CAAV Centenary Scholarship Report

THE VALUE OF SOIL HEALTH

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Central Association of Agricultural Valuers

June 2026

Harts Barn Farmhouse, Monmouth Road, Longhope, Gloucestershire

FOREWORD

Soil health has become increasingly central to discussions about farming resilience. Climate change – with greater swings between dry, hot and very wet conditions – and geo-political disruption to supply chains and input costs are causing more people to look to the condition of their soils and their land.

Healthier soils can improve the workability of soils, the soil biome and germination, give better water retention in dry periods and more infiltration and run-off during heavy rain, while reducing the need for manufactured fertiliser. At a higher level, governments and wider society are anxious for increased carbon storage and water management to prevent the flooding of homes or infrastructure.

However, discussion of the value of soil health can often become muddled. Social value and government policy intentions may not match market value; policy and supply chain discussions often miss significance on the farm and the practical details of land management at field level, overlooking relationships between landownership and the day-to-day farmers, such as tenants and contractors.

The better management of soil is increasingly seen in the work of CAAV members. A number of initiatives explore how payments can be made for increasing soil carbon; supply chains, concerned about resilience and Scope 3 emissions, can look to farmers to assess and improve their soils. More fundamentally, increasingly extreme weathers could see buyers begin to differentiate between blocks of land based on the condition and health of the soil. In farm tenancies and contract farming agreements, parties are drafting clauses to include soil health in the management plan for the holding.

Here, Harry Epsom combines his experience with the assessment and practical management of soil and his work as a valuer to offer a starting framework for considering the value of soil health:

- the first part of the paper reviews definitions of soil health and methods for assessment, including in-field, laboratory and outcome tests, giving a good introduction and signposting readers to further resources.
- the second part considers several approaches to value, covering market value, value to a farming business as well as wider social value. It flags questions and considerations that a valuer, looking at soil health in practice, may need to assess.
- the third section turns to agricultural tenancy questions and how plans to improve and manage soil health could be included in future agreements.

This paper is not prescriptive but offers a valuable introduction to the assessment of soil health and a starting point for considering, in the given circumstances, the question of value.

Julie Liddle
President *June 2026*

Author Biography

Harry Epsom was born in Kenya, and attended Michaelhouse School in South Africa. He studied at the Royal Agricultural University, graduating in 2015, qualified with the RICS in 2018 and passed the CAAV exams in 2019.

Harry established Epsom Rural in 2019, a land agency practice specialising in advising farmers and land managers on regenerative farming systems. He co-founded Abunda Land Matching in 2025, a service to help parties establish and develop long-term farming partnerships to support regenerative farms.

The views expressed in this paper are those of the author as a contribution to the debates on these important topics, and a useful starting point for members, but do not constitute advice from the CAAV.

Published by
The Central Association of Agricultural Valuers
Harts Barn Farmhouse, Monmouth Road, Longhope, Gloucestershire GL17 0QD

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June 2026

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Exploring Soil Health

What is Soil?

1.1 Soil is the foundation of our existence[1] and plays a crucial role in supporting ecosystems, biodiversity and global food and water security[2]. This section aims to provide an explanation of soil, its components, underlying chemical, physical and biological processes as well as methods for assessing and improving soil health.

1.1.2. The main functions of soil are organic matter decomposition, nutrient cycling, soil structure maintenance and community moderation, and associated disease control. [3]

1.2. **Components of Soil**

1.2.2. Soil is a critical natural resource from which much of life is created, maintained and to which it is then returned. Soil in its entirety is comprised of both living and non-living elements which together provide the basis of life on this planet [4].

In their simplest form, soils have three component factors:

1.2.2.1. **The physical factors** relate to the physical properties, structure, and processes occurring within the soil environment. This includes soil texture, structure, porosity, bulk density, water retention, and soil temperature. Soil texture refers to the relative proportions of sand, silt, and clay particles, while soil structure refers to the arrangement of soil particles into aggregates or clods. The soil's physical properties are influenced by factors such as parent material, climate, topography, vegetation, and land management practices. [5]

1.2.2.2. **The chemical factors** of soil encompass the composition, properties, and interactions of various chemical components within the soil matrix. Key chemical processes in soil include mineral weathering, ion exchange, nutrient cycling, redox reactions, and the absorption and desorption of contaminants. Soil chemistry governs nutrient availability, pH balance, soil fertility, and the retention and release of water and pollutants. Chemical properties of soil are influenced by factors such as parent material, climate, vegetation, land use practices, and anthropogenic inputs. [5]

1.2.2.3. **The biological factors** of soil refer to the living organisms and biological processes that occur within the soil ecosystem. This includes various microorganisms such as bacteria, fungi, archaea, protozoa, nematodes, and earthworms, as well as plant roots and soil-dwelling insects. These organisms play critical roles in nutrient cycling, organic matter decomposition, soil structure formation, and the suppression of plant pathogens. Biological activity in soil is influenced by factors such as temperature, moisture, pH, organic matter content, and the availability of nutrients. [5]

1.3. The Formation of Soil

The formation of soil has, in some cases, taken billions of years initially as a result of pressure, friction, impact, or other physical actions to separate the molecular structures of rock that then becomes soil. These processes are ongoing all the time. The erosion of rocks forms the parent material from which soils develop. [4]

1.3.2. The Parent Materials

1.3.2.1. There are three parent materials of soil which together form a multitude of soil types. These are sand, silt and clay and are fraction sizes of rock which have been eroded over time.

a) **Clay** has the smallest fraction size of soil particles and, in many ways, the most useful. These particles carry a negative charge and can hold more nutrients and water than sand and silt. Due to clay's high capacity to hold nutrients, it often includes a variety of nutrients bound to its structure. [4]

b) **Silts** are fine grains of soil but are larger than clay particles. Soils high in silt are prone to erosion if not managed properly. Silts are formed from physical and chemical processes and often comprise the top two most common minerals, Feldspars and Quartz. [4]

c) **Sand** is larger than silt and can be seen by eye. Most sand on earth is formed of silica and oxygen (SiO2) which is primarily derived from quartz or, in tropical areas, from calcium carbonate (CaCO3). Due to their larger particle size, sandy soils typically drain freely but do not easily hold nutrients and minerals. [4]

1.3.3. Organic Matter (OM)

1.3.3.1. Organic matter is sometimes not considered an important component of soil because it forms such a small fraction of most topsoil. However, without organic matter and soil life, soils would not be able to generate, support and recycle life. Since parent materials (sand, silt and clay) are non-living, mineral based substances, they do not have the necessary ingredients to support, create and decompose living organisms. Rather, soils often require organic matter to fuel the biological processes which help soils function optimally. [4]

1.3.3.2. Organic matter includes all organic molecules containing carbon, hydrogen, nitrogen and oxygen. [4] Soil organic matter can be found in four main categories:

a) Living organisms within the soil microbial communities including earthworms, protozoa, arthropods, bacteria and fungi (and many more).

b) Recently dead and incompletely decomposed plant and animal residues such as animal manures, crop residues, old roots and green manures. In healthy soils, these materials will be undergoing decay by various microbes and earthworms.

c) Materials which have decayed further, such as incorporated residues.

d) Humus, decomposed organic matter which has virtually no remains of decaying materials. This is a complex mixture of the chemical building blocks of life plus byproducts of the microbes that broke them down. Humus is typically rich in certain large molecules called humic substances, including humic acids, fulvic acids and ulmic acids all of which aid in making nutrients available to plants, improving soil structure and in stimulating plant growth.

1.3.3.3. The key to "building soils" is organic matter (OM). It is unlikely that land managers will import sand, silt or clay to change the soil composition. Therefore, you are only going to increase topsoil depth and loam structure through adding organic matter and working with soil biology. A land manager may add specific mineral amendments to soils but all essential elements for plants are found in healthy plant residues (i.e. organic matter). [4–7]

1.3.3.4. Increasing OM provides physical, chemical and biological benefits to soil. By increasing OM, this will improve the soil's nutrient holding capacity whilst also feeding soil biology which in turn releases organic compounds including plant available nitrogen. [8]

1.3.3.5. The benefits for increased soil OM have been well researched. Amongst these is improved crop yields which have mostly been attributed to OM's role of influencing the supply of water or nitrogen to plants. [9],[10],[11]

1.3.4. Air

1.3.4.1. Air provides interstitial spaces or pores in the soil and is vital for all aerobic soil life. The soil itself breathes in a way – diffusion is constantly happening whereby soil life is producing and consuming gases. Whilst it varies, a healthy organic soil can contain up to 80–90% of air containing pore spaces. [4,5,12]

1.3.5. Water

1.3.5.1. Water plays a vital role in the function of soils, including mobilising nutrients, supporting plant growth function and other biological activity. Therefore, soil moisture falling outside of optimum conditions will impact both crop production and soil function. [10]

1.3.5.2. Water is well known as the driving force of all life, but scientists are still learning about its application on our planet. Definitions of water typically include liquid, vapour and frozen states but, Matt Powers writes that there are also gel and EZ water states which are found all around us as well as "diamondized" water which has been found in the deepest boreholes on earth. [4]

1.3.5.3. Whilst we know that water in soils is vital, Matt Powers reports that the type of water impacts its efficacy (at times up to 70%) and affects how nutrients bind with minerals

in the soil, compost, fertilizer or other inoculants. Water quality also affects the efficacy of foliar sprays, whether chemical or biological, as pH, hardness and dissolved minerals can alter product solubility, compatibility, foliar uptake and active ingredient stability. [4],[13]

1.4. Soil as a Living Organism

1.4.2. Soil represents a dynamic amalgamation of physical, chemical, and biological components, forming a living system akin to a sophisticated computer network. This metaphor, eloquently articulated by Matt Powers, provides a profound lens through which to understand soil functioning. [4]

a) **The Hardware:** Within this metaphor, the parent materials comprising sand, silt, clay, rocks, and pebbles serve as the foundational mineral hardware upon which the intricate network of soil functions operates. Each component, akin to micro-processors of the soil's micro-biological world, contributes unique properties and behaviours. Notably, the Cation Exchange Capacity (CEC) functions analogous to processor speed and memory capacity combined, with parent materials largely dictating this aspect. Thus, the brand of hardware (parent material) determines the overall capabilities and mineral profile of the soil system.

b) **The Software:** Organic matter, representing the diverse array of humic compounds, emerges as the software programming the soil's ecosystemic trajectory. Like different programs executing specific functions, various types of organic matter direct distinct cycles and successions within the soil. Additionally, organic matter significantly enhances CEC, water retention, and provides a rich habitat and nourishment for soil life, akin to both the operating system and the battery powering the soil computer.

c) **The Operators:** Long-term evidence underscores the indispensability of the soil food web, plants, and soil organic matter in effective soil management. Acting as expert programmers and managers, these entities orchestrate soil processes and interactions, accomplishing feats previously deemed unattainable within conventional agrochemical paradigms.

d) **The Power:** In this metaphor, the sun assumes the role of the primary power source, paralleling its indispensable role in reality. Just as solar energy charges electronic systems, plants serve as the solar panels channelling carbon energy and protons into the soil, effectively charging it. This photosynthetic energy, stored within organic matter, functions as the soil's battery, with the sun serving as the vital catalyst for its replenishment. In effect, we cannot grow soil without plants.

1.5. What is Soil Health?

1.5.2. Soil health has been defined by Doran & Zeiss as *"the continued capacity of a soil to function as a vital living system."* [14]

1.5.3. According to Lal's paper 'Soil health and carbon management', [15] we must consider that soil quality and soil health are two distinct concepts. Soil quality is the inherent

potential for a particular soil to support a specified service (such as agriculture) whereas soil health describes the soil's actual condition as a system for supporting the specified services. [12]

1.5.4. In this case, in considering agricultural productivity, a healthy soil denotes a state of optimal physical, chemical, and biological balance within the soil ecosystem, conducive to sustained plant growth, ecosystem vitality, and environmental integrity. It extends beyond traditional notions of soil fertility to encompass a holistic understanding of the soil's condition. However, taking Lal's point, soil health should be seen relative to its inherent potential which includes its parent materials, climatic conditions and many other factors.

The following components should be considered when evaluating the health of a soil:

a) **Physical Properties:** Soil structure, texture, and porosity are key physical properties that influence soil health. Well-structured soil facilitates root penetration, water infiltration, and air exchange, essential for optimal plant growth. [5] Soil compaction, erosion, and aggregation adversely impact these physical properties, affecting soil health and productivity.

b) **Chemical Properties:** Soil chemistry plays a critical role in soil health by governing nutrient availability, pH balance, and the retention of water and contaminants. Nutrient cycling, ion exchange, and mineral weathering processes are fundamental to soil fertility and productivity. Parameters such as cation exchange capacity (CEC), soil pH, and nutrient ratios serve as indicators of soil chemical health, influencing plant growth and ecosystem resilience. [5]

c) **Biological Properties:** Soil biology, including microorganisms, fauna, and plant roots are integral to soil health. Microbial activity drives nutrient cycling, organic matter decomposition, and soil structure formation thereby impacting soil fertility and resilience. Soil fauna, such as earthworms and nematodes, contribute to soil aeration, nutrient mixing, and ecosystem functioning. [16]

1.5.5. **Characteristics of Healthy Soil:**

1.5.5.1. In summary, the following characteristics apply to healthy soil (assuming the context of agricultural production):

- Physical Characteristics:
    - Well-aggregated soil structure
    - Adequate porosity and water infiltration
    - Minimal compaction and erosion
- Chemical Attributes:
    - Balanced nutrient levels and ratios
    - Optimal soil pH and salinity levels

- High cation exchange capacity (CEC)

- Biological Diversity:
  - Abundant microbial biomass and diversity
  - Active soil respiration and microbial activity
  - Diverse soil fauna populations

1.5.5.2. The characteristics of healthy soil described above should not be treated as a universal standard. Soil health is context-specific and must be assessed in relation to the function the soil is intended to perform. For example, a soil supporting a wildflower meadow or flood plain meadow may be healthy despite having nutrient levels, pH or biological activity that would be regarded as sub-optimal for intensive agricultural production. Consistent with the distinction between soil quality and soil health, the same soil may therefore be healthy in one land use and constrained in another. For valuation and advisory purposes, soil health should be considered against the land's existing or reasonably foreseeable use, rather than against a generic agricultural benchmark.

1.6. What damages soil?

1.6.2. Healthy soil is susceptible to various human and environmental stressors that can degrade its functionality. By understanding the factors that damage soil, we can mitigate harm and implement practices to restore and preserve soil health.

- **Soil Erosion:**

  Soil erosion is the physical removal and movement of soil particles, typically by water, wind or mechanical disturbance. It is often accelerated by unsustainable land management practices such as excessive tillage, deforestation, and improper grazing, poses a significant threat to soil health. Loss of topsoil, containing valuable nutrients and organic matter, diminishes soil fertility and productivity over time. [4,17,18]

- **Soil Compaction:**

  Soil compaction, often resulting from heavy machinery, livestock trampling, and intensive tillage (especially on wet soils), impairs soil structure by increasing soil density and reducing pore spaces. This allows the particles to break down and become cemented together by electrostatic forces. As a result, compacted soils exhibit decreased water infiltration (and possibly increased run-off), reduced aeration thereby preventing root growth, and lowering beneficial soil organism populations (due to decreased oxygen). [19,20]

- **Waterlogging:**

  Waterlogging occurs where soil pore spaces become saturated for prolonged periods, restricting oxygen availability within the soil profile. It may arise from poor inherent drainage, compaction, high water tables, or changes in land management that reduce

infiltration. Anaerobic conditions, being the absence of air, inhibit root respiration and microbial activity, disrupt nutrient cycling (notably nitrogen), and can lead to root damage or plant loss. Repeated or prolonged waterlogging can degrade soil structure over time, particularly where trafficking occurs on saturated soils, increasing susceptibility to compaction and surface sealing. From a soil health perspective, waterlogging reduces functional resilience and limits the soil's ability to support productive or stable land use. [5]

- **Drought:**

  Drought conditions damage soil health primarily through prolonged absence of moisture, which restricts biological activity, reduces nutrient availability, and limits plant growth. Dry soils are more vulnerable to structural breakdown, surface crusting, and wind erosion, particularly where organic matter levels are low. Repeated drying and re-wetting cycles can also weaken soil aggregates, increasing runoff risk once rainfall returns. While drought is climatically driven, soil condition influences its severity: soils with poor structure or low organic matter are less able to retain and supply water to plants, amplifying the functional impacts of dry periods. [15]

- **Chemical Inputs:**

  Excessive use of synthetic fertilizers and pesticides can disrupt soil biology, alter nutrient cycling, and degrade soil health.[3,4] Navshree et al have shown pesticides to negatively affect soil microbiota, structure, composition and fertility. As a consequence, the availability and absorption of nutrients for plants are affected. [21] In a review of over 400 studies, Gunstone et al. found that in over 70% of cases, agricultural pesticides harm on non-target soil invertebrates. [22]

  Whilst chemical fertilizers have their benefits, the type, rate and timing is key as misuse can lead to unintended consequences including not being taken up by plants, causing harm to soil health and leaching into the wider ecosystem [19].

  Specifically concerning nitrogen fertilisation, a meta-analysis of 82 published field studies found that microbial biomass reduced by an average of 15% in response to heavy nitrogen use. [23] Barabasz et al found that long-term nitrogen use resulted in a 50% reduction of several beneficial species of bacteria whilst other bacterial species where completely eradicated. [24]

- **Excessive Tillage**

  Numerous studies demonstrate a correlation with tillage and lower soil health. [25] Tillage systems have been found to have lower levels of microbial biomass, less mineralizable nitrogen levels and reduced soil organic matter when compared to no-till or reduced tillage systems.[26,26–29] These effects are primarily linked to increased soil disturbance, accelerated organic matter oxidation, and disruption of soil aggregates.

  However, outcomes are highly dependent on soil type, climate, cropping system, and management intensity. In some UK contexts, particularly on heavy or poorly drained soils, reduced tillage may introduce countervailing risks such as compaction, waterlogging, or weed pressure, which can offset soil health gains. As such, tillage impacts should be interpreted as conditional rather than universal. [30]

- **Loss of Organic Matter:**

  Depletion of soil organic matter, accelerated by monocropping, soil disturbance, and direct exposure to the sunlight diminishes soil fertility, water retention, and microbial diversity. Loss of organic matter reduces soil resilience to environmental stressors and compromises long-term soil health. [31],[32],[33]

- **Acidification:**

  Use of fertilizers, particularly nitrogen, has been demonstrated to have a linear reduction in soil pH thereby resulting in soil acidification (particularly where buffering is insufficient). This is a considered as a significant threat to terrestrial ecosystem function and species diversity. [23,34,35]

  With lowered pH, soils face changes to the microbial community which in turn impact processes like organic matter mineralisation, nutrient cycling and the production of nitrous oxide via nitrification and denitrification. [25]

Systems thinking around Soil Health

2.1 Systems thinking is an approach to understanding how individual components within a system interact as part of a wider whole. For example, rather than viewing soils, crops, livestock, water, infrastructure and financial performance as separate issues, it considers the relationships, feedback loops and dependencies between them, recognising that change in one part of the system will often influence outcomes elsewhere.[36,37]

2.1.2. Adopting a systems thinking approach is paramount for understanding the intricate dynamics and interconnectedness of farming systems, especially in soil health management. Farming is not a linear process of "inputs and outputs," but rather a living web of ecological, economic, and social interactions. By recognizing soil as a complex ecosystem influenced by these multifaceted relationships, we can develop holistic strategies that not only enhance soil health but also build the resilience of the entire farming system.[36–38]

2.1.3. **Understanding Soil as a Living System:**

Soil is not merely an inert substrate for crops; it is a vibrant, living ecosystem teeming with organisms and biochemical processes that underpin agricultural productivity. Systems thinking emphasizes the interdependence of soil biology, chemistry, and physics, showing how soil health directly shapes crop yields, farm profitability, and long-term sustainability. Just as healthy soil fosters resilient crops, degraded soil can trigger negative feedback loops that reduce yields and increase dependence on external inputs. [36]

2.1.4. **Embracing Complexity and Feedback Loops:**

Farming systems are characterized by complex, nonlinear interactions. For instance, improving soil organic matter enhances fertility and water retention, leading to higher yields, which in turn generate resources for further soil investment—a reinforcing

loop of improvement. Conversely, short-term overuse of fertilizers may boost yield initially but degrade soil over time, creating a balancing loop that diminishes productivity. Systems thinking equips us to anticipate these feedbacks, helping farmers avoid unintended consequences and adapt management strategies proactively. [26]

2.1.5. Recognizing Socio-Ecological Interactions:

The management of soil health is inseparable from broader socio-ecological systems. Agricultural practices, land-use policies, markets, and socio-economic conditions all shape how soil is managed and what outcomes emerge. For example, policy incentives can encourage conservation practices, while economic pressures may drive overexploitation. Systems thinking highlights the importance of recognizing these interactions and integrating social, economic, and cultural perspectives into soil management, underscoring the need for collaboration among farmers, researchers, and policymakers. [39]

2.1.6. Promoting Resilience and Adaptive Management:

Resilience—the ability of a farm to cope with shocks and adapt to change—is key to long-term sustainability. For soils, this means encouraging diversity and flexibility so they can stay healthy under different conditions. For example, rotating crops and mixing in livestock doesn't just spread risk if one crop fails—it also improves nutrient cycling, adds organic matter to the soil, and helps farms handle challenges like drought or heavy rain. Systems thinking supports this by promoting management that can adjust over time, with soil health at the heart of creating resilient farm landscapes.[37]

2.1.7. Integrating Knowledge and Innovation:

Finally, systems thinking emphasizes the value of integrating diverse knowledge systems. Scientific research, traditional ecological knowledge, and farmers' experiential wisdom each provide critical insights for improving soil management. By combining these perspectives, agricultural communities can co-create innovative, context-specific solutions that are more resilient and sustainable. This collective learning process helps ensure that soil health practices evolve alongside environmental and societal changes. [39]

Assessing Soil

3.1 Assessing Soil Health

This chapter explores how to assess soil health.

Why Assess?

3.2. For advisers, the aim may not be to become soil experts but it is becoming increasingly important to be aware of the tools and techniques available to assess the quality and health of a soil, to spot material risks or opportunities, to monitor the soil's status

particularly in response to changes to management and to know how and where to receive expert advice. This chapter seeks to provide guidance to this extent.

3.2.2. Soil "health" is a practical, living-systems idea: we judge soils by how well they perform core functions (crop production, water regulation, nutrient cycling, resilience) under the intended land use. Soil "quality" on the other hand is the soil's inherent potential for a particular function. Therefore, assessing soil health or soil quality is context specific – we must first be clear on what the intended outcome is (for example, the production of arable crops or the creation of a flower meadow).

What to Assess?

3.3. There are an increasing number of techniques, tools and emerging technologies available to assess soil. It is therefore important that advisors are aware of these and able to oversee a pragmatic and helpful soil assessment and monitoring plan.

3.3.2. When assessing a soil, it is important to remember that for it to function optimally, it requires balance of each of the component parts. These can be broken down into chemical, physical and biological parts or, in more detail, into the following sections. [4]

- Air & Water
- Organic Matter
- Soil Biology
- Minerals
- Plant Roots & Photosynthesis

3.3.3. Under each heading above, there are a range of assessment options each varying in their indications and, by virtue, their usefulness to a particular context. It is therefore for an advisor to select a practical and meaningful combination of assessments as to provide a suitable collection of data.

A Tiered Approach

3.3.4. With the benefit of the context, a tiered approach can be taken to provide a cost effective and repeatable assessment and monitoring plan. This section provides a selection of tools which a Member might chose to implement. However, with the number of options available and soon to become available, this list is not exhaustive.

3.3.5. Tier 0 — Desk Study (set the context)

3.3.5.1. As a starting point, it is helpful to gather pre-existing information about a soil and its likely characteristics. This has been broken down into categories.

3.3.5.2. **Available Online Data:** Data on the underlying soil characteristics of an area is available, most notably, through the following:

- **Cranfield University's LandIS Portal / National Soil Map:** The LandIS Portal, developed by Cranfield University with Defra, provides open access to datasets for England and Wales, including the National Soil Map, Soilscapes, Soil Series data, horizon data and the National Soil Inventory. These datasets can assist with desk-based understanding of soil type, drainage, texture, chemical properties and environmental constraints. However, they remain strategic evidence and should not be treated as a substitute for field inspection, soil sampling or specialist survey where soil condition is material.[40]
- **UK Soil Observatory (UKSO):** This is an online archive of UK soils data from nine research bodies. It provides easy access to a huge range of data in a dynamic map viewer.[41]
- **SoilGrids (ISRIC):** this data set is designed as a globally consistent, data-driven system that predicts soil properties and classes using global covariates and globally fitted models. Information includes soil group, predicted carbon stock / density, texture, cation exchange capacity, nitrogen content and more. [42]
- **Provisional Agricultural Land Classification (ALC):** Available since 1988, the Provisional ALC map has long been subject to limitations for modern decision-making, particularly because of its age, scale and limited ability to distinguish Grades 3a and 3b nationally. It has now been replaced by the new Predictive ALC map for England. [43]
- **Predictive Agricultural Land Classification:** Launched in 2026, this map provides a material improvement for strategic assessment, particularly because it maps the 3a/3b distinction nationally. However, it remains a strategic-scale predictive tool and should not be relied upon as definitive field-scale evidence. Defra confirms that detailed field-based ALC surveys may still be required, for example in planning applications, and that a wider technical review of the ALC system is due to complete in 2028.[44] [45]

3.3.5.3. **Management History:** Information about how a farm has been managed and observations from the land manager can provide a helpful starting point. Questions should focus around topics include tillage / traffic, crop rotation, residue handling, application of fertilizers / manures / composts, grazing practices, liming, pesticide / herbicide history, compaction events and drainage works.[19]

3.3.5.4. **Required by Legislation:** To comply with the Farming Rules for Water, farmers applying organic manure or manufactured fertiliser to cultivated agricultural land must take account of soil test results that are no more than five years old. These must show soil pH and levels of phosphorus, potassium and magnesium; nitrogen must also be considered, although this may be assessed through Soil Nitrogen Supply rather than necessarily through laboratory soil testing. This presents a good opportunity to

gather useful information.[47] [48] This presents a good opportunity to gather useful information.

3.3.5.5. **Funded by Schemes:** Consider whether the land manager has been or is part of a scheme such as England's Sustainable Farming Incentive action SAM1/CSAM1 which requires a written soil assessment/plan and SOM test within 5 years; [49] Wales' SFS (from 2026) indicates minimum lab tests of pH, P, K, Mg and SOM on improved land, with a 4-year look-back. These set a sensible cadence and evidence pack. [50]

3.3.5.6. **Professional Relevance of LandIS Portal and Predictive ALC**

a) The recent launch of the Predictive ALC and open-access LandIS Portal are a significant development for professional practice. Whilst LandIs provides access to the National Soil Map of England and Wales and associated LandIS datasets, drawing on over 30,000 soil samples and more than 250,000 soil observations, the Predictive ALC offers an update on the historic Provisional ALC.[40]

b) For valuers and rural advisers, these datasets strengthen desk-study evidence for due diligence, land-use appraisal, tenancy baselining, climate resilience and natural capital assessment. However, it remains contextual evidence only: it can indicate likely soil characteristics and constraints, but it does not prove current field condition, compaction, drainage performance, nutrient status or biological function.

c) **Practice warning:** Desk-based soil mapping is a starting point for enquiry, not a substitute for field inspection or soil testing.

3.3.5.7. **Digital mapping and collation software:**

a) Digital mapping platforms can help advisers bring desk-study information together in a practical, visual format. One example is The Land App, a UK mapping platform which can be used to map holdings, view land-use and environmental information, prepare plans and collaborate with clients.[46]

b) For soil-related purposes, such software can help identify matters requiring further investigation, such as soil-type variation, drainage constraints, flood risk, environmental designations, scheme opportunities and natural capital considerations. It may also provide a useful way to record field observations, photographs and management notes during site visits.

c) However, these platforms should be treated as mapping and collation tools, not as conclusive evidence. The underlying sources, scale and accuracy of any mapped information should be checked, and material issues should be verified through field inspection, soil testing or specialist advice.

3.3.6. **Tier 1 — Field Triage (make observations)**

3.3.6.1. Following collection of pre-existing data set out in Tier 0 above, the next layer is collection of low-cost observational data. This list is indicative.

a) **Surface Inspection:** a natural starting point is a visual surface inspection of the soil and landscape. The Environment Agency's guide "Think Soils" encourages land managers to look for signs of erosion, soil deposition, compaction (such as ponding, wheel ruts, and poaching), or surface capping. One should also assess the crop's growth as an indicator of soil health. [51]

b) **Visual Evaluation of Soil Structure (VESS):** An approach for visually assessing soil, and use of an associate scorecard has been put forward by the GREATsoils initiative funded by AHDB and BBRO. This suggests two methodologies; for arable, the SRUC methodology and for grassland, the Healthy Grassland Soil methodology. [52]

c) **Infiltration / surface condition:** Using the "drainpipe" test, we can measure the infiltration of water into soil. This helps identify compaction or surface sealing which indicates the likelihood of soil erosion and loss of nutrients from land to water. [12] [13]

d) **Penetrometer:** Use of a penetrometer allows for an immediate in field assessment of soil compaction. The probe is pushed into the ground and the pressure being excreted is measured on a dial (normally in PSI) indicating how compact the soil is, and at what depts the compaction is found. This can help identify "plough pans" thereby allowing for remediation at the appropriate depth.

e) **Earthworms:** Quick counts of earthworm populations from across a field provide helpful cross-check on the soil's biological condition. Typically, a 20cm x 20cm x 20cm hole is dug and number of earthworms observed and recorded (alongside the VESS). Further guidance is provided by GREATsoils. [53]

f) **Brix Meters / Refractometers**: These are used to measure the concentration of soluble solids, primarily sugars, in plant sap through light refraction. They are inexpensive and easy to use and are used as a proxy indicator of plant metabolic activity. These are considered in more detail under paragraph 3.1.10.a.

3.3.7. Tier 2 — Laboratory Testing

3.3.7.1. There are many types of soil tests varying from basic packages to broad spectrum packages which measure essential nutrients, pH, CEC, soil texture, soil carbon, C:N ratio, microbial biomass and much more. These laboratory tests provide quantitative indicators of selected chemical, physical and biological properties but do not directly measure soil function or performance. [54]

3.3.7.2. It is important to remember that soils are dynamic and there will therefore be variations in readings due to seasons, weather and cropping cycles. [4] The magnitude of this variability differs between indicators, with biological and physical properties often exhibiting greater short-term fluctuation than many chemical properties. However, certain nutrients, such as nitrogen, are more mobile than others and therefore testing is of limited benefit unless undertaken at consistent times and interpreted in the context of recent management and climatic conditions. [54]

3.3.7.3. Soil nutrient testing is the most common method of testing and uses an extraction method to measure the nutrients that are assumed a crop can uptake during a growing season. They do not measure the total amount of nutrients in the soil, nor do they capture biological nutrient cycling or mobilisation through soil microbial processes. Different laboratories use different techniques and therefore may give different results. As a result, materially different outcomes may be reported from the same soil sample depending on the analytical method employed. For this reason, it is useful to use the same laboratory (and same methods) as to ensure the tests are comparable. [4]

3.3.7.4. Under the Farming Rules for Water, land managers must plan applications of organic manures and manufactured fertilisers so that they do not exceed soil and crop need and do not create a significant risk of agricultural diffuse pollution. Where relevant, nutrient planning must take account of recent soil test results, which must be no more than five years old at the time of application and show soil pH and levels of phosphorus, potassium and magnesium. Nitrogen may be assessed through soil nitrogen supply rather than necessarily through a laboratory soil nitrogen test.[47]

3.3.7.5. Other common laboratory tests include:

a) **Total Nutrient Content (TNC)** – total or near-total nutrient content measured by the laboratory method used, including reserve and non-readily available fractions, rather than only the immediately plant-available nutrient pool and typically includes N, P, K, Ca, Mg, S, B, Cu, Fe, Mn, Mo, Na, Zn.

b) **Broad Spectrum** – such tests typically include the nutrients mentioned above albeit for plant availability, CEC, pH, soil texture classification, organic carbon / organic matter.

c) **Carbon & Organic Matter** – several tests are available to provide data including on; biologically active carbon, organic matter, organic carbon, C:N ratio and estimated carbon stock.

d) **Soil Biology** – a range of tests can indicate soil biology including; total bacteria, total fungi, bacteria fungi ratio, hyphal diameter, protozoa and more.

3.3.7.6. A key limitation of laboratory testing is that results are only as robust as the sampling strategy that underpins them. Sampling depth, spatial coverage, compositing approach, timing and recent management all materially influence outcomes. Laboratory data should therefore be interpreted alongside clear metadata describing how and when samples were collected. [54]

3.3.7.7. A list of laboratories offering soil testing in the UK is available on the AHDB's website: https://ahdb.org.uk/knowledge-library/soil-and-forage-testing-companies

3.3.8. Tier 3 – Testing for Plant Health

Whilst not measuring the soil health directly, the assessment of the plant's health can be a helpful tool for farmers and advisors. The following may be used:

a) **Refractometers / Brix Meters** – this tool, which uses refraction of light, is cheap and easy to use. It provides a reading of the plant's sugar concentrations (by measuring the sap). By reading sugar levels, this indicates how efficiently a plant is producing exudates, interacting with the soil biology and photosynthesising. Users must be aware that values shift according to temperature, time of day and soil moisture content and therefore readings should be taken at the same time of day as to control the variables. This is a helpful tool but should not be relied on in isolation. [4]

b) **Plant Sap Analysis** – this test allows us to see if soil nutrients are being taken up by plants. This relatively new method of testing gives an accurate snapshot of nutrient mobility and plant sap nutrient levels which indicates how healthy a plant is currently. By doing this, growers can see whether their fertilizers have been absorbed by plants and, by also testing the soil nutrients (both soluble and non-soluble), they can see how much is being leached. This is an incredibly helpful tool both ecologically and economically, especially when used every few weeks. [4] In fact, Advancing Eco Ag claims that a sap test will yield 23 data points, which can indicate nutrient excesses and deficiencies in crops ahead of when symptoms can be observed in the field. [55]

c) **Amino Sugar Testing** – This is a lab test that estimates the share of soil nitrogen held in amino-sugar forms (part of the organic nitrogen pool). Because 95–99% of soil nitrogen is organic, not immediately available to plants, this test is used as a proxy for how much nitrogen the soil can naturally mineralise (release) into plant-available forms over time. Note, it cannot predict day-to-day availability of nitrogen as temperature, moisture and microbial activity govern the release in the field. [8]

3.3.9. **AHDB Soil Health Scorecard:** The AHDB Soil Health Scorecard provides a practical framework for bringing together several field and laboratory indicators into one repeatable assessment. It uses VESS, soil pH, extractable nutrients, earthworm counts and soil organic matter, and compares results against benchmark ranges for UK soil types and climate regions. It can provide a useful "traffic-light" snapshot to support management discussions and monitoring over time. However, it should be treated as a structured monitoring tool rather than a complete soil-health diagnosis, and its benchmarks are not applicable to all soils, including peaty or organic soils and some upland or semi-natural systems.[56]

3.3.10. Emerging Technologies for Soil Assessment:

3.3.10.1. A range of emerging technologies is likely to influence how soil condition is assessed and monitored. These include rapid in-field sensors, spectroscopy, high-resolution soil scanning, biological activity tests, remote sensing, artificial intelligence and non-invasive sub-surface imaging. At present, many of these tools appear to have limitations, particularly around calibration, interpretation, cost, repeatability and

acceptance within formal schemes or professional processes. However, technology is developing at pace, and improvements in capability, accessibility and cost may materially change how soil evidence is gathered and used. [57]

3.3.10.2. Examples include handheld biological or chemical sensors, smartphone-based microbial biomass tests, gamma-ray soil mapping, near-infrared spectroscopy, direct-contact soil carbon probes and non-invasive seismic approaches such as the Earth Rover Program.[58],[59],[60] These technologies may help advisers identify within-field variation, target sampling locations, monitor management change, support carbon or natural capital baselining, and provide clearer evidence for discussions with landowners, tenants, funders or scheme providers.[57,60,61]

3.3.10.3. This could become an important area for rural professional practice. If soil condition can be assessed more quickly, affordably and consistently, it may become easier to evidence change over time, support tenancy discussions, verify environmental outcomes and incorporate soil health into valuation and strategic advice. However, advisers should not assume that a technology is reliable or appropriate simply because it is new. The relevant questions remain: what does it measure, how has it been validated, is it repeatable, what are its limitations, and will its outputs be accepted by the relevant scheme, market, tribunal, client or professional process?

Improving Soil Health

4.1 Improving soil health is a multifaceted process. This section outlines various strategies that can be deployed to enhance the physical, chemical and biological functions of a soil. Whilst we can view actions as targeting one element of soil health, we must remember that each of these components is closely interlinked, and soils perform best where physical, chemical and biological functions are not constrained by a dominant limiting factor. [42]

4.1.2 Experts suggest that the most reliable pathway to increasing soil health is context-led, evidence-based and incremental. That is to say, a change in a farming system needs to consider the business' wider risks of transitioning to a new model, particularly concerning economics.

Working rule

As a general principle, it is helpful to consider *"what's the biggest limiting factor (structure, SOC, biology, pH, drainage), and what's the one change most likely to move that score within a year?"* Then act, monitor, and iterate. This is likely to result in the biggest return on investment when resolved.

4.2. Context, vision and baselining

4.2.2. As a starting point, it is crucial to review the farm's context. This includes establishing clear objectives for soil health (i.e. what the soil is expected to produce or support),

understanding the decision-making approach of the farm's stewards, and identifying the site's physical, regulatory and economic constraints. Ambition should be calibrated to inherent soil quality, operational risks and available cashflow, recognising that soils differ markedly in their capacity to respond to management.

4.2.3. UK climate projections reinforce the importance of this contextual approach. Projections indicate an increased likelihood of intense winter rainfall, drier summers and more frequent extreme weather events, placing greater emphasis on soils that can infiltrate rainfall efficiently, store water during dry periods and resist erosion under stress.[62] Evidence reviews by Defra further link good soil condition to improved resilience to both flooding and drought at farm and catchment scale.[63]

4.2.4. As part of setting this context, it is helpful to assess the soil's current condition and health. This can be achieved using the assessment tools outlined earlier in this report and may include the AHDB Soil Health Scorecard. The scorecard brings together a practical set of indicators, including Visual Evaluation of Soil Structure (VESS), soil pH, extractable nutrients (phosphorus, potassium and magnesium), soil organic matter content and earthworm numbers, providing an accessible baseline and benchmark for change. [64]

4.2.5. VESS in particular is widely used as a rapid, field-based method for assessing soil structural condition and identifying compaction or poor aggregation. While qualitative, it has been shown to be repeatable and effective at distinguishing management impacts when applied consistently. [65] These indicators are not intended to provide a complete diagnosis in isolation. Instead, they offer a practical starting point that can be repeated at suitable intervals, or following major management changes, to track trends and inform decision-making over time.

4.2.6. By establishing both context and a baseline, the farm business gains a clearer understanding of its current soil condition, its realistic potential, the key constraints limiting performance, and the resources available to address them. This provides a sound foundation for prioritising soil health interventions that are proportionate, evidence-based and aligned with both the physical capability of the soil and the wider needs of the business.

4.3. Physical foundations:

4.3.2. The physical condition of soil forms a fundamental foundation for improving soil health. Compaction, poor drainage and waterlogging are among the most common constraints on crop performance, root development and microbial activity. Where present, these constraints should be identified, monitored and remediated as a priority. Evidence consistently shows that where physical limitations remain unresolved, subsequent biological or chemical interventions are often ineffective or deliver only limited benefit. [6,17,66,67]

4.3.3. In the UK, a range of practical interventions can be used to address physical soil constraints, selected according to soil type, cropping system and severity of the issue identified.

4.3.4. Compaction and poor aeration should first be identified and mapped. Where compaction is confirmed, remediation should be targeted using appropriate tools and followed by changes in management to avoid re-compaction, such as reducing axle loads, avoiding trafficking in wet conditions and minimising unnecessary cultivation. [66] Where soil loosening is required, non-inversion tillage is often preferred to full inversion techniques, as it can alleviate compacted layers while better preserving soil structure and biological continuity. [4]

4.3.5. Where poor drainage is identified as a limiting factor, installing new drainage or restoring existing systems may be a justified intervention. Where drainage infrastructure is already present, maintaining functionality through repairing outfalls, clearing blockages or, where appropriate, mole draining can significantly improve soil performance. [68]

4.3.6. Effective drainage increases the number of workable field days, improves trafficability, and reduces surface slumping and capping, all of which support more consistent crop establishment and soil biological activity. [68]

4.3.7. On soils prone to compaction, managing traffic is critical. Approaches such as controlled traffic farming, the consistent use of tramlines, and the protection of headlands through grass margins or reduced trafficking can significantly limit the area of soil subjected to repeated loading.[69]

4.3.8. Reduced tillage and direct drilling systems can lower establishment costs and help protect soil structure, but their success is highly dependent on underlying soil condition. UK advisers consistently emphasise the need to "earn the right" to no-till by first addressing compaction, ensuring adequate drainage and managing surface residues effectively. [70] Where these prerequisites are not met, crop establishment can be compromised and biological activity suppressed.

4.3.9. A large global meta-analysis reported average yield reductions of approximately 5% under no-till systems when compared with conventional tillage. However, these yield penalties were shown to diminish or reverse where no-till was combined with residue retention, diverse crop rotations and favourable climatic conditions, highlighting the importance of system design rather than tillage choice in isolation. [28]

4.4. Water management

4.4.2. Healthy soils manage water effectively. The aim is to maximise rainfall infiltration and soil water storage while minimising runoff, waterlogging and erosion, and to apply irrigation precisely where it is used.

4.4.3. Improving infiltration and water storage begins with maintaining stable soil aggregates and a well-connected pore network. Practices such as maintaining soil cover, returning organic matter, avoiding trafficking or cultivation on wet soils, and disrupting preferential flow paths created by tramlines all contribute to improved infiltration and more effective use of rainfall. [67]

4.4.4. AHDB guidance highlights the importance of pore size distribution in determining both plant-available water and optimal conditions for soil microbial activity.[71]

4.4.5. Where soils are poorly drained, waterlogging can significantly reduce workable days, restrict root growth and suppress soil biological activity. In such situations, under drainage can be a justified and enabling intervention. The design, installation and maintenance of drainage systems should follow best practice to ensure long-term effectiveness and compliance.[68]

4.4.6. Where irrigation is available, it can play a supportive role in soil health by reducing periods of severe moisture stress, maintaining crop cover, and sustaining biological activity. However, irrigation should be viewed as a context-specific tool, not a universal solution, and its effectiveness depends on accurate application, suitable soil conditions and careful integration with nutrient and traffic management. [72]

4.4.7. In systems where irrigation is appropriate, precise application helps avoid the negative soil impacts associated with over-watering, such as surface sealing, nutrient leaching and prolonged anaerobic conditions. Modern irrigation strategies increasingly emphasise matching water supply to crop demand using soil moisture monitoring or plant-based indicators, thereby supporting both crop performance and soil function. [73]

4.4.7.1. The Farming Rules for Water place increasing emphasis on nutrient and manure planning, the prevention of runoff and soil erosion, and the timing of applications in relation to crop demand and soil conditions. Water management and soil condition are therefore closely linked to regulatory compliance. [74]

4.5. Organic Matter Management

4.5.2. Organic matter (OM) plays a central role in soil health by influencing physical structure, biological activity and nutrient cycling. Organic matter contributes to aggregate stability, improves water infiltration and storage, supports soil microbial communities and acts as a reservoir for nutrients that can be released over time. Maintaining or increasing SOM is therefore widely regarded as a foundational objective of soil management, although changes are typically gradual and strongly influenced by soil type, climate and management. [6]

4.5.3. Increasing organic matter can be achieved using the following non-exhaustive list of methods:

4.5.3.1. **Livestock Manures:** These manures and slurries provide organic carbon alongside nutrients and can stimulate soil microbial activity. Grazing livestock can also contribute to organic matter returns through dung, urine and root turnover. Nutrient content and availability vary widely depending on material type, storage and timing of application, and should be accounted for using RB209 guidance to ensure nutrients are matched to crop demand. [75–77]

4.5.3.2. **Cover Cropping:** Cover crops are widely used to protect soil between cash crops, reduce erosion risk and provide organic inputs through roots and above-ground biomass. Evidence from international studies shows that cover crops improve soil

aggregation, infiltration and structural resilience, particularly where soils would otherwise be left bare over winter. Their contribution to long-term soil organic matter levels is variable and management-dependent, but their role in supporting soil structure and biological activity is well established. [76,78,79]

4.5.3.3. **Composting:** Composted organic materials typically supply a more stable form of organic carbon than fresh residues, as labile fractions are mineralised during composting. When mature and well-aerated, composts can enhance soil aggregation and stimulate microbial activity, contributing to improved soil structure and biological functioning. Outcomes are strongly influenced by compost quality, soil type, and baseline soil condition, with the greatest responses generally observed in soils with low existing organic matter. [80,81]

4.5.3.4. **Green Manures:** Green manures and the incorporation of crop residues add organic biomass to soil and can contribute nitrogen where legumes are included. Their use can support biological activity and nutrient cycling, although benefits depend on timing, species choice and subsequent soil management. [78,81,82]

4.5.3.5. **Mulching:** Mulching refers to the presence of plant material on the soil surface, derived from retained crop residues, terminated cover crops, applied organic materials or, in some systems, living plant cover.

4.5.3.6. In arable rotations, chopped straw retained after harvest and the residues of terminated cover crops commonly function as surface mulches, protecting soil from rainfall impact, reducing surface sealing, improving infiltration and limiting erosion, while supporting aggregate stability and soil biological activity. Evidence from conservation agriculture systems (i.e. those based on three linked principles: minimum soil disturbance, maintaining soil cover and diversifying crop species) shows that these benefits depend primarily on maintaining sufficient and persistent surface cover rather than on the specific source of the material. [17,78,79]

4.5.3.7. In addition to dead residues, living mulches such as companion crops or understory species can provide continuous soil cover and active root inputs, but their suitability in temperate arable systems is highly context-dependent due to risks of competition and management complexity. In horticultural and perennial systems, applied organic mulches are more commonly used and can be particularly effective at conserving moisture and protecting surface structure. Across all systems, mulching should be viewed as a soil-protection strategy that supports soil function and resilience rather than as a rapid means of increasing soil organic matter. [79]

4.5.3.8. **Biosolids**: Where biosolids or composted sewage sludges are used appropriately, long-term research shows they can provide agronomic benefits and contribute to soil health through additions of organic matter and nutrients, when applied at suitable rates and in accordance with best practice. In England, this is underpinned by compliance with the Biosolids Assurance Scheme and the Safe Sludge Matrix, which set controls on treatment standards, application rates and crop restrictions. However, there is increasing scientific scrutiny of so-called “emerging contaminants”, including PFAS, microplastics, pharmaceuticals and antimicrobial resistance genes. While the

evidence base for these risks is still developing, the regulatory position is also evolving rapidly, particularly following the UK Government's 2026 PFAS Plan and ongoing Environment Agency investigations into contaminant transfer from biosolids to agricultural soils. Users should therefore follow current Biosolids Assurance Scheme guidance closely and remain alert to changes in monitoring requirements, assurance standards and policy controls. [83,84]

4.5.3.9. For advisers, biosolids use should therefore be treated not only as a nutrient and organic matter question, but also as a due diligence issue where historic applications, assurance records, crop restrictions and emerging contaminant risks may be relevant to letting, sale, environmental scheme participation or future liability.

4.6. Nutrient Management

4.6.2. Purpose and scope of nutrient management

Effective nutrient management is fundamental to both soil health and agricultural productivity. Crops require an adequate and balanced supply of nutrients to achieve optimal growth and yield; however, nutrient management also influences soil function through its effects on root development, biomass return, soil biological activity and nutrient cycling. In this way, nutrient management operates at the interface between crop performance and the physical, chemical and biological processes that underpin long-term soil resilience. [67]

4.6.3. Regulatory framework and baseline standards

In England, the AHDB Nutrient Management Guide (RB209) remains the principal reference for nutrient planning and regulatory compliance. RB209 provides evidence-based guidance on soil pH targets, nutrient indices for phosphorus, potassium and magnesium, crop offtake, and the nutrient contributions of manures, slurries and digestates.[75] Adherence to RB209 underpins compliance with the Farming Rules for Water and Nitrate Vulnerable Zone regulations and therefore represents the minimum standard for lawful nutrient use.[47,75]

4.6.3.1. Nutrient management models within RB209

Within this regulatory framework, two broad nutrient management models can be identified:

a) **Input-based (replacement) nutrient management**, in which nutrients removed in harvested crops are primarily replaced through manufactured fertilisers, with organic materials used where available.

b) **Nutrient cycling–led management**, in which soil organic matter, biological activity, legumes and cropping diversity are deliberately managed to mobilise, retain and recycle nutrients, with manufactured fertilisers used strategically to correct deficits rather than maximise supply.

4.6.3.2. Both models can operate fully within RB209 guidance. The distinction lies not in regulatory compliance, but in the degree of reliance on external inputs and the extent to which soil biological processes are expected to contribute to nutrient supply. [85]

4.6.3.3. Nutrients, plants and soil biology

Beyond meeting crop nutrient demand, nutrient management also influences soil biological processes indirectly through its effects on plant growth. Balanced nutrition supports vigorous root development and greater photosynthetic capacity, increasing the supply of carbon-rich root exudates to the rhizosphere. These exudates stimulate microbial activity, contributing to nutrient immobilisation, mineralisation and longer-term soil organic matter formation. [38]

4.6.3.4. Manufactured fertilisers: role, limits and risks

Evidence indicates that manufactured fertilisers do not inherently damage soil microbiomes. Their effects are context-dependent and influenced by application rate, placement, soil pH and organic carbon availability. [35] Where negative impacts on soil biology are observed, these are most commonly indirect, particularly through soil acidification associated with repeated ammonium-based nitrogen applications, reinforcing the importance of maintaining soil pH within RB209 target ranges. [34]

4.6.3.5. RB209 should therefore be regarded as the foundation rather than the ceiling of nutrient management. Where soils are structurally sound and pH is corrected, integrating organic nutrient sources, legumes and diverse rotations can improve nutrient-use efficiency and support biological function without departing from RB209 principles. This aligns with integrated soil management frameworks, which emphasise targeting the most limiting factors in crop production rather than maximising total nutrient inputs. [38]

4.6.3.6. Soil testing and pH as first principles

Regular soil testing remains the starting point for both nutrient management models. RB209 recommends routine analysis for soil pH, phosphorus, potassium and magnesium every three to five years, with more frequent testing where soils are at risk of imbalance or where organic materials are regularly applied.[75] Correcting soil acidity is a priority intervention: soil pH exerts a strong control over nutrient availability and microbial activity and is consistently identified as one of the dominant regulators of soil biological diversity and function.[34,86] Liming to RB209 targets therefore delivers both chemical and biological benefits and should precede investment in biological amendments or biostimulants.

4.6.3.7. Plant health as the delivery mechanism

Nutrient balance influences not only yield but also crop resilience to biotic and abiotic stress. Several frameworks describe plant health as a progression from basic metabolic function to enhanced stress tolerance and crop quality. One such conceptual model is the *Plant Health Pyramid* proposed by John Kempf, which outlines four functional levels: efficient photosynthesis, effective protein synthesis and disease resistance, tolerance to abiotic stress, and the production of secondary metabolites associated with crop quality. [87]

4.6.3.8. While the pyramid itself is a conceptual framework rather than a diagnostic tool, its underlying principles are consistent with established plant physiology. Balanced mineral nutrition underpins photosynthesis, enzyme activity and protein synthesis, all of which contribute to plant defence mechanisms and stress tolerance.[88] Well-nourished plants also allocate more carbon below ground, fuelling rhizosphere microbial activity and reinforcing nutrient cycling and soil organic matter formation. [38]

4.6.3.9. **Cropping systems and nutrient outcomes**

Nutrient management outcomes are strongly influenced by the cropping system within which nutrients are applied. RB209 recognises that crop choice and rotation affect nutrient demand, recovery and loss pathways and must therefore be considered alongside fertiliser planning. [75]

- **Diverse rotations**

  Including grass leys, break crops or multi-species cover crops can improve soil structure, increase organic matter inputs and enhance biological nutrient cycling. Evidence from long-term trials and farm-scale monitoring indicates that rotational diversity increases root biomass and carbon inputs while interrupting pest and disease cycles, contributing to improved nutrient-use efficiency over time. [85,89]

- **Integrated Pest Management (IPM)**

  Cropping systems that adopt IPM principles, including habitat provision for natural predators and reduced reliance on broad-spectrum pesticides, can lower pest pressure and reduce disturbance to soil biological communities. While IPM is primarily a crop protection strategy, reduced pesticide intensity can help preserve microbial-mediated nutrient processes and soil function. [90]

4.6.4. **Conclusion – Nutrient Management**

Nutrient management is not solely about optimising fertiliser efficiency. It is about creating a reinforcing cycle in which balanced nutrient supply supports strong plant growth; vigorous plants deliver carbon to soil biology; and biologically active soils improve nutrient retention, cycling and resilience. For advisers and valuers, the challenge is to integrate the precision and compliance framework of RB209 with an informed understanding of plant–soil interactions, ensuring nutrient strategies deliver reliable short-term performance while supporting long-term soil function and productive capacity. [35]

4.7. **Promoting Biology**

4.7.2. Soil biology—comprising microbes, fungi and soil fauna—plays a central role in binding soil structure, cycling nutrients and contributing to resilience against physical and chemical stress. Biological activity supports aggregation, nutrient immobilisation and mineralisation, and the regulation of pests and pathogens. However, biological function is highly dependent on soil physical condition, pH, moisture and carbon supply, and cannot compensate for unresolved structural or chemical constraints. [38]

4.7.3. Many of the practices discussed earlier—reducing compaction, improving drainage, maintaining soil cover, correcting pH and increasing organic matter inputs—are the primary drivers of improved biological activity. In some contexts, additional biological interventions may be used to complement these foundations, although their effectiveness is typically more variable and context-dependent. [35]

4.7.3.1. Inoculants and Biofertilisers

a) Microbial inoculants, including mycorrhizal fungi, endophytes and plant growth-promoting rhizobacteria (PGPR), are applied as seed treatments, granules or soil/foliar sprays to introduce or augment specific soil microorganisms with the intention of influencing plant–soil interactions rather than directly supplying nutrients. These organisms can enhance nutrient uptake, modulate plant hormone responses, suppress certain pathogens, and in some cases improve tolerance to abiotic stresses such as drought or low nutrient availability. PGPR are root-associated bacteria that may improve nutrient availability and produce phytohormones, while mycorrhizal fungi form symbiotic associations with roots that can expand the soil absorptive zone of the plant. Endophytes—microbes living within plant tissues—may also contribute to growth responses through a range of mechanisms. [91]

b) Evidence indicates that positive crop responses are possible and may be most pronounced where baseline soil biological activity is low or where key symbionts are absent—such as in degraded or intensively managed soils with limited indigenous microbial communities. For example, the magnitude of mycorrhizal growth responses to inoculation has been found to correlate inversely with a composite soil health index, suggesting greater potential benefit in soils of poorer biological condition and lower productivity. [92,93]

c) However, outcomes are highly context-dependent and often inconsistent in real-world field conditions where soils already support established and functionally diverse microbial communities. In many such settings, introduced inoculants may fail to establish, may be outcompeted by indigenous microbes, or may express limited benefit beyond normal microbial processes. These inconsistencies are widely documented across agronomic studies and reviews of microbial inoculants. [92]

4.7.3.2. Compost

a) From a biological perspective, composts promote soil health primarily by supplying organic substrates that support microbial activity and soil fauna, rather than acting as a persistent microbial inoculant (albeit composts do include microbiology, albeit at variable levels according to compost quality). Biological stimulation occurs mainly in the immediate zone surrounding decomposing compost particles, where microorganisms utilise available carbon sources and initiate aggregation processes that improve pore continuity, aeration and root–soil contact. [81]

b) Long-term experiments conducted by Rothamsted Research demonstrate that repeated applications of organic amendments, including composted manures, are associated with increased microbial biomass and earthworm abundance when

compared with mineral fertiliser-only systems. [29,94] These findings indicate that compost supports soil biological function indirectly, through the provision of energy sources and improved habitat, rather than through the direct transfer of microbial populations albeit inoculation is inevitable and a helpful introduction where a soil is low in microbial diversity.

c) Field-scale trials and guidance published by the Agriculture and Horticulture Development Board (AHDB) report that compost applications are associated with improved soil friability, rooting depth and earthworm activity, particularly on soils with low baseline organic matter or where physical structure has been degraded. Although biological indicators are not always measured directly, these outcomes are consistent with enhanced biological habitat and function. [7]

d) Vermicomposts, produced through the processing of organic materials by earthworms, typically contain higher microbial biomass and biologically active compounds per unit mass than conventional composts. [95] However, higher production costs and lower practical application rates generally limit their use to targeted or high-value systems rather than whole-farm soil improvement.

e) Biodynamic composts incorporate herbal and mineral preparations intended to influence microbial processes during composting. While some studies report changes in microbial activity or plant health responses, results are variable and difficult to distinguish from the effects of compost application itself. [96,97]

4.7.3.3. Compost teas

Compost teas are liquid extracts intended to deliver microbial populations to soil or foliage. Research suggests that, when well produced, they may temporarily increase microbial activity and/or suppress certain foliar pathogens; however, results are variable and dependent on compost quality, brewing method and application conditions. Evidence for consistent, long-term improvements to soil biology is limited. [98,98]

4.7.3.4. Biostimulants

Biostimulants, including seaweed extracts, humic substances, protein hydrolysates and microbial consortia, are used with the aim of stimulating soil and rhizosphere biological processes rather than supplying nutrients directly. Proposed mechanisms include enhanced root growth, increased root exudation, and stimulation of microbial activity involved in nutrient mobilisation and stress mitigation.

Evidence from meta-analyses indicates that biostimulants can produce modest average yield responses and improvements in stress tolerance, particularly under drought or salinity; however, these outcomes are indirect and mediated through plant–microbe interactions rather than direct fertilisation effects. Benefits are most consistently observed where soils are biologically constrained or crops are under stress, and responses are variable across soil types and systems. [99,100]

4.8. Conclusion – Improving Soil Health

4.8.2. Improving soil health is best understood as a process of removing constraints rather than applying isolated solutions. Across physical, chemical and biological dimensions, the evidence consistently indicates that soils perform best where no single factor—such as compaction, poor drainage, unmanaged acidity, nutrient imbalance or limited organic matter—dominates as a limiting constraint. Addressing these fundamentals creates the conditions in which soil biological processes can function effectively and reliably.

4.8.3. A recurring theme throughout this section is the importance of sequence and prioritisation. Physical condition and water management underpin all other aspects of soil health; without adequate structure, aeration and drainage, biological activity and nutrient-use efficiency are constrained. Similarly, correcting soil pH and nutrient imbalances in line with RB209 guidance is a prerequisite for both plant performance and microbial function. Organic matter management, whether through residues, manures, cover crops or composts, then supports longer-term improvements in aggregation, water regulation and biological habitat.

4.8.4. Biology should therefore be viewed as responsive rather than prescriptive. While targeted biological inputs may have a role in specific contexts, the most consistent improvements in soil biological activity arise from management practices that support healthy crops, maintain living roots, and sustain carbon flows into the soil. This reinforces the principle that healthy crops are the primary driver of soil health, supplying the carbon and energy that underpin nutrient cycling, aggregation and resilience.

4.8.5. Soil health improvements are typically incremental and context-specific, and their economic justification depends on proportionality. The most effective interventions are those that target the dominant limiting factor, deliver measurable functional benefits, and align with the wider objectives and risk profile of the farm business. For this reason, monitoring and iteration are integral to improvement. Simple, repeatable indicators—such as soil structure assessments, earthworm counts, rooting depth, workability and establishment costs—provide valuable feedback on whether changes in management are translating into improved soil function.

4.8.6. In summary, improving soil health is about applying evidence-based principles in sequence, observing system responses, and adapting management over time. Where this approach is followed, soil health improvements can enhance resilience, nutrient-use efficiency and productive capacity, providing a robust foundation for both agronomic performance and longer-term land value.

Practices

The following examples illustrate farming models and management approaches that have been associated with improvements in soil function and wider ecosystem services. Outcomes are highly context-specific and depend on soil type, climate, baseline condition, and management skill. These models are therefore best understood as frameworks that can support soil health regeneration when appropriately designed and integrated, rather than as guaranteed solutions.

5.1 Reduced Tillage

5.1.2 Reduced tillage refers to a spectrum of cultivation systems that disturb the soil less than conventional ploughing, leaving more crop residues on the surface and protecting the soil from erosion. The most recognised categories are no-till, strip-till, and shallow or reduced-till systems, each varying in the degree of disturbance and soil cover retained. [101, 27]

5.1.3 No-till (NT) involves leaving the soil undisturbed from harvest until drilling, with seeds placed into narrow slots. NT is widely reported to improve aggregate stability, soil organic carbon, and soil biological activity; however, evidence from a 5-year UK field trial suggests that such benefits may not be detectable in the short term when NT is adopted in isolation. [102]

5.1.4 Over time, NT systems reduce erosion, increase water infiltration and storage, and lower labour and fuel.[103] However, challenges include nutrient stratification, early compaction, and weed control – particularly in the first 5–7 years before soil structure and biology have fully adjusted.[104] Evidence suggests the best results are achieved where NT is combined with cover crops and diverse rotations, rather than used in isolation. [27]

5.1.5 Strip-till is a compromise between NT and conventional ploughing, disturbing only narrow strips of soil where seeds will be sown. This allows for quicker soil warming in the spring while maintaining much of the residue cover and structural benefits of NT. It can be especially useful on heavier soils where cold seedbeds are a concern, but requires specialist equipment and careful residue management.[105]

5.1.6 Reduced-till systems disturb the entire soil surface but to a shallower depth, often leaving 15–30% of residue cover after planting. They improve erosion control and can lower soil compaction relative to ploughing, but benefits to carbon storage and microbial activity are smaller than under NT.[104] They are, however, often more practical for farms looking to reduce tillage gradually.

5.1.7 Finally, some research supports occasional or strategic tillage within NT systems. A shallow cultivation every few years can break up compaction layers, incorporate

residues, and manage weeds without undoing the long-term benefits of reduced disturbance. Studies suggest that soils generally recover within months, particularly if cover crops are integrated. [106]

5.2. No-Dig Market Gardening

5.2.2. No-dig market gardening applies the principles of no-till farming to small-scale vegetable production. Gardeners layer organic matter, such as compost and mulch, directly onto the soil surface. This approach suppresses weeds, retains moisture, and builds soil health without turning or digging the soil (as much as practical). [107] The undisturbed soil structure promotes microbial activity leading to improved soil structure, increased nutrient cycling and ultimately to healthier plants. [4]

5.3. Rotational Grazing

5.3.2. Rotational grazing is a livestock management strategy where animals are managed to mimic grazing patterns of wild herbivores. This typically results in high stocking rates for short durations with long rest periods in order to stimulate pastures without overgrazing which in turn increases vegetation recovery. These models have been shown to promote diverse plant growth and robust root systems which enhance soil aeration and organic matter content therefore boosting water infiltration and moisture retention (without waterlogging). Rotational grazing also aids in evenly distributing manure, enriching the soil with nutrients. Popular frameworks which use rotational grazing are Holistic Farm Management and Adaptive Multi-Paddock Grazing. [77]

5.4. Agroforestry

5.4.2. Agroforestry integrates trees and shrubs into agricultural systems, combining forestry and farming practices. This model enhances biodiversity, improves soil structure, and increases carbon sequestration. Trees provide shade, reduce wind erosion, and contribute organic matter through leaf litter. The root systems of trees and crops occupy different soil layers, optimizing resource use and reducing competition. Agroforestry systems can lead to more resilient landscapes and diversified farm income.[108]

5.5. Pastured Poultry

5.5.2. Pastured poultry involves raising birds on pasture, allowing them to forage for a significant portion of their diet. This practice contributes to soil health by naturally fertilizing the land with manure, which adds organic matter and nutrients. The regular movement of poultry across pastures prevents nutrient overload in one area and reduces pest populations. Pastured poultry systems can enhance soil microbial activity and improve pasture quality over time. [109] [110]

5.6. Forest Pigs

5.6.2. Raising pigs in forested areas, or silvopasture, combines livestock production with forestry management. Pigs forage for nuts, roots, and other forest floor materials, which can help manage underbrush and promote tree growth. Their natural rooting behaviour aerates the soil and incorporates organic matter, enhancing soil structure and fertility.[111] Careful management, particularly active rotation, is necessary to prevent overgrazing and protect sensitive tree roots but this can be a very effective tool to support a woodland management plan. [112]

5.7. Field Drainage

5.7.2. Field drainage is the practice of installing systems such as mole drains, tile drains or open ditches to remove excess water from the soil profile. Well-designed drainage improves trafficability, extends workable periods, and crucially prevents waterlogging which can otherwise damage soil structure and restrict plant growth. By maintaining aerobic conditions, drainage supports soil biology and nutrient cycling. It can also reduce surface runoff and erosion when managed carefully. [68] However, poorly maintained or over-engineered systems may lead to nutrient loss, lower downstream water quality, and increased flood risk. The best outcomes arise when drainage is integrated with soil health management (e.g. cover crops, organic amendments) to build better infiltration and over time reduce reliance on hard infrastructure. [113]

Did you know, according to AHDB, around 6.4 million hectares of agricultural land in England and Wales is under-drained with piped systems.[68]

5.8. Irrigation

5.8.2. Irrigation provides a controlled water supply to crops during dry periods, reducing yield variability and improving resilience to drought. Drip, sprinkler or surface irrigation systems each have different efficiencies and costs. By maintaining consistent soil moisture, irrigation supports microbial activity, nutrient uptake, and overall plant health. This in turn helps sustain soil organic matter levels, since crops can achieve higher biomass returns to the soil. However, irrigation requires careful design and management: over-watering risks compaction, leaching and salinisation, while abstraction is increasingly regulated under UK water licensing. Where integrated with other soil management practices such as mulching, reduced tillage and organic matter additions, irrigation can be a tool that underpins both productivity and resilience.[114]

Philosophies of Regenerative Soil Health

6.1 Building on the practices described above, the following section outlines a number of influential philosophies shaping how farmers conceptualise soil health and farm system design. These philosophies vary in their scientific grounding, scope, and practical application. While many have been associated with improvements in soil function when translated into appropriate management practices, outcomes are

context-dependent and should not be assumed to arise solely from philosophical alignment.

6.2. Regenerative Farming

6.2.2. Regenerative farming is an outcome-oriented philosophy guided by a set of principles intended to restore and enhance soil function and wider ecosystem services. Rather than prescribing fixed practices, it emphasises adaptive management aimed at improving soil structure, biological activity, nutrient cycling, and water regulation over time. [115,116]

6.2.3. Unlike organic farming, regenerative farming is not a single regulated production standard in the UK unless it is tied to a particular private certification scheme; its meaning therefore depends on the principles, outcomes and verification framework being used.

6.2.4. While often associated with soil carbon sequestration and climate mitigation, the evidence base indicates that carbon outcomes are highly variable and strongly influenced by soil type, climate, baseline condition, and management intensity. As such, regenerative farming is best understood as a risk-management and resilience-building approach, rather than a guaranteed carbon accumulation strategy. [117]

6.2.5. Commonly cited regenerative principles include:

1) Working within the specific ecological and business context of the farm
2) Minimising soil disturbance
3) Maintaining soil cover
4) Keeping living roots in the soil for as much of the year as possible
5) Encouraging biological and rotational diversity
6) Integrating livestock where appropriate

6.2.6. Practices frequently associated with regenerative systems include reduced or no-tillage, cover cropping, reduced reliance on synthetic inputs, and increased use of biological amendments. Importantly, research indicates that outcomes depend less on adherence to the label “regenerative” and more on how coherently these practices are integrated within the farm system. [115]

6.3. Organic Farming

6.3.2. Organic farming is a regulated production system that prioritises ecological processes and restricts the use of synthetic fertilisers, pesticides, and genetically modified organisms. In the UK, organic production is governed by the Organic Products Regulations 2009 and overseen by approved certification bodies.

6.3.3. Long-term organic farming systems in the UK and Europe rely on diverse crop rotations, legumes, livestock integration and organic amendments to maintain soil fertility and structure. While some long-term comparisons suggest that organic systems can build soil organic matter and enhance biological activity over decades, other UK studies show mixed results for total soil organic matter and nutrient pools compared with conventional systems, highlighting context-dependent outcomes for soil fertility and nutrient availability. [118–121]

6.3.4. Meta-analyses indicate average yield gaps of 10–30% relative to conventional systems, although these narrow substantially in mixed farming systems and under drought conditions.[122] Farm business viability therefore depends heavily on price premiums, reduced input costs, and access to organic markets.
From a valuation perspective, organic status may indicate lower exposure to volatile input markets and regulatory risk, but introduces dependencies on certification, inspection, and market demand that must be considered explicitly.

6.4. Biodynamic Farming

6.4.2. Biodynamic agriculture, developed from Rudolf Steiner's lectures in the early twentieth century, represents a holistic farming system that integrates organic management with an explicit emphasis on whole-farm functioning and long-term soil vitality. In practice, biodynamic systems share many core features with well-managed organic agriculture, including diverse crop rotations, composting, mixed crop–livestock integration, and a strong focus on soil biological processes. [123]

6.4.3. A distinctive element of biodynamic practice is the use of specific compost and field preparations (commonly referred to as BD 500–508), derived from plant, animal, and mineral materials and applied in very small quantities. These preparations are intended by practitioners to support compost maturation and soil biological activity, and are typically used alongside management approaches aimed at closing nutrient cycles within the farm system. Biodynamic philosophy also encourages attentiveness to seasonal, lunar, and cosmic rhythms in farm operations, reflecting its broader conceptual framing of the farm as an integrated living organism. [123,124]

6.4.4. From a soil health perspective, a growing body of long-term comparative research indicates that biodynamic farming systems can perform well across a range of agronomic and ecological indicators. Reviews of the literature and results from long-running field trials have shown that biodynamic management is associated with higher soil organic matter levels, improved soil structure, and enhanced biological activity when compared with conventional systems. [118,124]

6.4.5. Comparisons between biodynamic and certified organic systems suggest that soil health outcomes are often comparable, and in some cases marginally enhanced under biodynamic management, especially with respect to soil aggregation, microbial biomass, and enzymatic activity. However, the prevailing interpretation within the scientific literature is that these benefits are largely attributable to system-level management practices—such as compost use, crop diversity, and careful nutrient

recycling—rather than to the biodynamic preparations themselves acting through unique or currently demonstrable mechanisms. [118,124]

6.4.6. Critical reviews highlight that certain biodynamic practices, including strict adherence to cosmic or astrological calendars, lack robust empirical validation, and that controlled experiments isolating the effects of biodynamic preparations have produced inconsistent or inconclusive results. As a result, while biodynamic agriculture is not generally supported as a distinct alternative biological science, it is increasingly recognised as a form of high-engagement organic farming that can deliver positive soil and ecosystem outcomes through well-established ecological processes. [97,123,124]

6.4.7. Overall, the research base supports a cautious but constructive assessment: biodynamic agriculture can contribute to long-term soil fertility, biological resilience, and farm sustainability, particularly where its practical management aligns with principles of organic and regenerative agriculture. At the same time, the literature consistently calls for further rigorously designed studies to clarify the specific contributions of biodynamic preparations beyond the effects of organic matter management, integrated livestock systems, and farmer management intensity.

6.5. Agroecology

6.5.2. Agroecology is a whole-farm and food-system philosophy that applies ecological science while explicitly integrating social, economic, and governance dimensions. Authoritative definitions position agroecology as simultaneously a science, a set of practices, and a social movement embedded in social-ecological systems. [126]

6.5.3. The FAO's "Ten Elements of Agroecology" extend beyond on-farm practices to include human values, governance, and circular economies, distinguishing agroecology from more narrowly defined regenerative approaches. [127]

6.5.4. In the UK, agroecology is increasingly framed as a pathway to resilient land use, with organisations such as the Food, Farming & Countryside Commission and the Soil Association advocating for structured transition support and farm-business modelling. [128,129]

6.5.5. From a soil health perspective, agroecology emphasises reduced input dependency, diversified rotations, and locally adapted systems. Its valuation relevance lies less in specific practices and more in the system-level resilience and policy alignment it seeks to deliver.

6.6. Holistic Management

6.6.2. Pioneered by Alan Savory and promoted by the Savory Institute, Holistic Management is a framework for managing complexity in ecosystems. It provides a decision-making framework that integrates ecological, social, and economic considerations to foster sustainable land use and soil health. A key component of this is rotational grazing.

6.6.3. One foundational principle is the development of a holistic context, wherein practitioners articulate overarching goals that encompass desired environmental outcomes, as well as community and financial aspirations.

6.6.4. Within this framework, continuous monitoring and feedback loops are pivotal, allowing managers to assess whether decisions—such as grazing rotations, rest periods, or technological interventions—align with the established context and desired ecological functions.

6.6.5. Another core element involves recognition of the four ecosystem processes—the water cycle, mineral cycle, energy flow, and community dynamics—which serve as diagnostic and evaluative tools to guide and adjust management actions. The framework also stresses strategic grazing practices, designed to mimic the positive impacts of natural herbivore behaviour on plant growth, soil biology, and carbon sequestration, while avoiding degradation often caused by overgrazing.

6.6.6. Finally, adaptive management—where decisions are continually refined in response to emerging data—ensures that objectives remain ecologically sound, socially beneficial, and economically viable over the long term.[125]

6.7. No Dig by Charles Dowding

6.7.2. The no-dig approach popularised by Charles Dowding focuses on minimising soil disturbance in intensive horticultural systems through surface compost applications and mulching. Dowding's long-running side-by-side trials demonstrate comparable or improved yields, reduced labour inputs, and enhanced soil structure relative to cultivated systems.

6.7.3. Evidence from horticultural research supports the biological mechanisms underpinning no-dig systems, including improved aggregation and microbial activity. However, these systems are reliant on imported organic materials and are not directly scalable to most arable or grazing enterprises. Their relevance lies in illustrating the benefits of disturbance reduction and organic matter protection at small scale. [18]

6.8. Biological Farming (Gary Zimmer)

6.8.2. Biological farming, as advocated by Gary Zimmer, emphasizes the importance of soil biology in crop production. It focuses on balancing the chemical, physical, and biological aspects of the soil. This philosophy promotes the use of natural amendments, cover crops, and reduced chemical inputs to enhance microbial life and nutrient availability. By fostering a healthy soil ecosystem, biological farming aims to produce nutritious crops while improving soil health over time. [19]

Certifications

7.1 There are a number of certifications which encompass frameworks and practices which are often seen to improve soil health. Below is an indicative list of the main certification types and relevant organisations in the UK.

7.2. Organic Certification

7.2.2. In the UK, the following organisations certify, oversee and enforce these standards.

- Organic Farmers and Growers CIC
- Organic Food Federation
- Soil Association Ltd
- Biodynamic Association Certification
- Quality Welsh Food Certification Ltd
- OF&G (Scotland) Ltd
- Irish Organic Association
- Organic Trust CLG

7.2.3. Achieving certification from these bodies not only provides consumers with assurance about the integrity of farming practices but also can offer farmers access to premium markets, thereby supporting both economic viability and environmental stewardship. [130]

7.3. Biodynamic Agriculture / Demeter Certification

7.3.2. In the UK, biodynamic certification known as Demeter is administered by the Biodynamic Association. Benefits of certification may provide access to premium niche markets—particularly in sectors such as wine, horticulture, and specialist grains—a demonstrable commitment to soil stewardship and low-input farming systems, and an approach that may positively influence long-term productivity and resilience.[131]

7.4. RegenAgri

7.4.2. RegenAgri is a regenerative agriculture certification program developed and managed by Control Union (headquartered in the Netherlands). It is aimed at supporting and verifying farming practices that enhance soil health, biodiversity, and overall ecosystem resilience.

7.4.3. The scheme employs a continuous improvement model, in which participating farms are assessed against key performance indicators—including soil organic matter levels, water retention capacity, and biodiversity indices—and are required to demonstrate progress in these areas over time. By integrating regenerative farming principles,

RegenAgri seeks to help producers transition away from extractive land-use models toward more ecologically balanced systems.

7.4.4. Certification involves documenting farm management strategies, undergoing periodic on-site evaluations, and meeting quantitative benchmarks that signify incremental gains in soil and environmental metrics. The ultimate objective of RegenAgri is to create a transparent, science-based framework that not only guides farmers toward regenerative techniques but also provides downstream buyers and consumers with a verifiable assurance of the farm's commitment to improving ecological outcomes and fostering long-term agricultural sustainability.[132]

7.5. Pasture for Life Association (PFLA)

7.5.2. The Pasture-Fed Livestock Association (PFLA) is a UK-based membership organization that champions the production of 100% pasture-fed meat and dairy. Operating under the "Pasture for Life" certification, the PFLA ensures that livestock diets come exclusively from grass, forage crops, and grazing—free from grains or manufactured feeds. This approach is grounded in evidence that such feeding regimes enhance animal welfare, promote soil health through managed grazing practices, and deliver environmental benefits like increased biodiversity and improved carbon sequestration. [133]

7.5.3. Farms seeking "Pasture for Life" accreditation are audited against strict standards, including rotational grazing protocols and robust traceability measures, to verify compliance. By connecting producers, processors, and consumers, the PFLA fosters a market for nutrient-dense, ethically produced food while reinforcing the ecological resilience of grassland ecosystems.

7.6. Ecological Outcome Verification

7.6.2. Ecological Outcome Verification (EOV) is a science-based monitoring protocol developed by the Savory Institute to assess and verify positive environmental impacts resulting from regenerative land management practices. Unlike prescriptive standards, which primarily focus on production methods, EOV places emphasis on measuring tangible ecosystem changes, such as soil health, biodiversity, and vegetative cover. By regularly collecting and evaluating field data—ranging from soil carbon levels to plant species richness—EOV offers land managers a dynamic feedback loop that links on-the-ground actions with ecological outcomes. This data-driven approach enables continuous improvement, as producers can adjust their management strategies in response to measurable trends in key indicators. [134]

7.6.3. As an outcome-based program, EOV ensures that regenerative agriculture claims are substantiated by verifiable, ecological evidence, thereby providing consumers, markets, and stakeholders greater confidence in the environmental benefits of certified operations.

7.6.4. In the UK, EOV is facilitated by the Savory Institute's local hub, 3LM. As a recognized regional partner, 3LM provides training, support, and on-site assessments for farmers and land managers seeking EOV status. [135]

Interpreting Opportunities, Risks and Value in Professional Practice

8.1 This section draws together the soil science, systems thinking and management concepts set out earlier in this report and reframes them through the lens of valuation and professional advisory practice. Its purpose is not to restate how soil health is created or improved, but to guide how soil-related opportunities, risks and value implications should be interpreted by valuers and rural advisers.

8.1.2 In this context, soil health is increasingly relevant to professional practice not as a standalone objective, but as a factor influencing risk, resilience, operational performance and, in some circumstances, income generation. Its significance lies in how it interacts with wider farming systems, regulatory frameworks and ownership objectives. A neutral and defensible approach therefore requires soil health to be assessed through a systems-thinking lens, beginning with an understanding of context and objectives, before interpreting problems and opportunities. Without this framing, there is a risk of overstating upside, mispricing risk, or recommending interventions that improve soil condition but weaken overall system performance or the ability to capture value.

8.2. Systems thinking as the foundation

8.2.2. Farming systems are complex, adaptive and non-linear. Changes intended to improve soil condition can influence labour requirements, machinery use, cashflow timing, regulatory exposure and future land-use flexibility. Soil health should therefore not be treated as an isolated attribute to be maximised, but as one component within a wider production, business and ownership system.

8.2.3. From a professional perspective, systems thinking helps to avoid:

- assuming linear cause-and-effect between soil condition and value;
- isolating soil metrics from management capacity or tenure;
- prioritising short-term indicators over long-term resilience and risk.

8.2.4. Soil health improvements are typically incremental, context-specific and slow to realise, while deterioration can occur rapidly through compaction, erosion, loss of cover, extreme weather or poorly aligned management decisions. This asymmetry reinforces the need to understand soil health primarily as a risk-modifying asset, rather than a guaranteed source of upside.

8.3. Understanding value through the 8 Forms of Capital

8.3.2. In professional practice, value is most commonly expressed in financial terms. However, financial performance is rarely the sole objective of landownership or land management, particularly in rural contexts. A useful conceptual reminder when applying systems thinking is that value exists in multiple forms, not all of which are immediately monetisable.

8.3.3. A widely referenced articulation of this idea is provided by the Regenerative Enterprise model, which describes eight forms of capital that together underpin the health, resilience and performance of a system. These capitals are not alternatives to financial capital, but complementary lenses through which value creation, degradation and trade-offs can be understood. [136]

8.3.4. The eight forms of capital are commonly described as follows:

- **Financial capital** – money, cashflow, profitability, access to credit and assets that can be monetised.
- **Living capital** – the vitality of natural systems, including soils, water, biodiversity and ecosystem function. In agricultural contexts, soil health is a core component of living capital.
- **Material capital** – the built and manufactured assets that support production, such as buildings, drainage, fencing, tracks, machinery and equipment.
- **Intellectual capital** – knowledge, data, innovation, systems understanding and the capacity to learn and adapt over time.
- **Experiential capital** – skills, judgement and practical know-how developed through experience. In farming systems, this often explains differences in performance more strongly than soil type or input level.
- **Social capital** – relationships, trust, networks and social licence to operate, including relationships with neighbours, regulators, supply chains and local communities.
- **Cultural capital** – values, traditions, identity and shared purpose, including stewardship ethic and perceptions of success or "good farming".
- **Spiritual capital** – meaning, purpose and sense of connection, often expressed through custodianship, legacy, place-based identity or intergenerational responsibility.

8.3.5. This framing is not intended to replace financial analysis, nor to suggest that all forms of capital carry equal weight in valuation. Rather, it provides a way of understanding why improvements in soil condition or land management may enhance resilience, legitimacy or fulfil ownership objectives without necessarily increasing short-term income or financial value.

8.3.6. In land-based systems, financial capital is often an outcome of interactions between the other forms of capital, rather than a direct proxy for system health.

8.4. Capital trade-offs and implications for valuation and advice

8.4.2. In practice, different forms of capital are frequently traded off against one another. For example:

- building living capital (through soil restoration) may reduce short-term financial returns while increasing long-term resilience and reducing risk;
- investing in intellectual or experiential capital (learning new systems, adapting management) may precede any measurable financial gain;
- strengthening social or cultural capital—such as through, education, collaboration, public access or high-quality food production—may enhance legitimacy, wellbeing or succession prospects rather than immediate profit.

8.4.3. In some cases, therefore, "increasing capital" is not about making more money, but about objectives such as:

- maintaining land in a condition aligned with stewardship or legacy objectives;
- reducing volatility, stress or exposure to external shocks;
- supporting more people on the farm;
- producing higher-quality food rather than greater volume.

8.4.4. From a professional standpoint, these choices are not irrational. However, they do have financial, operational and valuation implications that must be understood, articulated and, where necessary, evidenced.

8.4.5. For valuers and rural advisers, the relevance of the 8 Forms of Capital lies in recognising that:

- clients may legitimately prioritise different forms of capital at different stages of ownership or occupation;
- improvements in living, social or cultural capital may reduce risk and increase resilience without increasing headline market value;
- financial value is often realised only where the system is capable of converting other forms of capital into income or market recognition.

8.4.6. This reinforces the importance of clarity around objectives, time horizons and value capture. Where soil health or land-use decisions are intended primarily to build non-financial capital, advisers should ensure that:

- the financial consequences are clearly understood;
- risks and constraints are transparent;
- valuation advice remains grounded in market evidence and professional standards.

8.5. Understanding context before identifying opportunity

8.5.2. The relevance of soil health increasing value depends heavily on context. Key contextual factors include:

- personal objectives and belief systems;
- business objectives and access to financial capital;
- inherent soil type, drainage and climate;
- exposure to extreme weather events;
- access to labour, capital and infrastructure;
- regulatory environment;
- tenure structure and length of control;
- local market conditions and supply chains.

8.5.3. In systems terms, these factors describe which forms of capital are abundant and which are constrained. A holding may, for example, possess strong living capital in the form of healthy soils, but limited experiential, financial or institutional capacity, restricting its ability to convert soil condition into improved performance or financial return. Conversely, degraded soils may sit within a system rich in skills, capital and tenure security, creating scope for remediation and potential value uplift.

8.5.4. The same soil condition may therefore represent:

- a material constraint in one context;
- a manageable issue in another; or
- be largely irrelevant where other factors dominate value, such as location or non-agricultural demand.

8.5.5. For valuers, this reinforces the importance of assessing soil health relative to the land's existing and reasonably foreseeable use, rather than against an abstract or idealised benchmark.

8.6. Clarifying vision and objectives

8.6.2. Opportunities linked to soil health only become meaningful when assessed against the objectives of the landowner and/or occupier. These objectives may include:

- maximising short-term income;
- stabilising long-term returns;
- reducing exposure to volatile input markets;

- protecting capital value;
- succession planning or intergenerational stewardship;
- mitigating climate change impacts;
- alignment with lender, supply chain or ESG expectations.

8.6.3. In some cases, objectives may explicitly prioritise non-financial outcomes, such as:

- supporting more people on the farm;
- improving food quality rather than volume;
- enhancing wellbeing, legitimacy or succession prospects.

8.6.4. Without clarity on objectives, advisers risk endorsing changes that are technically sound but strategically misaligned. For example, a transition that improves soil resilience over a ten-year horizon may be inappropriate where ownership is uncertain, tenancies are short, or capital is constrained.

8.6.5. Understanding "what good looks like" for the holding allows advisers to distinguish between soil-related changes that strengthen the system as a whole and those that introduce fragility, misalignment or loss of optionality.

8.7. Interpreting opportunities through the systems lens

8.7.2. Once context and objectives are established, soil health considerations can be interpreted more robustly.

8.7.3. Enterprise stacking may enhance resilience where enterprises are complementary and aligned with management capacity. However, stacked enterprises are not automatically suitable and may compete for land capability, labour or capital, or constrain future land use.

8.7.4. New enterprises or system transitions may reduce input dependency or improve margins, but only where skills, experience and time horizons are aligned. Many failures associated with soil-focused transitions arise from economic or managerial weaknesses rather than agronomic limitations.

8.7.5. Natural capital and carbon markets may offer additional income streams, but they also introduce long-term contractual obligations that can affect land use, liquidity and valuation assumptions. These markets typically reward change rather than condition, meaning that high baseline soil health may reduce eligibility for certain schemes. For guidance, see the RICS publication "Impact of carbon markets on the rural economy".[137]

8.7.6. In each case, the professional task is not to assess whether an option improves soil indicators in isolation, but whether it improves overall system performance under realistic assumptions and having considered the holding's context and objectives.

Practice warning — System misalignment

Interventions that improve soil metrics but conflict with management capacity, tenure length, capital availability or ownership objectives can reduce overall resilience and value. Advisers should test whether soil-related opportunities strengthen or weaken the whole system, not just individual indicators.

8.8. Soil health, value and value capture

8.8.2. Soil health has value, but that value is not uniform. Its relevance depends on who captures the benefit, how it is realised, and over what timeframe.

8.8.3. From a systems perspective, improvements in soil health represent an increase in living capital. Whether this translates into financial value depends on the system's ability to convert that capital through management capability, tenure security, market access and regulatory alignment:

- For the **farm business or occupier**, value is primarily operational, expressed through yield stability, reduced input dependency, increased workable days and lower exposure to extreme weather or compliance risk.
- For the **landowner or investor**, value may arise indirectly through improved letting prospects, reduced regulatory or reputational risk, or enhanced appeal to certain buyers or tenants.
- For the **public**, soil health delivers wider benefits including flood mitigation, water quality and carbon storage, increasingly recognised through regulation and policy.
- For **environmental/nature markets**, value is conditional and typically linked to additionality and baselining rather than absolute condition.

8.8.4. This means that improved soil health may enhance resilience and reduce risk, while simultaneously limiting access to certain income streams where high baselines constrain eligibility.

Practice warning — Baseline effects

High soil health baselines represent strong living capital but may reduce eligibility for markets that reward measurable uplift rather than existing condition. Advisers should distinguish clearly between intrinsic system value and monetisable value when considering natural capital schemes.

8.9. Regulation, risk and resilience

8.9.2. In many contexts, the principal value of soil health lies in risk management. Well-functioning soils reduce the likelihood of runoff, erosion and pollution incidents, lowering exposure to enforcement under the Farming Rules for Water and related regulation. They may also increase resilience to extreme weather, reduce reliance on inputs and support more consistent crop and livestock performance.

8.9.3. Conversely, degraded soils may create latent liabilities, including higher compliance costs, operational disruption and reputational risk within supply chains. While these risks are rarely capitalised explicitly in market transactions, they can materially influence long-term performance, confidence and business viability.

8.10. Evidence, uncertainty and professional judgement

8.10.2. Market evidence linking soil health directly to capital value remains limited, and soil indicators are variable and method-dependent. Valuers should therefore apply established professional discipline to:

- use proportionate and repeatable evidence;
- link soil health to functional outcomes;
- document assumptions transparently;
- recommend further investigation where soil condition is likely to be material.

8.10.3. Where uncertainty is high, sensitivity analysis is often more appropriate than embedding optimism into valuations or advice.

Practice warning — Asymmetric risk

Soil health gains are typically slow and uncertain to accrue, while losses can occur quickly and materially affect performance. Advice and valuation assumptions should reflect this asymmetry.

8.11. Summary

8.11.2. Soil health presents genuine opportunities to enhance resilience, manage risk and, in some cases, unlock additional income. Equally, it introduces complexity and uncertainty, particularly where markets, regulation and management capability are evolving.

8.11.3. For valuers and rural advisers, the key is not whether soil health is inherently “good”, but who the value is for, how it is captured, and whether it is recognised by the relevant market or stakeholder. Grounded in systems thinking, clarity of objectives and proportionate evidence, soil health becomes a practical consideration in managing value and risk, rather than a prescriptive or ideological endpoint.

Approaching Value

9.1 The RICS Valuation Standards "the Red Book" is a useful starting point when approaching value of an interest in property, namely a freehold or leasehold. However, the principles are also relevant to the wider assessment of value, including its application when advising businesses or undertaking tenancy compensation or dilapidation assessments.

9.1.2. The RICS defines "valuation" as an "opinion of value." In forming an opinion of value, valuers will need to determine an appropriate basis of value and thereafter implement the approach(es) which they deem most helpful, using information which they have collected to support the analysis.

9.1.3. Soil health has a growing relevance to valuation of rural property. It can influence productivity, resilience, exposure to risk and even accessibility to non-farming income streams under public or private agreements. The valuer's role, as it pertains to soil, should include consideration as to whether and how soil quality and soil health contributes to value, given the purpose and basis of the instruction.

9.1.4. Despite the growing relevance to professional practice, at the time of writing this paper there is limited evidence to support enhanced market value of farmland due to improved soil health relative to comparable holdings.

Basis of Value

9.2 The Red Book and IVSC sets out a number of recognised basis of value. The most relevant to rural practice can be summarised as follow:

9.2.2 **Market Value** – The estimated amount for which an asset or liability should exchange on the valuation date between a willing buyer and a willing seller in an arm's-length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion.

9.2.3 **Market Rent** – The estimated amount for which an interest in real property should be leased on the valuation date between a willing lessor and a willing lessee on appropriate lease terms in an arm's-length transaction, after proper marketing and where the parties had each acted knowledgeably, prudently and without compulsion.

9.2.4 **Investment Value** – The value of an asset to the owner or a prospective owner given individual investment or operational objectives. This may also be known as "worth".

9.2.5 **Fair Value** – The price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.

9.2.6 **Equitable Value** – The estimated price for the transfer of an asset or liability between identified knowledgeable and willing parties that reflects the respective interests of

those parties. In contrast, market value requires any advantages or disadvantages that would not be available to, or incurred by, market participants generally to be disregarded.

9.2.7 **Synergistic Value** – The result of a combination of two or more assets or interests where the combined value is more than the sum of the separate values. The added value above the aggregate of the respective interests is often referred to as marriage value.

9.2.8 **Liquidation Value** – The gross amount that would be realised when an asset or group of assets are sold from a liquidation sale, with the seller being compelled to sell as of a specific date. This can be determined under either an orderly transaction, or a forced sale. [138]

Valuation Approaches & Methods

9.3. The Red Book sets out that valuers are responsible for adopting, and where necessary justifying, the approach and method of valuation used in any assignment. This choice must always have regard to:

- the nature of the asset,
- the purpose, intended use and context of the valuation, and
- any statutory or mandatory requirements in the jurisdiction concerned (such as under agricultural tenancy law).

9.3.2. No single approach is inherently superior. In many cases, it is appropriate to consider more than one approach or method to arrive at a balanced opinion of value.

9.3.3. For clarity, an *approach* refers to the general framework for assessing value (market, income or cost), while a *method* refers to the specific technique used within that framework.

9.4. The Market Approach

9.4.2. The market approach provides an indication of value by comparing the subject asset with identical or similar assets for which reliable price information is available. It is rooted in the principle that the market itself provides the best evidence of value where sufficient, relevant and transparent transactions exist.

9.4.3. This approach should be given significant weight when:

- the subject property has recently sold in an open market transaction,
- substantially similar assets are actively traded, or
- there is frequent and reliable evidence of recent comparable transactions.

9.4.4. It may carry less weight when transactions are scarce, dated, or where comparables differ materially from the subject.

9.4.5. Methods

a) **Comparable Transaction Method** – this method utilises information about transactions involving similar assets. Valuers thereby analyse recent sales or lettings of similar land and apply units of comparison (commonly £/acre or £/hectare). Where relevant, valuers can apply systematic adjustments for differences in location, tenure, physical condition, restrictions, or other attributes.

9.4.6. Implications for Soil Health

9.4.6.1. Soil health data is rarely explicit in headline transaction data, potentially making comparable analysis difficult. Particularly where the subject asset is thought to have a varied soil health status, a valuer should consider whether comparable transactions meet a comparable soil health status as to consider them without making subjective adjustments. In doing this, a valuer should be cautious as to ensure the level of evidence in relation to the soils are both reliable and sufficient to identify their individual characteristics and ability to perform in relation to their existing and any likely future use. Any adjustments should be reasonable, documented and supported by evidence.

9.4.6.2. Valuers should be aware that, in some circumstances, healthy soils may enhance marketability to certain specialist enterprises and purchasers and therefore support stronger bids. This is most likely where soil condition aligns with a buyer's operational objectives or risk profile, including Environmental, Social and Governance (ESG) considerations. Within valuation practice, ESG is relevant only to the extent that it influences the behaviour of market participants. For example, some buyers—such as institutional investors, supply-chain-aligned businesses or low-input farming enterprises—may place additional weight on land that demonstrates lower environmental risk, reduced regulatory exposure, or greater resilience to climatic and input price volatility.

9.4.6.3. However, in many rural markets, other factors such as location, scale, planning context, tenure structure and local demand remain the dominant determinants of value. Where these factors prevail, or where demand is thin, soil health status may have little or no discernible influence on price, notwithstanding its agronomic or environmental importance.

9.4.6.4. Conversely, degraded or contaminated soils may deter interest or reduce offers where remediation costs are material particularly for the intended use of the land. Valuers should be sure to have suitable information available and, if this is not available, document assumptions and if necessary, make recommendations for further investigations particularly where these require specialist input (such as remediating a contaminated soil).

9.5. The Income Approach

9.5.2. The income approach provides an indication of value by converting projected income, cashflows or cost savings into a single capital sum. It reflects the asset's ability to generate financial returns and is grounded in the principle of anticipation of future benefits.

9.5.3. This approach carries weight when:

- income generation is the principal element influencing value, and
- reliable projections of income and expenditure are available, but market comparables are limited.

9.5.4. Historically, agricultural profitability has not been the primary driver of farmland values, meaning income approaches have often been given less weight. However, they remain relevant where land is rented out particularly on Agricultural Holdings Act 1986 tenancies or longer Farm Business Tenancies and valuers may need to assess the rental yield which can be capitalised to arrive at a value, where Market Rent is more heavily influenced by the land's productive capacity.

9.5.5. Furthermore, with land-use specific support payments and the growth of environmental/nature markets, income potential may become more relevant to the sale or letting of land. Where income projections are uncertain, limited, or represent only part of the market value, the valuer should also consider corroboration with the market or cost approaches.

9.5.6. Methods

a) **Investment Capitalisation** – this is achieved by applying an appropriate yield to a maintainable rental income. This method is relevant in agricultural land valuation where rental evidence exists and can be analysed into an equivalent yield.

b) **Discounted Cash Flow (DCF)** – this is done by projecting net cashflows (revenues, costs, capital expenditure) over a defined period and discounting them to present value.

c) **Cost Saving Analysis (a variation of DCF)** – where the main economic benefit is identifiable reductions in operating costs or improved resilience, these savings could be modelled as a cashflow stream and discounted in the same way as revenues. For example, healthier soils may reduce fertiliser costs, fuel use, or compliance risks whilst achieving the same yields; conversely, degraded soils may increase operating costs and reduce gross margins. This is not a separate IVS-recognised method, but rather a practical adaptation of DCF to capture cost-side benefits that market participants would recognise.

In all cases, valuers must ensure consistency between the type of cashflow and the discount rate applied (eg, pre-/post-tax, nominal/real, whole asset vs equity). Assumptions must be documented, transparent and supported by evidence.

9.5.7. Implications for soil health

9.5.7.1. Healthy soils may improve gross margins through:

- higher or more stable yields,
- reduced fertiliser and cultivation costs,
- lower machinery wear and fuel use,
- eligibility / compatibility for agri-environment schemes.

9.5.7.2. Degraded soils may:

- increase costs of machinery operations,
- increase cost of inputs required,
- reduce cropping flexibility,
- expose occupiers to compliance risks (e.g. pollution fines under the Farming Rules for Water),
- diminish resilience to climate extremes,
- provide greater opportunities to markets for ecosystem services (relative to healthy soils).

9.5.7.3. In income terms, soil health may influence both the revenue and cost base of an agricultural enterprise through its effect on yield stability, input dependency and exposure to operational disruption. Where these effects are material and observable, projected gross margins and cost assumptions should reflect the soil's ability to support the land's existing or reasonably foreseeable use. Soil health may also be relevant to risk assessment within income-based valuations, including the selection of an appropriate capitalisation yield, insofar as demonstrably healthier soils may present lower income volatility than otherwise comparable land of the same inherent quality thereby indicating a lower yield is appropriate. Any such judgement should be evidence-based, proportionate and consistent with observed market behaviour.

9.5.7.4. Emerging income streams linked to carbon sequestration, biodiversity creation and other ecosystem services may further influence income-based valuations. However, these markets remain policy- and contract-dependent, and income projections should therefore be treated with caution, typically through sensitivity analysis or probability-weighted scenarios. Such agreements may also constrain future land use, affect liquidity, or introduce long-term management obligations, with potential implications

for value. In this context, baseline soil condition is relevant both to eligibility and additionality: depleted soils may present greater scope for monetisation of improvement, while land with high existing soil health may offer resilience benefits but more limited access to uplift-based schemes.

9.6. The Cost Approach

9.6.2. The cost approach is founded on the principle that a rational purchaser will not pay more for an asset than the cost of acquiring or recreating one of equivalent utility. It provides an estimate of value based on the cost of replacement or reproduction, less allowances for depreciation or obsolescence.

9.6.3. This approach may carry significant weight when:

- the asset is unique and not directly income-producing,
- market or income evidence is limited or unreliable, or
- the basis of value explicitly refers to replacement cost.

9.6.4. Methods

a) **Replacement Cost Method** – by estimating the cost of constructing a modern equivalent asset with the same utility, adjusted for depreciation, practitioners can arrive at a value. This usually includes both direct (labour, materials) and indirect costs (fees, overheads, profit margin).

b) **Reproduction Cost Method** – this process calculates the cost of creating an exact replica. In agricultural contexts this may rarely be relevant.

c) **Summation Method** – aggregating the separate values of component assets where the holding is essentially the sum of its parts. In an agricultural context, this could include the land (and its soil, permanent crops, drainage systems) and thereafter buildings, fixed equipment and machinery.

9.6.5. Implications for Soil Health

9.6.5.1. Soil regeneration costs (e.g. organic matter restoration, subsoiling to break compaction, drainage renewal, lime application) set a ceiling on any premium the market will pay for good soils. The rational purchaser will not pay more than the cost of restoring a poorer soil to an equivalent standard, adjusted for the time, risk, and opportunity costs involved.

9.6.5.2. Under agricultural tenancy law, this approach remains relevant in part being driven by statute. For example, an outgoing tenant may be entitled to compensation for certain elements based on the reasonable cost of works done, or, the impact on the value of the tenancy.

9.6.5.3. Conversely, land already in good soil condition may command a premium as the buyer avoids expenditure, operational disruption, uncertainty and risk.

9.6.5.4. Obsolescence concepts may need to be applied to soils:

- ***Physical obsolescence***: loss of fertility, erosion, waterlogging.
- ***Functional obsolescence***: outdated field layout, inability to support modern machinery.
- ***Economic/external obsolescence***: regulatory restrictions (e.g. NVZ rules), climate change risks, or adverse ESG profile (pollution liabilities, reputational risk).

Valuation of Soil Health

10.1 Valuing soil health is challenging. Unlike buildings or machinery, soils are living systems whose condition is variable, dynamic, site-specific, and difficult to measure with precision. Furthermore, the farmland market in the UK remains thin with soil health related market evidence, and prices are often driven more by location, supply and demand, or tax planning more than by soil condition.

10.1.2. Nevertheless, soil health is increasingly relevant for several reasons:

a) It directly affects farm business performance.

b) It may impact access to emerging income streams such as credits for carbon and biodiversity net gain.

c) It provides wide reaching public benefits recognised by Government.

d) It is becoming embedded in policy and tenancy frameworks.

Value to the Business

11.1 Separate from the Red Book definition, consideration should be given to the value of soil health to a business. This captures the operational worth of soil condition to the occupier's farming enterprise. This is becoming an increasingly important area of practice for CAAV Members, i.e. outside of Red Book valuations.

11.1.2. When assessing how soil condition contributes to or detracts from value, a valuer should consider the following interconnected factors:

11.1.2.1. **Profitability and Gross Margins** – healthy soils support efficient production through lower input requirements and more consistent yields; degraded soils likely require higher operational costs and may still suffer reduced margins.

11.1.2.2. **Cropping and Stocking Flexibility** – whilst different soil qualities attract different enterprises, improved soil structure, chemical composition and biology allow a wider choice of enterprises whilst compacted or depleted soils constrain options (at least without remediation, which comes at a cost and risk).

11.1.2.3. **Resilience to Weather** – soils with higher organic matter and or better structure buffer extremes of drought and flood better than those suffering low organic matter and/or compaction, thereby mitigating business risks including yield volatility and crop failure.

11.1.2.4. **Impact of Input Price Shocks –** biologically active soils reduce reliance on synthetic fertilisers, fuel and chemical inputs, cushioning the occupier against input price spikes. Poor soils increase dependency on external inputs, amplifying financial risk when markets are volatile.

11.1.2.5. **Regulatory Compliance and Risk of Fines** – well-managed soils help occupiers meet regulations such as the Farming Rules for Water and NVZ obligations; poor soils increase the risk of runoff, pollution incidents and subsequent enforcement action. As environmental regulation and enforcement increasingly reflect principles such as prevention, rectification at source and polluter pays, well-managed soils may become more important as a risk mitigation factor.

11.1.2.6. **Supply Chain and Carbon Auditing** – many buyers and processors are beginning to scrutinise soil management and carbon performance; soils with strong organic matter and resilience may provide commercial advantage in audited supply chains.

11.1.2.7. **Eligibility for Markets** – soil and ecosystem health directly affect the potential "gain" which can be monetized through schemes such as carbon credits and biodiversity net gain. Therefore, farms with higher soil carbon or general ecosystem health may be disadvantaged should they not have a previous recorded baseline prior to driving improvements.

11.1.2.8. **Insurance Value** – healthy soils act as a buffer against climatic and economic shocks, providing a form of "insurance" by sustaining performance in adverse conditions. This reduced risk may in the future reflect decreased insurance policy premiums or reduced lending rates from banks or other lenders, however, at the time of writing there is little recognition of this in the market.

11.1.2.9. **Marketability and Demand** – soil condition can influence the pool of potential consumers, tenants or purchasers. For example, where a farm demonstrates comparably better soil health, one could logically attest that if all other factors remain comparable then demand for produce from that farm would be higher than its competitors (particularly if retailing direct to consumers) however this is emerging on a case-by-case base with no "standard" recognition evident in the market. Likewise, should the farm come available to rent or buy, interested parties would logically prefer an enhanced soil health status (assuming the same use). In a world of increasing competition, this factor should not be overlooked.

11.1.3. In summary, the value of soil health to a farm business is primarily operational rather than capital. For the occupier, soil condition influences productivity, cost efficiency, resilience to weather and market volatility, and exposure to regulatory risk. Healthy soils tend to support more stable returns, reduce reliance on external inputs and provide greater flexibility in enterprise and management response, while degraded soils increase costs, constrain options and amplify business risk.

11.1.4. This form of value is best understood as business "worth" rather than market value. It may not be fully reflected in land prices, but it is increasingly material to business performance, risk management and strategic decision-making. For CAAV Members, soil health should therefore be viewed as a risk-modifying asset within the farming enterprise, with significance that depends on context, management capacity and the objectives of the occupier rather than on uniform market recognition.

Value of Soil Health to the Public

12.1 Soil health is not only an asset to the farm business but also a public good underpinning national resilience, environmental quality, and human wellbeing. This recognition has shaped UK agricultural policy since 2009, initially within the *"Safeguarding our Soils: A strategy for England"* publication and, post Brexit, under the 25 Year Plan for the Environment, with the principle of *"public money for public goods"* guiding subsidy schemes and most recently in *"The Land Use Framework for England".* [139],[140,141]

12.1.2. Stakeholders including the NFU, Soil Association, and Sustainable Food Trust have consistently highlighted this link, promoting soil health as the foundation of food security, climate resilience and nature recovery. [142],[143]

12.1.3. While these public benefits are increasingly recognised in policy and regulation, they are not automatically reflected in private land values. Their relevance to valuation and professional advice arises primarily where they are translated into enforceable obligations, income streams, risk mitigation, or market-recognised constraints or opportunities. This section therefore considers the public value of soil health in terms of how it is recognised, incentivised or regulated, rather than assuming direct capitalisation into land value.

12.2. Ecosystem Services

12.2.2. Healthy soils deliver multiple **ecosystem services**—the benefits that nature provides to people and economies, such as clean water, carbon storage, nutrient cycling, biodiversity support, and cultural wellbeing. These services reduce external costs to society and provide an economic rationale for public investment in farming practices that maintain or enhance soils. This was iterated in a House of Commons report which highlights that *"soil health is therefore fundamental to life on earth, and worsening soil health can have significant environmental, economic and societal consequences."* [140]

12.2.2.1. **Water regulation and flood mitigation** – Soils with good structure and organic matter absorb and store water, reducing surface runoff and mitigate downstream flood risk. The UK National Ecosystem Assessment valued flood regulation services at around £366 million annually. [144] Additionally, catchment-based soil and land management interventions are now explicitly promoted within national flood risk strategy as part of natural flood management, with Government and the Environment Agency advocating upstream measures that improve infiltration, reduce compaction and slow surface runoff. [124,125]

12.2.2.2. **Water quality** – Healthy soils reduce erosion and nutrient leaching, thereby lowering sediment, nitrate and phosphate loads entering rivers. Agriculture remains a significant contributor to diffuse water pollution in England, with soil runoff identified as a key pathway. Improved soil management can reduce these losses and improve

ecological status. [123] Reduced sediment and nutrient loading can in turn lower treatment requirements for water companies, with catchment-based interventions increasingly recognised as a cost-effective alternative to end-of-pipe treatment. Poor soil condition, by contrast, increases pollution risk and downstream treatment costs. [120]

12.2.2.3. **Pollution control** – Land management practices such as reduced tillage, maintaining permanent soil cover and diversified cropping systems are associated with improved soil structure, reduced erosion and lower surface runoff. Evidence indicates that, when applied together and appropriately managed, such practices can materially reduce sediment and nutrient losses from agricultural land, thereby improving downstream water quality and reducing pressure on watercourses.[66]

12.3. Climate Change Resilience and Regulation

12.3.2. Soils sit at the centre of both climate mitigation and adaptation:

a) **Climate regulation** – Soils represent the largest terrestrial carbon store globally. Improvements in soil organic carbon (SOC) contribute to climate mitigation by increasing carbon sequestration and reducing atmospheric CO_2 concentrations.[145] Estimates suggest that agricultural soils could contribute materially to global mitigation potential, although outcomes vary by soil type, climate and management. In the UK, industry strategies such as the NFU's Net Zero 2040 programme place significant reliance on soil carbon sequestration as part of the agricultural transition. [146,147]

b) **Climate resilience** – Well-structured soils with adequate organic matter improve water infiltration, storage and drainage, helping to moderate the impacts of both drought and intense rainfall. By reducing runoff and improving water availability during dry periods, healthy soils enhance resilience not only for farm businesses but also for rural communities and downstream settlements. [148]

12.4. Food Security

12.4.2. Soil health underpins food security, defined by the FAO as consistent access to sufficient, safe and nutritious food. Productive capacity in agriculture depends fundamentally on soil function, including nutrient cycling, water regulation and structural stability. [149]

12.4.3. In the UK, evidence indicates that soil degradation—including erosion, compaction and organic matter decline—can reduce yield reliability and increase vulnerability to extreme weather events. Improvements in soil organic carbon (SOC) are associated with greater yield stability under drought and rainfall stress, although responses vary by soil type and system. [147,150]

12.4.4. The Parliamentary Office of Science and Technology has highlighted the global scale of soil degradation and its potential implications for long-term food production. [151] While the UK food system is influenced by trade and supply chains, maintaining

domestic soil resilience remains an important component of national production capacity.

12.5. Nutrient Density of Foods

12.5.2. Soil condition influences crop nutrient uptake and, consequently, the nutritional composition of food. Soil organic matter, mineral availability and biological activity affect the supply of essential micronutrients to plants. While crop nutrient content is influenced by multiple factors—including variety, fertiliser management and post-harvest handling—evidence indicates that soil degradation can constrain micronutrient availability and plant uptake. [88,152]

12.5.3. Improving soil function may therefore support more consistent micronutrient supply within cropping systems, contributing to long-term food quality and dietary resilience. However, the relationship between soil management and human nutritional outcomes is complex and system-dependent.

12.6. Wider Considerations for Public Value

12.6.2. **Flood Risk and Public Infrastructure Savings** – Flood damages in the UK impose substantial economic costs, with government assessments estimating annual damages in the billions of pounds when accounting for direct and indirect impacts.[153] Public investment in flood and coastal erosion risk management has been shown to deliver strong economic returns, with appraisal evidence indicating that schemes commonly generate several pounds of benefit for every pound invested.[154]

12.6.2.1. While engineered infrastructure remains central to national flood protection, upstream land management measures form part of the recognised natural flood management approach. Improvements in soil structure and organic matter can enhance infiltration, reduce surface runoff and moderate peak flows at catchment scale. As such, soil health improvements may contribute to broader flood resilience objectives, complementing conventional infrastructure rather than replacing it.[148]

12.6.3. **Water Quality and Treatment Costs** – Poor soil condition increases the risk of erosion and nutrient runoff, contributing to sediment, nitrate and phosphate loading in rivers. Agriculture remains a significant source of diffuse water pollution in England, with soil runoff identified as a key pathway.[155] Increased pollutant loads raise treatment requirements for water companies and, ultimately, costs to consumers.

12.6.3.1. Ofwat has recognised that upstream catchment management, including improved land and soil management practices, can provide a more cost-effective solution than relying solely on end-of-pipe treatment infrastructure.[156] By addressing pollution at source, soil health improvements may contribute to reduced treatment burdens and improved water quality outcomes.

12.6.4. **Air Quality** – Agriculture is a significant source of ammonia emissions in the UK, primarily associated with livestock manure management and fertiliser use.[157] Soil condition and nutrient management practices influence the extent to which applied

nutrients are retained within the soil profile or lost to the atmosphere. Poorly structured or compacted soils can increase nutrient losses, contributing indirectly to ammonia emissions and secondary particulate formation.

12.6.4.1. DEFRA's Clean Air Strategy from 2019 recognises the importance of improved nutrient management and land management practices in reducing agricultural emissions.[158] Enhancing soil function and nutrient retention may therefore contribute, alongside wider livestock and fertiliser management measures, to improved air quality outcomes and reduced environmental and public health costs.

12.6.5. **Cultural and Recreational Services** – Soil health contributes to wider landscape quality by supporting vegetation diversity, habitat condition and ecosystem function. These attributes form part of the cultural ecosystem services recognised within the UK Natural Capital Accounts, including recreation, landscape character and sense of place.[159] National natural capital accounting demonstrates that access to high-quality natural environments provides measurable recreational and wellbeing benefits.[160] While such values cannot be attributed to soil condition in isolation, healthy soils underpin the ecological integrity that supports these wider public benefits.

12.6.6. **Natural Capital Accounting** – These wider benefits are increasingly reflected within public policy appraisal frameworks. DEFRA's *Enabling a Natural Capital Approach (ENCA)* guidance and HM Treasury's *Green Book* require consideration of natural capital impacts, including soil-related ecosystem services, within cost–benefit analysis for public investment decisions.[161,162] While not all services are fully monetised, this formal recognition embeds soil health within government decision-making processes.

12.6.7. **Intergenerational Equity** – Soil condition also engages principles of intergenerational equity recognised within public policy. Degradation of soil assets may result in future remediation costs, reduced productive capacity and diminished ecosystem service provision. Conversely, maintaining or improving soil health preserves natural capital and reduces the risk of transferring environmental and financial liabilities to future land managers and taxpayers.

12.6.8. **Green Book** – HM Treasury's *Green Book* requires that long-term environmental impacts and asset depreciation be considered within public appraisal, including where natural capital is at risk of irreversible decline.[161] In this context, soil health represents not only a current production asset but a long-term component of national capital stock.

12.6.9. **Social Licence to Operate** – Environmental performance is increasingly scrutinised within agricultural supply chains. Major UK retailers, including Tesco and Sainsbury's, have published sustainability strategies that reference regenerative agriculture, soil health improvement and reductions in supply-chain emissions.[163,164] These frameworks signal growing expectations that primary producers demonstrate responsible soil and land management as part of broader environmental assurance.

12.6.9.1. Industry assurance schemes and retailer procurement standards are beginning to incorporate soil-related metrics, alongside carbon accounting and nutrient

management planning. While this scrutiny does not automatically translate into price premiums, it may influence eligibility for contracts, participation in certain supply chains and access to longer-term commercial relationships.

12.6.9.2. In this context, soil health contributes to maintaining a farm's "social licence to operate"—that is, its ability to meet evolving environmental expectations of buyers, financiers and regulators. Market recognition remains variable, but demonstrable soil stewardship may increasingly form part of commercial risk assessment within parts of the agri-food sector.

12.7. Conclusion

12.7.2. Soil health delivers a range of recognised public goods, including contributions to flood risk management, water quality, climate mitigation, long-term food security and wider ecosystem services. These benefits are increasingly embedded within public policy frameworks, regulatory standards and environmental/nature markets. However, their relevance to valuation arises not from their existence alone, but from the extent to which they are reflected in enforceable obligations, income mechanisms, risk allocation or market behaviour.

12.7.3. For valuers and rural advisers, awareness of these wider public dimensions is essential when assessing risk, opportunity and long-term asset performance. Policy payments, emerging ecosystem markets, supply-chain standards and environmental regulation may transmit elements of public value into private decision-making. Understanding these transmission mechanisms allows advice to remain commercially grounded while responsive to policy and market evolution.

12.7.4. Soil should therefore be considered not only as a factor in current productivity, but as a component of natural capital with long-term economic significance. Managing soil condition influences resilience, compliance exposure and future optionality. While short-term profitability remains central to business sustainability, neglect of soil assets may carry deferred costs and constraints that affect future value. Professional advice should recognise both dimensions within a clear valuation framework.

Agricultural Tenancies & Soil Health

Introduction

13.1 Soil health has historically been treated as a background agronomic issue in agricultural tenancy practice. However, it is becoming increasingly relevant to professional practice in respect of agricultural tenancies. Advances in soil management, greater understanding of soil biology and structure, and the emergence of environmental income streams mean that soil condition can change measurably during the course of a tenancy. These changes may influence:

- productive capacity
- resilience to climatic variability
- regulatory compliance
- input costs
- eligibility for environmental schemes.

13.1.2. In some circumstances these factors may therefore influence value. However, agricultural tenancy law does not reward good farming in the abstract. It allocates value according to ownership, obligation and transferability. For the professional valuer, the key task is therefore not simply to determine whether soil condition has improved or deteriorated, but to establish how that condition should be attributed within the statutory framework governing the tenancy.

13.1.3. In doing this, three questions are central:

1. Is the soil characteristic inherent to the holding?
2. Has the condition arisen from the tenant's management or investment?
3. Does a measurable and transferable benefit remain for an incoming tenant?

13.1.4. These questions underpin the treatment of soil condition in:

- rent reviews
- compensation claims, and
- dilapidations disputes.

13.1.5. This section considers how soil health interacts with the two principal statutory tenancy regimes in England and Wales:

- the Agricultural Holdings Act 1986 (AHA)
- the Agricultural Tenancies Act 1995 (ATA)

13.1.6. Although the statutory structures differ, both ultimately require the valuer to separate inherent soil characteristics from occupier-created condition, supported by credible evidence.

Soil Condition and Agricultural Value

14.1 Before considering the legal framework, it is helpful to recognise how soil condition interacts with agricultural value more broadly.

14.1.2. The productive capacity of agricultural land is strongly influenced by soil quality, including:

- soil texture and structure
- depth and stoniness
- natural drainage characteristics
- organic matter levels
- nutrient availability.

14.1.3. These characteristics influence the crops that can be grown, the timing of field operations and the reliability of yields. They therefore form part of the intrinsic productive capacity of the holding.

14.1.4. However, many aspects of soil performance are also influenced by management decisions, including:

- liming and fertiliser management
- organic amendments
- cultivation systems
- crop rotations
- grazing systems.

14.1.5. Such management practices can significantly influence soil structure, biological activity, nutrient availability and resilience to weather events.

14.1.6. The difficulty in tenancy valuation arises because soil condition often reflects both inherent characteristics and management history. The legal framework governing agricultural tenancies requires these elements to be separated.

14.2. Evidence and Soil Condition

14.2.2. Across rent reviews, compensation claims and dilapidations disputes, arguments relating to soil health ultimately depend upon evidence.

14.2.3. Unlike buildings or fixed equipment, soil condition evolves gradually through management and environmental influences. As a result, disputes frequently fail not because the underlying agronomic argument is incorrect, but because the evidential basis is insufficient.

14.2.4. In practice, four evidential stages are particularly important:

14.2.4.1. Baseline condition

a) The most reliable foundation for any soil-related argument is a clear record of the holding at the commencement of the tenancy.

b) Under the AHA, records of condition prepared under section 22 may provide particularly valuable baseline evidence, although they are not mandatory. Under Farm Business Tenancies, baseline evidence is usually contractual and may include entry schedules or agreed soil testing.

c) Historically, such records focused on visible condition, drainage and nutrient indices. Increasingly, where soil condition may become relevant to valuation or dispute resolution, a more robust baseline may also include:

- soil classification and texture
- soil pH
- Cation Exchange Capacity
- soil aggregation and porosity
- bulk density
- soil organic matter or soil organic carbon
- nutrient indices including pH, phosphorus, potassium and magnesium
- biological measurements (e.g. microbial biomass)
- drainage condition (measuring infiltration)
- compaction
- erosion or surface capping
- cropping history (per field)

d) Without baseline evidence it becomes difficult to distinguish between inherent soil characteristics and condition arising from the tenant's management.

e) In agreeing on a baseline assessment, one must also consider how evidence is collected (i.e. by tenant or third party or jointly), and how many tests are undertaken per field or soil type.

f) It is also important to consider dispute resolution measures should the parties not agree with the results of such soil tests (whether for a baseline or subsequent assessment).

14.2.4.2. Management Evidence

a) Where a party seeks to attribute a change in soil condition to management practices, contemporaneous records are often critical.

These may include:

- cropping and rotation records
- fertiliser and lime applications
- organic amendments including manure, compost or digestate
- biological inoculants or extracts applied
- cover cropping or grazing regimes
- cultivation systems and drainage maintenance
- Brix readings, sap tests or plant tissue analysis

b) Such records help establish a causal link between management decisions and soil outcomes.

14.2.4.3. Exit Condition

a) At the termination of a tenancy, soil condition may become relevant in several contexts including compensation claims by the outgoing tenant or dilapidations claims by the landlord.

b) Exit assessments may include updated soil analysis, field inspection and comparison against baseline evidence where available. Usually, the same evidence should be collected to ensure suitable comparison and, where possible, this includes the same testing methodologies and the same laboratory.

c) Without such records at the end of a tenancy, a claim will likely struggle to put forward a robust case.

14.2.4.4. Persistence and Transferability

a) Even where soil condition has improved, a further question arises: does the improvement provide a transferable benefit to an incoming tenant?

b) Some improvements, such as drainage, structural remediation or liming, are durable and likely to persist regardless of immediate subsequent management. Others may depend on the continuation of a particular farming system. Improvements achieved

through reduced tillage, herbal leys or integrated grazing may diminish if an incoming tenant adopts different management practices.

c) For valuation purposes, the key question is therefore whether the improvement would reasonably remain available to a competent incoming tenant farming the holding in a competent manner.

Tenancies under the Agricultural Holdings Act 1986

15.1 Following the introduction into the valuation of soils within tenancies, this section focuses on the mechanisms within the Agricultural Holdings Act 1986 (AHA).

15.2. Rent Reviews under AHA

15.2.2. Under Section 12 and Schedule 2 of the Agricultural Holdings Act 1986, rent is assessed as:

"the rent at which the holding might reasonably be expected to be let by a prudent and willing landlord to a prudent and willing tenant." [165]

15.2.3. In determining this rent, the arbitrator must take into account factors including:

- the character and situation of the holding
- its productive capacity
- related earning capacity
- comparable evidence.
- other relevant factors

15.2.4. The statute also requires several matters to be disregarded, including:

- tenant's improvements (where uncompensated)
- tenant's fixed equipment
- grant funded landlord's improvements
- the effect on rent of the tenant's actual occupation
- the effects of high farming
- tenant's dilapidations
- distortions caused by scarcity or special bidding. [165]

15.2.5. Soil condition forms part of the holding's productive capacity and may legitimately influence rent where it reflects inherent characteristics of the holding.

15.2.6. These inherent qualities may include:

- soil type and depth
- stoniness
- slope and altitude
- natural drainage characteristics
- climatic position.

15.2.7. However, improvements in soil condition arising from the tenant's management—such as liming, adding organic amendments or mole draining—may fall within the category of tenant's improvements or the effects of high farming and must therefore be disregarded unless they were required by the tenancy or funded by the landlord (without grants).

15.2.8. A common professional risk lies in relying upon outcomes alone. Improved yields or reduced fertiliser requirements do not automatically justify a higher rent. The valuer must determine whether these outcomes arise from the inherent characteristics of the holding, the tenant's uncompensated management or factors which do not warrant compensation.

15.2.9. Concerning grant or other funding schemes, the financial gain resulting from this may be considered as part of Rent Reviews. However, advisors must first ensure there is no ancillary agreement to the tenancy which has an effect – such as the splitting of income under a BNG scheme, or, agreement to exclude certain income from consideration in rent reviews.

15.2.10. In practice, soil condition may therefore influence rent where it reflects the intrinsic productivity of the land itself, rather than as a result of the farming system adopted by the tenant.

15.3. High Farming

15.3.2. Section 70 of the AHA recognises the concept of High Farming, this is defined as a system of farming that is more beneficial to the holding than:

- the system of farming required by the contract of tenancy, or,
- in so far as no system of farming is so required, than the system of farming normally practised on comparable agricultural holdings;

and where the value of the holding as a holding has been increased during the tenancy. [165]

15.3.3. A tenant will not be eligible for a claim under High Farming, unless;

- the tenant has, not later than one month before the termination of the tenancy, given to the landlord notice in writing of his intention to claim compensation under this section, and
- a record has been made under section 22 above of the condition of the fixed equipment on the holding and of the general condition of the holding.[165]

15.3.4. The legislation adds that, compensation shall not be recoverable under this section in respect of any matter arising before the date of the making of the or, if more than one such record has been made, the first of them. This restates the importance of tenants ensuring suitable records of condition have been logged prior to adjusting the system of farming. [165]

15.3.5. The effects of High Farming must be disregarded when assessing rent but, provided the provisions have been met, may form the basis of a compensation claim at termination.

15.3.6. To succeed in such a claim, the tenant must demonstrate that:

- the holding has been farmed to a standard exceeding that required by the tenancy or that normally practiced on comparable holdings
- the holding is left in a more productive condition
- the value of the holding as a holding has been increased during the tenancy, having regard to the character and situation of the holding and the average requirements of tenants reasonably skilled in husbandry. [165]

15.3.7. High Farming claims have historically been uncommon and may never have been sustained in practice. The evidential and valuation hurdles are considerable, particularly where improvements arise gradually and are not supported by baseline evidence as would be the case with a soil-centric system.

15.3.8. Modern soil-focused farming systems may give rise to arguments under this provision. Practices such as reduced tillage, diverse rotations, integrated grazing and regular organic or biological amendments may improve soil structure, infiltration, resilience and profitability and, provided the eligibility criteria are met and an increased value can be demonstrated in respect of an incoming tenant reasonably skilled in husbandry, a claim for compensation may succeed.

15.3.9. However, whether such systems constitute High Farming depends on the requirement of the tenancy agreement, or, comparison with normal local practice on comparable holdings at the relevant time. Concerning the latter, practices that were once

exceptional may become standard over time, reducing the scope for successful claims. This may be part of the reason such claims are rare, particularly for soil-centric farming systems.

15.3.10. In summary, an eligible claim will receive compensation equal to the increase in the value of the holding as a holding caused by the tenant's adoption of a special or high farming system, subject to appropriate records under section 22 and notice being served on the landlord.

15.4. End-of-Tenancy Compensation

15.4.2. The AHA provides compensation to tenants through two principal statutory routes:

- Schedule 7 improvements
- Schedule 8 improvements.

15.4.3. These are considered in more detail below.

15.4.3.1. Schedule 7 – Long-term improvements

15.4.3.2. Schedule 7 typically includes capital works such as drainage or irrigation infrastructure.

15.4.3.3. Compensation is assessed as the increase attributable to the improvement in the value of the holding as a holding, reflecting its remaining life.[165]

15.4.3.4. For soil health, Schedule 7 is most relevant where infrastructure materially alters the physical capability of the holding—for example through improved drainage or water management.

15.4.3.5. Soil health improvements arising from preceding management will rarely constitute a separate compensatable improvement unless they fall within another statutory category and can be argued not to arise solely from the infrastructure improvement.

15.4.4. Schedule 8 – Short-term improvements

15.4.4.1. 8 Part I provides compensation for the following defined short-term improvements:

1) Mole drainage and works carried out to secure its efficient functioning.
2) Protection of fruit trees against animals.
3) Clay burning.
4) Liming (including chalking) of land.
5) Application to land of manure, fertiliser, soil improvers and digestate.
6) Production of manure arising from the consumption on the holding of relevant feedingstuff by livestock and equidae where the manure is held in storage on the holding.[165]

15.4.4.2. The provisions for compensation reflects the unexhausted value to a competent incoming tenant at termination.[165]

15.4.4.3. Since the revocation of statutory tables in 2015, market-reflective methods should be used, often supported by CAAV guidance. Detailed write-down methodologies are set out in the CAAV's publication 224 entitled "A Review of Tenant Right – A Preliminary Analysis".[166]

15.4.4.4. Under Schedule 8 Part 1, three principles are fundamental:

- Nutrient value and soil improver value must be separated.
- Write-down must reflect remaining transferable benefit to an incoming tenant.
- Claims for enduring biological benefit require credible evidence.

15.4.4.5. With the addition of soil improvers and digestate to Part 1 in 2015, it is important to note that there is no statutory definition of a soil improver. However, these are likely to include compost and similar materials used to improve the physical, chemical or biological soil properties but which may not also supply nutrients.

15.4.4.6. In assessing whether a claim for soil improvers is valid, one should consider the following:

- Was the material applied to the land?
- Did it improve soil fertility or condition?
- Does a residual benefit remain for the incoming tenant?
- What is the value of that benefit?

15.4.4.7. Naturally, without evidence, a claim may not survive scrutiny.

15.4.4.8. Another approach proposed in the CAAV publication 224 was to assess the organic matter benefit of a given soil improver (such as compost). To do this, the publication suggests a rate of £0.45/t is applied with a five-year write-down, but this must be adjusted for soil type, rainfall and management. [166]

15.4.4.9. Biological inoculants (e.g. compost teas or microbial products) may justify compensation but only if baseline-to-exit evidence shows measurable, enduring benefit, although in practice such claims face significant evidential hurdles.

15.4.5. Schedule 8 Part II – Tenant Right

15.4.5.1. Schedule 8 Part II provides a basis for outgoing tenants claiming tenant-right matters for which they are entitled to compensation. The legislation sets out the following claimable elements:

(i) growing crops and produce the tenant cannot remove or sell;

(ii) seeds sown, cultivations, fallows and acts of husbandry paid for by the tenant;

(iii) pasture leys with clover, grass, lucerne or sainfoin in defined cases;

(iv) acclimatisation or hefting of hill sheep;

(v) sod fertility of qualifying leys in arable districts.[165]

15.4.5.2. Since the calculation tables were revoked in 2015, valuers must rely on evidence and local practice. However, a written tenancy may substitute a different method for Part II items but not for Part I.[166]

15.4.6. Residual Sod Fertility

a) Most directly relevant to soil health are sod fertility claims. Whilst distinguished from claims for tenant's pastures, residual sod fertility reflects the long-term benefits for future crops from the pasture. This includes the ley's root mass and structure giving improved tilth and nitrogen benefits from legumes.

b) A valuer, in approaching value, will need to consider:

- A figure for "excess qualifying leys" (see CAAV publication 224)
- Whether the pastures can, under regulation, be ploughed out (in order to realise the benefits in an arable system)
- In considering the value, there may be two principle components, a.) the nutrient value, and b.) the wider benefits associated with incorporating leys into an arable rotation including, improved soil structure, increase soil organic matter and improved water infiltration. [166]

15.4.7. Seeds Sown, Cultivations, Fallows and Acts of husbandry.

a) This head of claim provides a wide-ranging category which may cover operations including subsoiling, seedbed preparation, rolling or spreading operations – provided they provide value to the incomer.

b) In approaching value, previous guidance has suggested applying the reasonable cost of the operations, using CAAV Costings, adjusted accordingly for the lifetime of the benefit. However, the statutory basis remains as the value to the incoming tenant. [166]

c) Biological inoculants may be considered an act of husbandry, but claims depend on evidence. Without baseline-to-exit testing showing measurable soil benefits (such as SOM increase, microbial biomass or infiltration improvements), demonstratable residual value is likely to be nil. Where evidence shows a persisting, transferable

benefit, an allowance could be made. Alternatively, biological inputs may be claimed as “soil improvers” under Schedule 8.

15.4.8. In summary, taken together, the statutory compensation framework largely recognises identifiable inputs and capital improvements. Many modern soil health gains arise from cumulative management decisions and therefore fall outside clearly defined categories of compensation. However, there may be scope to pursue a claim under High Farming albeit the bar of evidence required, particularly for a soil-centred system, is high and claims may not be successful. This creates uncertainty for tenants seeking recognition of soil management benefits.

15.5. Dilapidations

15.5.2. Under sections 71 and 72 of the Agricultural Holdings Act 1986, landlords may claim compensation where deterioration of the holding has been caused by the tenant.[165]

15.5.3. Section 71 relates to deterioration of particular parts of the holding, whereas section 72 relates to general deterioration of the holding, although a claim under section 72 requires notice to be served. For specific defects the landlord may alternatively pursue a contractual claim (for example breach of repair covenant) rather than proceeding under section 71, but not both in respect of the same matter.

15.5.4. Any dilapidations claim must establish:

- the tenant’s obligation
- breach of covenant or statutory duty
- causation
- resulting loss.

15.5.5. Soil deterioration presents particular complexity. Decline in soil condition may arise from avoidable management decisions, but also from unavoidable climatic events or inherent soil limitations for the permitted use.

15.5.6. Typical examples of deterioration may include:

- compaction
- erosion
- neglected drainage
- nutrient depletion.

15.5.7. However, deterioration alone is insufficient. The landlord must demonstrate that the deterioration results from a breach of covenant or failure to comply with the Rules of Good Husbandry set out in the Agriculture Act 1947. Modern regulatory baselines, such as the Farming Rules for Water, may also provide relevant context.

15.5.8. It is worth noting that that the Rules of Good Husbandry, whilst give a general provision of management, do provide somewhat subjective guidance as to what practices a tenant should undertake. For example, the responsibilities include ensuring "permanent pasture is being properly mown or grazed and maintained in a good state of cultivation and fertility and in good condition." Since 1948, the view on what proper mowing or grazing includes has in many minds changed. This presents another layer of complexity for valuers to consider. [167]

15.5.9. A decline in soil organic matter or structural quality does not automatically constitute breach; it must be demonstrated that the deterioration arose through the tenant's management rather than inherent conditions or external factors.

15.5.10. The measure of compensation differs depending on the statutory basis of the claim as follows:

- **Section 71 (particular parts):** assesses the reasonable cost of making good the deterioration, subject to a cap based on the diminution in value of the holding.
- **Section 72 (general deterioration):** assesses the reduction in the value of the holding as a holding, assessed on a competent-tenant having regard to the character and situation of the holding.

15.5.11. Consequently, the cost of remediation will not necessarily determine the recoverable loss. Under section 71 the recoverable amount may be limited by the diminution in value.

15.5.12. **For example:**

Whilst there are many factors to consider, as a simple illustration, a measurable decline in soil organic matter of 1% against a clear baseline might indicate remediation works costing £40,000. However, if the resulting diminution in the value of the holding is assessed and evidenced at £12,500, the compensation recoverable may be restricted to claim the lower amount.

Although not required for claims under sections 71 or 72, records of condition prepared under section 22 of the Agricultural Holdings Act 1986 are often valuable in distinguishing between inherent soil condition and deterioration attributable to the tenant.

Tenancies under the Agricultural Tenancies Act 1995

16.1 This section explores further the mechanisms within the Agricultural Tenancies Act 1995 (ATA), particularly as they relate to the valuation of soil health and associated factors.

16.2. Contractual Framework

16.2.2. Farm Business Tenancies (FBTs) governed by the Agricultural Tenancies Act 1995 operate within a more flexible framework than AHA tenancies. Many aspects of the relationship between landlord and tenant are determined primarily by the tenancy agreement itself.

16.2.3. In practice, soil health issues under FBTs tend to arise in three main contexts:

- the assessment of open-market rent at rent reviews;
- improvements and compensation at the end of the tenancy; and
- dilapidations or breach of covenant, where soil condition has deteriorated.

16.2.4. Across all three contexts, the same professional discipline applies. The valuer must distinguish between:

- inherent soil characteristics forming part of the holding;
- improvements arising from the tenant's management or investment; and
- soil outcomes that are transferable to a competent incoming tenant.

16.2.5. This attribution exercise becomes increasingly important as soil-focused farming systems develop and as environmental income streams — including carbon, biodiversity and environmental schemes — become more closely linked to soil condition.

16.2.6. The following sections consider how these principles operate in practice under the ATA framework.

16.3. Rent Reviews under FBTs

16.3.2. Farm Business Tenancies are subject to a statutory rent review framework. However, unlike tenancies governed by the Agricultural Holdings Act 1986, the ATA permits the parties to contract out of the statutory rent review provisions. In practice, many FBTs either adopt the statutory mechanism or include a contractual rent review clause.

16.3.3. Where the statutory framework applies, and the parties cannot agree the rent, the arbitrator must determine the rent properly payable. This reflects the open-market rent between a willing landlord and a willing tenant, taking into account all relevant factors and the terms of the tenancy.[168]

16.3.4. The statute requires the following to be disregarded:

- any increase in rental value attributable to tenant's improvements, except where the improvement was required by the tenancy, expressly authorised by the landlord, or has already been compensated;

- the fact that the current tenant is in occupation; and
- any reduction in rental value attributable to dilapidations caused by the tenant.[168]

Soil health in this Framework

16.3.5. Soil condition forms part of the holding's productive capacity and may legitimately influence the rent that a willing incoming tenant would pay. However, improvements created by the tenant's management — such as liming, manuring or compost applications — constitute tenant's improvements and must be disregarded where the statutory test applies.

16.3.6. The valuer must therefore distinguish between:

- inherent soil characteristics forming part of the holding; and
- advantages arising from the tenant's management system.

16.3.7. Baseline soil information can be particularly helpful in this context. Entry and exit soil records provide evidence of what element of soil condition is inherent to the holding and what has arisen from tenant management, however, interim records may be useful at the time of rent reviews. Without such evidence, attribution becomes more difficult and the risk of double counting increases.

Comparable Evidence

16.3.8. Soil quality often underpins local rent levels, but comparable evidence must be interpreted carefully. Rental evidence may reflect soil health improvement resulting from management undertaken by the outgoing tenant rather than the inherent productive capacity of the holding. Valuers must therefore ensure that comparable evidence reflects inherent soil quality rather than occupier-created advantage, unless such management is required by the tenancy in which case it may be reasonable to assume the soil health improvement shall be sustained.

Emerging Issues

16.3.9. As soil health becomes increasingly linked to environmental income streams — including carbon, biodiversity units and environmental schemes — arbitrators may also be required to consider whether such income should influence rent.

16.3.10. Where such income arises from the tenant's activities or investment, it may need to be disregarded. Where the opportunity flows with the land and would be available to a competent incoming tenant, it may properly be taken into account. Clear lease drafting addressing environmental schemes and natural capital rights is therefore increasingly important.

16.4. FBT Improvements

16.4.2. Part III of the Agricultural Tenancies Act 1995 addresses tenant's improvements. In practice, improvements are commonly distinguished between routine farming operations and non-routine improvements that go beyond ordinary husbandry.[168]

16.4.3. Routine improvements are those that a competent tenant would reasonably undertake in the normal course of farming. Examples may include subsoiling to alleviate compaction, sowing cover crops, or applying bulky organic matter such as farmyard manure, slurry, compost or digestate. These are normally undertaken without landlord consent.

16.4.4. Non-routine improvements go beyond ordinary husbandry or alter the character or capability of the holding. Examples may include installing irrigation systems or undertaking major drainage works. These require landlord's consent.

16.4.5. At termination, section 20 provides that compensation is assessed as the increase in the value of the holding as a holding attributable to the improvement. This is a worth-based test rather than reimbursement of cost.[168]

Soil-related Improvements

16.4.6. Soil-related improvements require careful classification.

16.4.7. Bulky organic materials such as farmyard manure, slurry, compost and digestate are usually routine husbandry operations. Their value is normally evidenced through nutrient analysis and soil-improver benefit, often supported by CAAV write-down schedules.

16.4.8. Biological inputs such as microbial inoculants or compost teas may justify compensation where credible evidence demonstrates a measurable and enduring improvement that enhances the productive capacity or letting value of the holding. Evidence might include soil organic matter trends, microbial biomass measurements, infiltration rates or independent agronomic reports. Without such evidence they will generally be treated as routine husbandry with no continuing value.

16.4.9. A recurring issue is that many soil health outcomes arise gradually through management systems rather than through identifiable improvements. Such outcomes may enhance soil performance but may not readily fall within the statutory framework governing compensatable improvements.

16.5. Dilapidations and End-of-Tenancy Issues

16.5.2. Dilapidations under FBTs depend primarily on the terms of the tenancy agreement. Some agreements adopt the repairing and insuring obligations in the Model Clauses under the AHA, while others contain bespoke provisions.

16.5.3. Soil-related dilapidations may include:

- compaction;
- erosion;
- neglected drainage; or
- failure to comply with contractual soil management provisions.

16.5.4. More recent agreements may also require tenants to maintain soil fertility, nutrient status or soil organic matter within defined ranges or minimums.

16.5.5. Remedies may involve remedial works — such as subsoiling, reseeding or reinstating drains — rather than cash compensation. However, end-of-tenancy claims depend on contractual wording and evidence.

16.5.6. In practice, baseline soil records at entry and exit remain the most reliable safeguard in determining whether soil condition has improved, deteriorated or remained unchanged.

Modern Tenancy Agreements

Drafting Modern Tenancy Agreements

17.1 Modern tenancy agreements are increasingly expected to address soil stewardship and environmental management. This reflects several developments within agriculture, including greater regulatory attention to soil protection, the emergence of environmental land management schemes, and the growing importance of natural capital markets such as carbon and biodiversity.

17.1.2. Recent national policy has increasingly emphasised land as a precious and finite natural asset. The Government's Land Use Framework for England highlights the need for land to deliver multiple outcomes simultaneously, including food production, climate mitigation, biodiversity recovery and water management. [141] In practice, many of these outcomes depend heavily on soil condition and soil management practices. Agricultural tenancy agreements are therefore increasingly required to accommodate land management approaches that influence soil health, environmental delivery and natural capital outcomes alongside agricultural production.

17.1.3. While a number of model agreements now exist — including the CAAV's precedent and the "environmental FBT" template developed by The Crown Estate and Burgess Salmon and the Duchy of Cornwall's "regenerative FBT" — the effectiveness of soil-related provisions depend less on the template used and more on the clarity of the underlying drafting principles.

17.1.4. For valuers and rural advisers, the objective is not simply to encourage good soil management, but to ensure that soil condition can be evidenced and attributed correctly if disputes arise. Without this evidential framework, soil provisions may increase uncertainty, and therefore disputes, rather than reduce it.

17.1.5. Several areas are particularly important when drafting tenancy agreements where soil health may become relevant to valuation, rent reviews or end-of-tenancy claims.

17.2. Agree the Shared Objectives

17.2.2. Where soil condition and environmental outcomes are likely to become relevant during the tenancy, it is important that the parties establish clear shared objectives for the management of the holding at the outset. This sets the tone when drafting the agreement.

17.2.3. Long-term Farm Business Tenancy guidance published by the Farm Tenancy Forum encourages landlords and tenants to consider the wider management vision for the holding and to record agreed objectives within a management plan accompanying the tenancy agreement. [169]

17.2.4. Such objectives may include matters such as:

- maintaining or improving soil health
- sustaining or increasing productive capacity of the land
- participation in environmental land management schemes
- habitat creation or landscape management
- diversification or natural capital opportunities
- opportunities for agricultural stacked enterprises

17.2.5. Establishing these objectives does not necessarily require highly prescriptive management obligations. Rather, the objective is to ensure that both parties understand the intended direction of management for the holding.

17.2.6. In practice, a clear statement of shared objectives can reduce the risk of misalignment and therefore disputes by providing context when interpreting soil management provisions, environmental commitments or rent review assumptions.

17.3. Tenancy Duration

17.3.2. The duration of the tenancy can have a significant influence on soil management decisions.

17.3.3. Many soil improvement practices operate over relatively long timeframes. Increases in soil organic matter, improvements in soil structure, restoration of drainage systems and the adoption of regenerative cultivation systems may all require several years before measurable benefits are realised and initial investments recovered.

17.3.4. Guidance on long-term Farm Business Tenancies from the Farm Tenancy Forum notes that longer tenancies can provide the security necessary for tenants to implement long-term farming plans and invest in sustainable land management systems.[169]

17.3.5. Shorter tenancies may discourage investment in practices where the costs are incurred early but the benefits arise over a longer period. This can include soil improvement measures such as organic matter building, drainage repair or structural remediation.

17.3.6. From a valuation perspective, the length of the tenancy may therefore influence both the incentive and the ability of the tenant to undertake soil improvement works whose benefits extend beyond the immediate cropping cycle. By the parties aligning on their objectives, a sensible term can be applied thus optimising outcomes for both the land and the parties involved.

17.4. Soil Baselines and Entry Evidence

17.4.2. A clear baseline record of soil condition at the commencement of the tenancy provides the most reliable foundation for evidencing soil change over time.

17.4.3. The increasing importance of baseline environmental information is also reflected in wider land policy. The Land Use Framework for England highlights the need for improved soil and land data to support evidence-based land management and decision-making across the rural economy.[141] Therefore, within tenancy agreements, the establishment of a baseline soil record therefore aligns with this broader movement towards improved land data and monitoring.

17.4.4. Historically, many tenancy agreements relied solely on general records of condition describing visible matters such as drainage, cropping or field boundaries. While such records remain useful, they may be insufficient where soil condition itself becomes relevant to valuation or dispute resolution.

17.4.5. Modern practice increasingly includes baseline soil sampling at the commencement of the tenancy. Baseline sampling may include:

- pH
- phosphorus, potassium and magnesium indices
- soil organic matter or soil organic carbon
- soil texture or classification
- visual observations, looking at structure and compaction
- drainage condition.

17.4.6. Sampling locations should ideally be GPS-referenced and repeatable, allowing meaningful comparison with later tests undertaken during the tenancy or at termination.

17.4.7. The purpose of the baseline is not to produce a detailed agronomic report but to establish a defensible starting point from which future changes in soil condition can be assessed.

17.4.8. Without baseline evidence, it may be extremely difficult to distinguish between:

- inherent soil characteristics of the holding; and
- changes resulting from the tenant's management or external factors such as weather.

17.4.9. In practice, the absence of such baseline evidence is a key reason why a soil-related claim might fail in arbitration.

17.4.10. Whilst baseline evidence is helpful, parties may also decide to apply interim record of conditions as to ensure the trajectory of the farm's objectives is on track. This may align with the provisions of the Farming Rules for Water or, for example, the SFI soil management actions which require soil carbon to be assessed periodically.

17.5. Soil Management Provisions

17.5.2. Some modern tenancy agreements include soil management plans or stewardship clauses covering matters such as:

- crop rotations
- cultivation systems
- cover cropping
- grazing management
- organic matter management

17.5.3. Such provisions may be motivated by several factors, including environmental policy requirements, supply-chain standards or the landowner's desire to protect long-term soil productivity.

17.5.4. However, from a professional perspective it is important that such provisions remain proportionate and practical.

17.5.5. Excessively prescriptive clauses may create difficulties where farming conditions change due to weather, market conditions or regulatory requirements. A clause requiring a particular cultivation method or crop rotation may become impractical or uneconomic over time.

17.5.6. In practice, advisers may favour outcome-based provisions rather than rigid operational prescriptions. For example, agreements may refer to maintaining soil fertility, avoiding erosion or complying with recognised good agricultural practice.

17.5.7. Where a landowner seeks to be heavily involved in the management of the holding, advisors may wish to recommend another structure such as a Contract Farming Agreement which by virtue of its structure provides for more involvement, both financially and operationally. As a consequence, risk is shared.

17.5.8. Where soil management plans are included, they should also be consistent with relevant regulatory frameworks such as the Farming Rules for Water, nutrient management regulations and cross-compliance requirements.

17.6. Nutrient and Lime Management

17.6.2. Soil fertility management is another area where clarity in tenancy drafting can reduce ambiguity and dispute risk.

17.6.3. Many agreements include provisions relating to:

- soil testing intervals
- nutrient management
- liming policies
- record keeping and data sharing requirements.

17.6.4. Soil testing intervals of three to five years are more commonly adopted within tenancy agreements and reflect standard agronomic practice.[75]

17.6.5. Responsibility for maintaining soil pH is often addressed explicitly, particularly in longer tenancies where declining pH can materially affect nutrient availability and therefore productive capacity.

17.6.6. Another emerging concept is that of maintaining a "nutrient balance sheet" with a requirement that tenants (particularly if farming livestock) manage nutrient loads over the whole farm, preventing repeated applications on the more convenient fields whilst ignoring other parcels (often further away). Whilst this has much merit, the question of practicality and measurability must be considered.

17.6.7. Maintaining records of fertiliser applications, lime spreading and nutrient analyses can provide valuable evidence where soil condition becomes relevant to valuation or end-of-tenancy claims.

17.6.8. Such records also assist in distinguishing between normal husbandry operations and actions that may constitute tenant's improvements.

17.7. Drainage and Water Management

17.7.2. Drainage refers to both surface drainage, such as ditches, and subsurface drainage otherwise known as “underdrainage”. Collectively, this is the system by which excess water is removed from agricultural land to increase productivity.

17.7.3. Drainage condition is often one of the most significant physical factors influencing soil workability and crop performance, particularly on heavy land. As a result, clarity regarding drainage maintenance responsibilities is an important aspect of tenancy drafting.

17.7.4. Responsibility for drainage maintenance may be allocated by reference to the Model Clauses (England) Regulations 2015, which establish standard obligations between landlord and tenant. Or, a bespoke provision may be agreed.

17.7.5. In practice, disputes often arise not because drainage has failed completely but because routine maintenance — such as clearing ditches, maintaining outfalls or repairing minor defects — has not been undertaken.

17.7.6. Maintaining practical records of drainage maintenance can therefore be useful. These may include:

- contractor reports
- photographs of outfalls or drainage works
- maintenance logs
- annotations on drainage maps

17.7.7. Where significant drainage infrastructure exists, the tenancy agreement may also benefit from including drainage plans or asset registers to ensure both parties understand the location and responsibility for key infrastructure.

17.8. Environmental Schemes and Natural Capital

17.8.2. Environmental land management schemes and emerging natural capital markets are increasingly linked to soil condition. Carbon sequestration, biodiversity improvements and water quality measures often depend upon soil management practices.

17.8.3. Policy developments increasingly anticipate that farm businesses may generate multiple income streams from the same land. Alongside agricultural production, land may support income derived from environmental land management schemes, biodiversity net gain, carbon markets or other ecosystem service payments. [141]

17.8.4. Many of these opportunities depend directly upon soil management practices. For example, soil carbon sequestration, reduced nutrient loss and improved soil structure may form part of the eligibility requirements for certain environmental or natural capital schemes.

17.8.5. Tenancy agreements therefore increasingly need to address participation in such schemes. Key drafting considerations include:

- whether the landlord or tenant may enter environmental schemes;
- how scheme payments are allocated between the parties;
- responsibility for compliance with scheme rules;
- allocation of risk where scheme breaches occur;
- ownership of environmental data;
- treatment of carbon credits or biodiversity units.

17.8.6. Where schemes involve multi-year commitments extending beyond the tenancy term, careful consideration should be given to exit arrangements.

17.8.7. For example, a tenant may undertake soil management practices that generate carbon credits over a defined period. If the tenancy ends before the scheme term concludes, the agreement should clarify how obligations and benefits are transferred. Additionally, the outgoing tenant may seek indemnity from the landlord.

17.8.8. Failure to address these issues at the outset may create significant uncertainty for both landlord and tenant.

17.9. Interaction with Rent Reviews

17.9.2. Where tenancy agreements incorporate soil stewardship provisions or environmental obligations, it is also important to consider how these provisions interact with rent review assumptions.

17.9.3. For example, if a tenancy requires the tenant to adopt specific soil management practices that restrict cropping flexibility, these obligations may influence the productive capacity of the holding and therefore the open market rent.

17.9.4. Conversely, if environmental payments or carbon revenues are generated through tenant actions, it may be necessary to clarify whether such income is to be treated as part of the holding's earning capacity or as a benefit arising from tenant investment.

17.9.5. In many cases, to avoid additional complexity, a "sharing mechanism" to handle additional income streams may be agreed outside of rent review provisions.

17.9.6. Clear drafting can reduce the risk of disputes arising during rent reviews.

18.1 Monitoring and Enforcing

18.1.2. The following section builds upon the previous section and discusses how modern tenancies may practically be monitored for compliance and, where they exist, breaches enforced.

18.2. Monitoring

18.2.2. Soil-related clauses within tenancy agreements are only effective if they can be monitored and enforced in a proportionate and practical manner.

18.2.3. In practice, soil condition is inherently variable and influenced by a range of factors including weather, cropping patterns and soil type. Monitoring systems therefore need to balance the desire for evidence with the need to avoid excessive administrative burden.

18.2.4. The collection and use of land management data is likely to increase in importance as agricultural policy and environmental/nature markets continue to develop. National land policy for England places increasing emphasis on improved land data, mapping and monitoring to support land use decisions and environmental outcomes. [141] In this context, maintaining clear records of soil condition and land management actions within a tenancy may assist both parties in demonstrating compliance with regulatory requirements or environmental scheme obligations.

18.2.5. Several practical monitoring mechanisms may be used, including:

- maintaining a shared evidence pack containing baseline and exit tests, nutrient records, drainage maintenance logs and photographs;
- requiring periodic summaries of soil management actions and observations from the tenant or their adviser;
- adopting outcome-based triggers where soil indicators fall outside agreed ranges;
- establishing staged notice procedures leading, where necessary, to expert determination or arbitration.

18.2.6. Monitoring arrangements should remain proportionate. Excessively complex monitoring systems may increase cost and dispute risk without necessarily improving outcomes.

18.3. Enforcement and Remediation

18.3.2. Where issues arise, remediation may often be preferable to immediate financial claims. Targeted remedial measures — such as subsoiling specific layers, reinstating drains or restoring ground cover — may restore soil condition more effectively than purely monetary remedies.

18.3.3. For example, targeted remedial measures such as:

- subsoiling compacted areas
- reinstating blocked drains
- restoring ground cover
- addressing erosion pathways
- increasing soil carbon through compost / manure applications
- liming to correct soil pH

may restore soil condition more effectively than pursuing compensation claims, particularly when there is a term remaining for the tenancy.

18.3.4. In practice, it may be helpful for tenancy agreements to incorporate staged procedures allowing concerns to be raised and remedial actions agreed before disputes escalate.

18.3.5. The objective of soil-related provisions should therefore be to provide sufficient evidence to support fair attribution of soil condition, rather than to impose rigid management systems that may prove impractical over time.

18.3.6. Where remediation cannot be agreed, tenancy agreements should provide for proportionate and appropriate dispute resolution. Consideration may be given to staged approaches, including initial negotiation or mediation, followed by referral to expert determination for lower value or technical soil matters, and arbitration where issues of liability or value arise. In line with RICS guidance on expert determination, any provision should specify that the appointed individual has suitable expertise (for example in soil science or agronomy). In all cases, the effectiveness of dispute resolution will depend on the quality of the underlying evidence available to support the parties' positions.

Conclusions – Soil in Agricultural Tenancies

19.1 Agricultural tenancy legislation was largely developed at a time when land improvements were understood primarily in terms of identifiable works or inputs such as drainage or fertiliser application.

19.1.2. Modern soil-focused farming systems often improve soil condition gradually through management practices rather than discrete improvements. As a result, many soil health gains fall outside traditional statutory categories of compensation.

For valuers and rural advisers, three themes remain central:

- distinguishing inherent soil quality from tenant-created condition
- establishing credible baseline evidence

- determining whether improvements provide a transferable benefit to an incoming tenant.

Handled carefully, soil condition can form a legitimate component of tenancy valuation. Handled loosely, it risks misattribution of value and unnecessary dispute.

19.1.3. A further consideration is that many future changes in land use are likely to occur through changes in land management rather than through complete conversion of land to different uses. Rather, national land policy anticipates that improvements in soil management, farming systems and environmental delivery will play a central role in achieving these outcomes. [141]

19.1.4. As a result, the way in which soil condition is managed and evidenced within agricultural tenancies is likely to become increasingly relevant to both environmental outcomes and the long-term value of agricultural land and requires careful consideration by advisors and their respective parties.

Appendices

Definitions

Acidification – The process by which soil pH falls, often as a result of repeated nitrogen fertiliser use, leaching of base cations or other chemical changes, potentially reducing nutrient availability and altering soil biology.

Additionality – A measurable environmental benefit beyond the established baseline that would not have occurred in the absence of the relevant intervention, management change or scheme, taking account of existing legal obligations and normal practice.

Aggregation – The arrangement of soil particles into aggregates or clods, forming part of soil structure and influencing porosity, water movement, root development and resistance to erosion.

Agroecology – A whole-farm and food-system approach that applies ecological principles to agriculture while also considering social, economic and governance factors; it is commonly described as a science, a set of practices and a social movement.

Agroforestry – The integration of trees or shrubs with crops and/or livestock within the same land management system, with potential benefits for shelter, biodiversity, soil structure, carbon storage and enterprise diversity.

Amino sugar testing – A laboratory method used to estimate part of the organic nitrogen pool by measuring amino sugars derived from microbial cell walls, which may indicate microbial turnover and potential nitrogen mineralisation over time.

Anaerobic conditions – Soil conditions in which oxygen is limited or absent, typically occurring under waterlogged or compacted conditions and affecting root function, microbial activity and nutrient cycling.

Baselining – The establishment of an agreed starting point for soil condition, against which future changes can be measured, attributed and, where relevant, valued.

Biodynamic farming – A form of organic farming based on whole-farm management, composting, closed nutrient cycles and the use of specific biodynamic preparations, alongside a broader philosophical view of the farm as a living organism.

Biofertiliser – A product containing beneficial microorganisms, such as nitrogen-fixing bacteria, phosphate-solubilising bacteria or mycorrhizal fungi, applied to improve nutrient availability or uptake rather than simply adding nutrients directly.

Biological farming – A farming philosophy that seeks to balance the chemical, physical and biological condition of soil, often using organic amendments, cover crops, reduced chemical dependency and biology-focused soil management.

Biosolids – Organic materials derived from the treatment of sewage sludge that may be applied to land as soil improvers or nutrient sources, subject to regulatory controls, assurance requirements and emerging contaminant considerations.

Biostimulant – A substance or microorganism applied to plants, seed or soil to stimulate natural plant nutrition processes, with the aim of improving nutrient use efficiency, tolerance to abiotic stress, crop quality or nutrient availability in the rhizosphere, independently of its nutrient content.

Brix meter – An instrument used to measure dissolved solids in plant sap, commonly used as an indicator of plant sugar content and, indirectly, plant metabolic activity; it should not be treated as a standalone measure of soil health.

Broad spectrum soil test – A laboratory testing package that assesses a wider range of physical, chemical and/or biological indicators than standard nutrient testing, although the precise scope varies between laboratories.

Bulk density – The mass of dry soil within a given volume, reflecting the relationship between soil particles and pore space and commonly used as an indicator of compaction.

C:N ratio – The ratio of carbon to nitrogen in soil organic matter or organic materials, influencing decomposition rate and whether nitrogen is released for plant use or temporarily immobilised by soil microbes.

Cation Exchange Capacity (CEC) – The ability of soil to hold and exchange positively charged ions, influencing nutrient retention, nutrient availability and soil fertility.

Clay – The finest mineral particle fraction in soil, with a high surface area and generally high capacity to hold water and nutrients, strongly influencing workability, structure and cation exchange capacity.

Compaction – The compression of soil that reduces pore space, restricting root growth, water infiltration, drainage, aeration and biological activity.

Composting – The controlled biological decomposition of organic materials into a more stable product that can be applied to land to add organic matter, nutrients and biological activity.

Conservation agriculture – A farming system based on three linked principles: minimum mechanical soil disturbance, permanent soil cover and diversification of crop species through rotations or associations.

Controlled Traffic Farming (CTF) – A farming system in which machinery is confined to permanent traffic lanes to minimise the area of soil affected by compaction and protect soil structure.

Cover crop – A crop grown primarily to protect and improve soil rather than for harvest, contributing to soil cover, organic matter, rooting, nutrient management and erosion control.

Denitrification – A microbial process, usually occurring under low-oxygen or waterlogged conditions, in which nitrate is converted into gaseous forms of nitrogen, including nitrous oxide and nitrogen gas.

Direct drilling – Establishing a crop by placing seed directly into untilled soil or crop residues with minimal soil disturbance, usually using specialist drilling equipment; it is an establishment method rather than a complete farming system.

Drought – A prolonged period of insufficient water availability that restricts plant growth, soil biological activity and nutrient movement, with impacts often worsened where soil structure or organic matter levels are poor.

Ecosystem services – The benefits provided by natural capital assets to people, businesses and the wider economy, including food production, water regulation, carbon storage, biodiversity support and recreation.

Eight forms of capital – A systems-thinking framework that recognises value across financial, living, material, intellectual, experiential, social, cultural and spiritual capital, rather than treating financial value as the only measure of system health.

Environmental markets – Markets through which environmental outcomes, such as carbon storage, biodiversity gain, nutrient reduction, flood mitigation or water quality improvement, are measured, verified and paid for by public or private buyers; increasingly referred to as nature markets.

Erosion – The loss or movement of soil particles by water, wind or cultivation, which can reduce soil depth, fertility, organic matter and productive capacity.

Farming Rules for Water – The regulatory rules in England aimed at reducing agricultural diffuse pollution by requiring land managers to plan nutrient applications, avoid runoff and erosion, and take account of recent soil test results when applying organic manures or manufactured fertilisers.

Food security – The condition in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Green Book – HM Treasury guidance for appraising policies, programmes and projects, including assessment of costs, benefits and risks and, where relevant, environmental and natural capital impacts.

Green manure – A crop grown and incorporated into the soil to add organic matter, release nutrients and improve soil structure.

Holistic Management – A decision-making framework, associated with Allan Savory, that considers ecological, financial and social outcomes together and is often applied to grazing and wider farm system management.

Humus – Relatively stable, well-decomposed organic matter within soil that contributes to nutrient retention, aggregation, biological activity and water-holding capacity.

Infiltration – The rate at which water enters the soil surface, influenced by soil structure, surface condition, compaction, vegetation cover and organic matter.

Inoculants – Products containing selected microorganisms applied to seed, soil, compost or plants with the intention of introducing or increasing beneficial biological activity.

Integrated Pest Management (IPM) – A whole-farm approach to managing pests, weeds and diseases by combining cultural, biological, physical and chemical controls so that pesticide use is targeted, economically justified and environmentally proportionate.

Mineral weathering – The physical and chemical breakdown of rocks and soil minerals, releasing particles and nutrients that contribute to soil formation and fertility over time.

Mole drainage – A secondary drainage technique in which unlined channels are pulled through suitable clay subsoils to improve water movement towards underdrains and reduce waterlogging.

Mulch – A layer of organic or inorganic material placed on the soil surface to reduce moisture loss, moderate temperature, protect against erosion and, where organic, contribute to biological activity as it breaks down.

Mycorrhizal fungi – Beneficial fungi that form symbiotic relationships with plant roots, extending the effective root system and assisting with nutrient and water uptake, particularly phosphorus, in exchange for plant-derived carbon.

Natural capital – The stock of natural assets, including soil, water, air, geology and living systems, from which flows of ecosystem services are generated over time, with soil forming a core asset in agricultural land use.

Nitrate Vulnerable Zone (NVZ) – An area designated as being at risk from agricultural nitrate pollution, where additional rules apply to the storage, timing and application of nitrogen fertilisers and organic manures.

Nitrification – The microbial conversion of ammonium into nitrate, making nitrogen more mobile in the soil and more readily available to plants, but also more vulnerable to leaching or denitrification.

No-dig – A cultivation approach, common in horticulture and market gardening, where soil is not dug or inverted and fertility is maintained through surface applications of compost, mulch or organic matter.

No-till – A cultivation system in which crops are established with minimal disturbance of the soil, preserving soil structure, biological continuity, surface residues and organic matter.

Non-inversion tillage – Cultivation that loosens or mixes soil without fully turning it over, often used to relieve compaction or prepare seedbeds while retaining more soil structure than ploughing.

Nutrient cycling – The movement and transformation of nutrients through soil, plants, microorganisms and organic matter, enabling nutrients to remain available for plant growth and be retained within the farming system.

Organic farming – A regulated farming system that restricts the use of synthetic fertilisers, pesticides and genetically modified organisms, relying instead on rotations, legumes, organic amendments and ecological processes to maintain fertility and productivity.

Organic matter (OM) – The living and once-living material within or added to soil, including roots, organisms, crop residues, manures, composts and more decomposed organic fractions, which supports nutrient retention, aggregation, water-holding capacity and biological activity.

Penetrometer – A tool used to measure the resistance of soil to penetration, commonly used to identify compaction layers and plough pans.

PFAS – Per- and polyfluoroalkyl substances, a large group of persistent man-made chemicals often called “forever chemicals”, which are of increasing concern in soils, water, biosolids and environmental regulation.

Plant sap analysis – A diagnostic method that analyses nutrients and dissolved compounds within plant sap to assess crop nutrient status and current plant metabolic performance.

Plough pan – A compacted layer formed beneath the cultivated horizon by repeated tillage at a similar depth, restricting drainage, aeration and root penetration.

Public good – A benefit that is generally non-excludable and non-rival, meaning people cannot easily be excluded from it and one person's use does not materially reduce availability to others; soil-related examples may include flood mitigation, carbon storage and improved water quality.

RB209 – AHDB's Nutrient Management Guide, used in the UK to support nutrient planning, fertiliser recommendations, manure management and interpretation of soil pH, phosphorus, potassium and magnesium status.

Reduced tillage – An umbrella term for cultivation approaches that reduce the intensity, depth or frequency of soil disturbance compared with conventional ploughing, including non-inversion tillage, strip tillage and some direct drilling systems.

Refractometer – Otherwise known as a Brix meter, this is an instrument used to measure dissolved solids in plant sap, commonly used as an indicator of plant sugar content and, indirectly, plant metabolic activity.

Regenerative farming – An outcome-focused farming philosophy aimed at improving soil function, biodiversity, water cycling, resilience and wider ecosystem performance, usually through reduced disturbance, soil cover, living roots, diversity and livestock integration where appropriate.

Resilience – The ability of a soil, farm business or wider land system to absorb shocks, such as drought, flooding, input price volatility or regulatory change, while continuing to function and adapt.

Rhizosphere – The narrow zone of soil around plant roots that is influenced by root exudates and root-associated microorganisms, and where many important nutrient cycling and plant–microbe interactions occur.

Rotational grazing – A livestock grazing system in which animals are moved between paddocks or grazing areas, allowing grazed areas to rest and recover before being grazed again.

Runoff – Water that flows over the soil surface when rainfall or irrigation exceeds the soil's infiltration capacity or when soil structure, compaction or slope prevents water entering the soil.

Sand – The largest of the three main soil mineral particle fractions, giving soils relatively free drainage and workability but usually lower nutrient and water-holding capacity than clay-rich soils.

Silt – A fine soil mineral particle fraction, intermediate between sand and clay, which can contribute to fertility and water retention but may be vulnerable to capping, slumping and erosion if poorly structured.

Social Licence to Operate – The informal acceptance or approval granted by customers, communities, regulators and wider society to a business or sector, based on trust that it is operating responsibly and legitimately.

Soil biology – The living component of soil, including microorganisms, fungi, earthworms and other organisms that drive decomposition, nutrient cycling and soil structure formation.

Soil classification – The categorisation of soils according to their physical, chemical and formation characteristics, such as texture, drainage, parent material and profile features, to support land use, management and valuation decisions.

Soil deposition – The accumulation of eroded soil particles in a new location, often at the bottom of slopes, in gateways, ditches, watercourses or lower-lying parts of a field.

Soil health – The condition of a soil relative to its potential to function as a vital living system for a specified service or land use.

Soil organic carbon (SOC) – The carbon component of soil organic matter, representing carbon stored within plant, animal and microbial residues at different stages of decomposition.

Soil pH – A measure of the acidity or alkalinity of soil, influencing nutrient availability, microbial activity, crop growth and the need for lime or other amendments.

Soil quality – The inherent potential for a soil to support a specified service or land use, reflecting characteristics such as texture, depth, drainage, parent material and climate.

Soil structure – The arrangement of soil particles into aggregates or clods, influencing porosity, root development, drainage, aeration and water-holding capacity.

Soil texture – The relative proportions of sand, silt and clay particles within a soil.

Strip till – A cultivation system in which only narrow strips of soil are disturbed for seed placement, while the inter-row area remains undisturbed and usually protected by residues.

Surface capping – The formation of a dense crust at the soil surface caused by raindrop impact, dispersion or fine particle sealing, which restricts infiltration and seedling emergence.

Systems Thinking – An approach that considers how the components of a farm or land system interact, rather than treating soils, crops, livestock, water, labour, finance and regulation as separate issues.

Topsoil – The upper layer of soil, generally containing the highest concentration of organic matter, roots, biological activity and available nutrients, and therefore critical to agricultural productivity.

Total Nutrient Content (TNC) – A measure of the total or near-total nutrient content reported by a laboratory method, including reserve and non-readily available fractions, rather than only the immediately plant-available nutrient pool.

Transferability – The extent to which a soil improvement, residual fertility benefit or associated income stream is capable of passing with the land or tenancy to a successor occupier.

Underdrainage – A permanent drainage system, typically consisting of buried pipes or historic tile drains, installed to remove excess water from the soil profile.

Value - The benefit, worth or significance of an asset, condition or outcome to a particular party for a particular purpose. In this paper, value is considered beyond financial price alone and may include the 8 Forms of Capital: financial, living, material, intellectual, experiential, social, cultural and spiritual capital. Soil health is primarily an element of living capital, but may also influence financial performance, resilience, risk, marketability, stewardship and public benefit. In formal valuation contexts, value should be interpreted by reference to the relevant basis of value.

VESS – Visual Evaluation of Soil Structure; a field-based method of assessing soil structure by examining soil aggregates, porosity, rooting and compaction through direct visual inspection.

Waterlogging – The condition in which soil becomes saturated with water, restricting oxygen availability, root function, nutrient cycling and biological activity.

Further Reading & Resources

The following resources may assist readers who wish to explore soil health further, particularly in the context of rural professionals. They are not intended to replace specialist agronomic, legal or valuation advice, but provide useful starting points for professionals seeking to understand soil health, soil management, natural capital opportunities and tenancy implications.

1. Introductory reading

Matt Powers – *Regenerative Soil: The Science and Solutions*
A highly accessible and practical book explaining soil as a living system, with particular emphasis on soil biology, organic matter, minerals, water, plant health and regenerative management. It is especially useful for readers who want a systems-based introduction to soil health rather than a purely academic soil science text. The book is used throughout this paper as a practical reference for explaining soil components, soil function, plant health testing and regenerative soil management.
Regenerative Soil - 2nd Edition 2025 UPDATED VERSION: The Science and Solutions - HARDCOVER + SIGNED — The Permaculture Student

2. Soil mapping, desk study and data sources

LandIS Portal / National Soil Map
A key practical resource for desk-based soil information in England and Wales, including soil type, drainage, texture and related soil characteristics.
https://portal.landis.org.uk/

Predictive Agricultural Land Classification Map for England
Relevant to strategic land-use, planning and rural valuation work, particularly where Agricultural Land Classification is material.
https://environment.data.gov.uk/dataset/a817d96f-271d-487b-89ad-48d271f931aa

UK Soil Observatory
A useful map-based portal bringing together soil datasets from several UK research bodies.
https://mapapps2.bgs.ac.uk/ukso/home.html

SoilGrids – ISRIC
A global soil information platform providing predicted soil properties such as texture, carbon, nitrogen and cation exchange capacity.
https://soilgrids.org

The Land App
A practical UK digital mapping platform for farmers, land managers and advisers. It can be used to map holdings, prepare plans, collate land-use and environmental information, and support habitat baselining, environmental scheme planning and natural capital discussions. It is particularly useful as a way of bringing soil, drainage, flood-risk, environmental

designation and scheme-opportunity data into one visual evidence pack. However, it should be treated as a mapping and collation tool rather than conclusive evidence of soil condition; material issues should still be verified through field inspection, soil testing or specialist advice.
https://thelandapp.com/

3. Practical soil assessment and monitoring

AHDB Soil Health Scorecard
A practical framework for combining visual soil assessment, earthworm counts, pH, nutrients and organic matter into a repeatable monitoring approach.
https://ahdb.org.uk/knowledge-library/the-soil-health-scorecard

AHDB – Think Soils
Practical guidance on identifying erosion, compaction, runoff and other visible soil risks.
https://ahdb.org.uk/thinksoils

AHDB – How to assess soil structure
Useful for Visual Evaluation of Soil Structure and field-based soil assessment.
https://ahdb.org.uk/knowledge-library/how-to-assess-soil-structure

AHDB – Soil and forage testing companies
A useful directory for locating laboratories and testing providers.
https://ahdb.org.uk/knowledge-library/soil-and-forage-testing-companies

4. Soil management and improvement

AHDB Nutrient Management Guide – RB209
Essential practical guidance for nutrient planning, pH, phosphorus, potassium, magnesium, organic manures and fertiliser use.
https://ahdb.org.uk/nutrient-management-guide-rb209

AHDB – Field drainage guidance
A practical starting point for understanding the role of drainage in soil workability, trafficability and waterlogging risk.
https://ahdb.org.uk/drainage

AHDB – Soil health and water supply
Useful for understanding the relationship between soil structure, pore space, water availability and crop performance.
https://ahdb.org.uk/knowledge-library/soil-health-and-water-supply

AHDB – Water regulations for farmers
Relevant to runoff, erosion, nutrient planning and regulatory compliance.
https://ahdb.org.uk/knowledge-library/water-regulations-for-farmers

5. Farming systems, philosophies and certifications

Organic products: approved UK control bodies – GOV.UK
Useful for identifying the UK bodies that certify organic production.
https://www.gov.uk/guidance/organic-food-uk-approved-control-bodies

Demeter Certification
Relevant for readers considering biodynamic certification.
https://demeter.net/certification/

regenagri
A regenerative agriculture certification scheme referred to in this paper.
https://regenagri.org/

Pasture for Life
Relevant to pasture-fed livestock systems and associated certification.
https://pastureforlife.org

Savory Institute – Ecological Outcome Verification
An outcome-based verification framework for regenerative land management.
https://savory-institute.gitbook.io/eov-manual-public

3LM
A UK Savory Institute hub supporting Holistic Management and Ecological Outcome Verification.
3LM | Holistic Management for Farmers

FAO – Ten Elements of Agroecology
Useful for understanding agroecology as a broader food-system and governance approach, rather than simply a set of farm practices.
https://www.fao.org/agroecology/overview/overview10elements/en/

6. Natural capital, carbon and public value

RICS – Impact of carbon markets on the rural economy
Important professional guidance for valuers and rural advisers considering carbon markets, contractual commitments and valuation implications.
https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/land-standards/impact-carbon-markets-rural-economy-1st-edition-practice-information-uk

Defra – Enabling a Natural Capital Approach
Useful for understanding how natural capital is considered in public policy appraisal and decision-making.
https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca

HM Treasury – The Green Book
Important for understanding public-sector appraisal, including long-term environmental impacts and natural capital considerations.

https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government

7. Regulation, policy and water protection

Farming Rules for Water – GOV.UK
Key regulatory guidance for nutrient applications, soil testing, runoff and diffuse pollution risk.
https://www.gov.uk/government/publications/applying-the-farming-rules-for-water/applying-the-farming-rules-for-water

The Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018
The underlying regulations commonly referred to as the Farming Rules for Water.
https://www.legislation.gov.uk/uksi/2018/151/made

8. Valuation, tenancy and professional practice

RICS Red Book
The starting point for valuation standards, basis of value and professional valuation discipline.
https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/valuation-standards/red-book

Agricultural Holdings Act 1986
Relevant to rent reviews, tenant's improvements, high farming, compensation and dilapidations under AHA tenancies.
https://www.legislation.gov.uk/ukpga/1986/5

Agricultural Tenancies Act 1995
Relevant to Farm Business Tenancies, improvements, rent reviews and end-of-tenancy issues.
https://www.legislation.gov.uk/ukpga/1995/8

Agriculture Act 1947 – Rules of Good Husbandry
Useful background for considering deterioration, good husbandry and soil-related dilapidations.
https://www.legislation.gov.uk/ukpga/Geo6/10-11/48/section/11

CAAV Publication No. 224 – *A Review of Tenant Right Valuation: A Preliminary Analysis*
Relevant to tenant right, write-downs, soil improvers, organic matter benefit and end-of-tenancy compensation.
https://www.caav.org.uk/resources/numbered-publications/no-224-a-review-of-tenant-right-valuation-a-preliminary-analysis

Guidance note on long-term Farm Business Tenancies in England
Useful for considering tenancy length, shared objectives, environmental management and long-term investment in soil condition.

https://www.rics.org/content/dam/ricsglobal/documents/standards/Long-term-farm-business-tenancies-in-England.pdf

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