

# Impact of Extreme Precipitation on Nutrient Concentration of Stored Manure Slurry

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In Vermont, dairy manure is primarily stored in liquid slurry lagoons. The slurry is emptied from the lagoon periodically throughout the summer months and applied to hay fields. During the summer and fall months of 2023, there was extreme and constant rainfall causing flooding and long durations where the soil was saturated. Many farmers have been unable to spread slurry to the fields.

The major factors influencing nutrient content include the type of livestock supplying manure, time of year, and the balance of water into and out of the lagoon. If a farm samples the lagoon manure at the same time of year, after several years, a predictable pattern of nutrient concentration should emerge. However, the extreme precipitation during the summer and fall heavily impacted the volume and nutrient concentration of the stored effluent.

Increased volume of slurry that needs to be land applied that contains less nutrients has farmers wondering how this will impact their 2024 nutrient management plans. Farmers must manage the volume of manure applied to each field on their farm to provide valuable crop nutrients while minimizing any impact on the environment. Manure application rates are determined by several factors including soil type, soil test information, manure nutrient concentration, crop being grown, erosion potential of the soil, and proximity to water. Changes to any of these factors will influence the rate of manure that can be applied to the field. To understand the impact of extreme precipitation on the nutrient concentration of the slurry, UVM Extension worked in partnership with custom manure applicators and farmers to collect manure samples from farms that had been unable to spread during the summer months of 2023.

Thus far, fifty-one manure samples have been collected from farms located throughout Addison, Franklin, and Orleans Counties. These manure samples were analyzed for nutrient and total solid content through the Dairy One Laboratory in Ithaca, NY.

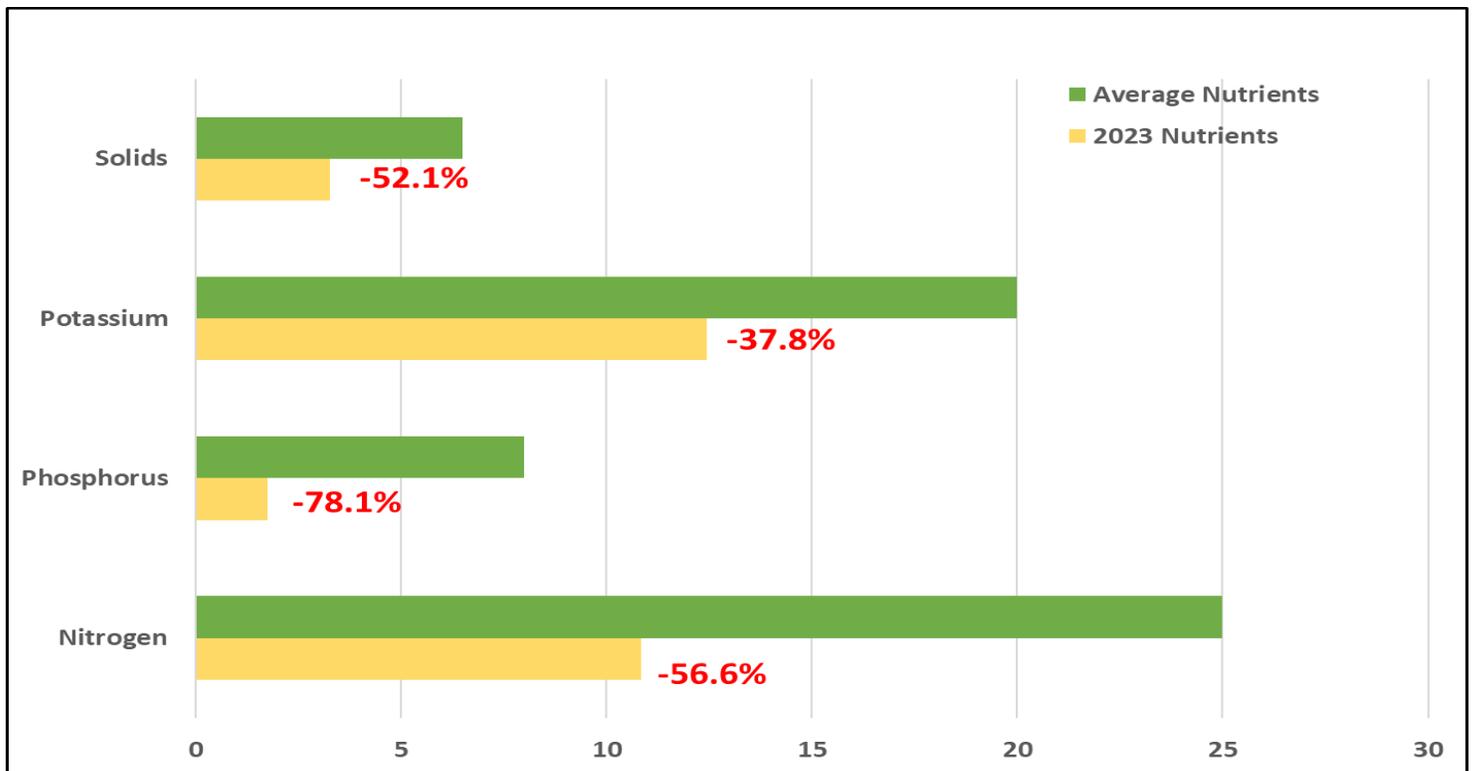
**Table 1. Nutrient concentration of liquid manure samples collected from farms following excessive rainfall in 2023.**

	Minimum	Maximum	Average	Book Value
Solids (%)	0.22	7.12	3.28	6.50
	lbs/1000 gallons of manure			
Nitrogen	2.03	22.0	10.8	25.0
P <sub>2</sub> O <sub>5</sub>	0.60	4.76	1.76	8.00
K <sub>2</sub> O	2.40	25.0	12.5	20.0

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The results were compared to the average book value for slurry manure in Vermont ([https://www.uvm.edu/sites/default/files/Northwest-Crops-and-Soils-Program/NutrientRec\\_BR1390.3\\_Sept2020.pdf](https://www.uvm.edu/sites/default/files/Northwest-Crops-and-Soils-Program/NutrientRec_BR1390.3_Sept2020.pdf)).

The slurry samples obtained ranged in total solids from 0.20% to 7.12% with an average of 3.28% (Table 1). This is 52.1% lower than the UVM book value of 6.85% total solids for slurry manure. This indicates that there was substantial dilution of the slurry manure from excessive rainfall. This significantly impacted the nutrient value of the manure with total nitrogen, phosphorus, and potassium declining in concentration compared to the UVM book values. The total nitrogen in samples from slurry lagoons averaged 10.8 lbs per 1000 gallons, a 56.6% decline compared to the UVM book value (Figure 1). The phosphorus concentrations were most impacted with a 78.1% reduction in nutrient concentration compared to the UVM book values (Figure 1). The slurry lagoons sampled in 2023 had an average 1.76 lbs of  $P_2O_5$  per 1000 gallons of manure. Finally, there was a 37.8% decrease in potash concentration in the slurry manure. As always, obtaining a manure analysis from an individual farm will provide the best information to build an accurate nutrient management plan for the 2024 cropping season.



**Figure 1. Manure nutrient concentration of samples collected following excessive precipitation in 2023.**

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