

Increasing soil pH reduces fertilizer-derived nitrous oxide emissions

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Experimental plots with greenhouse gas measurement chambers in Teagasc Johnstown Castle Research Centre. Credit: Teagasc

A new scientific paper from Teagasc has shown that getting soil pH right through a liming program can significantly reduce emissions of nitrous oxide (N_2O), a potent greenhouse gas. The paper from researchers at the Teagasc Environment, Soils and Land-Use Department in Johnstown Castle, County Wexford has just been published in the scientific journal

Agriculture, Ecosystems and Environment (AGEE). It concludes that increasing soil pH reduces fertilizer derived N₂O emissions in intensively managed temperate grassland.

Head of the Teagasc Environment Research Department, Dr. Karl Richards said: "The paper shows that there are reduced N₂O emissions from fertilizer applied to higher pH soils, where the pH is in the recommended agronomic range. Farmers that can improve soil pH for agronomic benefits, can also reduce N₂O emissions. This represents a win-win for the farmer and the environment."

Soil pH is generally considered a master variable, controlling a wide range of physical, chemical and biological properties, including a significant effect on microbial processes responsible for production and consumption of N₂O. Senior Research officer at Johnstown Castle, Dr. David Wall stated that "using an existing long-term intensive [grassland](#) liming and P trial, this research investigated the effect of longer-term lime and P management and their interaction on N₂O emissions and grassland productivity.

Postdoc Researcher with Teagasc, Ognjen (Oggy) Zurovec outlined the main findings: "We found that a long-term increase in soil pH as a result of liming significantly decreased N₂O emissions over 12-month measurement period. In addition, keeping the soil pH and P at the optimum level has the potential to further reduce N₂O emissions due to higher grass N uptake through increased yields. This means that the application of good farming practices has considerable N₂O mitigation potential in temperate grasslands."

The results showed that applying 5 tons of lime per hectare every three to four years increased soil pH from 5.1 to 6.9 and reduced N₂O emissions by 39%. The study estimated that the increase in [soil](#) pH of grasslands in Ireland over the last 12 years potentially reduced national

N₂O emissions by 95,000 T CO₂-eq yr⁻¹, with potential for a further reduction by up to 254,000 T CO₂-eq yr⁻¹ if all the remaining acidic soils are brought up to optimal pH.

More information: Ognjen Žurovec et al. Increasing soil pH reduces fertiliser derived N₂O emissions in intensively managed temperate grassland, *Agriculture, Ecosystems & Environment* (2021). [DOI: 10.1016/j.agee.2021.107319](https://doi.org/10.1016/j.agee.2021.107319)

Provided by Teagasc

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