Ecology and Management of a Neotropical Rainforest

Lessons drawn from Paracou, a long-term experimental research site in French Guiana

Cet ouvrage est dédié à la mémoire de Laurent Schmitt (1956–2004) qui a mis en place le dispositif de Paracou et y a dirigé les opérations de recherche jusqu'en 1990.

Son engagement, sa rigueur et sa compétence nous ont légué un outil de travail incomparable.

This book is dedicated to the memory of Laurent Schmitt (1956-2004) who set up the experimental site at Paracou and directed the research operations there until 1990.

Due to his commitment, scientific rigour and expertise, we have inherited an incomparable tool for research work

Ecology and Management of a Neotropical Rainforest

Lessons drawn from Paracou, a long-term experimental research site in French Guiana

under the auspices of ECOFOR

coordinated by
Sylvie Gourlet-Fleury, Jean-Marc Guehl, Olivier Laroussinie

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Acquisitions Editor: Annette Doré
Development Editors : Marie-José Rouquette, Gregg Colin
Project Manager: Gisela Tillier
Designer: Véronique Lentaigne

23, rue Linois, 75724 Paris cedex 15, France
http://france.elsevier.com

Photocomposition : MCP, 45774 Saran cedex, France
Imprimé par Krips B.V., Meppel, Pays-Bas
Dépôt légal : Août 2004

ISBN : 2-84299-455-8

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Preface

French Guiana is a territory located in the still developing Amazon region, but administered by a developed country; it is therefore not representative of equatorial forests around the world. However, it is on the basis of the ecological function of its forest, rather than its economical and social functions, that the scientific work carried out there is of international interest. For this reason, it has been considered useful to recount twenty years in the life of a scientific site close to the Guianan Space Center at Kourou: the Paracou site. At the beginning of the 1980s, a fair amount of data had already been collected concerning the effects of silviculture on tropical rain forests, as a result of which regulatory measures were enacted on all continents. However, this knowledge was difficult to apply to new territories, since it was often the fruit of short-term experiments carried out in small areas, with the entire spectrum from sowing the seed to the full grown tree having only been studied in part.

This is why the experiment set up at Paracou, considered ambitious at the time, aimed at thoroughly examining all strata of the tree populations before carrying out forestry operations and observing their long term effects, so as to collect information that could be applied by forest managers. Over a period of two years, around 100 hectares were mapped and inventoried before three quite distinct types of silvicultural rules were applied; one of these was very intensive in order to determine the limits beyond which there was a risk of irreparable damage to the integrity of the forest's biodiversity.This work describes how the forest reacted to these interventions. It also demonstrates how a project based on the study of links between natural regeneration and forest exploitation slowly led to the growth of a scientific community, which considerably expanded its research into diverse scientific disciplines aimed at increasing our understanding – rather than simple observation – of the ways in which this ecosystem functions.

Today, most of the long-established large experimental sites set up in the equatorial zones of the world have been abandoned for various reasons, mainly political unrest, whereas the global conventions that followed the 1992 UNEDC Summit in Rio require increasing research efforts on the part of the international community. The site at Paracou is now one of the rare locations where long and exacting scientific work can be carried out under satisfying material conditions in a secure political and social environment. It is hoped that this site – along with the other Guianan projects associated with it – will continue to prosper, to the greater benefit of forestry science and its application in the management of equatorial rain forests.

Francis Cailliez

Former Director (1984-1991) of the *Centre Technique Forestier Tropical*[1]
(Technical Center for Tropical Forests)

[1] Now CIRAD-Forêt (Forest Department of CIRAD).

Acknowledgments

This book represents five years of involvement for 40 authors, from the time the original idea developed in the course of a friendly discussion between the editors, to the final choice of the cover picture. We hope it will make more widely known the richness of the forest research potential of French Guiana, and the quality of one of its best research tools, the site at Paracou.

In recognition for having the Paracou Experimental Site available today, we must express our thanks to many people. First of all, to the initiators, the team of CTFT (now CIRAD-Forêt): scientists, foresters, and a special mention for the local workers: D. Max, O. Ngwete, Mo. Baisié and now Mi. Baisié, K. Ficadici, A. Etienne, F. Kwasie, K. Martinus, P. Naisso, R. Santé who have been providing their traditional knowledge of tree species. They were soon seconded by a team from the National Institute for Agronomic Research (INRA), directed by M. Bariteau, who took charge of the inventory of forest regeneration.

The Paracou database is essential to our work, and gratitude is due to N. Blanc, N. Haumont and S. Vrot who had the heavy responsibility of ensuring its quality and integrity.

The project received support from a large range of administrations and authorities, thanks to which financial support was available over the years: from the Ministry of Overseas Departments (CORDET) and the National Forestry Fund (FFN) at the beginning, from the State-Region Plan Contract for French Guiana and the European Structural Funds up to now. However, nothing would have been possible without the basic annual funding from the home institution, CIRAD-Forêt.

We wish to thank ECOFOR, the association of French forest ecosystem research institutions, which funded the publication of this book. We are grateful to the numerous reviewers who helped us improve the texts presented here (in alphabetical order): D. Auclair, J.G. Bertault, A. Billand, L. Blanc, F. Bongers, F. Cailliez, P. Cruiziat, C. Damesin, E. Dreyer, P. Dreyfus, J.R. Ehleringer, J.-M. Favre, E. Forni, A. Franc, N. Frascaria, H. Griffiths, D. Hammond, F. Houllier, F. Le Tacon, E. Loffeier, D. McKey, P.A. Mason, F. Morhen, B. Musch-Demesure, R. Nasi, D. Newbery, P. Nygren, R. Pélissier, D. Sabatier, J.K. Vanclay, G.G. Vendramin. Thanks are also due to those who gave us their help and time in improving the form of the manuscripts, particularly A. Molina, and, for the maps, C. Brognoli and N. Fauvet.

Finally, we would have given up without the invaluable involvement of Marie-Hélène Lagarrigue, from ECOFOR, who harmonised all the written matter we put in her hands and followed the complete editing process. She made intensive use of e-mails and did not hesitate to travel between Paris and Montpellier to constantly stimulate our efforts. She was a definite determinant in completing this book and we are particularly indebted to her.

This book is dedicated to all those who worked hard in the plots and know the cost of settling, measuring, and maintaining reliable data for the community: the importance, for forest research, of such a legacy from the past is of invaluable importance.

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Introduction

Ecology and Management of a Neotropical Rainforest

Introduction

Olivier Laroussinie, Hubert-Félix Maître

From a silvicultural experiment to a multidisciplinary research site

Paracou belongs to a type of experiment set up in the 1970s and 1980s to study the impact of silvicultural treatments on the dynamics of natural tropical rainforests. The objective was to improve the timber production of commercially valuable species. At the time, the main sites in the Amazon were Zanderij Belt in Surinam, and Tapajos and Curua-Una in Brazil. The Forest Department of CIRAD (formerly CTFT), which established Paracou in 1983, already had experience with such operations through similar experiments in Africa (M'Baiki in Central African Republic, N'Gouha II in the Congo, Mopri, Irobo, La Tene and Yapo in Ivory Coast, and Oyan in Gabon), and would later contribute, using the same layout, to setting up ZF2 (near Manaus, Brazil) and Berau (Western Kalimantan, Indonesia). The objective of having a network of similar experiments was to allow comparative studies, in different environmental conditions and with different types of forests.

The promoters of the Paracou experimental site sought to answer two main questions.

- What are the possibilities of recovering the commercial standing volume in logged forests of the coastal part of French Guiana?
- Is it possible to stimulate this recovery with appropriate silvicultural techniques and rules, easy to apply on a wide scale, in order to achieve sustainable production in these forests?

These two questions influenced the design of the operation, which was set up as a silvicultural experiment testing three levels of intensity of logging and thinning, associated with a control modality. More than 100 hectares of trees ≥ 10 cm diameter at breast height (DBH) were spatialised and monitored inside large plots, of which 75 hectares have been followed yearly since 1984. The first results were used directly by the Office National des Forêts (the French Forest Service) to establish management rules for the exploited forests of French Guiana and to orient further silvicultural trials in managed forests.

Although the initial objectives were not forgotten, additional research projects were initiated at the Paracou site as the experiment progressed, widening the scientific scope to include issues of functional ecology and biodiversity. This was due mainly to the advantages of the Paracou research site for forest ecologists. The experimental design, consisting of different disturbances of known intensity and fully documented, provides potential for a large range of ecological research. The long-term spatialised data set collected on the stands offers an excellent background for developing targeted studies. The plots are geo-referenced, which allows superposition of ground measurements with remote sensing data. Finally, the facilities at the site contribute to good working conditions for researchers: local shelters, easy access, proximity of the town of Kourou and its forest research centre, and permanent staff with a sound knowledge of the site. All together, these conditions gave rise to an opportunistic development of multidisciplinary research at the site, and led its managers to reformulate its scientific outlook towards the study of stand dynamics and functional ecology, as well as the reproductive biology and genetics of tree species. In this respect, the creation in 1992 of the Silvolab group, with the aim of co-ordinating forest research in French Guiana, helped in pulling together the efforts of the scientific organisations involved and in organising complementarity with the other local research sites (see below).

A brief glance at French Guiana

French Guiana is one of the Overseas Departments of France, located in South America in the Guiana Shield Region, neighboured by Suriname and Brazil. The total area is 84,000 km^2 [(1)] with forests accounting for 80,600 km^2. Population density is very low: approximately 200,000 inhabitants located mainly along the coast (95%) in a few places (Cayenne and Rémire-Montjoly, Kourou, Saint-Laurent du Maroni). The inland is occupied only along the two main rivers, the Oyapock at the Brazilian border and the Maroni at the Suriname border, by forest communities of Amerindians and Businenge (less than 10,000 persons in all). Economic activity is dominated by the European Space Centre in Kourou, followed by gold mining and shrimp fishery. The timber economy is poorly developed and suffers from unfavourable socio-economic and natural conditions; these include high salaries (the minimum wage in French Guiana is ten times higher than in neighbouring countries) and the lack of a deep-water harbour.

This situation results in very low pressure on the forest in general. The main concern in the coastal area is potential deforestation for agriculture settlements, not because of its importance but because of the natural habitats of high value which could be destroyed. Inland, the main threat comes from gold mining: although the area concerned is relatively small (about 5,000 hectares are concerned by legal as well as illegal exploitation), the ecological impact is quite high, including mercury pollution and muddying of rivers. The construction of a hydroelectric dam at "Petit Saut" on the Sinnamary river, in the 1990s, flooded some 30,000 hectares of forest.

The forest is mainly state-owned and managed by the Office National des Forêts. A small part, i.e. 668,045 hectares, has been granted the status of "livelihood areas", in favour of local communities who traditionally live from the forest. Regional land planning limits the management of the forest for industrial logging to a zone of 2 million hectares along the coast in the North. In the far South, a National Park is under development, which should be contiguous with the 3.8 million hectare Tumucumaque National Park created in 2002 in neighbouring Brazil.

In the early 1990s, forest management gradually changed from a system of forest logging concessions allocated to timber companies, to wood sales in forests regulated by a management plan. At the same time, a particular effort was made to reduce the impact of logging and to increase the number of tree species used (about 60 species are commercialised - out of 1,200 tree species - but four of these species alone account for more than 70% of the production). Today, 1,300,000 hectares of forests varying in size from 10,000 to 300,000 hectares are regulated by a forest management plan.

Silvolab-Guyane, forest research in French Guiana

Ten organisations are involved in forest research in French Guiana. They operate with both permanent scientists locally (some 20 researchers), and through short term scientific missions of scientists living in metropolitan France (around 80 persons). In order to co-ordinate their scientific policies as well as the management of facilities of common interest (e.g. research sites, herbarium, computer network, documentation), a Memorandum of Understanding was drawn up between these organisations under the name of Silvolab-Guyane ([2]). The general aim is to increase our understanding of the functioning of the forest ecosystem and to develop sustainable methods to manage the tropical rainforest and its natural resources. Modern tools and methodologies are used (e.g. modelling, remote sensing, stable isotopes, molecular biology) along with more traditional approaches (e.g. botany, zoology).

The scientific programme is organised around three main topics:

- Characterisation of the structure and dynamics of the forest as a whole, study of its ecology and identification of the main mechanisms and relevant levels of organisation, in order to propose effective forest description methods and to predict the impact of human activities.
- In-depth study of a few selected species of trees, chosen so as to cover the main ecological traits, including mating system, dispersal, spatial pattern, and symbiotic status.

[1] http://www.terresdeguyane.fr

[2] http://kourou.cirad.fr/silvolab/

• Sustainable use and management of natural resources (including timber production, game management, non industrial forest products, restoration of degraded lands and agriculture-forest relationships) studied through integrated projects associating research, training and development, as well as mobilising human and ecological sciences.

Several field stations have been equipped for different purposes, developing a set of varied and complementary data collections, all with the common characteristic of having long-term objectives.

• Three main research sites offer materialised plots with a basic set of data, along with practical arrangements facilitating access to the site and permanent technical staff: 1) Paracou, located close to one of the main roads, 60 km from Kourou. 2) “Les Nouragues”, located 100 km south of Cayenne, in natural forest in the neighbourhood of an inselberg. The station is legally protected by a 100,000 hectare Natural Reserve and is accessible by helicopter. The objectives at this site are to study a forest preserved from any human disturbance, with particular emphasis on biodiversity, canopy compartment, plant-animal relationships and the response of tropical forest ecosystems to climate changes. 3) At “La Piste de Saint Elie”, located (as is Paracou) in the coastal area close to the little town of Sinnamary, small experimental catchments were settled in the late 1970s to study the impact of different land uses (pasture, tree orchard, slash and burn, plantation forestry, natural forest) on soils and water. Although this experiment has been discontinued, forest ecological studies based on a 25 hectare permanent plot having a precise description of species and soils was established in the vicinity to complement the original programme and are still going on. The main objectives are the study of tree diversity in relation to soil characteristics, forest dynamics and functional ecology.

• Two other stations operate with more specific objectives: “Saint-Eugène” at the hydroelectric dam of Petit Saut is devoted to research on the impact of fragmentation, making use of the situation created by the flooding of the forest, and “BAFOG” (“Bureau Agricole et Forestier Guyanais”) is an old (nearly 50 years) set of plots located near Saint-Laurent du Maroni, where the forest dynamics is monitored after ancient and heavy logging for various products.

Other field experiments, under the direction of the Office National des Forêts in collaboration with CIRAD and directly related to forest management matters, complete this panorama. Several forest units (Montagne Tortue, Organabo, Risquetout) thus host silvicultural experiments on a real scale and are part of a network of permanent sample plots including Paracou and BAFOG; the extension of this network is underway. One forest unit, “Counami”, is used as a pilot forest for management planning: the general principle is to gather as much information as possible at each step of the planning and implementation, in order (i) to optimise the inventory efforts in terms of cost effectiveness, and (ii) to study the impact of main planning decisions dealing with reserves for biodiversity, road plans, rotation periods and spatial organisation of logging.

The book

The aim of this book is to present the variety of research carried out and the results obtained at the research site of Paracou. We expect it to contribute to the necessary dissemination of information on research results, as well as to the initiation of new scientific collaboration in the different scientific disciplines.

The book is organised as a collection of reviewed scientific articles, which are grouped in four parts. Part I describes the experimental design in detail, provides basic data on the plots, and presents the substance of the experiment. Parts II, III and IV cover the following main topics: functional ecology (resource acquisition and utilisation, functional diversity in trees and in root symbiotic associations), reproduction and genetic diversity, forest structure and dynamics. A final chapter summarises the main lessons to be drawn from Paracou and suggests orientations for the near future.

Meaning of the main abbreviations encountered

Organisations

CIRAD: Centre de coopération Internationale en Recherche Agronomique pour le Développement. CIRAD-Forêt, formerly CTFT (Centre Technique Forestier Tropical), is the Forest Department of CIRAD

CNRS: Centre National de la Recherche Scientifique

ECOFOR : Groupement d'intérêt public Écosystèmes Forestiers (Association of French Research Institutions working on forest ecosystems)

ENGREF: École Nationale du Génie Rural, des Eaux et des Forêts

INRA: Institut National de la Recherche Agronomique

IRD: Institut de Recherche pour le Développement, formerly ORSTOM (Institut Français de Recherche Scientifique pour le Développement en Coopération)

MNHN: Muséum National d'Histoire Naturelle

ONF: Office National des Forêts (National Forest Office)

Others

DCL: diameter cutting limit

DBH: diameter at breast height

ECEREX: Écologie, Érosion, Expérimentation

PSE: Piste de Saint-Élie

RIL: reduced impact logging

SGS: species or groups of species

Part I
Experimental Plots: Key Features

Ecology and Management of a Neotropical Rainforest

Experimental Plots: Key Features

Sylvie Gourlet-Fleury, Bruno Ferry, Jean-François Molino,
Pascal Petronelli, Laurent Schmitt

Abstract – The present chapter first provides a general overview of the Paracou experimental site within the ecological context of French Guiana and describes the original design of the Silvicultural Project and the main data collected on the plots. It then reviews the main characteristics and potential differences between these plots, as a basis for further discussion and interpretation of the results reported in some of the following chapters.

Keywords: French Guiana, Paracou site, Silvicultural treatments, Experimental plots, Database

1. General context

The Paracou Experimental Station is located in the coastal part of French Guiana, approximately 15 km SSE of the town of Sinnamary and 50 km NW of the European Space Centre at Kourou, at latitude 5°18′N and longitude 52°53′W (Fig. 1). The site is part of a private domain of about 40,000 ha, owned by the Centre National d'Etudes Spatiales, and is granted to CIRAD.

The climate is equatorial, strongly influenced by the movement of the Intertropical Convergence Zone which determines two main climatic periods: a well marked dry season occurring from mid-August to mid-November and a long rainy season, often interrupted by a short drier period between March and April. The mean annual rainfall in French Guiana decreases from the north-eastern region where it exceeds 4 m, to the north-western, western and southern regions where it is less than 2 m (Boyé et al., 1979). Records made near or at Paracou from 1979 to 2001 give a mean annual rainfall of 3,041 mm over this period with a minimum in September and a maximum in May (Fig. 2). The mean annual temperature is 26 °C with an annual range of 1 to 1.5 °C. Winds are generally weak (never exceeding 20 m/s according to Boyé et al., 1979), averaging 2.3 m/s and mainly oriented ENE according to data from the meteorological station at the Space Centre (Durrieu de Madron, 1993).

French Guiana is part of the geological unit called the "Guyana Shield", which spreads from the Amazon River to the Orenoque River. It is characterized by Pre Cambrian granitic and metamorphic formations, highly eroded, associated mostly with gently undulating landscapes and a very dense hydrographic system (Fig. 3). The "terra firme" hilly region corresponding to these formations covers 94% of French Guiana. To the north of the department, the hills progressively give way to lowlands, small coastal plains developed on quaternary alluvial sediments (Boyé, 1976). The Paracou site is located in the northernmost part of the hilly area, on a formation called the "série Armina", characterized by schists and sandstones and locally crossed by veins of pegmatite, aplite and quartz. The hydrographic system is globally oriented SW–NE.

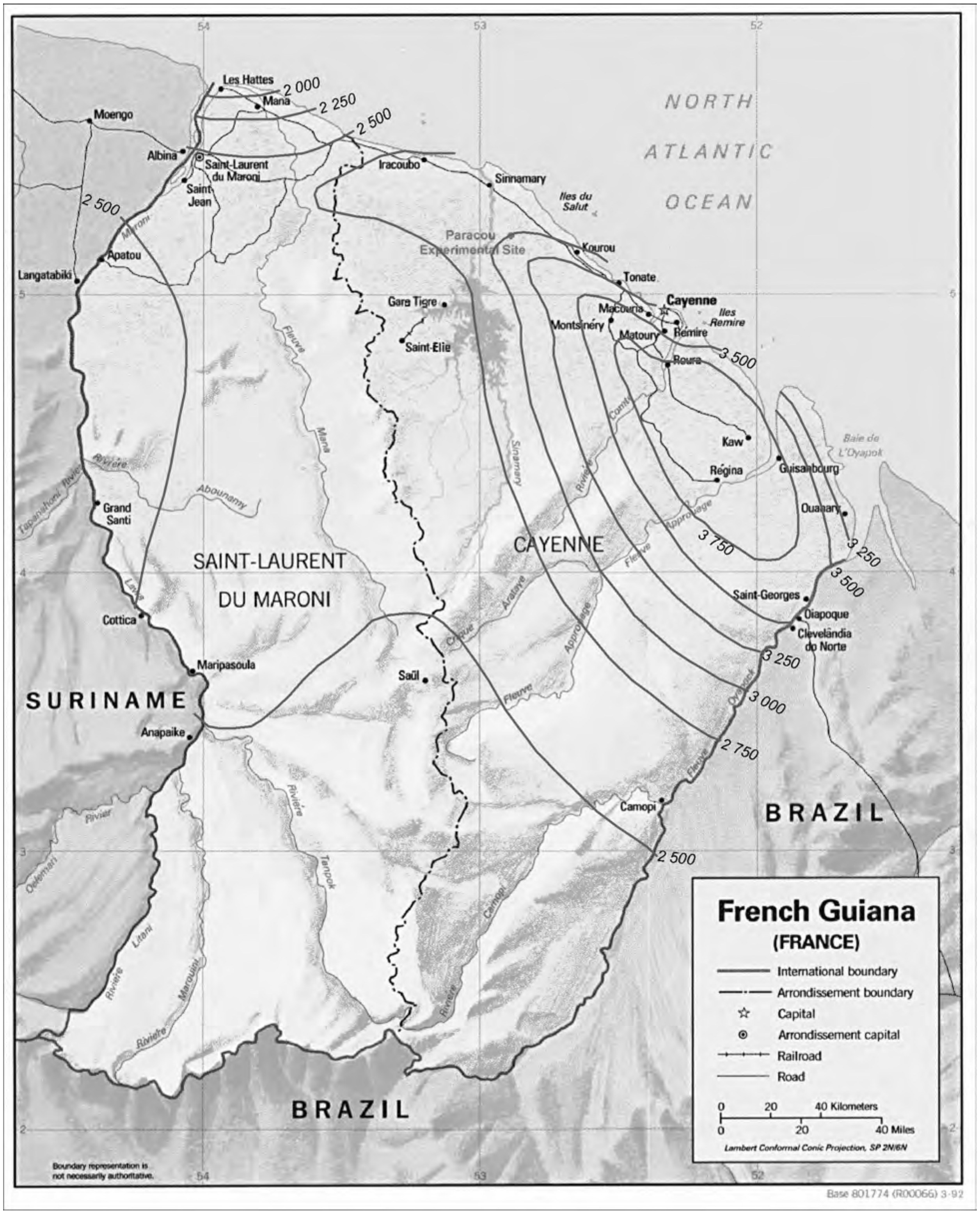


Fig. 1. General map of French Guiana, isohyets and location of the Paracou site. Map adapted from the file available at http://www.lib.utexas.edu/maps/americas/french_guiana.gif. See also the colour version, p. 309.

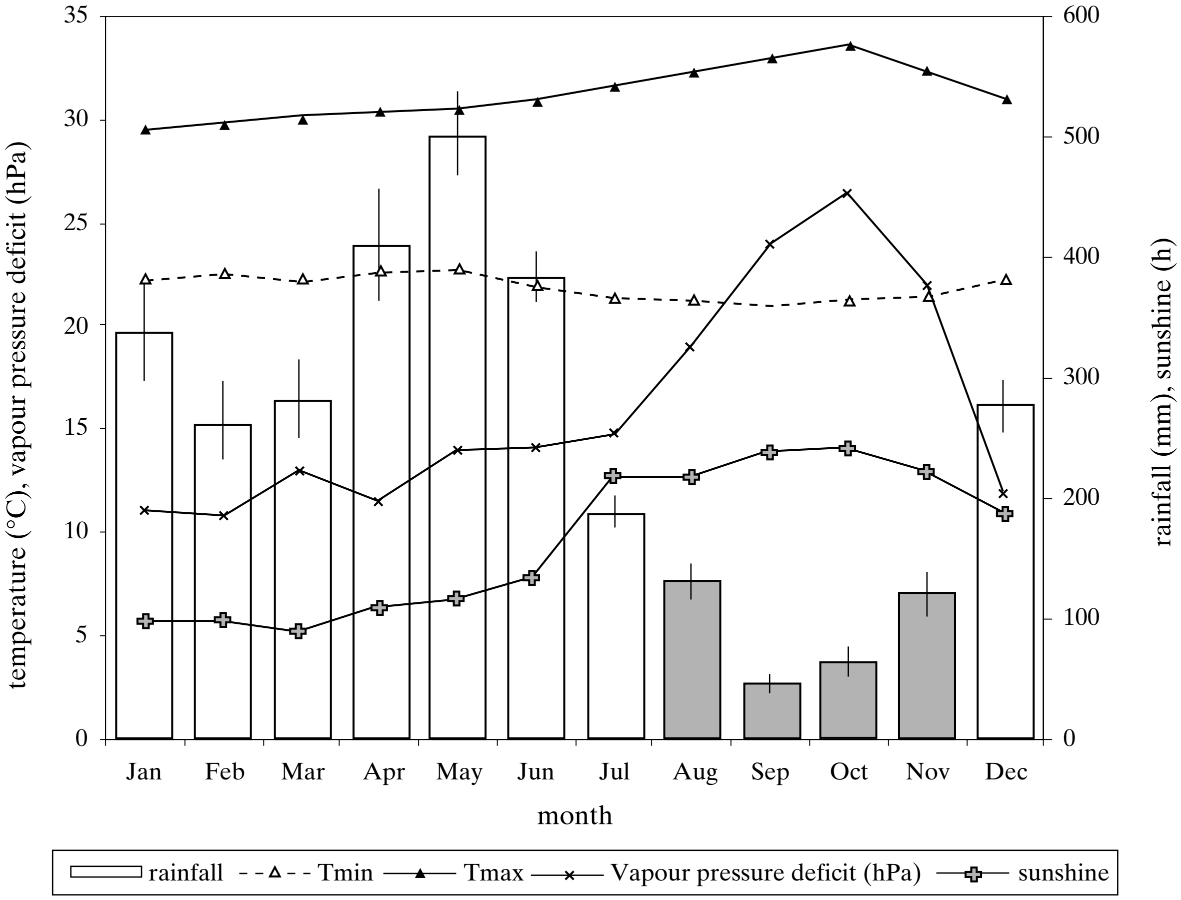


Fig. 2. Annual climate pattern at Paracou (5°18′N, 52°53′W), French Guiana. Bars are the means (SE) of monthly precipitation levels recorded from 1979 to 2001. Dry season months are shaded. Average hours of sunshine per month and temperatures minimum and maximum were recorded only for 1989–1991 and 1995–2001, vapour pressure deficits for 1997–1998. Sources: CIRAD-Forêt, "Service Météorologique de la Guyane" and INRA, partly tabulated by Baraloto, 2001; Bonal, 2000; Loubry, 1994; and Sabatier, 1983 compiled by S. Jésel (2002).

The relief of the site consists of small elliptic hills separated by narrow (<5 m wide) sandy waterbeds. The altitude varies from 5 to about 45 m above sea level.

Except for a few forest types limited to specific soil or topographic conditions (white sands, outcropped lateritic duricrusts, inselbergs, swamps or river banks), most of French Guiana is covered by lowland "terra firme" rain forests. The richness of tree species is relatively high in these ecosystems, with >140 species/ha reported for trees having a diameter at breast height (DBH) above 10 cm (Sabatier and Prévost, 1990): alpha-diversity is lower than in the forests of western Amazonia, but reaches the highest values on the Guyana Shield (Ter Steege et al., 2000). Variations in floristic composition and species richness are neither fully described nor explained, but probably result from the superpositioning of various gradients: at the local scale, ecological gradients such as soil drainage and composition, or light availability along post-gap successional phases; at the landscape and regional scales, topographic (micro- and meso-) climatic, and historical (biogeographical) gradients. Among the 75 families and about 1,500 species of trees of DBH above 10 cm that have been identified so far in French Guiana (Sabatier and Prévost, personal communication), none are really dominant. In all botanical inventories of this DBH class, the five most

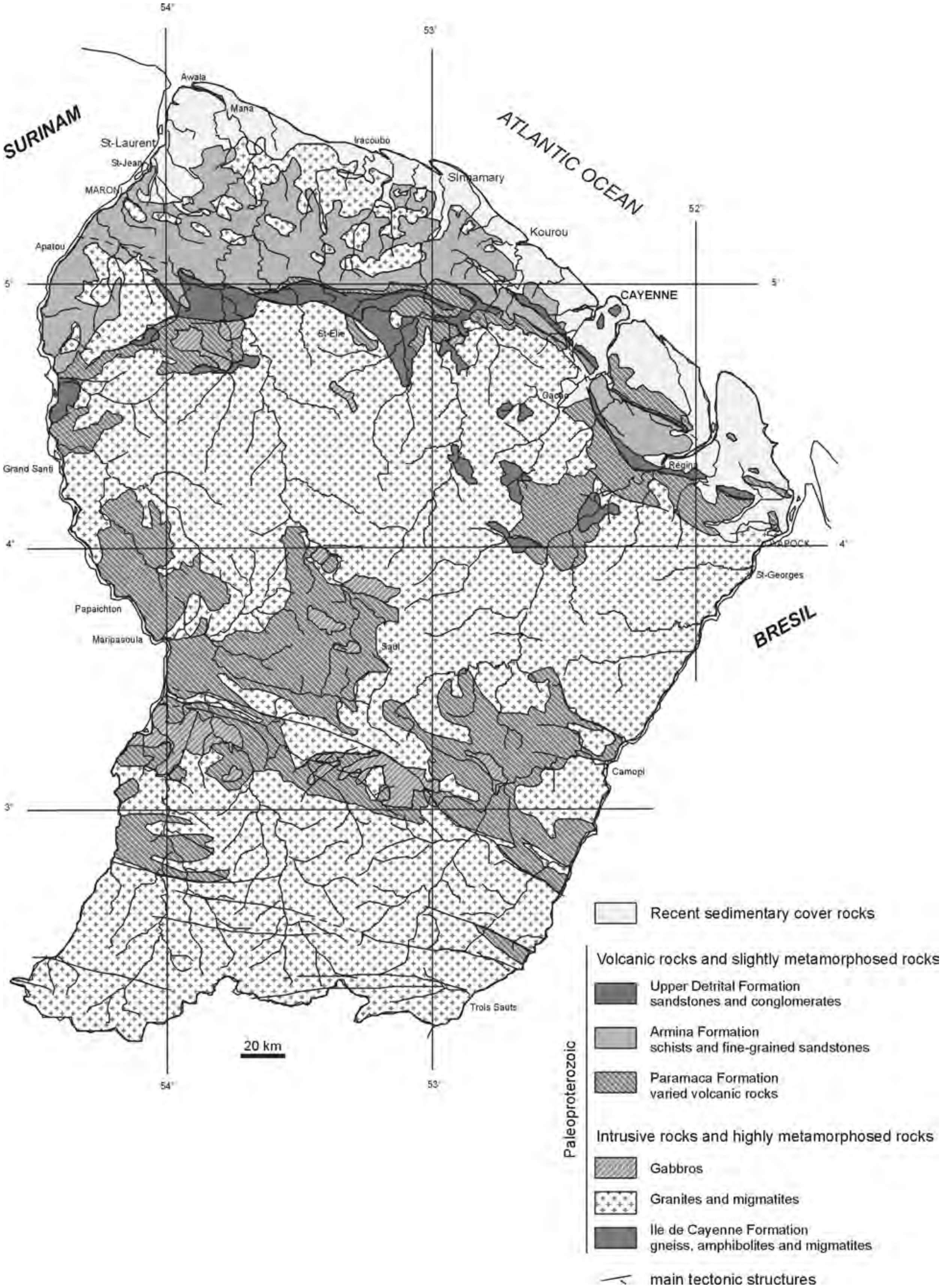


Fig. 3. Geology of French Guiana. From BRGM, adapted by Paget (1999). See also the colour version, p. 310.

abundant families taken together hardly exceed 60% of all trees. A few families are almost always present (the Lecythidaceae, Leguminosae, Sapotaceae and Chrysobalanaceae). Two taxa, the family Burseraceae and the leguminous family Caesalpiniaceae, play a much more contrasted role, being the top- or second-ranked groups in some regions, and a minor one in others. This has led to the distinction of two main facies in old-growth lowland "terra firme" forests: the Burseraceae and the Caesalpiniaceae forests (Sabatier and Prévost, 1990). The Paracou forest belongs to the latter facies.

2. Protocols

The Silvicultural Project was initiated on the Paracou site in 1982 to address the following questions (Maître, 1982).

- What are the possibilities of recovering the standing commercial volume in logged-over forests of the coastal part of French Guiana?
- Is it possible to stimulate this recovery with appropriate silvicultural techniques and rules, which are easy to apply on a large scale, so as to achieve sustainable production in these forests?

These questions led to specific objectives, among which were the testing of thinning techniques, the definition of silvicultural rules, and the study of the dynamics of stands and populations of the main commercial species, according to several types of silvicultural treatments. Time being a critical dimension of the last objective, efforts were directed at the design and implementation of permanent sample plots (PSP). Benefiting from their past experience in similar projects in African rainforests, the CIRAD-Forêt teams decided to comply with the following guidelines:

- work on large size plots, greater than the PSP usually used in this type of study (PSP techniques are fully described in Alder and Synnott, 1992 and Synnott, 1979) with as many replicates as possible, to better account for the great spatial heterogeneity encountered in these forests;
- delimitate plots in previously undisturbed stands and repeat surveys before any silvicultural treatment, so that each plot could be its own control;
- focus the silvicultural treatments on large trees, natural regeneration being observed rather than directly manipulated, and monitor only trees ≥10 cm DBH;
- detail all identifiable types of mortality, natural or following silvicultural treatments.

When reading this chapter, it is essential to keep in mind the initial questions addressed by the Paracou Project, as they explain choices which today may appear restrictive. The centre of interest in 1982 was clearly the timber resource and its renewal. Looking back, and as discussed in Chapters 4 and 5, Part IV of this book, considerable insight was gained into the dynamics of the stands of the coastal rainforests, which now form the basis of forest management decisions made by the National Forest Office (ONF) in charge of most of the forests of French Guiana. It can thus be considered that the initial objectives were largely fulfilled by the Paracou Silvicultural Project.

In addition, the questions posed to and by the scientific community evolved with the increasing awareness of the potential value of biodiversity, and the links between biodiversity and the functioning of the ecosystem. This led to the establishment of various scientific teams which initiated ecological, genetic and ecophysiological studies at the same site, enlarging the observations and data gathered at Paracou. These concerns will be discussed in Parts II and III of this book.

2.1. Layout of the plots and description of the silvicultural treatments

At the beginning of the project, the site was covered with a moist evergreen rain forest, which had never undergone major human disturbance, except, in some places, occasional extraction of Balata gum (*Manilkara bidentata*, Sapotaceae). Some selective logging also probably occurred in the past, but without detectable consequences on the stands as far as floristic composition, structure and dynamics were concerned.

A first inventory was carried out on a 476 ha area; it sought homogeneous places in terms of: soils, standing commercial timber, and density of future crop trees. This allowed, in 1984, the delimitation of 12 square plots of 9 ha each, located on soils with mainly superficial drainage, supposed to be the most widespread type in the coastal part of French Guiana. The stands are representative of the Kourou-Sinnamary region, according to previous large scale surveys carried out in this area (Schmitt, 1984).

Each 9 ha plot contains a buffer zone 25 m wide. Trees are monitored inside the core zone, i.e. in an area of 6.25 ha, while silvicultural treatments are applied to the whole plot (Fig. 4). The core zone is subdivided into four squares in order to facilitate the enumeration of trees. All trees of ≥10 cm DBH are localised by Cartesian coordinates and botanically identified when possible.

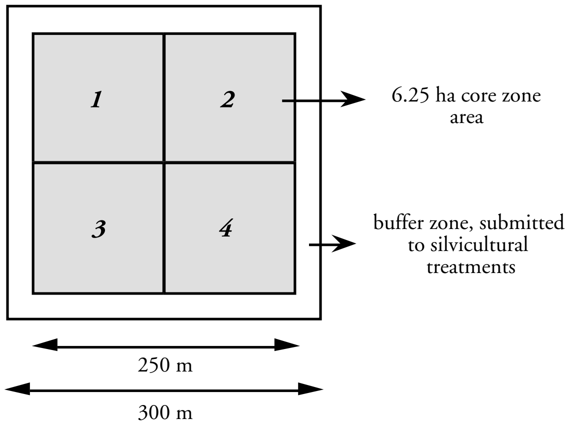


Fig. 4. Layout of a 9 ha plot. Silvicultural treatments are applied to the whole plot, but trees are localised and monitored only in the core zone of 6.25 ha. The core zone is split into four squares, numbered 1 to 4, in order to facilitate the enumeration and location of the trees.

In 1984, during the first survey, more than 46,000 trees were thus recorded in the database (Schmitt, 1985). In order to better evaluate the impact of the treatments on tree population dynamics, the natural regeneration of selected tree species was partially monitored inside circular sub-plots of various radii, located on a systematic grid inside each plot (see below, Section 2.3).

The 12 plots were assigned to three homogeneous blocks (four plots per block) defined according to the size structure characteristics of the main valuable species (Bergonzini and Schmitt, 1985). Three types of silvicultural treatments of increasing intensity were defined and, according to a randomised block design, applied to one plot inside each block, the last plot remaining a control. This left us with three replicates of three treatments plus three control plots (see Fig. 5).*

The treatments, applied between 1986 and 1988, were the following (Schmitt, 1989, see also Table 1):

- treatment 1 (T1): traditional selective felling for timber, representing about 10 trees/ha of DBH ≥ 50–60 cm, belonging to 58 commercial species or groups of species (SGS);
- treatment 2 (T2): selective felling for timber (as for T1) plus thinning by poison-girdling of all non-commercial species (NCS) of DBH ≥ 40 cm (about 30 trees/ha). Poison-girdling of commercial species was also carried out when trees had major defects;
- treatment 3 (T3): selective felling for timber (as for T1) plus logging of NCS of DBH between 40 and 50 cm (for fuelwood: about 15 trees/ha), followed by poison-girdling of all NCS of DBH ≥50 cm (about 20 trees/ha). As for T2, trees of commercial species with major defects were eliminated.

Twenty species only (1 to 3 trees/ha) are currently exploited in French Guiana, mainly for the internal timber market. The pool of species considered to have a commercial value in 1984 and targeted for logging on the plots included these valuable species, but was extended to others on the basis of their good technological properties, for two main reasons: (i) in view of a potential increase in the demand for timber, it appeared preferable to extend the range of exploited species inside the same stands rather than the areas exploited while keeping a restricted set of species; (ii) it gave some genericity to the experiment, allowing comparison of the results with other experiments in countries having higher logging pressure on forests and to obtain general results which could be adapted to other tropical rainforests.

The trial concerning logging for fuelwood was set up due to the perspective of a durable wood-fed thermal power station near Cayenne, that finally stopped its activity a few years later. This trial allowed to quantify the additional damage induced by clearing the stands by logging rather than by poison-girdling (a direct comparison was made possible between T2 and T3, as the same fraction of trees was eliminated in both treatments by the two methods).

* NB. In 1990, three new plots were added to the 12 initial ones in order to test a new silvicultural treatment. At present, they are still monitored as controls (no treatment applied). They will not be dealt with in this book. In 1991/1992, a last big plot (P16, 25 ha) was also established in the SW part of the site, on soils developed over migmatite; this plot is dedicated to studies dealing with the functioning of the undisturbed forest ecosystem (determinism of spatial patterns, phenology, population genetics).

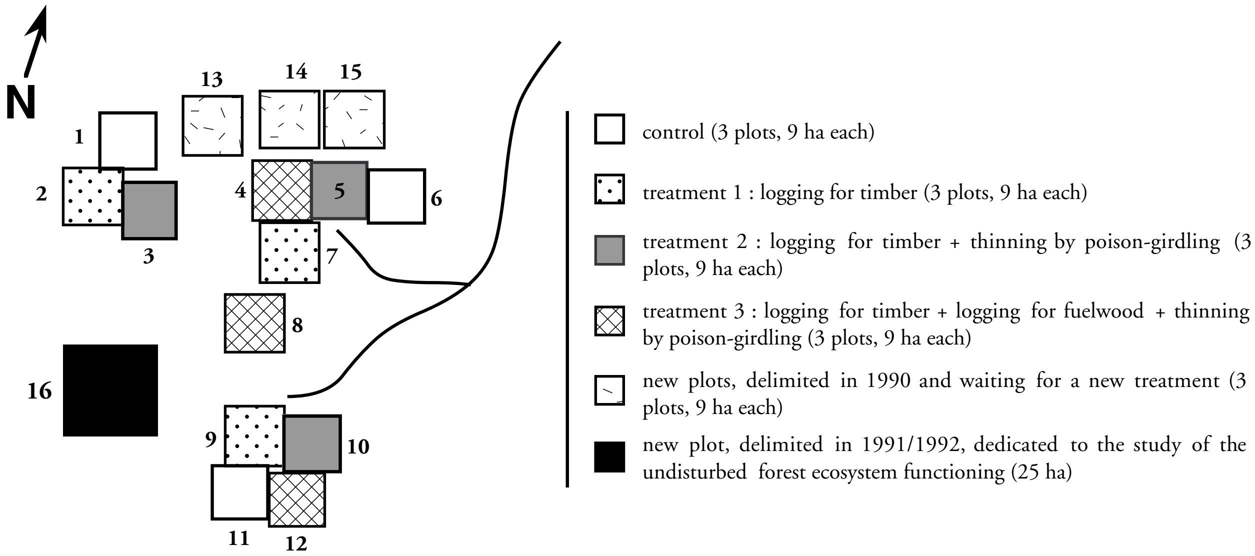


Fig. 5. Overview of the Paracou experimental plots. Block 1: P1 to P3 and P8. Block 2: P6, P7, P10 and P12. Block 3: P4, P5, P9 and P11.

Table 1
Treatments implemented on the Paracou plots. The three initial homogeneous blocks defined by Bergonzini and Schmitt in 1985 are the following: **P1**, **P2**, **P3** and **P8** **(Block 1)**; P6, P7, P10 and P12 (Block 2); and *P4*, *P5*, *P9* and *P11 (Block 3)*.

Treatments	*Plots*	*Logging*		*Thinning*
		Timber	*Fuelwood*	
Control (T0)	**P1**, P6, *P11*	–	–	–
T1	**P2**, P7, *P9*	DBH ≥ 50 cm or 60 cm, according to species: mean of **10 trees/ha**	–	–
T2	**P3**, *P5*, P10	Idem	–	DBH ≥ 40 cm, all non-valuable trees: mean of **30 trees/ha**
T3	*P4*, **P8**, P12	Idem	40 cm ≤ DBH ≤ 50 cm, all non-valuable trees: mean **20 trees/ha**	DBH ≥ 50 cm, all non-valuable trees: mean of **15 trees/ha**

The schedule of logging and thinning operations on the treated plots is shown in Table 2.

The impacts of the treatments in terms of basal area extracted, broken and damaged, as well as in terms of modifications of the dynamics of the stands are discussed in detail in Chapter 5, Part IV of this book.

2.2. Monitoring of the trees of DBH ≥ 10 cm

Since 1984, an inventory campaign has been carried out on the 12 plots each year during the long dry season (from August until the beginning of December). Data collected on this annual basis are the following:

Table 2
Schedule of logging and thinning on the Paracou plots. Logging (L) affected the nine treated plots, the plots of T3 being logged more heavily than the others. Thinning by poison-girdling (T) affected the six plots of T2 and T3.

Years	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Activity			**— L —**									
				— T —								

L: Timber logging, which took place between 6/10/86 and 21/05/87.
T: Thinning by poison-girdling, which took place between 8/12/87 and 22/01/88.

- girth of each living tree with a DBH of ≥10 cm, measured at 1.30 m when possible or above main defaults and/or buttresses by increments of 50 cm. The measurement is made with a steel tape and rounded up or down to the nearest centimetre. When the point of measurement is too high (well developed buttresses), a Bitterlich relascope is used. Anomalies causing imprecise measurement (non-circular trunks, point of measurement moved up, use of the relascope) are systematically coded in the data base, allowing the user to correct and/or disregard them: about 12% of the trees are concerned. From 1995 on, systematic measurements of girth have been made once every 2 years;
- identification of dead trees and of the type of death. Natural death: standing death, primary windthrow (fallen tree), secondary windthrow (fallen and broken tree as a result of a primary windthrow) and human-induced death: felling, death following damage due to logging operations, poisoning;
- location and botanical identification of new recruits (trees reaching the threshold DBH of 10 cm).

So far, data from 15 measurement campaigns are stored in the CIRAD-Forêt data base of Paracou. They allow the analysis, characterization and possibly the modelling of (i) growth, mortality and recruitment at the individual scale; (ii) specific characteristics such as spatial patterns; (iii) the influence of physical factors such as topography, geological substrate and soil, as well as disturbances induced by the silvicultural treatments on the components of the dynamics. They also provide support to many complementary research projects dealing with phenology, reproductive strategies, genetic diversity and ecophysiology (see Parts II and III).

However, two limitations still remain:

- botanical knowledge about the inventoried trees. At the beginning of the project in 1984, it was decided to limit botanical identification to the timber species likely to be logged during the 1986–1987 campaign. Moreover, due to a relative lack of taxonomic knowledge at the time, these commercial taxa were aggregated into 58 “species or groups of species” (SGS), 15 of them including two or more species. Only one non-timber species, *Pradosia cochlearia* (Sapotaceae), had been systematically censused because its characteristics (an abundant, large, emerging tree with huge buttresses) made it difficult to kill by poison-girdling. Other non-timber trees were grouped into five SGS, two of them corresponding approximately to the families Chrysobalanaceae and Arecaceae (the palm family), two more representing most of the Lecythidaceae, the last one grouping all remaining non-identified trees. This first “light” identification protocol progressively proved to be inadequate as the objectives of the investigations conducted on the site shifted towards more fundamental scientific questions. From 1992 onwards, further identifications (Favrichon, 1994, 1995) led to an enlargement of the pool of SGS, which numbers 200 species at present. More recently, inventories of trees of DBH ≥ 2 cm were conducted on ten 0.5 ha transects (25 m × 250 m) within 10 of the 12 original plots (Molino and Sabatier, 2001). Identification at the species level was the rule – for 99.2% of all trees – and relied on classical methods of botanical inventory, including collection of herbarium vouchers identified at the Cayenne Herbarium (CAY) or sent to specialists worldwide. Results showed the presence, on this small part (5 ha) of the Paracou site, of at least 546 tree species or morphospecies, 318 of them for trees of DBH ≥ 10 cm.

As a result, an important problem is that all trees having died before 1992, in particular those felled and poisoned, cannot be classified more precisely than allowed by the first identification. This makes an a posteriori comparison of the initial floristic composition among plots a difficult and doubtful exercise; we will discuss this point in more detail in Section 3.2.

- The number of dendrometric variables measured, namely one, the girth, which allows only a very simplified vision of the stands. Inventories of heights and crown dimensions have been undertaken for some species, but these data are difficult to collect accurately and are very time consuming.

2.3. Monitoring of natural regeneration

Systematic inventories of the regeneration stricto sensu (juveniles) were carried out by INRA on all the plots. They took place first in 1986, just before the beginning of logging operations, then in 1988, 1990, 1992 and finally in 1995. The implemented protocols underwent several modifications from one campaign to the other, as difficulties and new questions arose (Bariteau and Geoffroy, 1989; Bariteau, 1993; Montpied, 1995; Rankin de Merona, 1999 and see Chapter 3, Part IV in this book), but some principles remained unchanged:

- monitoring was restricted to a small number of species, for which botanical identification at early stages did not pose questions. Most of the data were collected on 12 species;
- the juveniles were classified into two stages: "seedlings", between 5 and 150 cm high, and "saplings", ≥150 cm high and having a DBH <10 cm. They were sampled at increasing rates (from 1% to 4.4%, depending on the campaigns);
- the inventory was made on circular sub-plots, with a radius varying according to the sampling rate (i.e. the stage of the juveniles), located at the nodes of a 20 m by 20 m grid: 144 sub-plots per plot were thus surveyed in 1986, 1988 and 1990, and this sample was reduced to 64 sub-plots per plot for the 1992 and 1995 campaigns.

Various data were collected during the 1986–1995 period: abundance classes, exact counts, exact measurements of height on some individuals, characterisation of several environmental factors. These types of systematic inventory yielded results which were sometimes difficult to interpret for the following main reasons: (i) many important species have populations which clustered on a small spatial scale, so that their juveniles recorded in the sub-plots are scarce; (ii) seedlings are affected by a very high mortality rate and it is difficult to assign a meaning to the series of density values derived from the inventories; (iii) the important "sapling" stage cannot be correctly assessed on a species basis due to the insufficient pool of monitored individuals. This led INRA to give up this project and to undertake, in collaboration with the MNHN, complementary species-oriented research projects which are now carried out through enlarged collaboration between CIRAD, INRA, MNHN/CNRS and Michigan University (see Baraloto, 2001 and Chapter 2, Part IV in this book).

3. Main characteristics of the plots

The Paracou plots were delimited within an area of 476 ha, according to the following criteria:

- soils should be homogeneous and representative of the conditions encountered in the coastal part of French Guiana;
- stands should be homogeneous from the viewpoint of (i) potentially extractable timber volumes; (ii) density of future crop trees on which it would be possible to focus to evaluate the effects of silvicultural treatments.

Although these criteria were met to a certain degree, some heterogeneity could not be avoided in the physical and structural characteristics, as well as in the floristic compositions from plot to plot, likely to interact with the dynamics of the stands under study.

This is why we found it necessary to go more deeply into the characterisation of the initial state of the plots, using as much information as possible. In the following paragraphs, we thus: (i) summarise our geomorphological, pedological and botanical knowledge about the site; (ii) perform several multivariate analyses to detect the similarities between plots on the basis of different factors (soil, landfacets, floristic composition, stand structure); (iii) discuss the potential links between plot characteristics and their subsequent evolution.

3.1. Geomorphology and pedology

The geomorphological map of the northern synclinorium of Orapu (Rouiller, 1997) shows that Paracou is located on the smoothest landscape units found on the schist of the Armina series. The landscape of plots P1 to P15 is a tabular system incised by streams, while plot P16 is on a still smoother relief. Altitudes range from about 5 to 45 m above sea level.

The hydrographic network which dissects the Paracou area (Fig. 6) converges towards several principal rivers at the north, west and south of the plots. These rivers run out slowly towards the Sinnamary river at the west, through a flat and marshy lowland less than 3 km wide.

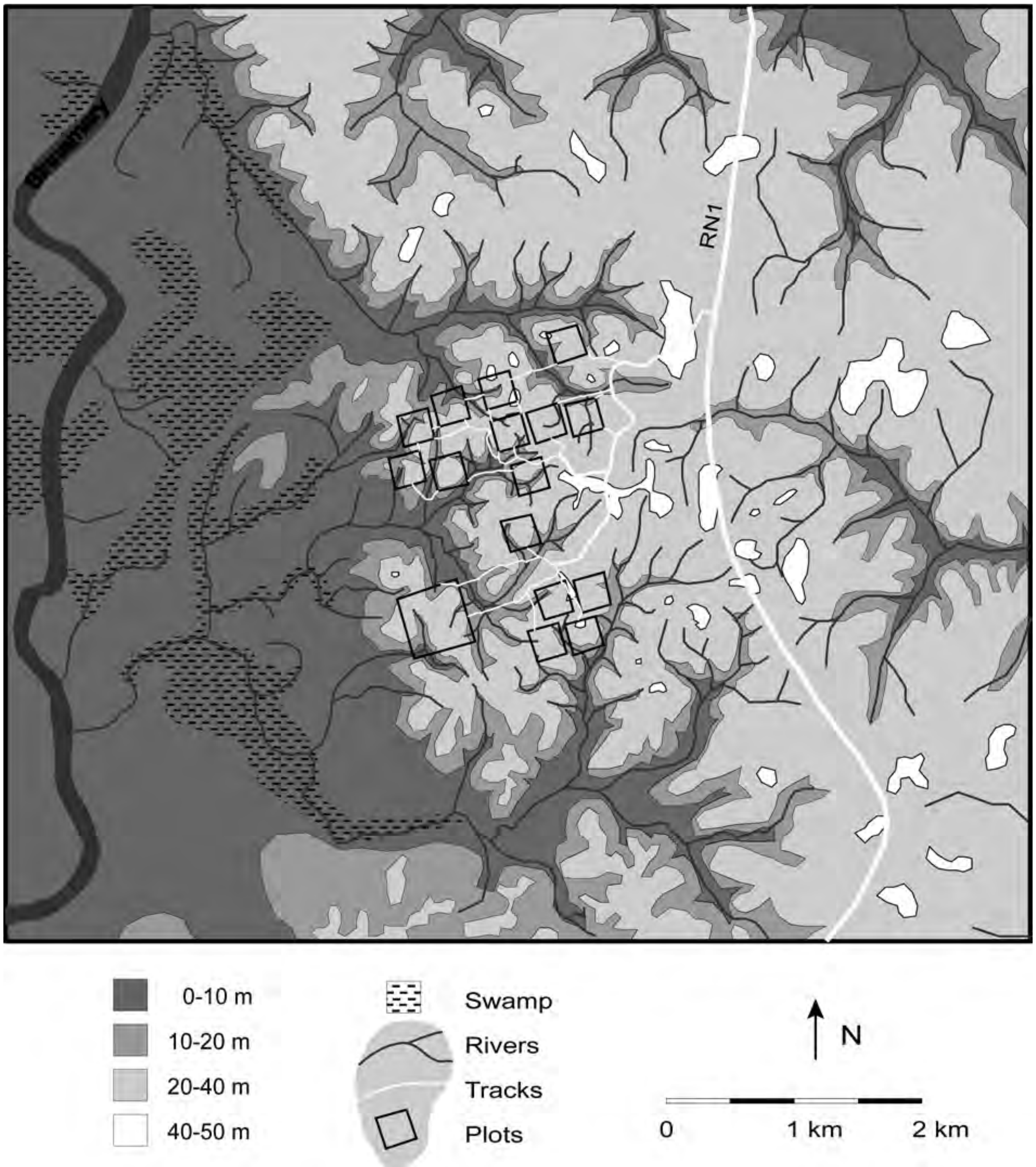


Fig. 6. General map of the bottomlands in the Paracou region. Black delimited squares represent the plots of the Paracou site.

One characteristic of these smooth landscapes is the lack of the continuous lateritic duricrust commonly found on hilltops elsewhere (Rouiller, 1997; Paget, 1999). A broad and rapid characterisation of the soil cover of the 476 ha area (Boulet et Brunet, 1983) revealed a juxtaposition of four major types of soil systems, with very contrasted morphology and functioning:

- the most widespread soils are the shallow ferralitic soils, limited in depth by a more or less transformed loamy saprolite (≤1 m deep), which has a low permeability and during heavy rain causes a lateral underground circulation of water; these soils are usually referred to as "mainly superficial lateral drainage soils" and suffer from low water holding capacity which constitutes a major constraint for the vegetation (Boulet et al., 1979 ; Barthès, 1988 ; Sabatier et al., 1997).
- Deep ferralitic soils, referred to as "free, deep vertical drainage soils" are primarily encountered on the highest residual summits of the area (approximately 40 m above sea level), but they can also be found at the bottom of the slopes.
- Podzols, more usually called "white sands", are present. Their hydrologic functioning is characterised by rather deep vertical drainage and very low water holding capacity; they are mainly found near thick ferralitic soils, in the same topographic situations.
- Along streams and in broad bottomlands, soils are subjected all year long to the influence of a fluctuating watertable, with periods of complete waterlogging; these edaphic conditions have the most dramatic effects on the vegetation.

It was decided to establish the Paracou plots mainly on shallow ferralitic soils, even if the density of the hydrological network made it impossible to avoid bottomlands. Moreover, the pedological studies carried out later by Barthès (1988) in plots P4, P5, P7, P8 and P11 and by Barthès (1991) in plots P1, P6 and P11 showed that some plots included areas covered by deep ferrallitic soils.

We will focus, in the following paragraphs, on the two main types encountered, namely ferralitic soils and bottomlands.

3.1.1. Ferralitic soils, mainly shallow, with superficial lateral drainage

The great majority of the ferrallitic soils are characterised by the presence, at a low to medium depth (between 50 and 120 cm), of a more or less transformed saprolite, with a texture characterised by the relative importance of silt, a variable colour (red, purplished, sharp brown-yellow, red with yellow volumes, yellow with a red network, bright white, grey-blue, …), a low apparent porosity and a rather strong compactness, the possible presence of mica spangles in abundance, as well as of crumbly lithorelics. In contrast, the upper horizons tend to be colourless, between brown-grey, brown-yellow and pale yellow; their texture is less silty and they are less compact; the coarse elements can be abundant and consist of ferruginised quartz or hardened lithorelics of schist. The colour of the top layer can be grey rather than brown, related to waterlogging during the rainy season (Barthès, 1991).

All during the rainy season, the profile is moistened in the upper horizons and in the top of the saprolite layer, whereas below the soil seems dry to the touch. Identical observations on the very similar pedological covers of ECEREX watersheds (Boulet, 1983) could be connected to measurements of the water dynamics in the soil (Guehl, 1984); this study showed that in the course of the rainy season, a watertable appeared at the top of this "dry to the touch" layer, flowing over it along the slope.

In the plots P1, P4 to P8 and P11 studied by Barthès (1988, 1991), the depth of the dry layer, during the rainy season, varies between less than 60 and 120 cm; the shallowest soils are usually located at the top or in the middle of hillsides. In some plots (P6 and P8), Barthès (1988, 1991) found significant areas covered by deeper soils, located at the bottom of the slopes, where the drainage can be considered as mainly vertical.

Another important characteristic of these soils is the presence of hydromorphy in the top layer, due to seasonal waterlogging. Most frequent in the lower topographic situations, it is also common in the flat upper areas with shallow porous soils. On the whole, hydromorphy at the top of the soils concerns 1/3 to 1/2 of the area of the plots studied by Barthès (1991).

Soil analysis data for Paracou are given in Table 3, showing that soils are characterised by a strong desaturation of exchange capacity in alkaline and alkaline-earth elements, but have a high level of exchangeable aluminium; the assimilable phosphorus content is very low. Comparable results were found in other studies on similar soils (Boulet et al., 1979; Sabatier et al., 1997).

Table 3
Pedological analyses of the upper layers (0–20 and 20–40 cm) of a shallow ferralitic soil (I) and a deeper ferralitic soil (II) of Paracou. Data from Ferry et al. 1997.

Station	*Depth*	*Coarse*	*Texture*			*Organic matter*			*pH*	*Exchange cations (co-hexamine)*							P_{assim}
	(cm)	*elements*	*Sa*	*Si*	*Cl*	*C*	*N*	*C/N*		*Ca*	*Mg*	*K*	*Na*	*Al*	*H*	*S/T*	*(Olsen)*
		(%)	*(%)*			*(‰)*				*(10^{-2} Cmol+/kg)*							*(mg/kg)*
I	0-20	43 ± 15	70 ± 3	10 ± 1	20 ± 2	21 ± 2	1.6 ± 0.2	14 ± 1	4.9 ± 0.1	9 ± 2	20 ± 3	7 ± 1	8 ± 1	163 ± 26	13 ± 6	20 ± 2	5.0 ± 0.8
	20-40	63 ± 8	65 ± 2	11 ± 0	24 ± 2	11 ± 2	0.9 ± 0.1	13 ± 1	5.0 ± 0.0	6 ± 2	10 ± 3	4 ± 1	5 ± 1	110 ± 22	5 ± 2	18 ± 6	<2.0
II	0-20	19 ± 9	70 ± 9	6 ± 2	24 ± 7	18 ± 3	1.5 ± 0.2	12 ± 1	4.7 ± 0.1	7 ± 1	16 ± 4	5 ± 1	5 ± 1	170 ± 18	22 ± 4	15 ± 2	4.5 ± 1.7
	20-40	23 ± 15	69 ± 5	7 ± 2	25 ± 4	10 ± 3	0.8 ± 0.0	12 ± 1	5.0 ± 0.0	4 ± 1	9 ± 2	3 ± 0	3 ± 1	113 ± 10	16 ± 2	13 ± 1	2.0 ± 0.0

I: Very shallow ferralitic soil (depth of the dry horizon = 60 cm) out of summit and upper part of a hillside, in plot 11.
II: Relatively deep ferralitic soil (depth of dry horizon = 120 cm) in the bottom of a hillside, in plot 16.
Each result is the average (± S.D.) of four average samples, each one being a mixture of six different auger borings. Analysis were made by the INRA laboratory of Arras.

3.1.2. Bottomlands submitted to permanent watertables

The soils located in the lowest topographic situations obviously differ from all the others. They tend to be less coloured, due to the elimination of iron (reduced and lixiviated), and to be more sandy than the surrounding ferralitic soils. The typical colours of a profile are grey-brown, black at the top (the colouring capacity of the organic matter is much stronger when iron oxides are lacking) and white, clear grey or pale yellow more in depth. Dark red hydromorphic mottles may be observed if iron oxides were not completely eliminated from the profile. A silty saprolite, bright white or highly coloured, all the more compact as it is close to the soil surface, generally appears under the bleached horizons.

According to Barthès' maps (1991), bottomland soils cover 12 to 23% of plots P1, P6 and P11. However, his classification was based only on the moisture profile during the rainy season, and further investigations showed that these soils were actually very heterogeneous, whatever their morphology or their water dynamics throughout the year. Four consecutive studies undertaken in late September, in the middle of the dry season, resulted in a new typology and a precise mapping of bottomland soils in all the Paracou plots. The typology takes into account soil morphology, watertable depth in late September, and occurrence of some plants of the understorey and palm trees. Two species appear to be particularly interesting: *Euterpe oleracea* (Arecaceae, palm tree), well known to heavily dominate the flora of swampy areas (e.g. Sabatier and Prévost, 1990) and *Rapatea paludosa* (Rapateaceae), abundant in the bottomlands of all the plots but P16, and strictly limited to the soils where the watertable is encountered close to the soil surface. Three units of bottomlands were eventually defined (see Table 4).

Relative areas covered by the soils of the various bottomlands encountered in the Paracou plots are shown on Fig. 7. We can see that:

- in the 12 main plots, bottomlands spread over 2 to 15% of each plot area. Units 0 and 1 cover 0.5 to 8.5% of the area when pooled together. Unit 0, where the constraints due to waterlogging are the highest, never exceeds 0.4%.
- Bottomlands tend to be wider in the control plots (10.2% of the area) than in the treated plots (5.1% of the area in the plots of T2).
- Two of the additional plots have particular characteristics: P13, where bottomlands occupy almost 25% of the area and plot P16 where the most hydromorphic unit 0 is well represented, covering 2% of the area.

Table 4
Typology of the soils of the bottomlands encountered on the Paracou site. Watertable depth was selected as a reference criterion for mapping, because it appeared to be, by far, the most operational.

Unit	*Depth of the watertable in late September*	*Soil morphology*	*Specific indicators*
0	0–10 cm	Brown dark. Presence of numerous fibrous vegetable residues	*E. oleracea*[2] very abundant
1	10–60 cm	Grey-black at the top of the profile and dark[1] down to 60 cm or lighter grey with dark-red hydromorphic spots	*E. oleracea* abundant to lacking; *R. paludosa*[3] almost always present and often abundant
2	60–100 cm	Not very thick humus-bearing horizon; soil grey or pale yellow down to 80 cm	*E. oleracea* very rare; *R. paludosa* sometimes present but not abundant

[1]Munsel value of the wet soil ≤ 5 on average between 20 and 60 cm.
[2]*Euterpe oleracea* (Arecaceae).
[3]*Rapatea paludosa* (Rapateaceae).

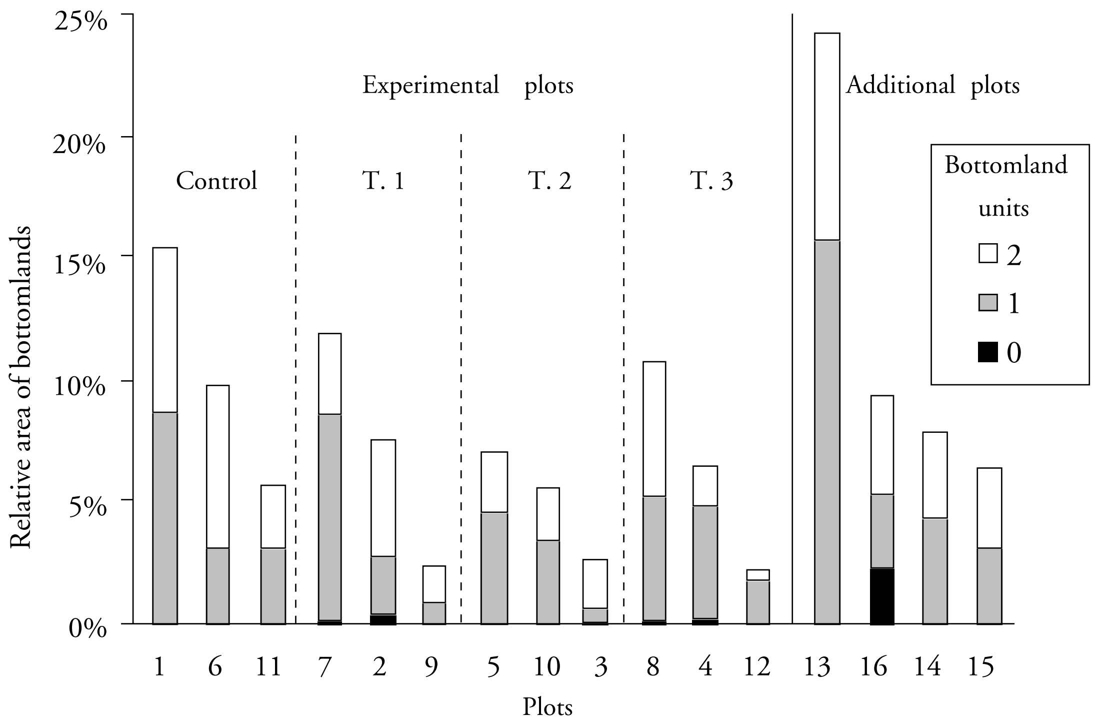


Fig. 7. Relative area covered by the soils of the bottomlands on the main plots of Paracou. The units are described in Table 4. P13–P16 are shown for comparison.

3.1.3. Synthesis over the 12 main plots

An attempt to extrapolate the pedological information available for the control plots to the 12 main plots of the site on the basis of topographical information was made by Gourlet-Fleury (1997) and Gourlet-Fleury et al. (1999). Three topographical landfacets were defined, making use of a digital elevation model built from 5 m contour lines established on all the plots: bottomlands (altitude ≤ 5 m and slope ≤ 5°), hillsides (slope > 5°, whatever the altitude) and hilltops (altitude > 5 m and slope = 0). Special attention was paid to the definition of bottomlands, as water constraints appear to be of major significance for vegetation studies. The limits in slopes and altitudes were fixed so as to maximise the overlapping between the topographical bottomlands and the pedological bottomlands defined by Barthès (1991). Assumptions made regarding the landfacets are as follows (see also Part IV, Chapter 4, Section 2.3):

- bottomlands are preferentially associated with deep sandy soils, permanent watertable, hydromorphy at the top of the soils, low carbon levels and high pH values;
- hillsides are preferentially associated with superficial soils and thus low water stocks;
- hilltops are often characterised by deeper, well drained soils with high carbon contents, but sometimes show tracks of hydromorphy at the top of the soil profiles (P11).

A correspondence analysis (COA) "landfacets × plots" helped to obtain a view of the main characteristics of the 12 plots (see Fig. 8).

Axis 1 carries the most information and separates the plots where the topographical bottomlands cover a large area: P1 and P6 mainly. Axis 2 separates plots where hilltops are relatively more frequent, P7 and P11 being mainly concerned.

When compared to the results from recent studies on the soils of the bottomlands (Fig. 7 and Table 4), it appears that the bottomlands sensu Barthès (1988, 1991) were too roughly defined and that the meaning of topographical bottomlands in terms of vegetation constraints is limited. The relative position of the plots on Fig. 8 can be discussed in this regard. In particular, P1 and P6 which mainly contribute to building axis 1 are in fact quite different in terms of their soil morphology and water constraints, P1 and P7 having the less favourable situation, while P6 appears to be among the group of plots where bottomlands categories 0 and 1 sensu Table 4 are the less widespread (P2, P3, P6 and P12). However, bottomlands cover a limited percentage of the total area of the plots and Fig. 8, even if inaccurate and unsatisfying, still provides a synthetic view to study potential links between the general substrate and stand characteristics.

3.2. Floristic composition

At the moment, three levels of floristic description are available for the site (see Section 2.2): (i) a first description using 58 useful SGS + one NCS, completed by five large categories clustering all other taxa. This is the only available set of floristic data anterior to 1992, and, notably, for the critical pre-treatment period; (ii) a second more detailed description involving 200 SGS, from 1992 onwards; (iii) a third description at the species level, limited to only 5 ha within plots P1 to P7 and P9 to P11 (Molino and Sabatier, 2001). On these sub-plots, a total of 17,016 trees of DBH ≥ 2 cm were censused. A determination by a trained botanist led to the recognition of 546 species or morphospecies belonging to 227 genera and 65 families. Among them, the 2,863 trees ≥ 10 cm DBH were found to belong to 318 species, 162 genera and 54 families.

From these results, it is quite difficult to estimate the actual richness of tree species of the Paracou site, even if limited to trees of DBH ≥ 10 cm. At the neighbouring Piste de St. Elie research station, M.-F. Prévost and D. Sabatier (unpublished data) found more than 560 species through similar inventories on 19 ha and 17,000 trees. At Paracou, we could expect to find a minimum of 600 species among the 70,000 censused trees within this DBH size class.

The two lists of species built from the identification of trees of ≥10 cm DBH (the first with 200 SGS for the whole plots and the second with 318 species for the transects) are shown in Annex 1 with the families they belong to. Correspondences, as well as indices of reliability between the two levels of identification, are given for the most abundant species in Annex 2.

Multivariate analyses were performed with the three levels of information, in order to give an image of the potential similarities between plots, despite the drawbacks caused by the lack of intensive identification at the beginning of the experiment. This work consisted in performing and comparing the results obtained through COA, using either the first (in 1984 and 1992), the second (in 1992 and 1995) or the third level of description (in 1995). We took into account: (i) the respective stand reaction to treatment and the level of information by comparing the results obtained, disregarding or not the heliophilic SGS (see Annex 2); (ii) the possible bias due to the transects by comparing them to the entire

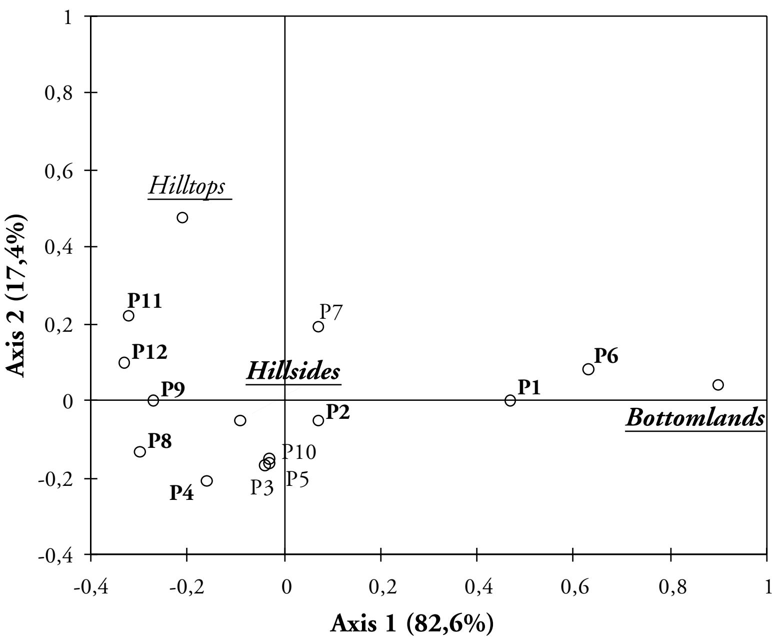


Fig. 8. First factorial map of a COA “landfacets × plots”. Plots printed in bold type are well projected on one of the two axes (i.e. the squared cosine of their angle with the axis exceeds 0.5). From Gourlet-Fleury (1997).

plots on the same floristic basis, using the second level of determination in 1995. Some of the factorial maps obtained at each step are shown in Fig. 9.

In all the analyses, plots P8 and P12 were processed as supplementary points in order to facilitate comparisons with the precise work carried out on the transects (no transect analysed on those plots). In the 1984 data set, we kept the SGS having more than 40 individuals on the 10 main plots (40 SGS in total). In the 1992 and 1995 plot data sets, SGS were kept when they totalled more than 50 trees on the 10 main plots: this left us with 100 and 102 SGS, respectively. In the 1995 transect data sets, the SGS were kept when totalling more than 10 trees (this left 60 SGS for the second level of information and 59 species for the third level).

We completed the analysis with the insights provided by the work on the 2 to 10 cm DBH classes on the transects.

3.2.1. Trees of DBH ≥ 10 cm

All the results obtained are in good general accordance and show two types of effect among the plots:

(i) a treatment effect, due to the invasion of pioneers and the increase of light-demanding species in the most opened stands: *Cecropia sciadophylla*, very abundant in P3 and P8 and, to a lesser extent, P2, P4 and P12 in 1992, increasing in number in P4 in 1995; *Cecropia obtusa*, invading the ≥10 cm DBH classes of P8 in 1992, abundant in P2, P3, P4 and P10, and becoming very abundant in P3, P4, P8, P10 and P12 in 1995. These species partly explain the relative position of the plots shown on Fig. 9(c to f), as well as the position of the control plots P1, P6 and P11. The effect is reinforced, from 1992 on, by the increase of *Tapirira guianensis* in P2 and P3, and later on P4 and P8, as well as that of *Vismia* spp. (mainly *V. sessilifolia*) in P4, P8, P10 and P12 (P3 to a lesser extent). Some light-demanding species already present in the plots greatly increased their numbers: species belonging to the genera *Inga* and *Sterculia*, mostly *Inga pezizifera* (P2, P3, P8 and P10) and *Sterculia pruriens* (P3, P4, P8 and P10). Other well known light-demanding species like *Jacaranda copaia* or *Goupia glabra* did increase their numbers in the younger stages but due to lower growth rates this was still not noticeable among trees of ≥10 cm DBH;

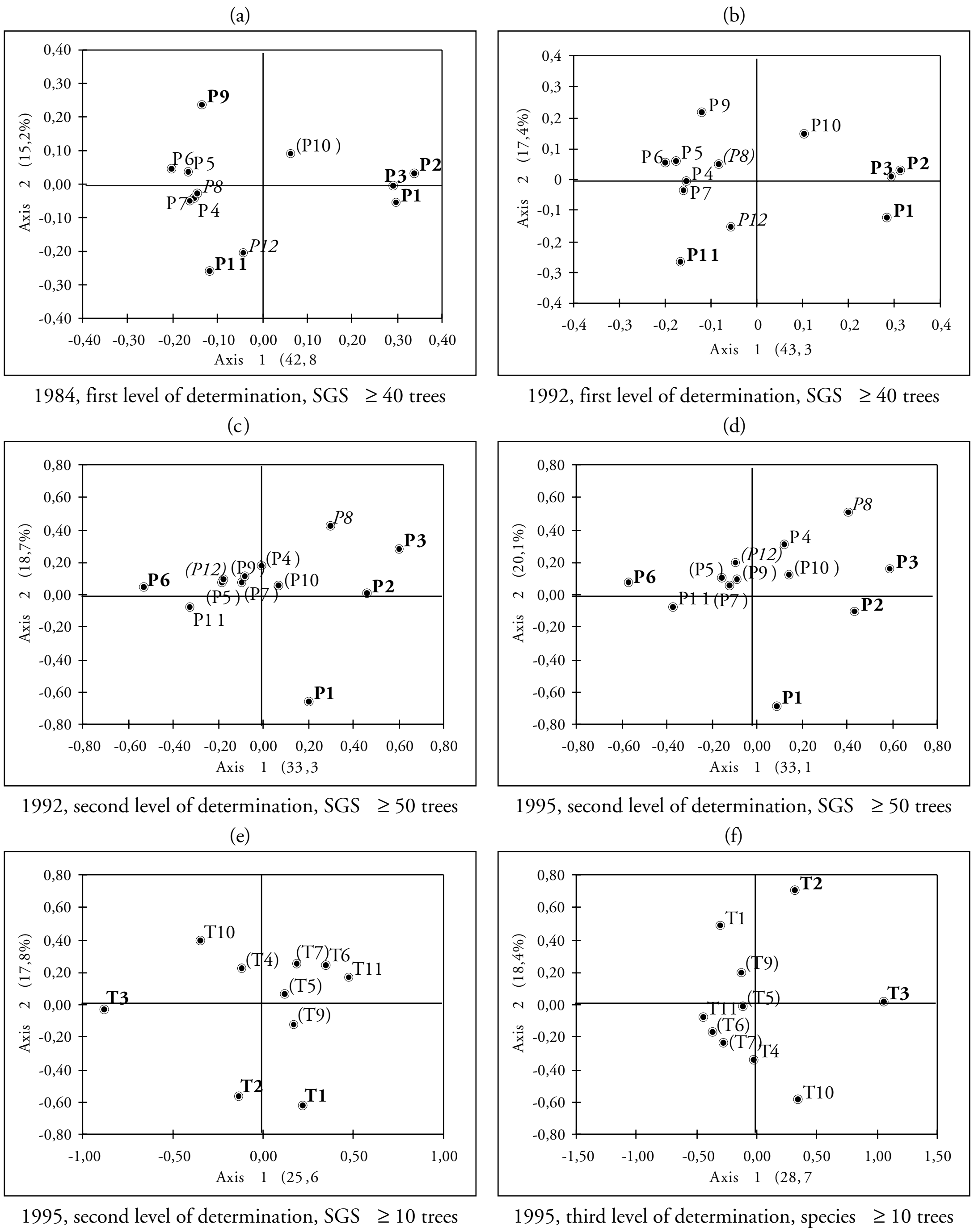


Fig. 9. First factorial maps of COA "SGS × plots" or "SGS × transects" performed using the different levels of floristic information. Plots printed in bold type are well projected on one of the two axes (i.e. the squared cosine of their angle with the axis exceeds 0.5), while plots in brackets are not correctly represented (the squared cosine is <0.2). The plots (or transects) in italics are supplementary points. (a) Situation in 1984, with the first level of floristic information. All the SGS are kept. (b) Situation in 1992, same conditions as in (a). (c) Situation in 1992, with the second level of floristic information. SGS are kept when they total 50 trees on the 10 main plots. (d) Situation in 1995, same condition as in (b). (e) Situation in 1995 for the transects, with the second level of floristic determination. SGS are kept when they total 10 trees on the transects. (f) Situation in 1995 for the transects, with the third level of floristic determination. Species are kept when they total 10 trees on the transects.

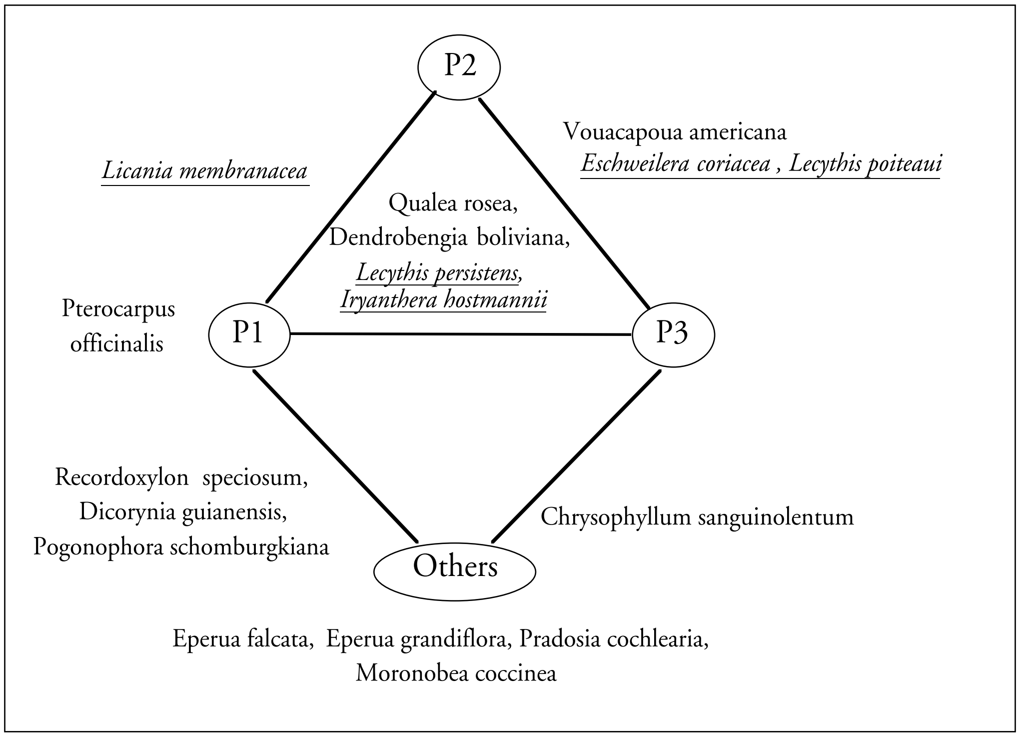
(ii) a geographic effect, independent of the previous effect (see trends on Fig. 11).

- The main effect comes from plots P1 to P3 located at the north-west of the site, which tend to be systematically contrasted to the other plots even when disregarding the most influent SGS and, after the treatments, the pioneer and light-demanding species. This effect was detected even at the first level of floristic determination, at the beginning of the experiment. As botanical information increased, the north-west group proved to be more heterogeneous than initially suspected, some newly determined species contrasting either P1 or P3 vs. the two other plots, but the north-west group always remained in a special relative position compared to the others. The main species responsible for these differences are listed on Fig. 10a. In first place are *Eperua falcata* and *Eperua grandiflora* the first being known to have an aggregative spatial pattern and being clustered inside very large patches the size of which exceeds the individual plot size. They are abundant on the Paracou site, but almost absent in the three north-west plots. The relative homogeneity of the north-west group at the beginning (see Fig. 9a and b) largely came from two SGS containing most of the species of the Lecythidaceae family, namely "Maho rouge" and "Maho noir" which acted as antagonists, Maho noir being more abundant in the north-west and Maho rouge lacking. When more precise determinations were undertaken, it appeared that significant confusion between the two SGS had occurred, and this provided meaningful information. On the transects, 92% of the Maho rouge finally proved to be *Lecythis persistens* ssp. *persistens* (141 over 153), a species more abundant in P1 to P3 than elsewhere, Maho noir being mostly *Eschweilera* spp. A similar situation was shown in two other studies carried out in nearby subcostal sites. At the Piste de St Elie, 15 km west of Paracou (Sabatier et al., 1997), complementary spatial patterns were shown between *Eperua falcata* with *Lecythis idatimon* and *Lecythis persistens* (Maho rouge) on one hand and *Eschweilera parviflora* with several other Maho noir on the other hand. At Counami, 40 km westward from Paracou, *Eperua falcata* (more or less associated with Maho rouge) and Maho noir showed opposite patterns (Couteron et al., 2003).
- Differences appear between the most distant plots of the site, namely P1 (together with P2 and P3), P6 (sometimes grouped with P5 and P7 but not systematically) and P11 (together with P12) almost always located at the summits of a triangle when the pioneer and light-demanding species are disregarded. The main species involved are listed on Fig. 10b. One of the species characterising P11, a plot with hydromorphic hilltops, namely *Chaetocarpus schomburgkianus*, was also characteristic of the hydromorphic hilltops at the Piste de St Elie study site (Sabatier et al., 1997). More generally, differences between the north and the south also appear through comparisons of P5 and P10, and between the west and the east through comparisons of P3 and P4/P5.
- The particular position of P10 on the factorial maps, intermediate between P1 to P3 and the other plots, is mainly caused by the relative lack on this plot of *Eperua falcata* and *Eperua grandiflora*, and to a lesser extent, the lack of *Pogonophora schomburgkiana* as well as the abundance of *Lecythis persistens* (same features as the north-west block).

The precise work (third level of determination) done on the transects allowed: (i) to identify the most problematic SGS, unreliable in the analysis when taking into account the entire plots and the second level of determination. The main problems still come from the *Licania*, *Eschweilera* and *Protium* genus (see Annex 2). If they are disregarded in the analysis, the differences between P1 and P2/P3 are lessened. (ii) To confirm and detail the main features already derived from the first and second levels of determination. However, due to their limited area and to their location, the transects cannot be considered as fully representative of the plots, and the results of the analysis performed with the accurate data collected on them must be considered carefully. The degree of representativeness can be evaluated by comparing Fig. 9d and e. Among species which affect the relative position of the plots on the transects, we can mention: *Pterocarpus officinalis* and *Licania canescens* (P1 becoming more similar to P2. The effect is strengthened by the presence of *Eperua falcata* on the transect of P3), *Qualea rosea*, *Eperua grandiflora* and *Dicorynia guianensis* (P9 becoming more similar to P11).

The comparison between analyses using the second or the third level of determination on the transects (see Fig. 9e and f) shows no fundamental differences, precisions being provided for: *Eschweilera coriacea*, mainly abundant in P2 and P3, *Lecythis poiteaui* and *Licania heteromorpha*, mainly abundant in P3, *Eschweilera sagotiana* and *Licania alba*, lacking in P3 and very abundant in P11, *Lecythis persistens*, abundant in P1 to P3, as well as *Iryanthera hostmannii*.

(a)



(b)

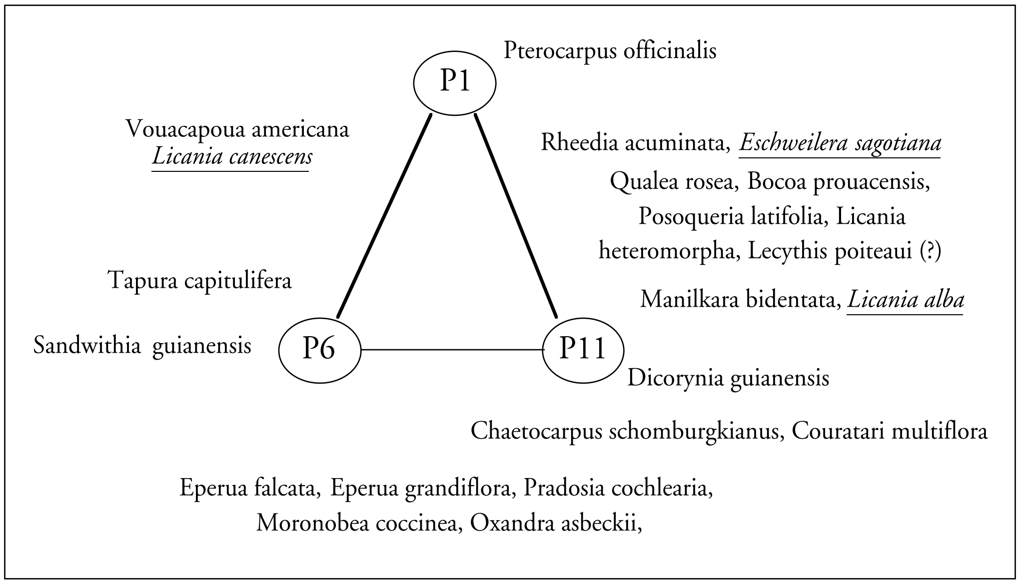


Fig. 10. Main species responsible for the differences appearing between the plots. (a) Plots of the north-west as compared to the others. (b) Most distant plots. See also Fig. 11. "?" means that the second level of determination is dubious. *Italics* means that the information relies on the transects and can be biased.

3.2.2. Trees of DBH between 2 and 10 cm

As it considerably increased the pool of censused trees on the ten 0.5-ha transects, the inventory of the 2 to 10 DBH class allowed comparisons of composition and species richness among these relatively small areas. In order to distinguish the effects of the location of the plots (geographical effect) from those of the silvicultural treatments on species mixture, we used two subsets of censused trees: (i) 12,263 "Non-heliophilic" trees of DBH ≥ 2 cm. To obtain this first dataset, we excluded 88 heliophilic species (the 49 pioneer and 39 other markedly sun-loving species) from the whole set of trees on the 10 transects. (ii) From the preceding dataset, we selected the 5,099 trees located in the less disturbed parts of the transects. The disturbance level was estimated in all non-overlapping 20 m by 20 m quadrats, using the percentage of heliophilic stems in the quadrat (%HS). %HS is defined as the percentage of all trees that belong to the 88 above-cited heliophilic species (Molino and Sabatier, 2001). Fifty quadrats (mostly in control plots: 12 in T1, 11 in T6 and 10 in T11) with <15% HS were considered as undisturbed or slightly disturbed.

From the first dataset, we calculated for each species the expected, observed and corrected frequencies in each of the 10 transects and in each of the three geographic blocks (P1 to P3 as "NW block"; P4 to P7 as "NE block" and P9 to P11 as "S block"). Expected frequency refers to the null hypothesis of random distribution among transects or blocks and corrected frequency is the ratio of observed to expected frequencies (Godron, 1966, 1968; Sabatier et al., 1997). In all cases, a one-tailed Fisher's exact test of proportions (Siegel, 1956; Sokal and Rohlf, 1997) was applied to test for the significance of the difference between observed and expected frequencies. The same figures were calculated on the second dataset, but only for the three geographic blocks.

As expected from former studies (Condit et al., 2000, and see Chapter 1, Part IV), most species appeared to be more or less aggregated: 167 (77.7%) of the 215 species represented by 10 trees or more in the first dataset had an observed frequency that was significantly distinct from the expected value (either higher or lower) in at least one transect, and 89 (41.4%) in at least two transects. The three most aggregated species were understorey trees or treelets: *Duguetia yeshidan* (Annonaceae) was significantly over- or under-represented in all 10 transects; *Sandwithia guianensis* (Euphorbiaceae) and *Anaxagorea acuminata* (Annonaceae), in nine transects. Aggregativeness was less important at landscape scale, i.e. between geographic blocks: only 157 (44.5%) of the 353 species with ≥3 representatives in the first dataset were either over- or under-represented in at least one geographic group, 93 (26.3%) in at least two groups and 23 (6.5%) in all three groups. These figures led to, respectively, 75 (31.5%), 28 (11.8%) and 14 (5.9%) of a total of 238 species with ≥3 individuals for the second dataset.

As a result, we can point out floristic variations between blocks that are most probably anterior to treatments, and somewhat different from those established above on trees with DBH ≥10 cm (see Fig. 11): the "NE block" appeared to be the most distinctive, being characterised by the presence of the three most aggregated species *Anaxagorea acuminata*, *Duguetia yeshidan* and *Sandwithia guianensis*, together with an over-representation of eight other species: *Eschweilera decolorans*, *Henriettella flavescens* (Melastomataceae), *Poecilanthe hostmannii* (Papilionaceae), *Rinorea amapensis* and *R. pectino-squamata* (Violaceae), *Tapura capitulifera* (Dichapetalaceae), *Votomita guianensis* (Melastomataceae) and *V. americana* (Caesalpiniaceae); the "NE block" was also opposed to the other two by a significantly low frequency of *Anaxagorea dolichocarpa* and *Bonafousia macrocalyx* (Apocynaceae). Meanwhile, the "NW block" was characterised by high corrected frequencies of *Cheiloclinium cognatum* (Hippocrateaceae), *Dendrobangia boliviana* (Icacinaceae), *Guarea pubescens* (Meliaceae), *Iryanthera hostmannii*, *Oxandra asbeckii* (Annonaceae), *Rheedia benthamiana* (Clusiaceae), *Rinorea flavescens*, *Trichilia schomburgkii* (Meliaceae). Finally, the "S block" was opposed to the other two by an over-representation of *Couratari oblongifolia* (Lecythidaceae), *Cupania hirsuta* (Sapindaceae), *Eperua grandiflora*, *Licania alba*, *Licania membranacea*, *Moronobea coccinea* (Clusiaceae), *Paypayrola guianensis* (Violaceae) and *Pradosia cochlearia*.

3.3. Structure of the stands

In this paragraph, we focus on the initial size class distributions characterising the plots and on the possible influencing factors. Spatial distributions are examined in Part IV, Chapter 1. The subsequent evolution of the plots according to the silvicultural treatments is analysed in detail in Part IV, Chapter 5.

The total number of stems by 5 cm wide diameter classes in 1984, as well as the total basal area, are given

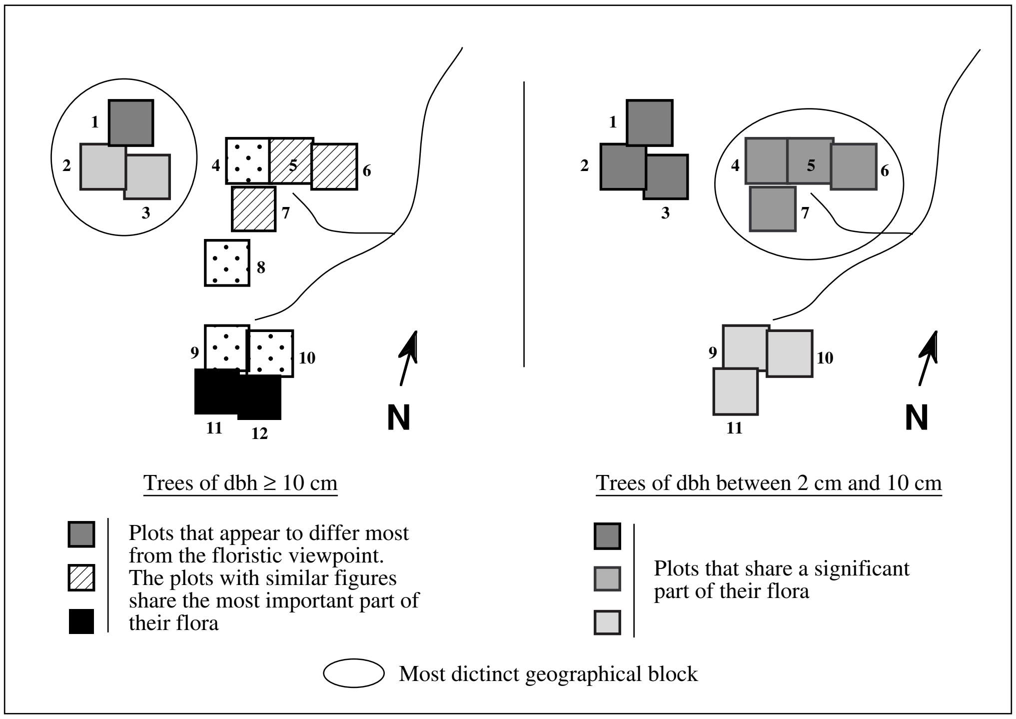


Fig. 11. Visualisation of the trends detected when analysing the floristic composition of trees of DBH ≥10 cm and trees and treelets of DBH between 2 and 10 cm, respectively.

for each plot in Table 5. Fig. 12a illustrates the global differences between the plots. Density values shift from 576 trees/ha (P2) to 683 trees/ha (P11), while basal area values go from 29.3 m^2/ha (P2) to 33 m^2/ha (P12). These variations are important: to give an idea, the mean basal area removed by the logging operations on Paracou is equivalent to the initial difference existing between plots P2 and P12.

Fig. 12b shows the first factorial map of a COA performed on the table "plots × diameter classes". The first axis sets plots with an excess of small stems and a deficit of big stems (Fig. 12c) apart from plots having a deficit of small stems and an excess of big stems (Fig. 12d). The second axis separates plots with a low number of trees in intermediate diameter classes from the others (see for example P2 and P7 on Fig. 12e).

The information provided by the first axis matches well with the scaling of plots according to density values (see Fig. 12a). Density is higher where small trees are numerous and lower where there are big trees. This is not true for basal area, as high values of this variable can result either from distributions showing many small trees, several trees of mean size, or a few big trees (compare P11, P7 and P8, for example), the decrease in the number of big stems often being compensated for by an increase in the number of small ones.

3.4. Discussion

The three components "geomorphology/pedology", "floristic composition" and "structure of the stands" depend partially on each other. Edaphic constraints have a direct impact on the density and size of the trees, but also on tree species distributions and thus floristic composition at a given site. Floristic composition, in its turn, influences the structure of the stands. In a recent study carried out in the Counami forest, between Sinnamary and Iracoubo, Mapaga (2000) showed that 14% of the information on the floristic composition of 411 inventory plots of 0.3 ha could be "explained" by the substrate characteristics and by the stand structure, the two explicative variables being non-redundant.

Soils characterised by heavy constraints, namely bottomlands and superficial soils, have a clear influence on the spatial distribution of species, and the

Table 5
Structure of the plots, by diameter classes and total basal area in 1984.

Plots	*P1*	*P2*	*P3*	*P4*	*P5*	*P6*	*P7*	*P8*	*P9*	*P10*	*P11*	*P12*
Treatment	*T0*	*T1*	*T2*	*T3*	*T2*	*T0*	*T1*	*T3*	*T1*	*T2*	*T0*	*T3*
Total number of stems (per ha) by diameter classes (cm)												
10–15	239.5	231.7	236.2	256.8	271.2	227.8	232.5	225.3	243.0	239.4	276.6	258.9
15–20	134.2	121.3	118.2	133.1	140.6	112.5	123.2	126.9	139.0	135.8	145.6	141.4
20–25	80.0	76.0	75.0	91.8	88.3	71.8	79.2	68.0	78.4	81.9	88.8	73.1
25–30	52.8	49.3	42.6	54.2	49.0	45.9	46.6	44.0	48.3	45.0	53.3	52.6
30–35	33.3	24.6	28.5	36.2	38.1	31.4	35.4	33.6	34.4	34.1	36.8	35.4
35–40	23.7	19.0	21.8	25.8	24.2	28.0	26.2	25.8	28.2	26.1	28.6	27.8
40–45	15.7	15.0	18.7	19.8	18.7	17.3	21.6	15.8	17.8	16.3	17.3	18.7
45–50	11.0	9.8	11.0	11.8	11.4	14.7	11.7	10.4	12.8	11.8	13.1	10.1
50–55	7.5	9.0	7.8	6.7	9.4	8.8	9.3	8.8	7.4	7.7	8.0	9.4
55–60	5.4	6.1	4.8	4.8	5.1	5.8	6.7	5.6	5.0	5.8	5.1	5.9
60–65	3.4	4.8	5.8	4.6	3.0	6.1	5.3	5.9	4.6	3.2	3.5	4.2
65–70	1.8	2.7	3.0	1.9	1.4	3.7	3.4	4.2	3.4	2.6	1.9	2.9
>= 70	6.1	6.6	11.0	6.2	4.3	5.4	5.0	7.4	4.5	8.6	4.2	6.7
Total number of stems (per ha)												
	614.4	575.8	584.5	653.9	664.8	579.2	605.9	581.6	626.7	618.2	682.9	647.2
Total basal area (m^2/ha)												
	30.1	29.3	32.7	31.8	30.5	31.1	31.6	31.4	30.8	32.4	31.7	33.0

density and size of the trees (Barthès, 1988, 1991; Bonjour, 1996; Collinet, 1997; Paget, 1999; Sabatier et al., 1997):

- bottomlands are preferentially occupied by particular species, either better adapted to these special conditions such as *Pterocarpus officinalis*, or less competitive in better conditions as seems to be partly the case of *Eperua falcata*;
- some species seem to be sensitive to the depth of the soil like *Dicorynia guianensis* (Kokou, 1992) or to the presence of alumine like *Eperua grandiflora* (Barthès, 1988);
- as far as stand structure is concerned, results similar to those presented in Fig. 12b to e were obtained by Paget (1999) who compared, in 42 stands of the Sinnamary region, the size class distributions to the edaphic conditions encountered on each site. This led him to the following conclusions: (i) the highest densities are observed on superficial saprolite and on some superficial iron crusts. These densities match with many trees of small diameter and the lack of big trees; (ii) when edaphic conditions become less constraining (deeper soils), densities decrease, there are

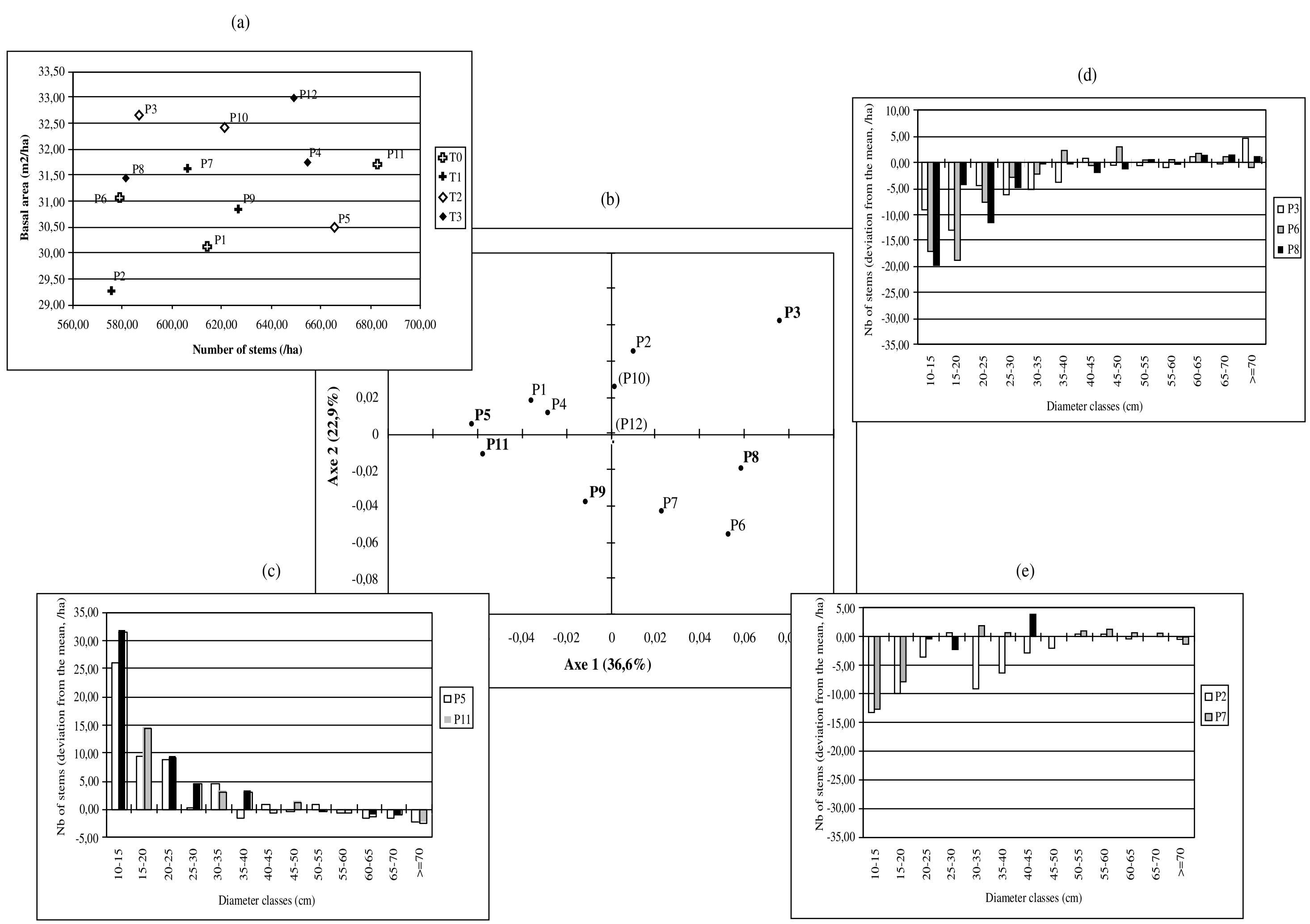


Fig. 12. Main structural characteristics of the Paracou plots in 1984. (a) Total number of stems ≥10 cm DBH (/ha) and corresponding basal area. (b) First factorial map of a COA "diameter classes × plots". Plots printed in bold type are well projected on one of the two axes (i.e. the squared cosine of their angle with the axis exceeds 0.5), while plots in brackets are not correctly represented (the squared cosine is less than 0.2). (c to e): deviation from the mean distribution of stems in the diameter classes for, respectively, plots P5 and P11 (c), plots P3, P6 and P8 (d), and plots P2 and P7 (e).

more trees in mean and high diameter classes while the number of trees in small diameter classes decreases;

- in bottomlands as on superficial soils, the stands are characterised by a great number of small trees, a lack of big trees and a generally low basal area (Barthès, 1991; Collinet, 1997).

Unfortunately, the state of soil description at Paracou is not complete and still not detailed enough to allow a valuable study of its influence on the floristic composition and the structural parameters of the stands. The difficulty is increased by the low level of botanical description in 1984. In fact, hillsides being preferably associated with superficial soils based on Barthès (1988), it was expected that plots characterised to a large extent by either bottomlands or hillsides would match (i) with plots having special floristic compositions differing from the others, and (ii) with plots showing high densities of small trees. However, no such trend was detectable (compare the characteristics of the plots on Fig. 7, and their relative positions on the factorial maps of Figs. 8, 9 and 12). According to Sabatier et al. (1997), this may be due to the complexity of the relationships between soil cover organisation and topography. For instance, the high stem density and the size class distribution characterising P11 could not be linked to the great extent of hilltops on this plot or to a general trend in the relationships between hilltops and deep soils. The bottomlands, categories 0 and 1 sensu Table 4, are best represented in plots P1, P4, P7 and P8, while hillsides cover the greatest area on P3 to P5 and P10. These groups of plots are floristically heterogeneous and do not appear to differ particularly from all the others. Moreover, they cover almost the whole range of densities and basal areas encountered at Paracou. However, if we refer to the work of D. Paget (1999), edaphic constraints are likely to explain at least partially the differences between the plots as far as size class distributions are concerned. An element in favour of this hypothesis comes from the study of tree growth: as shown in Part IV, Chapter 4, once initial size, species, local tree density and treatment are accounted for, the mean individual residual diameter growth is lower in plots with an initial high density than in the others. Clear conclusions on this subject will require an increased effort in description of the soils.

As differences between floristic compositions of the plots could have an influence on the structure of the stands, we also tried to investigate this point. On the ordination of plots according to size class distributions, we examined the effect of disregarding the most influent species shown by the analysis of Section 3.2 (see Fig. 9), when their trees could reach large diameters. This involved *Eperua falcata* + *Eperua grandiflora* (Wapas), *Pradosia cochlearia*, *Dicorynia guianensis*, *Qualea rosea* + *Ruizterania albiflora* (Gonfolos), *Vouacapoua americana* and *Sextonia rubra*. No fundamental changes were observed in as far as plots P5 and P11 remained opposed to plots P3 and P8. The most clear effect was observed on plot P6 of which the position on the factorial map of Fig. 12b is completely linked to the presence of *Eperua* spp.: when these species are disregarded, the characteristics of P6 are similar to those of P1 and close to those of P11 and P5.

4. Synthesis and conclusion

The main points that can be drawn from the results presented in this chapter are the following (see also Table 6):

- the Paracou plots differ between each other, according to substrate characteristics, floristic composition and stand structure. Classifications of the plots according to each type of information are largely non-redundant: the characteristics studied could not be clearly linked, possibly due to the lack of detailed data on the soils and the flora at the beginning of the experiment;
- the main source of edaphic heterogeneity between the plots is the varying importance of the stream- and riverside soils influenced by a permanent watertable; the area where the watertable is ≤1 m deep in the middle of dry season varies from 2% to 15% of the plot area, opposing plots P3 and P12 to plots P1 and P7. The other soils differ also by the thickness of their porous horizons (from 50 to 120 cm) and by the occurrence of seasonal waterlogging in surface horizons;
- botanical descriptions show a geographical effect, independent of the treatment effect: (i) between the north-western plots (P1 to P3) and the others; (ii) between the most extreme plots (P1, P6 and P11). The main species involved in this effect are not known to exhibit particular edaphic requirements (except for *Eperua* spp.) and their current spatial distribution could rather be linked to historical events;

Table 6
Main features of the Paracou plots (see also Figs. 7, 8, 10 to 12).

Plot (treatment)	*Topography*	*Floristic composition**	*Stand structure*
P1 (T0)	Bottomlands cover about 15% of the total area, steep slopes	North-west block (P1 to P3). *Eperua falcata*, *Eperua grandiflora*, *Pradosia cochlearia*, *Chrysophyllum sanguinolentum* missing. Relative importance of *Qualea rosea*, *Dendrobengia boliviana*, *Pterocarpus officinalis*, *Rheedia acuminata*, *Bocoa prouacensis*	Intermediate density, relatively low basal area, high density in the small diameter classes
P2 (T1)	Bottomlands cover about 8% of the total area, smooth slopes	North-west block (P1 to P3). Important similarities with P3. *Eperua falcata*, *Eperua grandiflora*, *Pradosia cochlearia, Chrysophyllum sanguinolentum* missing. Relative lack of *Recordoxylon speciosum*, *Pogonophora cochlearia*. Relative importance of *Vouacapoua americana*, *Qualea rosea*, *Dendrobengia boliviana*	Low density and basal area, low density in the small and intermediate diameter classes, medium density in the upper classes
P3 (T2)	Bottomlands and hilltops cover a restricted area, many hillsides, moderate slopes	North-west block (P1 to P3). Important similarities with P2. *Eperua falcata*, *Eperua grandiflora*, *Pradosia cochlearia, Chrysophyllum sanguinolentum* missing. Relative lack of *Recordoxylon speciosum*, *Pogonophora cochlearia.* Relative importance of *Vouacapoua americana*, *Qualea rosea*, *Dendrobengia boliviana*	Low density and high basal area, low density in the small diameter classes and very high density in the upper classes
P4 (T3)	Bottomlands cover about 7% of the total area, moderate to steep slopes	Differing from (P1 to P3), similarities with P8 and P9. *Eperua grandiflora* missing, *Eperua falcata* abundant	High density, intermediate basal area. High density in the small diameter classes
P5 (T2)	Bottomlands like P4, hilltops cover a restricted area, smooth to moderate slopes	Differing from (P1, P2, P3), similarities with P6 and P7. *Eperua falcata* and *Eperua grandiflora* well represented. *Qualea rosea* missing. Relative abundance of *Pogonophora schomburgkiana*, *Symphonia* sp1 (ex *globulifera*)	High density, low basal area. Very high density in the small diameter classes, very low density in the upper classes
P6 (T0)	Bottomlands cover about 10% of the total area, moderate slopes	Differing from (P1 to P3), similarities with P5 and P7. Characterised by the abundance of *Sandwithia racemosa* and to a lesser extent *Tapura capitulifera*. *Eperua falcata* abundant and *Eperua grandiflora* well represented *Qualea rosea* missing	Low density and intermediate basal area. Low density in the small diameter classes, high density in the intermediate classes

Table 6 *(continued)*

Plot (treatment)	*Topography*	*Floristic composition**	*Stand structure*
P7 (T1)	Bottomlands cover about 13% of the total area, moderate slopes	Differing from (P1 to P3), similarities with P5 and P6. *Eperua falcata* well represented, *Eperua grandiflora* present. *Qualea rosea* and *Chrysophyllum sanguinolentum* well represented, *Dicorynia guianensis* unfrequent	Intermediate density and basal area. Intermediate density for all diameter classes
P8 (T3)	Bottomlands cover about 12% of the total area, moderate slopes	Differing from (P1 to P3), similarities with P4 and P9. *Eperua falcata* and *Eperua grandiflora* well represented. Relative lack of *Symphonia* sp. 1 (ex *globulifera*)	Low density and intermediate basal area. Low density in the small diameter classes and high density in the upper classes
P9 (T1)	Bottomlands and hilltops cover a restricted area, smooth to moderate slopes	Differing from (P1 to P3), similarities with P4 and P8. *Eperua grandiflora* abundant, *Eperua falcata* present. *Dicorynia guianensis* abundant, *Pradosia cochlearia*, *Bocoa prouacensis* and *Posoqueria latifolia* well represented. *Qualea rosea* quite unfrequent	Intermediate density and basal area. High density in the small diameter classes, intermediate density for the others
P10 (T2)	Bottomlands cover about 6% of the area, no hilltops, smooth slopes	Differing from (P1 to P3), some similarities with P4, P8 and P9. *Eperua falcata* and *Eperua grandiflora* present but unfrequent. *Qualea rosea* missing	Intermediate density, high basal area. Low density in the small and intermediate diameter classes, high density in the upper classes
P11 (T0)	Bottomlands cover a restricted area, hilltops well represented, moderate slopes	Differing from (P1 to P3), P6, some similarities with P12. *Eperua falcata* and *Eperua grandiflora* quite abundant. *P. cochlearia*, *Moronobea coccinea*, *Oxandra asbeckii*, *B. prouacensis*, *Pognophlora excelsa*, *Posoqueria latifolia, Chaetocarpus schomburgkianus, Licania heteromorpha* abundant. *Qualea rosea* quite abundant	Very high density, intermediate basal area. Very high density in the small diameter classes, low density in the upper classes
P12 (T3)	Bottomlands cover a very restricted area, hilltops well represented, moderate slopes	Differing from (P1 to P3), some similarities with P11. *Eperua falcata* and *Eperua grandiflora* well represented. *Dicorynia guianensis*, *Bocoa prouacensis*, *Posoqueria latifolia* well represented. *Vouacapoua americana* and *Sextonia rubra* quite unfrequent	Intermediate density, very high basal area. High density in the small diameter classes, low density in the intermediate classes, high density in the upper classes

*Species mentioned are those which explain most of the differences between the plots. NW block refers to the floristic entity P1 to P3 (see Fig. 11).

- the plots differ greatly in their size class distribution, which is likely to be explained by edaphic constraints although no evidence for this could be drawn from our present data. No particular geographical trend appears in the ordination of the plots.

At the beginning of the project, efforts were made to secure a minimum homogeneity of the plots of the Paracou experimental site, through a pre-inventory carried out on a large scale before outlining the plots, and through a grouping of the plots into "homogeneous" blocks before any implementation of silvicultural operations (Bergonzini and Schmitt, 1985). These blocks were defined according to the size structure characteristics of the main valuable species, and it can be seen that (see Table 1):

- P1 to P3 were grouped together, while P1, P6 and P11 were assigned to three different blocks. This is coherent with the main differences observed in the floristic compositions;
- as far as the global structures of the stands are concerned, the grouping resulted in more contrasted situations: block 1 (P1 to P3 and P8), the most heterogeneous, groups very different plots, characterised either by a lot of small trees (P1), a lot of trees in intermediate classes (P2) or a lot of big trees (P3 and P8). Block 2 (P6, P7, P10 and P12) groups plots differing according to the weight of intermediate and large diameter classes. Block 3 (P4, P5, P9 and P11) is the most homogeneous, grouping mainly plots where small diameter classes are highly represented.

This last point will be the most crucial to consider in the following studies as (i) the structure of the stands will be directly affected by the silvicultural treatments and thus, for a given treatment, plots with contrasted initial size classes distributions will probably react in a contrasted way; (ii) the structure of the stands is supposed to be linked to substrate characteristics that will interact with all the parameters of the forest dynamics.

It was known that in such complex ecosystems the constitution of truly homogeneous blocks in the sense used in experimentation theory would be a difficult goal to achieve (Bergonzini and Schmitt, 1985). For this reason, it was decided at Paracou to monitor all the stands during 2 years before any human disturbance, so that each plot could be its own control for comparison as far as dynamics behaviour was concerned. However, given the high temporal variability of the measured phenomena, two years proved to be largely insufficient to properly characterise the plots. It thus remains particularly important, for most of ecological studies undertaken on the site, both to strengthen our knowledge on the physical and biological environment of the plots and to consider their initial state in detail.

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ANNEX 1

Table 1
List of Species or Groups of Species (SGS). SGS names in usage at Paracou and recorded as such in the database are in bold. They are either Créole, Boni or part of a scientific name. Some scientific names are good equivalents to vernacular names, whereas others are to be taken as tentative identifications (see also Annex 2). The species or groups of species that were exploited on the site are identified in the last column: they were initially grouped inside 58 global SGS (examples : *Qualea rosea* and *Ruizterania albiflora* were originally determined as "Gonfolo", code 211, *Iryanthera hostmannii* and *I. sagotiana* were originally determined as "Tosso passa", code 222, and so on).

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
101	**Acacia franc**	Bougoubatibatra	*Enterolobium schomburgkii*	Yes
102	**Amarante**	Papaati	*Peltogyne venosa*	Yes
103	**Angélique**	Singapetou	*Dicorynia guianensis*	Yes
104	**Bagasse** Bois vache	Kaw oudou	*Bagassa guianensis*	Yes
105	**Boco**	Aieoudou	*Bocoa prouacensis*	Yes
106	**Bois serpent**	Sineki oudou	*Zygia racemosa*	Yes
107	**Canari macaque**	Kouatapatou	*Lecythis zabucajo*	Yes
108	**Cœur dehors**	Baaka kiabici	*Diplotropis purpurea*	Yes
109	**Courbaril**	Ioka	*Hymenaea courbaril*	Yes
110	**Ebène verte**	Guinaati	*Tabebuia serratifolia*	Yes
111	**Inkassa**	Yongo	*Vataireopsis* sp.	Yes
112	**Moutouchi,** Moutouchi savane	Mongo goue goue	*Pterocarpus rohrii*	Yes
113	**Parcouri**	Longo mataaki	*Platonia insignis*	Yes
114	**Satiné rubané**	Paya	*Brosimum guianense*	Yes
115	**St. Martin rouge**	Lebikiabici	*Andira coriacea*	Yes
116	**Wacapou**	Bounaati	*Vouacapoua americana*	Yes
117	**Wacapou guitin**	Bounaati kiabici	*Recordoxylon speciosum*	Yes
201	**Acajou Guyane**	Cedé	*Cedrela odorata*	Yes
202		**Aieouekou**	*Dimorphandra polyandra*	Yes
203		**Anangossi,** Anangositi	*Terminalia amazonia*	Yes
204	Bougouni blanc	**Assao,** Mongui oudou	*Balizia pedicellaris*	Yes

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
205	**Balata franc**	Boiti	*Manilkara bidentata*	Yes
206	**Balata pomme**	Boiti	*Chrysophyllum sanguinolentum*	Yes
207	**Carapa**	Kaapa	*Carapa procera*	Yes
208	**Cèdres**	Apici	*Lauraceae* spp.	Yes
209	**Chawari**	Agougagui	*Caryocar glabrum*	Yes
210		**Diaguidia**	*Tachigali (Sclerolobium) melinonii*	Yes
211	**Gonfolo** (unspecified)	Gonfolo	*Vochysiaceae* sp.	Yes
212	**Goupi**	Kopi	*Goupia glabra*	Yes
213	**Grand moni**	Gambouchi	*Thyrsodium guianense*	Yes
214	**Grignon franc**	Wana	*Sextonia (Ocotea) rubra*	Yes
215	**Jaboty**	Kouali	*Erisma uncinatum*	Yes
216		**Kouata kaman**	*Parkia pendula*	Yes
217		**Koumanti oudou**	*Aspidosperma album*	Yes
218	**Manil**	Koukouniefou mataaki		Yes
219	**St. Martin jaune**	Gueli kiabici	*Hymenolobium flavum*	Yes
220		**Lebi sali**		Yes
221	**Tonka,** Ebène rouge, Gaïac guyane	Tonka	*Dipteryx odorata*	Yes
222	**Tosso passa**	Soso paasa	*Iryanthera sagotiana*	Yes
223		**Wandekole**	*Glycydendron amazonicum*	Yes
224	**Wapa**	Biodou	*Eperua falcata*	Yes
225	**Wapa rivière**	Watapan	*Macrolobium bifolium*	Yes
226	**Tosso passa marécage**	Soso paasa	*Iryanthera hostmannii*	Yes
227	**Tosso passa montagne**	Soso paasa	*Iryanthera sagotiana*	Yes
301		**Alimiao,** Pikimissiki	*Pseudopiptadenia suaveolens*	Yes
302	**Bois St. Jean**	Tobitoutou	*Schefflera morototoni*	Yes
303		**Bouchi kanaboli**	*Simaba multiflora*	Yes

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
304	**Copaya**	Yachimambo	*Jacaranda copaia*	Yes
305		**Dodomissinga**	*Parkia velutina* et spp.	Yes
306		**Dokali**	*Brosimum rubescens*	Yes
307	**Fromager**		*Ceiba pentandra*	Yes
308	**Maho cigare**	Ingui pipa	*Couratari multiflora* et spp.	Yes
309		**Kaiman oudou**	*Laetia procera*	Yes
310	**Maho cochon**	Kobe	*Sterculia* sp.	Yes
311		**Kouali**	*Vochysia tetraphylla*	Yes
312	**Maho coton**	Katon oudou	*Eriotheca globosa* et sp.	Yes
313	**Bois vache**	Mapa	*Lacmellea floribunda*	Yes
314	**Encens**	Moni	*Protium* sp.	Yes
315		Assoumaripa	***Simarouba*** *amara*	Yes
316	**Yayamadou marécage**	Moulomba	*Virola surinamensis*	Yes
401	**Gaulette**	Koko	*Licania* spp.	
402	Kimboto	**Kimboto**	*Pradosia cochlearia*	
403	**Maho noir**	Baikaaki	*Eschweilera sagotiana* et spp	
404	**Maho rouge**	Lebi loabi	*Lecythis corrugata* et spp.	
501	**Palmiers**		*Arecaceae* spp.	
502	**Patawa**		*Jessenia bataua*	
503	**Pinot**		*Euterpe oleracea*	
504	**Maripa**		*Attalea maripa*	
505	**Comou**		*Oenocarpus bacaba*	
601		**Koussissi**	*Conceveiba guianensis*	
602		**Mantapouhoupa**	*Gustavia hexapetala* et *G. augusta*	
603		**Bouchi kiki**	*Cordia nodosa*	
604	**Gonfolo rose**		*Qualea rosea*	Yes

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
605	**Gonfolo gris**		*Ruizterania albiflora*	Yes
606		**Niamboka**	*Pouteria guianensis*	
607	Manil marécage		***Symphonia** globulifera*	Yes
608	Manil montagne		***Moronobea** coccinea*	Yes
609		**Adougoue**	*Swartzia guianensis*	
611	Cèdre noir	**Baaka apici**	*Ocotea* sp.	Yes
612		**Baaka mapa**	*Couma guianensis*	Yes
613		**Malobi**	*Ecclinusa guianensis*	
614		**Mouamba**	*Oxandra asbeckii* et spp.	
615		**Diankoïmata**	*Guarea guidonia et pubescens.*	
616		**Bouchi mango**	*Tovomita* spp.	
617	Bois flèche	**Sipiki oudou**	*Chaetocarpus schomburgkianus*	
618		**Wan ede**	*Simaba cedron*	
619		**Pepe boïti**	*Chrysophyllum prieurii*	
620	**Bougouni**	Lebi oueko	*Inga alba*	
621		**Poulou**	*Helicostylis pedunculata*	
622		**Taapou tiki**	*Dendrobangia boliviana*	
623		**Bouchi cacao**	*Theobroma subincanum*	
624		**Singabassou**	*Talisia* spp.	
625		**Bouchi kassou**	*Anacardium spruceanum*	
627		**Agousiton**	*Posoqueria latifolia*	
628		**Lebi tongo**	*Amanoa guianensis*	
629	Balata blanc	**Bakouman**	*Micropholis guyanensis*	
631		**Bougou bougou**	*Swartzia polyphylla*	
632		**Tamalin**	*Hydrochorea corymbosa*	
633	Maho blanc	**Meli**	*Lecythis poiteaui*	
634		**Koukouniefou**	*Rheedia acuminata*	
635		**Kassaba oudou**	*Antonia ovata*	

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
636		**Bouchi banda**	*Eugenia coffeifolia*	
637		**Neko oudou**	*Poecilanthe hostmannii*	
638	Bois chapelle	**Palioudou**	*Chimarrhis turbinata*	
640		**Samaati palioudou**	*Aspidosperma nitidum*	
641		**Agananannga**	*Catostemma fragrans*	
642		**Tingui moni**	*Protium heptaphyllum*	Yes
643		**Akoisimba**	*Pouteria melanopoda*	
644		**Pepeangassa** oudou	*Anaxagorea dolichocarpa*	
645		**Asso oudou**	*Unonopsis rufescens* et *guatterioides*	
646	Cèdre argenté	**Weti apici**	*Ocotea guianensis*	Yes
647	**Bois de rose**		*Aniba* sp.	
648		**Bofo oudou**	*Sacoglottis guianensis*	
650		**Boumbikidia**	*Rinorea pectino-squamata*	
651	Bois blanc	**Weti oudou**	*Mabea piriri*	
653		**Bouchi kossoue**	*Sloanea grandiflora*	
655		**Tatou oudou**	*Talisia* spp.	
656	Mombin blanc	**Aganiamaïe**	*Tapirira guianensis*	
657		**Man papaïe**	*Pourouma guianensis*	
658	**Yayamadou montagne**		*Virola michelii*	
659		**Bofompeto**	*Tapura* sp.	
660		**Lakassi**	*Caraipa densifolia*	
661		**Pediekou**	*Xylopia* spp.	
662		**Topi**	*Mouriri collocarpa*	
663		**Baaka tiki**	*Diospyros guianensis*	
664		**Win oudou**	*Hyeronima alchorneoides*	
665		**Pindia oudou**	*Vismia cayennensis*	
666		**Bissangola**	*Micropholis venulosa*	
668		**Kouata bobi**	*Pradosia ptychandra*	

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
669		**Soupou oudou**	*Lueheopsis rugosa*	
670		**Bamba apici**	*Licaria rigida*	Yes
671		**Alouaou**	*Tetragastris panamensis*	Yes
672		**Kissiki banda**		
673		**Guebi oudou**	*Himatanthus articulatus*	
674	Moutouchi marécage	**Sabana guegue**	*Pterocarpus officinalis*	
676	**Bois corbeau**		*Tovomita* sp.1	
678		**Weti mapa**	*Macoubea guianensis*	
679		**Weti paya**	*Trymatococcus oligandrus*	
680		**Baaka pediekou**	*Xylopia nitida*	
681		**Apici**	*Ocotea canaliculata*	Yes
682	**Bois canon**		*Cecropia obtusa*	
683		**Diapapaïe**	*Cecropia sciadophylla*	
684	Cèdre jaune	**Gueli apici**	*Lauraceae* sp.	Yes
685		**Baaka messoupou,** Messoupou	*Byrsonima* sp.	
686		**Kakaboukou**	*Swartzia panacoco*	
687		**Wata tiki**	*Sagotia racemosa*	
688		**Weti pediekou**	*Xylopia* sp.2	
689		**Kankan oudou**	*Apeiba echinata*	
690	Bois diable	**Inkatou**	*Ficus maxima*	
691		**Diankoiton**	*Casearia decandra*	
692		**Moutchenguetche**		
693		**Mamadossou**	*Duroia aquatica*	
694		**Maaka**	*Minquartia guianensis*	
695		**Weti topi**	*Heisteria densifrons*	
696		**Matawai guedou**	*Tachigali paniculata*	Yes
697		**Aya touende**	*Palicourea guianensis*	
698		Wapa	*Eperua* ***grandiflora***	Yes

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
699		**Weti bakouman**		
701		Santi koko	*Licania alba*	
703		Gueli koko	*Sloanea* cf. *guianensis*	
704		Bolikin koko	*Couepia* cf. *caryophylloides*	
705		**Lebi koko**	*Licania* cf. *micrantha*	
706		**Fongouti koko**	*Parinari campestris*	
707		**Weti koko**	*Drypetes variabilis*	
708		**Atchientefi koko**		
709		**Baaka koko**	*Licania* cf. *hypoleuca*	
710		**Atila koko**	*Licania* cf. *canescens*	
711		**Sabana koko**		
712		**Kuedi koko**	*Couepia guianensis*	
713		**Maria congo**	*Geissospermum* sp.	
714		**Podo tiki**		
715		**Diankatou**		
716	**Bois rouge**			
722		**Moutende kouali**	*Vochysia guianensis*	
750		**Kokali mapa**	*Parahancornia fasciculata*	
751		**Messoupou**	*Miconia* spp.	
752		**Kouachi tiki**	*Casearia arborea* et *javitensis*	
753	Panacoco	**Agui**		
754	**Cèdre cannelle**	Caneli apici	*Licaria cannella*	Yes
755		**Niamichi oudou**	*Neea et Pisonia* spp.	
756		**Weti sali**	*Protium subserratum*	Yes
757		**Weti banda**	*Casearia* sp.	
758		**Papaoudou apici**		
759	**Hévéa**		*Hevea guianensis*	
760		**Weti loabi**	*Lecythis persistens*	

Table 1 *(continued)*

Code	*Créole name*	*Boni name*	*Scientific name*	*Logged at Paracou*
761		**Bita tiki**	*Casearia pitumba*	
762		**Pepe atiki**		
764		**Diaba oudou**	*Lueheopsis rosea*	
765		**Bouchi papaye**	*Pourouma* spp.	
766		**Wana kouali**	*Vochysia tomentosa*	Yes
767	**Bois corbeau**		*Caesalpiniaceae* sp.	
768		**Dachitan**	*Peltogyne paniculata*	
769		**Inkatou**	*Ficus* sp.	
770		**Bofo paya**		
771	**Satiné rubané rouge**	Neko oudou aguitin, Siton paya		
772		**Bouchikiki kissi**	*Cordia laevifrons*	
799		**Neko oudou aguitin**		
801		**Toupiki oueko**	*Inga huberi* et *stipularis*	
802		**Oueko**	*Inga cayennensis*	
803		**Baboun oueko**	*Inga tubaeformis*	
804		**Kodia oueko**	*Inga* sp.	
805		**Tete oueko**	*Inga* sp.	
806		**Podo liki**	*Rollinia exsucca*	
807		**Weti topi**	*Loreya mespiloides*	
808		**Pindia oudou**	*Vismia latifolia*	
809		**Pindia oudou**	*Vismia cayennensis, V. sessilifolia*	
810		**Weti topi**	*Miconia fragilis*	
811		**Moni**	*Protium* cf. *giganteum*	
815	**Baoulifi**	Tcheur		
816	**Grand mamadossou**			

Table 2
List of the 546 species and morphospecies identified during the census of all trees with DBH ≥ 2 cm in the ten 0.5-ha transects. **P**: pioneer (always sun-loving) species; **H**: sun-loving, but non-pioneer species; **PA**: record of DBH ≥ 10 cm at Paracou; **G**: records of DBH ≥ 10 cm from other French Guiana sites. Vouchers for all taxa are deposited at Cayenne Herbarium (CAY). Family circumscriptions follow Cronquist (1981).

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
Anacardiaceae	*Anacardium spruceanum* Benth. ex Engl.		PA
	Tapirira bethanniana J.D.Mitch.	H	PA
	Tapirira guianensis Aubl.	P	PA
	Tapirira obtusa (Benth.) J.D.Mitch.	P	PA
	Thyrsodium guianense Sagot ex March.		PA
	Thyrsodium puberulum J.D.Mitch. & Daly		PA
	Thyrsodium spruceanum Benth.		PA
Annonaceae	*Anaxagorea acuminata* (A.St.-Hil. ex Dunal) A.DC.		
	Anaxagorea dolichocarpa Sprague & Sandwith		G
	Annona ambotay Aubl.		G
Anacardiaceae	*Anacardium spruceanum* Benth. ex Engl.		PA
	Tapirira bethanniana J.D.Mitch.	H	PA
	Tapirira guianensis Aubl.	P	PA
	Tapirira obtusa (Benth.) J.D.Mitch.	P	PA
	Thyrsodium guianense Sagot ex March.		PA
	Thyrsodium puberulum J.D.Mitch. & Daly		PA
	Thyrsodium spruceanum Benth.		PA
Annonaceae	*Anaxagorea acuminata* (A.St.-Hil. ex Dunal) A.DC.		
	Anaxagorea dolichocarpa Sprague & Sandwith		G
	Annona ambotay Aubl.		G
	Annona foetida Mart.		G
	Annona cf. *sericea* Dunal		
	Cymbopetalum brasiliense (Vell.) Benth. ex Baill.		
	Duguetia calycina Benoist		PA
	Duguetia inconspicua Sagot		
	Duguetia surinamensis R.E.Fr.		G
	Duguetia yeshidan Sandwith		
	Fusaea longifolia (Aubl.) Saff.		G
	Guatteria citriodora Ducke		PA
	Guatteria guianensis (Aubl.) R.E.Fr.		PA
	Guatteria punctata (Aubl.) Howard		G
	Guatteria schomburgkiana Mart.		G
	Oxandra asbeckii (Pulle) R.E.Fr.		PA
	Rollinia exsucca (DC. Ex Dunal) A.DC.		G
	Unonopsis rufescens (Baill.) R.E.Fr.		PA
	Unonopsis stipitata Diels		G
	Xylopia crinita R.E.Fr.	H	PA
	Xylopia nitida Dunal	P	PA
	Xylopia pulcherrima Sandwith	P	PA
	Xylopia surinamensis R.E.Fr.	P	PA
	Sp.1		?

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
Apocynaceae	*Ambelania acida* Aubl.		PA
	Anartia meyeri (G.Don) Miers		PA
	Aspidosperma album (Vahl) Benoist ex Pichon		PA
	Aspidosperma cruentum Woodson		PA
	Aspidosperma excelsum Benth.		G
	Aspidosperma marcgravianum Woodson		PA
	Bonafousia disticha (A.DC.) Boiteau & L.Allorge		
	Bonafousia macrocalyx (Müll.Arg.) Boiteau & L.Allorge		
	Bonafousia undulata (Vahl) A.DC.		PA
	Couma guianensis Aubl.		PA
	Himatanthus articulatus (Vahl) Woodson		G
	Himatanthus bracteatus (A.DC.) Woodson		PA
	Lacmellea aculeata (Ducke) Monach.		PA
	Lacmellea floribunda (Poepp.) Benth. & Hook.f.		PA
	Macoubea guianensis Aubl.		PA
	Parahancornia fasciculata (Benoist ex Poir.) Pichon		PA
	Rauvolfia paraensis Ducke		G
Aquifoliaceae	*Ilex inundata* Poepp. ex Reissek		PA
	Ilex sp.3		PA
Araliaceae	*Schefflera decaphylla* (Seem) Harms	P	PA
	Schefflera morototoni (Aubl.) Maguire, Steyerm. & Frodin	P	PA
Arecaceae	*Astrocaryum sciophilum* (Miq.) Pulle		G
	Bactris constanciae Barb.Rodr.		
	Bactris rhaphidacantha Wess. Boer		G
	Euterpe oleracea Mart.		G
	Geonoma baculifera (Poit.) Kunth		
	Jessenia bataua (Mart.) Burret		PA
	Oenocarpus bacaba Mart.		G
	Socratea exorrhiza (Mart.) H.Wendl.		G
Bignoniaceae	*Jacaranda copaia* (Aubl.) D.Don	P	PA
	Tabebuia insignis (Miq.) Sandwith		PA
	Tabebuia serratifolia (Vahl) G.Nicholson		G
Bombacaceae	*Bombacopsis* sp.1		PA
	Catostemma fragrans Benth.		PA
	Eriotheca globosa (Aubl.) A.Robyns		PA
	Pachira aquatica Aubl.		G
	Pachira dolichocalyx A.Robyns		PA
Boraginaceae	*Cordia nervosa* Lam.		
	Cordia nodosa Lam.		G
	Cordia sagotii I.M.Johnst.	H	PA
	Cordia sprucei Mez		
Burseraceae	*Dacryodes nitens* Cuatrec.		PA
	Protium apiculatum Swart		G
	Protium aracouchini (Aubl.) Marchand		G

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Burseraceae)	*Protium decandrum* (Aubl.) Marchand		G
	Protium gallicum Daly		PA
	Protium giganteum Engl.		PA
	Protium guianense (Aubl.) Marchand		G
	Protium opacum Swart	H	PA
	Protium plagiocarpum Benoist		G
	Protium robustum (Swart) Porter		G
	Protium sagotianum Marchand		PA
	Protium subserratum (Engl.) Engl.		G
	Protium tenuifolium (Engl.) Engl.		G
	Protium trifoliolatum Engl.		G
	Tetragastris altissima (Aubl.) Swart		G
	Tetragastris hostmannii (Engl.) Kuntze		PA
	Tetragastris panamensis (Engl.) Kuntze		PA
	Trattinnickia rhoifolia Willd.		G
Caesalpiniaceae	*Bocoa prouacensis* Aubl.		PA
	Dialium guianense (Aubl.) Steud.		G
	Dicorynia guianensis Amshoff		PA
	Eperua falcata Aubl.		PA
	Eperua grandiflora (Aubl.) Benth.		PA
	Macrolobium bifolium (Aubl.) Pers.		PA
	Peltogyne paniculata Benth.		G
	Recordoxylon speciosum (Benoist) Gazel ex Barneby		PA
	Swartzia arborescens (Aubl.) Pittier		PA
	Swartzia grandifolia Bong. ex Benth.		PA
	Swartzia guianensis (Aubl.) Urb.		PA
	Swartzia panacoco (Aubl.) Cowan		PA
	Swartzia polyphylla DC.		PA
	Tachigali guianensis (Benth.) Zarucchi & Herend.	H	G
	Tachigali melinonii (Harms) Zarucchi & Herend.	H	PA
	Tachigali paraensis (Huber) Barneby	H	PA
	Vouacapoua americana Aubl.		PA
Capparaceae	*Capparis frondosa* Jacq.		G
Caryocaraceae	*Caryocar glabrum* (Aubl.) Pers.		PA
Cecropiaceae	*Cecropia obtusa* Trécul	P	PA
	Cecropia sciadophylla Mart.	P	PA
	Pourouma bicolor Mart.	H	G
	Pourouma guianensis Aubl.	H	PA
	Pourouma melinonii Benoist	H	PA
	Pourouma villosa Trécul	H	G
Celastraceae	*Goupia glabra* Aubl.	P	PA
	Maytenus oblongata Reissek		PA
	Maytenus sp.1		?

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
Chrysobalanaceae	*Couepia bracteosa* Benth.		PA
	Couepia caryophylloides Benoist		PA
	Couepia guianensis Aubl.		PA
	Couepia habrantha Standl.		PA
	Couepia obovata Ducke		PA
	Couepia parillo DC.		PA
	Hirtella bicornis Mart. & Zucc.		PA
	Hirtella glandulosa Spreng.		PA
	Hirtella hispidula Miq.		G
	Hirtella margae Prance		G
	Hirtella racemosa Lam.		
	Hirtella silicea Griseb.		G
	Hirtella sp.3		PA
	Hirtella sp.4		G
	Licania alba (Bern.) Cuatrec.		PA
	Licania amapaënsis Prance		G
	Licania canescens Benoist		PA
	Licania densiflora Kleinhoonte		PA
	Licania guianensis (Aubl.) Griseb.		G
	Licania heteromorpha Benth.		PA
	Licania kunthiana Hook.f.		PA
	Licania laevigata Prance		G
	Licania latistipula Prance		PA
	Licania laxiflora Fritsch		PA
	Licania licaniiflora (Sagot) Blake		PA
	Licania longistyla (Hook.f.) Fritsch		G
	Licania membranacea Sagot ex Laness.		PA
	Licania ovalifolia Kleinhoonte		PA
	Licania parvifructa Fanshawe & Maguire		PA
	Licania sprucei (Hook.f.) Fritsch		PA
	Licania sp.8		?
	Licania sp.9		?
	Licania sp.10		PA
	Parinari campestris Aubl.		PA
	Parinari montana Aubl.		PA
	Parinari rodolphii Huber		PA
Clusiaceae	*Caraipa densifolia* Mart.		G
	Moronobea coccinea Aubl.		PA
	Platonia insignis Mart.		PA
	Rheedia acuminata (Ruiz & Pav.) Planch. & Triana		PA
	Rheedia benthamiana Planch. & Triana		PA
	Symphonia globulifera L.f.		PA
	Symphonia sp.1		PA
	Tovomita brevistaminea Engl.		PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Clusiaceae)	*Tovomita* cf. *obovata* Engl.		PA
	Tovomita sp.1		G
	Tovomita sp.2		PA
	Tovomita sp.3		PA
	Tovomita sp.9		PA
	Tovomita sp.11		PA
	Vismia cayennensis (Jacq.) Pers.	P	G
	Vismia guianensis (Aubl.) Choisy	P	PA
	Vismia latifolia (Aubl.) Choisy	P	PA
	Vismia ramuliflora Miq.		G
	Vismia sessilifolia (Aubl.) Choisy	P	PA
	Buchenavia grandis Ducke		PA
	Buchenavia nitidissima (A.Rich.) Alwan & Stace		PA
Connaraceae	*Connarus fasciculatus* (DC.) Planch.		
Dichapetalaceae	*Tapura amazonica* Poepp. & Endl.		G
	Tapura capitulifera Baill.		PA
	Tapura guianensis Aubl.		G
Ebenaceae	*Diospyros capreifolia* Mart. ex Hiern		G
	Diospyros carbonaria Benoist		PA
	Diospyros vestita Benoist		G
Elaeocarpaceae	*Sloanea garckeana* K.Schum.		PA
	Sloanea grandiflora Sm.		PA
	Sloanea sp.1		G
	Sloanea sp.3		PA
	Sloanea sp.4		PA
	Sloanea sp.5		G
	Sloanea sp.6		G
	Sloanea sp.7		G
	Sloanea sp.8		PA
	Sloanea sp.9		G
	Sloanea sp.17		PA
Erythroxylaceae	*Erythroxylum citrifolium* A.St.-Hil.		PA
	Erythroxylum macrophyllum Cav.		G
Euphorbiaceae	*Alchornea schomburgkii* Klotzsch		?
	Alchorneopsis floribunda (Benth.) Müll.Arg.	P	PA
	Amanoa guianensis Aubl.		PA
	Chaetocarpus schomburgkianus (Kuntze) Pax & K.Hoffm.		PA
	Conceveiba guianensis Aubl.	P	PA
	Drypetes fanshawei Sandwith		PA
	Drypetes variabilis Uittien		PA
	Glycydendron amazonicum Ducke		PA
	Hevea guianensis Aubl.		PA
	Hyeronima oblonga (Tul.) Müll.Arg.		PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Euphorbiaceae)	*Mabea piriri* Aubl.	H	PA
	Pogonophora schomburgkiana Miers ex Benth.		PA
	Richeria grandis Vahl		G
	Sandwithia guyanensis Lanj.		PA
Flacourtiaceae	*Casearia acuminata* DC.		G
	Casearia commersoniana Cambess.		G
	Casearia javitensis Kunth		PA
	Casearia pitumba Sleumer		G
	Casearia sylvestris Sw.		PA
	Casearia sp.1		G
	Casearia sp.2		G
	Casearia sp.3		G
	Laetia procera (Poepp.) Eichler	P	PA
	Neoptychocarpus apodanthus (Kuhlm.) Buchheim		
	Ryania pyrifera (A.Rich.) Sleumer & Uittien		
Hippocrateaceae	*Cheiloclinium cognatum* (Miers) A.C.Sm.		PA
Humiriaceae	*Humiriastrum subcrenatum* (Benth.) Cuatrec.		PA
	Sacoglottis cydonioides Cuatrec.		G
	Sacoglottis guianensis Benth.		G
	Vantanea parviflora Lam.		PA
Icacinaceae	*Dendrobangia boliviana* Rusby		PA
	Discophora guianensis Miers		G
	Emmotum fagifolium Desv. ex Ham.		PA
	Poraqueiba guianensis Aubl.		PA
Lacistemataceae	*Lacistema aggregatum* (Bergius) Rusby		G
	Lacistema grandifolium Schnizl.		G
Lauraceae	*Aiouea guianensis* Aubl.		G
	Aniba guianensis Aubl.		G
	Aniba panurensis (Meisn.) Mez		G
	Aniba williamsii O.C.Schmidt		PA
	Aniba sp.1		PA
	Cinnamomum cinnamomifolium (Kunth) Kosterm.		?
	Cryptocarya guianensis Meisn.		?
	Endlicheria multiflora (Miq.) Mez		PA
	Endlicheria pyriformis (Nees) Mez		
	Kubitzkia mezii (Kosterm.) van der Werff		G
	Licaria cannella (Meisn.) Kosterm.		PA
	Licaria chrysophylla (Meisn.) Kosterm.		PA
	Licaria debilis (Mez) Kosterm.		
	Licaria guianensis Aubl.		G
	Licaria vernicosa (Mez) Kosterm.		G
	Licaria sp.1		PA
	Ocotea amazonica (Meisn.) Mez		PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Lauraceae)	*Ocotea cernua* (Nees) Mez		G
	Ocotea glomerata (Nees) Mez		PA
	Ocotea puberula (A.Rich.) Nees		PA
	Ocotea splendens (Meisn.) Mez		PA
	Rhodostemonodaphne grandis (Mez) Rohwer		PA
	Rhodostemonodaphne kunthiana (Nees) Rohwer		G
	Rhodostemonodaphne rufovirgata Madriñan		PA
	Sextonia rubra (Mez) van der Werff		PA
	sp.2		PA
	sp.5		PA
Lecythidaceae	*Couratari calycina* Sandwith		PA
	Couratari gloriosa Sandwith		?
	Couratari guianensis Aubl.		PA
	Couratari multiflora (Sm.) Eyma		PA
	Couratari oblongifolia Ducke & R.Knuth		PA
	Eschweilera cf. *chartaceifolia* S.A.Mori		G
	Eschweilera congestiflora (Benoist) Eyma		PA
	Eschweilera coriacea (DC.) S.A.Mori		PA
	Eschweilera decolorans Sandwith		PA
	Eschweilera grandiflora (Aubl.) Sandwith		G
	Eschweilera parviflora (Aubl.) Miers		G
	Eschweilera pedicellata (Rich.) S.A.Mori		PA
	Eschweilera sagotiana Miers		PA
	Eschweilera simiorum (Benoist) Eyma		PA
	Gustavia augusta L.		G
	Gustavia hexapetala (Aubl.) J.E.Sm.		PA
	Lecythis chartacea O.Berg		PA
	Lecythis corrugata Poit.		PA
	Lecythis holcogyne (Sandwith) S.A.Mori		PA
	Lecythis persistens Sagot		PA
	Lecythis poiteaui O.Berg		PA
	Lecythis praeclara (Sandwith) S.A.Mori		PA
	Lecythis zabucajo Aubl.		PA
Linaceae	*Hebepetalum humiriifolium* (Planch.) Benth.	H	PA
Loganiaceae	*Antonia ovata* Pohl	P	G
Malpighiaceae	*Byrsonima aerugo* Sagot	P	PA
	Byrsonima densa (Poir.) DC.		PA
	Byrsonima laevigata (Poir.) DC.		PA
Melastomataceae	*Henriettea succosa* (Aubl.) DC.	P	
	Henriettella flavescens (Aubl.) Triana		PA
	Loreya arborescens (Aubl.) DC.	P	G
	Loreya mespiloides Miq.	P	
	Miconia acuminata (Steud.) Naudin	P	PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Melastomataceae)	*Miconia argyrophylla* DC.	P	G
	Miconia eriodonta DC.	P	G
	Miconia minutiflora (Bonpl.) DC.	P	PA
	Miconia plukenetii Naudin	P	
	Miconia poeppigii Triana	P	G
	Miconia prasina (Sw.) DC.	P	
	Miconia cf. *punctata* D.Don ex DC.	P	?
	Miconia tomentosa (A.Rich.) D.Don ex DC.	P	G
	Miconia tschudyoides Cogn.	P	PA
	Mouriri crassifolia Sagot		PA
	Mouriri dumetosa Cogn.		
	Mouriri grandiflora DC.		
	Mouriri huberi Cogn.		G
	Mouriri nervosa Pilg.		PA
	Mouriri sagotiana Triana		G
	Votomita guianensis Aubl.		PA
Meliaceae	*Carapa procera* DC.		PA
	Guarea costata A.Juss.		
	Guarea pubescens (Rich.) A.Juss.		G
	Guarea silvatica C.DC.		PA
	Trichilia micrantha Benth.		PA
	Trichilia quadrijuga Kunth		PA
	Trichilia schomburgkii C.DC.		PA
	Trichilia sp.1		
Menispermaceae	*Abuta grandifolia* (Mart.) Sandwith		
Mimosaceae	*Abarema jupunba* (Willd.) Britton & Killip	H	PA
	Abarema mataybifolia (Sandwith) Barneby & J.W.Grimes		PA
	Balizia pedicellaris (DC.) Barneby & J.W.Grimes		PA
	Enterolobium oldemanii Barneby & J.W.Grimes		PA
	Enterolobium schomburgkii (Benth.) Benth.		PA
	Inga albicoria Poncy	H	PA
	Inga bourgoni (Aubl.) DC.	H	PA
	Inga brachystachys Ducke	H	G
	Inga capitata Desv.	H	PA
	Inga cayennensis Sagot ex Benth.	P	PA
	Inga graciliflora Benth.	H	G
	Inga gracilifolia Ducke	H	PA
	Inga jenmanii Sandwith	H	G
	Inga lomatophylla (Benth.) Pittier	H	G
	Inga melinonis Sagot	H	PA
	Inga nouragensis Poncy	H	G
	Inga paraensis Ducke	H	G
	Inga pezizifera Benth.	P	PA
	Inga rubiginosa (Rich.) DC.	H	PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Mimosaceae)	*Inga sarmentosa* Glaz. ex Harms	H	PA
	Inga semialata (Vell.) Mart.	H	G
	Inga sertulifera DC.	H	G
	Inga splendens Willd.	H	G
	Inga stipularis DC.	P	PA
	Inga thibaudiana DC.	P	PA
	Inga tubaeformis Benoist	H	?
	Inga umbellifera (Vahl) Steud. ex DC.	H	G
	Inga sp.4	H	PA
	Parkia nitida Miq.		PA
	Parkia pendula (Willd.) Benth. ex Walp.		PA
	Parkia ulei (Harms) Kuhlm.		PA
	Parkia velutina Benoist		PA
	Stryphnodendron moricolor Barneby & J.W.Grimes		G
	Stryphnodendron polystachyum (Miq.) Kleinhoonte		PA
	Zygia tetragona Barneby & J.W.Grimes		G
Monimiaceae	*Siparuna cuspidata* (Tul.) A.DC.		G
	Siparuna decipiens (Tul.) A.DC.		PA
	Siparuna guianensis Aubl.	P	
Moraceae	*Bagassa guianensis* Aubl.	P	G
	Batocarpus amazonicus (Ducke) Fosberg		G
	Brosimum acutifolium Huber		PA
	Brosimum guianense (Aubl.) Huber		PA
	Brosimum rubescens Taub.		PA
	Brosimum utile (Kunth) Pittier		PA
	Ficus nymphaeifolia Mill.	P	G
	Ficus paraensis (Miq.) Miq.	P	?
	Ficus pertusa L.f.	P	G
	Helicostylis pedunculata Benoist		PA
	Helicostylis tomentosa (Poepp. & Endl.) Rusby		PA
	Maquira guianensis Aubl.		PA
	Naucleopsis guianensis (Mildbr.) C.C.Berg		PA
	Perebea mollis (Poepp. & Endl.) Huber		G
	Pseudolmedia laevis (Ruiz & Pav.) Macbr.		G
	Trymatococcus oligandrus (Benoist) Lanj.		PA
	Trymatococcus paraensis Ducke		PA
Myristicaceae	*Iryanthera hostmannii* (Benth.) Warb.		PA
	Iryanthera sagotiana (Benth.) Warb.		PA
	Virola michelii Heckel	H	PA
	Virola sebifera Aubl.		G
	Virola surinamensis (Rol.) Warb.		PA
Myrsinaceae	*Cybianthus microbotrys* A.DC.		
	Cybianthus venezuelanus Mez		
	Stylogyne cf. *longifolia* (Mart. ex Miq.) Mez		

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
Myrtaceae	*Eugenia* cf. *albicans* (O.Berg) Urb.		?
	Eugenia anastomosans DC.		PA
	Eugenia coffeifolia DC.		G
	Eugenia cupulata Amshoff		G
	Eugenia cf. *ferreireana* O.Berg		
	Eugenia florida DC.		G
	Eugenia latifolia Aubl.		G
	Eugenia macrocalyx (Rusby) McVaugh		G
	Eugenia cf. *muricata* DC.		PA
	Eugenia patrisii Vahl		PA
	Eugenia aff. *pseudopsidium* Jacq.		G
	Eugenia tetramera (McVaugh) M.L.Kawas. & B.Holst		PA
	Eugenia sp.6		G
	Eugenia sp.9		G
	Marlierea ferruginea (Poir.) McVaugh		G
	Myrcia decorticans DC.		PA
	Myrcia fallax (Rich.) DC.		G
	Myrcia cf. *magnoliifolia* DC.		G
	Myrcia multiflora (Lam.) DC.		
	Myrcia cf. *paivae* O.Berg		G
	Myrcia splendens (Sw.) DC.		G
	Myrciaria floribunda (H.West ex Willd.) O.Berg		PA
	sp.7		?
	sp.9		?
Nyctaginaceae	sp.1		G
	sp.4		G
Ochnaceae	*Elvasia elvasioides* (Planch.) Gilg		PA
	Ouratea decagyna Maguire		PA
	Ouratea guianensis Aubl.		PA
Olacaceae	*Chaunochiton kappleri* (Sagot ex Engl.) Ducke		PA
	Heisteria cauliflora Sm.		
	Heisteria densifrons Engl.		PA
	Minquartia guianensis Aubl.		PA
Papilionaceae	*Andira coriacea* Pulle		PA
	Diplotropis purpurea (A.Rich.) Amshoff		G
	Dipteryx odorata (Aubl.) Willd.		G
	Dussia sp.1		G
	Hymenolobium sp.1		?
	Ormosia coccinea (Aubl.) Jacks.		PA
	Ormosia coutinhoi Ducke		PA
	Ormosia flava (Ducke) Rudd		
	Ormosia nobilis Tul.		G
	Ormosia paraensis Ducke		PA
	Platymiscium cf. *pinnatum* (Jacq.) Dugand		?

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Papilionaceae)	*Poecilanthe hostmannii* (Benth.) Amshoff		PA
	Pterocarpus officinalis Jacq.		PA
	Vatairea erythrocarpa Ducke		G
Polygonaceae	*Coccoloba mollis* Casar.		PA
Proteaceae	*Euplassa pinnata* (Lam.) Johnst.		PA
Quiinaceae	*Lacunaria crenata* (Tul.) A.C.Sm.		PA
	Lacunaria jenmanii (Oliv.) Ducke		PA
	Quiina guianensis Aubl.		PA
	Quiina macrophylla Ule		G
	Quiina obovata Tul.		PA
	Touroulia guianensis Aubl.		G
Rhabdodendraceae	*Rhabdodendron amazonicum* (Spruce ex Benth.) Huber		G
Rhizophoraceae	*Cassipourea guianensis* Aubl.		PA
Rosaceae	*Prunus myrtifolia* (L.) Urb.		G
Rubiaceae	*Alibertia* cf. *surinamensis* (Bremek.) Steyerm.		?
	Amaioua guianensis Aubl.		PA
	Chimarrhis turbinata DC.		PA
	Coussarea sp.3		?
	Duroia aquatica (Aubl.) Bremek.		PA
	Duroia eriopila L.f.		G
	Duroia genipoides Hook.f. & K.Schum.		PA
	Duroia sprucei Rusby		PA
	Faramea cf. *sessiliflora* Aubl.		?
	Faramea sp.1		PA
	Ferdinandusa paraensis Ducke		PA
	Isertia coccinea (Aubl.) J.F.Gmel.	P	PA
	Isertia spiciformis DC.	P	G
	Isertia sp.1		?
	Ixora cf. *intensa* K.Krause		
	Ixora graciliflora Benth.		
	Kotchubaea insignis Fischer ex DC.		G
	Palicourea guianensis Aubl.	P	G
	Palicourea longiflora (Aubl.) A.Rich. ex DC.		
	Palicourea quadrifolia (Rudge) DC.		
	Posoqueria latifolia (Rudge) Roem. & Schult.		PA
	Psychotria capitata Ruiz & Pav.		
	Psychotria cupularis (Müll.Arg.) Standl.		
	Randia armata (Sw.) DC.		?
	Tocoyena longiflora Aubl.		
Rutaceae	*Zanthoxylum* sp.1	P	?
Sapindaceae	*Allophylus* sp.1		?
	Cupania hirsuta Radlk.		PA

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Sapindaceae)	*Cupania scrobiculata* Rich.		PA
	Cupania sp.2		?
	Matayba arborescens (Aubl.) Radlk.		PA
	Talisia carinata Radlk.		G
	Talisia furfuracea Sandwith		G
	Talisia guianensis Aubl.		
	Talisia hexaphylla Vahl		PA
	Talisia longifolia (Benth.) Radlk.		G
	Talisia cf. *megaphylla* Sagot ex Radlk.		
	Talisia microphylla Uittien		PA
	Talisia mollis Kunth ex Cambess.		G
	Talisia pedicellaris Sagot ex Radlk.		PA
	Talisia praealta (Sagot) Radlk.		PA
	Talisia simaboides Kramer		PA
	Talisia sylvatica (Aubl.) Radlk.		
Sapotaceae	*Chrysophyllum argenteum* Jacq.		PA
	Chrysophyllum cuneifolium (Rudge) A.DC.		PA
	Chrysophyllum pomiferum (Eyma) T.D.Penn.		PA
	Chrysophyllum prieurii A.DC.		PA
	Chrysophyllum sanguinolentum (Pierre) Baehni		PA
	Chrysophyllum sp.4		PA
	Ecclinusa guianensis Eyma		G
	Ecclinusa ramiflora Mart.		G
	Manilkara bidentata (A.DC.) A.Chev.		PA
	Manilkara huberi (Ducke) A.Chev.		PA
	Micropholis egensis (A.DC.) Pierre		PA
	Micropholis guyanensis (A.DC.) Pierre		PA
	Micropholis obscura T.D.Penn.		PA
	Micropholis venulosa (Mart. & Eichler) Pierre		PA
	Pouteria ambelaniifolia (Sandwith) T.D.Penn.		PA
	Pouteria cf. *bangii* (Rusby) T.D.Penn.		PA
	Pouteria brachyandra (Aubrév. & Pellegr.) T. D.Penn.		G
	Pouteria caimito (Ruiz & Pav.) Radlk.		PA
	Pouteria coriacea (Pierre) Pierre		PA
	Pouteria egregia Sandwith		G
	Pouteria engleri Eyma		PA
	Pouteria eugeniifolia (Pierre) Baehni		PA
	Pouteria fimbriata Baehni		G
	Pouteria gonggrijpii Eyma		PA
	Pouteria grandis Eyma		G
	Pouteria guianensis Aubl.		PA
	Pouteria jariensis Pires & T.D.Penn.		PA
	Pouteria melanopoda Eyma		PA
	Pouteria reticulata (Engl.) Eyma		PA
	Pouteria sagotiana (Baill.) Eyma		G

Table 2 *(continued)*

Family	*Species*	*H & P*	*DBH ≥ 10 cm*
(Sapotaceae)	*Pouteria singularis* T.D.Penn.		PA
	Pouteria torta (Mart.) Radlk.		PA
	Pouteria venosa (Mart.) Baehni		PA
	Pouteria sp.2		PA
	Pouteria sp.17		PA
	Pouteria sp.18		PA
	Pouteria sp.19		G
	Pradosia cochlearia (Lecomte) T.D.Penn.		PA
	Pradosia ptychandra (Eyma) T.D.Penn.		G
	Sarcaulus brasiliensis (A.DC.) Eyma		G
	sp.1		?
Simaroubaceae	*Simaba cedron* Planch.		PA
	Simaba morettii Feuillet		PA
	Simaba polyphylla (Cavalcante) W.Thomas		PA
	Simarouba amara Aubl.	P	PA
Solanaceae	*Solanum leucocarpon* A.Rich. ex Dunal	P	
Sterculiaceae	*Sterculia pruriens* K.Schum.	H	PA
	Sterculia sp.2	H	G
	Sterculia sp.3	H	PA
	Theobroma subincanum Mart.		PA
Styracaceae	*Styrax glabratus* Schott ex Spreng.		?
Tiliaceae	*Apeiba glabra* Aubl.	P	PA
	Apeiba petoumo Aubl.		PA
	Luehea sp.1		?
	Lueheopsis rugosa (Pulle) Burret	H	PA
Verbenaceae	*Vitex triflora* Vahl		PA
Violaceae	*Amphirrhox longifolia* (A.St.-Hil.) Spreng.		PA
	Leonia glycycarpa Ruiz & Pav.		PA
	Paypayrola guianensis Aubl.		PA
	Rinorea amapensis Hekking		
	Rinorea flavescens (Aubl.) Kuntze		PA
	Rinorea pectino-squamata Hekking		G
Vochysiaceae	*Qualea rosea* Aubl.	H	PA
	Ruizterania albiflora (Warm.) Marc.-Berti		PA
	Vochysia guianensis Aubl.		G
	Vochysia tomentosa (G.Mey.) C.DC.		PA

ANNEX 2

Comparison between classification in SGS (species or group of species) in Paracou's database, and botanical identifications to species by D. Sabatier & J.-F. Molino of the same 2,191 trees of DBH ≥ 10 cm.

Table 1

Dispersion of SGS classification within each species. N_s : number of trees in the species. G_s : number of SGS found among the N_s trees. n_{gi} : number of trees of the species that are classified in SGS i (SGS are ranked by descending n_{gi}). D_s : homogeneity of SGS classification for the species. 1- D_s is the probability that two trees of the species are classified in different SGS:

$$D_S = \frac{\Sigma n_{gi}(n_{gi} - 1)}{N_s(N_s - 1)}$$

Species (det. Sabatier-Molino)				SGS #1			SGS #2 (with n_{g2}>1)			SGS # 3 (with n_{g3}>1)		
	N_s	G_s	D_s	Code	Name	n_{g1}	Code	Name	n_{g2}	Code	Name	n_{g3}
Apeiba glabra	6	2	0.67	**689**	*Apeiba echinata*	5						
Bocoa prouacensis	47	1	1	**105**	*Bocoa prouacensis*	47						
Brosimum guianense	7	1	1	**679**	*Trymatococcus oligandrus*	7						
Carapa procera	35	2	0.94	**207**	*Carapa procera*	34						
Catostemma fragrans	12	1	1	**641**	*Catostemma fragrans*	12						
Cecropia obtusa	33	3	0.68	**682**	*Cecropia obtusa*	27	**683**	*Cecropia sciadophylla*	3	**765**	*Pourouma* spp.	3
Cecropia sciadophylla	29	1	1	**683**	*Cecropia sciadophylla*	29						
Chaetocarpus schomburgkianus	15	3	0.55	**617**	*Chaetocarpus schomburgkianus*	11	**401**	*Licania* spp.	3			
Chaunochiton kappleri	5	2	0.6	**801**	*Inga huberi* et *stipularis*	4						
Chrysophyllum argenteum	6	2	0.67	**643**	*Pouteria melanopoda*	5						
Chrysophyllum prieurii	6	1	1	**619**	*Chrysophyllum prieurii*	6						
Chrysophyllum sanguinolentum	15	1	1	**206**	*Chrysophyllum sanguinolentum*	15						
Conceveiba guianensis	11	1	1	**601**	*Conceveiba guianensis*	11						
Couratari multiflora	26	2	0.92	**308**	*Couratari multiflora* et spp.	25						
Dendrobangia boliviana	6	1	1	**622**	*Dendrobangia boliviana*	6						

Table 1 *(continued)*

Species (det. Sabatier-Molino)	N_s	G_s	D_s	SGS #1			SGS #2 (with n_{g2}>1)			SGS # 3 (with n_{g3}>1)		
				Code	Name	n_{g1}	Code	Name	n_{g2}	Code	Name	n_{g3}
Dicorynia guianensis	32	1	1	**103**	*Dicorynia guianensis*	32						
Eperua falcata	180	5	0.93	**224**	*Eperua falcata*	174	**698**	*Eperua grandiflora*	3			
Eperua grandiflora	16	2	0.87	**698**	*Eperua grandiflora*	15						
Eschweilera congestiflora	9	2	0.78	**633**	*Lecythis poiteaui*	8						
Eschweilera coriacea	14	1	1	**403**	*Eschweilera sagotiana* et spp.	14						
Eschweilera decolorans	13	2	0.85	**403**	*Eschweilera sagotiana* et spp.	12						
Eschweilera sagotiana	86	3	0.79	**403**	*Eschweilera sagotiana* et spp.	76	**404**	*Lecythis corrugata* et spp.	9			
Goupia glabra	12	1	1	**212**	*Goupia glabra*	12						
Gustavia hexapetala	37	3	0.84	**602**	*Gustavia hexapetala* et *G. augusta*	34	**403**	*Eschweilera sagotiana* et spp.	2			
Hebepetalum humiriifolium	7	4	0.19	**401**	*Licania* spp.	3	**707**	*Drypetes variabilis*	2			
Inga pezizifera	30	3	0.57	**620**	*Inga alba*	22	**802**	*Inga cayennensis*	6	**804**	*Inga* sp.	2
Inga sp. 4	7	2	0.71	**620**	*Inga alba*	6						
Iryanthera hostmannii	32	3	0.47	**222**	*Iryanthera sagotiana*	18	**226**	*Iryanthera hostmannii*	13			
Iryanthera sagotiana	29	2	0.75	**222**	*Iryanthera sagotiana*	25	**227**	*Iryanthera sagotiana*	4			
Jacaranda copaia	15	1	1	**304**	*Jacaranda copaia*	15						
Jessenia bataua	62	2	0.82	**502**	*Jessenia bataua*	56	**501**	*Arecaceae* spp.	6			
Lecythis persistens	163	3	0.76	**404**	*Lecythis corrugata* et spp.	141	**403**	*Eschweilera sagotiana* et spp.	21			
Lecythis poiteaui	16	1	1	**633**	*Lecythis poiteaui*	16						
Leonia glycycarpa	6	2	0.67	**707**	*Drypetes variabilis*	5						
Licania alba	140	7	0.42	**705**	*Licania* cf. *micrantha*	79	**401**	*Licania* spp.	45	**701**	*Licania alba*	11
Licania canescens	17	4	0.29	**701**	*Licania alba*	8	**401**	*Licania* spp.	5	**710**	*Licania* cf. *canescens*	2

Table 1 *(continued)*

Species (det. Sabatier-Molino)				SGS #1			SGS #2 (with n_{g2}>1)			SGS # 3 (with n_{g3}>1)		
	N_s	G_s	D_s	Code	Name	n_{g1}	Code	Name	n_{g2}	Code	Name	n_{g3}
Licania densiflora	16	4	0.27	**706**	*Parinari campestris*	7	**701**	*Licania alba*	5	**709**	*Licania* cf. *hypoleuca*	2
Licania heteromorpha	32	3	0.88	**704**	*Couepia* cf. *caryophylloides*	30						
Licania membranacea	27	3	0.43	**709**	*Licania* cf. *hypoleuca*	15	**701**	*Licania alba*	10	**401**	*Licania* spp.	2
Licania ovalifolia	6	4	0.2	**401**	*Licania* spp.	3						
Licania sprucei	7	2	0.71	**401**	*Licania* spp.	6						
Macoubea guianensis	5	2	0.6	**678**	*Macoubea guianensis*	4						
Micropholis egensis	5	1	1	**629**	*Micropholis guyanensis*	5						
Micropholis guyanensis	5	1	1	**629**	*Micropholis guyanensis*	5						
Moronobea coccinea	20	2	0.81	**608**	*Moronobea coccinea*	18	**607**	*Symphonia globulifera*	2			
Mouriri crassifolia	16	2	0.87	**662**	*Mouriri* cf. *collocarpa*	15						
Oxandra asbeckii	82	4	0.93	**614**	*Oxandra asbeckii* et spp.	79						
Parinari campestris	5	2	0.6	**706**	*Parinari campestris*	4						
Pogonophora schomburgkiana	79	2	0.97	**703**	*Sloanea* cf. *guianensis*	78						
Poraqueiba guianensis	12	3	0.68	**401**	*Licania* spp.	10						
Posoqueria latifolia	12	1	1	**627**	*Posoqueria latifolia*	12						
Pouteria ambelaniifolia	5	2	0.6	**643**	*Pouteria melanopoda*	4						
Pouteria cf. bangii	5	2	0.6	**629**	*Micropholis guyanensis*	4						
Pouteria gonggrijpii	8	2	0.57	**606**	*Pouteria guianensis*	6	**629**	*Micropholis guyanensis*	2			
Pouteria guianensis	8	1	1	**606**	*Pouteria guianensis*	8						
Pradosia cochlearia	36	1	0.1	**402**	*Pradosia cochlearia*	36						

Table 1 *(continued)*

Species (det. Sabatier-Molino)				SGS #1			SGS #2 (with n_{g2}>1)			SGS # 3 (with n_{g3}>1)		
	N_s	G_s	D_s	Code	Name	n_{g1}	Code	Name	n_{g2}	Code	Name	n_{g3}
Protium giganteum	6	2	0.47	**756**	*Protium subserratum*	4	**314**	*Protium* sp.	2			
Protium opacum	5	2	0.6	**314**	*Protium* sp.	4						
Qualea rosea	27	2	0.93	**604**	*Qualea rosea*	26						
Recordoxylon speciosum	34	1	1	**117**	*Recordoxylon speciosum*	34						
Rheedia acuminata	7	2	0.71	**634**	*Rheedia acuminata*	6						
Rheedia benthamiana	6	1	1	**634**	*Rheedia acuminata*	6						
Rhodostemonodaphne grandis	5	1	1	**611**	*Ocotea* sp.1	5						
Sandwithia guianensis	15	2	0.87	**687**	*Sagotia racemosa*	14						
Sextonia rubra	10	1	1	**214**	*Ocotea rubra*	10						
Simaba cedron	21	1	1	**618**	*Simaba cedron*	21						
Sterculia pruriens	16	1	1	**310**	*Sterculia* sp.	16						
Sterculia sp.3	10	1	1	**310**	*Sterculia* sp.	10						
Swartzia polyphylla	9	1	1	**631**	*Swartzia polyphylla*	9						
Symphonia sp.1	61	2	0.97	**607**	*Symphonia globulifera*	60						
Tachigali melinonii	9	2	0.78	**210**	*Sclerolobium melinonii*	8						
Tapirira guianensis	12	1	1	**656**	*Tapirira guianensis*	12						
Tapura capitulifera	16	2	0.87	**659**	*Tapura* sp.	15						
Theobroma subincanum	12	2	0.83	**623**	*Theobroma subincanum*	11						
Thyrsodium guianense	6	2	0.67	**314**	*Protium* sp.	5						
Tovomita brevistaminea	5	1	1	**616**	*Tovomita* sp.2	5						
Tovomita sp.2	6	1	1	**616**	*Tovomita* sp.2	6						
Tovomita sp.9	9	1	1	**616**	*Tovomita* sp.2	9						
Trymatococcus oligandrus	5	1	1	**679**	*Trymatococcus oligandrus*	5						

Table 1 *(continued)*

Species (det. Sabatier-Molino)				SGS #1			SGS #2 (with n_{g2}>1)			SGS # 3 (with n_{g3}>1)		
	N_s	G_s	D_s	Code	Name	n_{g1}	Code	Name	n_{g2}	Code	Name	n_{g3}
Vantanea parviflora	6	2	0.47	**705**	*Licania* cf. *micrantha*	4	**401**	*Licania* spp.	2			
Virola michelii	5	1	1	**658**	*Virola michelii*	5						
Vismia guianensis	6	1	1	**665**	*Vismia cayennensis*	6						
Vismia sessilifolia	12	2	0.83	**665**	*Vismia cayennensis*	11						
Votomita guianensis	10	5	0.33	**662**	*Mouriri* cf. *collocarpa*	6						
Vouacapoua americana	44	2	0.95	**116**	*Vouacapoua americana*	43						

Table 2

Comparison between classification in SGS (species or group of species) in Paracou's database, and botanical identifications of species by D. Sabatier & J.-F. Molino of the same 2,191 trees of DBH ≥ 10 cm. N_g : number of trees in the SGS. S : number of distinct species found within the SGS. n_{si} : number of trees of the SGS identified as species i (species are ranked by descending n_{si}). NG : number of trees that belong to the genus of species 1, but not to sp.1. NF : number of trees that belong to the family of species 1, but to different genera. D_g : identification homogeneity of the SGS. $1 - D_g$ is the probability that two trees classified in the SGS belong to different species.

$$D_g = \frac{\Sigma n_{si}(n_{si} - 1)}{N_g(N_g - 1)}$$

T_g : taxonomic homogeneity of the SGS

$$T_g = \frac{5n_{si} + 2NG + 1NF}{5n_o}$$

D_{s1} : homogeneity of SGS classification for species 1 (from Table 1). C_g : taxinomic concordance between species 1 and the SGS. $C_g = 1$ if sp.1 and SGS name are identical (nomenclatural synonymies apart); $C_g = 0.4$ if sp.1 and SGS are of the same genus; $C_g = 0.2$ if sp.1 and SGS are of the same family. M : global SGS « efficiency » = 4,5 D_g + 3 D_{s1} + 2T_g + 0.5C_g, rounded to the nearest integer.

SGS			*Botanical identifications of species*							*Indices and marking*				
			S	*species # 1*		*species # 2*		*NG*	*NF*					
Code	*Name*	N_g		*Name*	n_{s1}	*Name*	n_{s2}			D_g	T_g	D_{s1}	C_g	*M*
105	*Bocoa prouacensis*	47	1	*Bocoa prouacensis*	47					1	1	1	1	10
207	*Carapa procera*	34	1	*Carapa procera*	34					1	1	0.94	1	10
641	*Catostemma fragrans*	12	1	*Catostemma fragrans*	12					1	1	1	1	10
206	*Chrysophyllum sanguinolentum*	15	1	*Chrysophyllum sanguinolentum*	15					1	1	1	1	10
601	*Conceveiba guianensis*	11	1	*Conceveiba guianensis*	11					1	1	1	1	10
622	*Dendrobangia boliviana*	6	1	*Dendrobangia boliviana*	6					1	1	1	1	10
103	*Dicorynia guianensis*	32	1	*Dicorynia guianensis*	32					1	1	1	1	10
224	*Eperua falcata*	177	4	*Eperua falcata*	174					0.97	0.98	0.96	1	10
304	*Jacaranda copaia*	15	1	*Jacaranda copaia*	15					1	1	1	1	10
214	*Ocotea rubra*	10	1	*Sextonia rubra*	10					1	1	1	1	10
402	*Pradosia cochlearia*	36	1	*Pradosia cochlearia*	36					1	1	1	1	10
604	*Qualea rosea*	26	1	*Qualea rosea*	26					1	1	0.93	1	10
117	*Recordoxylon speciosum*	35	2	*Recordoxylon speciosum*	34				1	0.94	0.98	1	1	10
618	*Simaba cedron*	21	1	*Simaba cedron*	21					1	1	1	1	10
631	*Swartzia polyphylla*	9	1	*Swartzia polyphylla*	9					1	1	1	1	10
658	*Virola michelii*	5	1	*Virola michelii*	5					1	1	1	1	10
116	*Vouacapoua americana*	43	1	*Vouacapoua americana*	43					1	1	0,95	1	10
501	*Arecaceae* spp.	6	1	*Jessenia bataua*	6					1	1	0.82	0.2	9

Table 2 *(continued)*

SGS			*Botanical identifications to species*							*Indices and marking*				
			S	*species # 1*		*species # 2*		*NG*	*NF*					
Code	*Name*	N_g		*Name*	n_{s1}	*Name*	n_{s2}			D_g	T_g	D_{s1}	C_g	*M*
682	*Cecropia obtusa*	28	2	*Cecropia obtusa*	27					0.93	0.96	0.68	1	9
683	*Cecropia sciadophylla*	33	3	*Cecropia sciadophylla*	29	Cecropia obtusa	3	3	1	0.77	0.92	1	1	9
308	*Couratari multiflora* et spp.	27	3	*Couratari multiflora*	25			1		0.85	0.94	0.92	0.4	9
602	*Gustavia hexapetala* et *G. augusta*	35	2	*Gustavia hexapetala*	34					094	0.97	0.84	0.4	9
502	*Jessenia bataua*	56	1	*Jessenia bataua*	56					1	1	0.82	1	9
608	*Moronobea coccinea*	18	1	*Moronobea coccinea*	18					1	1	0.81	1	9
614	*Oxandra asbeckii* et spp.	81	3	*Oxandra asbeckii*	79				1	0.95	0.98	0.93	0.4	9
627	*Posoqueria latifolia*	14	3	*Posoqueria latifolia*	12				1	0.72.	0.87	1	1	9
210	*Sclerolobium melinonii*	8	1	*Tachigali melinonii*	8					1	1	0.77	1	9
703	*Sloanea* cf. *guianensis*	81	3	*Pogonophora schomburgkiana*	78	*Licania alba*	2			0.93	0.96	0.97	0	9
607	*Symphonia globulifera*	65	3	*Symphonia* sp.1	60	*Symphonia globulifera*	3	3	2	0.85	0.95	0.97	0.4	9
656	*Tapirira guianensis*	13	2	*Tapirira guianensis*	12			1		0.85	0.95	1	1	9
659	*Tapura* sp.	16	2	*Tapura capitulifera*	15					0.87	0.94	0.87	0.4	9
617	*Chaetocarpus schomburgkianus*	12	2	*Chaetocarpus schomburgkianus*	11					0.83	0.92	0.55	1	8
619	*Chrysophyllum prieurii*	8	3	*Chrysophyllum prieurii*	6				2	0.54	0.8	1	1	8
704	*Couepia* cf. *caryophylloides*	36	6	*Licania heteromorpha*	30	*Couepia habrantha*	2		4	0.69	0.85	0.88	0.2	8
698	*Eperua grandiflora*	18	2	*Eperua grandiflora*	15	*Eperua falcata*	3	3		0.71	0.9	0.87	1	8
212	*Goupia glabra*	14	3	*Goupia glabra*	12					072	0.86	1	1	8
226	*Iryanthera hostmannii*	14	2	*Iryanthera hostmannii*	13					0.86	0.93	0.47	1	8
404	*Lecythis corrugata* et spp.	153	5	*Lecythis persistens*	141	*Eschweilera sagotiana*	9		11	0.85	0.94	0.76	0.4	8
609	*Swartzia guianensis*	5	2	*Swartzia guianensis*	4			1		0.6	0.88	1	1	8
686	*Swartzia panacoco*	5	2	*Swartzia panacoco*	4					0.6	0.8	1	1	8
623	*Theobroma subincanum*	13	3	*Theobroma subincanum*	11					0.70	0.85	0.83	1	8

Table 2 *(continued)*

SGS			*Botanical identifications to species*							*Indices and marking*				
			S	*species # 1*		*species # 2*		*NG*	*NF*					
Code	*Name*	N_g		*Name*	n_{s1}	*Name*	n_{s2}			D_g	T_g	D_{s1}	C_g	*M*
689	*Apeiba echinata*	6	2	*Apeiba glabra*	5			1		0.67	0.9	0.67	0.4	7
612	*Couma guianensis*	6	3	*Couma guianensis*	4				2	0.4	0.73	1	1	7
222	*Iryanthera sagotiana*	43	2	*Iryanthera sagotiana*	25	*Iryanthera hostmannii*	18	18		0.50	0.75	0.75	1	7
633	*Lecythis poiteaui*	27	5	*Lecythis poiteaui*	16	*Eschweilera congestiflora*	8	2	9	0.42	0.69	1	1	7
205	*Manilkara bidentata*	5	2	*Manilkara bidentata*	3	*Manilkara huberi*	2	2		0.4	0.76	1	1	7
687	*Sagotia racemosa*	18	4	*Sandwithia guianensis*	14	*Poecilanthe hostmannii*	2			0.60	0.78	0.87	0.2	7
303	*Simaba multiflora*	6	2	*Simaba morettii*	4	*Simaba polyphylla*	2	2		0.47	0.8	1	0.4	7
403	*Eschweilera sagotiana* et spp.	129	8	*Eschweilera sagotiana*	76	*Lecythis persistens*	21	28	3	0.39	0.68	0.79	0.4	6
620	*Inga alba*	32	6	*Inga pezizifera*	22	*Inga* sp.4	6	10		0.50	0.81	0.78	0.4	6
684	*Lauraceae* sp.	5	3	*Aniba* sp.1	3				1	0.3	0.64	1	0.2	6
705	*Licania* cf. *micrantha*	96	11	*Licania alba*	79	*Vantanea parviflora*	4	2	7	068	0.85	0.42	0.4	6
662	*Mouriri* cf. *collocarpa*	23	4	*Mouriri crassifolia*	15	*Votomita guianensis*	6	1	6	0.47	072	0.87	0.4	6
611	*Ocotea* sp.1	9	5	*Rhodostemonodaphne grandis*	5			1	3	0.28	0.67	1	0.2	6
756	*Protium subserratum*	5	2	*Protium giganteum*	4				1	0.6	0.84	0.47	0.4	6
634	*Rheedia acuminata*	13	3	*Rheedia acuminata*	6	*Rheedia benthamiana*	6	6		0.38	0.65	071	1	6
310	*Sterculia* sp.	29	5	*Sterculia pruriens*	16	*Sterculia* sp.3	10	10		041	0.69	1	0.4	6
679	*Trymatococcus oligandrus*	14	4	*Brosimum guianense*	7	*Trymatococcus oligandrus*	5	1	6	0.31	0.61	1	0.2	6
665	*Vismia cayennensis*	18	3	*Vismia sessilifolia*	11	*Vismia guianensis*	6	7		0.46	0.77	0.83	0.4	6
306	*Brosimum rubescens*	5	3	*Brosimum rubescens*	3			1		0.3	0.68	0.5	1	5
636	*Eugenia coffeifolia*	7	5	*Eugenia* cf. *muricata*	3			2		0.14	0.54	1	0.4	5
709	*Licania* cf. *hypoleuca*	24	8	*Licania membranacea*	15	*Licania canescens*	2	6		0.39	0.72	0.43	0.4	5
629	*Micropholis guyanensis*	28	15	*Micropholis guyanensis*	5	*Micropholis egensis*	5	7	13	0.07	0.37	1	1	5
606	*Pouteria guianensis*	30	11	*Pouteria guianensis*	8	*Pouteria gonggrijpii*	6	16	2	0.12	0.49	1	1	5

Table 2 *(continued)*

SGS			*Botanical identifications to species*							*Indices and marking*				
			S	*species # 1*		*species # 2*		*NG*	*NF*					
Code	*Name*	N_g		*Name*	n_{s1}	*Name*	n_{s2}			D_g	T_g	D_{s1}	C_g	*M*
616	*Tovomita* sp.2	28	8	*Tovomita* sp.9	9	*Tovomita* sp.2	6	19		0.18	0.59	1	0.4	5
621	*Helicostylis pedunculata*	5	5	*Helicostylis tomentosa*	1				2	0	0.28	1	0.4	4
801	*Inga huberi* et *stipularis*	7	3	*Chaunochiton kappleri*	4	*Byrsonima laevigata*	2			0.33	0.57	0.66	0	4
804	*Inga* sp.	5	4	*Inga pezizifera*	2			3		0.1	0.64	0.57	0.4	4
313	*Lacmellea floribunda*	8	3	*Lacmellea aculeata*	3	*Ambelania acida*	3		5	0.25	0.5	0.5	0.4	4
701	*Licania alba*	39	9	*Licania alba*	11	*Licania membranacea*	10	25	1	0.19	0.54	0.42	1	4
751	*Miconia* spp.	16	8	*Miconia acuminata*	4	*Miconia tschudyoides*	3	5	2	0.1	0.4	1	0.4	4
706	*Parinari campestris*	13	4	*Licania densiflora*	7	*Parinari campestris*	4	2	4	0.34	0.66	0.27	0.2	4
643	*Pouteria melanopoda*	14	6	*Chrysophyllum argenteum*	5	*Pouteria ambelaniifolia*	4	1	7	0.19	0.49	0.67	0.2	4
653	*Sloanea* cf. *grandiflora*	8	7	*Sloanea* sp.8	2			4		0.04	0.45	1	0.4	4
655	*Talisia* spp.	5	5	*Talisia pedicellaris*	1			2	1	0	0.4	1	0.4	4
707	*Drypetes variabilis*	16	7	*Leonia glycycarpa*	5	*Drypetes variabilis*	3		1	0.14	0.32	0.67	0	3
715	*Indet.*	6	4	*Maytenus oblongata*	3					0.2	0.5	0.5	0	3
802	*Inga cayennensis*	17	11	*Inga pezizifera*	6	*Inga thibaudiana*	2	6	1	0.12	0.51	0.57	0.4	3
401	*Licania* spp.	107	33	*Licania alba*	45	*Poraqueiba guianensis*	10	22	9	0,19	0,52	0,42	0,4	3
646	*Ocotea guianensis*	10	6	*Ocotea amazonica*	3	*Euplassa pinnata*	3	2	1	0,13	0,4	0,5	0,4	3
314	*Protium* sp.	16	7	*Thyrsodium guianense*	5	*Protium opacum*	4	3	1	0,15	0,4	0,67	0	3