Water and nitrogen supply for a native tropical sward to feed grazing animals through the year

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Introduction

Environmental factors such as day length, rain and temperatures affect tropical grass growth. In this case, to feed grazing animals, appropriate management is necessary to maintain grass availability through the year, for example using water and nitrogen supply which are classical tools in intensive tropical pasture systems. In Guadeloupe (F.W.I, 16°16'N, 61°30'W) natural *Dichanthium* spp. based pastures are prevailing. To propose management rules of the pastures, an experiment was carried out to assess the effect of water and nitrogen supply on *Dichanthium* spp. production, at two periods of the year differing by day length, rainfall and temperature.

Materials and Methods

Four plots of *Dichanthium* spp cut to ground level were either considered as control (C), or irrigated in accordance with evapo-

transpiration (I), fertilised with 2.5 kg N.ha^{-1} per re-growth day (F) or both fertilised and irrigated (IF). The plots were measured from April to June (P1) and from October to December (P2) during 2 successive re-growth cycles per period. The day length, rainfall and temperatures were respectively for P1 and P2 : 13h *vs* 11h15; 76 *vs* 218 mm; 23-29 *vs* 22-28°C. In each plot, at 18 different sites were measured : the total herbage mass (t DM. ha^{-1}) by cutting the herbage (0.09 m²) at 2-3 cm with hand-held electric clippers and by drying a representative sample (80°C, 48h); the stem, leaf and debris masses (t DM. ha^{-1}), by sorting manually fresh cut herbage samples, dried afterwards; the nitrogen content of the total herbage collected by the Kjeldahl method, the neutral and acid detergent fiber (NDF and ADF) by the Van Soest method, estimated only for P1.

Results and Discussion

There is no effect of water supply on total herbage mass or morphological composition at any period (Table 1) as already shown (Cruz and Boval, 2001) for *Dichanthium* spp.

Regardless of water supply, the effect of nitrogen fertiliser (P<0.01) was seen in P1 but not in P2 (Table 1). In P1, under nitrogen fertiliser (from C and I plots to F and FI plots) leaf mass increased by 55 %. Stem mass increased to a greater extent than did leaf, by 100%, whereas the debris remained constant. The rising leaf mass contributed to the improvement of the N content, greater indeed by 28 % in F and IF plots compared to unfertilised ones. Contrary to classically admitted, the rising stem mass under fertiliser, are not indicative of the herbage quality depreciation. Elongated stems under fertiliser may be similar in digestibility than leaves (Haggar and Ahmed, 1970). Rising stem production of *Dichanthium* spp. under fertiliser was already reported, and it has been shown that it did not affect digestibility of the diet consumed at pasture by cattle (Boval *et al.*, 2001). The greater effect of nitrogen in P1, may be explained by the higher photoperiod by 1h45 in P1, compared to P2. Many tropical pasture plants are sensitive indeed to small changes in photoperiod (Humphreys, 1991) even if the average radiation is similar.

Consequently, these results suggest that appropriate rules of management for *Dichanthium* spp. based sward is (i) to limit irrigation, even if in low rainfall (ii) to add nitrogen from the end of March to the end of July, when long day induce higher nitrogen productivity. This period (March-July) could be appropriate for drying and storing the excess of grass produced, as hay. Such experiments should also be carried out in grazed pastures where the cycling of nutrients through the animal reduce the mineral fertiliser requirement of grasslands

Table 1. *Dichanthium* spp. based sward characteristics for control (C), irrigated (I), fertilised (F) and irrigated and fertilised (IF) plots, at two periods of the year.

	April-June			
	C	**I**	**F**	**IF**
Grass mass (t DM.ha^{-1})	2.22^{b}	2.26^{b}	3.41^{a}	3.48^{a}
Stem mass (t DM.ha^{-1})	0.51^{b}	0.53^{b}	1.05^{a}	1.03^{a}
Leaf mass (t DM.ha^{-1})	0.82^{c}	1.08^{b}	1.47^{a}	1.49^{a}
Debris mass (t DM.ha^{-1})	0.89^{a}	0.66^{b}	0.90^{a}	0.96^{a}
N (% DM)	1.23^{b}	1.22^{b}	1.56^{a}	1.58^{a}
NDF (% DM)	68.9^{a}	70.1^{a}	69.0^{a}	67.4^{a}
ADF (% DM)	31.6^{ab}	32.3^{a}	31.5^{b}	30.9^{b}
	October-December			
	C	**I**	**F**	**IF**
Grass mass (t DM.ha^{-1})	2.10^{b}	2.09^{b}	2.01^{b}	2.22^{b}
Stem mass (t DM.ha^{-1})	0.55^{b}	0.58^{b}	0.53^{b}	0.61^{b}
Leaf mass (t DM.ha^{-1})	0.85^{c}	0.80^{c}	1.07^{b}	1.20^{b}
Debris mass (t DM.ha^{-1})	0.62^{b}	0.67^{b}	0.41^{c}	0.38^{c}

Values with different superscripts within treatments are significantly different (P<0.05).