

# Reply to Castellano and David: Long-term fate of nitrate fertilizer and nitrate from agricultural catchments

We thank Castellano and David for their insightful comments (1) on our paper (2), in which they point out that short-term changes in land use and agricultural management can lead to rapid reductions in nitrate leaching from agricultural systems. We fully agree with Castellano and David that in diversified cropping systems, this N distribution may be different, potentially resulting in reduced nitrate leaching.

Our study was, however, conducted in two lysimeters with a crop rotation of sugar beets and winter wheat and, hence, no change in agricultural management over more than three decades (2). Our paper demonstrates that in the investigated system with the given crop N demand, the slow-turnover soil organic matter-N pool is released over decades, with approximately one-third of the N taken up by the crops, one-third leaching toward the hydrosphere, and the remainder likely lost via gaseous emissions.

The major conclusion of our paper (2) is that the residence time of fertilizer-derived N in agricultural soils with constant crop rotation is of the order of a few decades, and that this long-term legacy of past N applications must be considered in agricultural N cycling models. This finding does not mean that suitable management strategies designed to reduce nitrate leaching from agricultural soils could not yield short-term reductions of N losses to the hydrosphere. We thank Castellano and David (1) for stressing this point.

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**1** Castellano MJ, David MB (2014) Long-term fate of nitrate fertilizer in agricultural soils is not necessarily related to nitrate leaching from agricultural soils. *Proc Natl Acad Sci USA* 111:E766.

**2** Sebilo M, Mayer B, Nicolardot B, Pinay G, Mariotti A (2013) Long-term fate of nitrate fertilizer in agricultural soils. *Proc Natl Acad Sci USA* 110(45):18185–18189.

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The authors declare no conflict of interest.

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