Diversity of secondary vegetation as a function of stand age and different forms of utilization forms
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1 Introduction

The objective of the realized investigation is to study the floristic composition and structure of secondary vegetation, so called capoeira. In order to get an idea of the function and successive development of secondary vegetation, different parameters of site history and their influence on the actual vegetation are analyzed. The object of this study is secondary vegetation that is 1-20 or more years old. The botanical research is divided into two parts younger secondary vegetation (one to six years) and older secondary vegetation (from seven to 20 years or more).

1. In the case of younger secondary vegetation the sample area was 60 m². The areas were divided into twelve 5m · 1m plots. The heights and diameters of all shrubby species (30cm) were measured and the coverage of all found species (scale of 0.2 % to 100 %) was estimated in every plot.
2. The size of the sample area in older secondary vegetation was 400 m², including eight 10 m · 5 m plots with 5 m · 1m subplots. The diameters and heights of all individuals with a circumference larger than 30 cm were determined. In the eight plots, the diameters and heights of all individuals with a circumference bigger than 5 cm and a height bigger or equal to 100 cm were measured. In the eight subplots the diameters and heights of all individuals of 30 cm to 100 cm were noted and all smaller species were counted

Two different types of site histories of secondary vegetation have been investigated already.
The first group is represented by secondary vegetation, which is part of the traditional cultivation cycle (two years of duration: maize, beans or cotton, cassava fallow); the second group includes vegetation, which established itself after the plantation of black-pepper (three to fifteen years duration of cultivation fallow).

2 Younger secondary vegetation

A total of 31 areas were studied. Approximately 450 species which belong to about 80 families were found in total. Fifty percent of all number of species were represented by the following families: Poaceae (5.9 %), Fabaceae (5.6 %), Mimosaceae (4.7 %), Caesalpiniaceae (4.4 %), Bignoniaceae (4.4 %), Rubiaceae (3.7 %), Connaraceae (3.5 %), Euphorbiaceae (3.5 %), Asteraceae (3.3 %), Sapindaceae (3.3 %) and Myrtaceae (3.0 %).

Seventeen capoeiras were studied, which are integrated in the traditional land-use system. An average of about 90 species was found in every area. Dominating families are Connaraceae, Myrtaceae and Poaceae. To demonstrate characteristics between vegetation of different ages, four areas of one, two, four and six years were evaluated.

An average of 870 individuals of trees, shrubs and vines were found in the four secondary vegetation. In the 6-year-old capoeira 765 individuals were measured (heights & diameters). As expected,

the total number of woody individuals on 60 m² decreased, whilst age of vegetation and mean height of individuals increased. An obvious change in composition of the important, dominating species, which represent 70 % of the total abundance found in these capoeiras was observed. The following group of species are dominate in the 1-year-old capoeira: *Bernardinia fluminensis* var. *villosa* (Connaraceae), *Coutoubea spicata* (Gentianaceae) and *Derris spruceanus* (Fabaceae). In the 6-year-old capoeira two more species of Melastomataceae, *Miconia alata* and *Miconia ciliata* appear. They are probably adapted to shaded sites. Furthermore *Vismia guianensis* (Guttiferae) seems to be of more importance in older vegetation. Maybe this species can successfully compete with other species for light, nutrients and water.

Following the cultivation of black-pepper fifteen capoeiras of different ages were investigated. The typical capoeira found in permanent agricultural areas is a degraded and poor vegetation. On this site a low average of 35 species could be detected. Dominating species, which mark the landscape, are pioneer plants like *Eragrostis ciliaris* (Poaceae), *Borreria verticillata* (Rubiaceae) and *Marsypianthes chamaedrys* (Lamiaceae).

3 Older secondary vegetation

The floristic composition of capoeira of different ages and site histories show variations. Nine areas were inventoried with ages varying from 8-30 years, about 250 species and 58 families were found. In the capoeiras of 10, 15, 20, 25 and 30 years one notes that the number of species and families increases up until 20 years (17.60 %, 28.40 %, 34.40 %) falls a bit between 20 and 30 years (25.20 %) and begins to increase again by 30 years of age (38.40 %). This fact can be explained by the stages of capoeira development.

In the development stage from 10 to 15 years, the area is invaded by shrubs and herbaceous species *Phenakospermum guianensis* (32.29 %), *Vismia guianensis* (12.45 %), *Myrciaria floribunda* and *Lacistema pubescens* are important. The families of greatest prominence were Strelitziaceae, Myrtaceae and Guttiferae. After 15 years, the species characteristic of this stage tend to disappear, however the appearance of other species is influenced by various factors such as the level of soil degradation, action of fire, seed availability and the larges influence is man's destructive actions. The dominant species at 20 years were *Inga heterophylla* (19.92 %), *Lacistema pubescens* (13.14 %), *Sloanea guianensis* (8.90 %), *Guatteria poeppigiana* (7.20 %). The most evident families were Mimosaceae, Annonaceae, Lacistemataceae and Elaeocarpaceae. At 25 years the predominance of the Lauraceae, followed by Annonaceae, Lacistemataceae and Flacourtiaceae were observed.

So called commercial species are established in the vegetation of 30 years of age and have a DBH greater than 40 cm. A majority of the commercial species which grow rapidly have light wood and are not very durable, but are useful in construction and carpentry. The presence of medicinal species was observed. *Parkia* spp. are other medicinal plants, which are found. Their development begins in areas of cassava abandoned 25 years ago.