

Neotropical Ecosystems



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

Proceedings of the
German-Brazilian Workshop
Hamburg, 2000

edited by
Reinhard Lieberei
Helmut Bianchi
Vera Boehm
Christoph Reisdorff

Editors	Reinhard Lieberei ¹ , Helmut K. Bianchi ² , Vera Boehm ¹ , Christoph Reisdorff ¹ ¹ Universität Hamburg, Institut für Angewandte Botanik, Ohnhorststr. 18, 22609 Hamburg, Germany ² GKSS-Forschungszentrum Geesthacht GmbH, Max-Planck-Straße 1, 21502 Geesthacht Germany
Layout	Helmut K. Bianchi, GKSS, Karsten Bittner, Documedia, Geesthacht, Germany
Printing	GKSS-Forschungszentrum Geesthacht GmbH, Geesthacht, Germany

ISBN 3-00-010691-X

Lieberei, R., Bianchi, H-K., Boehm, V., Reisdorff, C., (eds.) 2002:
 Neotropical Ecosystems, Proceedings of the German-Brazilian Workshop,
 Hamburg 2000. GKSS-Geesthacht .

The publishers give permission to copy single contributions from the Proceedings for personal use exclusively. Copies may be passed on only with the correct specification of the source.

The research cooperation has been carried out under the auspices of the German - Brazilian Governmental Agreement on the Cooperation in Scientific Research and Technological Development.

The issuance of the Proceedings and the production of the CD-ROM was sponsored (Code 0339991) by the



**Federal Ministry of
Education and Research**

The responsibility for the contents of the contributions is solely the authors'.

Contribution of the Different Growth Forms within the Leguminous Family to the Nitrogen Budget of Secondary and Primary Vegetation of Central Amazonia

Gehring, C.¹, Thielen-Klinge, A.², and Vlek, P. L.G.²

¹ Embrapa-CPAA, Amazonas, Brazil

² Zentrum für Entwicklungsforschung, Univ. Bonn, Germany.

Recuperation of nutrient stocks lost during cultivation are decisive for determining the sustainability and optimal fallow periods in traditional slash-and-burn agriculture. N-losses are particularly high, due to volatilisation, and Biological Nitrogen Fixation (BNF) is the only significant pathway of reaccumulation. This research project investigates symbiotic BNF by spontaneously growing legume species throughout successional development. Research is conducted on 25 sites representing chronosequences of secondary vegetation (ranging from 2- to 25-yrs.-old) and primary forest sites for comparisons. Secondary forests are derived from first-cycle manual slash&burn with approx. 1 year of cassava cultivation. Major constraints for BNF are to be expected in high clay contents, P-limitation and Al-toxicity of the Latossolo amarelo.

BNF-estimations will be based on the $\delta^{15}\text{N}$ natural abundance method (sample analysis in process). A methodological drawback of this method is the high

variability due to the heterogeneity of spontaneous vegetation. Therefore, a complete mapping of all (woody) legume individuals occurring in the study sites was undertaken. 98% of all legume individuals were identified to the species level for which aboveground biomass will be estimated allometrically.

Preliminary results:

57% of all legume individuals were lianas and 43% trees/shrubs. The importance of legume lianas was greater in secondary vegetation (66%) than in primary forest (40%). As 94% of all mapped liana individuals belong to species with known or probable nodulation capability (as opposed to 79% of legume tree individuals), lianas appear to play a key role in recuperating N-stocks.

Data on biomass composition, size and spatial distribution of legume species along successional development will be presented.

Modification of Traditional Fallow System towards Ecologically Sound Options

Vielhauer, K.¹, and Sá, T. D. de A.²

¹ ZEF, Universität Bonn, Bonn, Germany

² Embrapa Amazônia Oriental, Belém, PA, Brazil,

The project SHIFT Capoeira (ENV 25, "Secondary Forests and Fallow Vegetation in Eastern Amazonia - Function and Management") is actively accompanying the land-use changes of a region taken under extensive agricultural use a century ago and having it turned to an entirely anthropogenic landscape to date. Only a century ago the so called Bragantina region began to be colonized in a systematic approach. A railway and later roads were built, to the sides of which rectangularly shaped farms of 25 ha were given to settlers. In this process the initial steps of land-use changes were taken. Shifting cultivation with forest fallows moved to a bush fallow system with continuously shortening fallow periods as a consequence of growing demographic pressure. By 1991 population density had reached the number of

30 inhabitants km⁻². Nowadays the sustainable production of low-input food crops is becoming more and more difficult due to degrading soils caused by the shortened fallow periods, which do not favor the recuperative capacity of the secondary vegetation (capoeira), especially of the trees and the shrubby species. One of the staple foods, rice, a relatively high demanding crop, has disappeared in many regions completely. This is also due to the easier access to distant markets such as to the South of Brazil after its connection by the construction of the highway Belém - Brasília. Global markets start playing an increasing role in the regional small farmer agriculture, as well. There is a general tendency, nowadays, to shift to perennial high-input cash crops such as passion fruit and pepper which, in some

farms, replace the food crops completely. The success of both perennials is, to a high extent, subject to national and international price fluctuations. In passion fruit it is frequently observed that, at times, the market prices do not even justify the labor required to collect the fruits from the field. Pepper also undergoes similar price fluctuations, strictly connected to international markets and hence not to be influenced locally. Furthermore pepper can easily suffer total loss by the Fusarium rot. Considering also the extremely high initial investments, the gamble with perennial cash crops is greater, whereas annual food crops guarantee more security. Both latter systems, as well as others such as complex mixed cropping and agroforestry systems, have their perfect justification and will come and go as a function of external factors. Since these can be little influenced, the projects research activities are directed to meet cross-system requirements, which serve the purpose of

all systems. Establishing soil fertility is the most important one and is being given full attention by the project. Some important means are: adequate organic matter management, mineral fertilization, crop management, secondary vegetation improvement. It will be shown where and how the traditional fallow system can be modified for a more efficient and sustainable production and how and which potentials of the developed technologies can be considered for other systems, such as perennial cash crops and agroforestry systems. According to RUTHENBERG and ANDREAE (1982) the modification of traditional fallow systems towards more intensive land-uses is a usually encountered natural process in tropical farming systems. No outside incentive would be required, but the project can accompany this development by making it more sustainable and ecologically more sound. On these grounds the land-use intensification process can be accelerated securely.