Geophysical Research Abstracts
Vol. 21, EGU2019-2155, 2019
EGU General Assembly 2019

Minimizing N losses associated with N fertilization in grassland and winter-wheat crops

Antonio Rafael Sánchez-Rodríguez (1), Alison Carswell (2), Rory Shaw (3), Joseph Cotton (3), Karen Saunders (2), John Hunt (2), Paul H. Hill (3), Tom H. Misselbrook (2), David R. Chadwick (3), and Davey L. Jones (3)

(1) University of Córdoba, Agronomy, Córdoba, Spain , (2) Rothamsted Research, Sustainable Agricultural Sciences, North Wyke, Devon, UK, (3) School of Environment, Natural Resources & Geography, Bangor University, Gwynedd, UK

The use of nitrogen (N) fertilizers is essential to produce enough food for the growing world population. Their uncontrolled use in agroecosystems has environmental implications, such as the release of gaseous pollutants (as N_2O and NH_3) and eutrophication of water bodies (due to NO_3^- and other dissolved N forms). The main objective of this study was to assess different strategies to minimize N pollution associated with agroecosystems.

Field experiments located in North Wales and Southwest England focused on (i) assessing N offtake, N loss pathways, and the environmental and societal externalities associated with the use of different inorganic N fertilizers [urea (U), ammonium nitrate (AN) and U + urease inhibitors (UI) in grasslands]; (ii) the study of two different grass varieties (AberEcho-high in sugar content and AberNiche-drought resistant) subjected to different N rates (0-600 kg N ha^{-1}) and with/without red clover (at two N rates only: 0 and 50 kg N ha^{-1}), to study which combination was more appropriate from the point of view of primary productivity and environmental protection; and (iii) the use of nitrification inhibitor (NI) and pH reduction to mitigate gaseous N losses (N_2O and NH_3) when an organic (food-based digestate from a biogas plant) N source was applied to a winter-wheat crop.

NH_3 emissions were reduced by 48-65% in grassland under the U + UI treatment relative to U alone, and by 95% under the acidified digestate relative to non-acidified digestate for winter-wheat. N_2O emissions were not significantly reduced through the use of NI in any way. The use of UI, acidification of organic N fertilizer and clover in combination with the lowest N rates minimised N losses.