Using site-specific nitrogen management in rainfed corn to reduce the risk of nitrate leaching

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Abstract: Managing nitrogen (N) to achieve yield potential and limit losses to the environment is challenging due to the temporal and spatial variability in crop N uptake which affects the distribution of soil-N. Nitrogen fertilization using site-specific management (SSM) is one of a number of strategies that can improve the efficiency of N use and reduce the losses of N to the environment from cropping systems. The aim was to assess: (i) corn (Zea mays L.) grain yield and N uptake; and (ii) soil residual- and potentially leachable-N, and its relationship with N and water use efficiency using SSM vs. uniform management (UM) strategies in high-(HP) and low-(LP) productivity zones on soils of the Inland Pampas of Argentina. Differences in soil residual- and potentially leachable-N, corn grain yield, N uptake, water and N use efficiency were compared between treatments. In HP-zones, corn grain yield and total biomass were 2.7 and 4.2 $Mgha^{-1}$higher with SSM than UM, and corn grain N uptake and total N uptake increased by 21% and 18%with SSM when compared to UM. Soil residual-N at field-scale was reduced by 18% with SSM. Marginal differences in potentially leachable-N among treatments were observed throughout the soil profile; the highest nitrate concentration was 6.6 mg kg^{-1}in LP-zones with UM within the 210–240 cm soil layer. Overall corn water use efficiency in total biomass was 16% higher with SSM than with UM in both LP- and HP-zones. Using SSM in the LP-zones increased corn N use efficiency in grain and total biomass by 50%and 43% respectively. In this context, SSM can be considered as a conservation practice that optimizes N and water use efficiency by corn under dry conditions.

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