Risk of Phosphorus Desorption from Canadian Agricultural Land: 25-Year Temporal Trend

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PHOSPHORUS USE in Canadian agricultural systems contributes to the economic viability of agricultural enterprises and helps to maintain a secure food supply because it is an essential nutrient for plant growth. Phosphorus addition to the soil through inorganic P fertilizers, manures, and other wastes sustains and improves crop yields. Phosphorus fertilizers have been used extensively since the last century; availability was limited during World War II, but fertilization became more intensive in the 1950s and thereafter (MacDonald and Bennett, 2009). Phosphorus is also an essential nutrient for animals. The most widespread of all mineral deficiencies affecting livestock production is related to P. Since the late 1950s, researchers in animal nutrition have recommended P supplements to promote livestock production (Gueguen, 2005). In regions of intensive production, this trend has increased the nutrient surplus and, consequently, the risk of P transport from agricultural fields to surface water bodies.

Phosphorus is transported from agricultural land to surface water through surface runoff and from infiltrating water or tile drainage. In natural freshwater systems, P occurs in very low concentrations but may vary significantly with stream size and ecosystem characteristics (Chambers et al., 2008). Excessive amounts of P in surface fresh water contribute to the eutrophication of rivers and lakes and to cyanobacteria blooms (Carpenter et al., 1998). The risk of water contamination is considered greatest when soil tests show high P levels (Sharpley et al., 1996; Salvano et al., 2009), the ability of soils to retain P is low (Pellerin et al., 2006; Beauchemin et al., 2003; Khiari et al., 2000), P input and solubility are high (McDowell et al., 2001; Kleinman and Sharples, 2002; Shoher and Sims, 2007), the susceptibility for runoff is high and the macropore

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Abbreviations: ASAE, Society of Agricultural Engineers; CoA, Census of Agriculture; DSPS, degree of soil P saturation; FEMS, Farm Environmental Management Surveys; IROWC-P, indicator of risk of water contamination by P; LIPS, Livestock Farm Practices Survey; PSC, P sorption capacities; PSI, soil P saturation index; Pw, water extractable P; Pw Self-Davis, Self-Davis water extractable P analysis; SLC, Soil Landscape of Canada; STP, soil test P.

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