Science Societies

Stable Isotopes Track Leaching of Fertilizer Through Deep Soil

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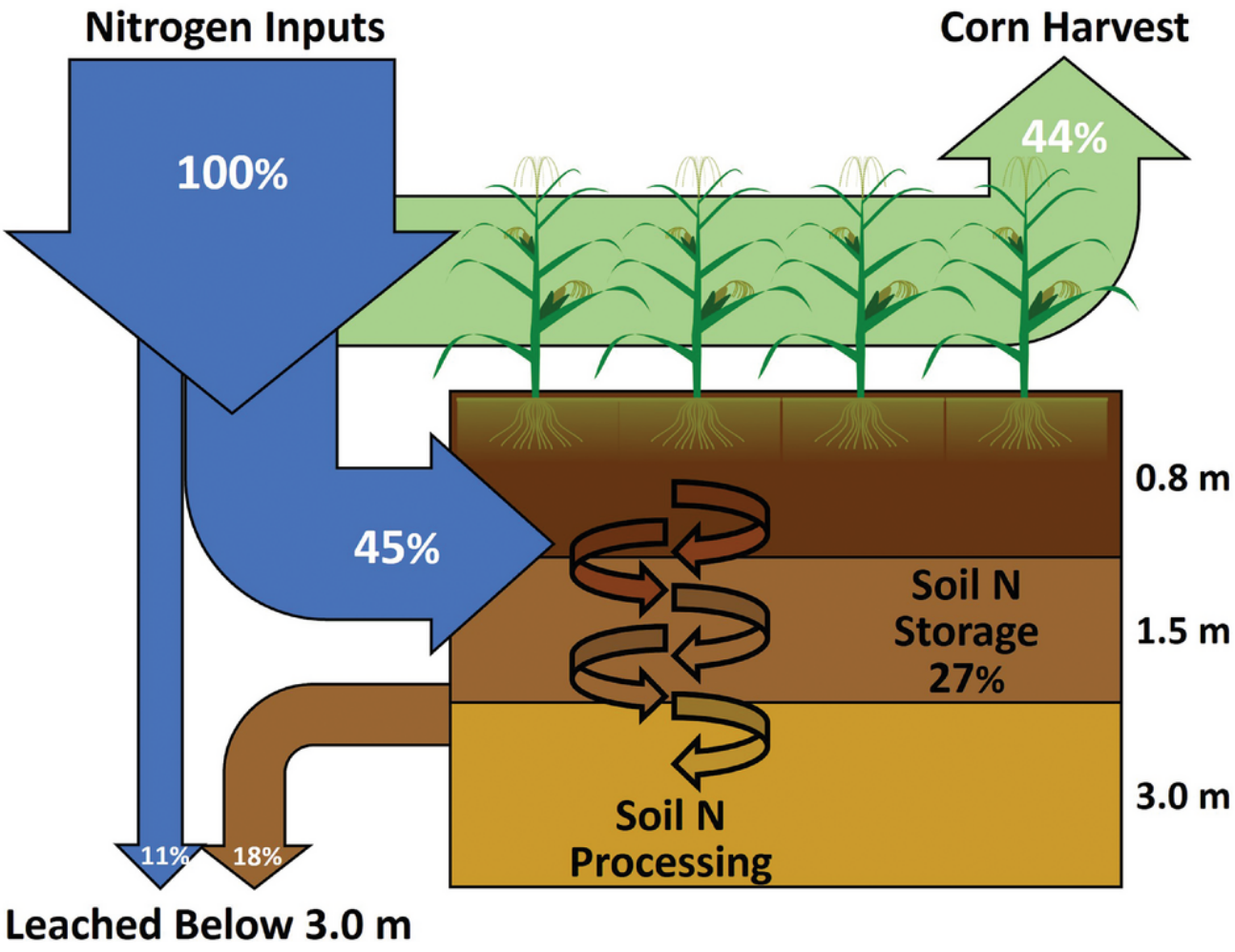

Fate of nitrogen (N) inputs at the Oregon State University field site across the three studied depths—0.8, 1.5, and 3.0 m. Illustration by Weitzman et al. (2024).

Nitrate contamination of groundwater is a global problem, particularly in agricultural regions where decades of fertilizer nitrogen (N) use has led to accumulation. Linkages between present-day practices and groundwater nitrate dynamics are often confounded by this legacy N and processes unrelated to current management. Quantifying leaching rates derived from recently applied fertilizer versus legacy N provides insights that could help mitigate groundwater contamination.

Researchers from the USEPA and Oregon State University analyzed natural abundance stable isotopes of water and nitrate at three depths to quantify fertilizer N utilization within an irrigated corn field in the southern Willamette Valley, OR. They consistently observed distinct annual “fertilizer signal periods,” indicating that nearly half of leached nitrate was from recent fertilizer applications moving below 3 m via preferential flow paths.

Adapted from

Weitzman, J. N., Brooks, J. R., Compton, J. E., Faulkner, B. R., Peachey, R. E., Rugh, W. D., Coulombe, R. A., Hatteberg, B., & Hutchins, S. R. (2024). Vadose zone flushing of fertilizer tracked by isotopes of water and nitrate. Vadose Zone Journal, 23, e20324. https://doi.org/10.1002/vzj2.20324

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