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4. Soil health in achieving the Sustainable Development Goals
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CROP RESIDUE MANAGEMENT IMPACT ON N2O EMISSIONS: RESULTS FROM 10-YEARS-8-CROPPING-SYSTEMS FIELD EXPERIMENT

P. BELLEVILLE [1], F. KEUPER [1], F. FERCHAUD [1,2], B. MARY [1], B. HEINESCH [1,3], B. DUMONT [1,4], J. LEONARD [1]

[1] BioEcoAgro Joint Research Unit, INRAE, Liège University, Lille University, Picardie Jules Verne University, Barenton-Bugny, FRANCE
[2] UMR Eco&Sols, Montpellier University, CIRAD, INRAE, IRD, InstitutAgro Montpellier, Montpellier, FRANCE
[3] Biosystems Dynamics and Exchanges (BIODYNE), Liège University, Gembloux Agro-Bio Tech, AgroBioChem/TERRA, Gembloux, BELGIUM
[4] Crop Science Unit, Liège University, Gembloux Agro-Bio Tech, AgroBioChem/TERRA, Gembloux, BELGIUM

Nitrous oxide (N2O) is one of the main problematic greenhouse gases (GHG). Between 2007 and 2016, 43% of the global N2O emissions were anthropogenic and half came from agriculture. Complex redox systems and multiple drivers effects challenge predicting N2O emissions. For example, crop residue removal has been shown to have either positive, negative or neutral effects on N2O emissions. Although meta-analysis show sthat crop residue return tends to increases N2O emissions in temperate climates, they also indicate that this trend is dependent on soil properties or other management practices. Regarding how crop residue influence N2O emissions, recent studies stress the major influence of residue quality. Despite numerous existing work, how crop residue globally influence cumulatived emissions, with a GHG perspective remains difficult to evaluate due to the short duration of most studies. We hypothesized that using the whole time scale of a long term experiment covering a wide range of practices would allow to unravel the relative weight of crop residue management on N2O emissions. We compiled 1-site-10-years-8-cropping-systems experimental data and defined joint restitution cycles (109 days to 646 days) for which both cumulative emissions and key driving variables, including measures of crop residue return and quality, were defined. The analysis of the 158 restitution cycles indicated that nitrogen fertilizer rate and length of the period were the main variables explaining N2O emissions while the C:N ratio of residue was the main driver of crop residue infuence, although that influence remains limited. The weight of crop residue influence was inversely proportional to the period length, supporting the importance of considering the timescale of measurements to evaluate how crop residue influence GHG emissions.

Keywords: climate change,crop residue,cropping system,nitrous oxide,machine learning