Does the intensification of grazing systems improve carcass traits of Brazilian beef?

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Abstract – This study was carried out during one growing year (12 months) to test five levels of grazing systems in carcass traits of beef (n=30): 1) EXT: extensive continuous grazing 2) CL: Integrated Crop-livestock 3) CLF: integrated crop-livestock-forestry 4) INT: intensive dryland rotational grazing 5) SP: integrated silvopastoral. Animals were slaughtered with 450 kg of minimum live body weight (BW). Data were analyzed as completely randomized block design. The animals from CL and INT systems presented greater final live BW, hot carcass weight, forequarter, hindquarter and spare ribs (*P*>0.0001), ribeye area (*P*=0.0170) and back fat (*P*=0.0035) when compared to those grazing in the EXT, CFL and SP systems. Systems CL and INT were the most efficients in this study.

Key Words – grassland; livestock; sustainable intensification;

I. INTRODUCTION

To reduce the pressure on forests in Brazil, it is essential that farmers be provided with sustainable options of intensification of pasture growth and cattle production. Integrated livestock production systems are those in which pastures, crops and trees are, alternately or simultaneously cultivated in the same area. Integrated silvopastoral, crop-livestock and crop-livestock-forestry systems aim at higher levels of productivity as well as environmental, social and economic sustainability (Vilela *et al.*, 1). The improvement of the whole-farm beef production system through grassland intensification is essential to reduce emissions from all relevant sources, like land use, land use change and livestock (Bowman *et al.*, 2). The objective of this study was to test the carcass traits of different intensification scenario in Brazil beef production.

II. MATERIALS AND METHODS

A total of 30 Canchim steers (243.6 ± 11.1 kg of live body weight (BW); 15 months old) were allotted to five grazing systems with two replicates each (blocks) during one growing year: 1)Extensive (EXT) - continuous grazing system; 2) Integrated Crop-livestock System (CL) - rotational grazing system with crop rotation in each paddock in four year cycles (three years with pasture and one year with corn); 3) Integrated Crop-livestock-forestry System (CLF) - the same as CL with eucalyptus trees (15 x 2 m spacing); 4) Intensive (INT) - dryland rotational grazing system; 5) Integrated Silvopastoral System (SP) - rotational grazing with eucalyptus trees (15 x 2 m spacing). Pastures in INT, SP, CL and CLF were established in 2012 with *Urochloa* (sin. *Brachiaria*) *brizantha* (Hochst ex A. Rich.) Stapf cv. Piatã and were fertilized with 50 kg of N ha^{-1} via urea, in each grazing cycle during the rainy season, amounting to 200 kg N ha^{-1} $year^{-1}$. Each of these systems had two replicate pasture areas, of 3 ha each, divided in six paddocks in a rotational system with six days of occupation and 30 days rest. The pasture in EXT was established in 2007 with *Urochloa* (sin. *Brachiaria*) *decumbens* (Stapf) R. Webster and was not fertilized. The EXT system had two pasture areas of 2.85 ha each managed under continuous grazing. The stocking rate was adjusted in all pastures using the "put and take" technique (Mott and Lucas, 3) and visual evaluation of forage availability. Animals were slaughtered with 450 kg of minimum live BW in a commercial slaughterhouse, according to Brazilian guidelines. Data were analyzed as completely randomized block design using PROC MIXED.

III. RESULTS AND DISCUSSION

As expected, the initial live BW of the steers of all grazing systems were similar (Table 1). The final live BW, hot carcass weight, forequarter, hindquarter and spare ribs were greater (P<0.0001) for the animals grazing in CL and INT when compared to those grazing in the EXT, CFL and SP systems. Animals in all systems presented similar dress %.

The ribeye area (REA) is positively correlated to the total amount of muscle in the carcass. Therefore, animals in the CL and INT systems, which presented a greater forequarter, hindquarter and spare ribs in the carcass, also presented (*P*=0.0170) greater REA. As in the other variables tested, animals from CL and INT presented greater back fat (*P*=0.0035) when compared to the others. Only animals from CL presented 3.3 mm of back fat, which are the minimum value of Brazilian market requirements for carcass fat thickness. Possibly the one year corn crop before pasture establishment in CL and the nitrogen fertilization throughout the year in INT system produced better quality and quantity forage meeting the requirements for better muscle development observed in this study. Although, the same intensification level as one year corn crop before pasture establishment in CLF and nitrogen fertilization in SP, the steers muscle development was lower when compared to CL and INT treatments. Possibly, the trees density (15 x 2 m spacing or 333 ha^{-1}) of both systems (CLF and SP) induced greater shading than expected, hindering the potential development of pasture or crop. With the intensification of the pastures systems in Brazilian Atlantic Forest Biome is possible have a large increase in animal carcass traits in the grasslands, saving land and keeping the legal reserve and permanent preservation area, which is 20% for this Biome according to the Lei nº 12.651 of the new Forest Code, (Brasil, 4). However, more studies with trees density in Agroecosystems is necessary.

Table 1. Live body weight and carcass traits of Nelore steers finished on different grazing systems in Brazil during one growing year.

Item*	**EXT†**	**CL†**	**CLF†**	**INT†**	**SP†**	**SEM**	***P* level**
Initial live BW, kg	241.7	236.8	248.5	239.8	251.3	11.07	0.8748
Final live BW, kg	454.8^{b}	536.0^{a}	464.3^{b}	500.6^{a}	431.3^{b}	15.78	<.0001
Hot carcass weight, kg	225.3^{b}	272.7^{a}	224.2^{b}	257.4^{a}	208.6^{b}	9.66	<.0001
Forequarter, kg	85.6^{b}	101.8^{a}	83.7^{b}	95.7^{a}	75.9^{b}	3.69	<.0001
Hindquarter, kg	110.6^{b}	133.1^{a}	110.7^{b}	126.8^{a}	105.1^{b}	5.04	<.0001
Spare Ribs, kg	24.9^{b}	32.2^{a}	24.5^{b}	29.6^{a}	23.1^{b}	1.17	<.0001
Dress, %	63.3	51.3	48.0	51.6	48.1	4.44	0.0934
Back fat, mm	1.2^{b}	3.3^{a}	0.7^{b}	2.6^{a}	1.2^{b}	0.47	0.0035
REA, cm^2	62.0^{b}	70.5^{a}	64.9^{b}	75.4^{a}	64.8^{b}	3.75	0.0170

^{a,b} Means with unlike letters within a row differ at P≤0.05; SEM = standard error of the mean.
†EXT: extensive continuous grazing system; CL: Integrated Crop-livestock System; CLF: integrated crop-livestock-forestry system; INT: intensive dryland rotational grazing system; SP: integrated silvopastoral system.
*BW: body weight; REA: ribeye area;

IV. CONCLUSION

The Integrated Crop-livestock (CL) and Intensive (INT) systems produced greater carcass, reflecting the most efficient systems in this study.

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