How farmers can enhance soil life.

Dr Liz Stockdale from The University of Newcastle visited the south west in March for three events focusing on soil biology and how farmers can enhance their soil life. The College's SWARM Hub team attended the events in Ponsanooth, Cornwall and Rattery, Devon and summarize the key points to come out of the visits.

The purpose of the Natural England funded project was to bring together current scientific knowledge about soil biology and to record what farmers are doing out in the field. The main take home message was that all soil is unique; it is a result of 12,000 years of interaction between the parent material (aspects underneath the soil) and factors from above (e.g. climate). It is the mixing of the climate and the geology in the middle (in the soil) that creates a unique specialist ecosystem that is alive and interactive.

Dr Stockdale went on to discuss some finer details about soil life. Soil is very species rich, and the classification and identification of all the populations present is by no means complete. In one jam jar of soil, there is somewhere between 1-100 000,000,000,000 (trillion) bacteria, over 10km of fungal hyphae, a few thousand nematodes and tens of thousands of single celled protozoa, as well as the visible organisms including earthworms, insects, small vertebrates and plants.

Within day to day running of farms, it is easy to focus too heavily on the above ground management, and neglect the below ground factors. As all these organisms grow, eat, and move their way through the soil, they perform a vast array of functions. Beneficial microbes decompose available organic matter including manure and plant residues; fix atmospheric nitrogen and solubilise soil minerals into plant available form; store and recycle soil nutrients; enhance soil aggregation; build soil organic matter and increase nutrient and moisture retention to name but a few.

In order to determine the potential size of the microbial population in any location, three sets of factors need to be considered. Firstly, the limiting factors that cannot be changed by management practises, and could include soil texture (which sets the surface area of the soil), depth, parent material and mineralogy. There are then a set of defining factors (the attainable level), which include aspects such as climate, litter quality and net primary productivity. The farmer has slightly more control over some of these. Finally there are a range of management-related factors such as crop selection, organic matter inputs, soil management and water balance, all that can be controlled by management.

Soil structure is driven by the biological composition that helps to add and stabilise the structure. There are simple things to look out for to see if your soil is a good place for species to live, and this starts by simply going into a field, digging a hole and subtracting a sample. A depth of 30cm is useful as this is the main zone of biological activity. From a wedge of soil it is possible to assess soil texture, and structure, as well as seeing whether this will help or hinder the microbial populations.

A large number of farmers who attended the events brought along soil samples, and having discussed the varying types of organisms that are present in the soil, it was time to try and relate this information to the wide range of samples present. Samples ranged from soils taken from permanent pasture that had not been cultivated since the 1980s to soil from fields that were growing harsher and hungrier crops that had been frequently cultivated. It was interesting for the participants to compare their soils to those of neighbours and to relate the issues raised by Dr Stockdale to practical examples.

On a farm level, it is about making your farm and soil management practises count. General guidance for maintaining a good soil biota would include minimising tillage activities, increasing inputs of organic matter, and varying crops in rotation. At the farm scale, the scientists understanding of the impacts of soil quality is incomplete, and where it does exist it is fairly sketchy. However, there is increased evidence that increasing inputs of organic matter and reducing tillage act together to promote increased biological activity. There is some indication that resilience to extreme weather events may be increased as a result. Increased organic matter inputs to maintain good baseline activities will help increase resilience to tillage disturbance even in aggressive operations such as those involved in growing potatoes.