

Emissions and carbon sequestration in silvopastoral cattle systems

Roberto Giolo de Almeida¹, Emizael M. Almeida², Rodrigo da Costa Gomes³, Fabiana Villa Alves³, Valdemir Antônio Laura¹, Vanderley Porfirio-da-Silva⁴, Genilson F. Costa⁵ and Davi José Bungenstab⁶

¹Agronomist, D.Sc., Researcher, Embrapa Beef Cattle, Campo Grande-MS

²Animal Scientist, M.Sc., Doctorate student in Animal Science, UFMS, Campo Grande-MS

³Animal Scientist, D.Sc., Researcher, Embrapa Beef Cattle, Campo Grande-MS

⁴Agronomist, D.Sc., Researcher, Embrapa Forestry

⁵Animal Scientist, Master student in Animal Science, UEMS, Aquidauana-MS

⁶DVM, D.Sc. Researcher, Embrapa Beef Cattle, Campo Grande-MS.

Goal was to evaluate enteric methane emissions and carbon sequestration under silvopastoral systems (SP), compared to monoculture sown pastures (PM) aiming enhanced sustainability. The trial was established in December 2015 at a Quatzarenic Neossol in the Savanna biome, Brazil, using *Urochloa brizantha* cv. BRS Piatã and *Eucalyptus urograndis* (clone I144). Evaluations took place in 2017-2018. Nellore steers grazed for 463 days (growing and finishing), following the Carbon Neutral Brazilian Beef (CNBB) protocol. Experimental design was random blocks with five treatments (PM, SP with 178, 238, 357 and 441 trees/ha) and two replicates. Growing animals were fed protein-energy supplement at 0.2% live weight (LW) raised to 1.2% LW for finishing. Dry matter intake (DMI), was predicted through the equation: $DMI \text{ (kg/day)} = -1.912 + 0.900 \times DMI_s + 0.094 \times LW^{0.75} + 1.070 \times ADG - 1.395 \times ADG^2$. Where: DMI_s = supplement intake (kg/day), LW (kg), ADG = average daily weight gain (kg/day). Enteric methane (CH₄) emission was calculated through: $CH_4 \text{ (kg/day)} = -0.1011 + 0.02062 \times DMI + 0.001648 \times NDF$. Where: NDF = neutral detergent fiber (%). There was effect of system for CO₂eq emissions (kg/ha), associated to stocking rates (animal-unit, AU/ha). PM showed highest values (3,357 and 1.86), followed by SP-357 (2,784 and 1.55) and SP-178 (2,561 and 1.42). Lowest values were found in SP-238 and SSP-441, with average 2,288 and 1.27. CO₂eq sequestration by trees (in the trunk) for SP-441, SP-178, SP-238 and SP-357 was: 13.9, 18.8, 32.5, and 28.5 ton/ha, respectively. CO₂eq balance for SP systems was positive. However, when estimating timber-based sequestration, only SP-238 and SP-357 are able to neutralize all CO₂eq generated by livestock for CNBB production.

Index Terms: Carbon Neutral Brazilian Beef, eucalyptus, stocking rate, timber.