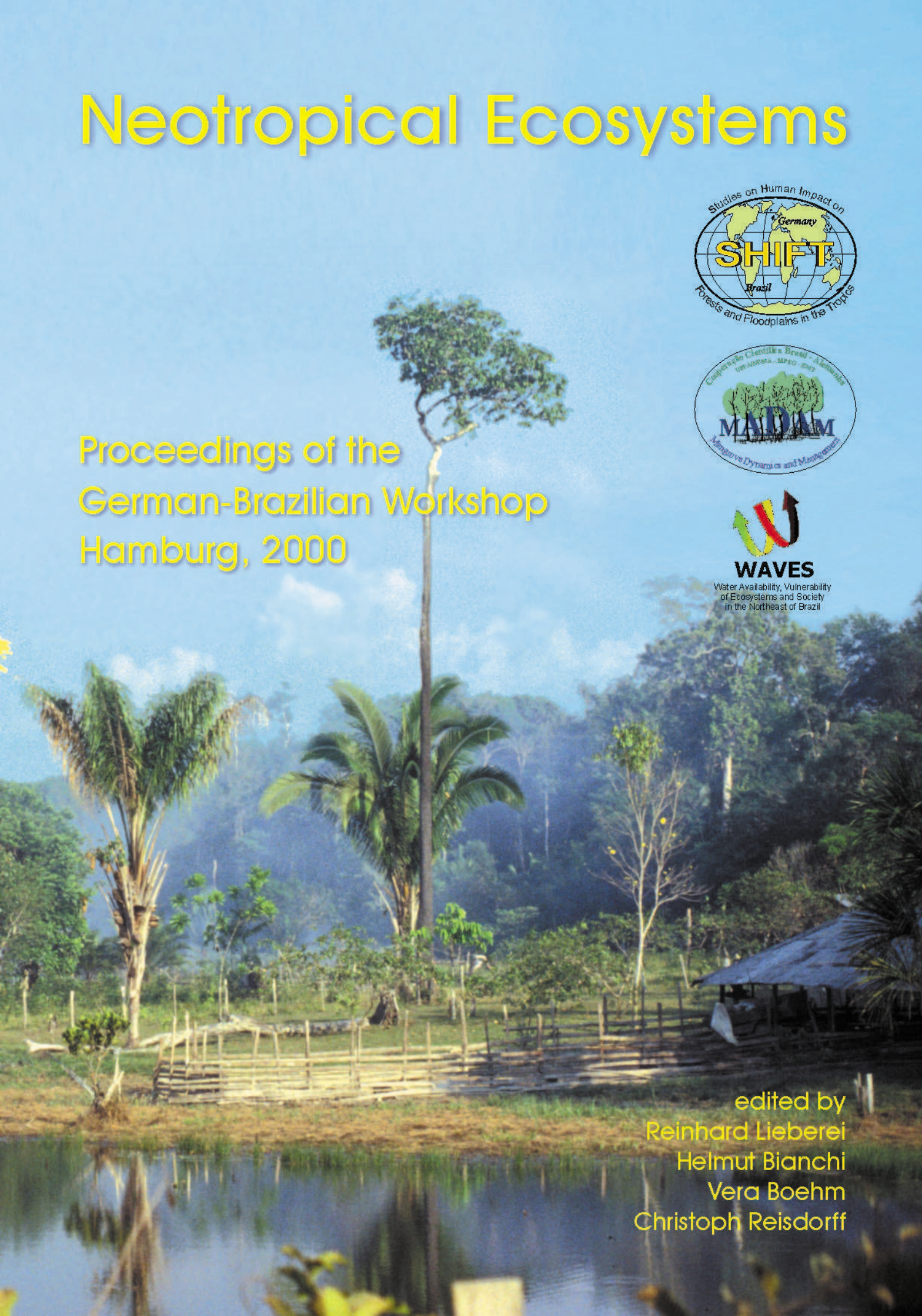
Neotropical Ecosystems



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

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

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Enriching Fallow Vegetation in the Eastern Amazon of Brazil Towards Improving Land-use

Brienza jun., S.[1], Denich, M.[2], Fölster, H.[3] and Vlek, P. L. G.[2]

[1] Embrapa – Amazônia Oriental, Belém, Brazil

[2] Universität Bonn, Bonn, Germany

[3] Georg-August Universität Göttingen, Göttingen, Germany

In the Eastern Amazon of Brazil, the fallow periods used after the slash-and-burn agriculture are been shortened and vary between three to four years or more, depending on different land use pressures. The main reasons for this are use of inappropriate cultivation technology, social problems and lack of adequate agricultural polices. As a consequence, there is insufficient time for the fallow vegetation recover. To overcome the problem, planting trees as an enrichment of fallow vegetation can promote biomass accumulation and build a biogeochemical nutrient cycle, reproducing in a short period, the same vigorous vegetation as found in older fallow.

Different techniques of fallow vegetation enrichment (recrû method and line planting), using wood trees, are already viable in some cases in the Brazilian Amazon. But those methods tie up the land during the growth of trees, and generally taken between 20-30 years. Therefore, this procedure is not feasible for small-holders, but rather for forest management units. Under pressure to shorten the fallow period two alternatives might be presented. In the first case, a leguminous tree or shrub or cover crop is used to improve soil conditions for the next cropping period. The planting density is generally high to suppress weed growth, representing a complete spontaneous fallow replacement. In the Eastern Amazon of Brazil scenario, the fallow vegetation plays an important role, as a source of energy production, medicinal plants, and hunting, among others. The substitution of spontaneous and heterogeneous fallow vegetation with homogeneous fallow may therefore not be in the farmer's best interest.

To study the capability of improving fallow vegetation biomass, leguminous trees were planted during the agricultural period at different spacing to enrich the later fallow. The first experiment used Acacia auriculiformis and the second Acacia angustissima, Clitoria racemosa, Inga edulis and Acacia mangium. Including both experiments, different ecological studies were done to characterize quantitative and qualitative aspects the different fallow systems as following: planted trees and fallow vegetation biomass; above- and belowground carbon storage; nutrient stocks, floristic diversity; soil fauna; rooting- structure and growth; rainfall partitioning; ecophysiological variables (stomatal conductance and water potential); light quality; gas emission; soil moisture content; mulch decomposition; N-mineralization; biologically fixed N; N-natural abundance and ^{15}N-labeling methods. The analysis of the impact on fallow time reduction showed that the enriched fallow systems provide in a total of 3 years (1 year cropping + 2 years of enriched fallow) a biomass accumulation equivalent to up to five years of traditional fallow.

The Role of Biophysical Information for the Management of Fallow Systems

Sá, T. D. de Abreu[1] and Vielhauer, K.[2]

[1] Embrapa Amazônia Oriental, Belém, PA, Brazil

[2] ZEF, Universität Bonn, Bonn, Germany

Biophysical information may help to improve the management of fallow systems, and to support the formulation of public policies aiming at the sustainable development of areas where the fallow vegetation is an important component of the landscape. A good sequence of key biophysical studies, attempting to space and time scales, associated to features of the particular fallow system scenario represents an important step in research/development in that context. A good example of that has been practiced by SHIFT Project Env-25 (Secondary forests and fallow vegetation in the Eastern Amazonia- function and management), centered in northeastern Pará state, and is being planned to continue in the next phases of this project, tackling on biophysical aspects of fallow vegetation, in the context of the family agriculture practiced for over a century in that region. During the first phase of