

Delayed N timing for maize reduced N₂O emissions and drainage [NO₃⁻] while increasing yield.

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Abstract

Traditional farmer practice in the central U.S. is to apply all N fertilizer before planting maize. Two long-term experiments (11 and 6 years, respectively) resulted in substantial yield benefits (30% and 13%, respectively) by delaying N fertilizer application until plants were 40 to 50 cm in height. N rate was selected using remotely-sensed color of maize leaves. The larger yield benefit in the 11-year experiment is likely due to more wet spring seasons. In the 6-year experiment, season-long N₂O emissions and [NO₃⁻] in drainage water were measured during the growing season. Average N₂O emissions were cut by half, and [NO₃⁻] was reduced by 35%, by applying N at maize height of 40-50 cm compared to application before planting. With more N in grain and less N in water and air, N efficiency went up by 13%. Further experiments with a wide range of N fertilizer sources and N timings confirmed that, for all N sources, later applications produced higher yield in wet years. When wet weather caused N loss in farmer fields where all fertilizer had been applied before planting, large yield response to additional (“rescue”) N was measured.

Keywords: nitrogen, fertilizer, timing, rate, nitrous oxide, nitrate, drainage, maize, grain yield
