ID # 22-47

PRODUCTIVITY AND COMPOSITION OF TWO IMPROVED NATIVE PASTURES UNDER DIFFERENT GRAZING MANAGEMENTS IN URUGUAY

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Abstract

Two improved native pastures were established by phosphoric (P) fertilisation and oversowing of: white clover (*Trifolium repens*) mixed with birdsfoot trefoil (*Lotus corniculatus*) (TbL) and annual lotus (*Lotus subbiflorus*) (Rin). Such pastures were evaluated during 5 years with steers at two stocking rates (High and Low) and two grazing managements (Rotational and Alternate). Presence of legumes was high and botanical changes were favourable in both pastures that evidenced good persistence. Daily liveweight gains of steers and total animal production were high in both pastures, but significantly ($P \leq 0.05$) higher in TbL. No significant differences were found due to grazing management. High stocking rate resulted in superior ($P \leq 0.05$) animal production per hectare than Low. No significant interactions were detected.

Keywords: improved pastures, composition, productivity, steer performance, stocking rate.

Introduction

Medium to shallow granitic soils comprise an important proportion of the traditional cattle and sheep husbandry zones of Uruguay. Typical native pastures, dominated by C4 grasses, show a medium to low forage yield and quality. They constitute the almost exclusive nutritional resource of predominant animal production systems to which they impose a limited potential. This situation may be reverted by applying phosphorus and oversowing adapted legumes that promote favourable and sustainable changes in the vegetation, enhancing forage production and quality, with benefits to animal performance (Berretta and Risso, 1995). As it is imperative for the country to develop more dynamic pastoral grazing systems, this low cost technology provides the Uruguayan farmers a means to strengthen their forage basis. The purpose of this five years study was to evaluate productivity, composition and persistence of two improved native pastures under different grazing managements with fattening steers.

Material and Methods

The experiment was conducted along 5 years, in a farm located at 33º 33' 08'' S; 56º 58'15''W, in Uruguay. The soil was moderately shallow, acid (pH 5.2) and low in organic matter (3.2%) and P (1.8 ppm Bray 1). Prior to P fertilisation and broadcast seeding in the fall, native vegetation was preconditioned by severe alternate grazings (to diminish competition and to ensure seed – soil contact) since the end of the previous spring. Seeding rate (kg/ha) was 4 + 12 for white clover cv Zapicán and San Gabriel Lotus (TbL) as well as 5 for annual Lotus cv El Rincón (Rin). Fertilisation was of 60 kg P_2O_5/ha and a maintenance dose of 45 kg P_2O_5/ha, was applied each successive fall.

TbL and Rin pastures were grazed with steers, either rotationally (Rot) or alternately (Alt). In Rot, two basic stocking rates were imposed, high (H) and low (L), while in Alt, only (L)

was utilised. A complete randomised block design was used, in a split plots arrangement with two replicates. The SAS (1990) package was used for the statistical analysis of data, employing the GLM and LSMEANS procedures.

Hereford and Aberdeen Angus steers, in 12 homogeneous groups according to liveweight were utilised, in two basic stocking rates. Grazing began every year in mid summer, after a resting period of 40 to 50 days in each pasture, to allow for seed setting to contribute to persistence as described (Risso and Berretta, 1997). Consequent forage accumulation at initial grazing, required extra steers for about 45 days or so, resulting in an annual average stocking rate of 1.9 and 1.6 AU/ha in H and L respectively in both swards.

Steers entered annually with an average liveweight of 280 ± 45 kg to be finished by the end of the following spring (approximately 290 days) with more than 460 kg liveweight. Rot management comprised 5 paddocks, each grazed for 7 days with 28 days of resting. Instead, the Alt management comprised 2 paddocks, each grazed for 21 days and rested for an equivalent period.

Herbage mass for each treatment was estimated before and after grazing, by cutting with hand shears at soil level in 5 areas (60x40 cm) per plot. Forage was dried to constant weight at 60-70ºC in a forced-air oven. Estimation of the botanical composition was accomplished either by hand separation and gravimetric determination of each fraction (introduced legume, native grasses, weeds) or by eye estimation of soil cover by a trained person. Complementary analytical estimates of the vegetation, for a more precise characterisation of its evolution, were performed in different seasons, with the modified double meter method (Berretta, 1981).

Steers liveweight (unfasted) was recorded every 28 days, estimating daily gain and total liveweight produced/ha.

Results and Discussion

Average (of all cycles of the five years period) initial herbage mass, was reasonable in all treatments that showed no significant differences, even though there was a tendency in favour of TbL pasture over Rin (1820 vs 1690 kg DM/ha). Except for two short periods (totalling less than 3 months) in the severe winters of 1996 and 1997 when grazing was suspended, residual herbage mass after grazing in all treatments was higher than 1000 kg DM/ha. This characteristic, tended to favour pasture conditions as well as animal selectivity, intake and performance (Burns et al, 1989; Risso, 1997). Average presence of legumes for the five years period, was important in the six treatments (Figure 1).

The introduced legumes made an important contribution to the swards in both pastures, with seasonal variations associated to the different growing cycle and habit of the species used. Irrespective of grazing applied (Rot or Alt) the highest proportion of legumes occurred in TbL pasture at L stocking, mainly due to an increased presence of the erect growing birdsfoot trefoil. Instead, more prostrate annual Lotus El Rincón instead, resulted fairly stable to management. Estimated average Crude Protein content of forage in treatments TbL was higher (15%) than in Rin (13%).

Increased fertility, presence of legumes and a more adequate grazing management in relation to traditional set stocking, favoured the increase in fine native winter species like: *Stipa setígera, Piptochetium stipoides* and *Adesmia bicolor,* as well as other subspontaneous like *Lolium multiflorum*. High quality native summer grasses as *Paspalum dilatatum* and *P. notatum* also increased their frequency. Relative frequency of tender and fine species in both improvements is higher than 55%, while in the native grassland is only 30%; in this, coarse grasses and forbes are predominant (65%).

All such pasture characteristics resulted in good animal performance and productivity for all treatments and as an average of the different cycles (Figure 2).

Pasture type had a significant effect on individual animal performance and annual liveweight production per hectare. Steer daily gain in TbL (0.656 kg/day) was higher ($P \leq 0.05$) than in Rin (0.549 kg/day). In the same manner, production per ha. in TbL was superior ($P \leq 0.05$) to that in Rin. Animal production at high stocking rate (H) was significantly higher ($P \leq 0.05$) than at L, because there were no differences in daily gain and there was approximately 18% more animals in H.

Grazing management did not result in significant differences in animal performance and production, probably due to the similarity of the grazing spell (Rot: 35 vs. Alt: 42 days) at a reasonable stocking rate (L). No significant interactions were detected.

Considering the important levels of productivity of both improved pastures, it should be stressed the good sustainability evidenced involving low use of inputs.

Aknowledgement

Special thanks are due to Dr. Fabio Montossi for his comments.

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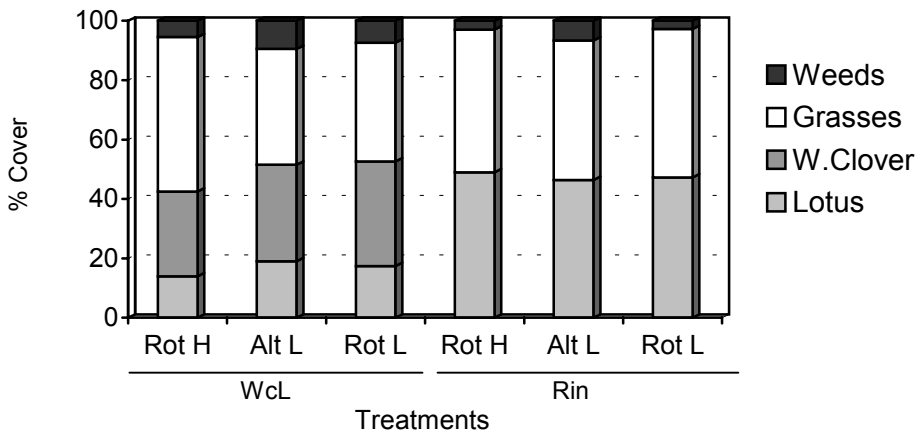

Figure 1 - Average (5 years) botanical composition of both improved pastures: white clover/birdsfoot trefoil (WcL) and annual Lotus (Rin).

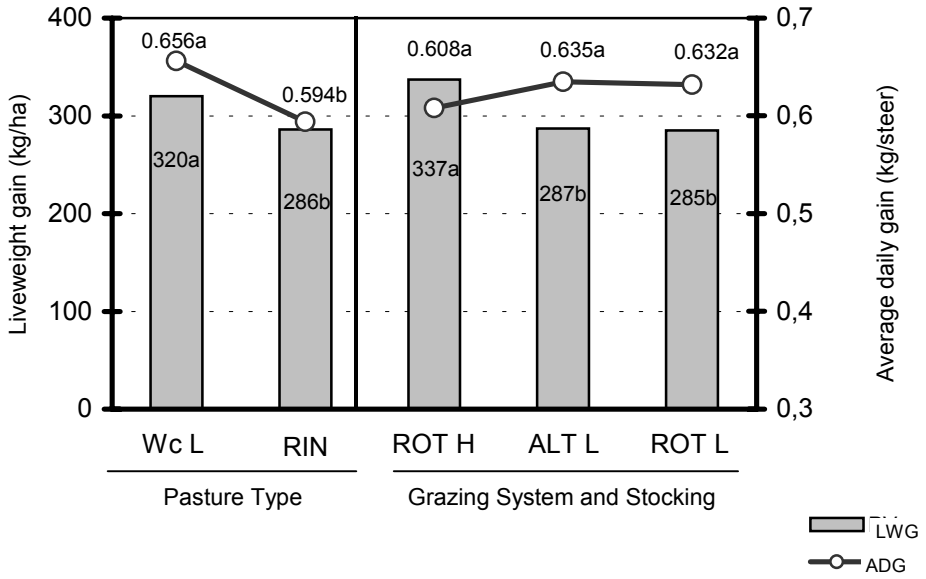

Figure 2 - Average (5 years) steer performance and annual animal output of both improved pastures: white clover/birdsfoot trefoil (WcL) and annual Lotus (Rin), under different grazing managements. (Different letters for same parameters (a, b) denotes significant difference ($P<0.05$)).