Phytoavailability and species of As, Cd, Cu, Pb and Zn in farmlands and their health risks on the residents

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The mining activities near a Pb-Zn mine have made heavy impacts on the agricultural ecosystem by bring the heavy elements into farmlands in the area. On the basis of the measurements of As, Cd, Cu, Pb and Zn in the farmland soils and vegetables and the estimation of their bioavailability, the species of Pb was measured by XANES and the health risks of the elements on human being were evaluated by the Estimated Daily Intake (EDI) and Target Hazard Quotient (THQ).

Based on the research, it was found that (1) high concentrations of As, Cd, Mn and Pb were detectable in both farmland soils and vegetables; (2) Most of As, Cd, Cu, Pb and Zn was found in the residual, the water and the weak-acid, the residue, the reducible, and reducible and residue, respectively; (3) The agricultural activities and plant growing increased the phytoavailability of As, Cd, Cu, Pb and Zn by decreasing their residual fractions in soils, and raising the soluble or extractable fractions; (4) Pb-FA complex, $Pb_5(PO_4)_3Cl$ and $Pb(NO_3)_2$ were identified in the sediment sample by XANES. In the measured focused size, Pb-FA is a major component, and the fraction of soluble Pb compounds ($Pb(NO_3)_2$, Pb(II)) are much larger than that obtained from the modified BCR with a large amount of soils.; (5) Parts of vegetables THQ were higher than 1, parts even over 10, which implies high risks of the heavy elements in the farmlands and vegetables on human health.