

The Relationship Between Earthworm Biomass and Soil Structure on the NWFP

University of Reading, MSc Environmental Management and MSc Environmental Pollution Field Trip, March 2017.
University of Reading: Tom Sizmur.
Rothamsted Research: Jennifer Dungait.

Earthworms are the most abundant animal, by biomass, in most soils and benefit agriculture by providing several ecosystem functions and services. One function provided by earthworms is the improvement of soil structure which, in turn, may increase plant root establishment, increase water infiltration and prevent soil erosion.

A group of 8 MSc students had a tour of the NWFP, then divided into 2 groups and set about monitoring the 'soil health' on fields representing each of the 3 treatments:

- Burrows (permanent pasture)
- Dairy South (increased use of legumes)
- Great Field (high sugar grasses)

In each field the students selected four locations (2 per group) to assess the earthworm population and the structure of the soil (Figure 1A). Earthworm populations were assessed by excavating a 20cm³ soil sample and sorting to find all earthworms (Figure 1B), which were identified and then weighed using a 2-place field balance. The structure of the soil was assessed using the semi-quantitative 'Visual Evaluation of Soil Structure' method (Figure 1C) which involved assigning a score from 1 to 5 (in order of decreasing soil quality).

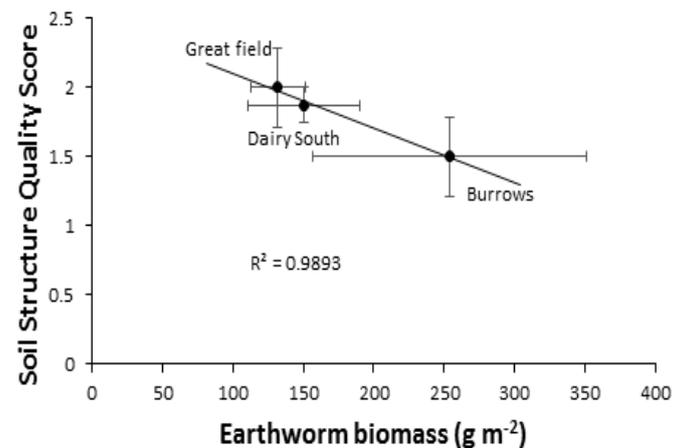
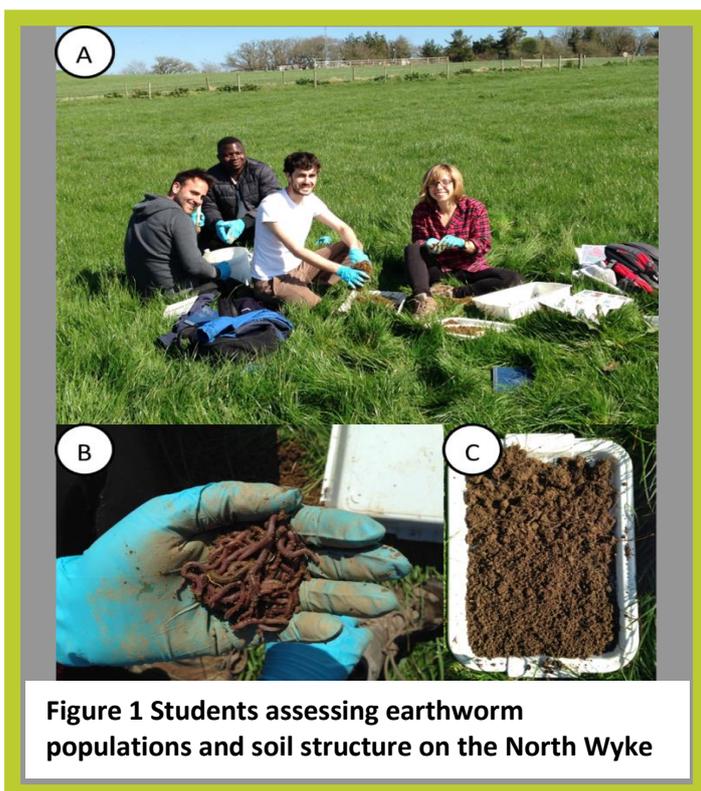


Figure 2 The relationship between earthworm biomass and soil structure on three fields on the NWFP

The lowest earthworm biomass and the highest Soil Structure Quality Scores (indicating the poorest soil structure) was observed in Great field (Figure 2) which was subjected to frequent reseeding with high sugar grasses. These soil properties may result from the disturbance associated with the re-seeding activities. The greatest earthworm biomass and the lowest Soil Structure Quality Scores (indicating the best soil structure) was observed on Burrows field (Figure 2). The greater soil biological and structural 'health' of Burrows field may be because it receives less disturbance and the quantity of root exudates and litter entering the soil (which provide energy for earthworm growth) is greater than in Dairy South due to faster plant growth resulting from inorganic nitrogen fertilisation. We cannot, of course, discount any differences that existed between the fields before the treatments were applied.

There was a correlation between the Soil Structure Quality Scores and the earthworm biomass across the three field sampled (Figure 2) which indicates that these two 'soil health indicators' may be related. Earthworms may improve soil structure by creating burrows and by depositing casts in the soil. However, this correlation does not necessarily imply causation, since both 'indicators' could be a result of greater root growth, exploration and exudation by the grassland plants.