

## ON THE USE OF PHOSPHOGYPSUM IN AGRICULTURE

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Phosphogypsum (PG), a by-product of the phosphate fertiliser industries, has been applied as soil amendment to reduce Na saturation in soils, in a reclaimed marsh area from SW Spain, where available PG has a typical fingerprint of  $710 \pm 40 \text{ Bq kg}^{-1}$  of  $^{226}\text{Ra}$ ,  $165 \pm 15 \text{ Bq kg}^{-1}$  of  $^{238}\text{U}$  and  $2.8 \pm 0.4 \text{ mg kg}^{-1}$  of Cd.

The work presented in this communication was focussed on the cumulative effects of PG amendments on the enrichment of these pollutants in cultivated soils and plants from the area studied, where PG has been applied since 1978 at recommended rates of  $20\text{-}25 \text{ Mg ha}^{-1}$  every 2-3 years. A field experiment was conducted over three years to compare activity concentrations of  $^{226}\text{Ra}$  and  $^{238}\text{U}$  in non-reclaimed soils, reclaimed soils with no additional PG application, and reclaimed soils with two additional PG applications.

A non-significant effect of two PG amendments (in three years) was observed when compared with non-amended reclaimed plots. Nevertheless, a significant enrichment of  $^{226}\text{Ra}$  was observed in the surface horizon (0-30 cm) of reclaimed plots relative to deeper horizons and also when compared with the surface horizon of non-reclaimed soil, thereby revealing the cumulative effect of three decades of PG applications.

The effect of a continuous application of PG was studied by analysing soils and tomato fruits from six commercial farms with different cumulative rates of PG applied. Cadmium concentrations in tomatoes, which were one order of magnitude higher than those found in tomatoes from other areas in South Spain, were positively correlated with  $^{226}\text{Ra}$ -concentration in soils, which can be considered an accurate index of the cumulative PG rate of each farm.

**\*On behalf of the Applied Nuclear Physics Group, University of Sevilla**