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Journal of Geography & Natural Disasters

Editorial

Increase Efficiency in Plants Using Nitrogen Fertilizers

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Editorial Note

Nitrogen is critical to plant growth and reproduction. Pasture and crop growth will often respond to an increased availability of soil nitrogen. This situation is often managed through the addition of nitrogen fertilizers. Nitrous oxide is a powerful greenhouse gas and accounts for 5 per cent to 7 per cent of global greenhouse emissions with 90 percent of these derived from agricultural practices. Nitrogen based fertilizers and livestock manure (urine and dung) are the key sources of nitrous oxide emissions on farms. Greater efficiency in the capture of nitrogen in products has the greatest impact on reducing nitrous oxide losses, as well as reducing ammonia volatilization to the atmosphere and nitrate leaching and runoff to groundwater and waterways. Improved Nitrogen Use Efficiency (NUE) has both productivity and profitability benefits.

Nitrous oxide is most likely released from warm, waterlogged soils where there is excess nitrogen in the form of nitrate. Volatilization of nitrogen as ammonia can also lead to indirect nitrous oxide emissions through redisposition contributing to excess nitrate elsewhere in the landscape. Nitrous oxide (N2O) is emitted from soils, N fertilizers and stock effluent. Sometimes called 'laughing gas', N2O is no laughing matter. Nitrous oxide can have significant impacts on our environment. It's a powerful greenhouse gas that's around 300 times more effective in trapping heat than carbon dioxide and it persists in our atmosphere for up to 114 years. Nitrous oxide also has the added downside of being an ozone layer destroying gas.

Nitrous oxide emissions represent a loss of valuable N from soils that would otherwise be available for plant growth. Nitrogen is critical to plant growth and reproduction. Production agriculture requires higher levels of N than are normally found in native soils. Hence, the addition of N fertilizers. Although some N2O production is a natural part of the N cycle, levels of N2O emissions are greatly affected by the way we manage our soils and fertilizers input. High levels of N2O emissions usually indicate overuse of N fertilizers. Unfortunately, there is increasing evidence that the relationship between N2O emissions and increasing N input is an exponential, rather than a lineal relationship for most crop types.

Excessive levels of N can also result in leaching of nitrates into water systems, both above and below-ground. Nitrogen rich leachates are a key culprit in algal blooms and dissolved oxygen depletion, which is toxic to wildlife. Nitrogen-based fertilizer's and livestock waste (urine and dung) are the key sources of N2O emissions on farms. In 2007, Australian N2O emissions from agricultural soils were estimated at 20.2 million tons of 'carbon dioxide equivalent' or 85.9 per cent of all anthropogenic N2O emissions. Between 1990 and 2007, N2O emissions in Australia rose by 24 per cent and this increase is largely attributable to the increased application of nitrogenous fertilizer's. That's why the race is on to better understand how nitrogen fertilizer can be better managed while finding cost-effective ways to reduce N2O emissions.

Currently, growers and their advisers can only guess the likely amount of In-Crop Mineralisation (ICM) that is occurring in these soils when making predictions about likely amounts of fertiliser that will need to be applied to meet predicted crop demand. However, simple and rapid soil tests are being developed that will allow an accurate assessment of potential N mineralisation rates before sowing. Two soil tests (Hot KCl and Solvita) show promise as predictors of ICM, both of which can perform better than some of the current 'rules of thumb' used by advisers across the regions but are not currently available commercially

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Received: November 01, 2021; **Accepted**: November 16, 2021; **Published**: November 23, 2021

Citation: Hoban Gale N (2021) Increase Efficiency in Plants Using Nitrogen Fertilizers. J Geogr Nat Disast.10: e359