Release of P from soil and suspended solids to assess the real risk of eutrophication

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Fertilization, in the long term, can affect the amount of phosphorus (P) compared to the crop needs and modify the soil P saturation. These factors can lead to P losses from soil to waters, especially via runoff and as particulate P causing eutrophication. To evaluate the effect of agronomic practices on P losses and on its bioavailability, soil samples (0-30 cm) from a middle term experiment have been selected. The field experiment is based since 1992 on maize cropping systems with different fertilizer applications: mineral, as NPK and PK, and organic, as manure (M) and slurry (S). A water dispersion test (DESPRAL), that simulates the surface runoff, has been applied to soil samples in order to obtain the amount of total dispersed solids and the main forms of that can be P lost. To assess the exchanging rate and the real availability of P bound to dispersed particles, chemical sequential extraction and isotopic exchange kinetics on soil and relative dispersed solids have been applied.

In the M system the bulk soil was almost P saturated and exchanged less P, but in the relative suspended solid a quite larger P exchangeability occurred in the short time, involving not only the most labile P forms but also the HCl-extractable fraction, considered more un-labile. The dispersed solids from S or PK systems had a similar behaviour, while in NPK ones the P exchangeability involved only the more labile P forms, also in the longer term.

From these results, it appeared that the real risk of eutrophication is linked to the amount of P that becomes available to algae rather than to the total amount reaching the water bodies and that the impact of the particulate P on water quality may be not easily deduced by P behaviour in soil.