BEEF CATTLE PRODUCTION ON RENOVATED GRASS PASTURES IN THE SAVANNAS OF BRAZIL

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ABSTRACT
A 3-year grazing trial was conducted, to study animal production on degraded grass pastures, renovated by two levels of fertilization. All paddocks were divided into halves: one received 1.5 t/ha of dolomitic limestone, 400 kg/ha of a fertilizer formula 0-16-18 and 50 kg/ha of microelements (FL1); and the other 3.0 t/ha , 800 kg/ha and 50 kg/ha of the same fertilizers (FL2). Productivity on FL2 pastures was greater than that on FL1 pastures, averaging 565 and 395 kg of liveweight gain (LWG)/ha/year, respectively. For all grasses the productivity in both fertilizer treatments decreased linearly from the first to the third, from means of 670 and 435 to means of 445 and 325 kg/ha/year, for FL2 and FL1, respectively. Progressive reduction in forage availabilities led to significant reduction of stocking rates over time and consequent productivity. Obviously, balanced nutrition with Ca, P, K, but mainly N, is required to sustain productivity of grass pastures.

KEYWORDS
Brachiaria brizantha, *B. decumbens*, fertilization level, *Panicum maximum*

INTRODUCTION
Brazil has a savanna ecosystem, the "Cerrados", which covers 200 million ha, of which almost 50 million are under cultivated pasture. Several introduced grass species are tolerant to the prevailing climatic conditions and low fertility characteristics of the Oxisols and Utisols. Low level of soil P is one of the most limiting factors for pasture productivity in the region (Macedo et al.,1993).

In addition to low soil P levels, incorrect pasture establishment and incorrect animal management can also lead to pasture degradation. Nowadays this is considered as the most important problem of cultivated pastures in the "Cerrados". Thus, the objective of this work was to evaluate the effects of two levels of fertilization on the recuperation of the productivity of five tropical grass species.

MATERIAL AND METHODS
The experiment was conducted at EMBRAPA-CNPGC (National Beef Cattle Research Center), Campo Grande, MS, Brazil from November 1991 to October 1994, on a Dark Red Latosol (Oxisol) - pH 5.4, OM 4.4%, Ca 0.71, Mg 0.33, K 0.12 and Al 0.73 meq/100 cc, P_{resin} 3.0 ppm and V 19%.

The experiment was established on 1.5 ha-paddocks of degraded pastures of five tropical grasses: *Brachiaria decumbens* cv. Basilisk, *B. brizantha* cv. Marandu, *Panicum maximum* cvv. Colonião, Tobiatã and Tanzânia. The experimental design was a RCB in a 5x2 factorial arrangement, with three replicates. All paddocks were plowed and disked, after which they were divided into halves: one received 1.5 t/ha of dolomitic limestone, 400 kg/ha of a fertilizer formula 0-16-18 and 50 kg/ha of FTE (FL1); and the other 3.0 t/ha , 800 kg/ha and 50 kg/ha of the same fertilizers (FL2).

All 0.75 ha paddocks, were continously grazed by 2 Nellore tester yearling steers (average initial weight of 200 kg), annually replaced. Additional steers were used to ensure equal forage availability (2.5 t of dry matter in the *P. maximum* cultivars and 3.0 t in the *Brachiaria* species), throughout the study.

Forage samples were taken and live-weight gain was measured at 56-day intervals. Twenty-four 1 m^2 areas were sampled at random, within each paddock, and herbage was harvested. The samples were separated into green and dead matters.

Data were analyzed by least squares analysis of variance. The model utilized included fixed effects of grass species, fertilization level, year period and year of evaluation, and the first and second interactions involving these variables. Estimates on the return of the fertilizer usage were made.

RESULTS AND DISCUSSION
These pastures were yielding 300 kg LW/ha/year before renovation started (Euclides, 1994).

Since *Brachiaria* species are known to accumulate more dead matter year round than *Panicum* cultivars, greater forage availability was proposed for *Brachiaria* pastures in this study. Despite the management imposed on the pasture to maintain similar amount of herbage available, it was only possible to keep 1700 ± 300 kg DM/ha throughout the experiment on Colonião pastures. However, forage availabilities were similar ($P > 0.05$) between Brachiaria species (3000 ± 400) and between Tanzânia and Tobiatã cultivars of P. maximum (2400 ± 330).

There was genera x month of the year interaction ($P < 0.05$) for green dry matter (GDM) availability, but no fertilization x month interaction ($P > 0.05$), thus individual genera relationships between available GDM/ha and time were: $y = 293 + 466.3x - 65.1x^2 + 2.43x^3$ ($R = 0.84$) for P. *maximum* cultivars and $y = -31 + 649.4x - 97.1x^2 + 3.89x^3$ ($R = 0.79$) for *Brachiaria* species; where y = kg of GDM and x = month in grazing season (being October = 1 and September = 12). The amount of GDM available for both genera increased progressively up to the middle of summer, and declined thereafter. Although *Brachiaria* species have presented a higher forage availability throughout the year, they accumulated more dead matter, mainly during the dry season, which lead to a lower GDM available during this period.

Average daily gains (ADG) were significantly ($P< 0.05$) affected by grasses (GR), fertilization levels (FL), period of year (PY), and the interactions involving GR x FL, GR x PY. Except for cv. Colonião, the ADG were greater on FL2 than FL1 (Table 1). Although all grasses presented a superior ADG during the wet season when compared to the dry season, the decrease patterns between seasons were different (Table 1).

There were no interactions ($P > 0.05$) involving GR x FL and GR x PY for stocking rate (SR). However, SR were different ($P < 0.01$) among grasses (Table 2). During the wet seasons the pastures sustained higher SR (3.1 steers/ha) than during the dry season (2.8 steers/ha). Pastures with FL2 presented a greater SR than those with FL1, averaging 3.3 and 2.7 steers/ha, respectively. There was no year x FL interaction ($P > 0.05$) for SR. But, the SR decreased linearly ($P < 0.01$) over years, and the general relationship from all observations pooled over FL was: $y = 4.5 - 0.83x$ ($R = 0.77$); where y = SR and x = 1st, 2nd and 3rd experimental years.

Interaction (P<0.01) involving GR and PY was observed for liveweight gain (LWG) per area (Table 2). The productivity on FL2 pastures was greater than that on FL1 pastures, averaging 565 and 395 kg LWG/ha/year, respectively. Liveweight gain/ha/year declined linearly from the first to the third year, i.e. 670 to 450 (FL2), 430 to 330 (FL1), respectively. Although the decreasing rate was higher on FL2 pastures, the productivity in the third year was equal to that of the first year on FL1 pastures

The content of P in the soil declined from 5.3 and 7.2 to 3.5 and 4.6 ppm, respectively, for FL1 and FL2 pastures, from the first to the third year after fertilization. This might explain the gradual decline in forage availability in this period, and the consequent reduction of the stocking rate over time. Despite the decline in production, renovation by fertilizer application was profitable for both treatments. The net income was US$ 30 and US$ 95/ha/year, respectively for FL1 and FL2. Obviously, balanced nutrition with Ca, P, K, but mainly N, is required to sustain productivity of grass only pastures.

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Table 1

Means for average daily gain (g/steer/day) on continuously stocked *P. maximum* cultivars and *Brachiaria* species pastures at two levels of fertilization (FL1 and FL2), during the wet and dry seasons, over a period of 3 years.

	g/steer/day		g/steer/day	
Grasses	FL1	Fl2	Wet	Dry
Tanzânia	425[a]	515[a]	670[a]	141[a]
Tobiatã	340[c]	435[b]	580[b]	60[b]
Colonião	370[b]	360[c]	550[b]	-40[c]
B. brizantha	330[c]	425[b]	540[b]	105[ab]
B. decumbens	325[c]	420[b]	510[b]	145[a]

Means in the same column bearing different superscript letters are different (P < 0.05), by Waller-Duncan.

Table 2

Means for stocking rate (SR) and liveweight gain (LWG) per area on continuously stocked *P. maximum* cultivars and *Brachiaria* species pastures at two levels of fertilization, during the wet and dry seasons, over a period of 3 years.

	SR	LWG(kg/ha)	
Grasses	(no. steers/ha)*	Wet Season	Dry Season
Tanzânia	3.08[b]	527[a]	45[ab]
Tobiatã	3.28[a]	505[a]	21[c]
Colonião	3.27[a]	277[c]	-3[d]
B. brizantha	3.21[ab]	452[b]	37[b]
B. decumbens	1.96[c]	437[b]	52[a]

*Average number of 250 kg steer/ha

Means in the same column bearing different superscript letters are different (P < 0.05), by Waller-Duncan.