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Fall tillage reduced manure nutrient losses from frozen soils

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Laxmi R. Prasad (foreground), a postdoctoral research associate at the University of Wisconsin–Madison and first author on the study, applies dairy manure on snow-covered frozen soil at the University of Wisconsin Arlington Agricultural Research Station to study runoff nutrient losses. Photo by Rachel Johnson and Edward Boswell.

Dairy farmers in cold regions apply manure to fields in winter to avoid problems with manure storage and soil compaction. However, when manure is applied to frozen ground (with or without snow cover), there is a high risk of runoff through snowmelt and rain-on-snow, which could lead to nutrient losses.

In a two-year field study published in the *Journal of Environmental Quality*, researchers report on runoff nutrient losses from frozen soils with fall chisel tillage (CT) and no-tillage (NT) receiving liquid or solid manure. They found CT created depressions that increased water infiltration and significantly reduced wintertime runoff compared with NT. With both CT and NT, applying manure on top of snow increased nitrogen and phosphorus in runoff compared with the control. Solid manure applied on snow remained on the soil surface after snowmelt, potentially releasing nutrients in multiple runoff events. Liquid manure infiltrated snowpack and either was partly lost with snowmelt or infiltrated soil, depending on soil frost and surface conditions.

The study demonstrates that applying manure over frozen soil risks nutrient loss. When manure must be applied in winter, opting for CT and liquid manure may reduce that loss.

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Prasad, L.R., Thompson, A.M., Arriaga, FJ., & Vadas, P. A. (2022). Tillage and manure effects on runoff nitrogen and phosphorus losses from frozen soils. *Journal of Environmental Quality*. **https://doi.org/10.1002/jeq2.20396**

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