

Duxford Monitor Farm

Meeting Title: Soils and rooting

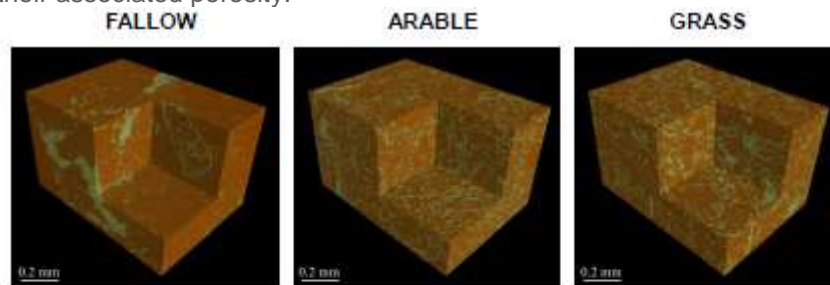
Date: 15 November 2019

Speakers: Karl Ritz (University of Nottingham), Liz Stockdale (NIAB)



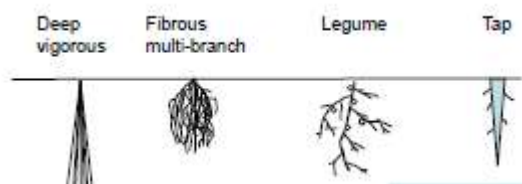
Rooting and soil structure Karl Ritz

- Aim is to have a diversity of space and pores, so you can have air and water in the same space.
- Biology and soil dynamics is “like being in a kindergarten” – moving, gluing, painting, eating, sewing!
- Think about soil as **architecture** - the spatial relationship of organisms with the space around them – organisms below ground and their living space.
- The more plants that you have in your soil system = the more porosity. Different plants have different effects on porosity.
- Fungus creates much more porosity than bacteria – life will only grow where it has roots to grow – “proliferation is where the food is”
- The CT scanning technology at the University of Nottingham has allowed this to be visualised and interpreted further. Below is an example of soil structure at the aggregate scale in three different situations and their associated porosity:



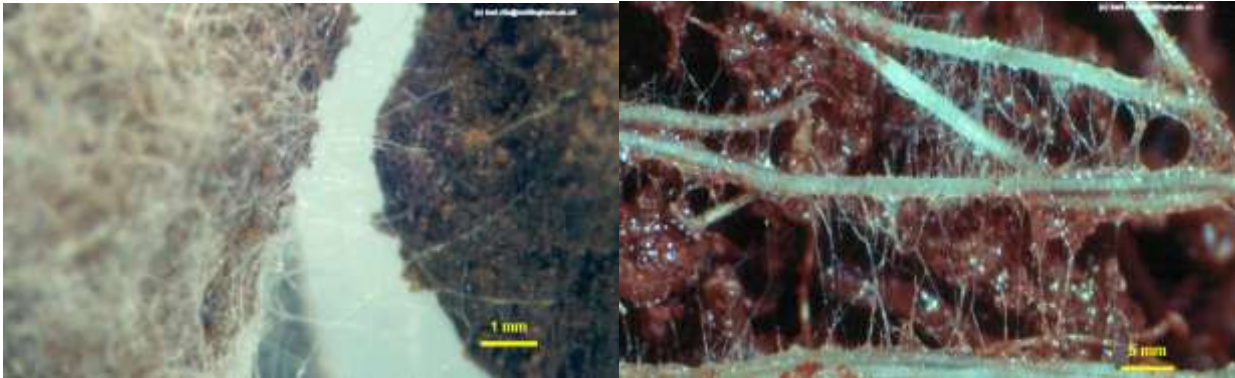
| Treatment | Porosity |
|-----------|-------------|
| Fallow | 15.0 ± 1.08 |
| Arable | 23.4 ± 0.94 |
| Grass | 31.1 ± 0.94 |

- In order to encourage fungi:
 - Disturb the soil as little as possible in order to encourage the mycelium
 - Provide a substrate for the soil biology
- Think about the root morphology of different cover crop species and the impact of that on relieving compaction:



Take-home messages

- Soil structure is fundamental to soil functioning
- Think about using plants as a management tool for your system – “solar powered soil management”



Further information

- For more information on the effect of cultivation strategies on crop rooting at the Strategic Cereal Farm – West, see ahdb.org.uk/farm-excellence/squabhall
 - [Crop rooting trial overview: Strategic Cereal Farm – West](#)

AHDB Soil health scorecard Liz Stockdale

- When assessing soils, you need to look at all three areas: biological, chemical and physical. Putting this all together means that when carrying out sampling in the future, it might mean a different approach, so that all three areas can be tested. This is being trialled and will be available through the new AHDB soil health scorecard – details can be found below.
- The results of the soil health scorecard taken by the group at this Monitor Farm meeting and the interpretation can be seen below:

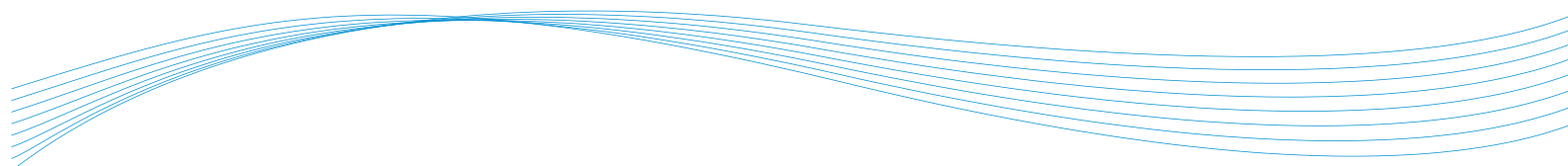
| East = rainfall region | | Site characteristics | | Physical | Chemical | | | | Biological | | |
|------------------------|-------------------------|----------------------|--------------------|----------|----------|------|------|------|------------|-----|-----------|
| | | Rotational cropping | Soil texture class | VES | pH | P | K | Mg | Earthworms | DM | CO2 burst |
| Site 1 | Barn Field A - Headland | Combinable crops | Heavy, calcareous | 4 | 8.3 | 12.8 | 89.4 | 26.7 | 2 | 3.5 | 46 |
| Site 2 | Barn Field B | Combinable crops | Heavy, calcareous | 3 | 8.4 | 17.6 | 148 | 28.1 | 5 | 4.1 | 53 |
| Site 3 | Base A | Combinable crops | Heavy, calcareous | 3 | 8.4 | 16.2 | 150 | 25.2 | 1 | 4 | 57 |
| Site 4 | Base B (Headland) | Combinable crops | Heavy, calcareous | 4 | 8.3 | 22.2 | 167 | 27.1 | 0 | 4.3 | 64 |
| Site 5 | DW 1A | Combinable crops | Heavy, calcareous | 2 | 8.4 | 11.4 | 162 | 32.2 | 2 | 3.8 | 51 |
| Site 6 | DW 1B | Combinable crops | Heavy, calcareous | 2 | 8.4 | 12 | 142 | 24 | 2 | 3.4 | 48 |
| Site 7 | DW 2A (Thriplo | Combinable crops | Heavy, calcareous | 1 | 8.2 | 10.8 | 185 | 40.3 | 4 | 4.1 | 69 |
| Site 8 | DW 1B | Combnable crops | Heavy, calcareous | 2 | 8.4 | 9 | 174 | 39.7 | 7 | 3.8 | 64 |

‘Green’ – no action required; ‘Amber’ – monitor (perhaps a bit more frequently than planned); ‘Red’ – investigate. A red traffic light doesn’t necessarily mean soil health is poor, rather it indicates that further investigation is required to understand why a particular property has been highlighted (which may mean repeat testing with a more detailed sampling scheme).

| | |
|---------------------------------|--|
| Soil structure | Visual Assessment of Soil Structure (VESS) shows a clear distinction between the two farms. Note that observations were made in fields with active cover crops at DW (Thriplow Farms). In this soil type maintaining/improving soil structure where there is regular cultivation and trafficking is difficult. Note the comparisons between the field and headland. Such local comparisons with an area known to be poor (e.g. gateway) and likely to be good (e.g. hedge bottom) can help to understand the structural range of the particular soil type. Assess regularly and especially after cultivation or trafficking in wet conditions. |
| pH | These soils are naturally high in pH because of the calcareous parent material. In high pH soils, trace mineral deficiencies including manganese, zinc and copper are aggravated as a result of the high pH soils. The availability of other nutrients such as P, K and Mg may also be reduced due to high Ca concentrations in calcareous soils. Monitor crops for trace element deficiencies; foliar feeds will be more effective than soil applications in these naturally high pH soils |
| P - phosphorus | Moderate P levels. Have you seen evidence of poor crop establishment / growth? There may be response in yield / quality where P applications are targeted together with nitrogen in early spring. Consider building the soil reserve. Higher P seen in headland may be a result of less crop offtake of P applied. |
| K - potassium | There may be no response of the current crop to a K-containing manure/ fertiliser but K is removed in crops so it is important to monitor the soil reserve. This soil may naturally maintain a steady supply K from the clays in the parent material. |
| Mg - magnesium | Moderate Mg reserve status. You may see a response to Mg-containing fertiliser. |
| Earthworms | Often the main factors affecting earthworm numbers and diversity are built in to the crop rotation. Can you reduce tillage intensity in some / all rotational phases? Can you leave more surface litter / crop residues after harvest? Can you increase organic matter inputs? If you want to get to know more about your earthworms, then look at the earthworm species present and the balance between |
| Organic matter | Lower than average for the climate/soil type; may be associated with intensive cropping rotations with few organic matter inputs in the medium/long-term. In this region, the threshold OM% set looking at the ranges seen is 4.5% on heavy soils. |
| Biological activity (CO2 burst) | CO2-burst assesses the potential microbial activity in the soil. Benchmarks are currently under review as part of the SBSH Partnership but here the benchmarks are given in comparison to 'typical' levels for the soil type. Both measures are roughly related to OM; it is known that sites with higher OM tend to have higher microbial activity - the most interesting thing to watch for is sites that don't show this pattern. We are noting that calcareous soils seem to give slightly lower values than soils of similar textures that are non-calcareous. |

Further information

- [Using the soil health scorecard case studies](#)
- [Soil health and biology partnership \(91140002\)Testing soil health](#)
- [Soil assessment methods](#)
- More information from the GREATsoils programme can be found at ahdb.org.uk/greatsoils



AHDB resources

- Understand your business costs with AHDB's benchmarking tool Farmbench at ahdb.org.uk/farmbench
- Monitoring tools are available at ahdb.org.uk/tools
- Sign up to market information and research newsletters at ahdb.org.uk/keeping-in-touch
- Find out what's going on at other Monitor Farms and Strategic Farms at ahdb.org.uk/farm-excellence
- All AHDB events can be found at ahdb.org.uk/events
- For guidance on how Brexit will impact your business, see ahdb.org.uk/brexit

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