IMPACT OF FOREST LOGGING IN THE DJA BIOSPHERE RESERVE, CAMEROON.

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ABSTRACT

The Dja Biosphere Reserve is located in the East and South Provinces of Cameroon. It covers an area of 5,260 sq. km and is classified among the largest protected areas of the Guinea-Congolian tropical rain forests. The Dja Wildlife Reserve is located at the meeting point of the low Guinean area and the Congolese Basin. The Reserve accommodates a large proportion of the equatorial flora and wildlife species including such endangered species as the forest elephants, the chimpanzees, and the gorillas. The major ethnic groups, the Bantus and the Baka Pygmies live side by side in and outside the reserve. The Dja reserve has not yet been subject to forest logging. But the high processing of timber extraction and the commercial hunting of large mammals around the reserve, result in fragmentation of the forest with negative impact on biodiversity and on the Baka pygmies. Today, eight (8) forest logging companies are working around the Dja reserve. In all, 157 429 m^3 of wood have been extracted in the North and the South of the Dja Biosphere Reserve from 2000 to 2003. Erythrophleum suaveolens (18,08% of the total volume of all species), Distemonanthus benthamianus (13,67%), *Baillonella toxisperma (11,76%) and Milicia excelsa (11,10%) appear to be the most important trees extracted according to the percentage of the volume exploited. During the month of July 2003, about 72,167 m^3 of Milicia excelsa for SOCIB and 7,154 m^3 of Entandrophragma cylindricum for LOREMA were illegally logged. Forest logging has been for the specific case of the Dja Reserve, a serious problem due to the reduction of wild fruits for local people and large mammals, and the intensification of commercial hunting in the Reserve. Animals are being hunted for sale primarily in towns and secondly in the forest sites. More than 70% of the plant species logged in the Dja region are scattered mostly by animals, which shows the importance of wildlife in the forest regeneration. Timber logging also has a negative impact on the medicinal value of the Dja forest, where about 80% of medicinal plants used by the local people are composed of ligneous species, with trees (50%) having the high proportion. Because of the lack of a definitive Simple Management Plan for the reserve, forest logging is being conducted in the areas that are supposed to be considered as buffer zones. The paper suggests the implementation of the Simple Management Plan (SMP) for the Dja Reserve and for each of the management forest unit boundaring the reserve. The improvement of the life of local people can also have a positive impact on the conservation of the biodiversity of the Dja Reserve.*

***Key-words**: Dja Reserve – Commercial hunting – Farming system – Monitoring.*

1. INTRODUCTION

Cameroon is located in central Africa and is usually referred to as Africa in miniature. It contains representations of continent's major ecosystems. According to the National Herbarium, Cameroon forests have 333 wood species, 6000 food plants and 1000 medicinal plants. The ratification of many international conventions and the creation of a certain number of protected areas all over the country are considered as index of conservation effort done by the Cameroon country. The Dja Biosphere Reserve is one of the most important protected area in Cameroon. It has not yet been subject to forest logging. But the high processing of timber extraction and the commercial hunting of large mammals around the reserve, result in fragmentation of the forest with negative impact on biological diversity (Betti 2002). This paper provide through the context of the Dja biosphere reserve, a preliminary assessment of the impacts of forest logging on the biological diversity and the possible fate of the Baka pygmies and their habitats, if current trends of timber logging continue. This work has been undertaken as part of an ongoing effort to assess the current status of the protect areas in Cameroon, and the pressures that affect them. The report is a case study for the Cameroon country, that will be presented in the seventh Conference of the parties (COP 7) of Convention on Biological Diversity (CBD) at Malaysia, from 9 to 23 february 2004. In the future, I aim to refine the assessment as improved information on the pressure of foreign trade companies on the timber extraction and the loss of biological diversity in the Dja forest. This report should therefore be viewed as a work in progress.

2. DESCRIPTION OF THE DJA RESERVE

The Dja Biosphere Reserve is located in the East and South Provinces of Cameroon (Fig. 1). It covers an area of 5,260 sq. km and is classified among the largest protected areas of the Guinea-Congolian tropical rain forests (Gartlan & Leakay, 1988). The reserve is bound by the Dja River which constitutes its natural boundary, except in the southeast.

The climate is equatorial and humid. Average annual rainfall is 1600 mm, while annual temperature is 23°C. The Dja loop is situated in the Congo basin on the Precambrian plateau. The altitude of this plateau varies between 600 and 700 m and slopes slightly towards the southeast. Relief is characterized by shallow valleys (Bedel *et al*., 1987).

The Dja Reserve belongs to the evergreen Cameroonian-Congolese forest, the Dja Congolese district to be precise. Among other salient facts of this district is the absence of semi-deciduous foliated forest species, at least in the Dja Congolese forest, which is intact as far as the trees and the underwood are concerned. The Acanthaceae shrubs of the semi-deciduous forest (at Yaoundé for example) are non-existent or rare (Letouzey 1985). According to Sonké (1998), three broad categories of forests can be distinguished in the Dja region: forests on rocks, forests on firm soil, and aquatic or hydromorphic forests. Forests on firm soil are further divided into primary forests (without perturbation) and secondary forests (subject to human or natural perturbation).

The Dja Wildlife Reserve accommodates a large proportion of the equatorial wildlife and flora (Gartlan 1989), and is located at the meeting point of the low Guinean area and the Congolese Basin. The Reserve was established as a Biosphere Reserve on 15 December 1982, and included in the list of world heritage sites on 5 December 1987.

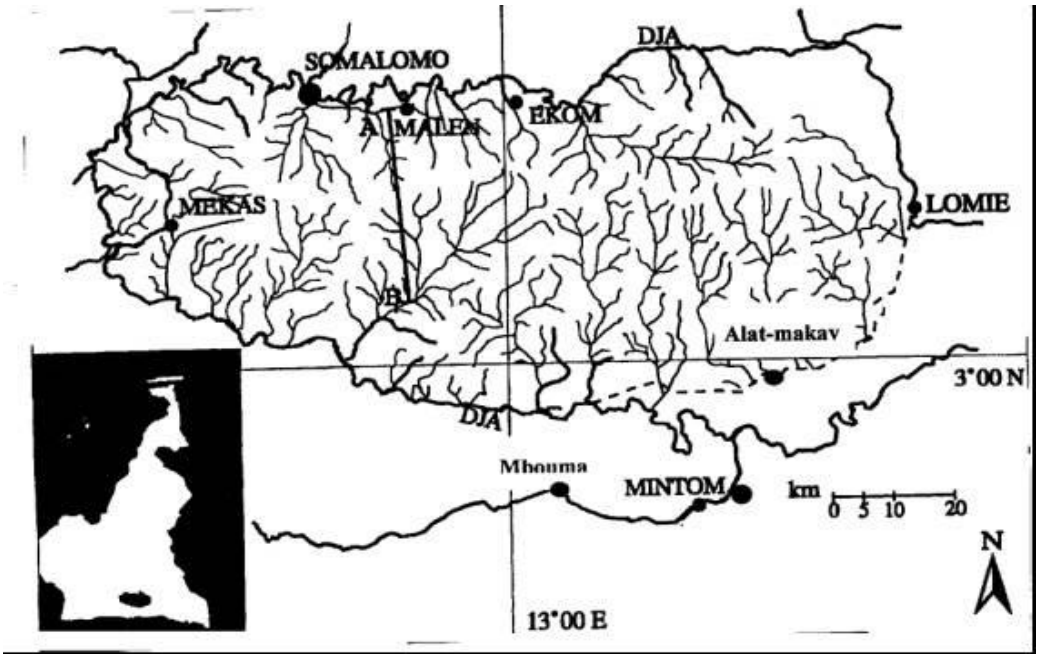

Fig. 1: Location of the Dja biosphere reserve in Cameroon

The major ethnic groups, the Bantus and the Baka Pygmies live side by side in and outside the reserve. The Bantus include the Badjoué in the North, the Nzimé in the East, the Mbulu in the West, the Fang-Nzaman in the South, and the Baka Pygmies and the Kako farmers who live mostly scattered in small settlements, mainly in the forest at some distance from the Bantu villages and roads. According to Gartlan (1989), the population density is not high, about 1.5 inhabitants/ sq. km. These people depend directly on the resources in the reserve for livelihood.

The Bantus practice "slash and burn" type of cultivation with a bimodal annual farming cycle, which is entirely dependent on the rainfall pattern (De Wachter, 1996). Hunting and gathering are practised by all. The cultivation cycle has been adapted to local conditions. Crop rotation represents a mix of the non-seasonal perennials, bananas and cassava, and the seasonal annual, groundnuts. The former can be planted and harvested at any time of the year. The latter deserve proper timing to make optimal use of seasonal rainfall.

As in the Itury forest in Haut Zaïre (Rösler 1997), men begin forest clearance in October/November. After measuring the fields, the undergrowth is remove with the machete, work which is usually done cooperatively by neighbours. Then trees are felled with axes, arduous work that continues for weeks with breaks of some days. Vegetation is not removed completely. Particular hard wood species are left standing. Clearing should be finished in January, so that felled vegetation will be dry enough to be burned in the middle of February at the peak of the dry season. Further cutting and burning of logs and trunks is carried out later, as pieces of land are prepared for planting. The first bananas and cassava can be planted in the new field as soon as the underbrush has been cut. Subsequent burning does not harm shoots or larger plants. Ground nuts are sown March/April and harvested June/July. Land is weeded and burned before ground nuts is secondly

sown in September/October and harvested December/January. High amounts of rainfall over nine months of the year generally provide considerable latitude in the timing of activities, and there are variations of up to three months in planting and harvesting dates of groundnuts. Nevertheless, yields can vary according to rainfall, damage inflicted by game, and labor input. According to De Wachter (1996), the labor is considered as the main limit factor, while fied-forest rotation is the “uniq mean” of improving soil fertility.

In terms of food preferences, cassava and ground nuts are often declared by the Dja people to be the more favoured than other crops. Cassava is also considered a food reserve, a substitute for bananas on poor soils. Since bananas demand fertile soils, their high preferential rank requires long forest fallow. This traditional agriculture does not consumes the forest. Only 5% of the primary forest is being depleted annually (De Wachter 1996, 2000).

3. FOREST LOGGING IN THE DJA AREA

The Dja Biosphere Reserve has not yet been subject to forest logging. But the high processing of timber extraction and the commercial hunting of large mammals around the reserve have negative impacts in its biological diversity. Forest logging began in 1970 in the Dja reserve. The main forest companies working in the East of the Dja reserve by the year 1980 were: CFB (licence 1740), Pallisco (1758 and 1818), SOCIB (1791), Lorema (1811), and SEPFECO (1938). By the year 1990, forest logging incresased more and more with the multiplication of the “ventes de coupe” at the East, North, and West of the reserve (Global Forest Watch 2000). About eight forest logging companies are now working around the Dja Reserve. These companies are listed here with their management forest unit (UFA): Assene Nkou (UFA 10 044) and SODETRANCAM (10 042) in the North-east; FIPCAM (10 047) in the North, Pallisco (10 041), Assene Nkou (10 039) and Kieffer (10 037) in the East; SFF (09 006), SOCIB (09 005b), and Lorema (09 003, 09 004a, 09 005a) in the South (Global Forest Watch 2003). In all, 157429 m^3 of wood have been extracted in the North and the South of the Dja Reserve from 2000 to 2003 by the following four companies: FIPCAM in the North, LOREMA, SFF and SOCIB in the south. LOREMA company being the one which extracted the high quantity of wood with 44,32% of the total volume (fig. 2).

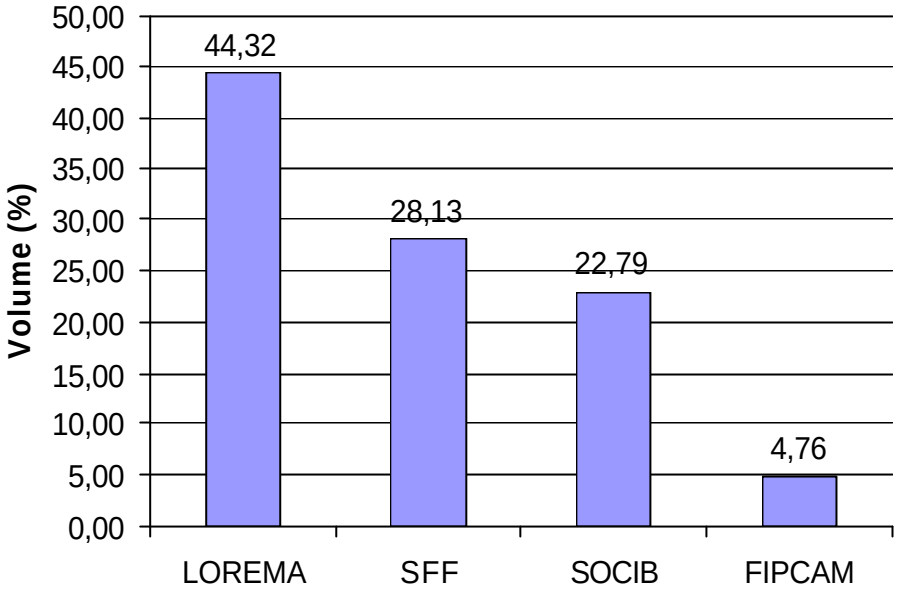

Fig. 2: Relative importance of forest companies working in the north and east of the Dja reserve in terms of total volume of timber extraction between years 2000 and 2003.

In all, 45 plant species were extracted in the Dja region. Figure 3 illustrates the relative importance of the 12 most logged species in the Dja area between 2000 and 2003. Those 12 species represent a total volume of 143 032 m3 of wood, which is about 90,85% of the total volume of wood logged during the period indicated. *Erythrophleum suaveolens* (18,08% of the total volume of all species), *Distemonanthus benthamianus* (13,67%), *Baillonella toxisperma* (11,76%) and *Milicia excelsa* (11,10%) appear to be the most important trees extracted according to the percentage of the volume exploited.

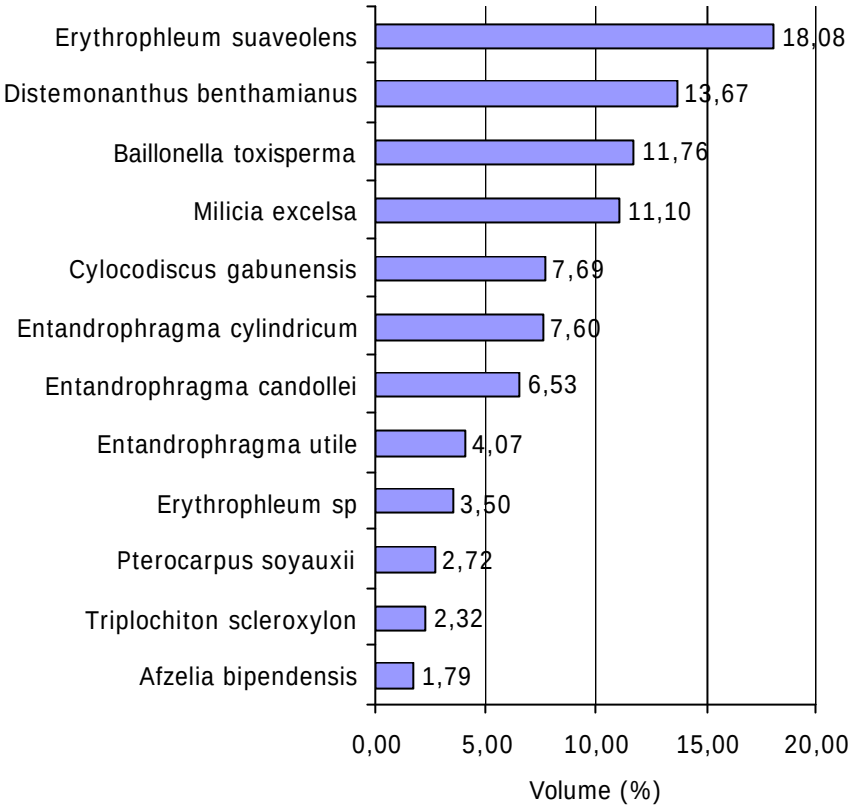

Fig. 3: Relative importance of plant species extracted in the north and east of the Dja reserve in terms of total volume of timber logging between years 2000 and 2003

Forest logging is being conducted in the areas that may be considered as buffer zones. The lack of a definitive management plan is the main cause of this situation.

During the month of July 2003, two companies LOREMA and SOCIB working in the South of the Reserve practised an illegal logging. In all, 72,167 m^3 of *Milicia excelsa* for SOCIB and 7,154 m^3 of *Entandrophragma cylindricum* for LOREMA were logged under the Minimum Diameter of Exploitability (DME). The two companies deliver their wood to SFID, a big French company (MINEF/PSRF 2003).

3. IMPACT OF FOREST LOGGING IN BIODIVERSITY

The Dja accommodates a variety of wildlife species including such endangered species as the forest elephants (*Loxodonta africana cyclotis*), the chimpanzees (*Pan troglodytes*), the leopards (*Panthera pardus*), as well as the forest buffaloes (*Tragelaphus euryceros*) and the gorillas (*Gorilla gorilla*).

In central Africa, forest logging leads to the destruction of 17% of forest area. The extraction of 5,5 m^3/ha of tropical forest leads to the loss of 3,8 m^3/ha (Global Forest Watch 2000). For the specific case of the Dja Reserve, forest logging constitutes a serious problem due to the reduction of wild fruits such as moabi (*Baillonella toxisperma*) for local people and large mammals and due to the intensification of commercial hunting in the Dja Reserve.

In the Dja reserve as well as in many african countries, the bush meat has become the main source of incomes supplies, following the economic crisis which attacked the Cameroon country in the late 1980s. The importance of Cocoa and coffee as cash crops declined and their cultivation has been abandoned completely. Number of hunters and the level of commercial hunting increased in the villages boundaring the reserve. Commercial hunting has been recognised as the principal threaten of wild life in Cameroon (Alpert 1993), and most specifically in the Dja region (Jeanmart 1998, Auzel 1999). In the North of the Dja reserve for example, Auzel (1999) noted an important trade of bushmeat leading primarily to towns, cities and secondly to forest sites (logging companies). Every year, more than 50 chimpanzees (*Pan troglodithes*) are being killed in the Eboumétoum forest site. The recent finding of an important trade of large mammals in the East of the Reserve by a team of the Green Peace, an international NGO, is an illustration of the commercial hunting of large mammals in the Dja Reserve.

In addition in towns and cities (Djoum and Sangmelima in the South province, Abong-mbang in the East province and Yaoundé in the Centre province of Cameroon), where domestic meat is freely available, bushmeat has become a luxury item, demanding a high price and fuelling the trade (Delvingt *et al*. 2000).

Traditional small-scale subsistence hunting, in which meat is hunt for local consumption and exchange, is being replaced by large-scale commercial hunting. Animals are being hunted primarily for sale in towns and cities, away from the forest villages. Commercialisation has led to over-hunting, and this is seriously depleting the populations of many forest-dwelling animals in the Dja region.

Exceptionally high levels of hunting, combined with accelerating habitats loss, are undoubtedly having a major impact on populations of forest animals and forest people (the Baka pygmies mostly). As more areas are hunted, there are fewer places that can act as a source of animals for recolonisation. Forest are growing quiet as the animals disapear, and in some areas many of the large animals have been killed, with negative consequences for both local people and global natural resources.

Some seeds need, before growing, to pass trough the digestive tube of some animals. Among these plants, those that are mainly scattered by large mammals, are said to be more vulnerable due to the commercial hunting of those animals in Africa in general and particularly in the Dja region. Plant species such as *Strychnos camptoneura* (Loganiaceae) or *Tetrapleura tetraptera* (Mimosaceae) can only be scattered by elephants (Christy 1999). The extermination of elephant, can lead at term to the floristical depletion of the tropical forests (Bousquet 1992). More than 70% of the plant species logged in the Dja region are scattered mostly by animals, which corroborates the results obtained by Betti (2001) and Sonké (1998) for the same area, showing the importance of wildlife in the forest regeneration. Research done on fauna and flora tend to show that the forest logging associated with the commercial hunting leave a dramatic situation in the periphery of the Dja reserve. The seed trees disappear and the scattered fauna is reduced to small animals of cultivated zones (Auzel 1999, Betti 1999, Delvingt 1997, Delvingt *et al*. 2000, Jeanmart 1997).

4. IMPACT OF FOREST LOGGING IN THE BAKA PYGMIES LIFE AND ON THE MEDICINAL VALUE OF THE DJA FOREST

Forest logging through the destruction of the forest has anormous costs for biodiversity, but also for forest people living in poverty thereby threatening their habitats and their access to food and medicine. For the specific case of the Baka pygmies living in the Dja reserve, it also means the loss of traditional lifstyles and their cultural identity.

Baka were among the first inhabitants in the Dja area (Bahuchet 2000). Their cultural identity is entirely link not only to their traditional practices, but also in their identification to a particular forest sector (Bailey *et al*. 1992). A large proportion of the habitat of the Baka pygmies (primary forest) has been negatively affected by the forest logging in the Dja region. Habitat loss, fragmentation and degradation are the major factors threatening Baka pygmies survival (Global Forest Watch 2003).

In central Africa, pygmies are well known in literature as the great healers, who know much about forest products (Bouquet 1969; Motte 1980). As in the case of Baguyeli Pygmies in the south-Cameroon (Dijk 1999), the large majority of medicines used by the Baka Pygmies are of plant origins (Motte 1980). The direct use of animal products is limited to the treatment of some specific ailments. For example, the shells of a giant snail (polo) is used for treating lumbago, the bones of the leopard are used as aphrodisiac and the eggs of turtles (kunda) is used for treating haemorroids.

The use of plant medicines plays an important role in daily health care. Local medicines are even preferred to modern medicines. They are of course less expensive, but they are often regarded as being more “effective”.

According to the Baka women interviewed in the Dja reserve for example (Betti in press), the *motoko-toko* (*Picralima nitida*) is at least twice as strong as chloroquine against malaria, and the *ma’a polo* (*Chenopodium ambrosioides*) has a similarly stronger potency than “vermox” against intestinal worms. In some households, “modern” health care is often applied in combination with traditional treatments.

Some medicinal plants used by the Baka pygmies for treating certain diseases are widely used in African countries in similar ways. There are also plants of which their effectiveness is confirmed in the literature with their biological activity relating to the specific diseases (Betti 2001, in press). The following are three of such plants used by the Baka pygmies and logged in the Dja biosphere reserve (Betti in press):

(1) *Alstonia boonei* (Apocynaceae) or Gouga (Baka’s name) was recorded among the Baka pygmies for treating abscess, hernia, jaundice, malaria, snake bites and typhoid fever. The usage against malaria is the more important and similar uses are also known in other African countries, such as Equatorial Guinea (Bitsindou 1996), Congo-Brazzaville (Diafouka 1997), Nigeria, Senegal and Togo (Richel 1995) and the Democratic Republic of Congo (Magilu *et al.* 1996). The genera Alstonia is not effective for malaria (Wright *et al.* 1993, Makinde & Salako 1991). But the bark of *A. boonei* (Olajide *et al*. 2000, Oliver-Bever 1986) has antipyretic properties which may explain the frequent use of this plant species for malaria, jaundice and typhoid fever. The

three diseases are characrerised by high fever, which appears to be the most important symptom (Betti 2002a, in press).The utilizations of A. boonei against abscess, hernia and snake bites may be linked to the analgesic (Olajide *et al.* 2000) or anti-inflamatory (Kweifio-Okai 1991, Kweifio-Okai *et al.* 1995, Olajide *et al.* 2000, Rajic *et al.* 2000) properties of the plant. About 243 m^3 of wood of *A. bonnei* were logged from 2000 to 2003 in the Dja Reserve.

(2) *Baillonella toxisperma* (Sapotaceae) or "Mabé" is the most important plant in the treatment of lumbago among the Baka pygmies (2002b). This usage is also known in the Cameroonian pharmacopoeia (Adjanohoun *et al.* 1996) and in the Congo-Brazzaville country (Bouquet 1969). About 18514 m^3 of the wood of *B. toxisperma* were logged from 2000 to 2003 in the Dja Reserve.

(3) *Nauclea diderrichii* (Rubiaceae) or Mossé à yooli is largely used among the Baka pygmies for treating malaria/fever. Similar use is known the Congo-Brazzaville and the Democratic Republic of Congo countries (Bitsindou 1996). Oliver-Bever (1986) confirmed the antipyretic properties of the plant. About 452 m^3 of the wood of *N. diderrichii* were logged from 2000 to 2003 in the Dja Reserve.

These examples show that some plants largely used among the Baka pygmies have often effective chemical substances, which explains the negative impact of forest logging on the Baka's life and the need of developing alternative medicines from local knowledge. Since current trends of timber logging continue in the Dja forest, the Baka pygmies are threatened with extinction.

The direct negative impact of timber logging on the medicinal value of the forest can also be illustrated through the extraction of ligneous products. About 80% of medicinal plants used by the people living in the Dja area are composed of ligneous plants, with trees (50%) having the high proportion (Betti 2001). Ligneous plants contain histological and anatomical structures of production and reserves. These structures allow the elaboration and the accumulation of secondary compounds (metabolites), which are responsible of the medicinal value of plants (Gayral 1961, Baniakina *et al*. 1995). According to Hladick A. and Hladick C.M. (1977), ligneous species have a high quantity of alkaloids compared to herbaceous species. That is why traditional healers prefer ligneous plants in their medicines. This is also true for the plants found in the home gardens in the Dja region, where trees represent 63% of medicinal plants (Betti 2001).

5. SOLUTIONS SUGGESTED

Urgent actions are required by the Cameroon goverment, with the financial and political support from the international community, to ensure the future survival of the Dja Biosphere Reserve.

The first solution will consist of establishing and implementing the Simple Management Plan (SMP) of the Dja reserve. The management plan must draw the three main functions assigned to a biosphere reserve: the conservation function, the development of local communities function and the logistical (research, and monitoring) function.

The second solution could consist of forcing the forest companies working in the Dja area to establish and implement the Simple Management Plan of their management forest unit (UFA). Althought the Cameroon forest policy is clear for the sustainable management of the UFA, no company has establish and implemented its Simple Management Plan. The Simple Management Plan of a UFA may identify high biodiversity sites of a given forest and propose specific controlled logging activities.

The third solution could consist of improving human being of local people. By investing in alternative meat and incomes supplies, the pressure on wild animal populations could be dramatically reduced. If these changes occur soon enough, many people believe that it will still be possible to save species such as chimpanzees, gorillas and elephants that are threatened by hunting in the Dja Reserve. Although it is widely recognised that poverty is the main cause of reduction of biological diversity, it has never been examined, wether agricultural yields improvements can contribute to the reduction of commercial hunting in Cameroon. This hypothesis can be test in the specific case of the Dja Biosphere Reserve. According to UNESCO (1996), the Biosphere Reserves are the sites where the compatibility of the conservation activities and the economical development actions can be tested. The development actions may be controlled, since it is stated that uncontrolled road construction in few remaining pristine forests as the Dja district makes increased bushmeat hunting and deforestation possible (UNEP 2003).

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