

Cycling of N and P in grass-alone (*Brachiaria*) and mixed grass/legume (*Brachiaria/Desmodium ovalifolium*) grazed pastures in the Atlantic forest region of Brazil

R.M. Boddey¹, R.M. Tarré¹, R. Macedo², C. de P. Rezende³, J.M. Pereira³, B.J.R. Alves¹ and S. Urquiaga¹

¹Embrapa Agrobiologia, C. P. 74.505, Seropédica, 23851-970, RJ, Brazil, Email: bob@cnpab.embrapa.br,

²Núcleo Centro-Oeste da Embrapa Gado de Leite, Embrapa CNPAF, C.P. 179, Goiânia, 75375-000, GO, Brazil,

³CEPLAC, Estação de Zootecnia do Extremo Sul da Bahia, BR 101, Km 754, Itabela, BA, Brazil

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Introduction There are estimated to be > 80 M ha of *Brachiaria* pastures in the tropical regions of Brazil. When continuously grazed with only modest fertiliser inputs (and no N) these pastures can maintain reasonable cattle weight gains (>200 kg LWG/ha per year). However, without fertiliser and when overgrazed, LWGs fall rapidly to low levels. Recent studies have shown that N and P deficiency are the most important factors limiting productivity. The objective of this study was to study fluxes of N and P in the pasture system in order to understand resilience to poor management and minimum nutrient requirements to guarantee their sustainability.

Materials and methods The experiment which was installed in 1987 at the CEPLAC field station in the Atlantic forest region south of Bahia (16°39'S, 39°30'W, mean annual rainfall 1,300 mm, no marked dry season, temperature 19 - 29°C). There were three stocking rates (2, 3 and 4 head/ha) for both grass-alone pastures of *B. humidicola* and a mixed sward with the forage legume *Desmodium ovalifolium* (see Rezende *et al.*, 1999). Throughout 1995, rates of deposition and disappearance (decomposition) were evaluated every 28 days as described by Rezende *et al.* (1999). All litter samples were analysed for N (semi-micro Kjeldahl), and P (colorimetry after perchloric/nitric acid digestion). Animal consumption was evaluated on two occasions (May and November) using chromic oxide as an external indicator (Raymond & Minson, 1955) and cattle fitted with oesophageal fistulae for sampling. Fistula and faecal samples were analysed for N and P as above.

Results Only the results of the highest and lowest stocking rates are shown (Table 1). In the absence of the legume the proportion of N and P consumed were 36 and 63 %, and 58 and 80 %, for the lower and higher stocking rates, respectively. With the legume in the sward these proportions were 25 and 56 %, and 49 and 72 %, respectively. The consumption of legume was highest at the highest stocking rate. Although the benefit to animal weight gain (an increase from 505 and 555 kg LWG/ha per year) was modest, N recycled though the litter pathway was increased by almost 50 %. The cattle obtained ~3 kg P/head per year from available salt licks, but even with this, apparent P utilisation rates were very high at the highest stocking rate.

Table 1 Annual fluxes of N and P through consumed and unconsumed forage of a grass-alone (*B. humidicola*) and mixed legume-grass (*B. humidicola/D. ovalifolium*) pasture in the Atlantic forest region of the south of Bahia, Brazil, grazed at two contrasting stocking rates by Zebu cattle

Sward/ Stocking Rate	Deposited Litter			Forage Consumption			Nutrient deposited in:			Exported in		
	DM Mg/ha	N kg/ha	P	DM Mg/ha	N	P	Urine N	Faeces P	N	P	LWG N	P
<i>Grass-alone</i> /SR 2	29.7	170	12.7	7.8	95.9	17.6	58.0	0.2	37.9	14.9	9.0	2.5
<i>Grass-alone</i> /SR 4	21.3	105	9.2	13.6	178.6	36.2	112.6	0.3	66.0	32.5	12.6	3.4
<i>Mixed sward</i> /SR 2	33.1	325	13.3	6.3	108.2	12.9	65.1	0.1	43.1	10.3	9.1	2.5
<i>Mixed sward</i> /SR 4	23.6	149	11.5	13.0	186.6	29.2	92.8	0.3	93.8	25.1	13.9	3.8

Conclusions While the introduction of a forage legume had little direct effect on cattle productivity, the increased deposition of N in litter in the pasture would allow higher stocking rates for longer periods without the necessity of N fertiliser. At high stocking rates consumption of P was high showing the necessity of regular P fertilisation for sustained animal production.

References

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