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Impact of weather variability on nitrate leaching

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The loss of nitrate (NO_3—N) to water via leaching and overland flow contributes to eutrophication of freshwaters, transitional and near coastal waters with agriculture contributing significantly to nitrogen (N) loading to these water. Environmental regulations, such as the Nitrates and Water Framework Directives, have increased constraints on farmers to improve N management in regions at risk of NO_3–N loss to water. In addition, farmers also have to manage their systems within a changing climate as the imapcts of climate change begin to impact resulting in more frequent extreme events such as floods and droughts. The objective of this study was to investigate the link between weather volatility and the concentration of leached NO_3–N spring barley. Leaching was quantified under spring barley grown on a well-drained, gravelly sandy soil using ceramic cup samplers over 6 drainage years under the same farming practices and treatments. Soil solution NO_3–N concentrations under spring barley grown by conventional inversion ploughing and reduced tillage were compared to weather parameters over the period. Weather was recorded at a national Met Eireann weather station on site. Soil solution NO_3–N varied significantly between years. Within individual years NO_3–N concentrations varied over the drainage season, with peak concentrations generally observed in the autumn time, decreasing thereafter. Under both treatments there was a three-fold difference in mean annual soil solution NO_3–N concentration over the 6 years with no change in the agronomic practices (crop type, tillage type and fertiliser input). Soil solution nitrate concentrations were significantly influenced by weather parameters such as rainfall, effective drainage and soil moisture deficit. The impact of climate change in Ireland could lead to increased NO_3–N loss to water further exacerbating eutrophication of sensitive estuaries. The increased impact on eutrophication of waters, related to climatic variability, requires new management solutions to help farmers maintain or improve the sustainability of their farming systems.