MONITOR FARM
Scotland

FARMER LED, FARMER DRIVEN

DEESIDE
Soil Special Report
August 2023

INTERACTIVE SOILS MEET AT MEIKLE MALDRON

12 members of the farming community attended this new soils' meeting at Duncan and Claire Morrison's Meikle Maldron farm, near Torphins in Deeside.

The gathering and topic was a suggestion by Duncan to understand more about the soil status on this upland farm.

- **Soil analysis** with Catriona McLean, SoilEssentials

- **Soil type, texture and structure** by Peter Beattie, Monitor Farms

- **Measuring and monitoring soil health** led by Nikki Yoxall, Pasture for Life

- With special thanks from **Vidacycle** for use of their **SoilMentor** app.

FARM FACTS

- **Meikle Maldron** sits at around 800'-1000'

- The soils are **humus-iron podzols** that are formed from granites and glaciers.

- They are naturally **acidic** and **mineral poor**.

- **The fields have a land capability score of 4.2**, indicating they are 'capable of producing a narrow range of crops, primarily on grassland with short arable breaks of forage crops'.

- The fields are in long-term grass, grazed by cattle.

Click on the icon for SoilMentor info

SOIL ANALYSIS, TEXTURE AND STRUCTURE

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Catriona McLean from **SoilEssentials** demonstrated how her team samples on a grid system to allow variable rate application of lime, based on pH results.

Meikle Maldron's fields are generally low in lime, naturally so because of the underlying soil type. **Phosphate** is on average low too and combined with the low pH can hinder re-establishment and regrowth of grass mixes.

Soil analysis is a starting point for improved soil fertility and grass growth.

However, **texture** has an impact on how soil holds on to nutrients and **structure** can influence the availability of nutrients to plants.

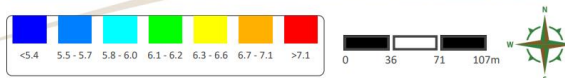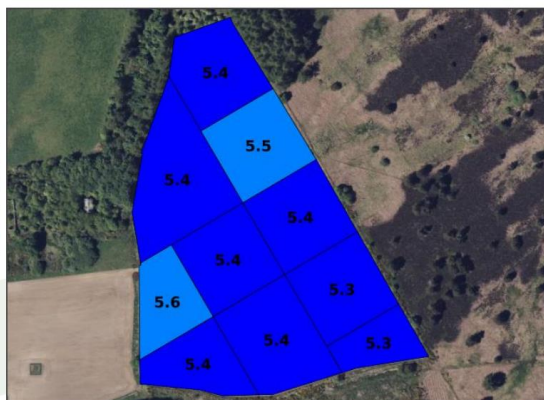The key tool to unlock your soil secrets is your **spade!**

The key soil senses are **sight**, **touch** and **smell!**

- We dug several soil pits, the breadth of a spade, down to the subsoil (where the soil colour becomes pale and the roots reduce significantly.

- Braeside Top's soil is a **sandy clay loam** texture (touch), with a **crumbly, friable** structure (sight) and a **fresh, organic** nose (smell).

- The topsoil was up to 25cm deep, with no obvious below surface compaction layers demonstrating the benefits of Duncan's regular rotation of stock and low machinery use.

- Bare soil, perhaps a result of low nutrient levels, does allow surface capping and increased run-off.
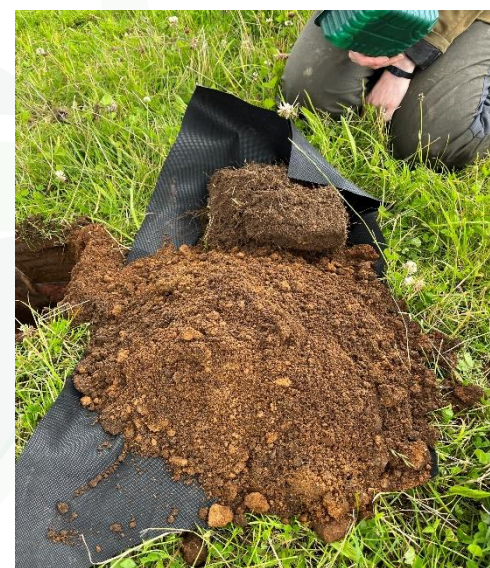
pH results

Field Name:	Braeside Top
Target pH:	6
Lime Type:	Calcium Lime
Sample Date:	07 Mar 2023

pH	Lime Req.	Area (ha)	Tonnes
5.3	7.0	0.87	6.1
5.4	6.0	3.73	22.4
5.5	5.0	0.57	2.9
5.6	4.0	0.42	1.7
Av pH	No. samples	Total	Total
5.5	10	5.59	33.0

| <5.4 | 5.5 - 5.7 | 5.8 - 6.0 | 6.1 - 6.2 | 6.3 - 6.6 | 6.7 - 7.1 | >7.1 |

0   36   71   107m

Routine results

| Field Name: | Braeside Top |
| Sample Date: | 16 Mar 2023 |

Phosphate (mg/l)   Potassium (mg/l)

Magnesium (mg/l)   Calcium (mg/l)

| Very Low | Low | Medium Low | Medium High | High | Very High |

0   85   170   256m

AHDB's GREATSOILS information on soil texture and structure are added below.

SOIL QUALITY AND SOILMENTOR

You *have* to get down and dirty to know your soils!

Nikki Yoxall from **Pasture for Life** broke apart the soils to demonstrate the healthy, organic glues that hold soil crumbs together.

Nikki broke the denser, rooty soil apart to look for **nodules**, the natural, nitrogen powerhouse of a sward.

The farmers then identified **rhizosheaths,** the soil particle coatings that cling to plant roots, making roots brown instead of white. They are a sign of good biological and microbial activity in the root zone.

Then Nikki challenged the farmers to find **earthworms**, highlighting two important types; small shallow and larger deep.

Nikki encouraged the group to estimate **root depth** and note **root structure**: asking if roots were clumped and limited by soil pans or seem to be able to reach down deep and uninterrupted.

Multi Species Swards (MSS)

Duncan is a big fan of **multi-species swards** which in the Meikle Maldron top fields comprise of perennial ryegrass, white clover, chicory and plantain. Chicory and plantain are deep rooting plants which help improve soil structure by breaking through soil pans and can bring up **nutrients** from deeper levels.

L-R: Chickory, Plantain, Clover and ryegrass showing typical root lengths in good soils.

Recording soils with the SoilMentor app.

It's easy to look at our soils and even measure key soil quality indicators. However, recording that information and using it to make decisions can be the challenge.

We introduced the SoilMentor app at the meeting. The app allows us to record soil information in the field, showing date, location and key measurements. We can then return to the same spots and record new information to show trends, improvements and challenges.

We're keen to trial its use with North East farmers. Contact **Peter Beattie** for more info.

Healthy grassland soils

How to assess soil structure

Step one: Surface assessment

Look at the quality of the sward to identify potentially damaged areas that require further assessment. Where the sward is moderate or poor, this may indicate that further investigation of the soil quality is required.

Good
- Sward intact
- No poaching
- Few wheelings

Moderate
- Surface poached
- Wheelings in places
- More weed species

Poor
- Surface capping
- Soil exposed
- Severe poaching
- Poor sward quality

Step two: Soil extraction

- Dig out one spade-sized block of soil (depth approx. 30 cm). Cut down on three sides and then lever the block out, leaving one side undisturbed
- Lay the soil block on a plastic sheet or tray

Tip: When starting out, it is useful to dig in an area where you know there may be a problem (e.g. a gateway) and get familiar with signs of soil structure damage.

Remember: Sample when the topsoil is moist – if the soil is too dry or too wet, it is difficult to distinguish signs of poor soil structure.

Step three: Soil assessment

Gently open the soil block like a book to break it up.

- If the structure is uniform – assess the block as a whole
- If there are two or more horizontal layers of differing structure, identify the layer with the poorest structure (the limiting layer)
- Carry out the rest of the assessment on this limiting layer

Limiting layer

Limiting layer

Moderate over **Good**   **Good** over **Poor**

Step four: Soil scoring

Break up the soil with your hands into smaller structural units or aggregates (soil clumps).

- Assign a score by matching what you see to the descriptions and photos overleaf
- A score of **1** or **2** is **Good**; a score of **3** is **Moderate** and **4** or **5** is **Poor** and requires management action
- Record the depth of the limiting layer to assess management options

Good
A score of **1** or **2**

Moderate
A score of **3**

Poor
A score of **4** or **5**

Place the top of the page level with the surface and assess the soil below (cm)

← 5
← 10
← 15
← 20
← 25

Score 1 – Crumbly (aggregates readily crumble with fingers)

Identification of structural problem e.g. limiting layer	Soil structure features	Description	Management options
	Small (<6 mm), rounded	Good soil structure Highly porous Numerous, well-distributed roots Sweet, earthy smell Small, rounded aggregates	Reassess after equipment crosses the ground, after grazing in wet conditions or every two years.

Score 2 – Intact (aggregates easily break apart)

Identification of structural problem e.g. limiting layer	Soil structure features	Description	Management options
	Rounded (10 mm)	Good soil structure Earthy smell Porous Some indication of larger aggregates Good root distribution	Reassess after equipment crosses the ground, after grazing in wet conditions or annually in spring.

Score 3 – Firm (most aggregates break down)

Identification of structural problem e.g. limiting layer	Soil structure features	Description	Management options
	Rounded (10 mm), but some are angular	Adequate soil structure Larger aggregates, some angular Moderate root distribution No strong smell Less visible pores	Consider infrastructure changes (e.g. back-fencing, multiple field entrances or tracks) to minimise traffic in marginal weather conditions.

Score 4 – Compact (effort needed to break down aggregates)

Identification of structural problem e.g. limiting layer	Soil structure features	Description	Management options
	Larger (>5 cm), angular	Large, angular aggregates (>5 cm across) with low pore numbers Some red/orange mottling may be present (sign of poor drainage) Roots clustered in large pores, worm channels and cracks between aggregates May have sulphur smell (i.e. bad eggs)	If soil structure is poor at a depth of less than 10 cm, use a sward slitter or aerator. If soil structure is poor at a depth of 10 cm or more, use a sward lifter or top-soiler. If the sward is poor, consider ploughing or reseeding.

Score 5 – Very compact (aggregates are compact, difficult to pull apart and platy)

Identification of structural problem e.g. limiting layer	Soil structure features	Description	Management options
	Large initially (>10 cm), angular	Very large, angular aggregates (>10 cm), with very few pores Any roots seen mainly at the surface or clustered down large pores or cracks May have grey colour with red/orange mottling (sign of poor drainage) May have strong sulphur smell (i.e. bad eggs)	If soil structure is poor at a depth of less than 10 cm, use a sward slitter or aerator. If soil structure is poor at a depth of 10 cm or more, use a sward lifter or top-soiler. If the sward is poor, consider ploughing or reseeding.

Based on the VESS method of soil structure assessment **www.sruc.ac.uk/vess**
See the *Healthy grassland soils pocketbook* for more information, available at **ahdb.org.uk**
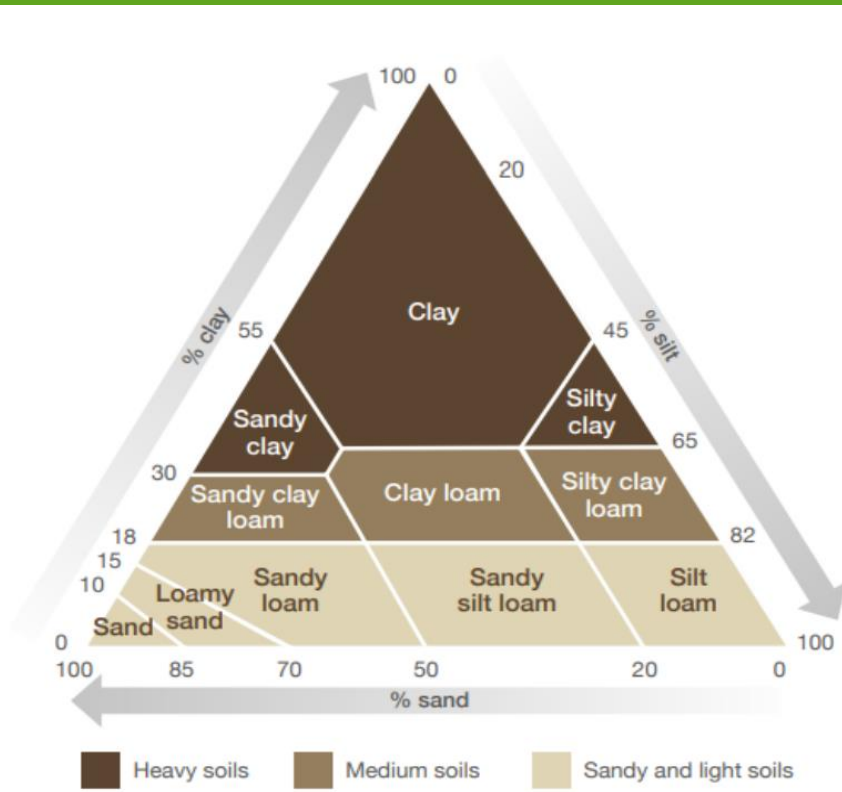
Figure 4a. Classification of mineral soils into soil texture classes

[1] Less than 50% sand in the mineral fraction
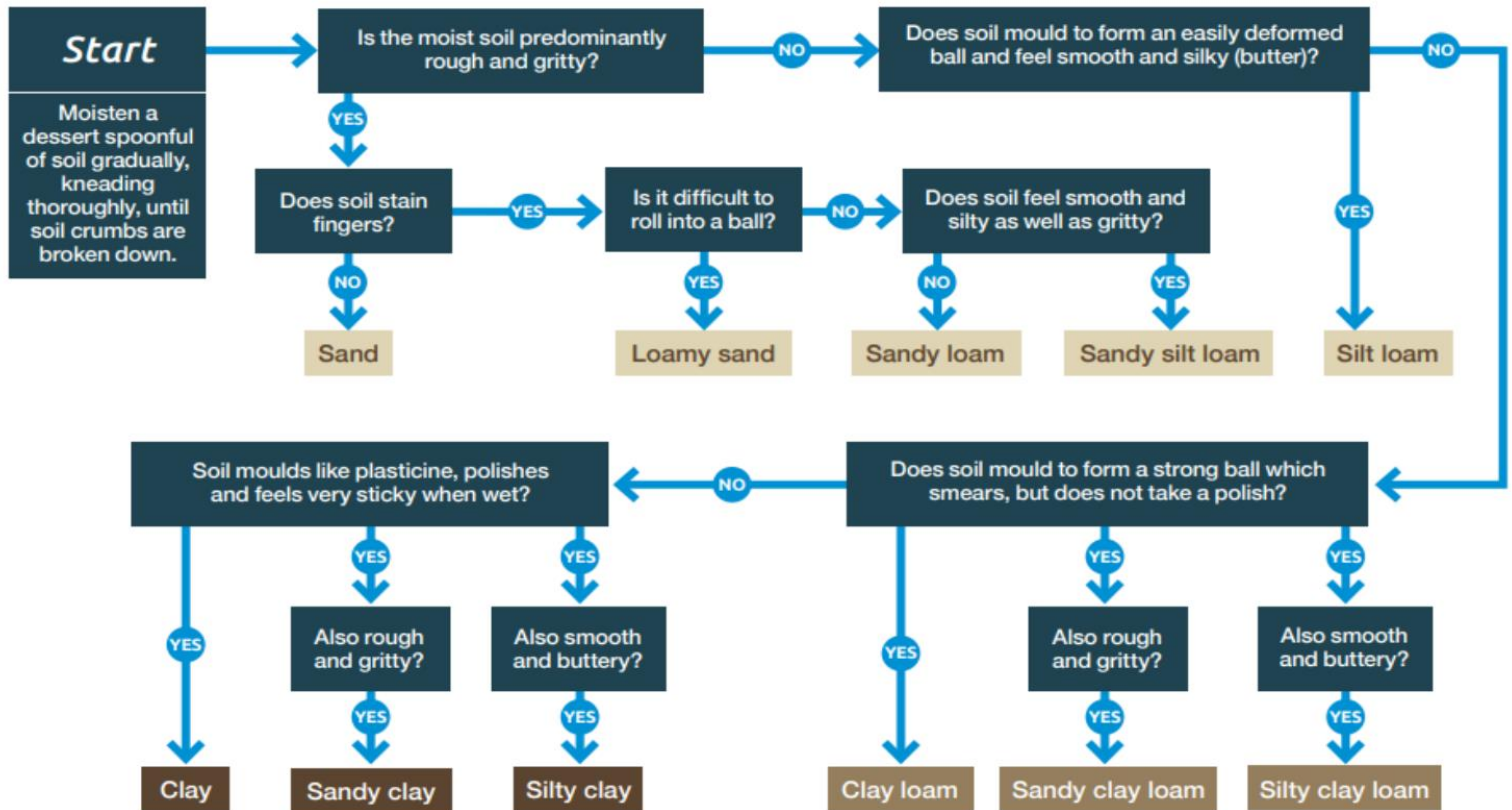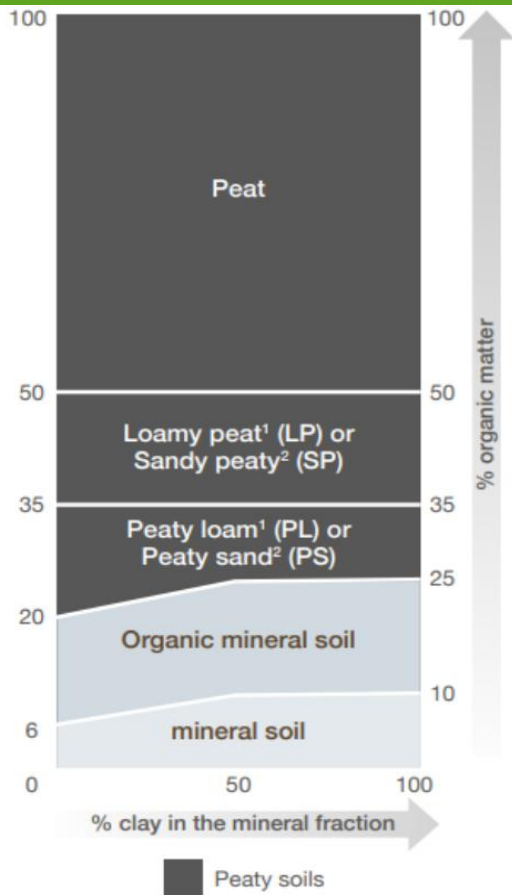[2] 50% sand or more in the mineral fraction

Figure 4b. Classification of mineral soils into soil texture classes

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To find out more or to sign up, please contact:

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