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A comparison of four land use intensities for forage production in eastern Uruguay

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Introduction

Rangelands in the eastern area of Uruguay are characterised for the limited forage availability in winter and great variability among years as a consequence of the great majority of C4 grasses in the sward. Winter production of native grasslands is not more than 10% of the total annual production which is of 3300 kg of dry matter (Carámbula et al., 1994). As beef cattle production is mainly done on grasslands base diets, animal performance during winter is dramatically low, resulting on negative effects on the animal that may affect its future performance (Scaglia, 1996). From previous experience it is known that the rotation between crops and mixed pastures (grasses and legumes) is beneficial in the maintenance or improvement of chemical and physical soil properties, decreasing hydric erosion and the increment of animal production which allows good economic results.

No-tillage has had a great impact in Uruguayan crop-cattle production systems in the last few years but less in extensive areas. This new technology may solve problems that commonly occur in the east region of Uruguay such as the high risk of soil erosion and degradation, lack of good soil conditions in winter to allow cattle grazing and high drought risk in summer (Terra, 1997).

Materials and Methods

In 1995, at Palo a Pique Experimental Unit of INIA Treinta y Tres began a long term experiment with the objective to identify land use alternatives through crops and forage rotations using no tillage technology. This will generate important information (Scaglia et al., 1997; Terra et al., 1997) for extensive production systems: sustainable in productivity and economical terms. The experiment evaluates four intensities of land use (rotation): a) Permanent oversown pasture (PP: which is a mixture of *Trifolium repens* and *Lotus corniculatus*; b) Long term rotation (LR: two years of winter and summer crops: basically oats and *Setaria italica* and four years pastures: *Trifolium repens*, *Lotus corniculatus*, *Festuca arundinacea*); c) Short term rotation (SR: two years of winter and summer crops: idem LR and two years pastures: basically *Trifolium pratense*) and d) Continuous crop (CC: winter and summer crops continuously: oats and/or wheat and *Setaria italica*, *Sorghum sudanese* and/or corn). The experimental design consists on counting with all the different alternatives in land intensity use (rotation) at the same time, without synchronous replication but with aleatorized assignation of the different experimental units at the beginning of the experiment. For long term statistical analysis, years will be considered as replications or blocks. The total area of the experiment is 72 has, and the experimental units are 6 ha paddocks, allowing direct grazing. Rotations are compared in terms of natural resources conservation, animal, forage and crop production, and economic results.

Only the experimental results in terms of animal and forage production for the period May 16 to November 23 of 1997 will be reported in this paper. In this period 95 Hereford calves (body weight 139 kg) and 109 Hereford yearlings (body weight 243 kg) were randomly assigned to each of the four intensities of land use, based on previous estimation of forage production, in order to calculate the appropriate stocking rate in each rotation.

Forage availability and refusals were obtained each time that the respective group of animals went in or out the paddock. Animals rotationally grazed the pasture assigned within the rotation and were weighed every time they entered a new pasture All inputs such as fertilisers, herbicide, gas, labour time, seeds, cattle retail price and outputs such as cattle sale price, were recorded for economical analysis.

Results and discussion

Table 1 shows the main results obtained in the considered period. Forage production was as expected, based on previous experience. SR presents the highest values due to the higher dry matter production of forage crops compared to pastures. The refusals were near the optimum recommended to allow a rapid and strong regrowth. From the animal production standpoint, all the intensities of land use allow to obtain high individual performance as well as productivity per hectare. This is more important if it is considered that for the same period, in range conditions, the animal production per hectare is 30% the one obtained in PP, which is the least.

No-tillage technology appears as an emerging technology that will permit to solve the important winter forage production deficiency. This will result in an improvement of animal performance compared with extensive animal production and will increase returns for beef cattle production systems.

	PP	CC	SR	LR
Stocking rate (AU/ha)	1.3	2.3	1.7	1.7
Instant stocking rate (AU/ha)	5.2	9.2	13.6	10.2
DM available crops (kg/ha)	--	1756	1569	1362
DM available pasture (kg/ha)	1738	--	2697	2278
DM refusals crops (kg/ha)	--	638	642	533
DM refusals pasture (kg/ha)	648	--	1046	1087
Grazing days/paddock	14	10	6	7
Calves daily gains (kg/animal)	0.54	0.60	0.75	0.58
Yearlings daily gains (kg/animal)	0.65	0.69	0.86	0.73
Beef production (kg/ha)	249	436	437	394

Table 1 Experimental results obtained during the considered period.

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