13 Cameroon

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13.1 Cameroon in brief

Cameroon is a Central African country, covering 475,000 km^2, situated between latitudes 2° and 13° N; longitudes 8°30′ and 16°10′ E. This position endows the country with diversified ecological and climatic conditions, ranging from semi-desert conditions in the north to tropical rain forest climates in the south, and hence many quite different vegetation types (see Letouzey 1968), and harbours 80,000 ha of plantation forest.
The population totals 19.4 millions (2010), with an annual growth rate of 3 %, and a density of 34.4 persons per km^2. Nearly half of the population lives in rural areas (FAO 2005), indicating the importance of forest for the population.

The total forest cover, with different types of forests ranging from evergreen forest to forest-savannah mosaic, is estimated to be 22.5 million hectares, of which 16.5 million are dense humid forests with high potential for logging (MINFOF 2005; De Wasseige et al. 2009). After some fluctuations at the start of the 21st century timber production has stabilised at about 2.3 million m^3 as from 2006 (De Wasseige et al. 2009). Logging is highly selective as only two species (*Triplochyton scleroxylon* and *Entandrophragma cylindricum*) account for more than 50 % of the production. Of the six types of logging rights, Forest Concession is the most important one in terms of the total volume of timber produced. About 100 Forest Concessions, made up of 110 Forest Management Units, and covering a total area of 6.5 millions hectares, presently have been granted. 45 % of this has been attributed to Cameroonians and 55 % to foreigners (MINFOF 2010). The above figures do not include non-conventional logging, an informal activity that is essentially illegal. Nevertheless, it remains the main source of lumber for local need/use, as the production from logging companies is meant mainly for export (Foahom 2007). Moreover, forest harvesting is not confined to logging but includes gathering of non-timber forest products (NTFPs, see Van Dijk 1999).

Even though the Forest sector's contribution to the national GDP (6 %) is the highest in the Congo Basin and represents the State's third source of hard currency, this contribution is still far from its real potential (De Wasseige et al. 2009).

13.2 Development of forest management till 1994

The first forest regulations of Cameroon date from 1974. Until then, activities in the forestry sector were governed by a colonial ordinance. The 1974 regulations were revised in 1981 and implemented in 1983. Procedures regarding licences, exploitation control and taxes were documented in a guide entitled "*Cahier des procédures pour l'exploitant forestier*" (Guidelines for forest exploitation procedures) (MINAGRI 1988).

Photo 13.1. Tropical rain forest near Kribi, photographed from Mont d' Elephant. (Photo Hans Vellema)

The forest was perceived mainly as a timber producing ecosystem, resulting in the marginalisation of other forest functions and products. So also did forestry research or any other action directed at forest management. Research activities focussed overwhelmingly on biological and technological factors, aiming at generating more knowledge on biological characteristics of forest ecosystems and their potential to produce timber, and developing silvicultural techniques for the most important timber tree species. Even if the quest for sustainability was a matter of concern in those days, it tended to focus on sustainable timber production.

Forest exploitation licences were granted to private companies for a period of five years and were renewable. The concession areas were divided into working coupes of 2,500 ha called "*Assiette de coupe*". After a coupe was closed, re-entry to harvest more timber was not permitted. The licensee nominated the coupes in advance. Maps were produced, showing the positions of harvestable trees, proposed forest roads, and the inventory results of commercial species. Other forms of logging permits are described below.

Photo 13.2. Flushing *Lophira alata*. (Photo Tropenbos International)

There were 45 tree species listed as obligatory for inventory purposes. It was not allowed to fell

trees smaller than a diameter specified in the "*Cahier*". The minimum diameter varied from 50 to 100 cm, depending on the species. Average volume extracted per hectare was estimated at 5 m^3 out of a commercial volume of about 35 m^3 (Evans 1990) as a consequence of the prevailing selective logging.

The writing of a Forest Management Plan was not a prerequisite to forest exploitation. Gazetted permanent production forest was almost non-existent, and timber production came from short-term concessions of one to five years.

13.3 Forest policy and its implementation since 1994

FAO's 1986 Tropical Forest Action Plan and the Rio Summit of 1992 stimulated the development of a new forest policy (NFP), accepted by parliament in 1994. Emphasis was shifted from the tree to the entire forest, including:

- the protection of the country's forest heritage;
- the participation of the local populations in the whole process of forest management;
- the improvement of the forest's contribution to the GDP, while preserving its productivity.

The NFP aimed at integrating the new perception of sustainable forest management, taking into account its multiple functions, and to safeguard the benefits derived by Cameroonians, now and in the future. The NFP consists of a set of institutional and legal regulations (law n° 94-01 of January 1994) and implementing instruments, such as the National zoning plan (Côté 1993), the National forestry action programme (MINEF 1995) and Guidelines for the elaboration of forest Management Plans and for Community forests (MINEF 2001). In the framework of this law, two ministries (the Ministry of Forests and Wildlife, MINFOF; and the Ministry of Environment and Natural Protection, MINEP) and one implementing institution (the National Agency to Support Forest Development, ANAFOR) were set up.

A new strategic plan, entitled "Forest-Environment Sector Programme" (PSFE) (MINEF 2003), is the outcome of an evaluation of ten years of implementation of the NFP, indicating a number of shortfalls:

- institutional shortfalls due to poor involvement of all parties including research institutions;
- specific shortfalls, such as poor integration of environmental concern into logging operations and limited application of Forest Management Plan procedures, due to inadequate knowledge and tools;
- poor coordination leading to poor capitalisation of outcomes generated by actions implementing the NFP.

The PSFE is therefore a coherent framework for improved implementation of the NFP, in order to meet the challenge of sustainable use of forest resources by all stakeholders. The PSFE, implemented since 2005, consists of five components:

- Component 1: Environmental management of forest activities (MINEP);

- Component 2: Production forests management and valorisation of forest products (MINFOF);
- Component 3: Biodiversity conservation and valorisation of wildlife products (MINFOF);
- Component 4: Community management of forest and wildlife resources (MINFOF);
- Component 5: Institutional reinforcement, training and research (MINFOF).

13.4 Forest reserves and off-reserve tree resources and their utilisation

The NFP stipulates that the national forest estate includes, in conformation with ITTO guidelines (1990), two forest categories: Permanent Forest and Non-Permanent Forest (Figure 13.1). Permanent Forests should cover at least 30 % of the national territory and reflect the nation's ecological diversity. So far, 22 % of the national territory has been allocated, including game ranches (FORAF 2008). For the southern-forested area, covering 14 millions ha, a National Zoning Plan (Côté 1993) forms an indicative framework for land use planning which is open to negotiation among stakeholders during implementation. Timber tree resources originate from diverse national forest estate types of Permanent and Non-Permanent Forests (Figure 13.2). Production Forests are meant mainly for timber production and account for more than 80 % of the total timber production (Figure 13.2). However, protected areas (Forest Protection) are not free from logging activities, especially not from non-conventional, i.e. mainly illegal, logging.

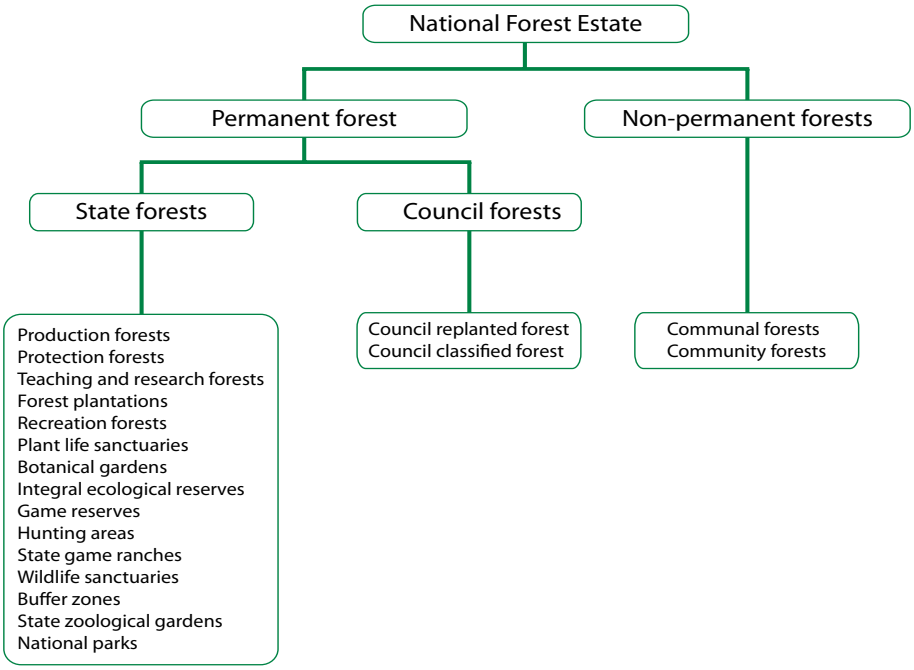

Figure 13.1. Categories of classified forest in Cameroon (Foahom et al. 2001).

According to the law, logging activities should be conducted, based on different categories of logging rights, as provided by the 1994 forest law:

- *Sales of Standing Volume*: Applied to state forest (permanent forest), logging should be undertaken in accordance with its management plan for a limited period of time. Applied to communal forests, it is an authorization to exploit, in an area not exceeding 2,500 ha, a specific volume of standing timber for sale;
- *Exploitation Permits*: This allows the extraction of not more than 500 m^3 timber for commercial ends in one non-permanent forest;
- *Individual Felling Authorisation*: This allows the extraction of not more then 30 m^3 of wood for non-commercial use from non-permanent forests. It is granted for a non-renewable period of three months, only to Cameroonian nationals.
- *Exploitation Contract (Concessions):* This aims at a long-term timber supply out of Production Forests for the wood processing industry of the licence-holder. It is agreed upon for a maximum period of 30 (2 times 15) years and is re-assessed every third year. It applies to a concession that may include one or more Forest Management Units (FMU) and does not exceed 200,000 ha.
- *State Exploitation or Sub-contracting Agreement*: It allows exploitation in state forests. This can be done either through the sale of standing volume or through an exploitation contract. However, the forest may be exploited by the administration in case there is need to recuperate the forest products concerned or in case of an experimental project.
- *Wood Recovery Permit*: It allows exploitation, when a forest has to be cleared for industrial or agricultural purposes, such as the establishment of an oil-palm plantation, where all trees would be destroyed anyway. It does not require trees of a minimum diameter to be left, nor a forest inventory.
- *"Vente de Coupe"*: It allows exploitation only in a non-permanent forest which can be converted into other forms of land use. It does not require a management plan and logging can be sub-contracted.

Photo13.3. Timber transport to the harbour of Kribi. (Photo H. Duiker)

As logging and forest exploitation remain an important economic sector in Cameroon, the government is struggling to ensure sustainable management of the forest resources. The different types of logging permits are currently allocated and the trend for a specific type to be more attractive depends on how easy the permit is obtainable. Of these eight types of logging permits, concessions (FMUs) are the ones that require management plans and which are allocated through a competitive bidding process. Next to these different legal logging rights and practices, non-conventional logging is a current practice in Cameroon, which is essentially illegal and informal. There are not many precise data on this activity, but so far it is clear that not only many people are involved, but also that chainsaw logging and lumbering, which is a main activity in non-conventional logging, appears to be the main source of lumber for local markets (Foahom 2006).

According to the 1974 Land Ordinances, all unoccupied land, considered here as Non-Permanent Forests, belongs to the state. In national forest estates (mainly Production Forest), logging companies are granted rights on forest resources to be harvested but not on the land. In Non-Permanent Forests, local people are granted user rights to meet their day-to-day needs (harvesting NTFP and construction materials, farming, hunting,) but they are not considered as land owners, unless they are holders of a state-issued land certificate. The certificate is issued provided that the said land bears visible signs of human presence, such as a building or perennial crops. Exploitation of trees in such areas is based on specific logging rights (see above), which are not restricted to individuals or communities close to that forest. Trees belong to an individual or a group, as far as those are planted by him, her or them; their user rights can be allocated to other people (to a third person). This applies only to timber trees, for trees producing NTFPs (*Baillonella toxisperma*, for example) form part of a heritage when they grow on farms. Local people can claim right on trees belonging to such an area (Non-Permanent Forest) and can use them accordingly, whether it is a fallow or a current farm.

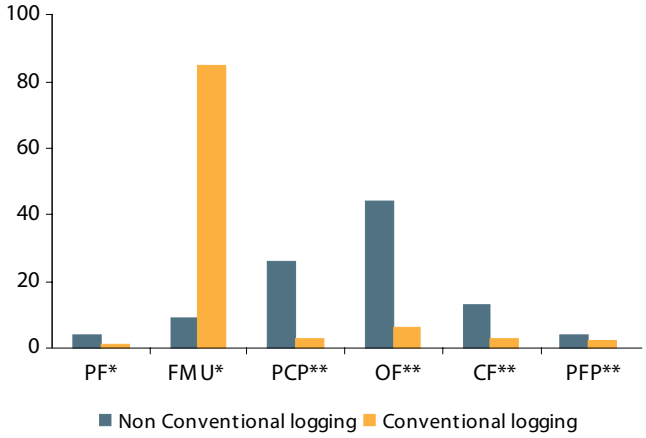

Figure 13.2. Percentage of tree resources according to different logging areas (Foahom 2006):
* Permanent Forests: Protection Forest (PF) and Forest Management Units (FMU).
* Non-Permanent Forest: Perennial Crop Plantations (PCP), Old Fallows (OF), Community Forest (CF) and Private Forest Plantations (PFP).

13.5. Productivity and annual allowable cut

The logging potential of Cameroon is quite substantial (Table 13.1). The figures in Table 13.1 include all actual and potential commercial timber tree species, estimated to be about 600 species. However, under prevailing economic conditions, most tropical countries are not achieving anywhere near the value that should be attained from harvesting, processing and marketing tropical moist forest species (Plumptre 1996), and this applies also to Central African countries (PFBC 2006). In Cameroon for example, average volume extracted, estimated at 7-10 $m^3.ha^{-1}$, and the average logging intensity, less than one tree per hectare, are low, compared to estimated figures of 50-80 $m^3.ha^{-1}$ in South-East Asia and 10-20 $m^3.ha^{-1}$ in Brazil (Karsenty & Maître 1994; Jonkers & Foahom 2003). This considerable difference is probably due to a selective choice of timber species in Cameroon (Figure 13.3).

Table 13.1. Estimated volume of exploitable timber according to land vegetation cover (MINFOF 2005)

Type of vegetation cover	Logging potential		
	Mean	Total	Percentage
	$m^3.ha^{-1}$	$10^6\ m^3$	%
Forest lands*	54.0	1,147.5	92.9
Other woodlands	1.6	23.4	1.9
Other lands	5.7	64.4	5.2
Total	**26.0**	**1,235.3**	**100.0**

* Congo-Guinean floristic region (Letouzey 1968) covering about 45% of the national territory

The forest management plan (FMP) concept was introduced in 1994 as part of the NFP, aiming at ensuring the production capacity of Production Forests including not only economic function, but also ecological and social functions of the forest. One of its main objectives is to ensure a continuous supply of timber. Consequently, timber yields should not exceed the net volume increment of the species to be harvested. The FMP therefore fixes the annual allowable cut (AAC). The AAC is expressed in terms of maximum yearly exploitable surface area (*Possibilité par contenance*) and/or the maximum volume of forest products (*Possibilité par volume*) to be extracted.

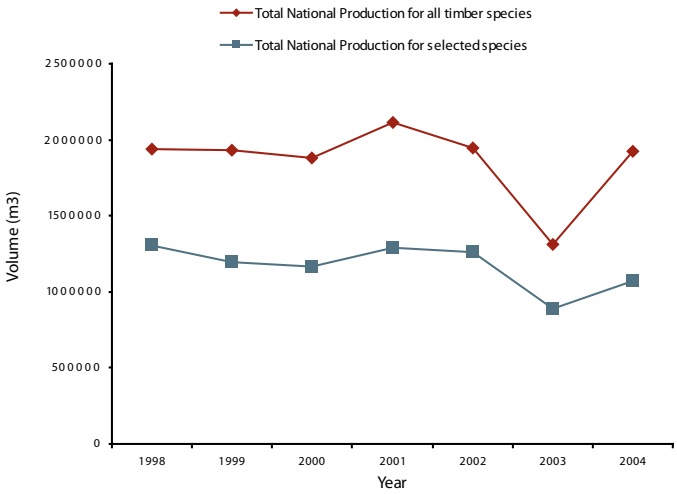

Figure 13.3. Selective logging in Cameroon, with four species representing more than 60% of the total timber production (Foahom 2006). Selected species are *Triplochiton scleroxylon, Lophira alata, Entandrophragma cylindricum, Afzelia bipindensis*).

Within the framework of the Tropenbos-Cameroon Programme, the so-called TROPFOMS (TROPical FOrest Management support System) model was developed (Eba'a 2000) as a tool to help the forest manager to determine sustainable production levels of production forests. For a given forest, the model calculates the growing stock at steady state, estimates the cutting cycle, the amount of timber to be harvested during each cutting cycle and the length of the conversion period. TROPFOMS is considered the best

model available in Cameroon, mainly because it includes the economic and ecological management aspects too. However, TROPFOMS has its limitations. As reliable increment and mortality data from Cameroon are not available, data used for its development were from Liberia. This applies to many other yield calculation programmes utilised in Cameroon, including the one used to estimate the AAC. Like in any model, the reliability of the output depends on the quality of the input data. Data collected in Cameroon and used in due time to update the model will certainly improve its reliability.

13.6. Silvicultural systems in Cameroon

In Cameroon, some silvicultural systems were applied or tested on a larger (practical) or smaller (experimental) scale:

- The **Natural regeneration system** "*Amélioration des Peuplements Naturels* (APN)" (natural stand improvement) was designed for the management of 175,000 ha semi-deciduous production forest in Deng-Deng (east Cameroon) (FAO 1977). Improvement operations were applied when at least 15 trees per hectare were available for future logging (diameter 20 to 40 cm). Twenty-two timber species in four timber quality classes were considered. Silvicultural operations undertaken three to five year after logging consisted of liana cutting and sanitary thinning to reduce competition. Natural regeneration was recorded but not provoked. Tending was planned in case regeneration occurred. If not, enrichment planting had to be applied, using some Sterculiaceae and Meliaceae timber species. This attempt to develop a management system for the Deng-Deng semi-deciduous forest was not successful due to institutional obstacles. More recent experiments testing an adapted form of the CELOS Management System are described in Section 7.
- **The Enrichment techniques** "*Méthode des grands layons*" (new lines method, Photo 13.3) and "*Méthode des Placeaux*" (small quadrat plots) were used to establish about 5,000 ha forest plantation some 70 years ago.
- **The Conversion techniques** "*Méthode de sous-bois*" (understory method), "*Méthode du Recrû*" (regrowth method), mechanised methods and methods associating crops (Taungya, for example) have been applied in Cameroon. Most of these and other methods developed in Central and West Africa and overseas were tested in Cameroonian context. Experimental plots were established in the most important forest zones in the Congo-Guinean region. *Aucoumea klaineana* (Okoumé), one of Africa's prime timber species, is presented here as an illustration (Table 13.2). Various silvicultural methods were tested. Preliminary results showed that the "new lines method" was not appropriate for the species, while the "mechanised strip method", a thinning operation, could be appropriately undertaken after 15 years, taking into consideration the mean diameter and the number of elite trees. The stand under the "regrowth method" was of somewhat less quality, but still acceptable. Thinnings in *Aucoumea* stands are delicate. The remaining elite trees have to be surrounded by dominated, suppressed trees, thus protecting the stand against 'black cancer' attacks.

Table 13.2. Characteristics of *Aucoumea klaineana* stands under three silvicultural treatments (Foahom 2005a)

Parameter	Dimension	Silvicultural treatment (*)		
		New lines methods	Mechanised strips	Regrowth methods
Years after treatment (age of plantation)	y	16	14	18
Density (d)	$n.ha^{-1}$	176	527	370
Basal area (G)	$m^2.ha^{-1}$	12.0	21.6	19.7
Diameter of tree of mean G (Dm)	cm	29,5	22,8	26.0
Mean annual increment (MDI)	$cm.y^{-1}$	1.8	1.6	1.4
Dominant trees	$n.ha^{-1}$	86	248	133
Co-dominant trees	$n.ha^{-1}$	53	190	96
Suppressed trees	$n.ha^{-1}$	37	89	141
Elite trees (among dominants trees)	$n.ha^{-1}$	7	114	96

(*) The 3 treatments apply to disturbed forest (after logging), with 3 different methods of land preparation :
- New Lines methods: Open East-West plantation lines 5 m wide, 10 to 20 meters apart. In order to improved the amount of light reaching the plantation lines, all trees (between lines) of more than 20 cm diameter are also poisoned.
- Mechanised strips: Mechanical land preparation where natural forest is completely destroyed, than line planting at 3 to 5 m apart.
- Regrowth methods: Manual land preparation where the forest is completely destroyed manually using cutlass/ chainsaw (for trees less than 20 cm diameter, at 40 cm above ground) and poison (for trees more than 20 cm diameter). Forest floor is preserved and line planting is undertaken at 3 to 5 m apart.

Forest plantations in Cameroon cover a total area of about 80,000 ha. All these plantations were established by the State, the most recent ones in the 1990s. Unfortunately, most of them failed as a consequence of lack of adequate tending. Since the 1990s only some small short rotation stands of *Eucalyptus* sp. have been planted by private persons in the Western Savannah zone.

Photo 13.4. An enriched forest stand with *Terminalia ivorensis* at Bilik (Cameroon), using silvicultural enrichment technique (new lines method). (Photo B. Foahom)

Conversion techniques are often looked at as a system that simplifies the ecosystem, especially concerning monospecific stands. It has been shown, however, that the vegetation/ species diversity of the natural regrowth under broad-leaved plantation stands is comparable to that of the surrounding, somewhat disturbed, natural forest (Foahom et al. 2005; Ngueguim 2007). Moreover, forest plantations present the advantage of yielding up to five times the volume of (harvestable) timber per ha, compared to natural stands and even more when one takes into consideration the selective character of logging activities in natural forest.

For quite a long time, the question to plant or not to plant has been discussed, thus underlining differences in the perception of its opportunity (Dupuy 1989). The reluctant attitude vis-à-vis forest plantations prevailed as they were considered to be costly. Whether it is better to plant or not to plant depends on the starting point (the forest quality) and the aim to be achieved. Moreover, timber from plantations is gaining a significant share of the market. This development may in the long run reduce the pressure on natural forest. In Cameroon, planting is gaining importance, through the government's strategy to stimulate planting operations by the private sector, communities, individuals, etc. As the state is no longer engaged in production activities, including plantations, the stimulation of plantations is the main task of ANAFOR. The policy framework for it, the "*Programme National de Reboisement*" (MINFOF 2006), was recently launched. Silvicultural techniques for the most important timber and NTFP tree species are being developed too (Foahom 1992; Sunderland et al. 2000).

13.7 Experiences from the Tropenbos-Cameroon Programme

Within the framework of the Tropenbos-Cameroon Programme, a natural regeneration technique, adapted from the CELOS Management System (De Graaf 1986; Jonkers 1987; Hendrison 1990; De Graaf & Van Rompaey 1990) and Côte d'Ivoire experiments (Miélot & Bertault 1980; Maître 1988), was tested between 1995 and 2001. Two types of silvicultural treatment, pre-felling and post-felling treatments, were studied. Prior to this, the phenology of 86 timber species and the forest structure was assessed. The diameter class distribution was found to be similar to the exponential model as described by Rollet (1979), meaning that a steady increase in the number of trees of harvestable sizes after silvicultural treatment can be expected (Bibani & Jonkers 2001).

→ The pre-felling treatment consisted of cutting all lianas with a diameter > 2 cm, aiming at reducing felling damage and stimulating the growth of climber infested trees. Large lianas were expected to contribute to logging damage and to compete with trees for light and nutrients. On the other hand, lianas do play an important role in biodiversity and as sources of non-timber forest products (NTFP).
The result of liana cutting on logging damage appeared to be negligible, however (Parren & Bongers 2001). This unexpected result can be explained by the fact that the trees to be felled were emergent trees with their crowns above the forest canopy. Lianas may contribute to logging damage when they connect the crown of the tree to be felled with crowns of other trees. However, the substantial distances between an emergent tree crown and other crowns make that such connections are rare, in spite of the abundant presence of lianas (Jonkers & Van Leersum 2000).
The impact of liana cutting on tree growth still needs to be proven as a recording period of many years is required to demonstrate such an effect. As a matter of fact, liana cutting costs about 1 US $ per hectare, and is therefore inexpensive. In case this operation proves to be effective in stimulating tree growth, the treatment should be adjusted to preserve NTFP climbers, such as rattans (*Ancistrophyllum secundiflorum* and *Calamus* spp.) and *Strophanthus gratus*, a major NTFP used in the pharmaceutical industry (Van Dijk 1999).

→ The post-felling treatments aimed at stimulating the growth of timber trees. This was done through a liberation treatment in which trees competing with timber trees for light

were killed. Major NTFP producing species were preserved regardless of their position in relation to timber trees, however, and were also expected to benefit from the treatment.

Two different treatments were applied in the same experiment as the pre-felling treatments (Bibani & Jonkers 2001; Jonkers & Foahom 2003). The treatments are based on four lists of valuable species occurring in the plots (Essama Etoundi 2002):

- List 1: 35 currently commercial timber species;
- List 2: 35 species, having the potential to become marketable timber species within 25 years (Zijp et al. 1999);
- List 3: 34 species, which produce important non-timber forest products, which grow to sizes > 20 cm dbh and which are not on lists 1 and 2;
- List 4: all other tree species.

In treatment A, all species of lists 1 and 2 in the size class 20-50 cm dbh were liberated. Larger trees were not liberated because they suffered little from competition; smaller trees were not liberated because competition for light is needed to stimulate their height increment and these small trees themselves give only meagre competition. The treatment consisted of killing trees > 30 cm dbh which competed directly for light with the trees to be liberated and which were on list 4. Trees to be killed were administered a plant hormone (arboricide) to the bark over a height of approximately 10 cm all around the tree. The treated trees gradually shed their leaves and died over a period of a few years. The dead trees generally remained standing and progressively fell apart. The treatment therefore caused hardly any damage to the remaining vegetation, and nutrients stored in the killed trees were gradually released.

Photo13.5. Baka pygmies collecting non-timber forest products in the forest. (Photo J.Schneeman)

Treatment B focused on currently commercial timber species and the liberation treatment was combined with a partial removal of the canopy. Only species of list 1 were liberated and the minimum diameter for trees to be killed in the vicinity of trees to be liberated was 20 instead of 30 cm. Furthermore, all large canopy trees, which belonged to a list 4 species and all commercial timber trees with diameters above the felling limit, were killed.

In addition to boosting timber production and preserving NTFP producing tree species, the treatments should also preserve the biodiversity and the stability of the forest ecosystem. To estimate the immediate effects on tree growth, plant biodiversity and phytomass, a large variety of treatment prescriptions (more or less species eliminated, other diameter limits, etc.) was simulated in a three-dimensional model of a forest transect. Treatments A and B were chosen, because they combine a considerable reduction

in light competition with preservation of all of tree species and a moderate reduction in phytomass.

So far, the preliminary results of the treatments are promising. The input required for both treatments applied were modest as only 1.1 man-day and about 8 litres of a 5 % solution of the arboricide P80 per ha are needed (Essama Etoundi 2002). Furthermore, a post-treatment enumeration showed that there was no reduction in the number of tree species. However, the (positive or negative) effects of the treatments on growth, regeneration and mortality of timber species still need to be proven. Ecological, economic and social (NTFP) aspects will then be important criteria to be considered. This will require a long time span. Unfortunately, for administrative reasons, no assessment has been undertaken until now, but the experimental permanent sample plots are available for study at any moment.

It is beyond the scope of this publication to describe all flanking research carried out to assess the ecological, economical, social, and other consequences of the treatments in this system. All results are summarized in Jonkers & Foahom (2003).

13.8 Main issues restricting sustainable forest management at present

The government of Cameroon has committed itself to manage its forest resources according to international standards conform bilateral and multilateral conventions of which Cameroon is a party. A new forest policy (NFP) was thus formulated in 1994, aiming at implementing sustainable forest management, based on concepts formulated in these conventions. Even though the NFP has been applied in some instances, sustainable Forest Management is still far from being reached.

The state is no longer engaged in forest plantations. Forest management plan prescriptions, in terms of forest regeneration, are not seriously taken care of. Natural regeneration techniques to be applied in forest management units require low impact logging practices, an innovation which is still far from being implemented by the majority of logging companies. Moreover, the silvicultural system designed and tested by the Tropenbos Cameroon Programme in the 1990s is the only one of its kind in Cameroon and still requires proving its effects on growth, regeneration and mortality of timber species. On the other hand, the already tested enrichment and conversion techniques are likely to support the National Regeneration Programme adopted in 2005 and launched in 2006.

Illegal logging remains an important issue, also as a consequence of some existing forms of logging grants such as "vente de coupe". The total forest area exploited as "*vente de coupe*" increased in recent years. As it is mostly granted for Non-Permanent Forests, it does not require a management plan. Moreover, logging can be subcontracted to others (logging companies, concession owners), thus undermining responsibility and accountability for forest exploitation and at the same time opening ways to exploit the forest as much as possible. Apart from the limitations, such as a maximum legal area of 2,500 ha and time restrictions, "vente de coupe", which is of course a legal logging grant,

appears to be less constraining for loggers. In a comparable way, most of the logging rights and wood recovery permits are open to wide abuse, without any concern with regard to the NFP goal.

Photo13.6. Abandoned logging road.
(Photo J. Schneeman)

"The mysteries of the tropical rain forest are still far from being revealed to us. Consequently, research occupies a prominent place in the field of conservation and sustainable use of tropical rain forest" (Pronk 1998). Tropical forest ecosystems are complex systems. Moreover, the prevailing reductionist approaches used now, instead of integrated holistic approaches, do not lead to sustainable management. As a consequence of the former approaches, insufficient scientifically sound tools for forest policy implementation exist, resulting in a weak application of available knowledge. There still is a strong tendency to resort to speculation, rather than to what is known. Some key institutions of the Cameroon forestry sector and their staff are still anchored in traditional forestry, resisting to adopt innovations, and believing strongly that the forest is a gift from God, which can be used in any way (Foahom 2005b).

Logging activities are most of the time still without full commitment to sustainable forest management. As a matter of fact, the concessionaires, after assignment, have three years to prepare a forest management plan. During that period, logging occurs on the basis of a provision in the law (three years temporary convention). Unfortunately, this period is usually illegally extended. However, some improvement was recorded recently. In 2008, 65 Forest Management Units (4.2 million ha) out of 109 (6 million hectares) had their management plans approved, of which 13 (895,492 ha) were attributed FSC certificates (De Wasseige et al. 2009).

Non-conventional logging is organised in the form of a complex chain linking many people. It is clear that the way it is conducted does not fit with sustainable forest management requirements. Each link in the chain can be a dubious one, by which good governance, transparency, legality, etc. can be endangered.

Logging is still concentrated on very few species. The consequence is that forest exploitation and the forest industry are far from achieving the value that could be attained from harvesting timber, while logging damage remains an important issue. The annual deforestation in Cameroon of about 0.88 % is still above the 0.78 % African average.

The concept of Community Forests was introduced in the NFP to improve the involvement of the local population in forest management. Unfortunately, much needs still to be done

in this respect. The access to community forests is still difficult for local communities due to complex procedures. A mediation process as developed in Cameroon (Lescuyer 2002; Jonkers & Foahom 2003) aims at ensuring that stakeholders share the benefits as well as the burdens resulting from sustainable forest management. Avoiding situations where a stakeholder or a part of the local population enjoys most of the benefits while the other suffers most of the burdens is the goal. However, the process still needs to be improved. Moreover, local populations which quite often profit substantially from the forest (Lescuyer 2002) are not well organised and therefore not able to defend their position with respect to forest exploitation.

References

Bibani Mbarga, R. and Jonkers, W.B.J. 2001. Silvicultural monitoring in permanents sample plots in Ebom forest, Southern Cameroon. In: Jonkers, W.B.J., Foahom, B. and Schmidt, P. (eds) (2001). Seminar proceedings "Sustainable Management of African Rain Forest". Part II: Symposium. The Tropenbos Foundation, Wageningen, The Netherlands, 102-111.

COMIFAC. 2006. Les forêts du bassin du Congo: Etat des forêts 2006. PFBC, 256 pp.

Côté, S. 1993. Plan de zonage du Cameroun méridional. MINEF Poulin Thériault. Inc., Montreal, Canada.

De Graaf, N.R. 1986. A silvicultural system for natural regeneration of tropical rain forest in Suriname. Series Ecology and Management of Tropical rain forest in Suriname 1. Agricultural University, Wageningen, The Netherlands. 265 pp.

De Graaf, N.R. and Van Rompaey, R. 1990. The CELOS experiments on silviculture with regeneration in Suriname. MAB/IUFRO/FAO. 14 pp.

De Wasseige C., Devers, D., Marcken de, P., Eba'a, A.R., Nasi, R. & Mayaux, P. 2009. Les forêts du Bassin du Congo: Etat des forêts 2008. Office des publications de l'Union Européenne. Luxemburg. 425pp.

Dupuy, B. 1989. Plaidoyer pour le reboisement. Bois et Forêts des Tropiques 221, 25-31.

Evans, W.R. 1990. La durabilité de l'exploitation forestière au Cameroun: étude de quelques cas. Consultancy report prepared for WWF. Foundation Renewable Resources, Banbury, UK.

Eba'a Atyi, R. 2000. TROPFOMS, a decision support model for sustainable management of South-Cameroon's rain forests. PhD-Thesis, Wageningen University, The Netherlands.

Essama Etoundi, J. 2002. Le déroulement des activités de terraindu sous-projet sylvicole F2, Programme Tropenbos Cameroon. Tropenbos-Cameroon Reports 02-1. Tropenbos-Cameroon Programme. Kribi, Cameroon. 33 pp.

FAO 1977. Aménagement de la forêt de Deng-Deng (Cameroun). Rapport Technique 2. Rome, Italy. 49 pp.

FAO (2005). The state of the world's Forest. FAO, Rome, Italy. 153 pp.

Foahom, B. 1992. Potentiel sylvicole de quelques espèces forestières de bois d'œuvre en forêt semi-caducifoliée au Cameroun. In: ONADEF/MINEF, Avenir des plantations forestières au Cameroun Rapport Séminaire-atelier, Bamenda, Cameroon, 97-122

Foahom, B. 2005a. Le point sur les essays sylvicoles à la Mangombé et Kienké en forêt dense humide du Sud Cameroun. IRAD/CSFSE (Rapport interne), Yaoundé, Cameroon.

Foahom, B. 2005b. Case study: State of knowledge as applied to sustainable forest management in Cameroon. International Course on Development of National Forest Policies and Strategies, March 8 – 18, 2005, Pretoria, South-Africa. 14 pp.

Foahom, B. 2006. Logging activities in Cameroon, with special reference to chainsaw milling and lumbering. International dissemination workshop on Chainsaw milling and lumber trade in West Africa. Accra 5-6 December 2006.

Foahom, B., Nkongmeneck, B.A., Pouentoumoun J.M., Kouodiekong L. and Caspa R. 2005. Gestion des plantations forestières et possibilités d'intégration de la conservation de la diversité floristique du sous-bois. Revue Scientifique de l'IRAD 2005.

Foahom, B. 2007. Logging activities in Cameroon, with special reference to chainsaw milling and lumbering. In: Proceedings of International dissemination workshop on: the Chainsaw milling and lumber trade in West Africa. Accra, Ghana, 5-6 December 2006 (in press).

FORAF 2008. Fiche de collecte de données sur les indicateurs de suivi de l'état des forêts d'Afrique Centrale, niveau national. Cameroun, RDC, RCA, Gabon, Guinée Equatoriale. Projet FORAF, Kinshasa, RDC.

Hendrison, J. 1990. Damage-controlled logging in managed tropical rain forest in Suriname. Ecology and Management of Tropical Rain Forest in Suriname 4. Agricultural University, Wageningen, the Netherlands.

ITTO 1990. Guidelines for the sustainable management of natural tropical forests. ITTO technical Series 5. Yokohama, Japan.

Jonkers, W.B.J. 1987. Vegetation structure, logging damage and silviculture in Suriname. Ecology and Management of Tropical Rain Forest in Suriname 3. Wageningen Agricultural University, Wageningen, The Netherlands.

Jonkers, W.B.J. and Van Leersum, G.J.R. 2000. Logging methods in South Cameroon: methods and opportunities for improvement. International Forestry Review 2(1), 11-16.

Jonkers, W.B.J. and Foahom, B. 2003. Sustainable management of rainforest in Cameroon. Tropenbos-Cameroon Series 9. The Tropenbos-Cameroon Programme. Kribi, Cameroon. 93 pp.

Karsenty, A. et Maître, H.F. 1994. L'exploitation et la gestion durable des forêts tropicales: pour de nouveaux outils de gestion. Bois et Forêts des Tropiques 240, 37-52.

Lescuyer, G. 2002. Environmental assessment as a new tool for sustainable management? An application in south-Cameroon rain forest region. Tropenbos-Cameroon Documents 13. The Tropenbos Cameroon Programme, Kribi, Cameroon. 133 pp.

Letouzey, R. 1968. Etude phytogéographique du Cameroun. Encyclopédie Biologique, Lechevalier, Paris, France. 508 pp.

Maître, H.F. 1988. Dynamique et production des peuplements naturels de forêt dense humide en Afrique. Bois et Forêts des Tropiques 213, 3-12.

Miélot, J. and Bertault, J.G. 1980. Etude dynamique de la forêt dense de Côte d'Ivoire. SODEFOR/CTFT. Abidjan, Côte d'Ivoire. 166 pp.

MINEF 1995. National Forestry Action Programme of Cameroon. Forest policy document. MINEF. Yaoundé, Cameroon.

MINEF 2001. Arrêté n° 222/A/MINEF du 25 mai 2001 fixant les procédures d'élaboration, de suivi et de contrôle de la mise en œuvre des plans d'aménagement des forêts de production du domaine permanent. MINEF, Yaoundé, Cameroon. 18 pp.

MINEF 2003. Programme Sectoriel Forêts et Environnement (PSFE). Document de Programme. MINEF, Yaoundé Cameroon. 95 pp.

MINAGRI 1988. Cahier des procédures pour l'exploitant forestier" (guidelines for forest exploitation procedures), Forestry Department of the Ministry of Agriculture, Yaoundé, Cameroon.

MINFOF 2005. Evaluation des ressources forestières nationales du Cameroun: 2003-2004. Unité Technique du projet d'Inventaire forestier national en collaboration avec la FAO. MINFOF, Yaoundé Cameroon. 90 pp.

MINFOF 2006. Programme National de Reboisement. République du Cameroun. Ministère des Forêts et de la Faune. Yaoundé, Cameroon. 104 pp.

MINFOF 2010. Understanding the Voluntary Partnership Agreement of the FLEGT process. Cameroon-EU Cooperation, Yaoundé, Cameroon. 22 pp.

Ngueguim J.R. 2007. Dynamique de croissance et diversité floristique dans les peuplements forestiers plantés de Bidou et Mangombé. Mémoire de DEA. Université de Yaoundé 1, Yaoundé, Cameroon. 50 pp.

Parren, M.P.E. and Bongers, F.J.J.M. 2001. Does climber cutting reduce felling damage in southern Cameroon? Forest Ecology ad Management 141, 175-188.

PFBC 2006. Les forêts du Bassin du Congo. Etat des Forêts 2006. COMIFAC-MAE France-Union Européenne-USAID. 256 pp.

Plumptre, R.A. 1996. Links between utilisation, product marketing and forest management in tropical moist forest. Commonwealth Forestry Review 75, 316-324.

Pronk, J.P. 1998. Opening speech. In: Tropenbos (ed.). Seminar Proceedings « Research in Tropical Rain Forests : Its challenges for the future », 25-26 November 1997. The Tropenbos Foundation, Wageningen, The Netherlands, 17-19.

Rollet, B. 1979. Application de diverses méthodes d'analyse de données à des inventaires forestiers détaillés levés en forêt tropicale. Oecol. Plant 14, 319-344.

Sunderland, T.C.H., Clark, L.E. and Vantomme, P. (eds.) 2000. Les produits forestiers non-ligneux: Recherches actuelles et perspectives pour la conservation et le développement. FAO. Rome, Italy. 304 pp.

Van Dijk, J.F.W. 1999. Non-timber forest products in the Bipindi-Akom II-region, Cameroon: a socio-economic and ecological assessment. Tropenbos-Cameroon Series 1. The Tropenbos-Cameroon Programme. Kribi, Cameroon. 197 pp.

Zijp, M.A., Polman, J.L. and Tongo Bokam T. 1999. MoreLKS: manual for a computer programme on Cameroonians lesser-known timbers and end-use requirements. Tropenbos-Cameroon Documents 2. Tropenbos-Cameroon Programme. Kribi, Cameroon. 75 p. + floppy disc.