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"Global food security and food safety:
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Beef Cattle Production in Brazilian Integrated Systems

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Abstract

In Brazil, an estimated 11.5 million hectares are used for integrated systems, as crop-livestock (ICL), crop-forestry (ICF), livestock-forestry (ILF), or crop-livestock-forestry (ICLF). Even though the inclusion of trees in crop-livestock systems has been done for many years, a systematic evaluation of the effects of this association is still to be made. Therefore, we evaluated the effect of tree density on the productive performance of Nellore heifers in ICLF in the Brazilian Cerrado compared with conditions where no trees are included. Three systems, implemented in 2008, were evaluated, an ICL system and two ICLF systems, both with *Eucalyptus urograndis* trees (ca. 25m height) planted in single rows with 2 m between trees within rows and 14 m (ICLF14) or 22 m (ICLF22) between rows. The experiment lasted between June 2015 and May 2016 with randomized blocks, in split-block, with four replicates. The grass was *Brachiaria brizantha* cv. BRS Piatã and continuously grazed with variable stocking densities. A total of 48 heifers, 290 kg of initial liveweight, were randomly allocated in the systems, they were weighed monthly following 16 hours of fasting. The results were grouped per season (i.e., winter, spring, summer, autumn), and subjected to analyses of variance and Tukey tests at 5 % probability level. Annual stocking rate was higher ($P < 0.05$) in ICL (1.9 animal units (AU) ha^{-1}; AU=450 kg liveweight) compared to ICLF22 (1.1 AU ha^{-1}) and ICLF14 (0.7 AU ha^{-1}). Because of a lack of forage due to the high shading imposed by the trees, all animals in ICLF22 had to be removed in spring, whereas for ICLF14 all animals were removed both in spring and winter. Daily liveweight gain of individual animals did not differ between systems ($P > 0.05$), averaging 0.673 g d^{-1} in summer, 0.349 g d^{-1} in autumn, 0.109 g d^{-1} in winter, and 0.525 g d^{-1} in spring. However, due to the higher stocking rate, ICL allowed for highest ($P < 0.05$) annual liveweight gain per unit of land area (376 kg ha^{-1}) followed by ICLF22 (229 kg ha^{-1}) and ICLF14 (119 kg ha^{-1}). The ICLF systems have lowest animal output per area; however, the overall benefits for farmers should also be considered income from the sale of trees.

Keywords: Animal production, eucalyptus, Nellore, silvopastoral, tropical grass

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