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Agricultural drained watershed effluents: a tracer experiment for hydraulic characterization of an artificial wetland as pesticide mitigation system

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With intensive agriculture, better crop yields were obtained thanks to artificial subsurface drainage of some easily water-saturated lands and a wider use of pesticides. This lead to ground and surface water pollution by these active substances which is now a global environmental stake. To meet European water quality guidelines (Water Framework Directive 2000/60/EC), mitigation strategies should be considered.

Pesticide agricultural non-point source pollution could be mitigated by implementing several measures at different scales. This project focuses on complementary measures to application reduction ones. As part of a LIFE ArtWET project (www.artwet.fr), two on-site pilot buffer systems, an artificial wetland and a forested plot (at Bray, Indre-et-Loire, France) are monitored to determine their pesticide mitigation efficiencies. The systems are located at the outlet of a 42 ha artificially drained crop watershed (wheat, barley, rape) where a majority of herbicides is applied each year. The main objectives are to understand wetlands functioning and provide optimization guidelines to improve water treatment in such rustic systems.

Inlet and both outlets are monitored to get flow-rate measurements and flow-weighted composite samples which are analysed for pesticides. To ensure system maintenance and functioning, it was chosen to get the watershed farmer collaborative involvement. By means of a removable PVC elbow, the farmer is in charge of opening subsurface

drainage water entrance to both buffer wetlands before the first storm events following pesticide applications.

For systems' functioning understanding and optimization, laboratory and field work is planned. A tracer experiment is scheduled, to assess hydraulic and pesticide retention times as well as main water pathways in the wetlands. This experiment will help determining if wetlands' hydraulic functioning is satisfactory on two main points. The first one is to ensure retention time long enough for pesticide biodegradation; secondly, it is necessary to know the main pesticide pathways to assess if the contact surface with soil or sediment matrices is high enough for pesticide immobilization.