

Saturated and integrated buffer zones as novel drainage mitigation measures in Denmark

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Vegetated buffer strips (VBSs) along watercourses have been introduced in many European countries to mitigate impacts on water quality and ecological quality of watercourses by reducing inputs of sediment and nutrients from surface runoff on intensively managed agricultural land. However, the effectiveness of VBSs was proven to be low for the retention of dissolved nutrients (NO_x, PO₄³⁻), especially when agricultural drainage water was directly discharging to streams via tile drainage pipes. Therefore, two new drainage mitigation measures namely saturated and integrated buffer zones (SBZs and IBZs) have been implemented at test sites and studied during the last five years in Denmark for their retention efficiency for nitrogen and phosphorus. Tile drain pipes were disconnected at the sloping field margin to the riparian zone by diverting drainage water either to a buried, lateral distribution pipe running parallel to the stream (SBZ) or charging a pond combined with a sub-surface flow infiltration zone planted with vegetation (IBZ). Altogether, six sites were intensively monitored over a period of 2-5 years to evaluate the nutrient removal efficiency of SBZs and IBZs. Depending on the water inflow, physical soil characteristics, water saturation of soils and dominant vegetation type, a substantial fraction of the water can infiltrate the soil before reaching the watercourse. While the results on total nitrogen removal were promising for both systems with mean removal efficiencies between 31% and 76 % of the load, a risk of phosphorus release occurred at higher summer temperatures or if the buffer zone had organic soils.

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