Assessment of the Impact of Herbage Allowance in Pampa Biome Pastures on Methane Emissions

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The pastural system predominates in the Pampa biome for cattle production, influencing both plant and animal productivity, as well as methane (CH_4) emissions. We assessed contrasting forage management strategies in native grasslands by adjusting stocking rates according to pasture growth to evaluate their effects on productivity and the environment across various scenarios. The experiment was carried out at the experimental station of the Federal University of Rio Grande do Sul. The treatments were allocated across 10 experimental units randomized into two blocks receiving five different forage allowances managed under continuous stocking. Forage allowances were determined relating the existing biomass of the pasture to the live weight (LW) of the animals. Treatments were 4, 8, 8-12, 12 and 16 kg of dry matter (DM) per each 100 kg LW day^{-1} (or % LW). The 8-12% treatment had a variable forage allowance of 8% in spring and 12% in summer. The forage allowance was targeted by changes in the stocking rate using put-and-take animals in addition to the three tester animals in each paddock. Animal performance and CH_4 emissions were assessed only on tester animals. Methane emissions were measured four times per year on two different sets of individual animals. Daily CH_4 emissions (g $animal^{-1}$) were measured using the sulfur hexafluoride (SF_6) tracer technique. Methane emissions per animal under forage allowances of 8-12, 12 and 16% of LW remained relatively constant at around 150 g day^{-1}, with a decrease to 118 and 107 g day^{-1} under forage allowance of 8% and 4%, respectively. Meanwhile, emissions intensity per unit of LW gain and unit area were driven by changes in animal productivity and decreased with increasing forage allowance. Animals subjected to 4% emitted 1.82 kg CH_4 kg^{-1} LW, whereas those under 8-12% emitted 0.76 kg CH_4 kg^{-1} LW, indicating a 41.75% reduction in CH_4 emission intensity per unit of weight gain. Managing forage allowance has proven to be an effective strategy in reducing CH_4 emissions, thereby improving animal production and mitigating environmental impact in the Pampa biome.

Keywords: load adjustment, grazing, greenhouse gases, climate change, livestock, sustainability.