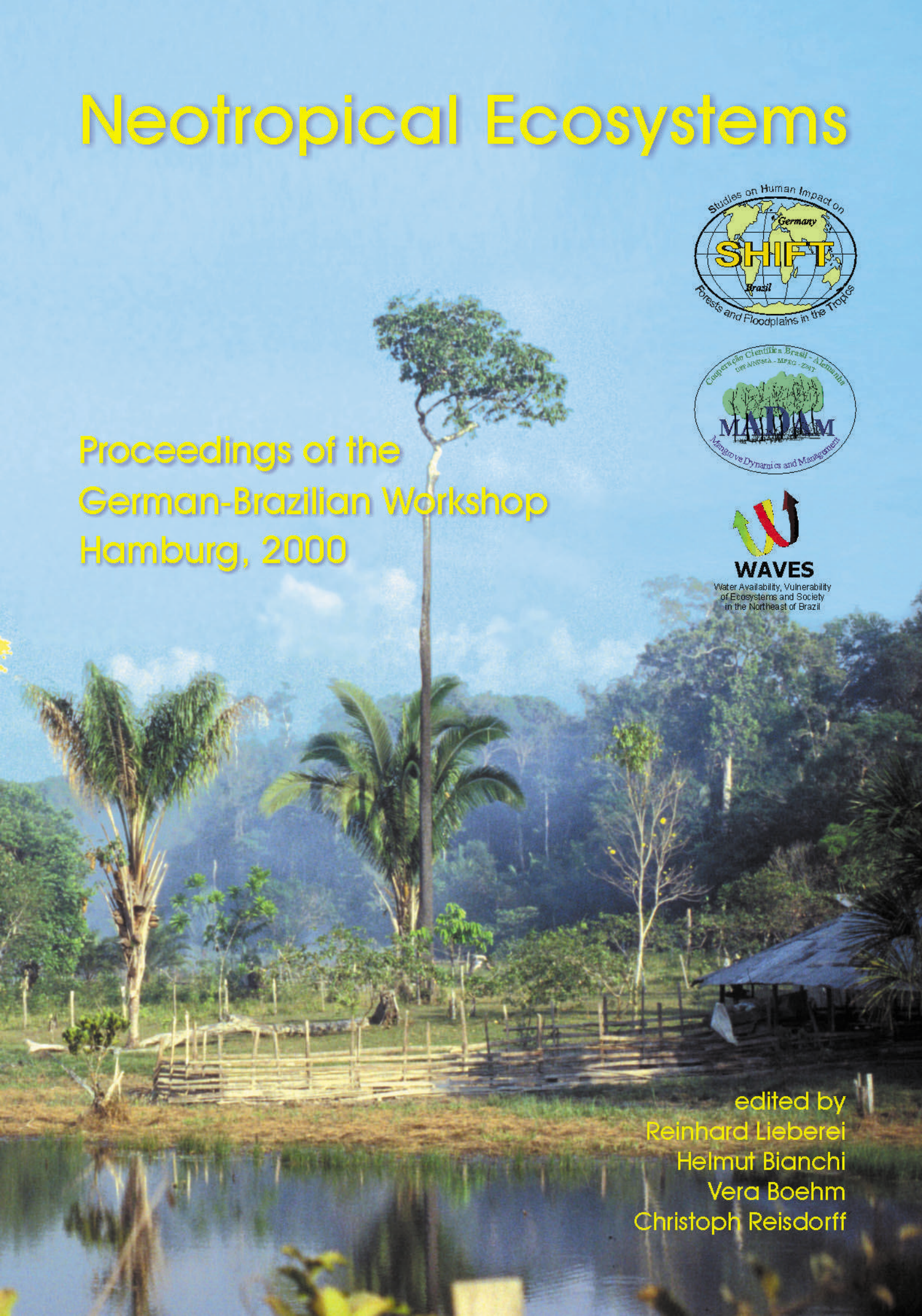
Neotropical Ecosystems



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

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this - decreasing growth rates and a deterioration in water uptake. The last one intensifies nutrient deficiency and the sensibility against drought.

Therefore *S.macrophylla* performs lower growth rates without fertilization than *C.guianensis* under the same soil conditions on the site in Manaus because of a reduced photosynthetic capacity and an increasing photosynthetic light demand in the lower part of the crown or under the shelter of other trees. In a mixed forest *C.guianensis* is the more successful of this two tree species on this soils.

Finally the results demonstrate that basic properties like nutrient demands and – especially - nutrient uptake as well as the water uptake interact strongly with photosynthesis and have implications on the shade plant character. The photosynthetic CO_2 gain of a plant however is at least decisive for the success of a particular species in a particular habitat.

Phosphorus Availability in Slash-mulch System in Eastern Amazonia

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1 Introduction

Since land preparation is on important aspect to give alternative to slash-and-burn system, to compare these effect of non using burning and of fertilizer application upon concentration and forms of phosphorus (P) in the soil, is considered of high interest.

The field experiment was conducted in small holder farm in the municipality of Igarapé Açu, PA, Brazil on Ultisol. The shrubby fallow vegetation had a total above-ground biomass dry matter of 24 t ha^{-1} with 9 kg of P stored in it. The treatments were two methods of land preparation: Slash-and-burn (SB) and slash-and-mulch, with and without NPK fertilizer. SM was achieved by slashing all existing above-ground and grinding it with a silage chopper and spreading it equally over the field. The fertilizers employed were: 50, 25, 25 kg h^{-1} for rice and 10, 22, 42 kg ha^{-1} NPK respectively for cowpea in the form of urea, triple superphosphate and potassium chloride. The cropping system were rice followed cowpea plus cassava. Plant available in the soil was determined by extracting the soil samples with the method of Mehlich (extractor: HCl + H_2SO_4) and by using a bio-assay. Furthermore, extraction of P was performed by sequential fractionation (Method of HEDLEY et al. (1982) with modification by TIESSEN and MOIR (1993). And the concentration of P was determined colorimetrically by the ascorbic molybdate acid method, a 712 nm with spectrophotometer.

2 Results

Concentrations of P were influenced by the land preparation method in the following manner: In the plant available P-pool (MEHLICH) of the non-fertilized treatments high rates of P (12.7 mg kg^{-1}) were found in SB shortly after burning as a consequence of the immediate P release out of the biomass (Tab. 1). There was also an increase in pH (4.7 to 6.4) due to the liming effect of the ashes. After 30 months, the available P had decreased to 4.7 mg kg^{-1}. In SM relatively low levels of available P (6 mg kg^{-1}) were found shortly after land preparation due to the slow liberation of nutrients of the non burned mulch layer with its wide C:P ratio, which also decreased to 4.7 mg kg^{-1}. In the fertilized plots plant available P did not vary much in time and between land preparation treatments.

The bio-assay results show that in the non-fertilized SM treatment 30% more phosphorus was extracted from the soil by the test plants (maize) than in SB. With fertilizer application this difference increased to 43%.

Out of the P fractionations, Resin-Pi reflected best the treatment differences in the non-fertilized half of the experiment. It was highly correlated with the available (labile) P-pool by Mehlich showing high values (5.8 mg kg^{-1}) in the burning treatment right after land preparation and decreasing thereafter until the first (rice) harvest (3.7 mg kg^{-1}). In the non-burning treatment it was the least labile inorganic P-pool (NaOH-Pi) that was reduced from a comparatively high level (4.5 mg kg^{-1}) at the beginning to a comparatively low level (4.0 mg kg^{-1}) being the P-pool that supplies the other two P-pools (Resin-Pi and $NaHCO_3$-Pi), which in turn behave inversely by increasing P values in the same period of time. Fertilization in general caused considerable increase of all inorganic P fractions especially in the two more labile ones (Resin-Pi and $NaHCO_3$-Pi).

3 Conclusion

It can be concluded that, in the short period of time under study, burning raised the availability of P to plants only at the beginning of the planting phase of rice, and that the greatest increases in P levels were observed after addition of fertilizer to soil. Without burning available P was dependent on the mulch decomposition.

Treatments	P-Mehlich [mg P kg-1]				
	Oct 941	Jan 952	Aug 95	Aug 97	Means
Capoeira	3.0	3.3	2.3	2.0	2.7
Burning		12.7	3.0	4.7	6.8
Mulching	-	6.0	3.0	4.7	4.6
Burning + NPK	-	12.7	16.3	13.3	14.1
Mulching + NPK	-	6.0	13.0	13.7	10.9

Tab. 1: Dynamics of available P as a function of land preparation and fertilizer in experimental

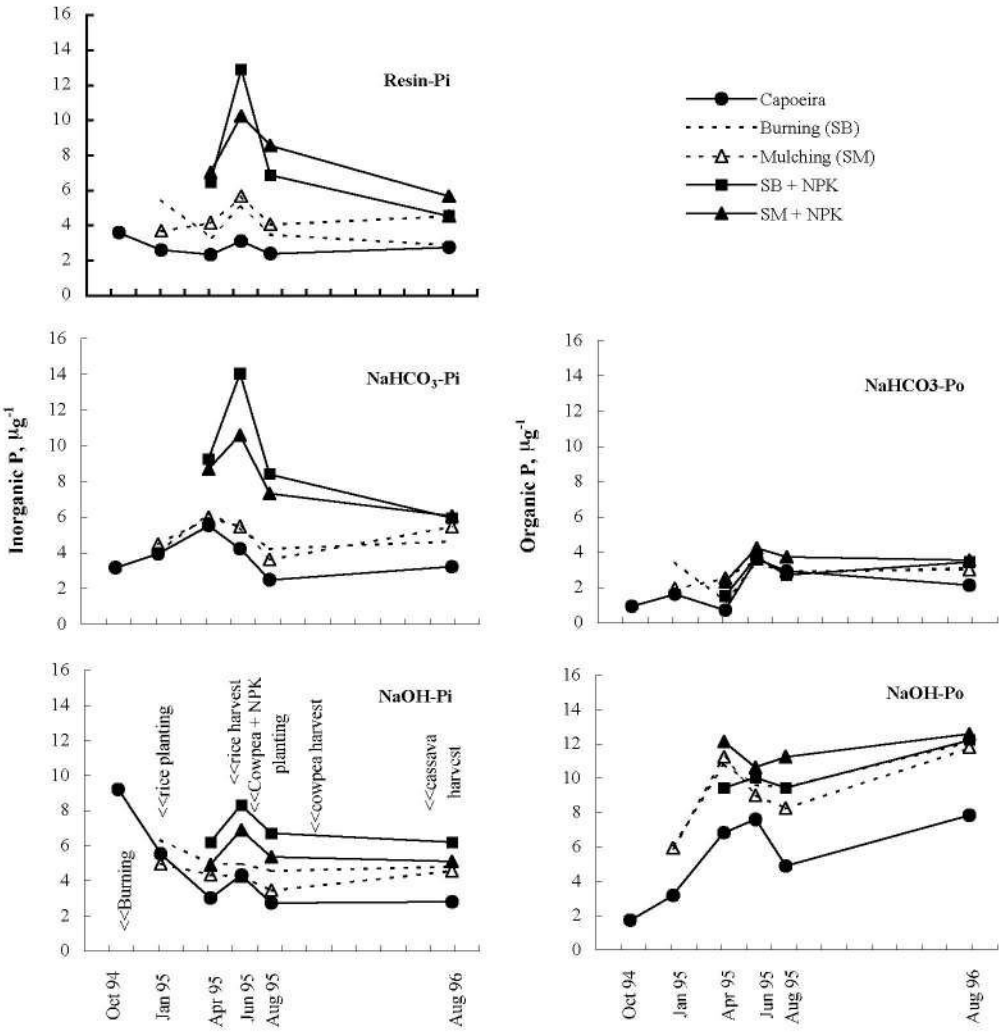

Fig. 1: Dynamics of Pi and Po fractions as a function of land preparation methods and fertilizer