Phosphate Desorption Across Particle Size After Sustainable Agriculture Practices

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Within a watershed, increased phosphate (PO_4^{3-}) concentrations can result in accelerated eutrophication, a process through which excess amount of nutrients, such as nitrogen (N) and phosphorus (P), lead to accelerated algae growth and eventual decay, depleting dissolved oxygen. The study site, Babe and Sage Farm in Gordon, Georgia, is a small sustainable farm that follows USDA regulations for Organic production. The farmers were seeking field research to determine the efficiency and sustainability of their practices related to fertilizer (nutrient) applications. This study investigates horizontal and vertical phosphate movement though soils to assess the impacts of sustainable agriculture practices on the local watershed. We are investigating the possibility of particle-based transport and investigating phosphate desorption (release) across a range of particle sizes on the millimeter to micrometer scale, achieved through a differential centrifugation technique for size separation and the ascorbic acid method for phosphate concentration. Total phosphorus concentration within the soil will be assessed using acid digestion and/or X-ray fluorescence (XRF) methods. To assess the impacts of environmental or field-management conditions (e.g., acid rain, and/or liming) on phosphate desorption. pH was manipulated across experiments. Additional measures to understand the phosphate transport by groundwater flow throughout the soil profile were conducted, including *in situ* field measurements of permeability and *ex situ* K_{sat} determinations. Finally, qualitative and semi-quantitative observation of phosphate concentrations with varying particle size will be studied through Scanning Election Microscopy/Energy Dispersive X-ray Spectroscopy (SEM/EDS) investigation. We project that our results will indicate consistent phosphate concentration throughout the testing sites, due to the compound's stability in the soil, with phosphate concentration decreasing with depth due to phosphate's ability to resist soil leaching. Differing particle diameter expressed though the centrifuge could illustrate whether smaller particles would transport phosphate more effectively throughout the soil profile, due to their increased mobility.

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