

System-Level Approach Needed to Reduce Nitrogen Pollution

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Left: Bottles containing subsurface drainage water samples. Inset shows a top-down view of the inside of the auto-sampler used to collect water samples. Right: Giovani Preza-Fontes, who worked on the study as a doctoral student at the University of Illinois Urbana-Champaign, takes greenhouse gas samples from the field. Photos by Giovani Preza-Fontes.

Understanding nitrogen (N) cycling trade-offs and synergies is essential for developing and implementing conservation practices to mitigate agricultural N pollution. However, few studies have evaluated the impacts of conservation practices on multiple N loss pathways in the same site year. Comparing environmental N losses on a mass basis is further complicated because of their different human health and ecological impacts.

Researchers from the University of Illinois Urbana-Champaign reported that pairing two in-field recommended practices for improving water quality may have unintended consequences on air quality. Over the three-year study, the authors found that combining in-season split N application with a cereal rye cover crop reduced nitrate losses by 37% compared with pre-season N application. However, nitrous oxide emissions also increased by 26%. As a result, total N losses and environmental damage costs from each system were not different.

These findings highlight that because N losses still occur even with conservation practices, further reductions will only be possible through a holistic accounting of its environmental and social risks. Broad engagement from all sectors of society, including governments, producers, and agri-food industries, will be needed.

Adapted from Preza-Fontes, G., Christianson, L.E., & Pittelkow, C.M. (2023).

Investigating tradeoffs in nitrogen loss pathways using an environmental damage cost framework. *Agricultural & Environmental Letters*, 8, e20103.

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