Effect of parent materials and land use on soil phosphorus characteristics in Southern Belgium

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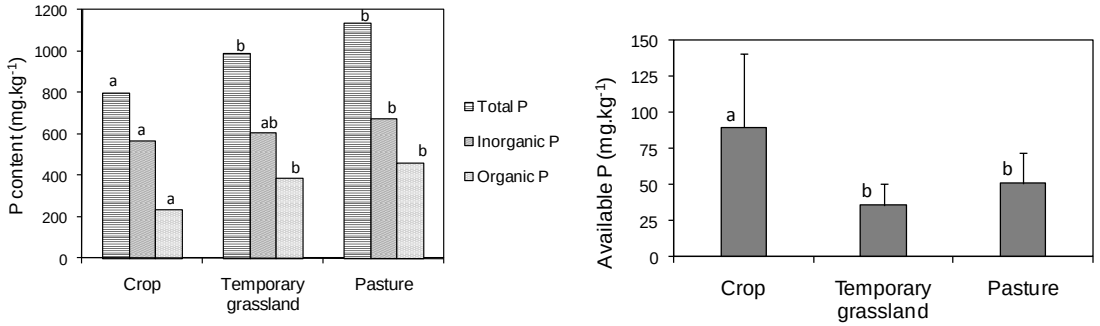
Appropriate management of soil phosphorus fertility should rely upon sound knowledge about phosphorus (P) reserve and bioavailability. The fate of P in the soil-plant-water system depends on both soil characteristics and agronomic practices. The evaluation of soil P compartments can be a tool for the assessment of P susceptibility to migrate to other compartments of ecosystems.
In this study, twelve parent materials were selected according to their spatial representativity. Surface (0-25 cm) and deeper (80-120 cm) horizons have been sampled in ten crop or pasture fields for each parent material. Total (HNO_3+$HClO_4$+HF), inorganic (H_2SO_4), organic (Total minus inorganic) and available (CH_3COO-NH_4+EDTA) P pools were measured in the laboratory.
A large range of P content was observed among results under significative influence of both parent material and land use. Evidence of parent material influence was found for surface as well as deeper horizons for available, total, organic but also inorganic P. Highly significative differences have been shown for these parameters. As a result, a North-South gradient can be observed in Walloon Region.
Land use had also an influence on P content but only for surface horizons. Pasture soils presented higher P content than crop soils but lower available P. Temporary grasslands presented similar properties than pastures, except for inorganic P which showed an intermediate behaviour between pasture and crop.
The ratio of organic to inorganic P depends on land use and no significant differences were observed between parent materials. This ratio is higher in pasture than in crop. Organic P won't be available for plants before mineralization unlike a part of inorganic P.



Generally, the trend of P availability is opposite to total P. This could be explained by the Al and Fe content of the soil, which reflects P sorption capacity. Linear relationships between available or total P and total Al and Fe contents were observed. These characteristics are clearly linked to the soil texture. In light textural soils, such as sandy or silty soils, P is more readily available for plants and for lateral transfers. Other parameters, such as pH, clay content or organic matter which depend from land use, also seem to have an impact on P availability.
This study confirmed that the management of phosphorus resources in cultivated soils has to take into account the sub-regional specificities of soil parent materials and land use.