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Assessment of SOIL Quality Using a BIOindicator (SoilBio)

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Assessment of SOIL Quality Using a BIOindicator (SoilBio)

- Objective, is to develop a novel test that combines biological (DNA), chemical and physical measures of soil to provide a measure of soil quality across the UK and internationally, relevant to all crops.
- Three year project 2016-2018
- c. 6,000 soil samples





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Soil Quality


- There is no single definition of soil quality.
- Ability of soil to perform ecological services or functions** essential to people and the environment.
 - e.g. sustaining plant and animal productivity, maintaining or enhancing water and air quality, and supporting human health and habitation

“Upon this handful of soil our survival depends. Husband it and it will grow our food, our fuel and our shelter and surround us with beauty. Abuse it and the soil will collapse and die taking man with it” Hindu Sanskrit literature 2000 BC

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What should be considered in a soil health plan?

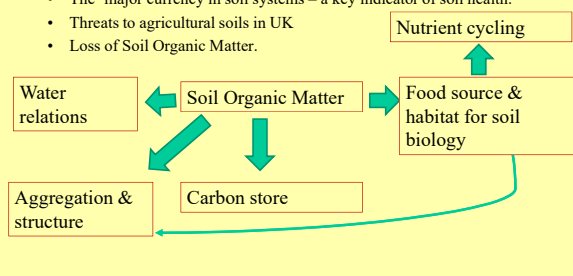
How should a whole-farm soil management plan approach be developed that can support managing soil health and monitor progress?



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Potential Indicators - Soil Organic Matter?

- The majority of soil functions are driven by biological processes, underpinned by SOM decomposition.
- The 'major currency in soil systems – a key indicator of soil health.
- Threats to agricultural soils in UK
- Loss of Soil Organic Matter.



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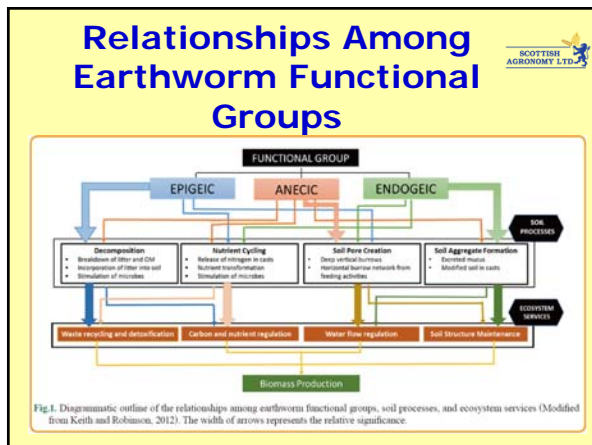
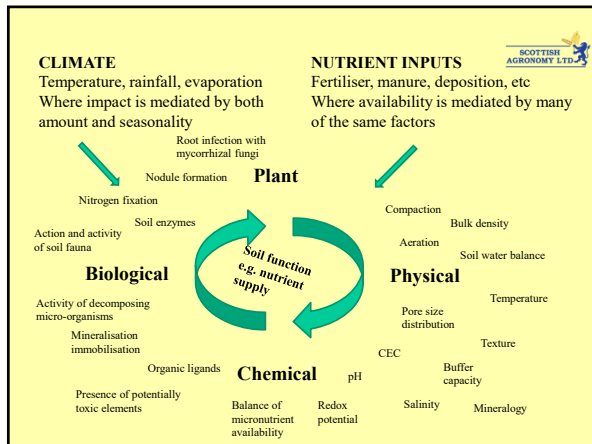
Soil Organic Matters

Nutrient Cycling

- Increases nutrient holding capacity
- Builds nutrient pools
- Chelates nutrients (reduces P sorption)
- Feeds organisms that release nutrients

Water dynamics

- Improves infiltration
- Decreases evaporation
- Increases water holding capacity
- Improves drought resistance

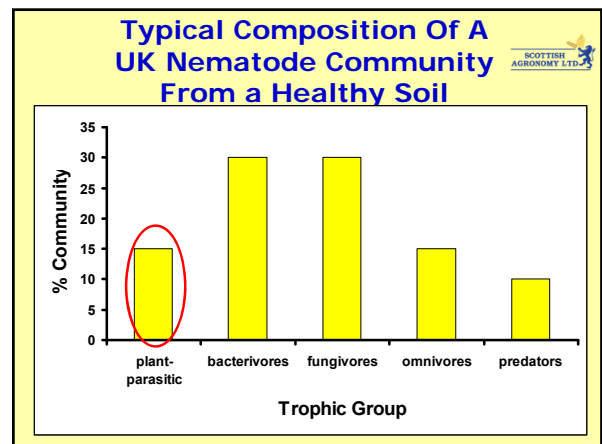


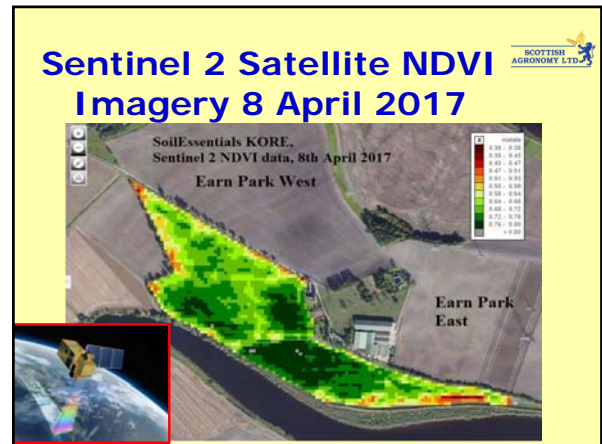
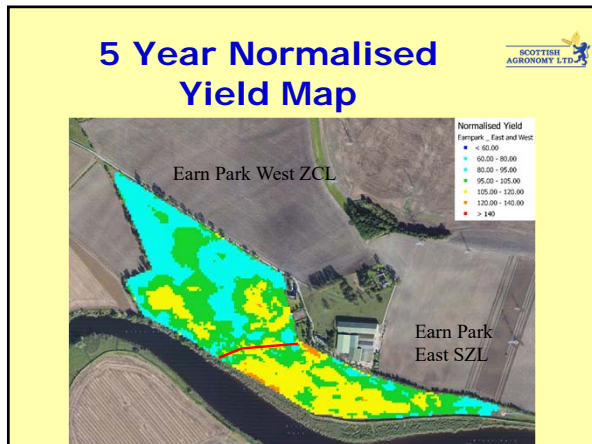
Nematodes

- Nematodes are the most abundant Metazoan on earth and unlike commonly used biological indicators such as plants, butterflies and birds, *nematodes* occur in every habitat.
- Nematodes* can also be classified into different trophic groups which can be a proxy measure of their function in soil.

Benefits of Using Nematodes as Bioindicators

- Abundance
- High species richness
- Range of trophic groups
- Tolerance sensitivity range
- Low mobility
- Cycle life times
- Conservative reproduction strategies
- Interstitial mode of life





Soil Biological Properties, Soil Quality

- While the chemistry (and physics) of the soil system provides the context. . . it is the **soil biota which is adaptive to changes in environmental circumstances.**
- Under conditions of change, **biological indicators form an integral component in soil health assessment, since, by virtue, they involve complex adaptive systems** (i.e. the biota) by integrating key soil processes in ways that other indicators do not.

Direct Value of Using Nematodes as Bioindicators

- SoilBio is a research-led solution to measuring soil quality that can potentially inform national strategies and policy.

Acknowledgments

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