

Assessment Environmental and Economic of Yerba Mate as a Feed Additive on Feedlot Lamb

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Abstract : Meat production is a significant sector for Brazil's economy; however, the agricultural segment has suffered censure regarding the negative impacts on the environment, which consequently results in climate change. Therefore, it is essential the implementation of nutritional strategies that can improve the environmental performance of livestock. This research aimed to estimate the environmental impact and profitability of the use of yerba mate extract (*Ilex paraguariensis*) as an additive in the feeding of feedlot lamb. Thirty-six castrated male lambs (average weight of 23.90 ± 3.67 kg and average age of 75 days) were randomly assigned to four experimental diets with different levels of inclusion of yerba mate extract (0, 1, 2, and 4 %) based on dry matter. The animals were confined for fifty-three days and fed with 60:40 corn silage to concentrate ratio. As an indicator of environmental impact, the carbon footprint (CF) was measured as kg of CO₂ equivalent (CO₂-eq) per kg of body weight produced (BWP). The greenhouse gas (GHG) emissions such as methane (CH₄) generated from enteric fermentation, were calculated using the sulfur hexafluoride gas tracer (SF₆) technique; while the CH₄, nitrous oxide (N₂O - emissions generated by feces and urine), and carbon dioxide (CO₂ - emissions generated by concentrate and silage processing) were estimated using the Intergovernmental Panel on Climate Change (IPCC) methodology. To estimate profitability, the gross margin was used, which is the total revenue minus the total cost; the latter is composed of the purchase of animals and food. The boundaries of this study considered only the lamb fattening system. The enteric CH₄ emission from the lamb was the largest source of on-farm GHG emissions (47%-50%), followed by CH₄ and N₂O emissions from manure (10%-20%) and CO₂ emission from the concentrate, silage, and fossil energy (17%-5%). The treatment that generated the least environmental impact was the group with 4% of yerba mate extract (YME), which showed a 3% reduction in total GHG emissions in relation to the control (1462.5 and 1505.5 kg CO₂-eq, respectively). However, the scenario with 1% YME showed an increase in emissions of 7% compared to the control group. In relation to CF, the treatment with 4% YME had the lowest value (4.1 kg CO₂-eq/kg LW) compared with the other groups. Nevertheless, although the 4% YME inclusion scenario showed the lowest CF, the gross margin decreased by 36% compared to the control group (0% YME), due to the cost of YME as a food additive. The results showed that the extract has the potential for use in reducing GHG. However, the cost of implementing this input as a mitigation strategy increased the production cost. Therefore, it is important to develop political strategies that help reduce the acquisition costs of input that contribute to the search for the environmental and economic benefit of the livestock sector.

Keywords : meat production, natural additives, profitability, sheep

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