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Beef cattle production in Brazilian integrated systems

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Introduction

In Brazil integrated crop-livestock-forestry (ICLF) systems cover 11.5 million hectares, and are a model for sustainable crop, trees, and animal production.

Despite their relevance, a systematic evaluation of the effects of this association is being carried out.

Objective

Evaluate the effects of tree density on the forage and productive performance of Nellore cattle within ICLF systems in the Brazilian Cerrado

Materials & Methods

Three systems were evaluated (figure 1):

Figure 1. A – ICLF14 system with 357 *Eucalyptus urograndis* trees/ha, implanted in a 14x2 m-grid, *Glycine max* soybean as crop, *Brachiaria brizantha* cv. BRS Piatã as forage grass, and Nellore heifers as livestock component. **B** – ICLF22 system with 227 *Eucalyptus urograndis* trees/ha, implanted in a 22x2 m-grid, *Glycine max* soybean as crop, *Brachiaria brizantha* cv. BRS Piatã as forage grass, and Nellore heifers as livestock component. **C** – Integrated crop-livestock system (ICL) without trees with *Glycine max* soybean as crop, *Brachiaria brizantha* cv. BRS Piatã as forage, and Nellore heifers as livestock component.

The systems were evaluated in four seasons, i.e. winter, spring, summer, and autumn.

Forty-eight heifers (initial liveweight of 290 kg) randomly allocated to the systems.

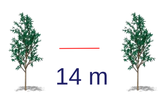
Forage biomass (kg dry matter, DM/ha) was harvested within a metallic square of 1.0 x 1.0 m area, and its crude protein (g/kg DM) analyzed by NIRS.

The experiment lasted between June 2015 and May 2016 with randomized in four blocks, in split-block design, with four replicates.

System and season were the main factors, and the means were compared by analysis of variance (PROC GLM, SAS, 5 % probability level, Tukey test).

Results

Table 1: Stocking rate, daily liveweight gain and liveweight gain per area of the integrated systems in different seasons.

	ICLF14 (357 trees/ha) 	ICLF22 (227 trees/ha) 	ICL	P-value	
				System	System x Season
Stocking rate (animal unit, AU[1]/ha)					
Winter	0.0^{b}	0.7^{ab}	1.3^{a}		
Spring	0.0^{b}	0.0^{b}	1.1^{a}		
Summer	1.5^{b}	2.4^{ab}	2.6^{a}	<0.01	0.09
Autumn	0.9^{b}	1.2^{b}	2.6^{a}		
Liveweight gain (kg/animal/day)					
Winter	-	0.058^{Ba}	0.160^{Ba}		
Spring	-	-	0.525^{A}		
Summer	0.648^{Aa}	0.783^{Aa}	0.588^{Aa}	<0.01	<0.01
Autumn	0.435^{Aa}	0.238^{Ba}	0.373^{ABa}		
Liveweight gain per area (kg/ha)					
Winter	0^{Ba}	6^{Ba}	26^{Ba}		
Spring	0^{Bb}	0^{Bb}	54^{Ba}		
Summer	93^{Ab}	186^{Aa}	169^{Aa}	<0.01	<0.01
Autumn	25^{Bb}	39^{Bb}	136^{Aa}		

[1]AU = 450 kg liveweight.
Number of observations for Stocking rate and Liveweight gain per area; 48, and for Liveweight gain; 36.
Means followed by the same letter, uppercase within the columns and lowercase within rows do not differ by Tukey test at 5% probability

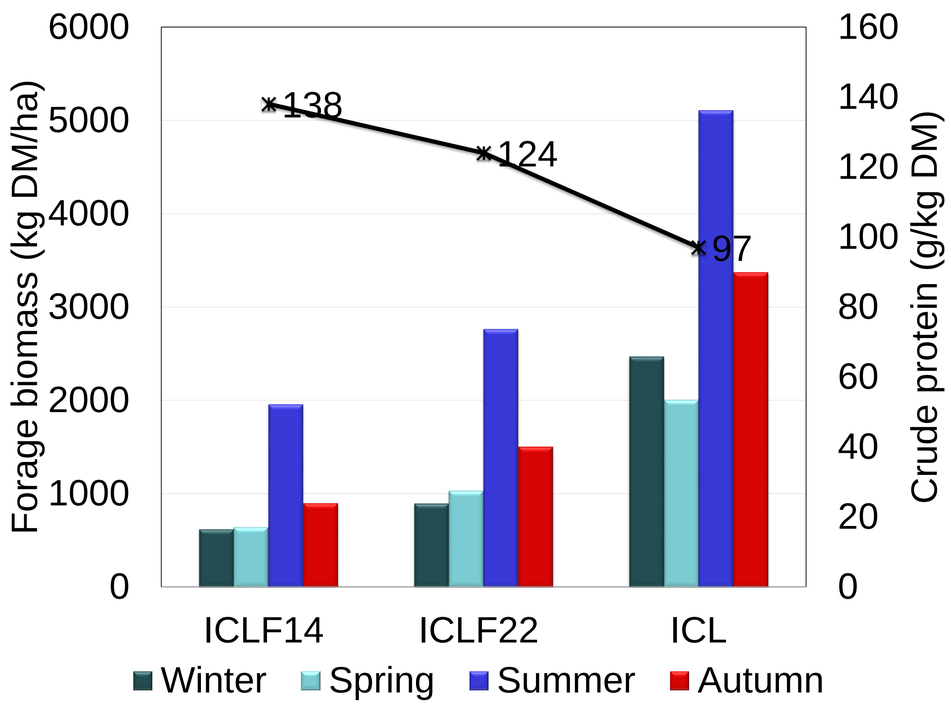


Figure 2: Forage biomass and crude protein of the integrated systems.

Conclusions

Although the rise of tree density decreases the liveweight gain per area, the crude protein of tropical grass increases, and liveweight gain per animal does not differ among the systems.

The overall benefits for farmers should also consider environmental and economics aspects from trees, which were not evaluated in this study.

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