

## Extracellular Enzymes as Promising Soil Health Indicators: Assessing Response to Different Land Uses Using Long-Term Experiments

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**Abstract :** Extracellular enzymes play a key role in soil organic carbon (SOC) decomposition and nutrient cycling and are known indicators for soil health; however, it is not understood how these enzymes respond to different land uses and their relationships to other soil properties have not been extensively reviewed. The relationships among the activities of three soil enzymes:  $\beta$ -glucosaminidase (NAG), phosphomonoesterase (PHO) and  $\beta$ -glucosidase (GLU), were examined. The impact of soil organic amendments, soil types and land management on soil enzyme activities were reviewed, and it was hypothesized that soils with increased SOC have increased enzyme activity. Long-term experiments at Rothamsted Research Woburn and Harpenden sites in the UK were used to evaluate how different management practices affect enzyme activity involved in carbon (C) and nitrogen (N) cycling in the soil. Samples were collected from soils with different organic treatments such as straw, farmyard manure (FYM), compost additions, cover crops and permanent grass cover to assess whether SOC can be linked with increased levels of enzymatic activity and what influence, if any, enzymatic activity has on total C and N in the soil. Investigating the interactions of important enzymes with soil characteristics and SOC can help to better understand the health of soils. Studies on long-term experiments with known histories and large datasets can better help with this. SOC tends to decrease during land use changes from natural ecosystems to agricultural systems; therefore, it is imperative that agricultural lands find ways to increase and/or maintain SOC in the soil.

**Keywords :** biological soil health indicators, extracellular enzymes, soil health, soil, microbiology

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