo, School of Wildlife Garoua<br>- School of Agriculture, School of Veterinary | Inclusion of biodiversity in curricular |
| **Non conventional animal breeding** | The ministry of livestock now has a programme of non conventional animal breeding involving breeding of snails, frogs, guinea pigs, rabbits, cane-rats. | Increased sensitization towards environmental conservation during the practice of this kind of breeding |

## 3.1 INTEGRATING INTO OTHER STRATEGIES AND PROGRAMMES

Considerable efforts have been made to integrate biodiversity into other national plans and strategies. Section 3.2.1 summarises the strategies and programmes.

### 3.1.1 POVERTY REDUCTION PLAN

Concrete measures have been taken in the Poverty Reduction Plan on the following:-

**Efforts at National Level**:

- Promotion and strengthening of cooperative organisations – formed PNVRA, PNDP. 644 fishermen and 2826 fish- farmers
- PNDP manages programme the capital on natural resources (minerals, biodiversity) and they are financed by the world bank.
- Professional training in the fields of agric, livestock, fisheries, with assistance of French Cooperation.

**Efforts at the Regional Level:**

- Building reference laboratories to analyse the quality of pesticides and pesticides residues to products in the sub-region. MINPLAN 2006,
- Project on the Sustainable Management of Non-Timber forest products in Forest concession in Central Africa (with the technical and financial assistance of FAO)
- Centre Africain des Recherches sur Bananiers et Plantains (CARBAP) regrouping 5 Central African Countries,
- Commission des Basin du Lac Chad
- Central African Botanic Garden and Arboreta Network (CABGAN), where Limbe Botanic Garden is a member
- African Botanic Garden Network (ABGN)
- Cameroon Bio-sciences Society
- Reseau des Aires Protégé de l'Afrique Centrale (RAPAC)
- The Access Initiative (TAI)
- African Network for Tropical Soil Biology and Fertility Institute (CIAT)
- Reseau Bioveg , Agence Universitaire de la Francophonie

### 3.1.2 NATIONAL PLAN FOR ACHIEVING THE MILLENNIUM DEVELOPMENT GOALS:

This is the decision on the global efforts to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women. It encourages the development of activities in a way consistent with achieving the objectives of the CBD and "The 2010 Target". What is the specific national plan on the MGD? Table 45 summarises all national actions taking place towards achieving the **Millennium Development Goals** in Cameroon.

## 3.2 THE MILLENNIUM DEVELOPMENT GOALS ACHIEVEMENT

**A summary of achievements of the Millenium Goals in Cameroon is summarizes in Table 44**

**Table 44: Summary of Millennium Development Goals Achievement.**

| Prin. Goal | Government Action | Period |
|---|---|---|
| **Hunger Food & Nutrition** | Developed National Plan for Food Security<br>National policy for nutrition and the action plans were validated in 2005 | 1995-2005 |
| **Poverty** | Strategy and Action Plan on Poverty Reduction by:<br>- Stabilising the macro-economy<br>- Activating the private sector<br>- Developing the infrastructure<br>- Regional integration<br>- Improving human resources<br>- Improving institutional setting and providing "Good Governance" | 2003 |
| **Disease** | The Cameroon health strategy was adopted in October 2001 and was aimed at :<br>- Fighting against Malaria in 2006, against HIV, *Tuberculosis & Onchocerose* | 2001 |
| **Illiteracy** | Strategy on education was adopted with focus on the unprivileged, the girl child and the handicapped.<br>- Programmes for basic, secondary and higher education. | 2006 |
| **Environmental degradation** | Developed two action plans and National programmes.<br>- Environnemental Management Actions Plan (PNGE)<br>- National plan to fight against desertification<br>To cover the environmental and sustainable development sector, Cameroon has created three structures:-<br>- National Consultative Commission for the Environment and Sustainable Development and (CNCDD)<br>- Inter Ministerial Committees for the Environment (CIE)<br>- Plan d'Action d'Urgen ce (PAU) from the 'Yaoundé Declaration' | 1992-1995<br>1999 |
| **Discrimination against Women** | - Multi- sectoral plan of action on the judicial status of the women and girl child and fight against violence and discrimination practice.<br>- Sub- regional plan of action against trafficking on women and girls<br>- Action Plan Against Genital Mutilation<br>- Policy to fight the regional inequality and obstacles against educating the girl child. MAEPAT 2004 | 1999<br>1998 |
| **Policy on Gender Mainstreaming** | - Law on welfare, equality. Anti-poverty, the efficiency and the empowerment approaches, (VABI . 2001) | |

| | | |
|---|---|---|
| **Forestry** | - The National Forestry Action Plan containing 82 projects to last for 10 years, a Programme of Action, projects on Forest Management, Remote Sensing, Rural Forestry, Industrial Development, Wildlife, Development of NTFPs, etc.<br>- Programme of forest management and conservation of biodiversity<br>- Creation of the sectoral forest wildlife policy including the DSRP and PPTE programmes and using the lessons gained from PNGE of PAFN and PAU | 1995 |
| **Rural Development** | Government development strategy document for the rural development, aimed at improving rural development and improving production it focuses on 5 areas.<br>- Local development, improved production, strengthen institutions, management of natural resources, developing financial mechanisms for the rural sector | |
| **Tourism** | - Elaboration of the Tourism Policy<br>- Creation of a National Tourism Council presided by the Prime Minister;<br>- An engagement by the State to ensure the security of tourists<br>- Opening of tourist information offices all over the world<br>- Authorisation of chartered flights from all foreign destinations<br>- Encouragement of eco-tourism by identifying/improving tourist sites nationwide | |
| **Mining** | - Mining code developed<br>- Creation of Ministry of Mines, Water and Energy. Then separated to Ministry of Mines in order to focus on mineral wealth<br>So as to focus more on the mineral wealth.<br>- Identified sites with mining potentials of :<br>Class A minerals: Nickel, Cobalt, Rutile<br>Class B - Iron<br>Class C - Wolframite, Uranium<br>Extensive exploitation of certain mineral resources<br>- Hydrocarbons, Gold, Diamonds | |
| **Fishing** | There is a policy on Marine Coastal Ecosystems and biodiversity conservation. There are fishery regulations in the law.<br>Many Cameroonians earn their livelihoods on fishing and fish-farming<br>80 % of 100 000 tons / year are artisans while 20 % is individual fishing . provides 240 000 jobs | |

### 3.2.1 NATIONAL SUSTAINABLE DEVELOPMENT PLAN

- Creation of CNCDD and placed under the Prime Minister's authority;
- Expected to follow up the implementation of recommendations of Agenda 21
- Prepare Government's constitution towards the U.N.O's Commission for Sustainable Development.
- The Inter-ministerial Committee on the Environment (CIE) exists and coordinates the role of the PNGE on all environmental studies and decisions.

### 3.2.2 NATIONAL ACTION PROGRAMME TO COMBAT DESERTIFICATION

- Sensitization, training
- Preparation and attendance of Conference of Parties meetings
- Follow up and practicing the resolution
- Acting on the programme of "Green Belts"
- Follow up and putting in action the National Observatory on Desertification.

### 3.2.3 NATIONAL PLAN FOR GOOD GOVERNANCE BASED ON NEPAD PARTNERSHIP PRINCIPLES.

The National Good Governance Programme was structured to consist :-

A steering committee, a national coordination, the agency for its working and sectoral consultative committees. Main objectives are :

- Bringing administration closer to the people,
- Consolidating the state of law
- Clean financial management and accountability, fight against corruption
- Decentralise administration to allow participation in management

Already 360 local councils have been created in Cameroon as a major step towards decentralisation.

### 3.2.4 FINANCIAL ADJUSTMENT PROGRAMME

Undertaken in 1995/1996 to:

Consolidate economic growth, reduce inflation rate, stabilize public finances, improve on external adjustment initiative. Reacted on trade restrictions by abolishing quantitative import restrictions, suspend administrative bottlenecks; got rid of inbalances caused by preferential tax regimes, introduction of VAT in 1999, introduced forest revenue securitization programme.

### 3.2.5 NATIONAL PLAN FOR FOOD SECURITY: (NPFS)

The new agricultural policy, the new Food and Nutritional Action Plan aims at:

- Reduction of pre and post harvest losses and improvement in food conservation;
- Improvement of food production through increase of animal and crops products;
- Improvement of marketing and processing of food products;
- Improvement of the infrastructure to ease the commercialisation of food products;
- Improve the food security of urban and rural dwellers.

## 3.3 OTHER CONVENTION PROCESSESs

Internationally, Cameroon has ratified over 39 biodiversity related conventions and put in considerable effort in implementing them. The following are among the list: CITES, OMS, RAMSAR, World Heritage Convention, Rio Convention, CBD, UNFCC, UNCCD, Information on the conventions and implementation processes are contained in Table 45.

At national level, Government has transformed policies and international Conventions into 13 appropriate biodiversity related legislations, most of them with their accompanied text of application. Institutionally, Cameroon has created appropriate institutional structures – Ministerial and private sectoral organisations for the safe management of its biological resources. Reference is made to the creation of Ministry of Environment and Protection of Nature 2005, Ministry of Forestry and Wildlife, Ministry of Agricultural Development, Ministry of Fisheries and Animal Industries, Ministry of Scientific Innovations, Ministry of Tourism.

In the private sector, there are national and international institutions which play an important role in the management of the countries biodiversity. There are over 20 of such institutions.

**Table 45: Information on Convention Processes in Cameroon**

| N° | Convention | Ratification Date | Focal Point Institution |
|---|---|---|---|
| **1** | Convention on biological Diversity (CBD) | 19 : 10 : 94 | Ministry of Environment and Protection of Nature |
| **2** | Convention on International Trade on endangered species(CITES) | 05 : 6 : 81 | Ministry of Forest and Wildlife |
| **3** | Ramsar Convention | ? : ? : 2005 | Ministry of Environment and Protection of Nature |
| **4** | World Heritage Convention | 07 : 12 :82 | Ministry of Culture |
| **5** | Convention on the Fight Against Desertification | 25 : 05 : 97 | Ministry of Environment and Nature Protection |
| **6** | Convention on Climate Change | 29 : 05 : 97 | Convention on Climate Change |
| **7** | Convention on the Conservation f Migratory Species | 07 : 09 : 81 | Ministry of Forest and Wildlife |
| **8** | The United Nations Convention on the Law of the Sea (UNCLOS) | 19 : 11 : 85 | Ministry of Fisheries and Animal Industries |
| **9** | African Convention on the Conservation of Nature and Natural Resources. | 29 : 09 : 78 | Ministry of Environment and Protection of Nature |
| **10** | Kano Convention on African Migratory Locusts | 27 : 07 :64 | Ministry of Agriculture and Rural Development |
| **11** | Convention for cooperation in Protection and Development of the Marine and Coastal Ecosystems | ? | Ministry of Environment and Protection of Nature |
| **12** | The International Tropical Timber Agreement | 19 : 11 :85 | Ministry of Forest and Wildlife |
| **13** | UNESCO Convention on Man and the Biosphere (MAB) | ? | Ministry of higher Education |
| **14** | Montreal Protection on Substances that deplete the ozone layer | 30 : 08 : 89 | Ministry of Environment and Protection of Nature |

# CHAPTER IV

# CONCLUSIONS

## *4.1 PROGRESS TOWARDS THE 2010 TARGET AND IMPLEMENTATION OF THE STRATEGIC PLAN*

The information for this part of the report has been provided in accordance with decisions VII/30 of the COP of the CBD. Every effort has been made to keep to the objectives of the decisions (UNEP 2004). Contribution for information on sectoral strategies and plans, progress made in implementing the NBSAP and obstacles met (Annex II has been completed accordingly.) Contributions have come from stakeholders in various fields of biodiversity. Their submissions have been accepted as genuine on the following basis:

- The National report preparatory stage allowed them enough time to check the realities of the activities they were reporting.
- All the reporters are specialists in their fields of reporting and many have lived through the experiences of the CBD implementation requirements and processes.
- Most of their information had been cross-checked by field monitors and current progress reports.

## 4.2 Progress towards the Goals of the Strategic Plan of the Convention

Information for this sub-section has been linked up with what has already been supplied in previous sections .In many cases cross references from the report sections have been used. The model is found in Annex II.

**Ta ble 46. Progress Towards "The 2010 Biodiversity Target"**

| Goals | National Targets | Incorporation into Sectoral Strategy plans | Progress made in Implementing NBSAP | Indicators for measuring Progress | Obstacles Encountered |
|---|---|---|---|---|---|
| 1.Promote conservation of Biodiversity, Ecosystems, Habitats and Biomes | 1.1 At least 10% of each of the World's ecological regions effectively conserved | Target is to conserve 30% of national territory | Former PAs exist new ones are being acquired | PAs so far 9% of national territory. PAs under creation 2.1% of national territory | Financial limitations<br>Illegal exploitation<br>Illegal hunting/poaching population pressure<br>NBSAP not known to most stakeholders |
| | 1.2 Areas of particular importance to biodiversity protected | Formation plans on mountain Ecosystem<br>Botanical, zoological gardens, wildlife sanctuaries | Emphasis on protection since adoption of NBSAP<br>15 national parks, 20 forest reserves, 3 zoological gardens, 2 botanical gardens, 4 sanctuaries | Recruitment of control staff<br>Eco-guards and forest guards for protected areas | Poor application of PAs regulations |
| 2.Promote the conservation of Species Diversity | 2.1 Restore, maintain, or reduce the decline of species of selected taxonomic groups | Wildlife, Forestry, Fisheries, regulations Strategies and Action Plans in agriculture livestock and fisheries, forestry | Special attention on threatened spp of plants and animals like *Tauraco persa* (bird) *Psittacus erithacus* (bird) *Gorilla gorilla* (primate) *Loxodanta africana* | Protection measures of classified species into classes A, B, C for wildlife and exploitation diameter classes for timber and quotas for non-timber spp | Limited capacities and funds for research and publication of findings<br>NBSAP not well known to stakeholders |
| | 2.2 Status of threatened species improved | Policies and laws on threatened ecosystem and species.<br>Forest, Agriculture, Fisheries, Livestock, Wildlife and Land Policies. | Texts limiting exploitation and exportation of some plant/animal spp<br>Text of application of Law nº94/01 of 20 January 1994 on Forestry, Wildlife and Fisheries | Text of application of laws on fisheries, wildlife, forestry<br>Information to biodiversity users<br>Projects to encourage protection of threatened spp | Limitation of funds for adequate information to users of biodiversity<br>NBSAP not well known to stakeholders |
| 3. Promote the | 3.1 Genetic diversity of crops, | Conservation | Indigenous communities have | Participation in workshops related | Lack of incentives |

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|---|---|---|---|---|---|
| conservation of Genetic Diversity | livestock and of threatened species of trees, fish and wildlife and other valuable species conserved and associated indigenous and local knowledge maintained | measures are built on the "Participatory Approach"<br>Encouraging the participation of the communities in resource management (MINFOF 2008) | always contributed in decision-markers<br>Their knowledge used for programming and management of biological resources | to Biodiversity conservation<br>Assist in providing information for ethno-botanical studies<br>Report of activities of stake holders e.g. TDCs<br>Indigenous knowledge now considered for public health programmes | Poor infrastructure<br>Poverty<br>NBSAP not well known to stakeholders |
| 4. Promote sustainable use and consumption | 4.1 Biodiversity-based products derived From sources that are sustainably managed and production areas managed consistently with the conservation of biodiversity | National laws and regulations on resource management emphasis on sustainable availability of products | All biodiversity management ministries, water, energy and soil sectors ensure external series for strict implementation of the laws | Fines and sanctions including prison sentences to defaulters of resource exploitation | Inadequate means for implementing regulation |
| | 4.2 Unsustainable consumption of biological resources or that impact on biodiversity reduced. | Texts of application of regulations<br>Special text | Determination of Quotas for heavily exploited and threatened spp | There are quotas for fish exploiters, wildlife hunters and forest exploiters | Non respect of the regulations |
| | 4.3 No species of wild flora or fauna endangered by international trade | Cameroon is a member of the CITES Convention | The specific institution that applies the CITES is MINFOF | Exportation & research certificates are issued for every species exported | Abuse in application of CITES regulation |
| 5 Pressures from habitat loss, land use change, degradation and unsustainable water use reduced | 5.1 Rate of loss and degradation of natural habitation decreased | Soil, water & species conservation policies exist | CBD Focal Point Ministry coordinates with other ministries for correct application of soil, water & habitat conservation measures | Agricultural and Livestock Extension Services to educate the farmer-grazier on best soil and water conservation methods | Poor /lack of information and coordination |
| 6. Control threats from Invasive | 6.1 Pathways for major potential Invasive Alien Species controlled | Control of IAS has been provided for in | National programme underway to identify and control IAS | Project on Monitoring with assistance of GEF | Delay and inadequate finances |

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| Alien Species | | the NBSAP | | | |
| | 6.2 Management plans in place for Invasive Alien Species that threaten ecosystems, habitats or species | Plans underway | Identification and monitoring plans underway | All biodiversity sectors already have their list of IAS | Absence of a policy and regulation on IAS |
| 7. Address challenges to biodiversity from climate change and pollution | 7.1 Maintain and enhance resilience of the components of biodiversity to adapt to climate change | CBD, CCC are pulling resources for better coordination of efforts of both conventions | Specific Focal Points and Strategies for CBD and CCC | Regular reports on the effects of CC on biodiversity | Limitation of Intervention and reporting/monitoring |
| | 7.2 Reduce pollution and it's impact on biodiversity | National Policy on the Environment | Application law on the Environment | Law of implementation by the Focal Point Ministry on the Environment | Poor implementation of the regulations |
| 8 Maintain capacity of ecosystems to deliver goods $ services and support livelihoods | 8.1 Capacity of ecosystems to deliver goods and services maintained | NBSAP was developed on the "Ecosystem Approach" | Concern of every ecosystem are being considered and monitored | Economic activities on each ecosystem encouraged | Poor incentives<br>Lack of markets<br>Increase taxation<br>Poor finances for commercial activities |
| | 8.2 Biological resources that support sustainable livelihoods local food security and health care especially of poor people maintained | Agricultural Policy emphasis on Food Security and Poverty alleviation | Research, agricultural inputs and education encouraged | Farm to market roads and village health infrastructure developed | Lack of roads and health infrastructure<br>Absence of food processing and conservation units |
| 9. Maintain socio-Cultural Diversity of indigenous and local communities | 9.1 Protect traditional knowledge, innovations and practices | Research on traditional medicine | Ethno-botanical studies | Catalogue of medical plants<br>Institute of medical-medicinal plants Yaounde | Lack of funds for continued research<br>No incentives for indigenous knowledge |

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| | 9.2 Protect the rights of indigenous and local communities over their traditional knowledge innovations and practices including their rights to benefit -sharing | Policy on Traditional knowledge<br>Fiscal regulations on exploitation rights | Existence of indigenous knowledge organisation of Cameroon | Communal taxes from forest and wildlife resources | Benefit sharing is in inequitable or ignored<br>Benefits do not provide noticeable development marks |
| 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources | 10.1 All access to genetic resources is in line with the CBD and its relevant provisions | Benefits are determined in all forms of biodiversity resource exploitation | Laws and regulations exist | Finance laws on benefit sharing for communal taxes | Non application of regulations<br>Embezzlement |
| | 10.2 Benefits arising from the commercial and other utilization of genetic resources should in a fair and equitable way with the country's providing such resources in line with the CBD and its relevant provisions | Participatory management of genetic resources with local population | Rural communities interest included in the laws of wildlife, fishery and forest | Employment of local communities in projects<br>Training of youths<br>Government Extension Services in Agriculture, Veterinary and Rural Development | Lack of educational infrastructure<br>Refusal of village community to cooperate with resource managers |
| 11. Parties have improved Financial, human, scientific technical $ technological capacity to implement the CBD | 11.1 New additional financial resources are transferred to developing country parties to allow for the effective implementation of their commitments, under the Convention in accordance with its article 20 | Appropriate institutional legal framework in place for implementation of the CBD<br>All biodiversity stakeholders involved at national level | CBD implementation strategies achieved | NBSAP 1,2,3 National Reports<br>Cartagena Protocol on Biosafety<br>Cameroon attended all COP meetings<br>See section (2.5.1) | Government contribution sometimes inadequate |
| | 11.2 Technology is transferred to developing country parties to allow for the effective implementation of their commitments under the Convention with its article 4 | Appropriate technologies being developed through modern biotechnologies | Law on Biosafety has relevant articles on use of appropriate technologies | The safe handling of GMOs and the use of existing capacities | Limited staff and inadequate technological capacities |

## Annex III – Goals and objectives of the strategic plan and provisional indicators for assessing progress

| Goals | Objectives | Progress implementing NBSAP | Indicators | Obstacles encountered |
|---|---|---|---|---|
| 1.the convention is fulfilling its leadership role in internal biodiversity | 1.1 The convention is setting the global biodiversity agenda. | Education and sensitising all biodiversity stakeholders in al sub-region and the African region | Several international conferences in Cameroon on biodiversity - Yaounde Declaration of 1999 - COMIFAC | Lack of cooperation from member states |
| | 1.2 The convention is promoting corporation between all relevant international instruments and processes to enhance policy coherence. | Focal Point Ministry coordinates with all stakeholders on CBD processes | Fishery, wildlife, forestry and Agricultural Policies in Cameroon are harmonised with regards to "sustainable use and resource conservation | Strict application of regulations<br>Poor sensitisation mechanism<br>Absence of coordination |
| | 1.3 Other international processes are actively supporting implementation of the convention in a manner consistent with their respective framework. | Cameroon has ratified over 39 other Conventions and processes related to the CBD | Focal Points of other Conventions work together with CBD Focal Point<br>Synergies on capacity building exist between CBD, CCC and UNCD | Change of policy managers<br>Poor infrastructure at national level<br>Conflicting Ministerial Mandates |
| | 1.4 The Cartegena Protocol on Bio safety is widely implemented. | Cameroon ratified the Cartagena Protocol since 2003 in a participatory manner | Law on Biosafety since 2005<br>Text of application published in national media and the internet | Limited only to the reading public<br>To many ethnic groups (over 250)<br>Non respect of laws during imports of GMOs/LMOs by some stakeholders |

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| | 1.5 Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programming and policies at the regional and global levels. | Biological Resource Ministries all involved in developing plans and policies that hinge around CBD objectives | Fishing, forestry, agricultural, wildlife laws and regulations are based and amended following CBD objectives and obligations | Implementation failing to be applied accordingly<br>Inappropriate texts of application<br>Instruments of regional cooperation not operational |
| | 1.6 Parties are collaborating at the regional and sub-regional levels to implement the convention. | Several sub-regional and regional conferences on biological resource management and formation of biotechnology for collaborative management | Formation of CEMAC, COMIFAC, WWF, IUCN, CARPE etc | Irregularity in information sharing<br>Parties not being of same level implementing the CBD |
| 2. Parties have improved financial, human, scientific technical and technological capacity to implement the CBD | 2.1 All parties have adequate capacities for implementation of priority actions in national biodiversity strategy and action plans. | Countries of the sub-region have at least ratified the CBD | Sub-regional assessment conferences organised | Financial constraints<br>Lack of appropriate capacities<br>Inappropriate legal/institutional arrangements |
| | 2.2 Developing country parties in particular, the least developed and the small island developing states among them and other parties with economies in transition have sufficient resources available to implement the three objectives of the convention | Most countries of the sub-region have developed their NBSAP, National report and developed appropriate strategies. | Many of such countries have received assistance from developed countries | Unwillingness of recipient country |

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| | 2.3 Developing countries parties in particular the least developed and small among them and other parties with economies in transition, have increased resources and technology transfer available to implement the Cartegena Protocol on biodiversity | Cameroon has shown capacity to implement the Cartagena Protocol | Ratified the Protocol<br>Developed the Biosafety law | Means of applying the law<br>Sensitising the rural communities |
| | 2.4 All parties have adequate capacity to implement the Cartegena Protocol on Bio safety. | Cameroon is planning out following its law on Biosafety | Text of application already available | Delay in tracing appropriate personnel |
| | 2.5 Technical and scientific cooperation is making a significant constitution to building capacity. | International Organisation assist Cameroon to build capacity | Training underway on modern biotechnology – University of Yaounde I and university of Buea | Poor working conditions<br>Lack of moltivation |
| 3.National biodiversity strategies and action plan and their integration of biodiversity concerns into relevant sectors serve as effective frameworks for the implementation of the objectives of the CBD | 3.1 Every party has effective national strategic plans and programmes in place to provide a national framework for implementing the three objectives of the convention and to set clear national priorities. | Cameroon like all other parties was obliged to develop national framework and strategy to implement the CBD objectives | NBSAP developed since 1998<br>1st National Report 1997<br>2nd National Report 2003<br>3rd National Report 2005<br>4th National Report 2008 | Limited funds for wider distributed of strategy and plan documents |
| | 3.2 Every party to the Cartegena protocol on biodiversity has a regulatory framework in place and functioning to implement the protocol. | Cameroon has the law on based on the Cartagena Protocol on Biosafety | Law has now text of application | Financial and appropriate capacities for applying the law<br>Problems of sensitising the rural communities<br>Structures on the control of risks of handling GMO |

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| | 3.3 Biodiversity concerns are being integrated into relevant national sectoral and cross sectoral programmes and policies. | CBD programmes involved in agriculture, fisheries, forestry, livestock and research | All biodiversity stakeholders nationwide are regularly informed of changes and innovations on the CBD | Absence of funds for wider circulation |
| | 3.4 The priorities in national biodiversity strategies and action plans are being actively implemented as a means to achieve national implementation of the convention and as a significant contribution towards the global biodiversity agenda. | Various actions plans are receiving attention nationwide | Demonstration of actions occurs in various project sites and in other sectorial centres | Inadequate man power<br>Limited funding |
| 4. there is a better understanding of the importance of biodiversity and of the convention and this has led to broader engagements across society | 4.1 All parties are implementing a communication education and public awareness strategy and promoting public participation to the support of the conservation. | Conservation education is wide spread in Cameroon | Envirionmental education already figures in school curricular<br>Department of Biodiversity included in University of Yaounde I | Finances to develop appropriate trading material |
| | 4.2 Every party to the Cartegena Protocol on biodiversity is promoting and facilitating public awareness, education and participation in the protocol. | University and research bodies education in GMO and modern Biotechnology | IRAD runs research instititues in Agronomy, Animal science, Entomology<br>Fishery research in Batoke | Staff to teach relevant issues on biodiversity |
| | 4.3 Indigenous and local communities are effectively involved in the implementation and in the process of the convention, at national, regional and international levels. | Sensitisation of all local communities on CBD implementation processes | Field staff representation within rural communities | Limited staff for Extension services |
| | 4.4 Key actors and stakeholders including the private sector, are engaged in partnership to implement the convention and are integrating biodiversity concerns into their relevant sectoral and cross-sectoral programmes and policies. | Biodiversity stakeholders have been widely informed about convention processes | Projects on Agriculture, fisheries, livestock and wildlife located nationwide | Poor means of monitoring sectorial activities |

## 4.3 CONCLUDING STATEMENT

From the foregoing, it is evident that Cameroon's implementation of the Convention on Biological Diversity has made a positive impact towards achieving the objectives of the Convention in Cameroon. This is seen from the following observations:

### 4.3.1 ON CONSERVATION:

National policies and legislations of all biodiversity-related and thematic programmes are regulated nationally and are backed by appropriate policies, laws and institutions.

- Land under protected area management rose from 3.482.741 ha in 200 to 5.377.832 ha in 2008 such that today about 30% of the national territory is under protected area management including 8.138,880 ha managed under "Safari Hunting", (Table 6).
- The tree-planting programme: "**Sahel Vert" and "Operation One Billion Trees" Programmes** are all in progress.
- Agriculture, Aquaculture, livestock extensions services as evidenced by the domestication of fish, animals and plant species are measures taken towards biodiversity conservation throughout the national territory.( see also Section 2.2.1, Table 37).

### 4.3.2 ON SUSTAINABLE USE OF BIODIVERSITY

Stake-holders including rural dwellers that use and work with biodiversity have been regularly sensitized on the importance and the need for sustainable use of biodiversity products. This is shown by:

- Information on various uses of biodiversity for food, medicine shelter, music, tradition, etc
- Measures taken to avoid pre and post harvest losses.
- Use of the land classification System (*Plan de Zonage* ) since 1995.
- Resource exploitation based on the quota system e.g. forest exploitation is now based on the " *ufa* "system;
- Fishery is based on the FAO Code of responsible Fishing.
- No policy/programme on biodiversity

### 4.3.3 ON FAIR AND EQUITABLE UTILISATION OF GENETIC RESOURCES

- Various laws on biodiversity have been revised with emphasis on access to resources and benefit-sharing.
- Finance laws on council and communal royalties – the councils of the Eastern Province and of some areas in Manyu, South West Province have been receiving huge sums of monies as the forest royalties for the forest resources exploited in their areas.
- Access and Benefit Sharing modalities have been laid down to take care of bio-prospecting activities throughout Cameroon.

- Indigenous Knowledge is highly recognised and Government collaborates with several national associations on IK
- No policy on ABS
- There is an IPR Organisation in Cameroon and Government recognises its recommendations. However, it is not integrated into the research activities of MINRESI and MINESUP, etc.

### 4.3.4 LESSONS LEARNT

Many lessons have been learnt in the Course of implementing the CBD in Cameroon. Among the many lessons are:

- Policy-makers learnt much from the objectives and articles of the CBD and have seen the need to revise the laws and institutions associated with biodiversity management and sustainable use.

- It is established that although biological resources are renewable, they can get depleted if not properly managed and used in a sustainable manner.

- Village communities have now known the importance and the need for the sustainable use of biodiversity.

**Successes Registered**:

Among the many success in CBD implementations are:

- The obligation to implement the CBD has added greater impetus in applying national laws related to biodiversity
- There are stronger collaborative links between Government and the civil society since all must seek towards better resource management and sustainable use.
- Significant awareness and advances in science and technology - Cameroon Academy of Science, Associations and research bodies undertake many programmes on biodiversity management.
- Application of the National Biosafety Regulations
- Advances in modern biotechnology using facilities in Yaounde, Buea Universities., biotechnology laboratories.
- The inclusion of biodiversity and environment programmes in school curricula.

### 4.3.5 SOME SET BACKS:

In spite of successes and advantages CBD implementation has the following set backs:

- Lack of infrastructure does not ensure total coverage and implementation of instructions and decisions on all the resources.; The Korup National Park was created under the IUCN National Park status but has failed to be administered as such since the 6 villages in the Park resettlement scheme have to date not been resettled out of the Park.
- Neglect of the estuarine mangroves of Rio del Rey in South West Province has exposed the fishing and forest resources to uncontrolled exploitation by alien fishermen who plunder both the mangroves and fish for foreign markets.

- NBSAP not disseminated to local communities
- Absence of biotechnology policy/programmes
- Difficulty in respecting biosafety regulations
- Governance (particularly financial) problems with some related conventions (e.g with POP convention) which affects CBD implementation.

### 4.3.6 NATIONAL ENDEAVOUR

The Cameroon Government is sparing no effort to arrive at successful implementation of the CBD in Cameroon. This is why she coordinates and collaborates with national and international biodiversity stake-holders. These and others are assisting in making the CBD message go nationwide, and undertake CBD implementation through project activities.

The media has been playing an effective role in educating the public on the best conservation and resource use practices.

### 4.3.7 PROPOSALS:

The following proposals should be considered to enhance the implementation of CBD in Cameroon:

- There is need to re-define and re-enforce the status and role of the CBD focal Point rather than handling the functions as part time or subsidiary to other functions. This entails additional tools and resources as well as institutional strengthening. Focal point representation should be felt nation-wide so that the influence and importance of the CBD can be truly effective.
- Dissemination of NBSAP
- The application of the relevant article of the CBD and Action 4 of Marine and Coastal biodiversity in the NBSAP in respect to Invasive Alien Species (IAS) should be an urgent consideration.
- Development of biotechnology policy/programme
- The monitoring system using criteria and indicators in all six country's ecosystem (recommendation in Section 5.4 of NBSAP) should be re-dynamized making sure that the objectives, criteria indicators and the means of verification are regularly reported.
- Greater effort should be made in integrating biodiversity in other sectors
- The obligation to implement the CBD in a country whose economy largely depends on its biodiversity requires that:
    - Operational mechanisms such as the CHM and BCH work poorly within the framework of the administration. They should therefore be located within a financially autonomous body (e.g. National Biosafety Authority)
    - A substantial budgetary allocation be provided for implementing the CBD monitoring and reporting;
    - Implementation reports should regularly reach the various biodiversity key players including the grass-roots;

- Information on implementation should be participative and as much as possible come from the rural masses. It should take the bottom-top approach.

In order to systematize and obtain a reliable data-base on the country's biodiversity information, the following measures are recommended. (Solbrig 1991).

- Organize series of workshops to recommend basic sampling methods for various taxa, so that data collected on the same groups will be comparable. Each workshop should focus on a given taxon or discipline (e.g arthropods, plankton, fungi, soil micro-organisms soils macro-organisms, trees, fishes, birds, mammals, insects etc.).
- Geographical and taxonomically based questionnaire requesting information from specialists about the best sites for monitoring should be sent to all working systematists.
- A workshop on special techniques to estimate species richness is required. Both statistical and calibration-multiplication methods should be considered. Participants should include systematists, ecologists and statisticians.
- A National Biodiversity Committee and National Biosafety Authority should be set up which will be responsible to collect, centralize, approve and disseminate updated data in all areas of biodiversity in Cameroon.

# APPENDICES

***Appendix I. Cultivated Areas and Production of Food Crops in Cameroon 2001-2005***

| Crop | 2001 | | 2002 | | 2003 | | 2004 | | 2005 | | 2005 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Area (ha) | Prodn (tons) | Area (ha) | Prodn (tons) | Area (ha) | Prodn (tons) | Area (ha) | Prodn (tons) | Estimated Area (ha) | Estimated Prodn (tons) | Final Area(ha) | Final Prodn(tons) |
| **FOOD CROP PRODUCTION** | | | | | | | | | | | | |
| Pine apples | 3 121 | 44 186 | 3 215 | 45 555 | 3 311 | 46 968 | 3 410 | 48 424 | 3 509 | 49 925 | 3 514 | 100 139 |
| Ground nuts | 284 447 | 203 587 | 290 136 | 210 712 | 295 939 | 218 087 | 301 858 | 225 720 | 307 777 | 233 620 | 292 722 | 353 953 |
| Banana | 75 145 | 645 746 | 77 399 | 692 886 | 79 721 | 743 466 | 82 113 | 797 739 | 84 505 | 855 974 | 84 680 | 815 375 |
| Plantains | 225 712 | 1 199 820 | 232 483 | 1 237 014 | 239 458 | 1 275 362 | 246 642 | 1 314 898 | 253 826 | 1 355 660 | 130 248 | 1 670 686 |
| Cucumber | 101 412 | 124 686 | 98 095 | 127 429 | 121 887 | 122 306 | 115 214 | 124 997 | 108 541 | 127 747 | 108 397 | 129 373 |
| Ginger | 1 377 | 7 593 | 1 391 | 7 761 | 1 405 | 7 931 | 1 419 | 8 106 | 1 433 | 8 284 | 1 433 | 8 284 |
| Okra | 28 230 | 33 320 | 32 990 | 34 120 | 38 553 | 34 938 | 45 054 | 35 777 | 51 555 | 36 636 | 47 973 | 36 292 |
| Beans | 206 727 | 180 793 | 212 929 | 186 940 | 219 318 | 193 296 | 225 898 | 199 868 | 232 478 | 206 663 | 232 701 | 264 795 |
| Palm oil | 45 348 | 144 454 | 49 884 | 153 121 | 54 873 | 162 308 | 60 360 | 172 047 | 65 847 | 182 369 | 66 175 | 215 290 |
| Yams | 35 175 | 268 387 | 35 877 | 274 292 | 36 595 | 280 326 | 37 327 | 286 494 | 38 059 | 292 796 | 38 076 | 372 524 |
| Coco yams | 186 771 | 1 056 294 | 192 374 | 1 079 533 | 198 145 | 1 103 282 | 204 090 | 1 127 555 | 210 035 | 1 152 361 | 191 178 | 1 240 037 |
| Maize | 378 708 | 813 461 | 416 579 | 861 456 | 458 237 | 912 281 | 504 060 | 966 106 | 549 883 | 1 023 106 | 552 586 | 1 178 921 |
| Cassava | 237 709 | 1 960 503 | 261 481 | 2 003 634 | 287 629 | 2 047 714 | 316 392 | 2 092 763 | 345 155 | 2 138 804 | 345 790 | 2 776 787 |
| Watermelon | 7 265 | 35 713 | 8 105 | 36 820 | 9 042 | 37 961 | 10 088 | 39 138 | 11 134 | 40 351 | 11 166 | 40 351 |
| Millet | 342 806 | 511 780 | 383 600 | 541 975 | 429 248 | 573 951 | 480 328 | 607 814 | 531 408 | 523 484 | 353 122 | 764 485 |
| *Niébé* | 95 809 | 87 503 | 100 599 | 90 478 | 105 629 | 93 554 | 110 910 | 96 735 | 116 191 | 100 024 | 113 281 | 112 501 |
| Onions | 6 420 | 68 655 | 7 383 | 70 303 | 8 491 | 71 990 | 9 764 | 73 718 | 11 037 | 75 487 | 11 067 | 111 838 |
| Other melon varities | 1 472 | 28 504 | 1 619 | 29 388 | 1 781 | 30 299 | 1 959 | 31 238 | 2 137 | 32 206 | 2 135 | 34 582 |
| Potatoes | 37 336 | 178 059 | 39 947 | 181 976 | 42 744 | 185 980 | 45 736 | 190 071 | 48 728 | 194 253 | 48 795 | 242 481 |
| Hot pepper | 4 968 | 6 685 | 5 507 | 7 287 | 6 104 | 7 942 | 6 765 | 8 657 | 7 426 | 9 436 | 6 359 | 15 209 |
| Irish potatoes | 30 051 | 133 407 | 34 559 | 136 342 | 39 743 | 139 341 | 45 704 | 142 407 | 51 665 | 145 540 | 48 227 | 177 817 |
| Rice | 39 110 | 42 065 | 39 782 | 44 546 | 39 857 | 47 175 | 40 236 | 49 958 | 40 615 | 52 905 | 39 896 | 84 197 |
| Sesame | 24 202 | 3 050 | 25 572 | 3 157 | 27 021 | 3 267 | 28 552 | 3 382 | 30 083 | 3 500 | 30 123 | 3 630 |
| Soya beans | 11 088 | 6 082 | 11 220 | 6 295 | 11 357 | 6 515 | 11 496 | 6 743 | 11 635 | 6 979 | 11 640 | 7 113 |
| Tomatoes | 23 597 | 380 039 | 28 788 | 389 160 | 35 122 | 398 500 | 42 849 | 408 064 | 50 576 | 417 857 | 50 762 | 639 874 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Voandzou* | 11 508 | 8 784 | 12 084 | 9 082 | 12 688 | 9 391 | 13 322 | 9 711 | 13 956 | 10 041 | 13 976 | 17 979 |
| **CASH CROP PRODUCTION** | | | | | | | | | | | | |
| *Cocoa* | | 121 161 | | 138 202 | | 414 809 | | 518 826 | | | | 174 228 |
| *Coffee Arabica* | | 7 824 | | 6 580 | | 5 281 | | 6 401 | | | | 5 083 |
| *Coffee Robusta* | | 72 070 | | 61 548 | | 76 713 | | 49 864 | | | | 41 387 |
| *Rubber* | | 54 260 | | 57 233 | | 58 634 | | 54 523 | | | | 58 483 |
| *Cotton Fibre* | | 96 819 | | 102 704 | | 95 188 | | 96 293 | | | | 141 355 |
| Banana | | 645 746 | | 692 886 | | 743 466 | | 797 739 | | | | 815 375 |
| Palm oil | | 144 454 | | 153 121 | | 162 308 | | 172 047 | | | | 215 290 |

**Sourc :** MINADER / DESA / AGRI-STAT N°14 Avril 2008

## *Appendix II : Crop Diversity in Cameroon*

| Cash Crops | Food Item | Fruits | Vegetables | Spices | Ecosystem |
|---|---|---|---|---|---|
| Cocoa | Cassava | Oranges | Bitter leaf | Onions | Tropical Humid Dense Forest |
| Coffee | Plantain | Lemon | Huckle Berry | Leeks | Tropical Humid Dense Forest |
| Rubber | Cocoyam | Tangerines | Cassava leaves | Alligator | Tropical Humid Dense Forest |
| Banana | Yams- five types | Grapefruit | Sweet potato leaves | pepper | Tropical Humid Dense Forest |
| Oil palm | Rice | Pineapple | Water Leaf | Hot pepper | Tropical wooded Savannah |
| Tea | Sorghum | Guava | Beans(leaf) | Bush Pepper | Tropical wooded Savannah and THDF |
| Cotton | Sweet potatoes | Mangoes | Eru | Njangsang | Tropical wooded Savannah and THDF |
| Groundnuts | Irish potatoes | Plums | Ekongobong | Bush Mango | Tropical wooded Savannah and THDF |
| | Beans- Six types | Avocado Pear | Anchia | Lion Cola | Tropical wooded Savannah and THDF |
| | Groundnuts | Pawpaw | Cabbages | Magi leaf | Tropical Humid Dense Forest |
| | Maize | Coconut | Lettuce | Bush Onions | Tropical wooded Savannah and THDF |
| | Pumpkin | Cola Nuts | Fern spp | Pepper | |
| | Egusi | Bitter Cola | Pumpkin leaves | | |
| | | Monkey Cola | Tomatoes | | |
| | | Raffia bamboo fruit (Akup) | Garden eggs | | All Ecosystems |
| | | Berries | Cocoyam leaves | | |
| | | | Colocassia leaves | | |
| | | | Okra fruit and leaves | | All Ecosystems |
| | | | Green (3 types) | | All Ecosystems |
| | | | Elephant grass stock | | All Ecosystems |
| | | | Cow pea leaves | | |

**Source:** MINADER, TDHF Tropical Dense Humid Forest

## *Appendix III: Timber Production in Cameroon*

| Year | Volume ($M^3$) |
|---|---|
| 2002 - 2003 | 1 947 654 |
| 2003 | 1 315 274 |
| 2004 | 2 218 655 |
| 2005 | 2 020 694 |
| 2006 | 2 289 416 |
| 2007 | 2 086 244 |

**Source:** DF/MINFOF October 2008

The species heavily exploited are:

- Ayous – Triplochiton scleroxylon
- Tali – Erythrophleum ivorensis
- Adoun – Cylicodiscus gabunensis
- Eyong – Eribroma oblongum
- Kossipo– Entandrophragma candollei

***APPENDIX IV: Some Native Orchids of Floriculture Potential - Checklist for Commercial cultivation***

| Scientific Name | Family |
|---|---|
| Angraecopsis sp. Vel. tenerrima | Orchidaceae |
| Brachycorythis kalbreyeri | Orchidaceae |
| Polystachya odorata var. odorata | Orchidaceae |
| Disa aff. nigerica | Orchidaceae |
| Nervilia bicarinata | Orchidaceae |
| Angraecum birrimense | Orchidaceae |
| Aeangis biloba | Orchidaceae |
| Chamaengis odoratissima | Orchidaceae |
| Cyrtorchis chailluana | Orchidaceae |
| 3 undertermined Orchids | Orchidaceae |
| Polystachya laxiflora | Orchidaceae |
| Polystachya odorata | Orchidaceae |
| Habenaria buntingii | Orchidaceae |
| Habenaria macrandra | Orchidaceae |
| Habenaria macrantha | Orchidaceae |
| Habenaria malacophylla | Orchidaceae |
| Habenaria manii | Orchidaceae |
| Habenaria sp | Orchidaceae |
| Habenaria weilerana | Orchidaceae |
| Diaphananthe fellucida | Orchidaceae |
| Calamthe sylvatica | Orchidaceae |
| Aerangis Luteo | Orchidaceae |
| Aerangis stelligera | Orchidaceae |
| Ancistrochilus rothschildienus | Orchidaceae |
| Ancistrochilus thomsonianus | Orchidaceae |
| Angraecum birrimense | Orchidaceae |
| Angraecum eichleranum | Orchidaceae |
| Angraecum sp | Orchidaceae |
| Ansellia africana | Orchidaceae |
| Brachycorythis macrantha | Orchidaceae |
| Brachycorythis sceptrum | Orchidaceae |

**Source :** Fominyam C. Limbe Botanic Garden 2008

| Scientific Name | Family |
|---|---|
| Brachycorythis sp | Orchidaceae |
| Bulbophyllum bidenticulatum | Orchidaceae |
| Bulbophyllum renkinia | Orchidaceae |
| Bulbophyllum schinizianum | Orchidaceae |
| Callanthe sylvatica | Orchidaceae |
| Calyptrochilum emaginatum | Orchidaceae |
| Diaphananthe fragrantissima | Orchidaceae |
| Eulophia alta | Orchidaceae |
| Eulophia bouliawongo | Orchidaceae |
| Eulophia buettneri | Orchidaceae |
| Eulophia cristata | Orchidaceae |
| Eulophia cucallata | Orchidaceae |
| Eulophia euglossa | Orchidaceae |
| Rhipidoglosum kameruneensis | Orchidaceae |
| Eulophia flavopurpurea | Orchidaceae |
| Eulophia gigantea | Orchidaceae |
| Eulophia horsfallii | Orchidaceae |
| Eulophia milnii | Orchidaceae |
| Eulophia oedaplection | Orchidaceae |
| Eulophia sp1 | Orchidaceae |
| Eulophia sp2 | Orchidaceae |
| Eulophia sp4 | Orchidaceae |
| Eulophia sp5 | Orchidaceae |
| Eulophia sp6 | Orchidaceae |
| Eulophia sp7 | Orchidaceae |
| Habenaria englerana | Orchidaceae |
| Habenaria gaboneensis | Orchidaceae |
| Habenaria procera | Orchidaceae |

## *APPENDIX V: Some Native Species of Floricultural potentials*

| Scientific Name | Family |
|---|---|
| Microdracoi.des squamosus | Cyperaceae |
| Impatiens Spp | Balsaminaceae |
| Palisota sp | Commelinaceae |
| Palisota pynaertic | Commelinaceae |
| Palisota sp(Variegated) | Commelinaceae |
| Crinum zeylanicum | Amaryllidaceae |
| Scadoxus multiflorus | Amaryllidaceae |
| Scadoxus cinnabarenus | Amaryllidaceae |
| Antigonum leptopus | Polygonaceae |
| Polygonum nepalense | Polygonaceae |
| Clerodendrum buchholzii | Verbanaceae |
| Clerodendrum bipindense | Verbanaceae |
| Clerodendrum buettneri | Verbanaceae |
| Clerodendrum melaneraler | Verbanaceae |
| Clerodendrum scandens | Verbanaceae |
| Clerodendrum dusenii | Verbanaceae |
| Clerodendrum thomsonae | Verbanaceae |
| Clerodendrum splendens | Verbanaceae |
| Clerodendrum SP.(White flowers, grows in the wild) | Verbanaceae |
| Clerodendrum inaequipetiolatum | Verbanaceae |
| Clerodendrum melanocrater | Verbanaceae |
| Clerodendrum violaceum | Verbanaceae |
| Clerodendron alatum | Verbanaceae |
| Clerodendron thomsonae | Verbanaceae |
| Pararistolochia goldieana | Aristolochiaceae |
| Cycnium adonense subsp. camporum | Scrophulariaceae |
| Cynanchum codifolium | Asclepiadaceae |
| Pentas schimperiana | Rubiaceae |
| Gardenia nitida | Rubiaceae |
| Craterispermum Cerinanthum | Rubiaceae |
| Dracaena fragrans | Dracaenaceae |
| Dracaena phrynioides | Dracaenaceae |
| Dracaena goldieana | Dracaenaceae |
| Dracaena aubryana | Dracaenaceae |
| Dracaena braunii | Agavaceae/ Liliaceae |
| Dracaena camerouniana | Agavaceae/ Liliaceae |
| Dracaena Thalioides | Agavaceae/ Liliaceae |
| Dracaena deisteliana | Dracaenaceae |
| Dracaena sanderiana | Dracaenaceae |
| Dracaena reflexa | Dracaenaceae |
| Amorphophallus abyssiniccus | Araceae |
| Culcasia striolata | Araceae |
| Rektophyllum mirabile | Araceae |
| Begonia paculifera | Begoniaceae |
| Begonia Spp | Begoniaceae |
| Afrocalathea rhizantha | Maranthaceae |
| Afenidia conferta | Maranthaceae |
| Maranthe leuconeora | Maranthaceae |
| Megaphrynum brachystachyum | Maranthaceae |
| Ensete gillettii | Maranthaceae |
| Rosa sp. | Rosaceae |
| Rubus fellatae | Rosaceae |
| Rubus rigidus | Rosaceae |
| Costus schtechteri | Zingiberaceae |
| Costus spectabilis | Zingiberaceae |
| Zephyranthes grandiflora | Zingiberaceae |
| Chlorophytum comosum | Liliaceae |
| Leptonychia sp | Sterculiaceae |
| Campilospermum flavum | Ochnaceae |
| Costus dinklagei | Costaceae |
| Crassula vaginata | Crassulaceae |
| Sature robusta | Labiatae |
| Helichrysum cymosum | Compositae |
| Helichrysum camerooneunse | Compositae |
| Rumex abyssinicus | |
| Ipomoea alba | convolvulacea e |
| Podococcus barteri | Arecaceae |
| Sclerosperma manii | Palmae |

**Source :** Fominyam C. Limbe Botanic Garden 2008

**WORKSHOP ON THE FOURTH NATIONAL REPORT ON BIODIVERSITY FOR CAMEROON HELD IN THE CHAMBER OF COMMERCE: 17-18 July 2008**

## List of Participants

| N° | Drivers of biodiversity loss | Names | Provenance |
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| **2.** | Assistant General Supervisor | Dr Aboubakar Djalloh | |
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| **5.** | Assistant Coordinator | Dr WASSOUNI | |
| **6.** | **National Consultant (1)** | Chief BOKWE Augustine | |
| | | | |
| **7.** | **Resource persons (6)** | Dr MBAH David | |
| **8.** | // | Dr NWAGA Dieudonné | |
| **9.** | // | Dr MOHAMADOU Hamidou | |
| **10.** | // | Mr Chris Fominyan | |
| **11.** | // | Mr. Mahamat Habibou | |
| **12.** | // | Mr. Neckmen Samson | |
| | **Key Ministries (9)** | | |
| **13.** | MINTOUR | 01 representative | **YAOUNDE** |
| **14.** | MINFOF | 01 representative/CITES Focal Point | **YAOUNDE** |
| **15.** | MINADER | Mme Ekobo Colette | **YAOUNDE** |
| **16.** | MINEPIA | Dr Mohamadou | **YAOUNDE** |
| **17.** | MINRESI | Mr Mohamadou Habidou | **YAOUNDE** |
| **18.** | MINCOMMERCE | 01 representative | **YAOUNDE** |
| **19.** | MINPROFF | 01 representative | **YAOUNDE** |
| **20.** | MINREX | Mr BOUM BISAI | **YAOUNDE** |
| **21.** | MINEPAT | 01 representative | **YAOUNDE** |
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| **23.** | RAMSAR | Mr ONDOUA Serge Hervé | **YAOUNDE** |
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| **25.** | Desertification | Mr EBWELLE Fils Leroy | **YAOUNDE** |
| **26.** | Ozone | Mr ENOH Peter AYUK | **YAOUNDE** |
| **27.** | Stockholm | Mr HAMANI ANATOLE | **YAOUNDE** |
| **28.** | CITES | DFAP/MINFOF | **YAOUNDE** |
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| **30.** | Golf of Guinea Large Marine Eco. | Dr Wassouni | **YAOUNDE** |
| | **Provincial Chiefs of Services for** | | |

| | | | |
|---|---|---|---|
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| **32.** | West | Chef de Section MINEP | **BAFOUSSAM** |
| **33.** | Centre | Chef de Section MINEP | **YAOUNDE** |
| **34.** | Littoral | Chef de Section MINEP | **DOUALA** |
| **35.** | East | Chef de Section MINEP | **BERTOUA** |
| **36.** | North | Chef de Section MINEP | **GAROUA** |
| **37.** | Far North | Chef de Section MINEP | **MAROUA** |
| **38.** | South | Chef de Section MINEP | **EBOLOWA** |
| **39.** | South West | Chef de Section MINEP | **BUEA** |
| **40.** | Adamaoua | Chef de Section MINEP | **NGAOUNDERE** |
| | **Research institutions (03)** | | |
| **41.** | IRAD | 01 representative | **YAOUNDE** |
| **42.** | CIRAD | 01 representative | **YAOUNDE** |
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| | **Herbaria (03)** | | |
| **44.** | National Herbarium | 01 representative | **YAOUNDE** |
| **45.** | Limbe Botanic & Zool. Garden | 01 representative | **LIMBE** |
| **46.** | Mvog Betsi Zool. & Bot. Garden | 01 representative | **YAOUNDE** |
| | **NGOs (8)** | | |
| **47.** | CBSDC | 01 representative | **YAOUNDE** |
| **48.** | BDCPC | 01 representative | **YAOUNDE** |
| **49.** | Enviro-Protect | 01 representative | **YAOUNDE** |
| **50.** | Save nature | Reverend Ayuk | **YAOUNDE** |
| **51.** | Betterworld | 01 representative | **YAOUNDE** |
| **52.** | ASANEEF | 01 representative | **MBALMAYO** |
| **53.** | STANFAM | 01 representative | **BAMENDA** |
| **54.** | ACWITD | 01 representative | **BAMENDA** |
| | **Business (5)** | | |
| **55.** | CHOCOCAM | 01 representative | **DOUALA** |
| **56.** | Cameroon Tea Estate | 01 representative | **LIMBE** |
| **57.** | HEVECAM | 01 representative | **KRIBI** |
| **58.** | SOSUCAM | 01 representative | **MBANJOCK** |
| **59.** | MAISCAM | 01 representative | **DOUALA** |
| | **Parliamentarians (03)** | | |
| **60.** | Honourable Angeline Ndo | | **YAOUNDE** |
| **61.** | **Urban & Local councils (1)** | | **YAOUNDE** |
| **62.** | **Universities (5)** | | |
| **63.** | BUEA | 01 representative | **BUEA** |
| **64.** | YAOUNDE 1 | 01 representative | **YAOUNDE** |
| **65.** | DSCHANG | 01 representative | **DSCHANG** |
| **66.** | NGAOUNDERE | 01 representative | **NGAOUNDERE** |
| **67.** | YAOUNDE II | 01 representative | **YAOUNDE** |
| | **International Organs.** | | |

| | | | |
|---|---|---|---|
| | **(22)** | | |
| **68.** | SNV | 01 representative | **YAOUNDE** |
| **69.** | CARPE | 01 representative | **YAOUNDE** |
| **70.** | African Development Bank | 01 representative | **YAOUNDE** |
| **71.** | CIFOR | 01 representative | **YAOUNDE** |
| **72.** | ICRAF | 01 representative | **YAOUNDE** |
| **73.** | IITA | 01 representative | **YAOUNDE** |
| **74.** | IUCN | 01 representative | **YAOUNDE** |
| **75.** | FAO | 01 representative | **YAOUNDE** |
| **76.** | SNV | 01 representative | **YAOUNDE** |
| **77.** | GTZ | 01 representative | **YAOUNDE** |
| **78.** | UNDP | 01 representative | **YAOUNDE** |
| **79.** | UNICEF | 01 representative | **YAOUNDE** |
| **80.** | WWF | 01 representative | **YAOUNDE** |
| **81.** | World Bank | 01 representative | **YAOUNDE** |
| **82.** | UNICEF | 01 representative | **YAOUNDE** |
| **83.** | UNESCO | 01 representative | **YAOUNDE** |
| **84.** | WCS | 01 representative | **YAOUNDE** |
| **85.** | Global Water Initiative | 01 representative | **YAOUNDE** |
| **86.** | Living Earth | 01 representative | **YAOUNDE** |
| **87.** | Birdlife International | 01 representative | **YAOUNDE** |
| **88.** | COMIFAC | 01 representative | **YAOUNDE** |
| **89.** | **Technical Team (3)** | NGALA Israel | **MINEP** |
| **90.** | // | Adele Zaboya | **MINEP** |
| **91.** | // | Ms KIKA Delphine | **MINEP** |
| **92.** | **Support staff (6)** | Mr. NGUIMGOU Bienvenu | **MINEP** |
| **93.** | // | Ms. Constance Akwa | **MINEP** |
| **94.** | // | Mr. Walters Tafor | **MINEP** |
| **95.** | // | Mr. MUBE Peter | **MINEP** |
| **96.** | // | M. CHE Cyprine | **MINEP** |
| **97.** | // | Mme Wassou | **MINEP** |

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