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Greening Phosphate – Uranium in Soils Applied with Phosphate Fertilizers

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ABSTRACT

It is well known that uranium (U) in mineral phosphorus (P) fertilizers may accumulate in agricultural soils. However, this U accumulation occurs at different rates yet mostly poorly quantified. Soil samples were therefore taken from the surface soil and selected depth profiles of seven long-term experiment sites at grassland fertilization trials in Rengen (Germany), and agricultural experiment sites in Thyrow (Germany), Askov (Denmark), Broadbalk and Park Grass (Rothamsted, UK) as well as from Geitasandur and Sámstaðir (Iceland). Uranium concentrations were analyzed after strong oxidative acid extraction as well as complete digestion. We conclude that accumulation rates of fertilizer-derived U in agricultural soils are region-specific, depending on the source and the amount of P fertilizer applied. For P fertilizers with low U content, the soil U concentration will remain at a non-critical level even at the multi-centennial scale. In contrast, the agricultural sites where large amounts of P fertilizers are applied to low bulk density and high soil organic matter content (such as in Andosol) are vulnerable to rapid U accumulation.

Keywords: phosphorus, uranium, agriculture, soil, food security

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