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Adaptation of the STICS crop model to subsurface drained soils

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The generic crop model STICS was modified to take into account shallow watertable fluctuations and subsurface drainage in the context of French waterlogged soils. This was accomplished by incorporating a subsurface drainage component into STICS code. The SIDRA (Simulation du Drainage) model was adapted to a daily time-step. For the dimensional aspect, the passage from two-dimensional drainage functioning to STICS one-dimensional conceptualisation is done by taking an average water elevation between drain and mid-drain spacing. A simple concept for nitrate leaching was added. According to specified leaching dynamics of subsurface drained shallow water table, nitrate flux was removed of the soil profile considering the concentration at the depth of water table and the drained simulated discharge.

Simulation performances of the new STICS were evaluated by comparing its predictions with six years (1979–1983 and 1985–1986) of measured data from the field experiment of Arrou, located in northern France. Comparisons of STICS predictions with the measurements of drain-flow rates, total drained volumes, depths to water table and nitrate leaching for different crops and drain spacings were satisfactory. Nevertheless, the performances were better for drain spacings of less than 20 m and for winter crops or covers.