Phosphorus mobilization at plot and field scale

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To control P transfer from soil to water it is crucial to know in detail the mechanisms that rule P accumulation in soil, mobilization and transport.
Here it will be reviewed studies dealing with mobilization of P from soil, at plot and field scale.
Mobilization is defined as the initiation of P movement; solubilization and detachment are the two primary processes by which P may be mobilized. Solubilization indicates the transfer of P from a solid phase to a water phase and the driving mechanism is chemical non-equilibrium. Physical detachment brings into suspension soil particles and colloids with attached P due to mechanical forces exerted by moving water. The reactions responsible for solubilization are dissolution/precipitation, sorption/desorption and mineralization/organication that control the amount of P in the soil water phase both in inorganic and organic forms. To predict the risk of P mobility associated with solid soil particles, both the amount of P associated to the different size fractions and the dispersibility of soil particles as a function of soil properties and management practices must be evaluated.
Due to the heterogeneity of the soil both the entity and the direction of the processes regulating P solubilization and detachment, vary substantially from one particle to the others, and both in vertical and horizontal directions determining the overall fate of the mobilized P. Thus researches aimed to develop a basis for understanding the mobilization processes regulating P export from soils to waters need to use a range of scale issues and of methods of investigation. Laboratory experiments have been designed to assess the relationships between soil properties, including P surplus, and potential P mobility. Profile or plot-scale experimental studies provide accurate data on P losses related to specific soil type, agronomic practices and climatic conditions; field scale research provides information on P losses induced by particular land use and allows the assessment of heterogeneity within the systems. Laboratory, profile, plot and field studies cannot provide information on the fate of exported P beyond their individual boundaries but they do provide a means of determining the relative significance of individual processes and identifying the controlling factors. These two informations are essential when considering system behaviour at larger scale.