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Nitrous oxide emissions of production systems in lowlands of Rio Grande do Sul

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The lowlands of Rio Grande do Sul, Brazil, are mainly used for irrigated rice cultivation, being an important source of methane (CH_4) to the atmosphere, due to the establishment of anaerobic environment by flood irrigation of the soil. However, nitrous oxide (N_2O) emissions may also be relevant, especially for production systems involving crop rotations or grazing crop, that require the application of high amounts of nitrogen fertilizers. The objective of this work was to evaluate N_2O emissions in representative production systems of the Rio Grande do Sul lowlands and in a natural area. The study was conducted in a Planossolo (Typic Albaqualf) in Capão do Leão, State of Rio Grande do Sul, Brazil. N_2O emissions evaluations were performed from June 2015 to May 2016. Three production systems (irrigated rice/fallow, soybean/ryegrass/corn and improved pasture) and a natural area were evaluated. In each area, three greenhouse gas collectors systems (closed static chamber) were distributed, constituting the replications of the treatments. N_2O fluxes and N_2O total emissions were measured seasonally (fall/winter period - 2015 and spring/summer period 2015/2016 (summer season)) and throughout the year. During fall/winter period, N_2O emissions were generally low, except for improved pasture system, which presented several high emission peaks associated with the application of nitrogen fertilizer and the deposition of feces and urine of grazing animals. The natural area provided small N_2O absorption in both periods (fall/winter: -0.04 kg N_2O ha^{-1} and summer season: -0.29 kg N_2O ha^{-1}). During the summer season, N_2O emissions were higher than in fall/winter period for all production systems, decreasing from improved pasture (22.8 kg N_2O ha^{-1}) > soybean/ryegrass/corn (10.8 kg N_2O ha^{-1}) > irrigated rice/fallow (2.5 kg N_2O ha^{-1}). The sum of emissions from fall/winter period and summer season shows that the soybean/ryegrass/corn and improved pasture systems provide greater annual emission of N_2O than irrigated rice/fallow system and natural area. Thus, the irrigated rice/fallow system, contrary to CH_4, presents low N_2O emission potential. On the other hand, production systems involving rainfed and pasture crops increase the emission of N_2O.

Keywords: Greenhouse gas; Mitigation; Flooded rice; Crop rotation; Pasture

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