# CoForChange

Predicting the effects of global change on forest biodiversity in the Congo Basin

# The transgressive behaviour of the African rain forests during the last centuries

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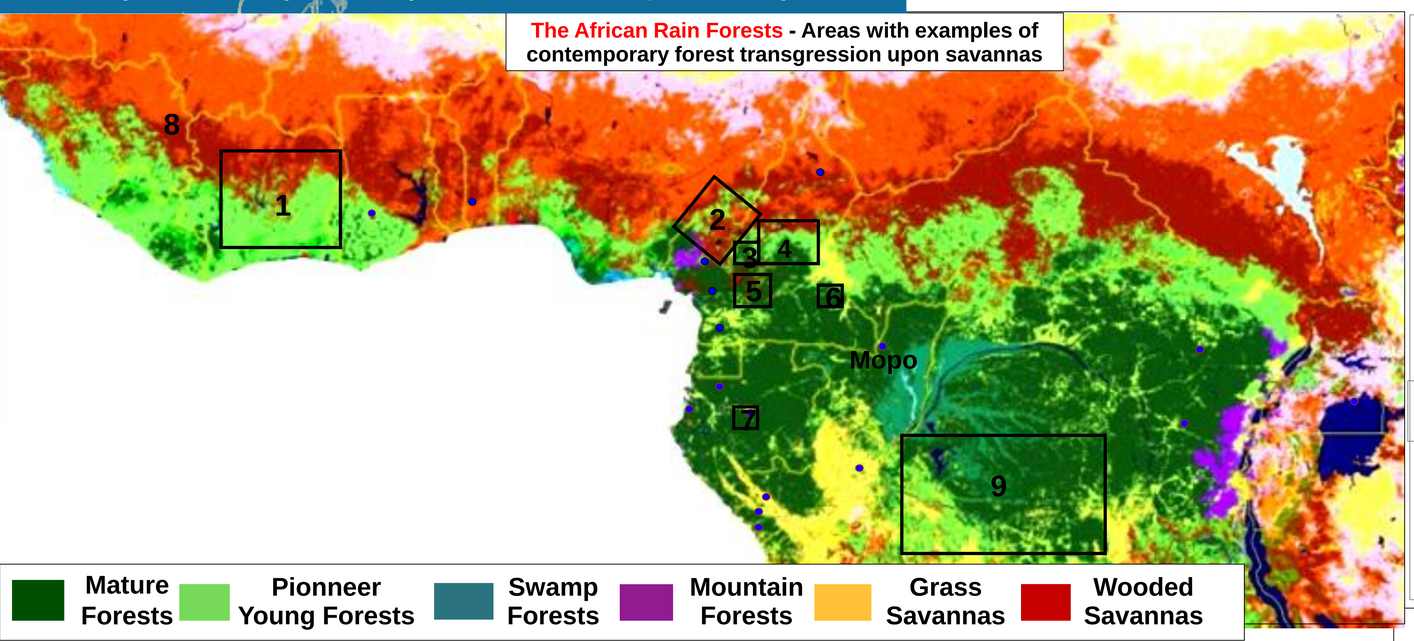












About 4 years after the burning of the savanna, a process of **reconstitution of the forest vegetation is** starting at the periphery of the forest island, characterized by the rapid growing of **a pioneer tree with large leaves**, ***Anthocleista***

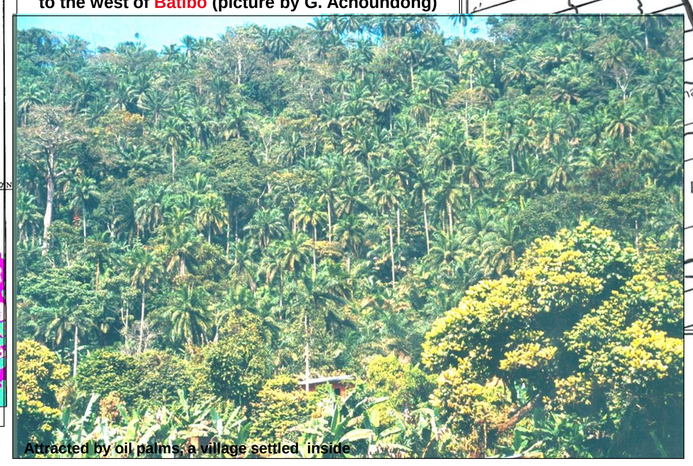



About 6 years after the burning of the savanna which killed numerous trees at the periphery of the forest islands, one observes a strong growing of a **Pioneer Forest Formation** dominated by ***Anthocleista***.

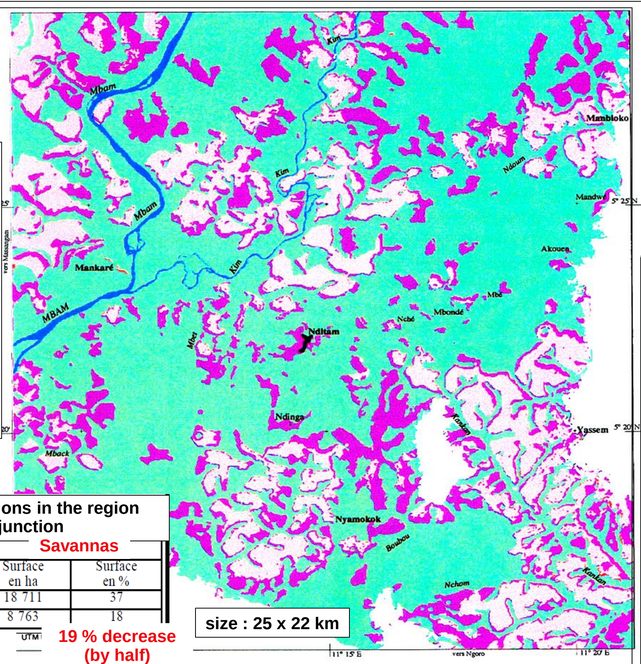



This forest belt, dominated by **oil palms**, extends over ca. 150 km. This belt corresponds to **the last major extension phase of the Forest Domain which began during the second part of 19th century** (Letouzey, 1978; Maley & al. 2001)

Natural Palm grove in semi-deciduous forest to the west of **Batibo** (picture by G. Achoundong)




**Contemporary extension of the Forest Domain in south Cameroon**
**(junction of Mbam and Kim rivers)**




**Old Forests, existing before 1950**

**Forests spread between 1950 and1989 to the detriment of savannas. These areas were obtained by superposing a mosaic of IGN aerial photographs taken in 1950 and SPOT/satellite images taken in 1989**

**Recent residual savannas (in 1989)**

**(Youta Happi, Ph D,1998)** 3

**Forest and Savanna surface variations in the region of Mbam and Kim rivers junction**

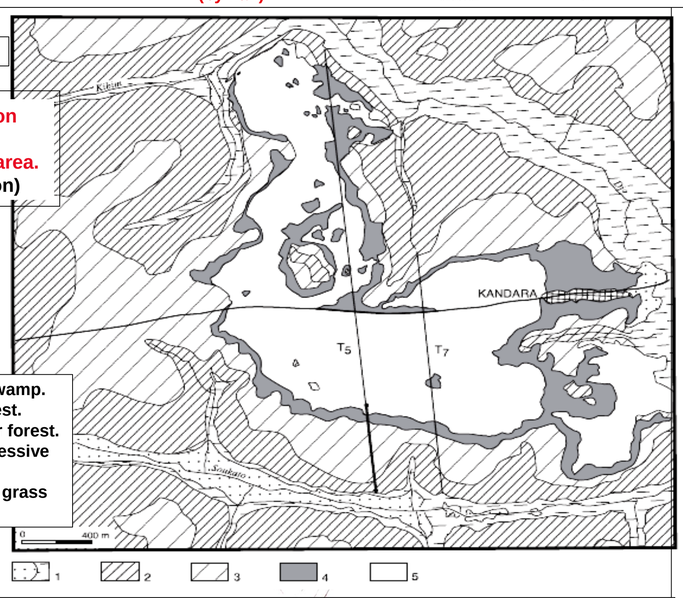
| Years | Forests | | Savannas | |
|---|---|---|---|---|
| | Surface en ha | Surface en % | Surface en ha | Surface en % |
| 1950 | 34 477 | 63 | 18 711 | 37 |
| 1989 | 44 525 | 82 | 8 763 | 18 |

**21 % increase** **19 % decrease (by half)**

**size : 25 x 22 km**

**Youta Happi, 1998**

**Main vegetation Formations in the Kandara area. (east Cameroon)**

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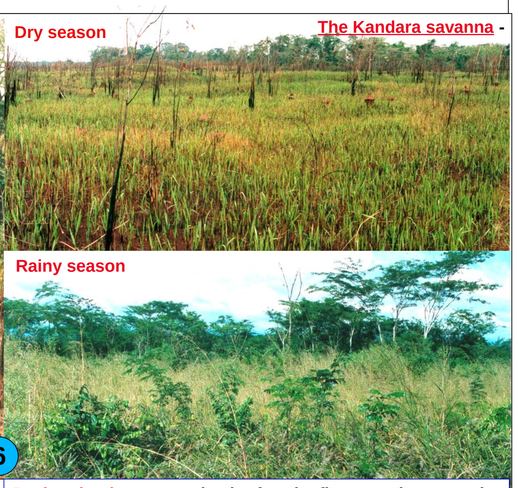
**1 - Herbaceous swamp.**
**2 - Mature forest.**
**3 - *Albizzia* pionner forest.**
**4 - Recent transgressive forest.**
**5 - Shrub and tall grass savanna.**


**The vegetation Formations near the forest edge are similar to those of the Ndtiam area, with important spreading of the large herbaceous Marantaceae and Zingiberaceae which are, by place, substituted by *Chromolaena odorata (Eupatorium).***
**Because they well support the fires going through, all these herbaceous plants promote the forest spreading.**




**During the dry season (top), after the fires passing over, the grass grows again rapidly. The small trees which belong to the pionneer g. *Albizzia* (Mimosaceae), well support the fire (burned stems) and grow again vigorously during the rainy season (below). This phenomenon favours the progressive forest spreading. Numerous former termitaries in the form of large typical mounds can be observed under all surrounding forests. Because these termites cannot live in forests, this feature evidenced a large forest spreading over the past centuries.**

The forest fragmentation period which occurred during the second part of the third millennium BP (Maley, 2002, 2012), triggered a significant expansion of pioneer forest formations, as apparent at Barombi Mbo and other sites. **Several data show the more seasonal character of the climate during this perturbated phase**, as in south Cameroon, with the cultivation of *Pennisetum*, a Sahelian cereal, by Early Iron Age people (Neumann, 2012). These pioneer forest formations favoured the forest recovery which began in early second millennium BP. Pollen data from a core collected in northern Congo revealed a vegetation history similar to that outlined previously from other sites, and in particular a brief savanna extension episode dated ca. 2500 yr cal.BP. **These data reinforce the possibility that a corridor of mainly savanna** could have spread briefly in the Sangha River Interval across the Central Forest Domain (Maley, 2010; Doumenge, 2012)**(Poster 1, n° 5, 6).** This pollen record, which continues until the present time, shows first a rapid and significant expansion of pioneer taxa. Subsequently, from the beginning of the last millennium BP, the progressive development of numerous, more mature trees occurred, which belong to the present-day forest habitat. **These data confirm the beginning of forest recovery in the early second millennium BP, a transgressive phenomenon which continues up to the present-day**.

This transgressive process probably stopped **during the Little Ice Age**, between ca. 15 to 18th centuries, as shown by pollen data from Gabon (Ngomanda, 2007). However, expansion re-started markedly near the end of the 18th c., a process that was also observed in West Africa. For example, different historical sources in the southern Ivory Coast indicate that **from the end of the 18th century until the end of the 20th c. the forest expanded** northwards by 50 to 80 km (Fairhead, 1998) 1 In West Cameroon, near the savanna border, a natural oil palm belt of 10 to 20 km width and extending over ca. 150 km, began to develop during the second part of the 19th century 2 Subsequently, a semi-deciduous forest began to develop inside this pioneer formation. As a result, this belt now comprises a mixture of oil palms and semi-deciduous trees, which corresponds to the last major expansion phase of the Forest Domain (Maley, 2001).

Data show that present-day transgressive forests progressively reduce the areas of pre-existing savannas, thereby demonstrating that former savannas were more extensive. Moreover, botanists studying present-day vegetation have provided additional evidence for savannas in adjacent sectors: north and south of the Central Congo-Guinean Forest Domain, as in southern Cameroon at Akonolinga, east of Yaoundé; 5 at Kandara, south of Bertoua 6 and also in the central part of the Congo RDC. 9 In 1985, Letouzey published a vegetation map 4 that was in part derived by superimposing satellite images obtained in the early 80s with the first aerial photographs taken in 1950. Letouzey calculated that south of the Adamaoua Plateau, the Forest Domain increased by more 1 million hectares. Furthermore, numerous savanna fragments, enclosed within the forest, existed near the junction of the Kim and Mbam rivers (5° 20' N – 11° 20' E), where a large forest expansion was also calculated by using the same method. 3 Compared to 1950, in 1989 the forest area increase was 21%, linked to a savanna decrease of 19%, about half that existing in 1950 (Youta Happy, 1998).

Forest recovery can be very fast, as observed recently in the large savanna area remaining at La Lopé, central Gabon, close to the equator. 7 Indeed, an aerial photograph taken in 1995 showed the complete burning of a fragment of savanna encircling the small lake of Kamalété, where coring was undertaken. The fire killed numerous trees at the forest margin. In 1999 a process of forest regeneration was already underway at the margin, characterized by the rapid growth of *Anthocleista schweinfurthii*, a pioneer tree with large leaves. In 2001, this process continued, with numerous *Anthocleista* attaining between 5 to 8 metres in height. This forest expansion process also concerns relatively well populated areas, such as the region near Yaoundé. 5 Moreover, when comparing the position of the forest/savanna boundary from a map published in 1910 with a more recent map published in 1995, a northward forest expansion of ca. 25 km is evident. In some regions, as in eastern Guinée, near Nzérékoré, the village of Beyla 8 is located within a semi-natural forest island that the people probably deliberately managed in order to protect the village against the fires which burn frequently in the surrounding savannas.




**Forest transgression north of Yaoundé between the beginning of the 20th c. (red line, forest/savanna boundary from the map of the German Geographer M. MOISEL, published in 1910) and the end of the 20th from the map drawn by J.F.VILLIERS (ORSTOM, Atlas of South Cameroun, 1995); a northward forest expansion of ca. 25 km is evident. Note the included savanas east of Yaoundé, near Akonolinga, presently also in a process of forest transgression. Similar included savannas exist also in the southern part of the Forest Domain, in the center of the RD Congo (see below).**

**Main References** (abbreviated)
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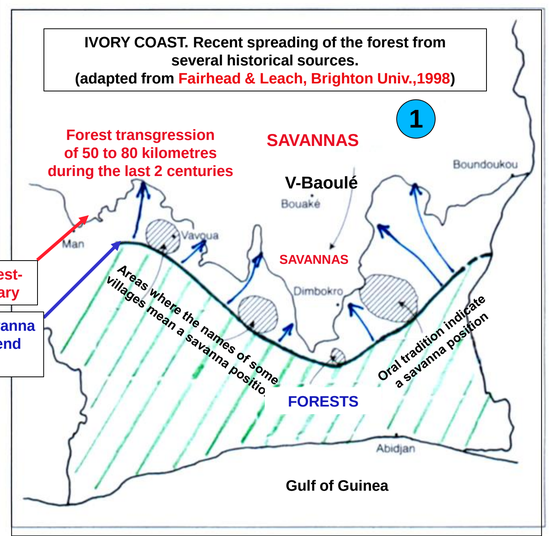
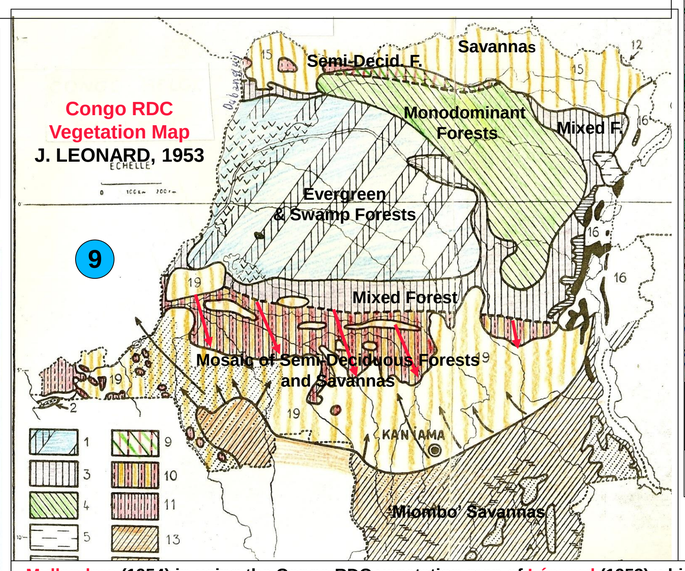
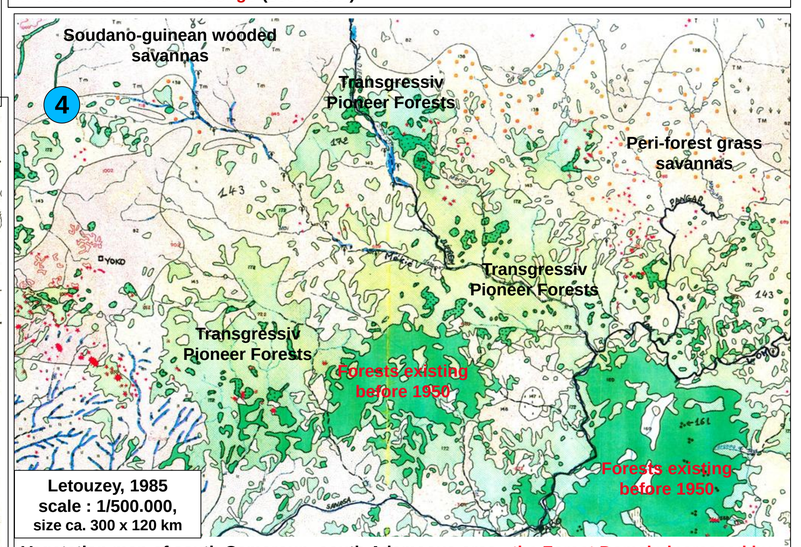
**In the savanna of eastern Guinée, the village of Beyla is included in a semi-natural forest island. The dark purple areas correspond to recently burned savannas.**




**Mullenders (1954) in using the Congo RDC vegetation map of Léonard (1953) which shows, to the south, a wide belt formed by a Forest//Savanna mosaic (purpel), and more to the north, a very large area with arboreal savannas (yellow), estimated that these savanna elements invade presently the southern Guinean sector in drawing back the Forest Domain (northward black arrows).**
**However this conclusion is wrong because, without a major aridification phase, the enclosing in forest of savanna patches is impossible without eliminating the forest elements. So, it lead to the conclusion that, in contrary, it is the Guinean forest element which spread southward (red arrows) in including remaining savanna islands, as it is observed, for instance, in south Cameroon : see the Akonolinga savannas, east of Yaoundé, or the Kandara savanna, south of Bertoua.**




**Vegetation map of south Cameroun, south Adamaoua area : the Forest Domain increased by more than one million hectares in this area between 1950 and the beginning of the years 80's.**