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Saline Soils Emit More N2O than productive soils in the Northern Great Plains

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Top: Chambers for taking greenhouse gas measurements in the field. Bottom: That's not snow—

Top: Chambers for taking greenhouse gas measurements in the field. Bottom: That's not snow—it's salt. Some areas on the righthand side of this photo are starting to look a bit better after four years. Photos courtesy of Sharon Clay.

Saline/sodic soils in the Northern Great Plains are intertwined with productive soils. Although plant growth is limited, they are often cropped in the same way as more productive areas.

In a two-year study published in the *Journal of Environmental Quality*, researchers compared greenhouse gas (GHG) emissions from highly productive and saline/sodic soils treated with 0 or 200 lb N/ac. They measured emissions every four hours for seven days in mid-July. Scientists analyzed soil samples for inorganic N, microbial

biomass, and copy numbers of specific denitrification functional genes.

The team found that productive soil had greater CO_2–C emission and microbial biomass and less N_2O–N emission than saline/sodic soils. Nitrogen application did not influence CO_2–C emission; however, fertilizer-derived N_2O–N emissions were 57–84% greater from saline/sodic soil than productive soil. The nitrite reductase gene, *nirS*, copy number was 42-fold greater in the saline/sodic than productive soil.

These data suggest that saline/sodic soil has a large denitrification potential and N_2O–N emissions would be reduced by not applying N to these areas.

Dig Deeper

Fiedler, D.J., Clay, D.E., Joshi, D.R., Engel, A., Marzano, S.-Y., Jakubowski, D., … & Clay, S.A. (2021). CO_2 and N_2O emissions and microbial community structure from fields that include salt-affected soils. *Journal of Environmental Quality*, *50*, 567–579. https://doi.org/10.1002/jeq2.20223

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