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Phosphorus losses from a subdrained clayey soil as affected by
cultivation practices

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Abstract

Conservation tillage practices are included in the Finnish Agri-Environmental Program as phosphorus (P) loss control measures, but only few experiments have been performed to check their effectiveness in the local conditions. We studied surface and subsurface losses of P from a clayey underdrained field (Jokioinen/ Kotkanoja; Vertic Cambisol/Typic Cryaquept), with 2% mean slope, during two separate experimental periods. Primary tillage treatments of the first experimental period of three years were moldboard ploughing (to 20–23 cm depth) vs. no autumn tillage (wintertime stubble). During the second experimental period of five years, the treatments were moldboard ploughing (20–23 cm) vs. shallow (to 5–8 cm) autumn tillage. The stubble treatment of the first experimental period produced higher dissolved reactive P (DRP) losses (104–259 g ha⁻¹ yr⁻¹) than autumn ploughing (77–96 g ha⁻¹ yr⁻¹), and equally high particulate P (PP) losses (mean 660, 235–1300 g ha⁻¹ yr⁻¹). During the second experimental period, shallow autumn tillage produced 28% higher DRP losses (mean 120, 107–136 g ha⁻¹ yr⁻¹) than ploughing (83–117 g ha⁻¹ yr⁻¹) and 11% higher PP losses (mean 1090, 686–1336 g ha⁻¹ yr⁻¹) than ploughing (783–1253 g ha⁻¹ yr⁻¹). Surface runoff made up 28% and 16% of the total flow from the ploughed soil during the first and the second experimental period, respectively, as compared to 50% for the stubble and 44% for the shallow autumn tillage. Routing of flow between surface and subsurface pathways had a major influence on the P losses. In the relatively flat landscapes of the main agricultural areas of southern Finland, the potential for decreasing agricultural P losses by reduced tillage appears limited.

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