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Dynamics of methane and nitrous oxide emissions in lowland production systems.

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The main greenhouse gases (GHG) associated with agricultural activity are methane (CH₄) and nitrous oxide (N₂O), providing significant emissions when expressed in carbon dioxide (CO₂) equivalent, as they have the capacity to absorb infrared radiation 25 and 298 fold higher than CO₂, respectively. The objective of this work was to evaluate CH₄ and N₂O emissions in representative production systems of the Rio Grande do Sul lowlands. The study was developed at an Embrapa Temperate Agriculture experimental area, in Capão do Leão, State of Rio Grande do Sul, Brazil, during 2016/2017 summer season. Three production systems (native pasture with extensive livestock, irrigated rice/fallow and soybean/corn rotation under no-tillage system - cultivating corn during the evaluation period) and a natural area, used as a reference. Gas collection was performed using closed static chambers with three replicates per treatment. The fluxes and total emissions of CH₄ and N₂O were determined. Significant CH₄ emissions were found only in irrigated rice system; the maximum CH₄ emission peak occurred on the 60th day after sowing (2,048.04 g CH₄ ha⁻¹ h⁻¹), being attributed to the anaerobic condition promoted by flooded soil. On the other hand, higher N₂O emissions were observed in the soybean/corn rotation system, which presented high magnitude peaks at the 19th, 40th and 63rd day after sowing, corresponding to 800.08; 11,980.5 and 25,832.7 mg N₂O ha⁻¹ h⁻¹, that were associated to topdressing nitrogen fertilization and to the variation in the conditions of soil oxidation, conditioning nitrification and denitrification processes, promoted by rainfall events. The irrigated rice system provided higher total CH₄ emission (803.83 kg ha⁻¹), followed by soybean/corn rotation (4.35 kg ha⁻¹), native pasture (0.97 kg ha⁻¹) and the natural area (0.82 kg ha⁻¹); while the highest total N₂O emission was determined for the soybean/corn rotation (10.92 kg ha⁻¹). The emission of methane and nitrous oxide from the lowland production systems is greater than in the natural area.

Keywords: greenhouse gas; irrigated rice; crop rotation; grassland.

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