



Legacy Phosphorus Effect and Need to Re-calibrate Soil Test P Methods for Organic Crop Production.

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Phosphorus (P) is a required nutrient for the normal development and growth of plants and supplemental P is needed in most cultivated soils. Large inputs of cover crop residues and nutrient-rich animal manure are added to supply needed nutrients to promote the optimal production of organic grain crops and forages. The effects of crop rotations and tillage management of the near-surface zone on labile phosphorus (P) forms were studied in soil under conventional and organic crop management systems in the mid-Atlantic region of the U.S. after 18 years due to the increased interest in these alternative systems. Soil nutrient surpluses likely caused by low grain yields resulted in large pools of exchangeable phosphate-P and equally large pools of enzyme-labile organic P (Po) in soils under organic management. In addition, the difference in the P loading rates between the conventional and organic treatments as guided by routine soil test recommendations suggested that overestimating plant P requirements contributed to soil P surpluses because routine soil testing procedures did not account for the presence and size of the soil enzyme-labile Po pool. The effect of large P additions is long-lasting as they continued to contribute to elevated soil total bioactive P concentrations 12 or more years later. Consequently, accurate estimates of crop P requirements, P turnover in soil, and real-time plant and soil sensing systems are critical considerations to optimally manage manure-derived nutrients in organic crop production.