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Evaluation of nitrate removal in buffer zone supply by water from agricultural drained catchment

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The European Directive 2000/60/CE states objectives of a good ecological and chemical status from water body until 2015. The Cemagref project focuses on the constructed wetlands (CW) which can be used as buffer zones to lower the impact of agricultural practices on hydrosystems and decrease or even stop the transfer of contaminants via the surface waters.
The experiments are carried out on a drained area where the runoff is limited and waters from the soil profile are concentrated at the drain pipes outlet. The constructed wetland studied is located at Aulnoy (77) at 70 km north-east of Paris, within the Orgeval catchment (France). Our aim is to assess the efficiency of constructed wetlands on the removal of agricultural nitrates. We are also interested in the hydrological balance of CW and agricultural catchment.
The buffer zone is connected to a drained agricultural catchment of 35 hectares. The crops in the agricultural plots mainly consist in cereals (corn, maize), vegetables (horse bean, pea), sugar beet and rape. Nitrogen fertilizers are applied following normal agricultural practices. The site is monitored since 2005 for discharge and nitrate concentration in order to infer water and nitrate budgets. The buffer zone includes a pond (860m2) and a reservoir (3305 m2).
The storage volume is estimated to 8000m3 which corresponds to about 10% of drainage runoff.
Our study reveals potential nitrate removal because a decrease of nitrate average contents has been documented between inlet and outlet CW over a measurement period of 4 years. Average values of 57 mg/l, 40 mg/l and 27 mg/l are respectively measured at the main drain, in the pond mean and in the reservoir; that is a reduction close to 50% of nitrate fluxes. The semi-potential denitrification experiments confirm the denitrification capacity of buffer zone sediments.
This constructed wetland allows the treatment of waters from agricultural drainage and provides results in line with the expectations of "good ecological status". These encouraging achievements are also due to sustainable agricultural practices.