Improving control of soil phosphorus availability by agricultural practices

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Agriculture is facing a big challenge. As world population raises, agriculture aims to produce enough food in a sustainable way. During the last decades, the use of nitrogen (N) and phosphorus (P) fertilizers has expanded at a faster rate than the world food production leading to a reduce in their efficiency (Rockström et al., 2009) and their accumulation into soils. P is quite abundant in soil but the major part is not present as the available form for plants. Phosphate ions (available form) are poorly mobile and in low concentration in the soil solution because they make multiple and strong associations with soil compounds (Hinsinger, 2001). Concerns about increased P loadings into the environment led to develop alternative agricultural practices that can compensate for P fertilization and improve soil P availability (Ohno et al., 2005).

This PhD research aims to investigate the performance of non-conventional agricultural models to improve efficiency of soil P mobilization by plants. The behavior of P in the soil-water-plant system will be studied at various scales (profile, aggregate, and rhizosphere).

The studied agro-ecosystems are: « Export of crop residues versus residues restitution », « intercropping versus monocropping » and « introduction of animal (through manure recycling) versus no animal ».

This project is organized in two issues: a characterization of the spatio-temporal soil P distribution and the study of the soil P dynamics.

References