



Co-construction of pesticide mitigation solutions in a subsurface drained watershed to limit groundwater pollution

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Champigny calcareous aquifer groundwater is a major drinkable water resource of the Ile de France region, including the city of Paris. For some sub-basins, the aquifer recharge is mainly due to surface water direct infiltration through karst sinkholes. In such cases, aquifer vulnerability is all the more high that several aggravating factors apply: i) the sinkholes are mainly located in the bottom of the rivers, ii) upstreams soil occupation is dedicated to intensive agriculture and thus subjected to pesticide applications, iii) a shallow impervious layer is present upstream inducing waterlogging, tile drainage and specific water fluxes.

Regulations became increasingly stricter with the application of the water framework directive (2000/60/EC). Local authorities are expected to propose and apply measures to protect water resource quality. In this context, the Aqwi'Brie association is in charge of the Champigny aquifer monitoring and of promoting measures for its protection. For this later aspect and considering the specificities of the pollution, Aqwi'Brie has chosen a pilot watershed and initiated in 2005 an original approach for finding and testing an applicable solution for sinkhole protection from pesticide rural pollution. The originality of this approach derives from considering at the same time technical (agronomy, hydrology), economical and sociological aspects. All water stakeholders

(local authorities, farmers, farmers' adviser and scientists) are collectively involved in the co-construction of the solution. The paper presents the solution, which is two fold: to improve the quality of the surface water by use of constructed wetlands, and to reduce pesticides application.

The watershed under question is a 400 ha agricultural area where 10 farmers are mainly growing cereals, sugar beat and colza. A monitoring station was set up for flow and pesticide dynamic characterization at the outlet. Sub-surface drains are connected to a main ditch directly linked to a single sinkhole, so called in French "les goufres de Rampillon" in which maximal observed discharge was 430 l/s. All agricultural practices were gathered from the farmers by their adviser. Meeting conversations were analyzed *a fortiori* by sociological scientists and a method incorporating everybody's claims was proposed.

Throughout the co-construction, it was introduced complementary mitigations: pesticide amount reduction and pesticide transfer limitation via artificial wetlands. The scientists highlighted that the technical solutions needed to be adapted to socio-economical aspects. Land occupation appeared to be the key point. Finally, 8 small artificial wetlands will be implemented in 2008 at drain collectors' outlet of different sub-basins and managed by the farmers themselves. Additionally, a large wetland will be built at the watershed outlet, before the sinkhole, to control final water quality as a security redundancy.