A simple procedure for estimating soil porosity

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Soil degradation from mismanagement is of international concern. Simple, accessible tools for rapidly assessing impacts of soil management are required. Soil structure is a key component of soil quality and porosity is a useful indicator of structure. We outline a version of a procedure described by Piwowarczyk et al. (2011) used to estimate porosity of samples taken during a soil quality survey of 38 sites across Ireland as part of the Government funded SQUARE (Soil Quality Assessment Research) project. This required intact core (r = 2.5 cm, H = 5cm) samples taken at 5-10 cm and 10-20 cm depth, to be covered with muslin cloth at one end and secured with a jubilee clip. Samples were saturated in sealable water tanks for $\approx$ 64 hours, then allowed to drain by gravity for 24 hours, at which point Field Capacity (F.C.) was assumed to have been reached, followed by oven drying with weight determined at each stage. This allowed the calculation of bulk density and the estimation of water content at saturation and following gravitational drainage, thus total and functional porosity. The assumption that F.C. was reached following 24 hours of gravitational drainage was based on the Soil Moisture Deficit model used in Ireland to predict when soils are potentially vulnerable to structural damage and used nationally as a management tool. Preliminary results indicate moderately strong, negative correlations between estimated total porosity at 5-10 cm and 10-20 cm depth (rs = -0.7, P < 0.01 in both cases) and soil quality scores of the Visual Evaluation of Soil Structure (VESS) method which was conducted at each survey site. Estimated functional porosity at 5-10 cm depth was found to moderately, negatively correlate with VESS scores (rs = - 0.5, P < 0.05). This simple procedure requires inexpensive equipment and appears useful in indicating porosity of a large quantity of samples taken at numerous sites or if done periodically, temporal changes in porosity at a field scale, indicating the impacts of soil management.

Reference

Piwowarczyk, A., Giuliani, G. & Holden, N.M. 2011. Can soil moisture deficit be used to forecast when soils are at high risk of damage owing to grazing animals? Soil Use and Management, 27, 255-263.