

I SEMINAR ON NATURE BASED SOLUTIONS IN AGRICULTURE AND FORESTRY:

Strategies for Carbon Capture and Reduction
of GHG Emissions in Brazil



September 4th and 5th, 2023



Research Centre for
Greenhouse Gas Innovation



PROGRAMME AND BOOK OF ABSTRACTS

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N₂O EMISSION FACTORS FOR NITROGEN FERTILIZERS AND ANIMAL EXCRETA IN PASTURES: A META-ANALYSIS FOR BRAZIL.

Lucas Ferreira PENTEADO¹; Sandra Furlan NOGUEIRA²; Cristiano Alberto de ANDRADE^{2,3}; Nilza Patrícia RAMOS²; Ricardo Antônio Almeida PAZIANOTTO⁴; Danilo Trovo GAROFALO⁵

¹ Agronomist engineer, PhD Student in Management of Agro-environmental Resources at the Agronomic Institute (IAC), e-mail: lucaspenteado@hotmail.com; ²Researcher in Embrapa Environment; ³Professor at the Department of Agro-environmental Resources Management at the Agronomic Institute (IAC).⁴Analyst at Embrapa Environment; ⁵Agroicone Researcher.

Keywords: Greenhouse gases (GHG); Livestock; Mitigation.

Impact: Improve and customize information on national, regional, and sectoral GHG emissions from agriculture and livestock, based on information already available.

Highlights: Default values of N₂O emissions can generate misleading information for inventories. Different nitrogen sources and environmental conditions provide particular N₂O EFs. Knowledge of N₂O EF will support future agricultural strategies.

Abstract: Between 1985 and 2020, Brazil increased its pasture area by 38%, from 111 to 154 million hectares. In turn, N₂O emissions from the agricultural-livestock sector in 2016 accounted for 87% of the total emissions of this gas in the country. The determination of N₂O EF in national inventories is carried out using the values recommended by the IPCC, but there are limitations, since a default N₂O EF is used for diverse nitrogen fertilizers, in different situations of livestock practices and edaphoclimatic conditions. This standardization of the EF, mainly for a country like Brazil with continental dimensions and with great edaphoclimatic diversity, can lead to future mistakes in the dimensioning of the N₂O emissions caused by national livestock. Therefore, this review and meta-analysis study aimed to propose consistent and reliable N₂O EFs for each type of nitrogen fertilizer and animal excreta in pastures in Brazil. The selection of studies was carried out through a systematic review by consulting the databases of online scientific articles: Web of Science, Scopus, and Scielo from December 2018 to August 2022. The queries used the search syntaxes: “Brazil” and “nitrous oxide emission” and “emission factor” and “pasture”, “pasturelands”, “grasslands”, “livestock”, and 20 articles were considered suitable for analysis, which had information about the EFs or experimental conditions that allowed the calculations of the EFs. The meta-analysis was performed using the methodology without weighting for variance, where the means and 95% confidence intervals

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for the EF were estimated using the bootstrap non-parametric resampling method. The mineral fertilizers evaluated in the studies were urea, ammonium nitrate, and ammonium sulfate presented EFs and confidence intervals (%) of 0.57 [0.46-0.68]; 1.16 [0.51-1.81] and 0.28 [0.13-0.43], respectively. As for animal excreta, results were found regarding feces, urine, and feces plus urine of 0.14 [0.12-0.16]; 0.75 [0.63-0.87]; 0.59 [0.34-0.84], respectively. The average value found for EFs from mineral fertilizers was 0.69 and from animal excreta was 0.48 compared to the default value of 1% by the IPCC. It is concluded that the values offered by the IPCC in relation to the N₂O EF would overestimate the real values found in Brazilian pastures.