Nitrogen Losses through N_2O Emissions after N Mineral Fertilizers Application

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ABSTRACT

Nitrogen losses represent a key economic and environmental issue. In oil palm plantations, the use of mineral fertilizer is common practice. Globally, some of the nitrogen (N) mineral fertilizers that are applied to cropping systems are not absorbed by plants, but instead lost to the environment as Ammonia (NH_3), Nitrate (NO_3^-) and Nitrous oxide (**N_2O**), a greenhouse gas with 300 times the heat-trapping capacity of Carbon dioxide. These losses raise agricultural production costs and contribute to pollution and climate change.

When N mineral fertilizers are applied, soil microorganism break them down and N_2O is released to the atmosphere as a result of nitrification and denitrification, depending on the soil moisture content. Regarding our management practices, we apply N mineral fertilizer twice a year during the wet season. The aim of this study was to quantify N_2O emissions at different levels of urea application (0, 102 and 204 kg/ha, respectively) and different levels of soil moisture (low, medium and high) in order to determine the optimum N-mineral fertilizer application and we also investigated the potential of both urease and nitrification inhibitor (AgRHO N dual protect B) to mitigate N_2O emission. Air samples were manually collected from closed chambers for 6 (six) months and N_2O concentrations were determined by gas chromatography.

We found that N-N_2O losses/emission factor (EF) were significantly affected by level of soil moisture. At both levels of urea application, EF was lowest when soil moisture level was low, however low moisture level condition might promote N-losses through volatilization of NH_3. The losses of N-N_2O ranged from 0.37 to 3.72 kg N_2O/ha from the total of N applied during the application of fertilizer. However urease and nitrification inhibitor (AgRHO N dual protect B) had potential to mitigate N_2O losses by up to 64 %.

More investigations are being carried out to study the effect of N-N_2O losses/EF with various N-fertilizer application strategies.