LAND USE *for* NET ZERO >>> HUB

On-Farm Soil Health Measuring & Assessing Initiatives

Workshop presentations by the AHDB, Soil Association Exchange, UKCEH and WRAP

13th June 2025

UK Research and Innovation

Department for Environment Food & Rural Affairs

Department for Energy Security & Net Zero

Llywodraeth Cymru Welsh Government

Scottish Government Riaghaltas na h-Alba

DAERA Department of Agriculture, Environment and Rural Affairs
An Roinn Talmhaíochta, Comhshaoil agus Gnóthaí Tuaithe
Depairtment o' Fairmin, Environment an' Kintra Matthers
www.daera-ni.gov.uk

Contents

Introduction

Soil assessment is an increasingly crowded space. A large and growing number of organisations are looking to influence or prescribe how farmers measure and assess their soil. This has the potential to lead to:

- Confusion among farmers – unsure of what approach to use, and for what purpose.
- Inconsistent data collection - for stakeholders looking to understand change and impact over time.
- Different interpretations of what a healthy soil is.

In 2024, the Sustainable Soils Alliance (SSA) with the support of stakeholders across the sector, carried out an extensive mapping exercise of the principal initiatives used to measure and assess on-farm soil health in the UK. This research included government policies, certification schemes and carbon calculators, and revealed that different metrics, methodologies, thresholds and terminology are used, generating inconsistent data and therefore different interpretations of soil health.

	Field name (Soil texture)			
	70 Acres (Medium stony)	Old Park (Light silt stony)	Rye Furlong (Medium stony)	Typhrees (Medium)
SOM (%)	4.2 (CM)	4 (CM)	3.9 (R)	3.7 (R)
pH	8.2 (R)	7.5 (R)	8 (R)	7.6 (R)
Ext. P (mg/L)	37 (CM)	48 (R)	56 (R)	28 (CM)
Ext. K (mg/L)	125 (CM)	151 (CM)	186 (CM)	97 (R)
Ext. Mg (mg/L)	28 (R)	47 (R)	32 (R)	29 (R)
PMN (mg/kg)	43 (CM)	107 (CM)	46 (CM)	99 (CM)
CO_2-burst (mg/kg)	66 (I)	159 (CM)	71 (I)	148 (CM)
VESS	2 (CM)	1 (CM)	1 (CM)	3 (R)
Earthworms	13 (CM)	12 (CM)	8 (CM)	29 (CM)

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Presentation 1:

AHDB soil health scorecard

Dr Amanda Bennett, AHDB

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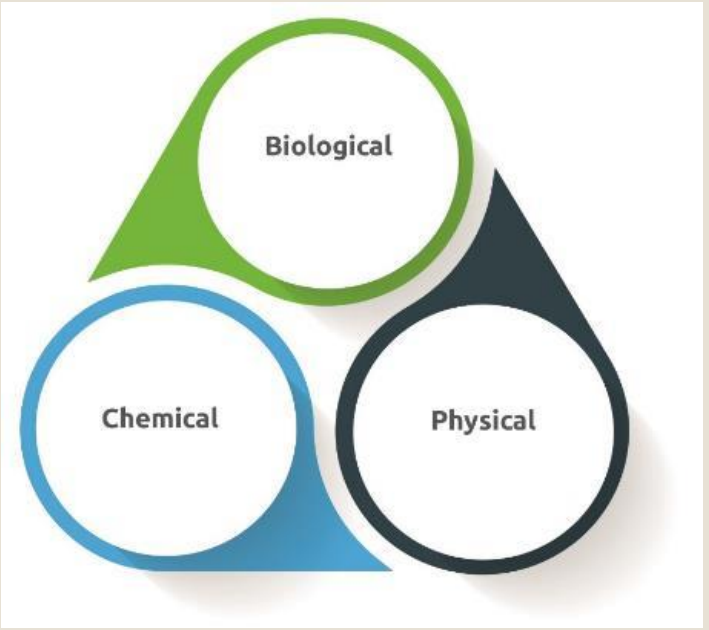
Dr Amanda Bennett, AHDB

Soil Biology and Soil Health Partnership

Aims:

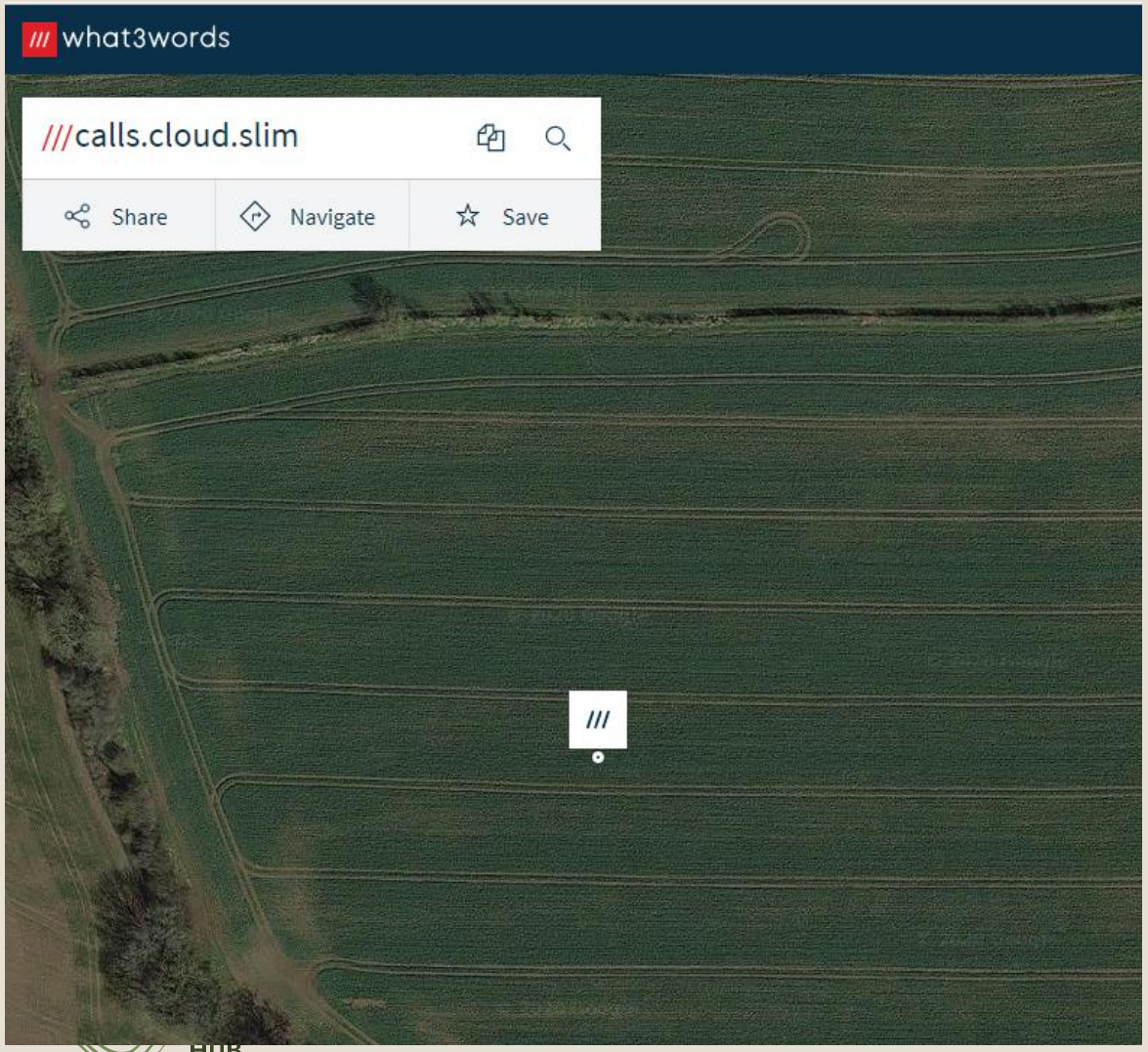
- Develop and validate indicators of soil health for routine on-farm monitoring
- Improve understanding of soil biology in relation to soil health management



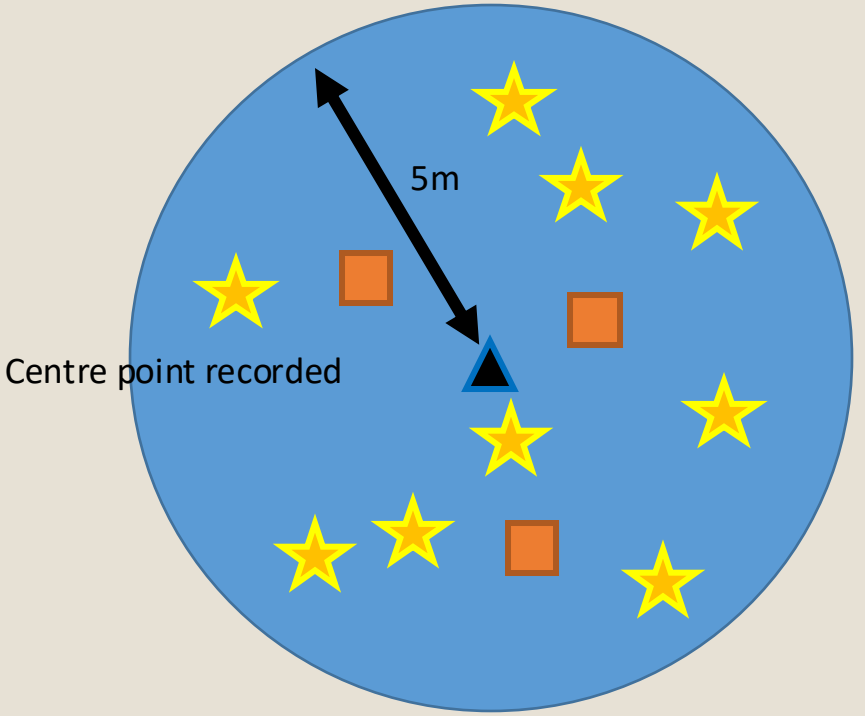
ahdb.org.uk/soil-biology-and-soil-health-partnership

Dr Amanda Bennett, AHDB

Sampling location



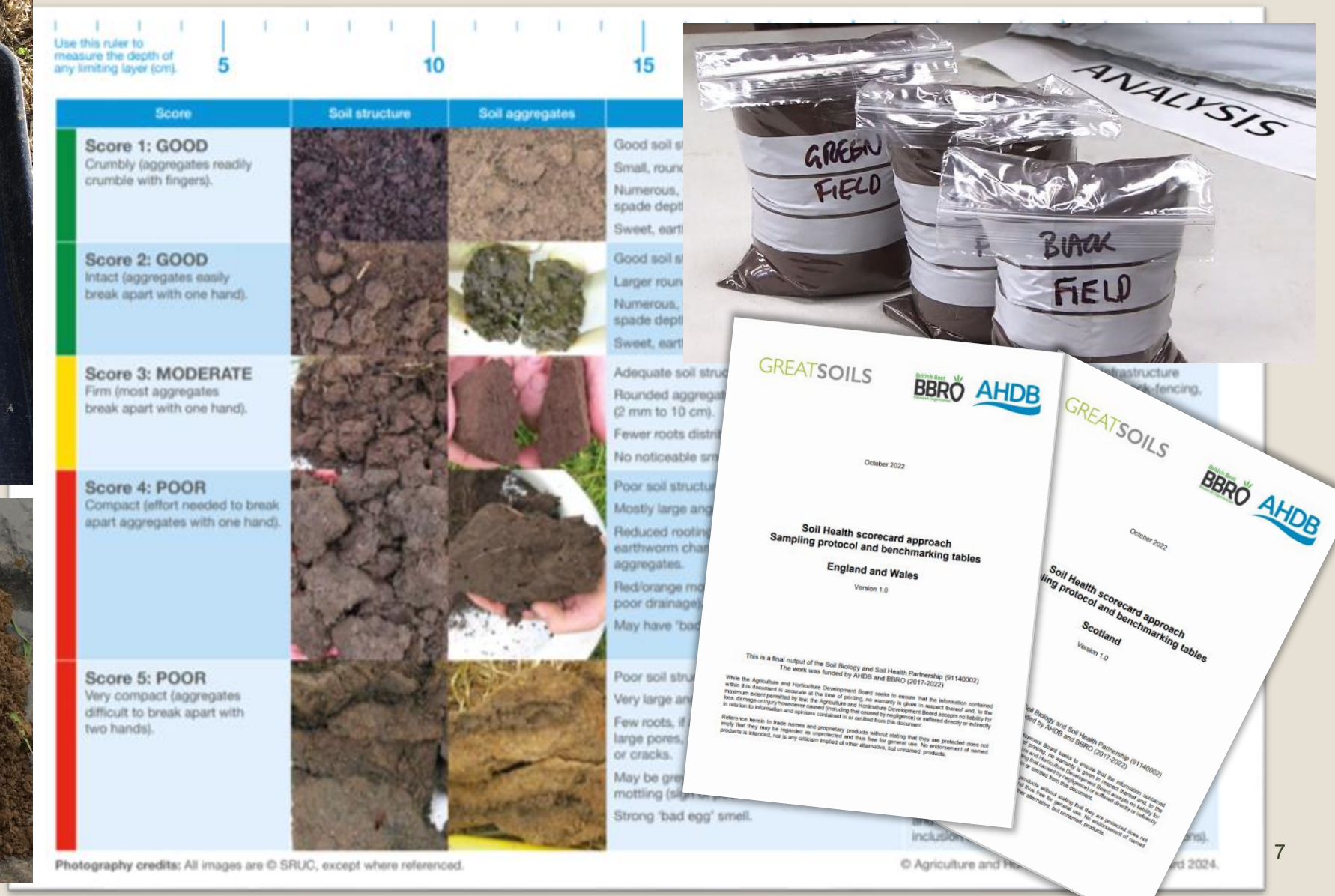
Sampling site within field



Spade assessment of structure

Randomly located multiple cores (use numbers advised) consolidated into sample sent for analysis

Dr Amanda Bennett, AHDB



Dr Amanda Bennett, AHDB

Soil organic matter (Loss on ignition) %

Table 1 Cropping – East England

In the table below, locate your topsoil character and the data range for your result for specific benchmark values and management notes.

Soil status	Threshold values within each topsoil character			Management notes
	Light	Medium	Heavy	
Investigate	≤1.0	≤1.7	≤2.2	**INVESTIGATE** Very low for the climate/soil type; may be associated with intensive cropping rotations with few organic matter inputs. In general, the simple rule is to add more organic materials and build more soil organic matter. Changes in SOM as a result of changes in practice can take a long time to detect. Consider whether crop residues can be returned and what sources of organic materials can be accessed.
Review	1.1-2.1	1.8–3.3	2.3–4.4	**REVIEW** Lower than average for the climate/soil type; may be associated with intensive cropping rotations with few organic matter inputs. In general, the simple rule is to add more organic materials and build more soil organic matter. Changes in SOM as a result of changes in practice can take a long time to detect. Consider whether crop residues can be returned and what sources of organic materials can be accessed.
Monitor (Typical)	2.2–3.2	3.4–5.0	4.5–6.5	**CONTINUE ROTATIONAL MONITORING** Typical for the climate/soil type; likely to be associated with crop residue returns and other regular organic matter inputs, e.g. through cover cropping or compost. Changes in SOM as a result of changes in practice can take a long time to detect. There is no clear evidence for a critical value of SOM. Ensuring there are regular additions of organic matter to 'feed' the soil is more important than achieving any particular measured value.
Monitor (High)	≥3.3	≥5.1	≥6.6	**CONTINUE ROTATIONAL MONITORING** Above average for the climate/soil type; likely to be associated with crop residue returns and other regular organic matter inputs, including ley-arable rotations. Many well-established conservation agriculture or organic farming systems would appear in this group. Ensuring there are regular additions of organic matter to 'feed' the soil is more important than achieving any particular measured value.

Extractable P (Olsen) mg/L

In the table below, locate the data range for your result for specific benchmark values and management notes.

Soil status	Threshold values	Management notes
Investigate	≤9	**INVESTIGATE** Index 0. P should be applied in fertiliser/organic materials to help meet crop needs and build the soil reserve. The best crop response may be seen where P is applied in early spring together with nitrogen.
Review	10–15	**REVIEW** Index 1. P should be applied in fertiliser/organic materials to help meet crop needs and build the soil reserve. The best crop response may be seen where P is applied in early spring together with nitrogen.
Monitor	16–45	**CONTINUE ROTATIONAL MONITORING** Index 2 and Index 3. A clear rotational P management plan is needed to maintain the soil reserve without compromising productivity or increasing environmental risk.
Review	46–70	**REVIEW** Index 4. A clear rotational P management plan is needed to sustainably maintain the soil reserve whilst reducing the environmental risk.
Investigate	≥71	**INVESTIGATE** Above Index 4. Potential risk to the environment. A clear rotational P management plan is needed to sustainably run-down the soil reserve without compromising productivity.

Access the benchmark documents via:
ahdb.org.uk/soil-biology-and-soil-health-partnership

Home > Knowledge library > The soil health scorecard

The soil health scorecard

- Scorecard introduction
- Scorecard data
- Scorecard results
- Scorecard in Scotland
- Soil assessment resources
- Scorecard research

The scorecard provides a framework to monitor soil health on a rotational basis.

Get the soil health scorecard for England and Wales

Get the soil health scorecard for Scotland

Scorecard introduction

The Excel-based tool uses soil analysis results for core soil health indicators and compares them to typical ranges for UK soil types and climate regions (benchmarks).

Scorecard indicators

1. Soil structure – using VESS (Visual Evaluation of Soil Structure).
2. pH.
3. Extractable nutrients (phosphorus, potassium and magnesium).
4. Earthworms.
5. Soil organic matter.

Walkthrough video (1/4): introduction

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ahdb.org.uk/knowledge-library/the-soil-health-scorecard

Dr Amanda Bennett, AHDB

Soil health scorecard (England and Wales) Version 1.1

Enter your information into the orange shaded boxes to find out how your field's soil health compares with those associated with optimal conditions for crop growth. You can enter data for up to three sample locations by scrolling across the spreadsheet. Results will show whether you need to investigate, review, or continue to monitor your soil, with links to guidance on how you can do that.

Results (Column headings, e.g. pH link to specific benchmark values, management notes and practical information on soil management.)

Farm and field	Region	Rotational cropping	Topsoil character	VESS	pH	P	K	Mg	Earthworm count	SOM
Home farm/Top field	E England	Cropping (combinable crops)	Medium	4	6.2	8	155	200	5	4.2
				Investigate	Review	Investigate	Monitor	Monitor	Review	Monitor

Step 2

Enter your soil health indicator data

Physical indicators	Average	Rep 1	Rep 2	Rep 3
Visual assessment of soil structure (VESS) score*				

*The VESS score should be based upon the most limiting layer observed in the soil profile.

Additional VESS field notes (optional). Click in this section to add supporting pictures and text. Use 'Alt and Enter' to add a new line of text within this cell or add a text box. This section can be enlarged as needed.

Biological indicators	Average	Rep 1	Rep 2	Rep 3	Spade width (cm)
Earthworm count**					
Soil organic matter (%)					

**Earthworm benchmarks are referenced to counts from a 20x20x20 cm (8 in cubed) spadeful of soil. If your spade width is different then enter the measured width (in cm) into the 'spade width' column above, and the results will be corrected.

Additional earthworm field notes (optional). Click in this section to add supporting pictures and text. Use 'Alt and Enter' to add a new line of text within this cell or add a text box. This section can be enlarged as needed.

Chemical indicators
pH

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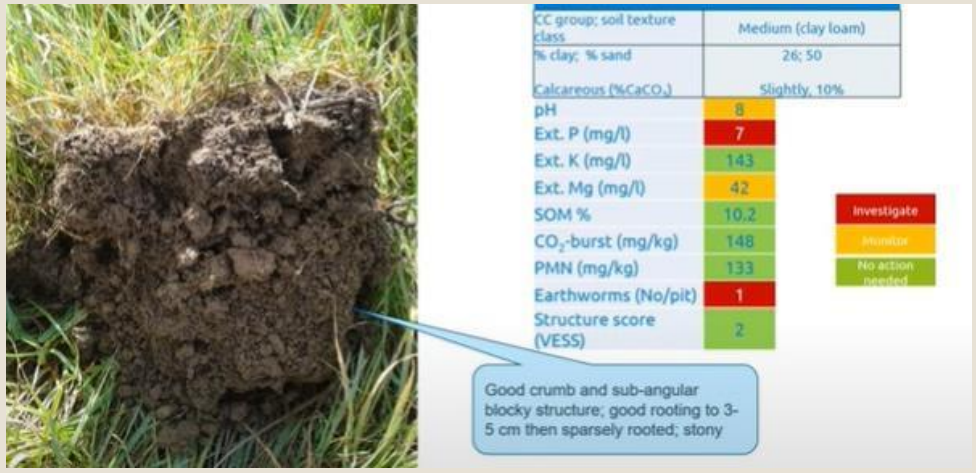
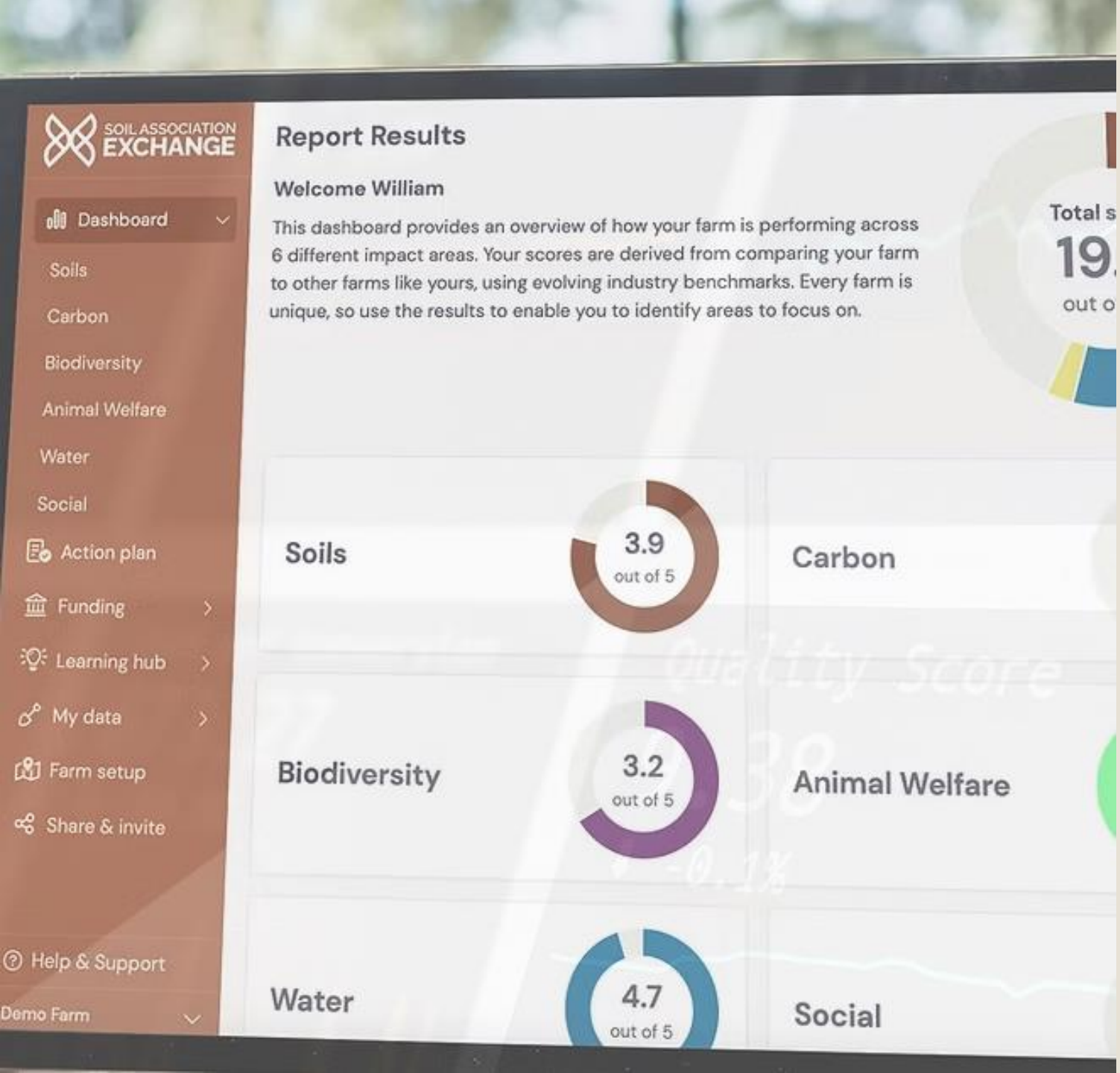
Monitoring soil health on farm

Dr Amanda Bennett, AHDB




‘Inspiring our farmers, growers and industry to succeed in a rapidly changing world’



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Presentation 2:

Soil Association Exchange Dynamic Benchmarking

Joseph Gridley, CEO

UK Research and Innovation

Scottish Government
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Department for Environment Food & Rural Affairs

Department for Energy Security & Net Zero

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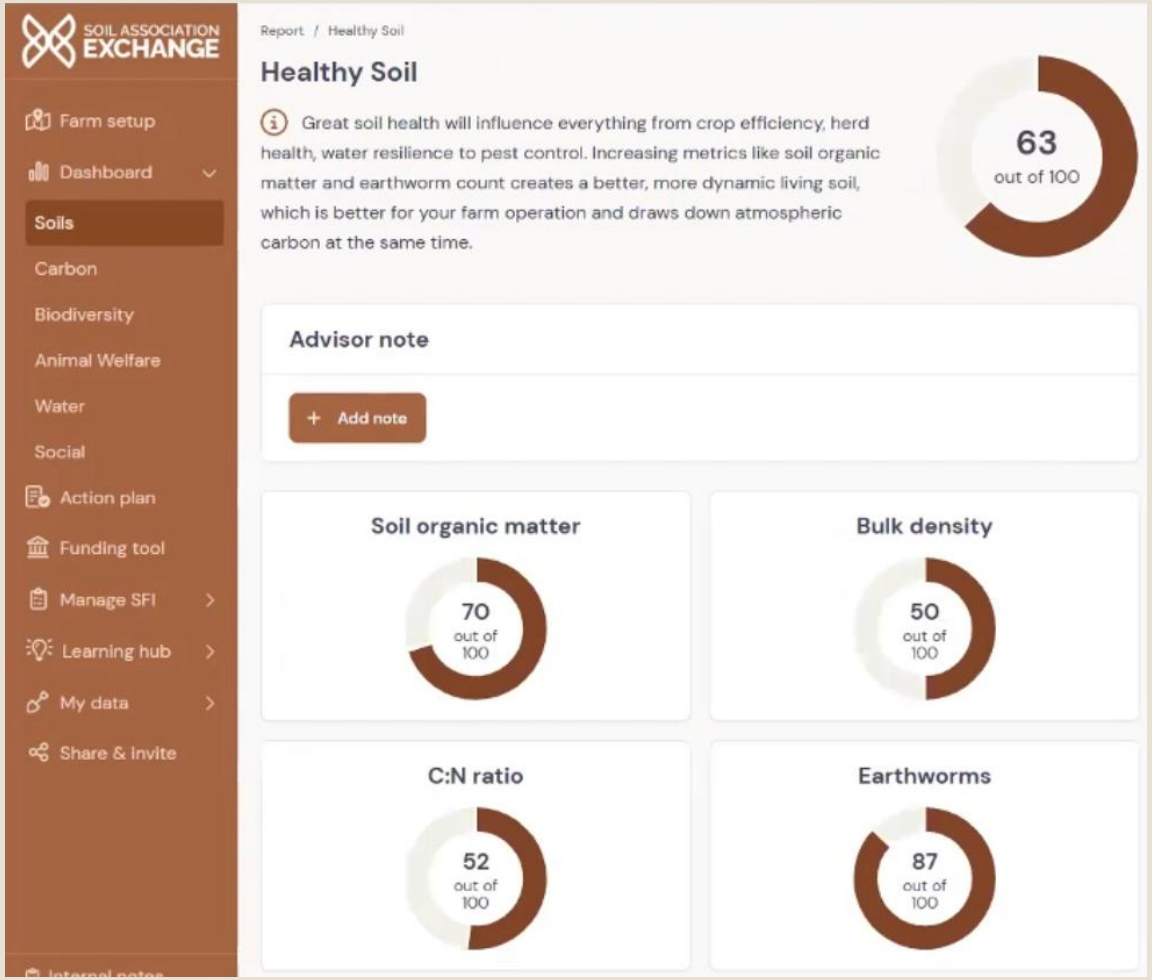
Measurement, advice & improvement, and linking advice to financial incentives

Joseph Gridley,
Soil Association Exchange

Soil Association Exchange's Dynamic Benchmarking keeps users informed with real-time soil data updates, allowing them to see how their farm's performance measures up against others.

As farmers update their soil data, scores automatically adjust, providing accurate and current insights in a continuous flow of information that helps them make timely, informed decisions to improve their farm's resilience and profitability.

Dynamic Benchmarking
from Soil Association Exchange



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Presentation 3:

SOil funDamentals (SOD) webtool for soil health

Dr Chris Feeney, UKCEH

UK Research and Innovation

Scottish Government
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Department for Environment Food & Rural Affairs

Department for Energy Security & Net Zero

Llywodraeth Cymru
Welsh Government

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Dr Chris Feeney, UKCEH

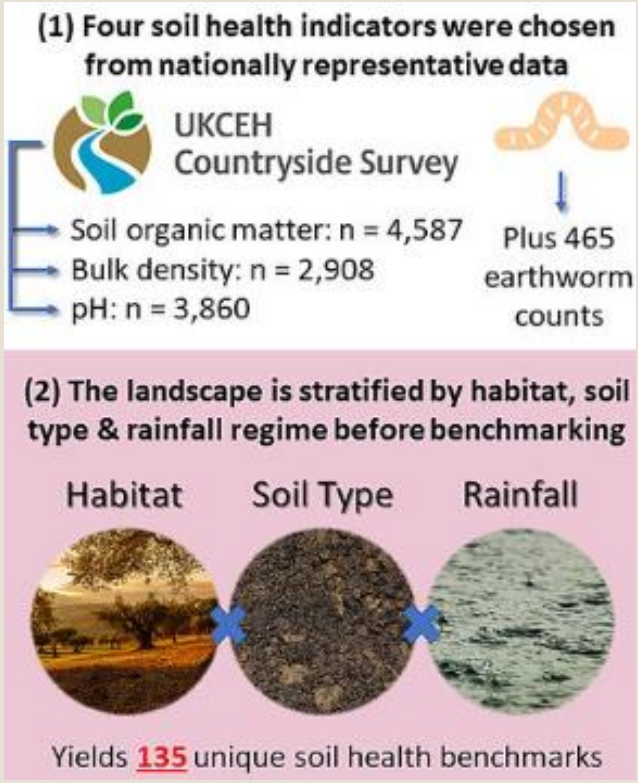
Benchmarks for soil health indicators for Great Britain

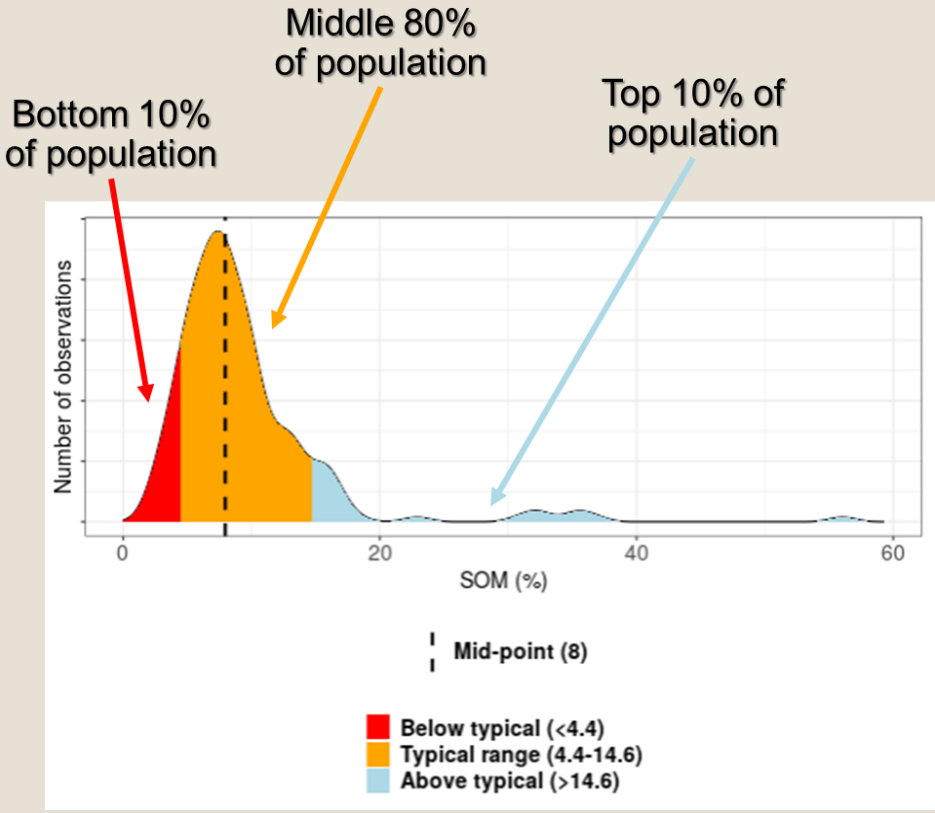
UKCEH has undertaken national-scale monitoring since 1978 under the Countryside Survey.

Drawing on the rich soils database from surveys taken in 1978, 1998, 2007 & 2019-21, we've developed a series of references for indicators of soil health.

Landscape context is significant:

- Arable land will have very different soils to upland bogs.
- And even for similar land uses, soil type & climate differences will impact typical soil condition.





For more information, please see: https://www.ceh.ac.uk/our-science/projects/countryside-survey

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Dr Chris Feeney, UKCEH

UKCEH Countryside Survey Soil Health Webtool

SOil funDamentals (SOD)

Welcome to SOD

This web tool was designed to be used on a computer, and may not render well on mobile devices. SOD aims to help all landowners monitor and improve the health of their soil. More tools will come soon focused on different aspects of soil health. Have your vote what comes next in our Feedback section

What makes this different from other soil health tools?

We have the most up-to-date and nationally representative data from across Great Britain covering all common habitats and soil types to ensure you know where your soils sit in the bigger national picture. We hope in the future to include Northern Ireland.

What data was used?

The tool was developed using data from the UKCEH's nationwide Countryside Survey which has been exploring the change in soils and vegetation across the landscape since 1978 from cropland to woodlands, grasslands to wetlands.

What data isn't included?

Some habitat and soil types are small in area so we don't have enough data to create a benchmark. We also don't currently monitor in our towns and cities so can't benchmark urban soils. The assessment of the health of deep peat needs additional data to what we can provide, so to avoid confusion we have not included these soil types, however, other wetlands types are included. Finally, we only have data for the topsoil (0-15cm). In time, we hope data on lower soil depths may become available.

Why do we care about soil?

Andy Sier (UKCEH, top) and Chris Lowe (UKCEH, bottom)

David Robinson (UKCEH, top) and Alwyn Sowerby (formerly NERC-CEH, bottom)

Functionality of SOD webtool

What it DOES do	What it DOESN'T do
• Provide context for your chosen environment	• Tell you the status of your land specifically
• Information on 4 key indicators covering physical, chemical & biological aspects of soil condition	• Report information on a wider array of nutrients, contaminants, compaction or other soil biology
• Show references (benchmarks) based on nationally representative data	• Show thresholds or targets, as these are highly context specific or in some cases may not exist
• Produce an assessment summary file, which you can save for later reference	• Keep a permanent record of your inputs – once you close SOD, the input data is gone instantly!
• Provide helpful guidance so you can go out and collect your own measurements	• Tell you how to improve or maintain your soil's condition

You can access the SOD webtool from here: https://connect-apps.ceh.ac.uk/soilhealth/

Dr Chris Feeney, UKCEH

Soil health assessment guidance

UK Centre for Ecology & Hydrology

Step-by-step guide for the measurement of soil health

Planning

- Divide up your land holding/farm into similar sampling units by habitat (e.g. arable; broadleaved woodland), management (min till; organic) and/or soil groups (e.g. heavy-clayey soils - see SOD webtool). The number of units you select will depend on how variable your land holding is and the resources you have available. An example of a single unit could be: Cropland - Min-Till - Medium loamy-textured soils.
- If not already known, identify your soil types using the SOD webtool

Sampling frequency and timing

- Decide on sampling frequency of sampling units and select a representative subsample of locations if all fields are not to be included. You may wish to sample 20% of the farm or land holding each year aiming to cover the whole farm in five years or decide to do all assessment in 1 year with no sampling for the next 4 years. Change is unlikely to be detected easily over a period of less than 5 years.
- Avoid sampling after any fertiliser or manure additions.
- The best time for sampling is when the soil is moist and not too dry. The autumn is often selected as a suitable time outside of the main growing season.

How to get the best from your sampling

- A good baseline or starting point is important so future change can be followed.
- When re-sampling, it is important to standardise / geolocate sampling locations as resampling in future years to assess change in the same location, using the same methods and where possible the same laboratories significantly reduces the variability in the results and so your ability to pick up changes.
- The important point is for you to start looking and assessing your own soil and tracking how current or changes in management are restoring and improving your soil.

Kit required for sampling

Soil Organic Matter (SOM) and pH

1. Closed auger (a screw or open auger can be used but are not ideal as they can under-sample the organic rich layer in grasslands. A spade is generally less accurate in collecting a consistent sample across the 15cm depth)
2. Ruler to check sampling only goes from for 0 to 15cm depth. Depth has a large effect on the results so it is important to standardise to a set depth.
3. Clean bucket for sorting/mixing
4. Bags and labelling for sending to the laboratory
5. Phone or handheld GPS for geo-locating sample locations

Send samples to an accredited laboratory for analysis for SOM and pH. (You may also want to add other requests such as nitrogen, available-phosphorus, potassium etc).

Bulk density

This is difficult to do without specialised field equipment. We advise seeking professional help to assess this soil property.

Alternatively, assessing soil structure using a visual approach can provide useful information including information on sub-soil. New guidance from national governments will be available soon on this and we will provide a link.

Earthworms

1. Spade
2. Ruler to assess 20cm x 20cm x 20cm block
3. Mat
4. Pot
5. Bottle of water
6. Notepad to record numbers

Sampling in the field

Example of a 'W'-shaped sampling scheme in a selected field.
25 points are taken, covering the breadth of the field multiple times; at each of these, cores of topsoil are taken for analysis of SOM, pH (and BD). These are shown in blue. The 10 red circles indicate where soil should be dug alongside the sample for SOM, pH and BD to count the number of earthworms. Note: earthworms counts can be done on a separate day if time is limited, but it's usually more efficient to do all assessments on the same day.

Measuring SOM, pH and BD

Fields should be selected that are representative of a habitat type, management block and soil type.

25 samples should be taken across the field to a depth of 15 cm and put into a clean bucket. Points should be evenly spaced across the 'W', and ideally geolocated to ensure sampling at the same location in future assessment. Avoid sampling minor unrepresentative small areas such as water troughs, feeders and gateways.

Litter and stubble should not be included in the sample and in grassland the evident plant roots and grass should be removed so that it is the soil that is tested, not the plant. Time to sort through and remove the roots should be standardised to avoid bias.

The same method, equipment, depth and analysis must be adhered to each time to ensure change is real and not related to the methodology. A closed auger to take the sample is ideal as it effectively samples all soil types effectively including the organic rich top layer in grassland. Screw and open augers can miss these layers but are adequate for arable and horticultural soils.

Bulked samples should be placed in a plastic bag and clearly labelled including, who, when, where and the habitat, management and main crop / vegetation noted.

Measuring earthworm abundance

Sampling should take place in spring and/or autumn when conditions are not dry.

5-10 samples should be taken per field or management block where possible. Points should be evenly spaced across the 'W' used for SOM, pH and bulk density.

At each point dig out a pit (20cm x 20cm x 20cm) and place soil on a plastic sheet. Note that this is deeper than the depth for SOM, pH and bulk density.

The soil should hand-sorted placing earthworms in a container.

Count and record the total number of earthworms.

Acknowledgement: This guidance is adapted from a previous version co-written with Richard Smith and the Sustainable Soil Alliance.

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Diolch / Thank you

For more information please contact:

enquiries@ceh.ac.uk

@UK_CEH

ceh.ac.uk

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Presentation 3:

Shared Waters

Sophie Harrison, WRAP

UK Research and Innovation

Scottish Government
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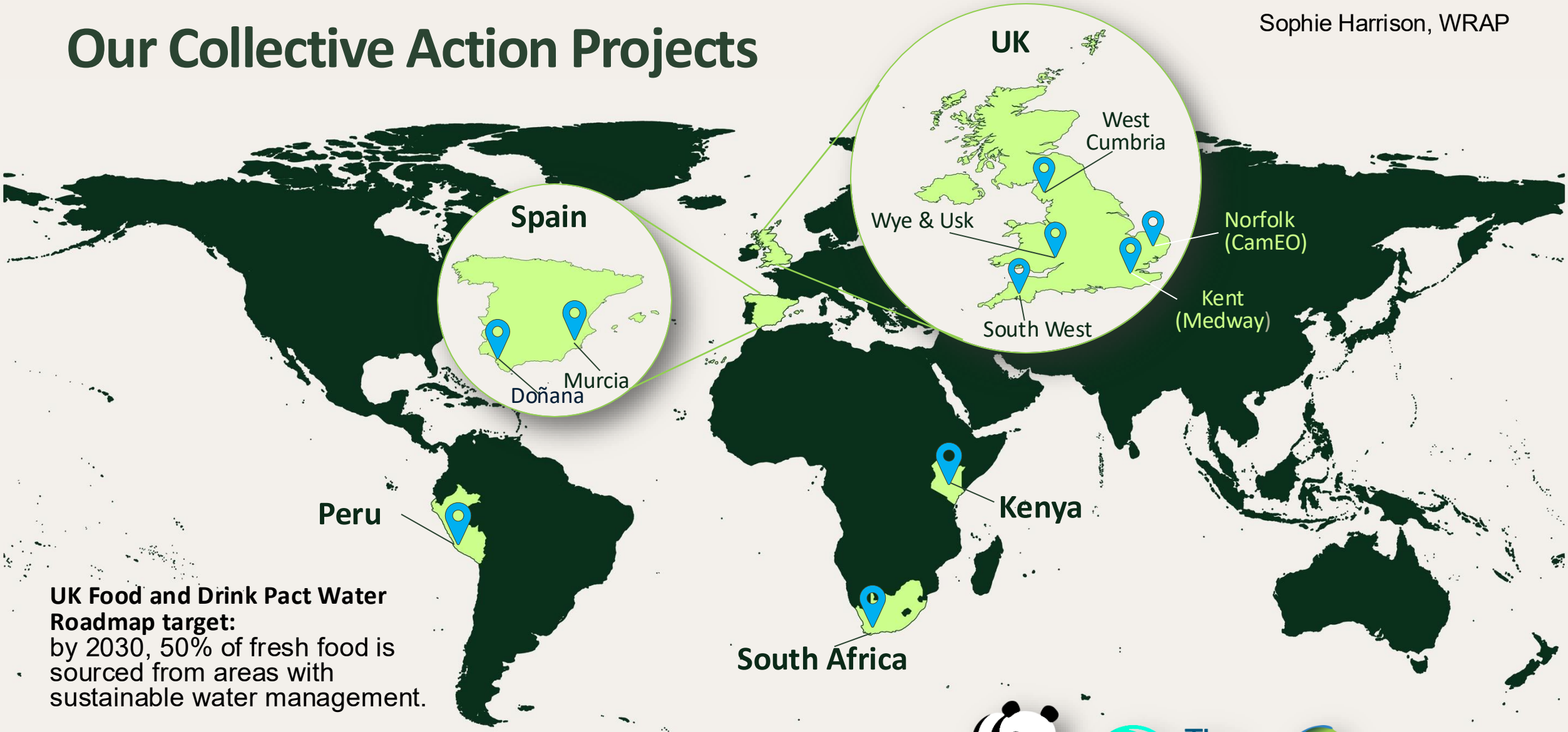
Our Collective Action Projects

Sophie Harrison, WRAP



UK Food and Drink Pact Water Roadmap target:
by 2030, 50% of fresh food is sourced from areas with sustainable water management.

Countries with live projects

WWF

The Rivers Trust

GSI GOOD STUFF INTERNATIONAL

22

Who we work with

Sophie Harrison, WRAP

- **39 businesses** funding our Collective Action Projects
- **Water Roadmap signatories:** 89 businesses, 15 supporters (104 total)

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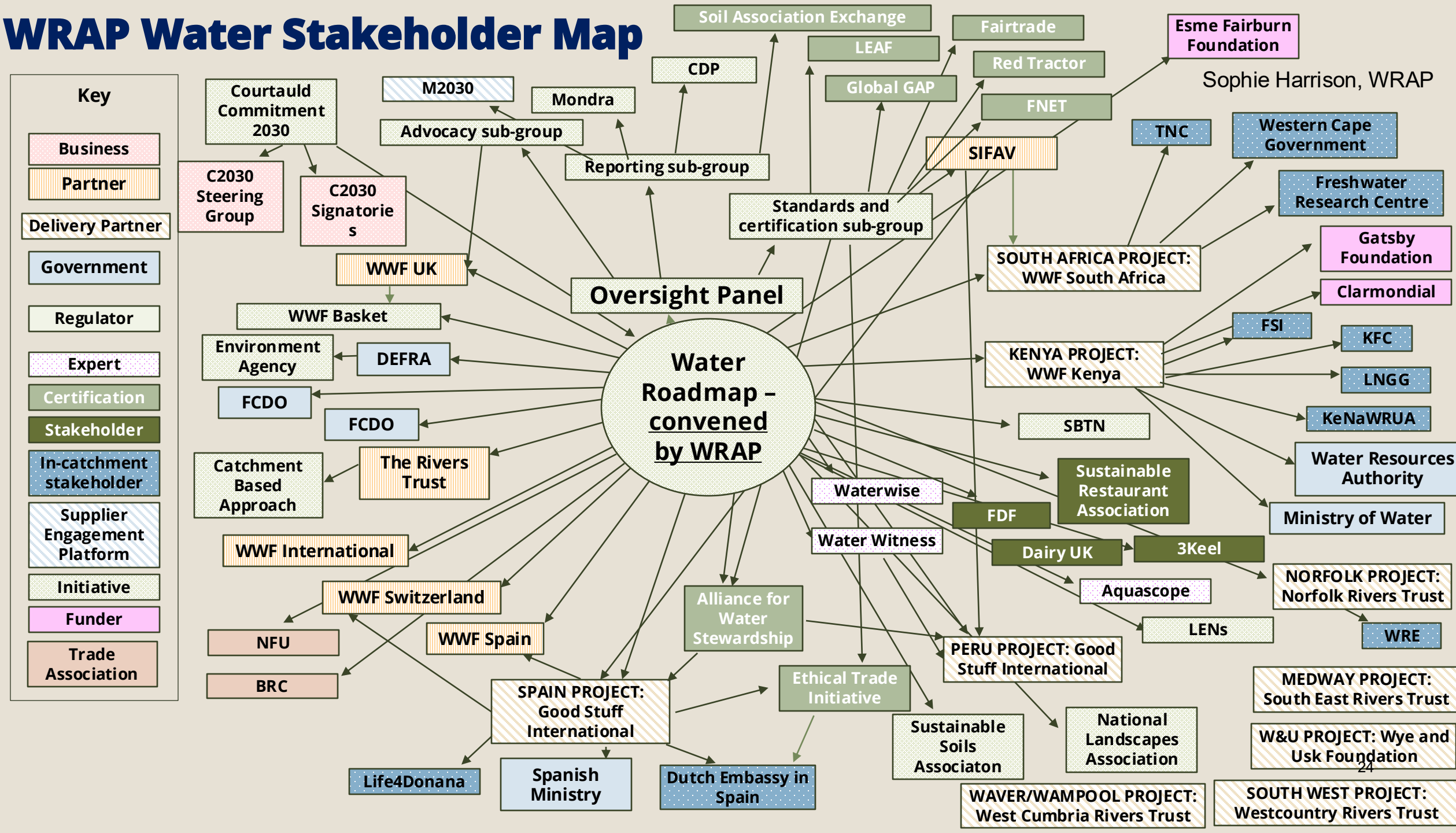
WRAP Water Stakeholder Map



Our Impact

Sophie Harrison, WRAP







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End

This slide deck is accompanied by a workshop recording – click here to watch
For more information, questions or comments, please get in touch:
ellen@sustainablesoils.org

Web: LUNZHub.com **X:** @LUNZHub

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