



Tracking sources and fate of phosphate in agroecosystems using O-isotopes of phosphate

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The eutrophication of fresh waters is mainly the consequence of excessive inputs and successive losses of nutrients, especially phosphorus (P), from agricultural systems. The transfer mechanisms of P from soils to surface water are erosion, surface run-off, and preferential flow to tile drains. However, information is still needed on the origin of P lost from the field. In fact, because P is applied to agricultural fields in a variety of forms, such as cow and pig manure, organic, mineral and conventional fertilizers, it may follow diverse paths in the soil, distributing to mineral and organic phases, which present different and well-defined reactivities. The fact that P has only one stable isotope precludes studies dealing with stable isotopic fractionation. However, recent studies have shown that it is possible to analyze the isotope composition of the oxygen present in the phosphate group, which is related to temperature and biological activity. This kind of approach could help in deciphering the various steps of the phosphorus cycle in the natural environment and in tracing and quantifying the contribution of different sources of phosphate to diffuse losses. Our first results indicate that fertilizers of different nature and soils amended with them, present significantly distinct isotopic signatures (about 5 permil between mineral fertilizers and composted manure, and about 6 permil between the respective amended soils). We will combine data from fertilizers and soils to data from water samples of a eutrophicated lake in Switzerland (Lake Baldegg), to assess the effect of different phosphorus inputs to soils and the risk

of phosphorus losses to water bodies.