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**Cobalt in Soils
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This short article aims to explain the importance of cobalt in soils, concentrating on European Soils for which more information is currently available.

How much Cobalt is in European Soils?

The average Cobalt (Co) concentration in European soils is between 1- 20 mg/kg of Co (i.e. 1 – 20 mg of Co per kg of soil) dry weight, although this can become much higher in areas which are geologically rich in Co such as North Wales. For example, Paveley (1998) found natural levels of Co at over 2,500 mg/kg dry weight in soil. The study noted that the area had a totally healthy eco-system which had adapted to these naturally high concentrations. Maps of total Co and other metals in European Soils can be found on the FOREGS website (<http://www.gsf.fi/publ/foregsatlas/index.php>).

The majority of Co in the soil is not bioavailable. Co forms stable carbonate and hydroxide minerals which cannot be absorbed by the animal or plant life (Perez-Espinosa et al, 2004). Consequently, a very large amount of Co would have to be introduced into a volume of soil before local wildlife could be adversely affected.

How does Cobalt get into the Soil?

Cobalt occurs naturally in soils through two major pathways: the breakdown of organic matter which contains Vitamin B12, and the weathering of the local geology into soil particles. Mankind also adds Co to the soil, primarily through three mechanisms. The major mechanism is use of Co salts, e.g. Cobalt sulphate, as a feed additive to keep cattle and crops healthy in areas where there is not enough natural bioavailable Co. Smaller amounts of Co also enter the soil from the air transport of particulate emissions and application of sewage sludge onto fields.

Why is Cobalt added to some soils?

Due to the problems associated with Cobalt deficiency in agricultural soils, the behaviour of Co entering, and within, soils has been studied for a number of years. A lack of Co in a form which plants or earth dwelling organisms are able to absorb can have major effects on the health of the wildlife in an area. A classic example of this is the “Nova Scotia Moose Mystery” (Frank et al, 2004) where moose in Eastern North America were observed to have a wasting debilitating disease. It was found to be related to inadequate levels of bioavailable Co in their diet. The authors concluded

that Co salt licks should be introduced in limited areas of Nova Scotia to balance the moose's diet and restore them to health.

Bioavailable Co in soil is also necessary for healthy functioning of some plants. This is especially true for leguminous plants, Co being an essential nutrient for the micro-organisms which fix atmospheric nitrogen in the plants root nodules (Gad, 2002).

References and Further Reading.

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