

Tracking phosphorus runoff from livestock manure

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Nutrient runoff from livestock manure is a common source of agricultural pollution. Looking for an uncommon solution, a team of scientists has developed an application of rare earth elements to control and track runoff phosphorus from soils receiving livestock manure. In addition to reducing the solubility of phosphorus, this method shows particular promise for researchers interested in tracking the fate of manure nutrients in agricultural settings.

Led by Anthony Buda, a team of scientists from the USDA Agricultural Research Service and the Chinese Academy of Sciences applied two rare earth chlorides (lanthanum chloride and ytterbium chloride) to poultry, dairy, and swine manures. The goals were to evaluate the effects of rare earth elements on [phosphorus](#) solubility in manures and to describe the fate of phosphorus and rare earth elements in surface runoff when manures were surface-applied to packed [soil](#) boxes and subjected to simulated rainfall.

The study was reported in the May/June 2010 edition of the [Journal of Environmental Quality](#), published by the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America.

Common uses for rare earth elements include industry, technology, and agricultural production, but there is a growing trend for using them in environmental research, particularly to label and track soil erosion and sedimentation during storm events on agricultural and rangeland

watersheds.

The results of the study showed that rare earth elements had a remarkable ability to reduce soluble phosphorus in livestock manures. In particular, adding lanthanum resulted in maximum reductions of water extractable phosphorus from dairy and poultry manures.

While these soluble phosphorus reductions were comparable to using other chemical treatments such as alum and lime, widespread use of rare earth elements in this manner would likely be cost prohibitive.

According to the authors of the study, the real potential benefit of rare earth elements lies in their ability to label phosphorus in livestock manures, a boon for researchers. Their rainfall simulation experiment clearly showed that rare earth elements precipitated greater than 50% of the dissolved phosphorus in runoff. The results revealed that rare earth elements can be used to track the fate of phosphorus and other manure constituents from soils treated with manures.

This study introduces [rare earth elements](#) as a potentially valuable new tool for research in agricultural phosphorus management. Extending this technique to field, landscape, and small watershed scales will contribute to testing and validating phosphorus management strategies, including critical source area management. Agriculture, particularly the dairy, poultry and swine industries, stand to benefit from improved nutrient containment of their manure-treated soils.

More information: View the abstract at jeq.scijournals.org/cgi/content/abstract/39/3/1028

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