

# Neotropical Ecosystems



**WAVES**

Water Availability, Vulnerability  
of Ecosystems and Society  
in the Northeast of Brazil

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Reinhard Lieberei  
Helmut Bianchi  
Vera Boehm  
Christoph Reisdorff

**Editors**

Reinhard Lieberei <sup>1</sup>, Helmut K. Bianchi <sup>2</sup>, Vera Boehm <sup>1</sup>, Christoph Reisdorff <sup>1</sup>

<sup>1</sup> Universität Hamburg, Institut für Angewandte Botanik, Ohnhorststr. 18, 22609 Hamburg, Germany

<sup>2</sup> GKSS-Forschungszentrum Geesthacht GmbH, Max-Planck-Straße 1, 21502 Geesthacht Germany

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traits and are therefore abundant in a large spectrum of sites. The analysis reveals at least three fundamentally different ecological types of secondary forest tree species and some of their functional traits:

Type 1: Treelet, fraction leaf biomass / overground biomass high -  $\pm$  large leaves - low leaf area weight - leaves hairy;

Type 2: Low tree, large leaves - high leaf area weight - leaves  $\pm$  hairy;

Type 3: Medium tree, fraction leaf biomass / overground biomass low - small leaves - low leaf area weight - leaves glabrous.

These sets of traits indicate different strategies for an efficient use of resources in a changing environment during a progressive succession.

## From Monotonous to Enriched Bushy Pastures to Replace the Traditional Smallholder Management in North-Eastern Pará, Brazil

Hohnwald, S.<sup>1</sup>, Rischkowsky, B.<sup>1</sup>, Camarão, A. P.<sup>2</sup>, Rodrigues Filho, J. A.<sup>2</sup>, Vielhauer, K.<sup>3</sup>,  
Schultze-Kraft, R.<sup>4</sup>, King, J. M.<sup>1</sup>

<sup>1</sup> Georg-August-University of Göttingen, Germany

<sup>2</sup> Embrapa Amazônia Oriental, Belém, Brazil

<sup>3</sup> Center for Development Research, Bonn, Germany

<sup>4</sup> University of Hohenheim, Stuttgart, Germany

### Abstract

This study explores possibilities to replace the traditional pasture management of smallholders in the Bragantina region in northeastern Pará, Brazil. Whereas the practice of the smallholders is to keep a 'clean', monospecies grass-only pasture, biodiverse pastures could probably be ecologically more adequate and sustainable. Thus, two options are being tested, a *Brachiaria humidicola* pasture enriched with two bushy and one herbaceous legume, namely *Cratylia argentea*, *Chamaecrista rotundifolia* and *Arachis pintoii*, and a *Brachiaria humidicola* pasture allowing a controlled regrowth of secondary vegetation ("Capoeira"). The functionality of these two alternatives is currently being studied in a researcher managed on-farm experiment by comparing them with a traditional pasture and an undisturbed regrowth of Capoeira.

### Keywords

Capoeira, cattle, enriched pastures, humid tropics, legumes, secondary vegetation, smallholder

### 1 Introduction

In the humid tropics smallholders' pastures reach an advanced state of degradation after 7 to 10 years due to decreasing soil fertility (SERRÃO & NEPSTAD 1985), insect pests and invading secondary vegetation, so-called 'Capoeira' (UHL et al. 1988). The stocking rate has to be gradually reduced until the costs of maintaining the pasture are no longer justified. At the end,

usually after 10 to 15 years of use, pastures are abandoned and it is difficult to convert the area into agriculturally cultivatable land. Not only this degradation of monospecies grassland but also the experience with other monocultures in biodiverse woody ecosystems suggest that there is a need for ecologically more adequate solutions. This study proposes to abandon the concept of 'clean' grasslands and to find alternative pasture management strategies.

### 2 Material and Methods

#### 2.1 The Grass/ Legume Pasture

One option to achieve greater diversity is to enrich traditional, sown pastures with legumes, which are particularly valuable because of their ability to fix nitrogen and to improve the animal diet. A combination of 5 m strips of *Arachis pintoii* combined with *Cratylia argentea* (foreground of photo) and 5 m strips of *Chamaecrista rotundifolia* (background) combined with *Brachiaria humidicola* is tested.

#### 2.2 The Grass/ Capoeira Pasture

A second option is to tolerate the natural regrowth of the Capoeira vegetation in the pastures (LOKER, 1994). A precondition to a successful integration of pastures in the traditional slash-and-burn cycle is that the species composition under the heavy impact of cattle (eating, trampling) remains the same as in an undisturbed Capoeira.



Fig.1: The four treatments: Traditional pasture, Grass/Legume pasture, Grass/Capoeira pasture, Natural Capoeira

These two new types of pasture are compared with a traditional pasture and an undisturbed regrowth of Capoeira (Fig. 1). The experiment was set up on a 3.2 ha field of a smallholder in Igarapé-Açu, which had been cultivated with annual crops (maize, cassava) for 1.5 years preceded by a 12-year-old Capoeira. The three pasture types are being tested in three replications in a block design. Within each pasture plot an enclosure of 100 m<sup>2</sup> has been fenced to allow the undisturbed regrowth of Capoeira. Three male crossbred cattle with an initial weight from 165 to 240 kg have been allocated to each of the three treatments and rotated between the three replications. The stocking rate will be adjusted according to forage availability and the grazing and resting periods of the treatments are synchronized. On each pasture plot the vegetation dynamics is being observed in four 10 x 10 m permanent sub-plots.

### 3 Results

After six months of establishment and 6 months of grazing, the Grass/Legume pasture fulfils its two functions with some problems (Fig. 2). *A. pintoi* is spreading only slowly and is further diminished during the grazing periods. The

leaves of *C. argentea* were completely consumed during the second rotation but they regrow well. *C. rotundifolia* was found in 16 % of the feces samples and persists well on the pastures (CAMARÃO et al., 2000).

Fig. 3 shows the numbers of plant species in a Grass/Capoeira pasture in comparison to an undisturbed Natural Capoeira, before and after half a year of grazing. The Grass/Capoeira pasture has only a slightly lower phyto-diversity, which increases with time as in the Capoeira, while the proportion of trees, bushes, lianas, herbs and grasses has remained nearly the same.

### 4 Discussion

The slow but successful establishment and the persistence of the legumes after the first six months of grazing look promising. Still it has to be awaited if the legumes persist in the dry season and if they meliorate the soil fertility. Contrary to expectation the contribution of the legumes to the cattle diet did not lead to higher daily weight gains.

So far, grazing did not alter the composition of the secondary vegetation though some Capoeira tree species contributed to the cattle diet (cf. CAMARÃO et al., 2000). If



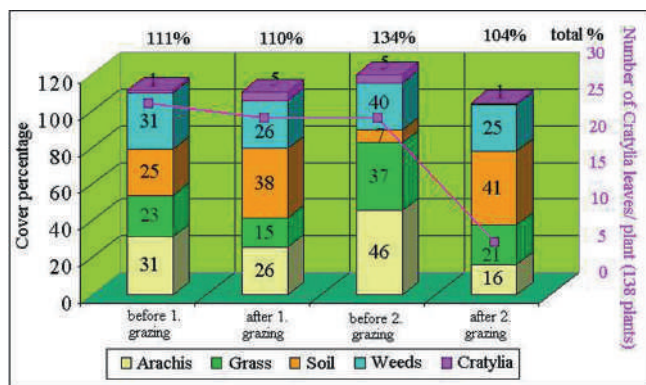


Fig. 2: Cover estimation of *A. pintoi* and *C. argentea* in the 5 m.

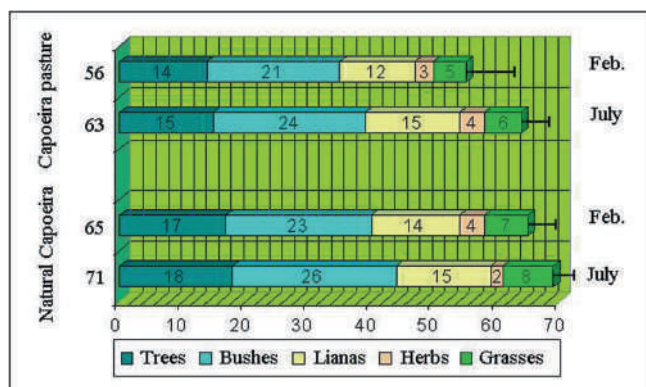


Fig. 3: Changes in phytodiversity on a Grass/Capoeira pasture strips (36 samples from 1 m x 1 m plots) in comparison to an undisturbed Natural Capoeira.

the regenerative potential of the Capoeira can be sustained during the whole period of pasture use, then the area could easily be used for cropping allowing a short fallow period after abandonment.

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## Regeneration Strategies of Selected Forest Plant Species in the Central Amazon

Skatulla, M.<sup>1</sup>, Coêlho, L. F.<sup>2</sup>, Gottsberger, G.<sup>3</sup>, Lieberei, R.<sup>1</sup> and Preisinger, H.<sup>1</sup>

<sup>1</sup> Universität Hamburg, Institut für Angewandte Botanik, Hamburg, Germany

<sup>2</sup> Instituto Nacional de Pesquisa da Amazônia, Manaus-AM, Brazil

<sup>3</sup> Universität Ulm, Institut für Spezielle Botanik, Ulm, Germany

## 1 Introduction

During succession the occurrence of plant species depends on their regenerative strategies, which do fit or not under the conditions present in the developing vegetation. Plant species, which can re-establish by new sprouts from the root stock, tolerate regular cutting of their stems. Otherwise new plants of the species have to germinate from seeds out of the soil seed bank. The upgrowing plants modify the conditions of the site, thus leading to competition and impairment of further establishment of those plants common in the vegetation. Plant species of other vegetation types, showing other regenerative strategies, could get established now. As an example for these competitions three plant species typical for primary forest and three plant species typical for secondary vegetation with different regenerative strategies

have been studied with special reference to their importance for the plant establishment and succession.

## 2 Results

Abandoned areas are mainly occupied by plants which regenerate vegetatively (Tab. 1). Species of the former primary forest, as *Pogonophora schomburgkiana* Miers. ex Benth., regenerate from their root stocks. On the other hand the Pioneer *Vismia guianensis* (Aubl.) Choisy is very abundant due to its sprouting from lateral roots. Besides them only plant species with high seed production and unspecialized seed dispersal, as *Cecropia concolor* Willd., establish frequently in the younger secondary vegetation. The fruits produced in the younger fallow vegetation attract small birds, leading to the dispersal of species of older