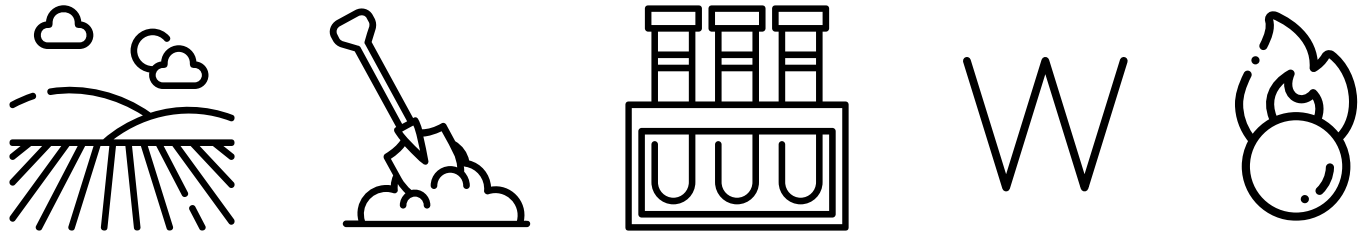
SUSTAINABLE SOILS ALLIANCE

A Review of Soil Health Measurement and Assessment Initiatives in the UK

April 2025



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Section 1: *Soil Health Measurement and Assessment Initiatives*

SUSTAINABLE SOILS ALLIANCE

1.a) A crowded space

A large and growing number of organizations 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.

1.b) Ownership and influence

We identified 34 schemes/initiatives in widespread use.

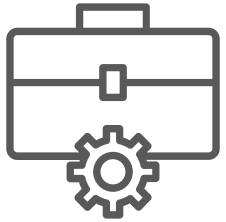
They either have official ‘authority’ e.g. from government and/or a high-profile, respected organization, or are representative of novel trends in on-farm sustainability/GHG measurement.

These schemes are ‘owned’ by a variety of organizations with different objectives and different levels of influence over the end-user. This is reflected in the tools they adopt to influence soil measurement.

Regulatory Compliance

Incentivization Schemes

Certification



Toolkits

Novel Technology

See Appendix I (slide 15) for a full list of the initiatives identified.

1.c) Different focus

The 34 initiatives differ in terms of focus. Some are exclusively interested in soil health, others consider soil in the context of a package of broader measures of overall farm sustainability, a farm's carbon/GHG footprint, monetization of soil carbon or water pollution.

Soil Health

AHDB

vidacycle

UK CEH

Soil Carbon

Downforce Technologies

nrm part of Cawood

Agricarbon

Farm Carbon Toolkit

Farm Sustainability

SAI Platform

Soil Association

FAO Fiat Panis

Red Tractor Certified Standards

Linking Environment and Farming LEAF

OF&G Organic

regenagri

demeter

Pasture for Life Certified

Certified Regenerative by AGW

DEFRA Sustainable Farming Incentive (SFI)

Welsh Government Sustainable Farming Scheme

Scottish Government Preparing for Sustainable Farming

DAERA Northern Ireland Soil Nutrient Health Scheme

Clean Water

Natural England

DEFRA (2018) Farming Rules for Water

Welsh Government (2021) The Water Resources (Control of Agricultural Pollution) (Wales) Regulation

Scottish Government (2021) The Water Environment Regulation (Scotland)

DAERA (2019) The Water Framework Directive

GHG Emissions

CFA Cool Farm Alliance

Farm Carbon Toolkit

agrecalc

trinity AGTECH

1.d) Different scope

12/34 initiatives

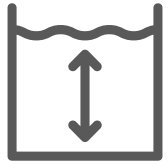
1. Don’t specify soil metrics

Simply highlight the need for soil measurement to take place.

22/34 initiatives

2. Specify soil metrics

Specify the soil metrics farmers should measure.



13/34 initiatives

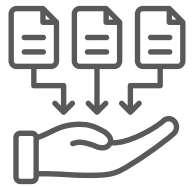
3. Define methodologies for soil samples

Define protocols on how soil measurements should be made.

11/34 initiatives

4. Include interpretation for soil test results

Analyze and interpret the results of the measurement that have taken place.



10/34 initiatives

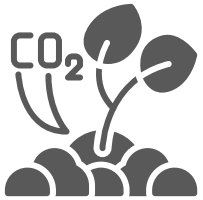
5. Collect soils data

Collect and store soils data – either for a farmer’s own benefit or as part of a wider program.

1.e) Changes in soil health priorities

The different approaches to soil health are indicative of changing political and corporate as well as environmental priorities, as well as the underlying evidence base. Some initiatives are relatively well established (e.g. Nutrient Management Guide RB209), others have been published only in the last few years. Changes in priorities include the following:

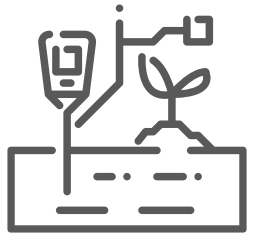
Historically soil measurement focused on **chemistry** to advise farmers on the appropriate application of chemical fertilizers – driven largely by clean water legislation.



Interest in farming's role in climate change mitigation has increased the focus on **soil carbon** – both as an indicator of a farm's net zero performance and a proxy for overall soil health.

Interest in **biological activity** and the regenerative farming movement has highlighted the importance of overall soil health – and life.

Recent extreme weather has emphasized the importance of measuring **soil structure** to understand soil's water-holding capacity and climate resilience.



As more organizations need to report on the impact on climate and nature – including soils, **precise data collection** and storage has become a priority.

1.f) Initiatives not included

Whilst the following initiatives weren't included due to their scope and/or geographies falling outside of the scope of this research, they are interesting to consider alongside initiatives driving on-farm soil health measuring and assessments in the UK.

Food and Agriculture Organization (FAO) of the United Nation Global Soil Partnership Standard Operating Procedures (SOPs)

This initiative seeks to globally harmonize standard operating procedures (SOPs) for different soil metrics. SOPs are step-by-step instructions on how to perform laboratory analyses. This is a critical component in ensuring the replicability of a measurement and the credibility and traceability of data. Such instructions are relevant to policy makers and laboratories rather than being drivers of on-farm soil health monitoring. Instead, the FAO's Tool for Agroecology Performance Evaluation (TAPE) was included in this research as a toolkit with soil metrics for farmers seeking to implement and evaluate regenerative practices.

European Union's Common Agricultural Policy (CAP)

Whilst CAP does not incentivize farmers to measure soil health, under the CAP cross-compliance rules, beneficiaries have their payments linked with good agricultural and environmental conditions (GAECs) such as minimum soil cover and minimum land management to limit erosion and maintenance of soil organic matter. This is no longer relevant to UK farms.

European Union's Soil Monitoring Law

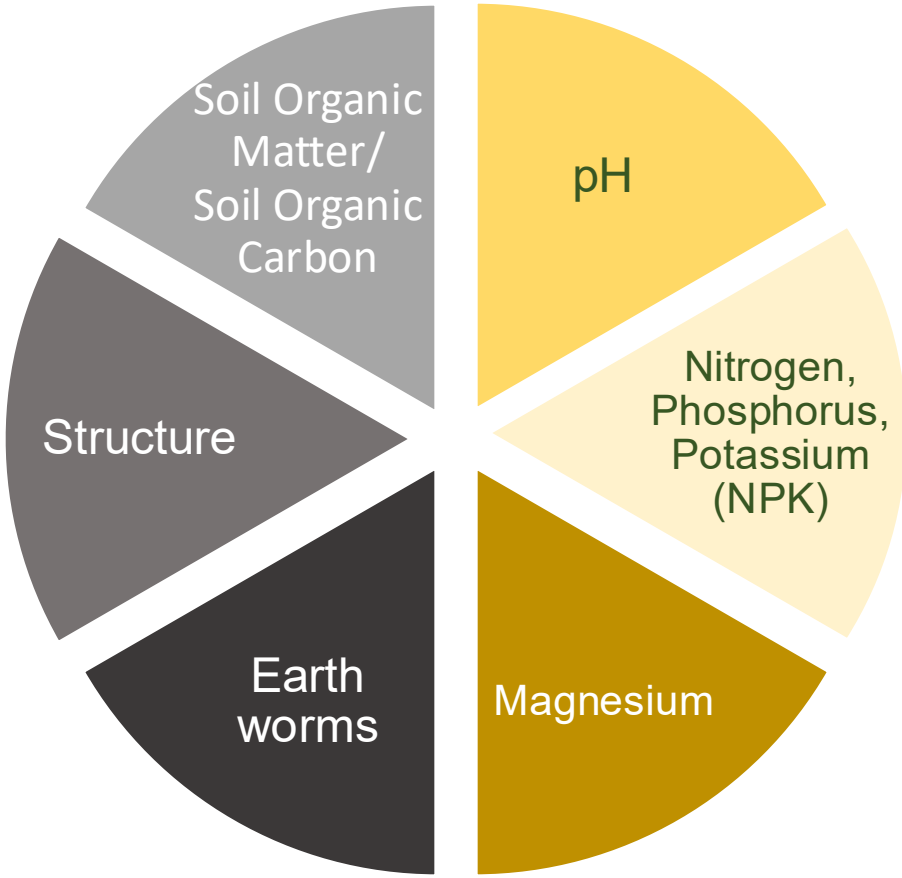
The law is in its draft format. If finalized, member states will be required to monitor and assess the health of all soils in their territory (including but not limited to farm land). This will include chemical, physical and biological properties of soil health. This will not be applicable in the UK.

Section 2: *Soil Metrics*

2.a) 8 'core' metrics

8 metrics recur most frequently throughout the 34 initiatives and might therefore be considered ‘core metrics’.

There are 3 chemical, physical and biological properties that recur most frequently throughout the different initiatives. These are not legal requirements and there is considerable variation in sampling protocols advocated by the different initiatives.



There are 5 chemical properties that farmers are legally required to measure in England (Farming Rules for Water). Nitrogen is also a legal requirement in Wales. Sampling protocols for these metrics can be found in the Nutrient Management Guide (RB209).

See Appendix II (slides 15-18) for a breakdown of the metrics included in different types of initiatives.

2.b) Beyond the core metrics

Beyond the 8 core metrics, some initiatives specify additional metrics that reflect specific user scenarios such as:

Regenerative:

Schemes that are looking to promote regenerative farming use indicators such as aggregate stability, bulk density and other biological metrics.

International:

The UN FAO Tool for Agroecology Performance Evaluate (toolkit) which includes many metrics to tailor to different regions across the globe.

National:

Northern Ireland's SNHS includes Sulphur which is relevant to soils in the country.

Section 3: *Sampling Protocols*

3.a) Variations in sampling protocols

Whilst there is consistency when it comes to sampling protocols (how these metrics are being measured) for legally required metrics (chemistry), there are variations when it comes to sampling protocols for SOM/SOC, Structure and Earthworms – which affects results. Main differences are as follows:

Types of fields: Ranging from representative fields to those with problem areas.

Number of samples: Ranging from 3 to 15 samples.

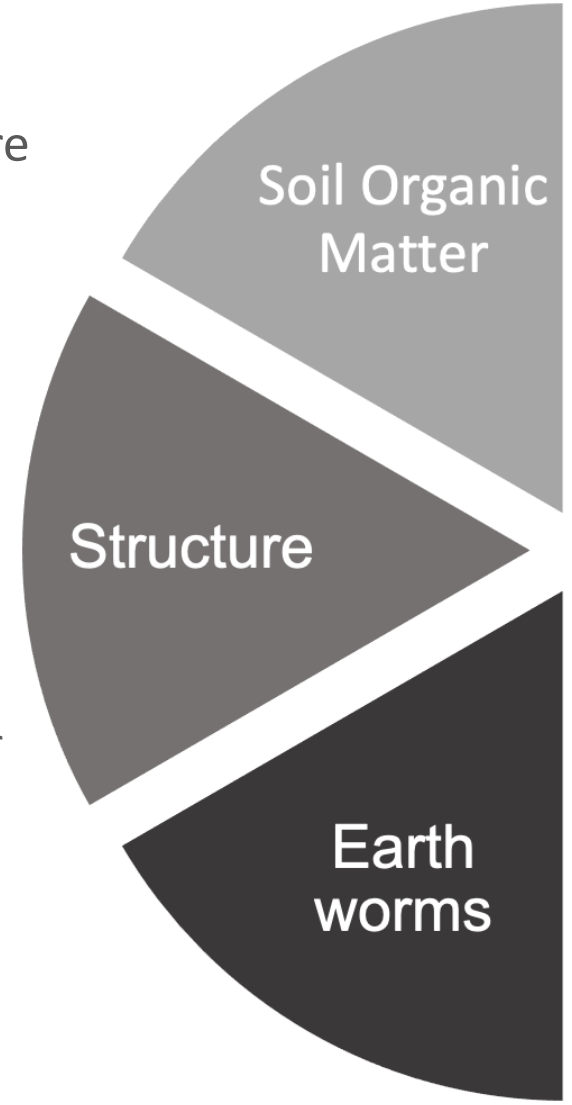
Sampling design: Some do not specify what design to use, some call for a 'W' transect, others use a 5m radius area.

Depth: Some only look at topsoils, others include sub soils. Measurements for top and sub soils range between 0-25cm, and 10cm-1m.

Tests: SOM/SOC tests include Loss of Ignition (LOI) test, DUMAS test and Elemental Analysis. Tests for good soil structure either use scores developed by SRUC or guidance from ThinkSoils.

Tools: Most use spades, some use an auger.

Frequency of measurement: This ranges between 1 to 5 years.



Section 4: *Result Interpretation*

4.a) Differences in results interpretation and presentation

The **interpretation** of results, i.e. how farmers understand and benchmark the state of their soil varies throughout initiatives according to the following:

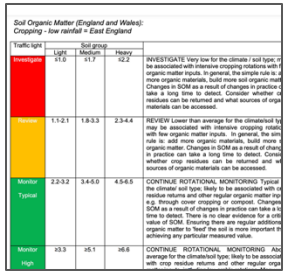
Different static parameters:

- Approaches to soil type/classification.
- Approached to land use type/classification.
- Approaches to climate (rainfall) and geography (England, Scotland, Wales) remain the same if included.

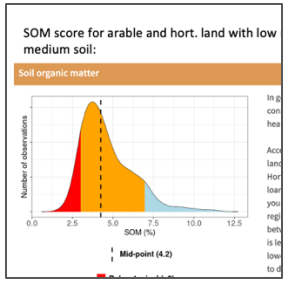
Different underlying datasets (for SOM/SOC):

- Defra projects SP0306 and SP0310 (2001-2004). England and Wales.
- James Hutton Institute (JHI) Soil Information System database. Scotland.
- UK CEH Countryside Survey (1978-2007). England, Wales and Scotland.

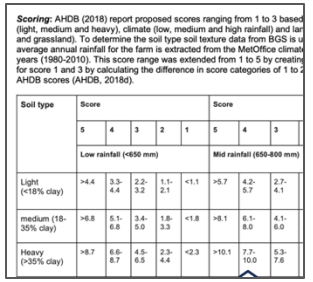
How these results/benchmarks are **visually presented** also varies:



Traffic light (AHDB)



Graph (UK CEH)



Grid (SA Ex)

4.b) Example of different interpretations

The use of different scoring systems, datasets and terms used to describe thresholds means the same soil health results may be understood differently across different initiatives.

For example, 1.8% SOM in the same farming context (soil type, land use and climate) will score a 'medium' (2/3) result in the AHDB SHSC, 'below medium' (2/5) in SA Ex and a 'below typical' (1/3) in UK CEH SOD.

AHDB soil health score card (SHSC)

Soil Organic Matter (England and Wales):
Cropping - low rainfall = East England

Traffic light	Soil group			
	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: add more organic materials, 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: add more organic materials, 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.

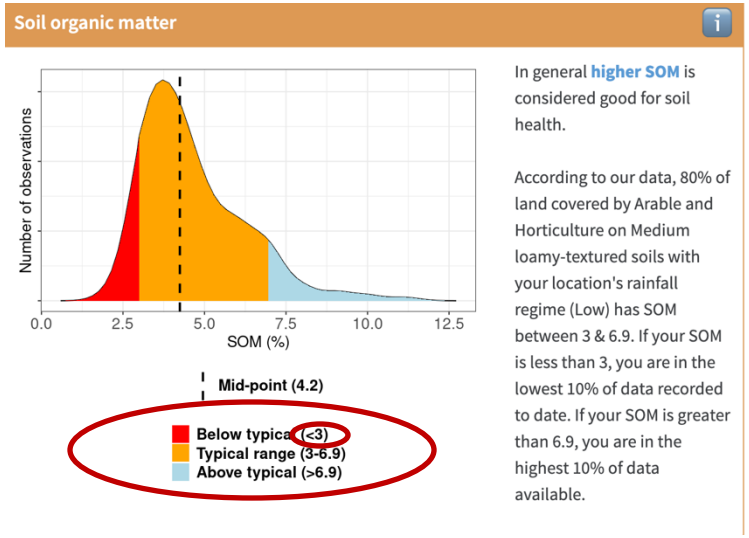
Soil Association Exchange (SA Ex)

Scoring: AHDB (2018) report proposed scores ranging from 1 to 3 based on soil type (light, medium and heavy), climate (low, medium and high rainfall) and land use (arable and grassland). To determine the soil type soil texture data from BGS is used. Mean average annual rainfall for the farm is extracted from the MetOffice climate data for 30 years (1980-2010). This score range was extended from 1 to 5 by creating subcategories for score 1 and 3 by calculating the difference in score categories of 1 to 2 and 2 to 3 of AHDB scores (AHDB, 2018d).

Soil type	Score					Score				
	5	4	3	2	1	5	4	3	2	1
	Low rainfall (<650 mm)					Mid rainfall (650-800 mm)				
Light (<18% clay)	>4.4	3.3-4.4	2.2-3.2	1.1-2.1	<1.1	>5.7	4.2-5.7	2.7-4.1	1.1-2.6	<1.1
medium (18-35% clay)	>6.8	5.1-6.8	3.4-5.0	1.8-3.3	<1.8	>8.1	6.1-8.0	4.1-6.0	2.0-4.0	<2
Heavy (>35% clay)	>8.7	6.6-8.7	4.5-6.5	2.3-4.4	<2.3	>10.1	7.7-10.0	5.3-7.6	2.8-5.2	<2.8
	High rainfall (800-1100 mm)					Permanent pasture (all climates)				
Light (<18% clay)	>8.6	6.2-8.6	3.8-6.1	1.4-3.7	<1.4	>10.8	7.9-10.8	5.0-7.8	2.2-4.9	<2.2
Medium (18-35% clay)	>10.1	7.6-10.0	5.1-7.5	2.6-5.0	<2.6	>12.2	9.3-12.2	6.4-9.2	3.5-6.3	<3.5
Heavy	>11.5	8.9-	6.3-	3.7-	<3.7	>13.4	10.5-	7.6-	4.7-	<4.7

UK CEH SOil funDamentals (SOD)

SOM score for arable and hort. land with low rainfall and medium soil:



Section 5: *Data Collection*

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5.a) Differences in data collection, storage and use

There are different approaches to data collection, storage and use across the different initiatives. Different purposes include the following:

- **Farmer use only:** Farmers upload and can access their test results to record their soil health and track changes. This data is not shared externally (most toolkits offering web-based tools or apps).

- **Compliance purposes:** A Soil Management Plan, including test results, is used to demonstrate that testing has taken place, but no data is collected (certification or incentivization schemes).

- **Comparison:** Data is anonymized but aggregated to enable local comparison and benchmarking (NRM).

- **National benchmarking:** Data is anonymized and used to improve models and nationwide benchmarking (the DAERA Soil Nutrient Health Scheme).

Appendix I: *Initiatives Included in the Study*

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'Government' (incentives, regulations)

- DEFRA (2024) Sustainable Farming Incentive (SFI)
- DEFRA (2018) Farming Rules for Water
- Welsh Government (2023) Sustainable Farming Scheme
- Welsh Government (2021) The Water Resources (Control of Agricultural Pollution) (Wales) Regulation
- Scottish Government (2024) Preparing for Sustainable Farming
- Scottish Government (2021) The Water Environment Regulation (Scotland)
- DAERA (2023) Northern Ireland Soil Nutrient Health Scheme
- DAERA (2019) The Water Framework Directive
- Natural England, Catchment Sensitive Farming

Toolkits (soil health/farm sustainability)

- AHDB Nutrient Management Guide (RB209)
- AHDB Soil Health Scorecard
- UK Center for Ecology and Hydrology SOil funDamentals (SOD)
- Vidacycle Soilmentor
- Soil Association Exchange
- UN Food and Agriculture Organisation (FAO) Tool for Agroecology Performance Evaluation (TAPE)
- Farm Carbon Toolkit

Certification (quality, farm sustainability, organic/regen)

- Red Tractor
- Red Tractor Greener Farm Commitment (*withdrawn*)
- LEAF Marque
- Soil Association Certification
- Organic Farmers & Growers
- SAI Platform Farm Sustainability Assessment (FSA)
- Regenagri
- Pasture for Life
- BDA Certification/Demeter
- Certified Regenerative by AGW

Soil Carbon Measurements & GHG Calculators (soil carbon, farm GHG)

- Farm Carbon Toolkit Calculator
- Cool Farm Tool
- Agrecalc
- Trinity AgTech (Sandy)
- Downforce Technologies
- NRM's (Cawood) CarbonCheck
- Agricarbon

Framework (holistic farm sustainability metrics)

- Global Farm Metrics

Appendix II: *Soil Metrics in Different Initiatives*

SUSTAINABLE SOILS ALLIANCE

II.a) Government initiatives

Across the UK the 4 administrations look to drive soil measurement through both:

a) **Financial incentives** which increasingly address soil organic matter (SOM).

b) **Regulations** which focus on soil (chemistry) as a driver of water quality.

	Department for Environment Food & Rural Affairs	Llywodraeth Cymru Welsh Government	Scottish Government Riaghaltas na h-Alba gov.scot	Department of Agriculture, Environment and Rural Affairs
Farming incentivisation schemes soil testing requirements	**Sustainable Farming Incentive** *SOM (required in CSAM1)* *Earthworms, VESS (suggested in CSAM1)* *pH, phosphorus, potassium and magnesium (suggested CNUM1)*	**Sustainable Farming Scheme** (in development) *pH, PK, Mg, SOM (Universal Action 3)*	**Preparing for Sustainable Farming** (in development) *pH, PK, SOC*	**Northern Ireland Soil Nutrient Health Scheme** *pH, PK, Mg, SOM, SOC, S, Ca*
Regulation (water quality legislation) soil testing requirements	**Farming Rules for Water** *NPK, Mg, pH*	**The Water Resources Regulation** *N*	**The Water Environment Regulation** ☒	**The Water Framework Directive** ☒

II.b) Certification schemes

Certification schemes take a generally light-touch approach to soil metrics. While some require farmers implement a soil management plan with some testing, they rarely specify what needs to be measured.

	Red Tractor Certified Standards	LEAF Linking Environment and Farming	Soil Association	OF&G Organic	SAI Platform	regenagri	Pasture for Life Certified	demeter	Certified Regenerative by AGW
Require Soil Management Plan	*Only for fresh produce, crops & sugar beet*	☑	☒	☒	☑	☑	☒	☒	☒
Require tests for Soil Metrics	☒	*Soil tests required but metrics not specified*	*No soil tests required* (but farmers may need to show them as proof for maintaining soil fertility)	*Nutrients and pH*	☒	*SOM, SOC, pH, CEC, NPK, Mg, infiltration rate, bulk density*	*Recommen-ded but not required*	☒	☒

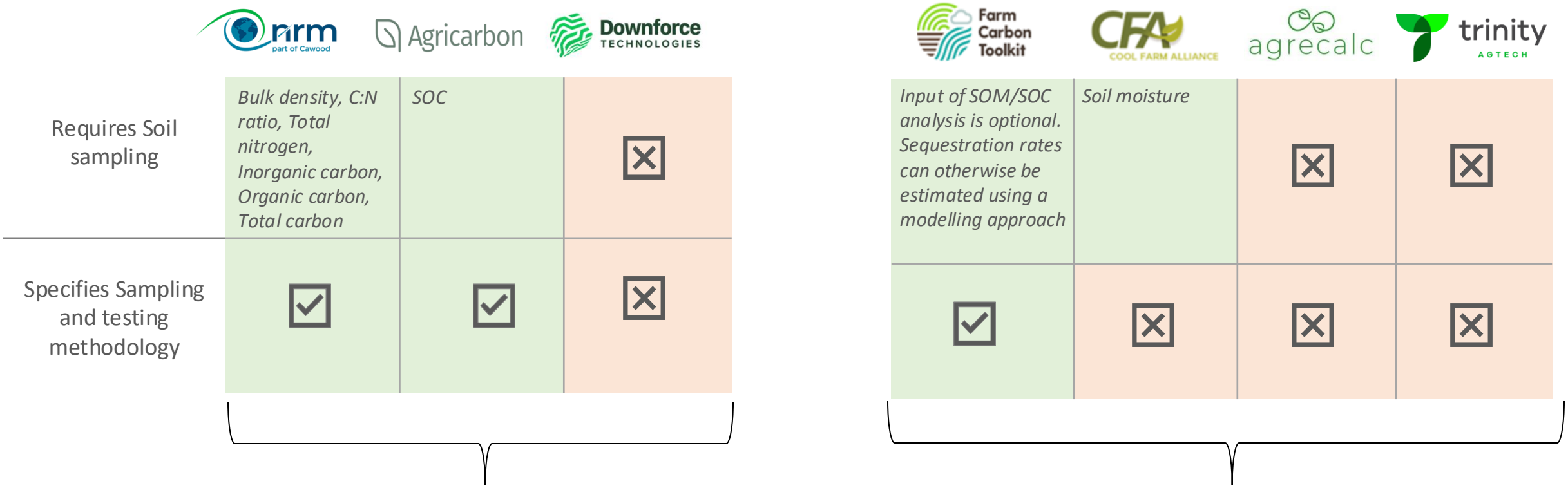
II.c) Toolkits

Of all the initiatives, the toolkits are the most prescriptive in terms of both the soil metrics they require and the underlying sampling methodology.

	RB209 Nutrient management guide (Eng)	Soil health scorecard	SOil funDamentals (SOD)	Soilmentor	Soil Association Exchange	Farm Carbon Toolkit	UN FAO Tool for Agroecology Performance Evaluate
Soil Metrics included	*pH, NPK and Mg,*	*SOM, pH, Phosphorus (P), Potassium (K), Magnesium (Mg), earthworms, Structure (VESS)*	*SOM, pH, bulk density and earthworms*	*Earthworms, Slake, Infiltration Rate, VESS, Basal cover, bulk density, SOC, Rhizosheath, insect score, rooting depth, Nodulation of Legumes, Brix, biodiversity recording, pH (others available too)*	*SOM, pH, earthworms, VESS, bulk density, Nitrogen, pH, C:N ratio*	*Structure, bulk density, ea rthworms, infilt ration, SOM, SOC, NPK, Mg, aggregate stability*	*Soil structure, microbiological activity and SOM for advanced level*
Specify a sampling methodology	☑	☑	☑	☑	☑	☑	☒

II.d) Carbon and GHG initiatives

Among initiatives looking to assess changes in soil carbon there is considerable variation, with some favoring modelling over measurement, some combining carbon with other indicators and some specifying a particular laboratory approach.



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Agricarbon (2024) https://www.agricarbon.co.uk/
AHDB (2017) Nutrient Management Guide (RB209) https://ahdb.org.uk/nutrient-management-guide-rb209
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Cawood (2024) NRM CarbonCheck https://cawood.co.uk/wp-content/uploads/2021/08/CarbonCheck-brochure-2021.pdf
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DEFRA (2018) Farming Rules for Water https://www.gov.uk/government/publications/farming-rules-for-water-in-england
DEFRA (2024) Sustainable Farming Incentive (SFI) https://www.gov.uk/guidance/sfi-actions-for-soils
Downforce Technologies (2024) https://www.downforce.tech/
Farm Carbon Toolkit (2024) https://farmcarbontoolkit.org.uk/toolkit/
Global Farm Metrics (2023) https://www.globalfarmmetric.org/reports/global-farm-metric-overview-2023/
LEAF Marque (2023) https://leaf.eco/leafmarque/standard
Natural England (2010) Catchment Sensitive Farming https://publications.naturalengland.org.uk/category/45002
Organic Farmers & Growers (2013) https://ofgorganic.org/useful-info/organic-standards
Pasture for Life (2024) https://www.pastureforlife.org/certification/the-pasture-for-life-standards/
Red Tractor (2024) https://redtractor.org.uk/our-standards/
Red Tractor Greener Farm Commitment (CANCELLED April 2024)
Regenagri (2024) https://regenagri.org/wp-content/uploads/2024/04/regenagri-standard-criteria-v3.1-1.pdf
SAI Platform (2022) Farm Sustainability Assessment (FSA) https://saiplatform.org/resource-centre/fsa/?document-id=16738&document-archive=fsa&document-action=Download&document-source=fsa39-guidance-note.pdf#document-12354
Scottish Government (2021) The Water Environment Regulation (Scotland) https://www.gov.scot/publications/water-environment-legislation/
Scottish Government (2024) Preparing for Sustainable Farming https://www.ruralpayments.org/topics/all-schemes/preparing-for-sustainable-farming--psf-/preparing-for-sustainable-farming--psf--full-guidance/
Soil Association (2024) https://www.soilassociation.org/our-standards/read-our-organic-standards/organic-standards-for-great-britain/
Soil Association Exchange (2024) https://www.soilassociationexchange.com/
Trinity AgTech (2024) Sandy https://www.trinityagtech.com/what-is-sandy-agtech-software
UK Center for Ecology and Hydrology (2024) SOil funDamentals (SOD) https://connect-apps.ceh.ac.uk/soilhealth/
UN Food and Agriculture Organisation (FAO) (2018) Tool for Agroecology Performance Evaluation (TAPE) https://www.fao.org/agroecology/tools-tape/en/
Vidacycle (2024) Soilmentor https://soils.vidacycle.com/
Welsh Government (2021) The Water Resources (Control of Agricultural Pollution) (Wales) Regulation https://www.gov.wales/water-resources-control-agricultural-pollution-wales-regulations-2021-guidance-farmers-and-land
Welsh Government (2023) Sustainable Farming Scheme https://www.gov.wales/sites/default/files/consultations/2023-12/sustainable-farming-scheme-consultation-document_0.pdf