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Biomass Production and Relative Palatability of Possible Supplementary Forage Plants of the Northeastern Amazon

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Introduction

In the Bragantina region of north-eastern Pará, Brazil, the sustainability of extensive smallholder pastures is constantly jeopardized by resprouting trees of the native resprouting secondary vegetation, nationally called capoeira. In all, more than 825 plant species have been identified within the Bragantinian capoeira, including numerous trees, shrubs, and forbs. However, not all spontaneous capoeira species are just weeds but most of them play an important role in the above-ground biomass accumulation of the fallow. Moreover, a recently conducted study showed that on a grass-capoeira pasture, where the resprouting capoeira was partly tolerated on the plots, many capoeira trees were intensively and regularly browsed by cattle (Hohnwald 2002). Thus, we assumed that within this huge pool of capoeira species there is still a considerable pool of promising underutilised forage supplement plants. To select these species, the following criteria were chosen: plants should have a high palatability, leafy biomass production, fast recuperation abilities after defoliation, free accessibility on smallholdings, good adaptations to environmental conditions (climate, acid soils, frequent fires, slashings), and high nutrient contents in leaves. Furthermore, species should be easy to handle with a minimum of management. Fitting the same criteria, we also looked for other common introduced and domesticated tree species on smallholdings. To evaluate the respective species we compared its leafy biomass production and relative palatability against well-known multi-purpose forage legumes, hypothesizing that they possess the same forage values.

Material and Methods

An on-farm buffet trial was therefore conducted on a 0.5 ha pasture in the centre of the Bragantina region, at Igarapé-Açu (1°08'36"S/ 47°35'33"W). The region belongs to the per-humid warm tropics with a mean annual temperature of 26.7°C, and 2469 mm rainfall. It is furthermore characterized by acid Latosols, poor in P and N, with a low cation exchange capacity. Six native species, namely *Attalea maripa* (Arecaceae), *Cecropia palmata* (Cecropiaceae), *Phenakospermum guyannense* (Strelitziaceae), *Abarema jupunba*, *Inga edulis* (both Fabaceae), and introduced *Tithonia diversifolia* (Asteraceae), *Mangifera indica* (Anacardiaceae), and *Racosperma mangium* (Fabaceae) were tested against the forage legumes *Cratylia argentea* (Desvaux) O. Kuntze cv. Veraniega and *Flemingia macrophylla* (Willd.) Merr. (Figure 1). All species were joined in an on-farm experiment, where 25 saplings of each species were planted on 25 m² plots, respectively, and repeated eight times in a randomized block design

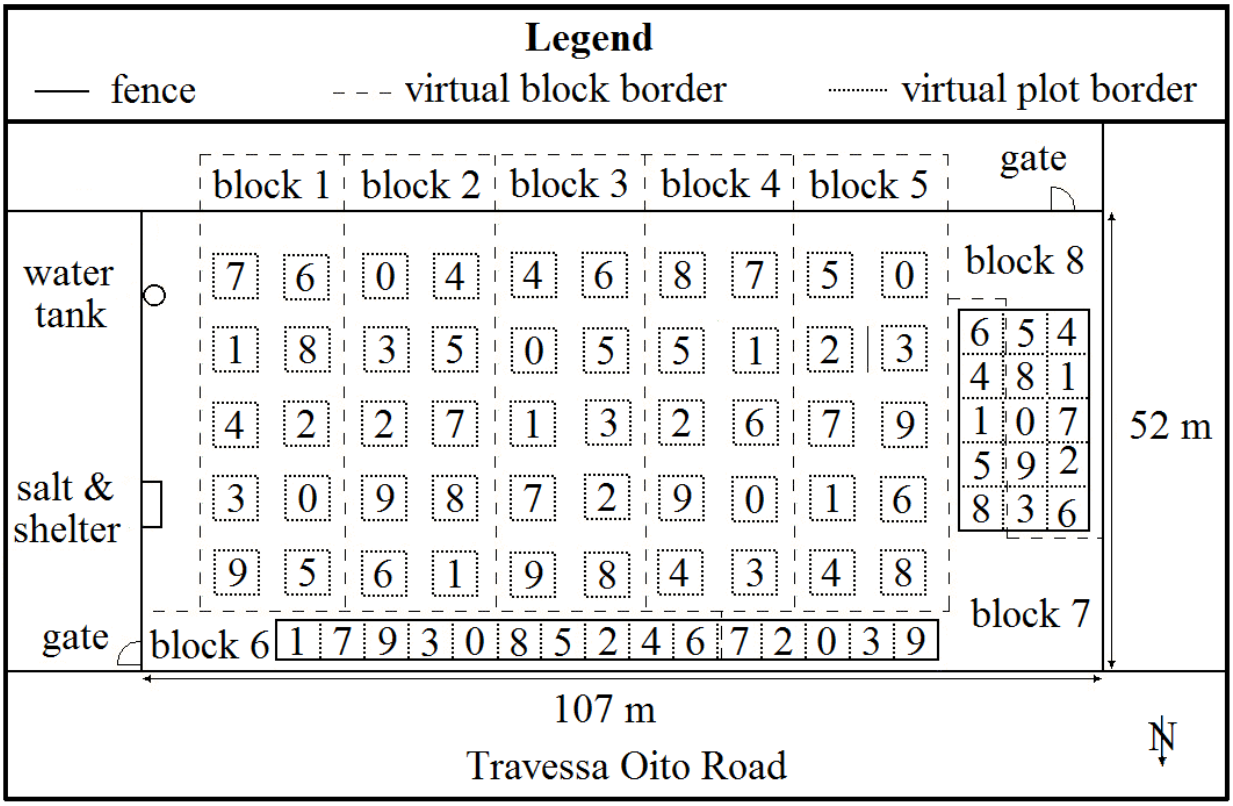

Figure 1: Schematic design of the buffet trial: 1=*Racosperma mangium*, 2= *Inga edulis*, 3=*Cratylia argentea*, 4=*Abarema jupunba*, 5=*Mangifera indica*, 6=*Tithonia diversifolia*, 7=*Flemingia macrophylla*, 8=*Phenakospermum guyannense*, 9=*Attalea maripa*, 0=*Cecropia palmata*.

(n=80 plots, n=2000 saplings). After 24 months of establishment time, the buffet trial was grazed by four mixed-bred steers (mean liveweight: 506 kg; 2 AU/ha) for one week. The leafy biomass

of ten randomised mean individuals per species before and after cattle access was collected and dried in an oven (65°C) until weight constancy was reached (n=200). The biomass values were extrapolated to kg/ha and the consumed biomass calculated as percentage from the biomass values before cattle access. Protein values were evaluated according to the Weende analysis.

Results

The results showed that many tested species had a comparable leafy biomass production, protein values and palatability like the two reference legumes (Table 1). Especially *R. mangium* showed a severe growth while other species, e.g. *A. maripa* and *T. diversifolia* suffered from the transplantation on the slightly degraded pasture plot. The consumption of most tested species was found mainly between the reference legumes. However, while *C. palmata* showed even higher consumption values than *C. argentea*, *I. edulis* and *P. guianensis* were hardly browsed at all by cattle, which can be explained by its small plant heights, hardly detectable in the overgrown forage grasses. This was also true for *A. maripa* and *T. diversifolia*, where even not enough biomass was found for evaluation. The protein contents were also mostly satisfactory besides the relatively low values of *P. guianensis*, *M. indica*, and *A. maripa*.

Table 1: Leafy biomass, consumed percentages and protein contents of the 10 compared forage species.

Species name (plus family)	Leafy biomass in kg/ ha (standard deviation)	Consumed biomass in %	Protein contents in % (standard deviation)
R. mangium (Fabaceae)	455 (429)	21	9.6 (0.33)
F. macrophylla (Fabaceae)	260 (89)	13	14.1 (0.11)
C. argentea (Fabaceae)	164 (87)	40	19.2 (0.41)
P. guianensis (Strelitziaceae)	156 (13)	1	8.1 (0.08)
M. indica (Anacardiaceae)	156 (19)	25	6.1 (0.03)
A. jupunba (Fabaceae)	140 (13)	29	13.9 (0.81)
I. edulis (Fabaceae)	94 (9)	8	13.3 (0.52)
C. palmata (Cecropiaceae)	88 (20)	60	15.1 (0.32)
A. maripa (Arecaceae)	60 (13)	-	6.1 (0.31)
T. diversifolia (Asteraceae)	57 (62)	-	20.4 (0.43)

Discussion

The results of the buffet trial elucidated that smallholders possess excellent free accessable forage alternatives on their farms and even on their pasture plots. Thus, it is recommendable to farmers not to eliminate all resprouting capoeira trees but just unpalatable species. This idea would also

fit into the improvement philosophy of smallholder agriculture: to invest more in knowledge-intensive than into labour-intensive systems and to avoid monocultures in the humid tropics. Therefore, the promising species should also not be taken into breeding consideration.

Establishment of the buffet trial was problematic and transplantation of saplings to a soil-compacted and sun-exposed pasture cannot be recommended to farmers as mortality was high and growth rates were low (Figure 2). Transplantation also means high-input activities on farms, which would be hardly acceptable for farmers. However, frequent pruning of the trees into accessable heights for cattle is advisable as the pioneer trees would grow quickly out of the animal range. Furthermore, tolerating trees on pastures and invest into silvo-pastoral systems will also counteract the foreseen climate change in the NE-Amazon.

Figure 2: View on the buffet trial, 16 months after capoeira transplantation on the pasture. In the foreground, yellowish leaves of *Phenakospermum guianensis* from block 5 can be seen (background block 7 and 8).

References

Hohnwald, S., 2002: A Grass-Capoeira Pasture Fits Better Than a Grass-Legume Pasture in the Agricultural System of Smallholdings in the Humid Brazilian Tropics. Cuvillier Verlag Göttingen, Germany, ISBN 3-89873-614-8