Science Societies

Air-drying biases paddy soil nitrogen—new model corrects it

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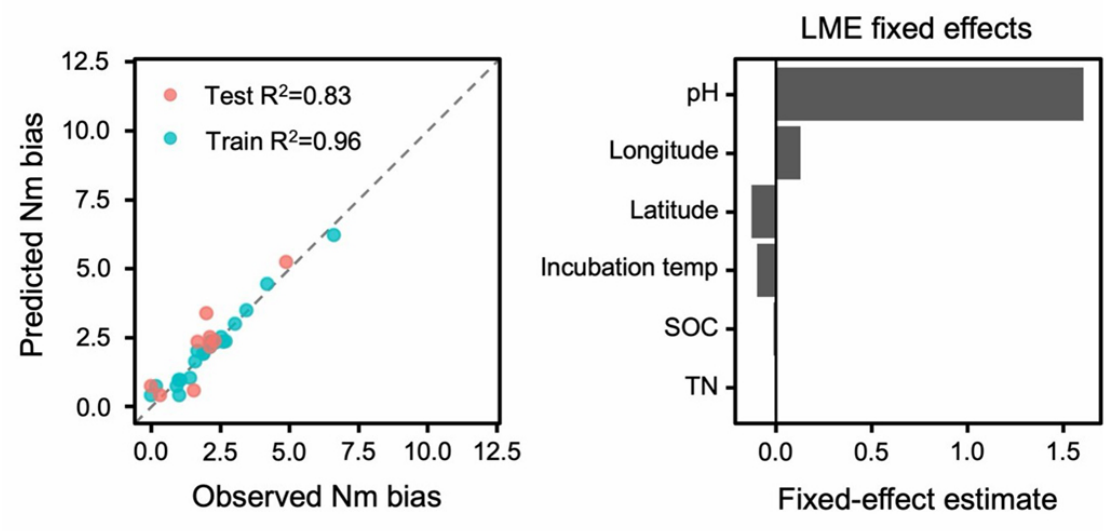

Evaluation of an empirical model for estimating nitrogen mineralization potential bias and variable importance. Figure courtesy of Xu Zhao.

Paddy soils supply nitrogen to rice through microbial mineralization, and scientists often measure this process by air-drying soil samples before laboratory tests. Air-drying, however, triggers a burst of nitrogen release when the soil is rewetted. Because studies vary in how they handle samples, results have been hard to compare across regions and datasets.

Now, researchers have quantified this bias globally and built a model to correct it. The research team compiled a global dataset of paired fresh versus air-dried measurements from 66 soils and ran 112-day anaerobic incubations on nine contrasting paddy soils. Air-drying consistently altered early-stage mineralization and shifted the overall mineralization potential away from fresh-soil values. A statistical model using soil pH, total organic carbon, total nitrogen, and incubation temperature predicted the direction and size of the bias with high accuracy. A short pre-incubation period also reduced the divergence, showing that microbial communities can re-equilibrate after rewetting.

These findings mean that researchers can now rescue decades of archived air-dried data by applying a simple correction and that future studies should either pre-incubate samples or adjust their results statistically. The authors recommend pre-incubation or model-based corrections to make nitrogen mineralization assessments comparable across studies and climates. This work makes nitrogen mineralization assessments from different studies and climates directly comparable, strengthening the foundation for soil fertility management.

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Liu, Y., Cai, S., Liu, X., Wang, Y., Zhao, X., & Yan, X. (2026). Predicting and correcting the air-drying bias in paddy soil nitrogen mineralization: A global synthesis and experimental validation. *Soil Science Society of America Journal*, *90*, e70288. https://doi.org/10.1002/saj2.70288

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