

Soil analysis and Management

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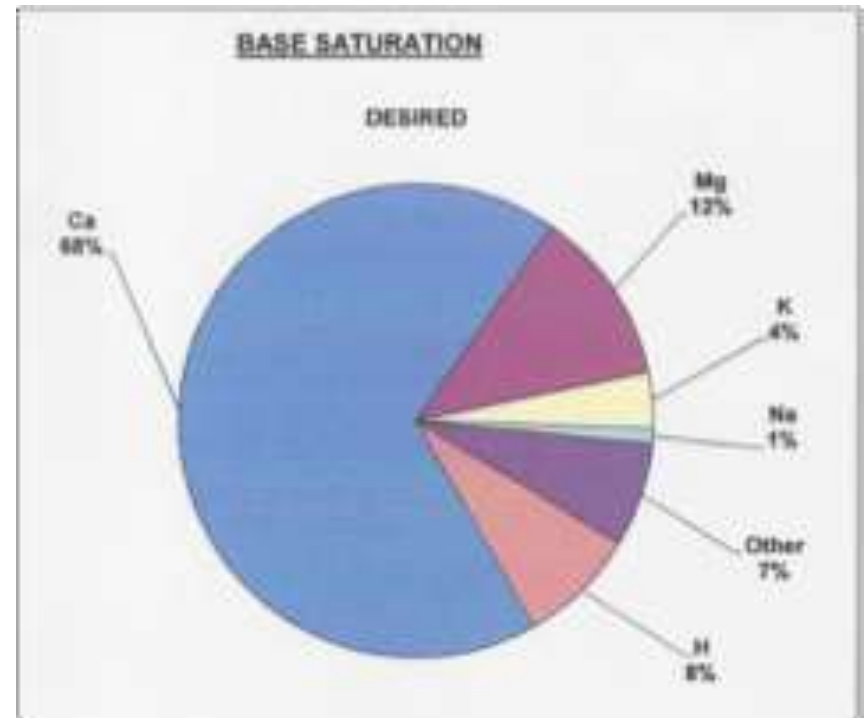


UK experience

- Farmers reluctant – 10% analysing regularly?
- Current best practice –
 - targets one Index lower than conventional
 - Routine once per rotation
 - Same 2 sample fields every year, including SOM
- My observations, stable, some decline, low yields
- Interest in Albrecht but lack of evidence

Albrecht/Base Cation Saturation Ratio

- Key elements: soil structure and biological activity and correct nutrient balancing in order to optimise nutrient availability to the plant
- Optimum cation ratios are given as 65 - 85% Calcium, 6 - 12% Magnesium and 2 - 5 % Potassium.



Albrecht/BCSR

- Analysis includes the following:
- Organic Matter,
- Available and reserve Phosphorus,
- Exchangeable Potassium,
- Magnesium,
- Calcium
- Hydrogen,
- Soil pH (2 extracts),
- Cation Exchange Capacity,
- Percent Base Saturation of Cations
- Sodium,
- Nitrate Nitrogen,
- Sulphur,
- Trace elements: Zinc, Manganese, Iron, Copper, and Boron.

- Many also provide assessment of biological activity by the Solvita Respiration test and/or Potassium Permanganate test.

BCSR recommendations

- Rectifying any **soil structure** problems by soil aeration, subsoiling, deep rooting plants, gypsum and stimulating biological activity
- Considering **nutrient reserves**, particularly phosphate, when making recommendation for fertiliser use
- **Stimulating biological activity** if necessary e.g. by aeration or use of molasses
- Use of a much broader range and higher level of **inputs** than is typical of organic farming in the UK and place particular emphasis on the role of calcium.



BCSR inputs used in organic farming in the USA

- Chilean nitrate
- Molasses
- Humates
- Mycorrhiza inoculants
- Fungal inoculants
- Nitrogen fixing inoculants
- Rock phosphate
- Potassium Sulphate
- Kieserite
- Compost
- Trace elements
- Sulphur
- Gypsum
- Poultry manure

BCSR Validation

- Loddington, conventional
- Missouri, conventional/organic
- Oberacker, conventional



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Results from Missouri

- All Factors of Soil Health Are Changed By the Albrecht System
- Soil Biology-more Actinomycetes, mycorrhizae, bacteria, more available carbon for microbial food
- Soil Chemistry-more Ca, less Mg
- Soil Physical –greater Aggregate Stability
- Albrecht system leads to better water infiltration and holding capacity
- Improved crop and forage yield
- Improved crop and forage quality

What About Our Study? After Four Years of Albrecht Recommendations?

	?	Myco.	Fungi	Bacteria	Actinomycetes	PFLA?
Nonly	?	2950b	2616ab	28,992b	11,164b	9,561b?
Recom	?	514a	222b	2,989a	2,713a	108,247a?
Recom-Lime	?	3012b	3281a	30,254ab	11,801ab	100,911ab?
Recom-Lime+Mg		148ab	311b	30,624ab	10,306b	94,962b?
Recom+Mg	?	727b	3162a	27,164b	10,306b	100,766ab?
MicrosOnly	?	3043b	3220a	30,236ab	11,413ab	100,755ab?
PandKOnly	?	3026b	3365b	31,492ab	12,434a	109,99ab?

Soil Health Analysis

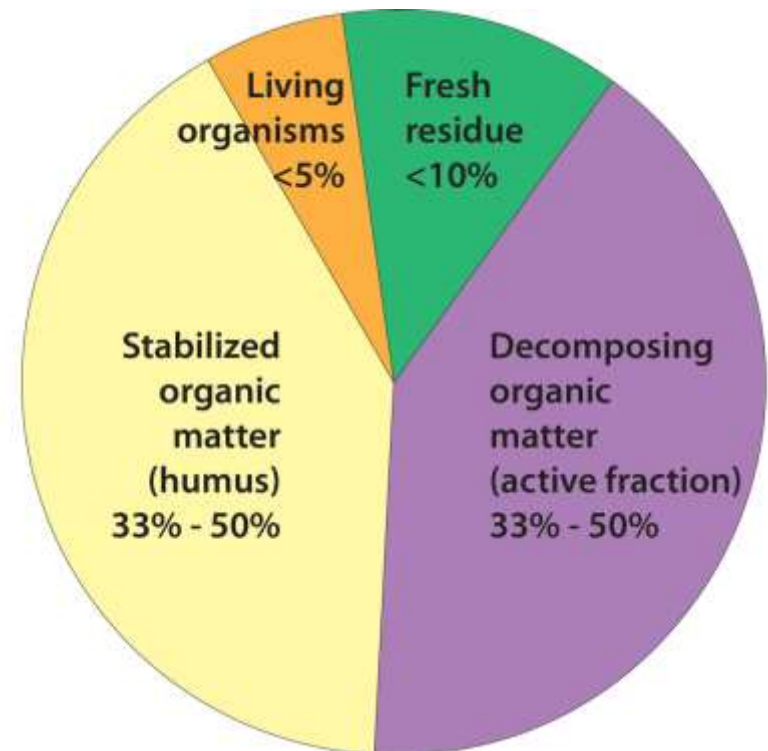
(Cornell, NRM, Haney)

- Physical:
 - Available Water Capacity
 - Surface Hardness
 - Subsurface Hardness
 - Aggregate Stability
- Biological
 - Organic Matter
 - Soil Respiration
 - (Soil Protein)
 - (Active Carbon)
- Chemical
 - pH, P, K, Mg
 - Trace elements: Mg, Fe, Mn, and Zn (Al, Ca, Na,)
- **Inform overall management rather than fertiliser inputs.**



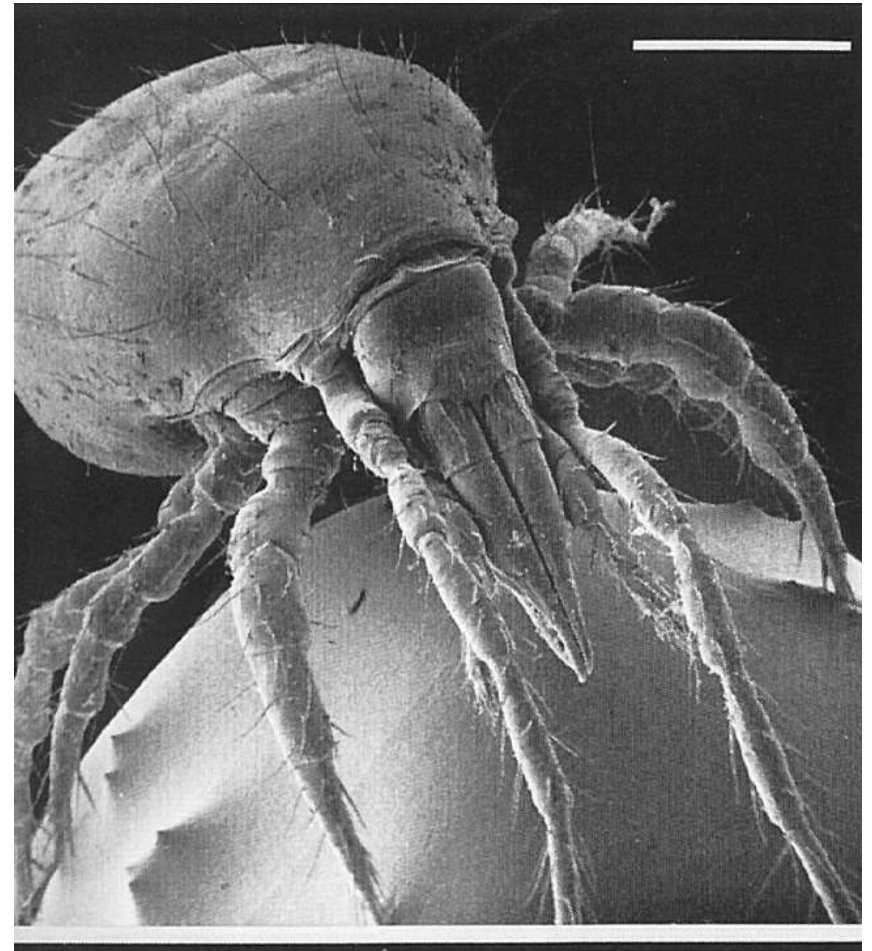
Soil Organic Matter analysis

- Loss on ignition – soil carbon – total organic matter
- **Potassium permanganate test**
 - Measures the labile carbon, the active carbon
 - Better indication of soil fertility than SOM



Soil Biology analysis

- Solvita respiration test.
(Carbon dioxide production on incubation)
- Soil Food Web
- DNA
- Earthworms



Conclusion 1: how should I monitor soil?

- As a minimum:
 - standard pH, P, K, Mg analysis all fields at least once a rotation at start of the ley/GM. Add S analysis on arable. Repeat analysis at end of ley if deficiencies.
 - Standard analysis plus active carbon/organic matter on 2+ representative fields every year
- Rectify any deficiencies: target 1 index lower than conventional RB209 recommendation
- Identify any local trace element deficiencies, monitor with rotation analysis and rectify as needed
- If you want to fine tune, particularly for high value cash crops and dairy consider Albrecht, but beware of the analysis cost and input costs – it will not be cost effective in all situations.
- Potential for plant tissue or sap analysis.
- **Dig, walk, look, smell**

Conclusion 2: what should I do?

- Get soil structure right
- Feed soil life with small quantities of manure and large quantities of green manures for energy/carbon and keep ground alive all year with plant roots
- Apply appropriate mineral fertilisers for pH and minerals
- Manage nitrogen:
 - Fix sufficient N; leys and green manures
 - Don't lose it; use cover crops for permanent ground cover
 - Manage C:N ratio
 - Apply manure or slurry to supply N at the right time