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### Scientific contribution to the efficiency of the nitrate action programmes

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### **ABSTRACT**

Analyses monitored over six decades in Wallonia and particularly those from the groundwater of the Meuse hydrographic district have showed an increase in nitrate concentration compared to 1975. The necessary transfer time for nitrate from the top soil to the aquifer zone is estimated from 10 to 20 years, depending on the thickness and the nature of the unsaturated zone. The reason of this water quality degradation, from the agriculture contribution, has its origin in changes of practices between 1950 and 1970. Through this period, (1) an important decrease of grassland cover for the benefit of annual crops occurred as well as (2) an increasing use of N fertilizers (manure and mineral nitrogen) to intensify crop yields.

Up to now, due to loss of incomes factor, going back from annual crops to grassland is not conceivable. The first solutions are thus investigating an efficient use of nitrogen to minimize its content in the soil at the beginning of the leaching period. These solutions are to set restricted periods to spread fertilizer (which includes manure storage capacities), to set limits on N application rates achieving optimal crop yield, to install catch crops. In the vulnerable zones of the Walloon region, these rules are controlled since 2008 by the measurement of the soil nitrate content at the beginning of the lixiviation period, so called 'PLN' (Potentially Lixivable Nitrate-nitrogen). This control is realised each year in some 300 farms (~ 3% of the farms located in the vulnerable zones). Results are compared with annual 'reference' values established by the two scientist teams, partners of Nitrawal (a government advising body), based on observations realised in parcels with good practices. Replication of poor results over 3 years leads to substantial penalties for the concerned farmers.

Lysimetric plots in the field conducted by GxABT in the Meuse hydrographic district since 2003 have showed that PLN is a good indicator of the nitrate concentration within the water percolating below the root zone. Moreover, observations realised since 2004 by GRENeRA in the groundwater of a small agricultural watershed (where farmers are framed and advised by Nitrawal) indicate that good PLN values are slowly leading to a water quality improvement of this monitored small water body. Anticipating the 10 or 20 years of transfer time, we may be optimistic concerning the effect of the action programs on the water quality in the Walloon region.

The challenges are now (1) to maintain a good balance between rules, controls and penalties and (2) about rules, to take into account the necessary delay time to see the positive impact of a rule on the groundwater and avoiding so too efficient (for the environnement) but also too costly (for the farmers) imposition of 'good practices'.