

## **Soil Carbon Stocks - using soil subgroup classification to derive pedotransfer functions for the calculation of soil bulk density.**

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To understand soil organic matter functioning, robust information is needed. Whether this is at the plot or the national scale, baseline data is required to document and evaluate any change over time.

In 2014 Teagasc released a new national soil map and associated database (Irish Soil Information System). This map utilised a novel approach at the national scale of combining predictive mapping techniques with traditional soil survey for validation of the map product. In addition to the map product, 225 soil pits were described in detail and samples analysed down to a depth of 1 m. The analyses included; pH, C:N, OC, CEC, Base Saturation, Fe/Al (oxalate, dithionite and pyrophosphate extractions), texture, bulk density, Microbial biomass C, Multiple Substrate Induced Respiration, Phospholipid Fatty Acids (PLFA) and Nematodes.

In addition to the 225 soil pits described by this project, this project has an archive database of over 500 soil profile pits for which soil carbon data and associated parameters are available with the exception of bulk density. Bulk density and consequently coarse fractions are crucial to defining clearly the amount of carbon present in a given area (carbon stock). To account for this, pedotransfer functions have been developed using known bulk density, carbon and texture values from the 225 soil pits surveyed in ISIS for the various horizon types found in Irish soils (i.e. Oh, Ap, E, Bs, Bt, BC etc). Using the soil carbon data and texture content from the archive database, we have applied this series of pedotransfer functions to calculate bulk density for typical horizon types, thereby allowing the calculation of a carbon stock by horizon.

Soil is classified in Ireland, using a three-tiered approach; 1) Great Groups define the arrangement of soil horizons, 2) subgroups account for diagnostic features which are often related to the management of a soil and 3) soil series further defines the texture and parent material of a soil subgroup.

This paper will classify soils to subgroup level and will apply the C stock values for the specific arrangement of horizons that represent a particular soil subgroup. To do this pedotransfer functions were calculated at horizon level across all samples and then aggregated into the pedotransfer functions for the arrangement of horizons at a particular subgroup level.

A final validation will be performed using an additional 27 soil pits from the archive, which had bulk density data.