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DYNAMICS OF WOODY SPECIES DURING THE POST-HARVEST REGENERATION IN SEMI-DECIDUOUS FOREST OF CÔTE D'IVOIRE

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Abstract

The present study concerns the characterization of the dynamics of woody species during post-harvest regeneration. Conducted to Oumé and Diégonéfla in semi-deciduous forest zone of west-central of Côte d'Ivoire, this study was based on floristic inventories in 54 fallow aged of 1 to over 53 years. The main objective was to identify a model reconstruction of woody species in semi-deciduous forest zone that often do not follow conventional models known. The data show that the development of woody species begins after 9 years and continues beyond 40 years.

Keywords: Woody species, Dynamic, fallow, semi-deciduous forest, Côte d'Ivoire

Introduction

The study of the dynamics of woody plants requires a synchronous and diachronic observation of vegetation over time. Unlike herbaceous layer in which you can sometimes see many variations on the short or medium term, the changes occurring in the woody stratum over time are usually slow. It is quite remarkable that this layer is mainly composed of species of the group "K" with a long life (CLAUDE *et al*., 1998). In addition, the overall analysis of the reconstruction does not always allow a satisfactory understanding of the changes that are taking place within the structure of the vegetation, especially that of woody plants. Also, the study of the replenishment process of woody vegetation is very important if we consider that it is a resource which induces many changes in vegetation, mainly in the structuring and physiognomy thereof. According to YOSSI (1996), the establishment of woody vegetation is the most obvious sign of biological recovery and stability of savannas. Moreover, FARINAS (1982) found that the structure of the vegetation is the result of interactions between individuals constituting the plant community.

The study of the dynamics of woody species has been discussed in some natural ecosystems. However, repetitions and reproduction of ecotypes are necessary for the comprehension of the phenomena that cause many changes in the nature. These phenomena are governed by climate changes that are sometimes related to human action and cause major changes in the nature. These changes alter the traditional models of reconstruction which applies to modern plantations.

1. Materials and Methods

The study was conducted in Oumé, in semi deciduous forest zone of Côte d'Ivoire. This department (Fig. 1), covers about 2400 km ². It is located 260 km northwest of Abidjan, between: 6 ° and 7 ° north latitude and 5 ° and 6 ° west longitude. All study sites are under the influence of a sub-equatorial climate with 4 seasons: two rainy seasons: a large one of March to June and a small one of September to October and two dry seasons including a high from November to February and a small of July to August (SODEFOR, 2012). The average annual rainfall is about 1215 mm. The rainfall has considerable variability. Vegetation based on lateritic soils low to medium unsaturated (MONNIER, 1983). The study was conducted on 54 plots of 1 to 53 years. All inventoried plots were subjected to the same treatment as having been cultivated. In all, 51 plots of 1 to 53 years and 3 control (forests, experimental plot of the CNRA, buffer zone). The floristic inventories were made in unit plots each measuring 50 m X 50 m (Fig. 2). The measured parameters on the woody species are: height, circumference and the density of the woody species. In the heights measurement, only species over 2 m were measured. The measurement of circumference at breast height performed focused on woody species over 20 cm, however, all woody species present from the small plant stage to trees stage were taken into account in the estimation of stand density. During the analysis of the flora, the maximum age of 60 years was taken as the age of the control plots.

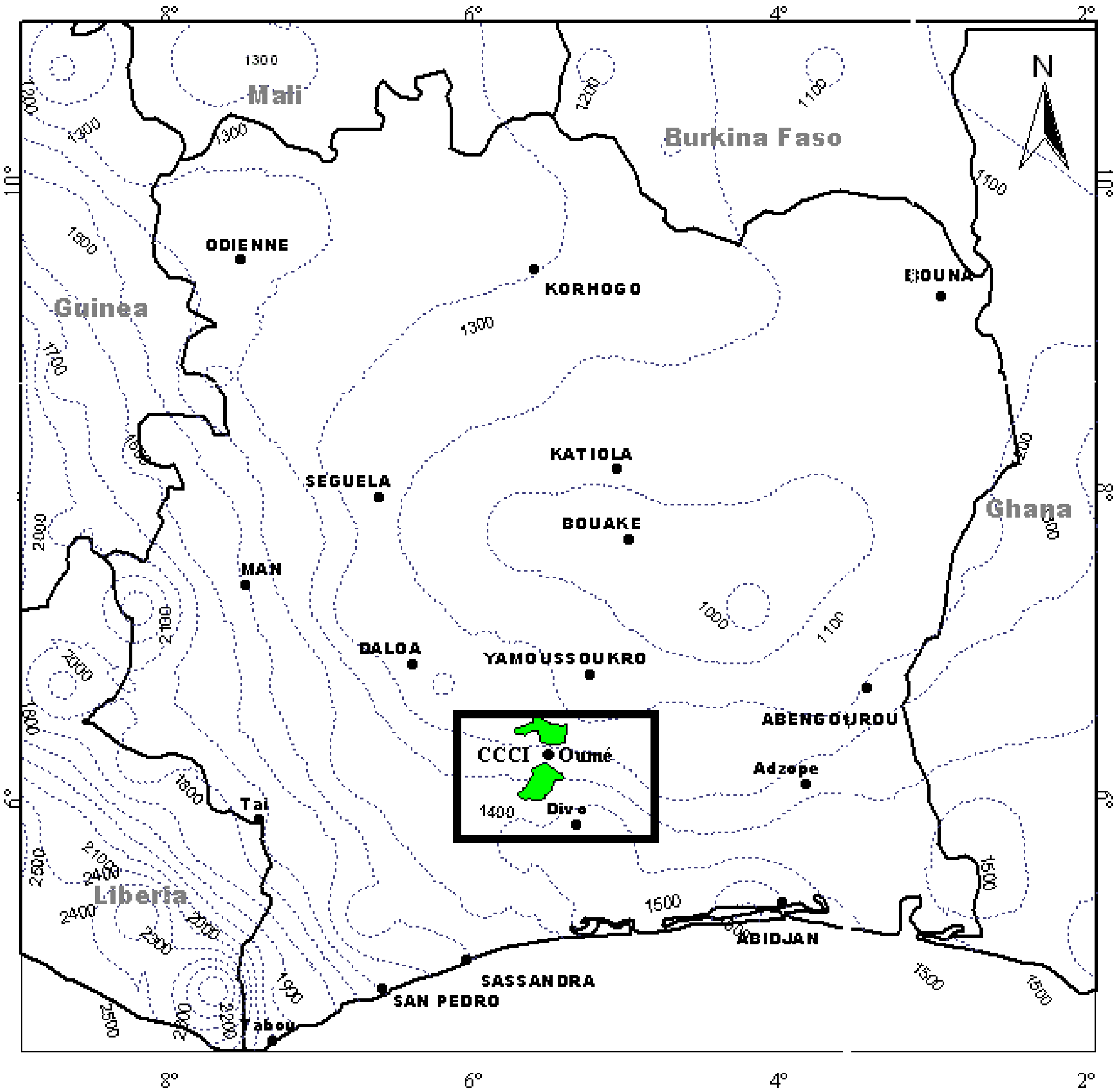

Fig. 1: Map of Côte d'Ivoire (Origin: MONNIER, 1983)

Scale : 1/ 400 000

Study environment
F C = liste forest

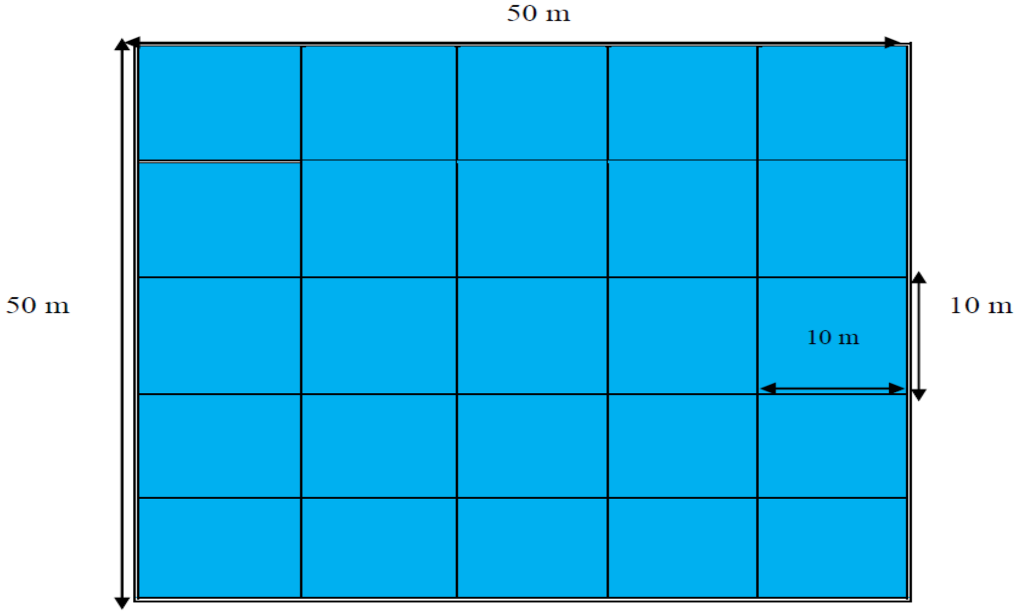

Fig. 2: Plots of floristic inventory

- Quadrat of inventory

2. Results and Discussion

2-1- Fallow period, evolution of the vertical structure of the woody species

2-2-1- Duration of fallow, and changes in the height of woody species

The overall analysis of the vegetation shows that the woody species of the forest begins their development in training beyond 6 to 10 years of fallow. The distribution of stems in classes heights (Fig. 3) shows a high density of rods in the height class] 8, 16] m. These stems are distributed across all other age groups except that of 0-5 years. In addition, these stems are many in age class 6-10 years and 11-20 years. the woody species of height class,] 4, 12] m are distributed across all age class. They are more numerous in the age from 11 to 20 years. The height class] 16, 32] m of woody species are present in vegetation over 9 years. They are more numerous in fallow 31 to 40 years and over 40 years. Specimens of more than 32 m from heights are mainly present in the training of 31 to 40 years and over 40 years. Few species of this size are present in the plots of 11 to 20 years.

2-2-2 - Evolution of the average height of woody species

The linear regression (Fig. 4) shows a gradual evolution of the average height of woody species over time. Low (less than 5 m) at the beginning of fallow (0-5 years), it evolves and reaches more than 20 m in 10 years. Maximum values (≥ 25 m) are reached between 20 and 30 years and 31 to 40 years.

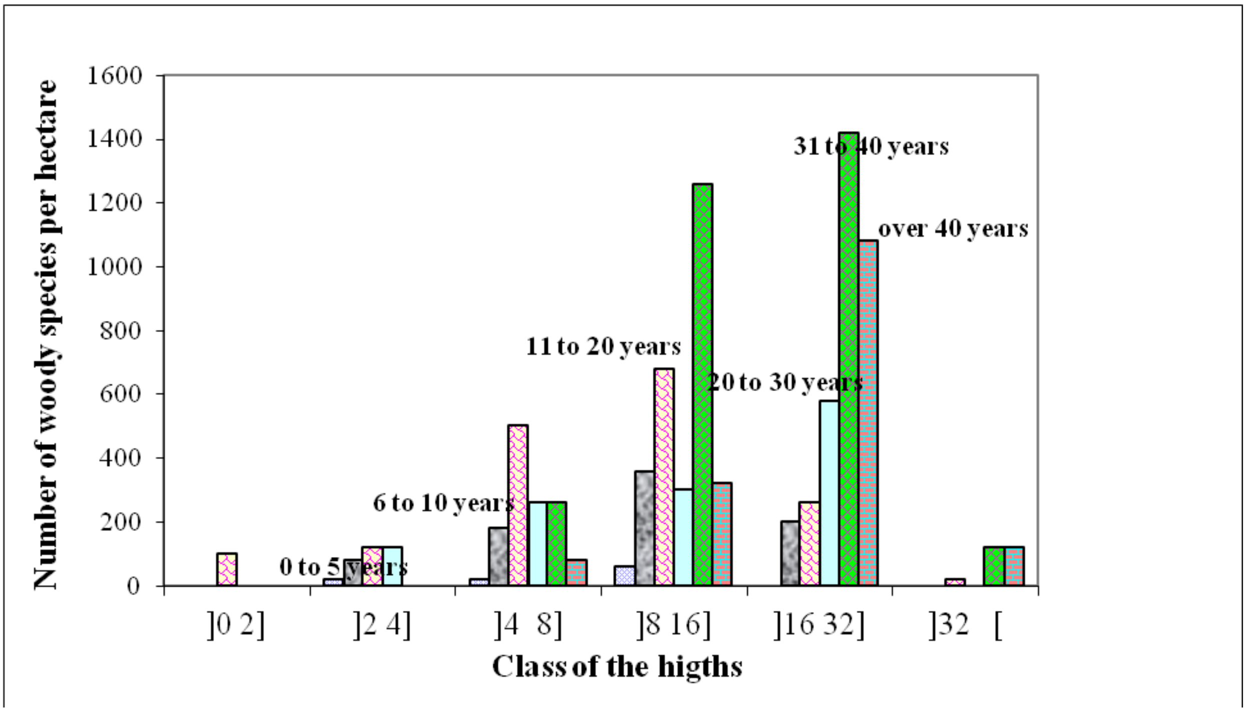

Fig. 3: Distribution of stems of woody species in height classes

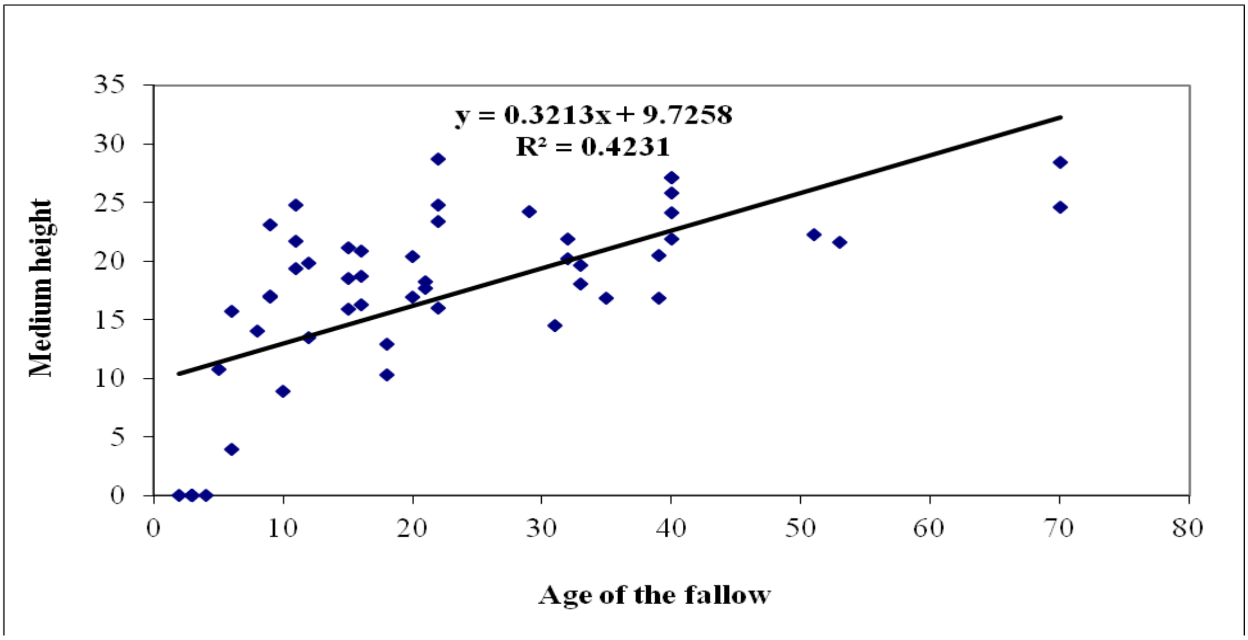

Fig. 4: Relationship duration of fallow, changes in average height

2-2- Duration of fallow, evolution of the horizontal structure of vegetation

2-2-1- Duration of fallow and distribution of woody species in diameter classes

The distribution of stems in diameter classes (Fig. 5) shows that the stems diameter ≤ 10 cm are grouped in plant formations from 0 to 5 years 6 to 10 years, 11 to 20 years and 21 to 30 years. The number of rods decreases over the years (in the climax formations). Small specimens are absent in plant formations of 31 to 40 years and over 40 years. The rare specimens over 100 cm in diameter are mainly present in the plots of 31 to 40 years and over 40 years. The woody species belonging to the diameter class] 20, 30] cm are many in the formations of 31 to 40 years. The woody species of diameter class] 0, 10] cm,] 10, 20] cm are mainly represented in the age group 11 to 20 years. The large diameters (≥ 30 cm), predominate in plant formations of 31 to 40 years and 40 years.

2-2-2 - Average annual growth of trees in thickness depending on the age of the fallow

The linear regression (Fig. 6) shows high annual average growth in thickness of the trees in fallow 5 to 10 years. These rate increases down over time. This decline becomes evident from 6 years to 20 years of fallow. The maximum average annual growth (0, 25 cm / year) is obtained in fallow of 30 years. Besides this case, the mean maximum (0,18 cm/ year) is obtained in fallow of 10 years. These values decline gradually and reach less than 0, 1 cm/year in 20 years and 0.05 cm/year around 40 years. The increase is more noticeable beyond 50 years.

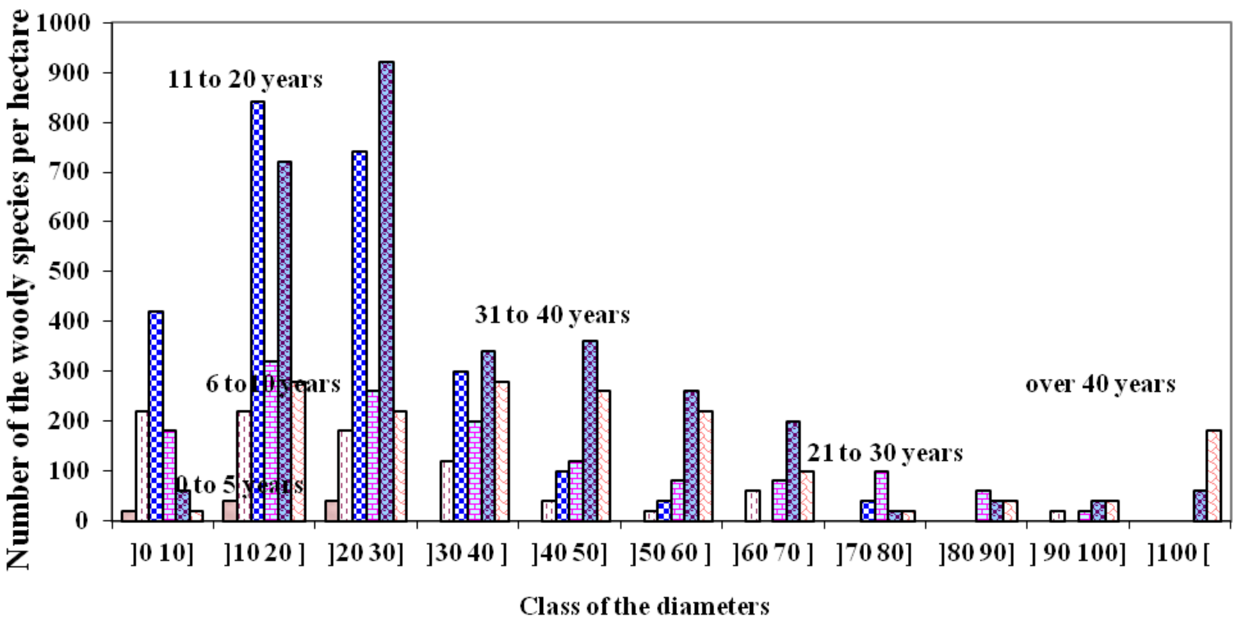

Fig. 5: Distribution of individuals of woody species in the diameter classes

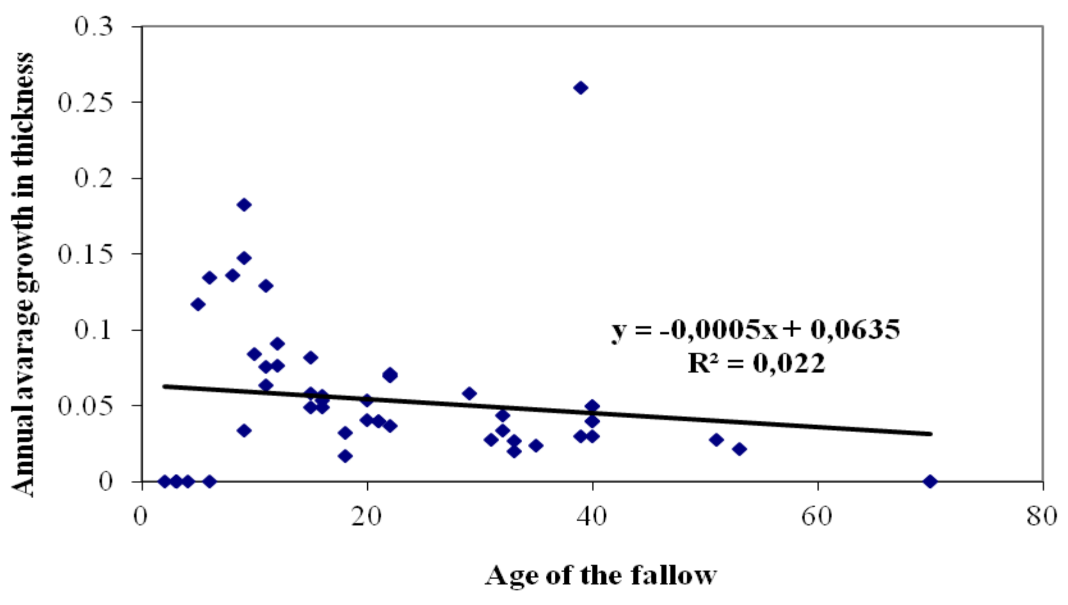

Fig. 6: Evolution of annual average increases of timber over time

3. Discussion

3-1 - Floristic inventory

DEVINEAU (1984) advises the inventory of timber based surveys along a line without thickness and taking into account the individuals that overlap. This method applies to all classes of diameters and heights in the analysis of the structure of the vegetation. However, aware of the mistakes that often cause these types of statements, we have made several sampling lines (50 lines of 100 m in plots of 2500 m² unit). In this case the methods recommended by GAUTIER *et al*. (1994) and that of DONFACK (1993) were combined to minimize the margin of error. This choice is due to the fact that it not only statistical analysis but also offers the advantage of being well suited to the study of heterogeneous vegetation. The vegetation structure can be characterized in several ways. However, our analysis is based primarily on the strength parameters (height, diameter, biomass and mean annual increment), over time as the characteristics of plantations would be difficult to apply to natural populations of highly diversified floristic composition each subpopulation trees of the same species is also represented by individuals of varied ages.

3-2 - Duration of fallow and evolution of lignin structure

The results showed that the plots of 0-5 years are poor in woody species due to the slow recovery of the post-crop plants. This slowness is due to the great degradation of the crop soil. The poverty of fallow in woody species characterizes early recovery as shown by the work of ALEXANDRE (1989) and STROMGAARD (1986) in the forest zone of Côte d'Ivoire and in moist savanna. The many variations that occur in nature often confuse the unwary experimenter. Indeed, the distribution of individuals by diameter class and height class although widely used to account for the dynamics of woody species can sometimes encountered barriers in tropical areas. In areas where the species are multistoried and always in competition, there is no linear model that can explain the growth in height or in thickness from the stage of bare soil at the stage of forest trees. ALEXANDRE *et al*. (1978) have checked with *Turraeanthus africanus* whose height growth was more pronounced (10 to 30 cm / year) than under forest cover (2.5 cm/year). This heterogeneity in the growth in thickness of the trees is what explains the lack of chronology in the growth of timber. Many authors (YOSSI 1996; MITJA, 1992, ALEXANDER, 1989) were unanimous on the fact that the installation of the wood is a sign of the rise in fertility, soil moisture and indirectly, the change of the vegetation physiognomy. But this appearance is caused by the structure of woody species which move into the vegetation. It is easier to translate in terms of classes of height and of diameter the vertical and horizontal changes of vegetation to express the dynamics of ligneous. However, these parameters are highly variable and difficult to interpret, especially in tropical forests.

3-3 - Distribution of woody species in diameter classes

The absence of large diameter specimens in many plant communities is related to the abusive exploitation of wood species in the studied vegetations. In addition, fallow of over 30 years that include the desired species are not immune to this practice. The growth in thickness of trees depends on the age of the plot and soil quality. Indeed, the rich fallows in woody species are aged 31 to 40 years and 40 years. The exception noted (trees over 100 cm in diameter) in the fallow of 11 to 20 years, is probably related to soil quality.

3-4 - Annual average growth of woody species

The aging of trees in fallows of over 30 years is which explains their small increase in thickness within these formations. Indeed, at this age cambial activity begins to slow for many tree species. The fall of the increases of the tree annual average in thickness is long-term evidence of the limitation of the growth of these trees over a given period. Therefore, the only changes that occur there are now cyclical and spatial variability related to the existence of the phases of planting trees. The evolution of the basal parts of trees that realize in some cases the spatial occupation and indirectly the horizontal structure was ruled out because of the circumferences difficulty measure.

4.Conclusion

The actual reconstruction of the woody vegetation begins after 9 years of fallow and continues until 31 years. At more than 40 years, the vegetation changes from stage to stage fallow preforest climax if there is no major disruption. Many elements promotes the reconstitution. In addition to the conditions mentioned, the time, environment and history of the fallow must shed light on the models and states of the plant reconstitution.

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