North Wyke Farm Platform

Case study no. 15

Soil Selenium profiles across the farm platform and correlating with forage content

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Soil Se bioavailability determines Se forage concentrations. Livestock depend on forage for adequate nutrition including macro and micro minerals such as Se, which supports a healthy immune system and is vital for metabolic processes. Forage Se deficiency can cause nutritional muscular dystrophy in sheep and cattle (Figure 1).

Selenium (Se) exists in different fractions within soil. A soluble and an exchangeable fraction which are both available to plants; a bound fraction associated with hydrolysable organic matter, iron, aluminium and manganese oxides, which is not readily available to plants. Finally, there is a residual fraction of elemental and insoluble Se which is also unavailable.

This project investigated the fractions of soil Se and total forage Se concentrations across the Farm Platform to determine: (1) a difference between pasture treatments, (2) correlations between soil fraction and forage Se concentrations and (3) the spatial variability of Se concentrations across one field from each treatment.

Soil Se fractionation was achieved by sequential extraction using: HNO_3, KCl, and KH_2PO_4. Soil and forage were digested using HNO_3, H_2O_2, HCl on a hot plate before dilution to measure total Se. Analysis used hydride generation atomic fluorescence spectrometry (HG-AFS).

No significant differences were found between farm platform pasture treatments ($P=0.064$). Positive correlations were found between total ($P<0.05$) and exchangeable soil Se ($P<0.01$) and forage Se concentrations. There was high infield variability in the forage and soluble Se concentrations due to localised controls such as pH, redox potential and organic matter.