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Can the catchment scale SWAT model undertake management at field scale?

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Nitrate losses from agricultural areas to waterways remain a serious stressor for aquatic ecosystems in many developed countries, despite the fact that decades of water action plans have reduced these losses. More intelligent ways of further reducing nitrate losses are now sought for, particularly the ability to pinpoint the location of critical areas where the potential for nitrate losses are high. Here, mathematical models can play a key role, as they offer the ability to locate areas at various size-discretization, where losses could potentially be high. The Soil and Water Assessment Tool (SWAT) have been widely applied for quantifying nitrate losses from agricultural catchments, but the model have rarely be validated at field scale that are relevant for implementation of management measures, often due to lack of data from such scales. In this study, we calibrated the SWAT model for intensively monitored smaller Danish catchments based only on data from the catchment outlets. We then looked into smaller areas within these catchments and evaluated the SWAT models ability to reproduce observed tile drain dynamics and nitrogen budgets at the field scale, including fertilizer application, crop yields, leaching through the root zone and tile drainage. To evaluate the importance of the simulated tile drainage at larger scales, we applied the SWAT model to a large section of the River Odense catchment in Denmark and analysed the nitrogen sources and budgets.