

# Increasing soil pH reduces fertilizer-derived nitrous oxide emissions

29 January 2021



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<sub>2</sub>O), 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 N<sub>2</sub>O emissions in intensively managed temperate grassland.

Head of the Teagasc Environment Research Department, Dr. Karl Richards said: "The paper shows that there are reduced N<sub>2</sub>O 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 N<sub>2</sub>O 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 N<sub>2</sub>O. 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 N<sub>2</sub>O 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 N<sub>2</sub>O emissions over 12-month measurement period. In addition, keeping the soil pH and P at the optimum level has the potential to further reduce N<sub>2</sub>O emissions due to higher grass N uptake through increased yields. This means that the application of good farming practices has considerable N<sub>2</sub>O 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 N<sub>2</sub>O emissions by 39%. The study estimated that the increase in [soil](#) pH of grasslands in Ireland over the last 12 years potentially reduced national N<sub>2</sub>O emissions by 95,000 T CO<sub>2</sub>-eq yr<sup>-1</sup>, with potential for a further reduction by up to 254,000 T CO<sub>2</sub>-eq yr<sup>-1</sup> if all the remaining acidic soils are brought up to optimal pH.

**More information:** Ognjen Žurovec et al. Increasing soil pH reduces fertiliser derived N<sub>2</sub>O 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

APA citation: Increasing soil pH reduces fertilizer-derived nitrous oxide emissions (2021, January 29) retrieved 20 October 2021 from <https://phys.org/news/2021-01-soil-ph-fertilizer-derived-nitrous-oxide.html>

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