

Impacts of nitrogen fertilizer, greenhouse, and crop species on yield-scaled nitrous oxide emission from corn and soyabean agri-fields: A meta-analysis

A systematic understanding of nitrous oxide (N_2O) emission from maize and soyabean field is still lacking. The primary aim of this study was to quantify the N_2O emissions and grain yield, as well as their responses to mitigation strategies, in intensively managed agroecosystems. We examined the impacts of soil amendment and fertilizer application on N_2O emissions based on 74 peer-reviewed papers. Synthetic fertilizers as well as organic amendments (animal manure, straw and biochar) were considered as well as soil texture and structure, soil physical and chemical properties (soil organic carbon, soil pH, bulk density, total nitrogen), and climate variable. Preliminary results showed that soil pH played a crucial role in regulating the N_2O emissions after application of soil amendments. The C:N ratios of manure, straw, biochar also significantly affected soil N_2O emission. In addition, the reduced N fertilizers, water-saving irrigation, reduced or no tillage, and applying enhanced efficiency fertilizers significantly decreased soil N_2O emissions. The effects of soil physical and chemical characteristics, management practices and nutrient amendment as well as climatic condition on soil N_2O emission at various agro-climatic zones across the world will be further investigated. This meta-analysis improved our understanding of fertilizer-derived N_2O emissions, helped address disparities in the global N_2O budget, and refined the accuracy of N_2O mitigation protocols. This study was supported by the USDA and NSF projects.