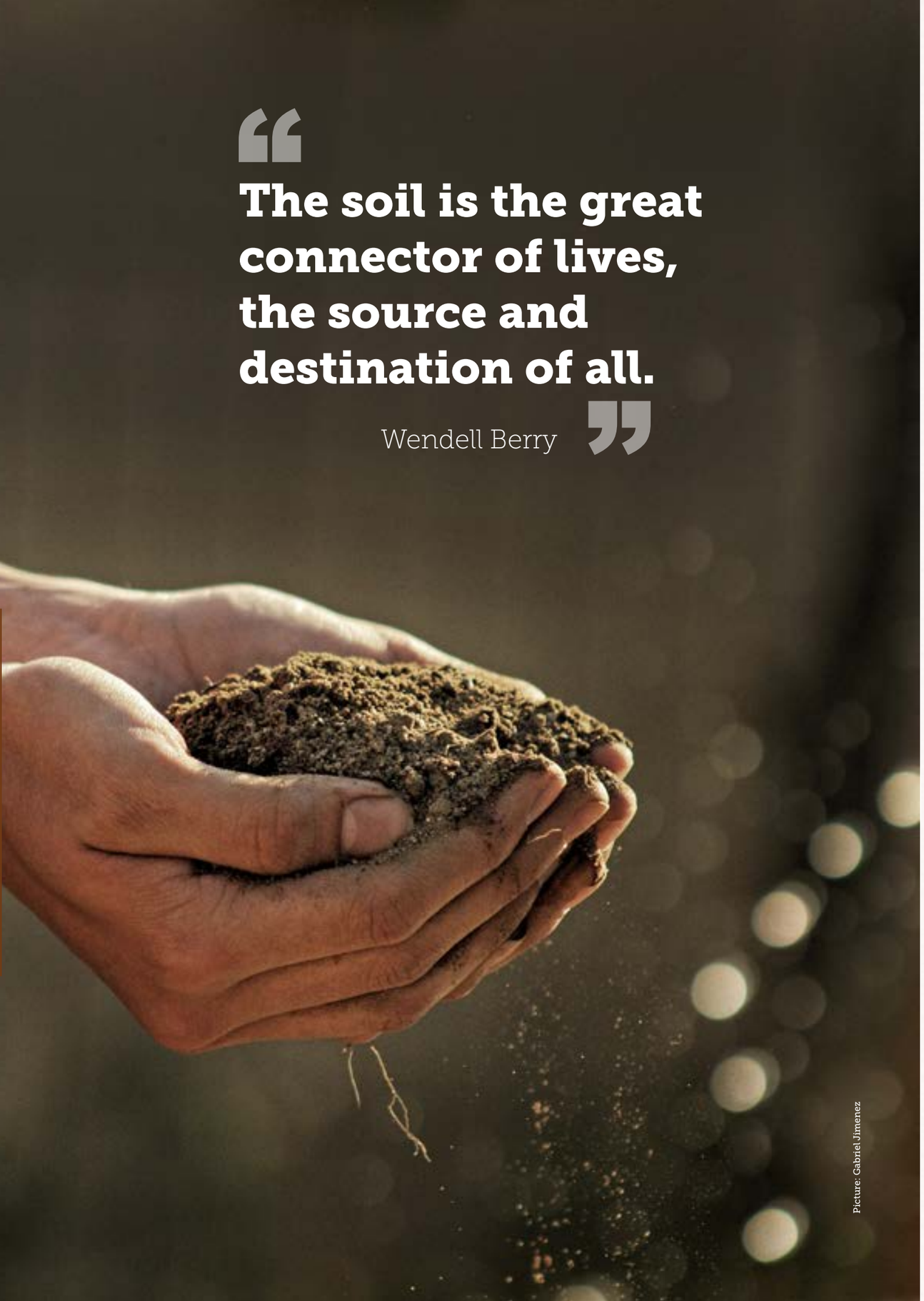
SAVING OUR SOILS

Healthy soils for our climate, nature and health



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INTRODUCTION

Our planet is called 'Earth' for good reason. Soil is one of our most important natural resources. It is the planet's skin, a rich and complex ecosystem that provides the life systems we all need to survive: oxygen, clean water and food. It is no exaggeration to say that civilisations rise and fall according to the health of the soils on which they are built.

Soils are also central to tackling the climate, nature and health emergencies; but for far too long they have been overlooked, unprotected and undermeasured. This means our understanding of the health of our soils is limited. However, what we do know is alarming. Soils are degraded and in decline.

From farmers to politicians, people are waking up to the fact that soil degradation is a problem across the UK. This report builds on Seven Ways to Save our Soils, which we published five years ago. It shines a spotlight on the current state of our soils and finds that action to reverse our soil crisis remains far too slow. It identifies where urgent intervention is needed to build on the growing awareness of the importance of soils, and the key actions that farmers and policy makers need to take to save our soils.

HEALTHY SOILS

Healthy soils act as a huge sponge, soaking up carbon and water. When degraded, they emit carbon and other greenhouse gases, and lose their ability to absorb water. Our continuing soil crisis therefore is a huge threat to our net zero emission targets, and our ability to cope with extreme weather caused by climate change. Biodiversity in soils is critical to providing food for declining wildlife and to tackling pests and diseases. And declining soil health threatens future food security, and therefore human health and wellbeing.

To achieve healthy soils, we need to focus on restoring multiple soil functions. This requires changes across the whole agricultural system. This report, Saving our Soils: healthy soils for climate, nature and health, sets out how we can do this.

POLICY ENABLERS

Soils are incredibly complex and variable, which makes them difficult to monitor and protect both at the farm level, and in setting government policy. Unlike for water and air, there is no single soil policy instrument, and policy remains complex and piecemeal. This complexity has resulted in inertia, or at best slow progress, despite growing interest in soil health.

FARM PIONEERS

Awareness is slowly increasing around the existence of our soil crisis and many farmers are leading the way to solving it. They are demonstrating that not only is it entirely possible to halt soil degradation but to reverse it through regenerative practices. Nonetheless, on the ground, action across UK agriculture remains slow and some broader trends are taking us in the opposite direction.

A RECIPE FOR SAVING OUR SOILS

Recovering and protecting our soils, and the life within them, is one of the best win-win solutions available at our fingertips. It is a key part in the puzzle to solving many of the major crises facing us today. Saving our Soils: healthy soils for climate, nature and health lays out what we need to do. We revisit the seven ways towards healthy soils that we identified five years ago – and the urgent progress that needs to be made on them, at the farm and policy levels. We also call for a single policy instrument for soils to set a clear vision and pathway to achieving this.

If there is one key take home message, it is that, together, the seven areas identified here help form a much-needed whole farm approach to soil health. This approach doesn't just deliver healthy soils, it delivers a healthy, sustainable farm system in the round. Simply put, restoring soil health requires a transition to agroecological farming systems, such as organic.

WHY DO WE NEED TO SAVE OUR SOILS?

"The nation that destroys its soil destroys itself"

Franklin D. Roosevelt

Soil health underpins our climate, our nature and our health. Healthy soils are critical to most, if not all our ecosystem services. When soils fail, civilisations fall.[1] Although there are still gaps in our understanding, we know that degrading our soils is costing us dear, and that we must reverse the trend. The evidence is mounting, and the urgency to save our soils is increasing, yet we have failed to act fast enough.

OUR CLIMATE

Without healthy soils, we can't tackle the climate crisis. The Earth's soils contain more than three times the amount of carbon in the atmosphere and four times the amount stored in all living plants and animals.[2]

Poor soil management degrades this store and releases the greenhouse gases carbon dioxide and nitrous oxide* into the atmosphere. Greenhouse gas emissions from **UK soils contribute to 21% of total UK agricultural emissions**.[3] Emissions linked to poor soil management practices more generally (such as from fertilisers) are even higher**.

* Nitrous oxide is a long-lived greenhouse gas that contributes to global warming. It stays in the atmosphere for an average of 114 years and is 300 times more potent than carbon dioxide. Reducing emissions is crucial if we are to mitigate the worst impacts of the climate crisis.

** Soils receive an excess of nitrogen, mainly from artificial fertilisers. The manufacturer of these fertilisers consumes 3-5% of all global natural gas. See our report Fixing Nitrogen for more.

Healthy soils would sequester carbon rather than release it. Although the exact potential of soil as a carbon sink is not fully understood, studies show agroecological systems, where soil health is central, store more carbon. For example, **organic farms store, on average, nearly 3.5 tonnes more soil carbon per hectare**,[4] and release less nitrous oxides, than conventional farms.[5]

Increasing soil organic matter (and carbon) allows us to better cope with extreme weather. Research from the U.S. confirms that healthier soils mean increased resilience to floods and droughts, and fewer floods in the first place [6, 7]. That is because healthy soils act as sponges. Farms that have improved health have seen dramatic improvements in water infiltration and storage.

OUR NATURE

Healthy living soils, full of abundant species, are critical to wildlife. Around **25% of biodiversity lives in our soils**,[8] and whilst they may be hidden to us, a huge number of insects and animals are directly dependent on them for their food. Hidden impacts to soil life therefore disrupt food webs and play a little-understood role in our biodiversity crisis.

Healthy soils can help to address the wider impacts of our wildlife crisis. Our living soils **reduce the need for pesticides** by ensuring competition and predation to keep pests and disease under control. The **biocontrol of disease**, for example, is seen in organic arable farming. Whilst non-organic arable farms use fungicides, often at a high frequency throughout a growing season[9], organic farms (with their focus on healthy soils) often use none and yet have fewer disease problems. [10]

Similarly, healthy soils **reduce the need for artificial fertilisers**. Many minerals and nutrients in soils are made available to plants via the populations of bacteria and fungi that are present in healthy, living soils. Perversely, artificial nitrogen applications switch these populations off [11] and tend to replace the organic matter inputs that would provide the necessary 'food' for soil life. Improving soil health thus both requires and enables reduced fertiliser applications. Nutrient pollution is no small problem either. It affects our **hedgerows, woodlands, rivers and oceans** and the plants and animals that live in them. Only 16% of rivers, lakes and seas in England are considered close to their natural state – largely as a result of nitrogen and phosphorous surplus.[12]

OUR HEALTH

The founders of the Soil Association understood that living soils support healthy ecosystems, which support healthy people.

The health of our soils affects how much food we can grow. **A review of soil farm studies globally found that 16% had soils so damaged that their food producing capability spanned less than 100 years.**[13] Lack of monitoring in the UK means the exact cost of industrial agriculture on future food supplies is unknown, but we do know that it has damaged soil fertility.

Soil management also **affects the nutritional quality of our food** by

affecting soil organisms that help plants take up key nutrients.[14] Drinking water is affected too. **Groundwater quality has been deteriorating in the UK, and the main cause is nutrients released from poor soil management and fertiliser applications.**[15] Measures to improve soil health reduces the high expense of drinking water treatment.

Growing a narrow diversity of crops has undermined human health and soil health. Restoring soil health requires crop diversification and this matches our need to diversify our diets. Currently, our diets are heavy in ultra-processed foods which are often derived from a handful of plant types (e.g. wheat, maize, rice and soya). The animal products we consume also ultimately derive from these same plants, which predominate in animal feed. On farms, this has led to monocultures and short rotations, requiring intensive practices (using chemical fertilisers and pesticides), which has damaged soils. In our diets, the consumption of more of these foods has coincided with a decline in pulses, nuts, fruits and vegetables (both in terms of quantity and variety) and a rise in malnutrition, obesity and other diet-related diseases.

Soil has saved countless lives as a source of new antibiotics for medical innovation. That is thanks to soil microbes, locked in a continuous antibiotic arms race in which they make these compounds to fight off pathogens. However, it can also be a source of resistant bacteria and fungal strains that cause drug resistant disease. **Applying fungicides**[16, 17] **and herbicides**[18] **to soils increases the presence of antibiotic resistant genes**, and may be playing a part in the rise of drug resistant diseases.

THE STATE OF UK SOILS

Soil health problems in the UK's 700+ soils vary across types, regions, geography and weather. No clear figure exists for the health of the UK's soils, but a 2020 review estimated that only 30-40% of Europe's soils are healthy.[19] From this and other studies, we can be confident that soil degradation is a huge problem across the UK, and that urgent action is needed.

AVERAGE ORGANIC MATTER LEVELS ARE DECLINING

Organic matter is critical to soil health, biodiversity, productivity and carbon storage. UK soils store an estimated 10 billion tonnes of carbon, dwarfing the 0.2 billion tonnes stored in UK vegetation. In 2013, **soil carbon loss was estimated to amount to 4% of UK greenhouse gas emissions, higher than for many industrial and energy sources combined.**[20] Losses are highest in peat soils, but arable soils too are of concern.[21, 22] Losses in arable soils have been caused by intensive tillage, high inputs of agrochemicals, replacement of plant or animal-based fertilisers with synthetic ones, and the introduction of new crops such as maize.

SOIL EROSION REMAINS A CRITICAL PROBLEM, THOUGH A NATIONAL PICTURE IS UNCLEAR

A 2020 review of studies found that 16% of arable farms had soil erosion so high that it was a threat to future food production. It should be noted that studies were biased to sites of known problems, so a national picture is unclear.[23] Increased maize growing is a major risk factor for erosion, being a late harvested crop. **A survey of over 3,000 maize growing sites in south-west England found that 75% of fields couldn't let rainwater in deeper than the upper soil layers, meaning heavy rainfall could wash the soil away.**[24] Sedimentation (linked to soil erosion on land) is a major problem in many rivers (for example, 5% of the counts for failed good status in English rivers).[25] The worst soil erosion, however, is on peat soils.

PEAT SOILS ARE WIDELY DAMAGED

Occupying around 12% of the UK land area, **around 80% of peat soils are in a damaged state.**[26] Upland peat soils are damaged from nitrogen deposition, overgrazing, drainage and burning. Lowland peat soils suffer rapid erosion from extraction and pump-drainage for cultivation. As peat soils dry out, the land also sinks. Future sea level rises, caused by the climate crisis, risk the inland flooding of many lowland

peat areas.[27] The most famous example of degradation is in the lowland Fens, where a third of England's fresh vegetables are grown.[28] Overall, many peat topsoils will disappear within decades unless they are rewetted so that peat formation can begin to build them up again. Otherwise, they remain major sources of emissions, rather than the carbon sinks they should be. One analysis suggests unless action is taken to rewet UK peat soils, peat emissions could cancel out all carbon emissions reductions through new and existed forests, **making net-zero emissions in the UK virtually impossible.**[29]

SOIL LIFE HAS SUFFERED

Unlike terrestrial and aquatic wildlife, our soil life has not been well monitored. However, we know that **many of the chemical actives applied to farm soils negatively affect soil microbial functions and biochemical processes, altering soil communities, both in terms of diversity and quantity.** [30, 31] When use of chemicals is combined with ploughing, reduced crop diversity, acidification from nitrogen applications and losses in organic matter (a key source of food), soil life is badly impacted. Research suggests that reduced soil life can affect crop growth, development and disease incidence, potentially resulting in a negative feedback loop leading to increased use of agrochemicals.[32] **One major cause for concern is the reduction in arbuscular mycorrhizal fungal diversity and biomass in UK arable soils.**[33] These are fungal networks associated with most crops that provide key benefits and are keystones within healthy soil communities.

EVIDENCE FROM ORGANIC FARMING

The terms agroecology and regenerative farming cover an umbrella of agricultural practices. Organic farming is perhaps the best known, legally defined example. Organic standards are designed to ensure that regenerating soil health is a key priority for a farmer.
For example, artificial fertilisers and pesticides are banned to help build natural fertility, nutrient recycling and plant health. This all requires healthy, living soils.

Evidence from hundreds of comparative studies has found organic farm soils (compared with non-organic):

- Release as much as 40% less nitrous oxide [36] (a potent greenhouse gas) per hectare
- Store more carbon, on average nearly 2 tonnes for every football pitch sized area,[37] and are 25% more effective at storing carbon long-term[38]
- Store up to twice as much water and perform better during drought[39, 40]
- Have a more diverse range of microbes living in the soil[41, 42]
- Organic crops are up to 60% higher in antioxidants than conventionally grown ones. This is potentially due to lower nitrogen and pesticide applications[43]

RESTORING SOIL HEALTH REQUIRES AN AGROECOLOGICAL TRANSITION

Our food system is unsustainable. We are experiencing high levels of pollution and greenhouse gas emissions (10% of UK greenhouse emissions and 30% of offshored consumption emissions)[34]; a biodiversity crisis in large part driven by our agriculture; farms that are financially vulnerable with rising costs and tighter profit margins; food poverty and inequality with cheap foods being the unhealthiest; and two thirds of UK adults overweight with reduced lifespan expectancies.

Degraded soils are a key characteristic of a broken food system. Soil is the beating heart of every farm. Almost every decision made in farm businesses, and therefore the wider food system, impact on the soil. As with the human heart, if we make decisions that ensure it remains healthy, the rest of the system runs smoothly. A healthy system leads to broader benefits for our climate, nature and health.

SO WHY DOES RESTORING SOIL HEALTH REQUIRE AN AGROECOLOGICAL TRANSITION?

Ecology is the study of relationships between plants, animals, people, and their environment – and the balance between them. **Agroecology** aims to move us towards a healthy agricultural system through application of these concepts and principles. The result is sustainable farming that aims to work with nature, not against it.

A key aim of agroecology is to meet the need for a shift towards a more **circular and diverse** system. However, this is something we have been moving away from in conventional agriculture. **Circularity** is the principle that everything should be recycled back into a healthy system for the sake of efficiency, low waste levels and therefore minimal pollution. **Diversity** is about enabling resilience and useful synergies, and is needed at multiple levels, from landscape to crops and biodiversity. To enable both requires an emphasis on the interrelatedness of farm systems. This means agroecology requires taking a step back, to look at the entire farm, or farm sector, using a **whole farm approach**. At its heart of this, is this focus on soil health. Indeed, this has led to another commonly used term, **regenerative agriculture.**

Agroecology can't pretend to have all the answers. But by working with nature, shifting towards a more diverse, circular model, and emphasising soil regeneration, it can get us in the right direction. The Ten Years for Agroecology model by IDDRI shows that a wholesale transition to agroecology can feed Europe's growing population a healthy diet, drastically reduce emissions, help restore biodiversity, and regenerate our soils.[35]

A KEY PART OF AN AGROECOLOGICAL TRANSITION IS FIXING THE CURRENT DISRUPTION TO OUR NITROGEN AND SOIL CARBON CYCLES

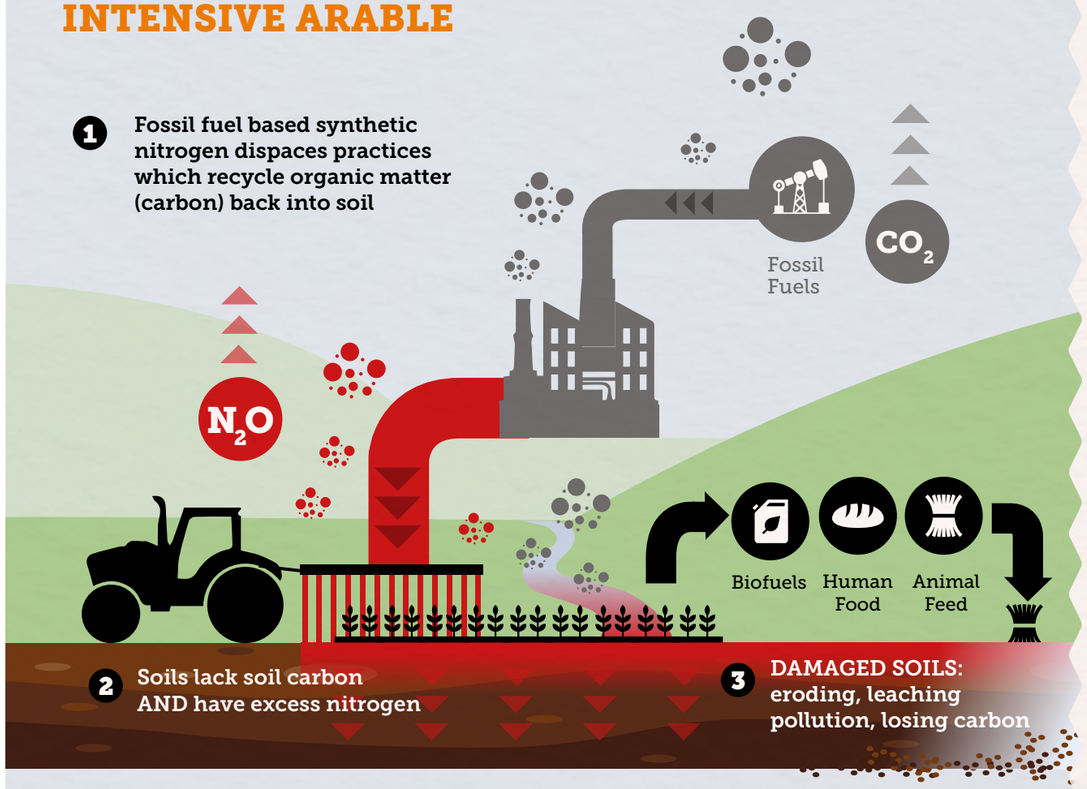
A drive for high yields and cheap food has resulted in specialisation which disrupts natural soil carbon and nitrogen cycles. Farms have moved away from being diverse and circular mixed systems. As a result, they have lost key parts of crop rotations that would have included legumes for building soil fertility, and livestock to graze and provide manure directly to the field.

Instead, livestock, no longer pasture fed in mixed systems, are reared in intensive units and fed on grain grown on arable only farms and soya imports from areas associated with deforestation and biodiversity loss. With such high stocking rates, these intensive livestock systems create far more concentrated manure and slurry than can be efficiently recycled back to the soil. This results in air and water pollution (including emissions of nitrous oxide, methane and carbon dioxide), due to inadequate storage and the overapplication of nutrients on land. Arable farmers on the other hand, suffer soil degradation due to the reliance on fossil fuel based synthetic fertilisers (linked to nitrous oxide emissions), that have displaced the need for organic matter inputs (manure) and have enabled simple rotations.

SOIL CARBON AND NITROGEN CYCLES ARE DISRUPTED, AND SO ARE SOILS

INTENSIVE ARABLE

1 Fossil fuel based synthetic nitrogen dispaces practices which recycle organic matter (carbon) back into soil

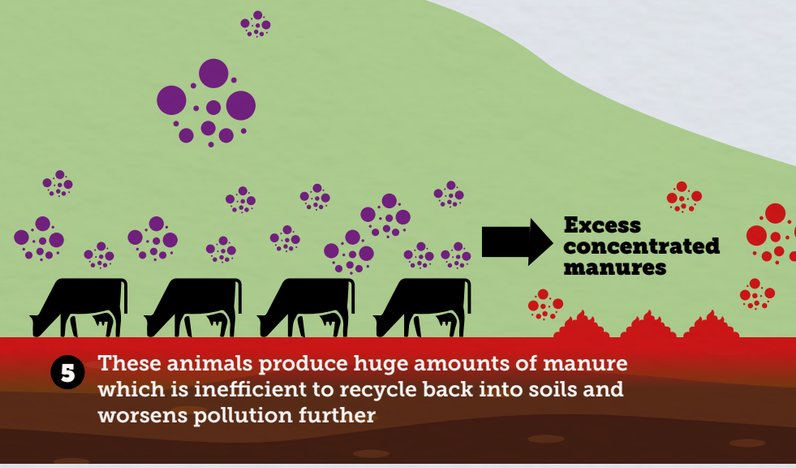


2 Soils lack soil carbon AND have excess nitrogen

3 DAMAGED SOILS: eroding, leaching pollution, losing carbon

INTENSIVE LIVESTOCK

4 Crops grown on these degrading soils fed to intensively kept livestock often at distant locations

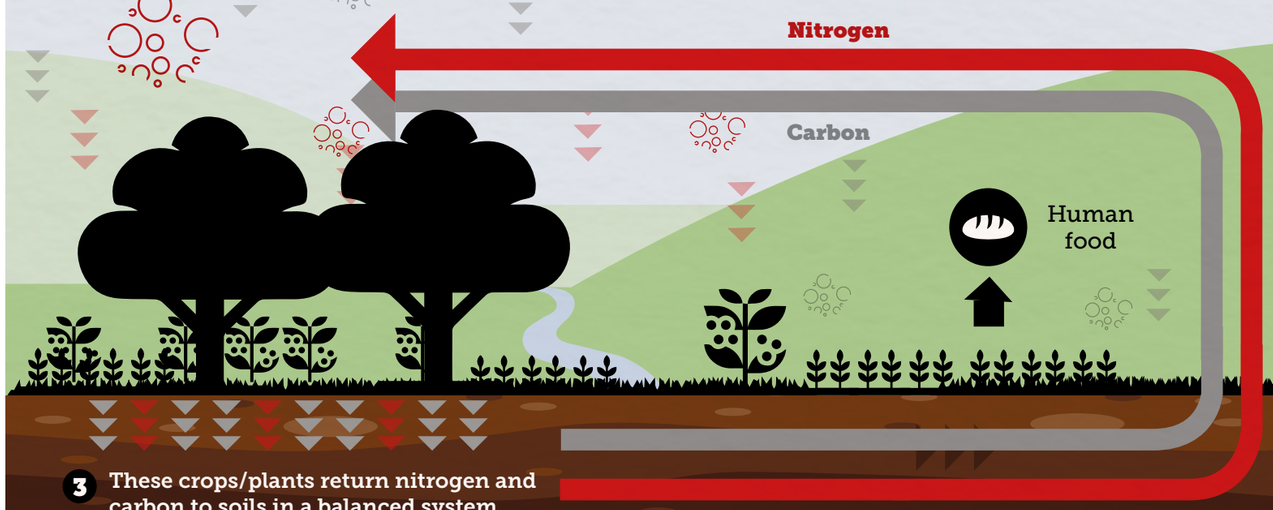


5 These animals produce huge amounts of manure which is inefficient to recycle back into soils and worsens pollution further

AN AGROECOLOGICAL TRANSITION REBALANCES THESE NUTRIENT LOOPS, REDUCES EMISSIONS, REDUCES POLLUTION AND REGENERATES SOILS

1 Cover crops, diverse cropping and grass absorb carbon

2 Legumes "fix" atmospheric nitrogen



3 These crops/plants return nitrogen and carbon to soils in a balanced system

4 Fewer livestock integrate with crops to ensure efficient nutrient recycling

5 HEALTHY SOILS: resilient carbon sinks reducing emissions and pollution

THE SEVEN WAYS TO SAVE OUR SOILS

Picture: Beltini Orlando

In 2016 the Soil Association published a report identifying seven ways that make up this much needed agroecological, regenerative approach to soil health.

These seven ways together represent a whole farm approach to soil health – for individual farmers to take practical actions and for policy makers to reset the agricultural agenda.

In the intervening five years, there have been some signs of progress, including a growing awareness of the soil crisis by farmers, politicians and decision makers. Indeed, increasing numbers of farmers are making significant changes to how they farm to improve soil health; adopting practices such as integrating cover crops to keep soils covered, reductions in cultivations and more diverse crop rotations.

However, faster and more system-level change and progress is needed, especially if we are to avoid the worst impacts of climate change. A lack of policy enablers, and widespread misunderstanding of the importance and value of soil means progress across the seven ways remains slow.

Historically we have tended to think of agricultural soil as nothing more than a rooting zone whose nutrient requirements are met through artificial fertilisers, rather than a living organism deeply connected with the health of people and our planet. Whilst awareness is growing around our 'living soils', with the term 'regenerative agriculture' becoming more mainstream, progress remains piecemeal.

On the ground, progress can only be seen in a fragmented way (see 'The fragmented approach to soil management'). Farm policy, research and practice continues to focus on tweaking practices to solve individual problems. This ignores the fact that farms are complicated and interconnected ecological and economic systems, with interrelated problems. These problems must be considered together, using a whole farm agroecological approach, entailing all seven areas detailed here.

We need to step up our action on soil health as a matter of urgency, for our climate, nature and health. Here we revisit the seven ways, consider progress and highlight examples of positive change.

THE FRAGMENTED APPROACH TO SOIL MANAGEMENT

A 2020 project between the University of Sheffield and ADAS sought to find out the state of play of soil management in the UK through a survey with a cash prize. It resulted in 302 useable responses from farmers and land managers, who were approximately representative of farm types.

It found:

- Most farmers/land managers (89%) are concerned about soil degradation, but most (~75%) didn't think the problem applied to their own farm.
- Most (92%) said they practiced sustainable soil management, though not all (85%) could then name a recognised sustainable soil management practice that they used.
- A diversity of sustainable soil management practices are being used. The top practice by far was manure application (74%). Uptake of practices such as min/no-till, cover cropping, and leys was between 33% and 44%.

However, the researchers found no evidence of a significant uptake in what is really required: "a wide-spread adoption of a systemic approach to sustainable soil management." By this they meant farmers using a diverse array of practices in a holistic manner. In arable farming, for example, this could mean a combination of minimal soil disturbance, soil cover, organic matter returns and diverse cropping. For livestock, it could be the use of holistic grazing and diverse leys. They also found poor awareness of the need for this holistic approach.

THE SEVEN WAYS TO SAVE OUR SOILS:

Restoring our damaged soils is key to solving our climate, nature and health crises. Together, these seven ways form a necessary whole farm approach to saving our soils. Progress on the ground remains slow, so policy makers need to better support and enable farmers.

1 MONITOR SOIL HEALTH ON FARMS

All farmers should know the state of their soils, and how they compare to farms of similar soil type.

2 INCREASE THE AMOUNT OF PLANT AND ANIMAL MATTER GOING BACK ONTO FIELDS

Farms should be building up or maintaining high levels of soil organic matter (relative to each soil type)

3 IMPROVE SOIL LIFE BY REDUCING TILLAGE AND CHEMICALS

Farmers should be enabled to plough less and drastically reduce agrichemical inputs.

4 COVER UP BARE SOIL WITH CONTINUOUS PLANT COVER

Soils should only be bare for short periods of time. You can't normally see healthy soil – it is covered by plants.

5 BRING MORE TREES ONTO FARMLAND

Farmers should be enabled to adopt agroforestry. UK farm woodland area should double.

6 REDUCE SOIL COMPACTION FROM MACHINERY AND LIVESTOCK

Farmers should address compaction across all farm systems.

7 DESIGN CROP ROTATIONS TO IMPROVE SOIL HEALTH

Farmers should be enabled to have long, diverse rotations or cropping systems.

THE TRANSITION TO AGROECOLOGICAL AND REGENERATIVE FARMING APPROACHES IS DEPENDENT ON ADOPTION OF THESE SEVEN WAYS

1 MONITOR SOIL HEALTH ON FARMS

PROGRESS: **AMBER**

All farmers should know the state of their soils, and how they compare to farms of similar soil type.

This is the most important of our seven ways – it is difficult to improve something that is not being measured. Soil monitoring gives farmers a valuable new perspective on how well their farm is, and should be, doing. Not just about measuring pH and nutrient profiles, monitoring soil health also requires measurements of soil organic matter, soil life and soil structure.

There remains no requirement for farmers to test soil health beyond pH and chemical content. Holistic soil health monitoring by farmers, for organic matter, soil life and structure, does seem anecdotally to be on the increase. There are a number of useful tools to choose from. New innovative metrics, such as DNA sequencing and remote sensing to monitor changes in organic matter in real time, open up possibilities still further. However, monitoring remains fragmented and patchy, and benchmarking to see how you compare with those with similar soils is tricky without one standard set of tools. A 2020 survey (See box 'The Fragmented Approach to Soil Management') suggests around half of land managers carry out soil health assessments. Only 17% of respondents undertook soil organic matter tests.[44]

WHAT CAN FARMERS DO?

- Undertake routine soil health analysis and take appropriate remedial action. This will ensure compliance with the farming rules for water and ensure nutrients are only being applied when needed.
- As part of this, test and monitor soil organic matter levels – especially for arable farms as these can be most at risk.
- Stick with one lab and measure regularly (at least every five years) to map changes. Ideally do this as part of a whole farm appraisal, using, for example, the Farm Carbon Cutting Toolkit, the Cool Farm Tool or Agrecalc.

WHAT CAN GOVERNMENT DO?

- Have a clear plan, including policy mechanisms, to ensure all farmers monitor their soil health and can benchmark their results. Provide incentives to motivate farmers to improve soil health above their soil type baseline.

THE SOIL ASSOCIATION EXCHANGE

(SAX) initiative aims to create an industry-wide set of standards and tools to enable farmers to measure their impact and make a positive environmental and social change on their farms. Soil carbon is on the list of monitoring measures to develop, alongside metrics such as biodiversity.

CARBON ASSETS FOR SOIL HEALTH

CASH (Carbon Assets for Soil Health) is a project by the Soil Association looking to bring together UK farm records of soil carbon to capture better data on how much certain practices and farm systems – in particular organic farming – increase carbon and secure it long term.

TRIALLING INNOVATIVE SOLUTIONS

Most agricultural research happens off farm. But with many of the best ideas coming from farmers, we need more research and monitoring that is led by farmers. That's the aim of **Innovative Farmers.**

First launched by the Soil Association in 2012, Innovative Farmers is now a partnership that has developed a proven model for engaging farmers and researchers to collaborate and co-design on-farm trials. The only programme in the UK pioneering and facilitating a culture of innovation and research amongst farmers, the approach recognises farmers as developers and primary beneficiaries of agricultural research, rather than being confined to simply being customers purchasing the products that emerge from market led R&D investments. There have been over 100 field labs so far.

Many have looked at practices which improve soil health, and several examples are highlighted in this report.

One such area is in the development of new monitoring tools.
Seven farmers in the Westmorland Dales are being supported in an Innovative Farmers Field Lab to develop a toolkit for monitoring soil health in northern upland farming. They will then work with researchers and advisors to implement changes and monitor the results. One aim is to assess whether simple, inexpensive approaches can provide useful data for monitoring and regeneration.

Picture: Innovative Farmers

2 INCREASE THE AMOUNT OF PLANT AND ANIMAL MATTER GOING BACK ONTO FIELDS

PROGRESS: **RED**

Farms should be building up or maintaining high levels of soil organic matter (relative to each soil type). High levels are essential to achieving good soil health.

Building soil organic matter can be slow, but results in multiple benefits that extend far beyond the farm. Levels are low or declining on many UK farms, so we urgently need to work to reverse this trend.

At the farm level, it means recycling more animal and plant matter, for example by making greater use of cover crops and leys. But for many farms, there is a lack of plant and animal matter to recycle back into soils, hence the hefty reliance on synthetic fertilisers. A wholesale shift away from artificial fertilisers and intensive livestock systems is therefore needed, towards the reintegration of grass fed livestock instead of diverse animal feeds. To fully close nutrient loops, we also need to make sure our food waste and sewage waste is safely recycled back to soils.

An ADAS survey suggests that spreading manure is common (nearly 75% of respondents), but other practices to increase soil organic matter, such as using green manures in arable rotations, were much lower in uptake,[45] such as using green manures in arable rotations.[46] Intensive livestock units and dairy herd sizes are still increasing,[47] concentrating manures into smaller areas. This puts pressure on slurry storage and application timings. High quantities lead to overapplication on land near to farm buildings, which results in a lack of application, and therefore declining health of soils, in land further away.

The need to increase soil organic matter in soils calls into question the continued diversion of materials such as straw for energy production rather than soil improvement, and the use of farmyard manure for anaerobic digestion. Also worrying, there remains a growing trend for fields of maize grown for large-scale anaerobic digestion (AD) [48, 49] which are heavily associated with soil erosion. Progress is being made in terms of reducing and recycling food waste back to soils,[50] although solutions to recycling our own biosolids safely remain a long way off. [51, 52]

WHAT CAN FARMERS DO?

- Read about the additional benefits of animal manure and composts and use them in place of synthetic nitrogen-based fertiliser wherever possible.
- Try out a fertility-building green manure (e.g. by taking part on a field trial) and grow cover crops where possible.
- Bring livestock onto arable farm grass leys. Utilise herbal and diverse leys, which are deeper rooting.
- Utilise subsidies to fund ecological restoration of grassland.

WHAT CAN GOVERNMENT DO?

Adopt a clear vision and plan to close nutrient loops in farming with policy mechanisms to make it happen. This could include:

- A clear ambition to increase mixed farming including through incentives.
- Policy levers to increase farmer take-up of manures and composts
- Supporting new fertility-building green manures/ cover crops
- Reducing the number and scale of intensive livestock units (to reduce manure and slurry volumes)
- Developing a hierarchy of use of fibre in farming, such as in relation to anaerobic digestion
- Ensuring all domestic and non-domestic food waste is recycled safely back into our soil.
- Increasing the amount of sewage waste safely recycled back to the soil.
- Supporting research to reduce contamination of these recycled products.
- An investigation into the current and future potential to recycle more soil organic matter from the different sources (livestock waste, human waste, food waste, crop waste)

FARMERS ARE CHANGING HOW THEY THINK ABOUT ORGANIC MATTER

Taking part in a field lab helped Jonathan Boaz, an arable farmer in the West Midlands, to understand his soils even more:

"You just can't take it for granted. If you keep on with cereal production without using farmyard manure or grass leys, the soil will essentially die on you. Though it is possible to grow a crop off it, it isn't easy. You're fighting the elements and you're putting a lot of stuff on which really isn't always desirable. You can achieve the same level of success growing crops in a much more environmentally friendly way by using green manures and grass leys."

Jonathan Boaz, Curlew Call Farm, Huddington, Worcester

3 IMPROVE SOIL LIFE BY REDUCING TILLAGE AND CHEMICALS

PROGRESS: **AMBER**

Farmers should be enabled to plough less and drastically reduce agrichemical inputs.

The Soil Association vision is for soils to be living entities, full of diverse organisms that are essential to our ability to cope with floods and droughts and to maintain crop productivity. Historically, regulations and policy have mostly avoided the issue of how chemical fertilisers, pesticides and tillage take us in the opposite direction. Research in recent years, however, demonstrates these practices can all – directly and indirectly – damage soil life and therefore soil health. Whilst more research is still needed, we know enough to act. Regulations should be updated to consider the associated risk more fully, such as within the authorisation process of pesticides. Given the implications for soil health (and more broadly), action needs to be taken to reduce the use of pesticides, artificial fertilisers and tillage (ploughing).

INTENSIVE INPUTS AND SOIL BIODIVERSITY

Artificial fertilisers: Displace organic matter inputs that provide the food necessary to soil life. They also reduce beneficial microbes necessary to efficient nutrient recycling, which make nutrients more available to crops. [53] Microbes which excrete carbon-based polymer 'glues', fundamental to the structure of healthy, porous soils and reduced greenhouse gas emissions, are also reduced. [54]

Conventional tillage: Also negatively affects beneficial microbial activity[55], and reduces the abundance and alters the communities of earthworms[56]

Pesticides: A 2021 meta-analysis of nearly 400 studies found 70% showed negative effects and concluded that "pesticides of all types pose a clear hazard to soil invertebrates." [57]

PROGRESS REDUCING TILLAGE: AMBER

Surveys suggest reduced tillage, and to a lesser extent, no-tillage, is becoming more common in UK arable production. In a 2019 peer-review paper, it was estimated that 47.6% of English arable land is cultivated using minimum tillage and 7% under no tillage.[58] Even water companies are interested. Thames Water are looking into no-till and cover crops as a way of trialling more water sensitive management practices with farmers. Many no-till systems still rely on herbicides and support is needed for research into alternatives.

PROGRESS REDUCING CHEMICAL INPUTS: RED

Application rates of artificial fertilisers have changed little since 2012/2013.[59] Pesticide use statistics have generally suggested use has been increasing in recent years (average number of treatments for crops has increased).[60]

WHAT CAN FARMERS DO?

- Reduce nitrogen fertiliser inputs: Undertake a Farm Gate Nutrient Balance of Nitrogen and assess the whole farm operation to find out how much money may be being wasted, what damage may be being caused due to nitrogen surplus and how a switch to using recycled nitrogen produced on the farm could be made.
- Fewer and less pesticides: For farms highly dependent on pesticides, start by creating more habitat for natural predators and cutting insecticide use.
- Check need for fungicides by leaving small areas unsprayed. As soil health is improved, the risk of fungal disease may be reduced and routine use less likely to be necessary.
- Experiment with reducing herbicide use; sometimes messier doesn't mean lower yields.
- Less tillage: Try to reduce soil disturbance. Visit farms where reduced tillage is practiced to see how it could apply.
- Find out about **Innovative Farmers** carrying out farm trials or consider taking part. If there is nothing local, get in touch with the Soil Association. Check out the **BASIS** training courses which include the Foundation Award in Soils.

WHAT CAN GOVERNMENT DO?

- Invest in R&D on the benefits of soil biology, which practices optimise these, and how chemical use damages them.
- Address gaps in chemical regulation to better protect soils.
- Have a statutory pesticide reduction target (for both use and known risks).
- Apply the polluter pays principle to pesticides and fertiliser use.
- Incentivise and reward low levels of pesticide and fertiliser use.
- Support an increase in minimum and no-tillage systems, especially as part of whole farm approaches.

LIVING MULCH:
AN ATTEMPT TO REDUCE CHEMICAL INPUTS AND TILLAGE

In one ongoing trial, six farmers (conventional and organic) are growing a living mulch of clover under cash crops, pooling knowledge and sharing results. A key question is whether – and by how much – the mulch affects yields. If the trial is successful, the farmers say that their discovery could be the 'holy grail' for arable farming: a way to build fertility without livestock, tillage (particularly important for organic farmers) or synthetic inputs, while sequestering more carbon, cutting costs, and improving productivity.

The trial is part of the **living mulch field lab** being run through the Innovative Farmers programme with the support of AHDB, Organic Research Centre and Organic Arable.

4 COVER UP BARE SOIL WITH CONTINUOUS PLANT COVER

PROGRESS: **AMBER**

Soils should only be bare for short periods of time. You can't normally see healthy soil – it is covered by plants.

Plant roots hold soils together, reducing erosion and allowing air to penetrate in the spaces around them. Roots also encourage healthier soil communities through plant-fungal interactions. The benefits of plant cover spread beyond the farm – with huge gains in terms of biodiversity, carbon storage, flood and drought control and water quality.

More farmers are becoming aware of these benefits. A nationwide ADAS survey of sustainable soil management practices recorded 44% of farmers using cover crops, and 40% using diversified rotations.[61] Another survey found a growing trend in the use of cover crops – with 90% of respondents who did not use them saying they would consider their use with more information.[62]

Intercropping remains rare, but **farmer led research** in arable intercropping looks promising, and more research is needed.[63] The area under permanent grassland increased between 1998 and 2014, but has remained roughly stable in the last five years[64].

WHAT CAN FARMERS DO?

- Where appropriate use cover crops, green manures and under-sown crops, with the added benefit of improving soil fertility.
- Consider growing crops that come to harvest earlier, such as whole crop cereals, instead of maize, so that cover crops can be effectively incorporated into rotations.
- Investigate options for intercropping cover crops such as grass in maize, and sowing cover crops pre-harvest to encourage plant development earlier in less ideal areas.
- Bring vulnerable land into permanent grassland, for example through new environmental subsidy schemes.
- Investigate the Innovative Farmers field lab on providing a permanent understorey in arable crops.

WHAT CAN GOVERNMENT DO?

- Support enhanced adoption of fertility-building green manures/cover crops.
- Support an increase of the area under permanent grassland and longer leys, particularly on vulnerable soils.
- Develop a strict regulatory baseline to keep vulnerable soils better covered, e.g. no overwintered maize stubble without a cover crop and no subsidies for maize used in AD.
- Fund research to help farmers choose the right cover crop for the right situation, and advice to ensure knowledge exchange.

TRIALLING NEW METHODS TO PROTECT WINTER SOILS

Many farmers encounter difficulties establishing catch crops (a fast-growing form of cover crops), and are forced to leave their land bare due to a lack of specialised equipment and significant time pressures during harvest.

Triallist and arable farmer Alex Jasinski has adapted a sprayer to sow the catch crops directly into his standing crop of vining peas prior to harvest. He is trialling this method in an Innovative Farmer's field lab. It is hoped that this new method may help farmers to overcome the usual challenges by enabling them to sow cover crops before the busy season, and therefore protect their soils in the gap that often occurs before they sow their next cash crops in the autumn.

5 BRING MORE TREES ONTO FARMLAND

PROGRESS: **AMBER**

Agroforesty should be adopted on farms and the UK farm woodland area should double.

Trees bring more to the landscape than just their aesthetic value. They provide multiple benefits, including habitats for birds, mammals and insects, and play a role in soil stabilisation, carbon sequestration and nutrient recycling. Trees in the right place can improve water management, reduce flooding risk and enhance wider farming operations. Integrating trees into farming systems, as individual trees, hedges, agroforestry systems or farm woodland can also provide productivity gains. These include sheltering crops and livestock from heat, cold and wind, and providing new market opportunities from the trees themselves (e.g. fruit, nuts and timber) in the longer-term.

There is growing interest from farmers in the benefits of integrating more trees and farm woodland into their farming systems, and policy makers are increasingly receptive to the opportunity. There is now a real chance to instigate a farmer-led tree revolution.

But barriers remain. The UK government and Devolved Administrations need to ensure that the landowners' initial capital investment in trees is funded and supported by a positive regulatory environment, to ensure that both public benefits and long-term benefits for farm enterprise viability from more trees in the UK farmed landscape, are achieved.

Good advice on what tree to plant and where, tree management strategies and how best to use and market the output from trees is needed. The Soil Association is calling for farm woodland area to double by 2050 as a significant contribution towards wider government targets for increased woodland cover, and that 50% of farms should be implementing some form of agroforestry by 2040 to ensure that the wider benefits of integrating trees into farming systems are achieved.

WHAT CAN FARMERS DO?

- Find out more about the value that trees can bring to your farming enterprises and farm resilience. There are some easy wins on soil health, animal welfare and productivity. Download The Agroforestry Handbook and take the E Learning course on Options and Opportunities for Farm Woodland and Agroforestry.
- Plant or allow trees to naturally regenerate on vulnerable, steep sided fields and rough grazing.
- Investigate the many ways to increase useful tree cover on farms as woodland or agroforestry systems e.g. shelterbelts, riparian planting, extending existing woodland and linking woodlands via corridors; or even just planting awkward field corners.
- Consider augmenting existing or replacing historical hedges, or implementing alley systems where trees provide a further income stream (timber, fruit, nuts) whilst supporting continued farming operations.

WHAT CAN GOVERNMENT DO?

- Fund advice to farmers on suitable farm woodland and agroforestry system choices for their farm.
- Support capacity building and training, so that farmers have the skills and expertise to manage the trees and woodlands on their farms.
- Support agroforestry research and knowledge transfer initiatives to farmers.
- Provide capital grants to support new farm woodlands and agroforestry systems and ensure that these support the integration of trees into the farming system
- Investment in woodland supply chains and infrastructure

Picture: Jim Witeman and Innovative Farmers

SILVOPASTURE FIELD LAB

In 2021 seven farms in Devon began collaborating on a 12-year Innovative Farmers field lab – the largest participatory research project to date looking at Silvopasture (the practice of integrating trees and livestock) in the UK. The farmers, who produce beef, sheep, venison and dairy, are expecting the trees to bring a range of benefits to their farming systems by enhancing the natural processes that underpin sustainable food production.

Research to date suggests that soil health is expected to improve, with increased soil carbon, earthworms, fungi and other indicators of soil biology. It is hoped that livestock health and welfare will improve due to additional shelter and nutrition (from tree forage), as well as farm income diversification from crops of fruit, nuts and timber. According to Andy Gray, one of the farmers involved, it presents a marketing opportunity too: "it helps us show our customers that we are doing our bit."

Rothamsted is leading the soil monitoring research, with the aim of demonstrating in a relatively short timeframe that this approach can positively affect soil health. Dr Martin Blackwell notes that "being able to accurately quantify the size and speed of these [soil] changes will be particularly important as the UK farm payment system moves away from direct subsidy towards rewarding environmental enhancement."

The other key partners in this field lab are Organic Research Centre, FWAG South West and the Woodland Trust.

6 REDUCE SOIL COMPACTION FROM MACHINERY AND LIVESTOCK

PROGRESS: **RED**

Farmers should address compaction across all farm systems.

Soil compaction is a major problem in the UK – as well as one of the most easily resolved. It can lead to increased surface run-off, drought stress, fewer grazing days, poor root growth and reduced overall yields.[65]

An estimated 3.9 million hectares of agricultural land are at risk of compaction in England and Wales. Many issues are caused by late harvesting, unstable soils due to over cultivation and declining organic matter.

The risk is highest on clay soils during wet periods, exacerbated by the increasing proportion of rainfall coming in very short periods of time. Severe soil compaction and poor soil condition is also an issue in many livestock systems (around 10% to 15% of grassland fields, due to over-grazing and trafficking on wet land[66]). Attempts to shorten the winter period by using extended grazing systems have aggravated things further. New, lighter machinery is only one part of the solution. We need measures more generally that reduce the number of passes of machinery, the density or intensity of livestock, and the use of cover crops and deep rooting grasses.

Awareness is increasing around the risks of compaction, but measures to tackle the problem have been piecemeal. The trend for bigger tractors and machines continue to cause compaction. Some – mainly arable – farmers are adopting Controlled Traffic Farming systems (restricting traffic to a small route in the field), using sat nav technology to minimise travelling on soil and trying reduced or no-till systems where appropriate. The 2018 farming rule requirements (in England) to take reasonable precautions to prevent agricultural diffuse pollution[67] have led to an increase in the policing of compaction issues from farms, but more action is needed.

WHAT CAN FARMERS DO?

- Undertake a routine visual assessment to identify levels of compaction and take remedial action. Water infiltration tests will highlight areas of concern within a field.
- Be aware that small areas of compaction are found within fields and may need to be managed in different ways to the whole field.
- A range of alleviation practices are available to reduce compaction risk:
  - Use lighter machinery.
  - Adopt Controlled Traffic Farming (arable farmers).
  - Use correct tyre pressure.
  - Reduce the number of passes.
  - Try out reduced-till/ no till farming.
  - Avoid over-grazing.
  - Avoid trafficking over and grazing wet land
  - Avoid late harvesting of crops on vulnerable soils

WHAT CAN GOVERNMENT DO?

- Raise awareness of the impact of soil compaction on performance and how to avoid, identify and tackle it.
- Ensure baseline regulations have compaction prevention as a clear standard.
- Ensure this baseline can be regulated and enforced with clear penalties and adequate funding for enforcement.

7 DESIGN CROP ROTATIONS TO IMPROVE SOIL HEALTH

PROGRESS: **RED**

Farms should have long, diverse rotations or cropping systems.

The current trend in farming for simple arable crop rotations, combined with financial pressures and short-term tenancies all put pressure on farmers to make short-term decisions. The result is a drop in UK food diversity, weeds that we can no longer control, and soils being stripped of their nutrients and organic matter. To reverse this, farmers need diverse, long-term crop rotations.

Diverse rotations can increase UK production of crops for human or animal consumption, thereby reducing the need to import them from farming systems worldwide that are associated with biodiversity loss and soil health depletion.

There has been very little change in cropping areas or rotations in the last few years. Many alternative crops are still considered as niche and high risk, and research is still concentrated on mainstream crops such as wheat and oilseed rape. Pulse crops are particularly underfunded, despite being a very valuable part of a crop rotation and offering an alternative to soya bean meal for animal feed.

The three-crop rule, thought to deliver little environmental benefits,[68] is no longer applicable, and needs urgently to be replaced with something which does have positive impact.

WHAT CAN FARMERS DO?

- Many high value crops – such as potatoes and carrots – cannot be grown sustainably in a short rotation. **Design a longer crop rotation** which avoids these problems. Where possible, focus on financial margins over the course of a whole rotation, rather than annual margins and look at net as well as gross margins
- Design crop rotations with more diversity and longer gaps before going back to the same crop. Using spring crops increases the opportunity to add cover crops and soil organic matter into the rotation.
- Consider growing crops that help protect soils and build soil organic matter such as legumes and catch crops.
- Grow crops with different rooting depths to take advantage of the soil's varying nutrient profile.
- Where possible include temporary leys in a rotation, used for grazing by livestock.

WHAT CAN GOVERNMENT DO?

- Incentivise use of UK grown legumes for animal feed to replace imported soya.
- Incentivise longer and better rotations and intercropping.
- Support farmers to move to niche and protein crops.
- Support research on alternative crops, with a special focus on climate resilience.
- Ensure that new baseline regulations transition away from basic rotations, for example that maize / potatoes are grown no more than one year in five on the same field.

INTERCROPPING

Doug Christie, a member of the Plant Team field lab, has been successfully growing plant teams , (mixtures of crop species grown together), for several years on Durie Farm, a 500-acre mixed arable and livestock, partly organic farm in Fife.

Doug says: "I started five or six years ago to get more diversity in the crops I grow, partly for benefits you can see, like soil health and cutting back on input costs.

"I've grown oats, spring oil seed rape and peas together, for example, vetch and spring oil seed rape, and beans and oats.

"It has drastically cut my input costs – I've hardly needed to spray those fields at all with fungicides or herbicides and I don't need nitrogen fertiliser. I've had no pests on my oil seed rape – no pollen beetle damage or flea beetle – so I've used no insecticides. In terms of yield it's hard to say but I've had less from my beans on their own than the beans and oats together.

"I'm also interested in sustainable farming, and there are wider benefits like carbon sequestration and biodiversity."

TO SAVE OUR SOILS WE NEED NATIONAL SOIL STRATEGIES

Whilst progress on the ground is slow, welcome signs are starting to appear in government policies, including progress in creating more complete national baselines and in new incentive schemes.

As we write, tentative steps are being made towards improving soil health through New Environmental Schemes, but these need to be strengthened to ensure impact. For example, they must set requirements for soil monitoring and ensure the results lead to improvements being made. Incentives for no-till and min-till are welcome but need to be encouraged and supported as part of a whole system rather than adopted as standalone soil measures in a one-size-fits-all solution.

National baselines and targets are being developed. Wales is possibly furthest ahead with a baseline of the state of soils. A Scotland Soil Monitoring Action Plan is ongoing. In England in 2018, soil monitoring made up less than half a percent of government spending in England on water, air and soil combined. Now a baseline and monitoring scheme is being developed as part of the 25-year environment plan indicator framework. Whilst such progress is welcome, it is vital that plans ensure monitoring and targets are robust and fully funded.

Policy efforts are being made to reduce chemical reliance. A draft update to the UK wide National Action Plan on Pesticides was shared for public consultation in early 2021, containing draft commitments to develop a new metric and target to reduce risk (though a reduction target is also needed), and to better assess the effects of pesticides on soil life within regulatory frameworks. In Wales, the introduction of a Nitrate Vulnerable Zone status across the whole of the Welsh farming area, although adding unwelcome costs, should lead to better return of nutrients

However, soil policies remain incoherent. Significant progress won't happen without an overarching soil management policy that puts soils on a par with water and air – both of which have had their own EU Framework Directives (which, post-Brexit, have since been cemented into UK regulations). These frameworks have driven government action thanks to strict legislation that ensures stringent target setting and action that filters down into relevant policy areas. For example, the Clean Air Strategy is putting government pressure on reforming urea standards in order to slash ammonia air pollution. At

the time of writing, no such overarching policy framework exists for soils, either UK wide or within any devolved nation.

That is why we are calling for National Soil Strategies

These should work as an overarching policy instrument similar to the Water and Air Quality Framework Directives. Each strategy should recognise the many different factors that influence soil management and unite these under a common policy framework. Whilst universal in its application, they must be implementable across the 747 different soil types in the UK and the many different vulnerabilities and capabilities of farms.

Strategies must be long-term and include:

- A clear vision and pathway on how to achieve this vision
- Actions to ensure progress towards the seven ways to save our soils

They must also include:

- Policy to ensure the long-term monitoring of soil health and a commitment to a statutory soil health target
- Sub-targets and plans for achieving healthy soils in critical soil types or sectors. For example, damaged arable soils and peatland soils.
- For peat, this should include targets on rewetting (restoration) and action to transition horticulture from cultivated lowland peat, linking to any pre-existing peatland action plans.
- Policy that integrates soil management priorities with climate, nature and health objectives to ensure soil health is further front of mind and joined up across relevant policy areas
- Action to drive research and knowledge exchange, ensuring more farmer led research.
- Action to address the offshored impact of soil degradation through our food imports.
- Action to address the risks of trade deals to soil health and any possible race to the bottom in environmentla standards.

WE ASKED THE SUSTAINABLE SOILS ALLIANCE, A PARTNERSHIP WORKING TOWARDS RESTORING UK SOIL HEALTH, FOR THEIR ASSESSMENT OF UK SOILS POLICY

SUSTAINABLE SOILS ALLIANCE

Here is what the Co-Directors Ellen Fay & Matthew Orman, had to say:

For a generation, soil as a policy priority has been the poor relation among environmental indicators in comparison with air, water and even biodiversity.

The lack of nationwide targets for soil has meant no imperative to report on its changing health, a lack of investment in monitoring, no data on which to base decisions and hence, inevitably, a lack of tangible policy interventions on the ground.

Recently however, big ticket policy drivers give hope that soils policy might finally get the attention it deserves. These include: the Natural Capital approach, Net Zero, the (England) 25 Year Plan for the Environment, the ambition for a 'green recovery' from the Covid pandemic, and most critically - EU exit – necessitating a raft of new policies.

Across the UK the four nations are turning environmental ambitions into separate agro-environmental policy frameworks, tailored to their respective farming cultures, crop and landscape types - many with soils at their heart. The Sustainable Farming Incentive, due to be rolled out across England in 2022 is built around two soil-specific 'Standards', and rewards for land management practices that protect and improve soils.

Not all drivers of soil policy are government-led. Retailers and manufacturers are promoting the use of regenerative practices to attract consumers and demonstrate their commitment to Net Zero and sustainability targets, ambitions which are being rolled out throughout their supply chain via their own research, collaboration and guidance.

In addition, a soil carbon marketplace is emerging whereby farmers are being paid for practices that sequester carbon into soils, by investors looking to champion sustainable farming or offset their emissions. This has the potential to unlock up to £500m annual revenues by 2030 for farmers and landowners.

Whilst we are encouraged by the recent explosion of interest in all things soil after decades in the policy doldrums, the sudden and simultaneous emergence of these various drivers is not without risk.

There are practical challenges, since individual initiatives come with their own sets of guidance, metrics, targets and payment rates. And philosophical challenges, as soil's importance becomes abstract and muddied - presented as both public and private good, a cost and an income, a responsibility and a commodity, subject simultaneously to market forces and regulation, and layers of potentially inconsistent advice and guidance.

The picture is confusing at a time when farm incomes are at their most uncertain, and farmers' need for clarity most urgent. This is where government leadership comes in.

We endorse the recommendations in this report. Any government-led soil strategies must be universal in their application, yet implementable across soil types, landscapes and farms. The overriding aim must be to provide long-term clarity against which farmers can make vital long-term investment and management decisions, and ensure our soils fulfil their primary responsibility, that of supporting safe, nutritious, and profitable food.

SUMMARY

Urgent action is needed to address the state of the UK's depleted soils for the sake of our climate, nature and health.

Although there is increased interest in soil health among farmers and policymakers, there has been little progress on the ground. We need to go further – and faster – in saving our soils.

Current government policies are not sufficient, and emerging policies risk incoherence.

To achieve thriving, living soils there needs to be a transition to agroecology and progress across seven identified areas:

1. Monitor soil health on farms.
2. Increase the amount of plant and animal matter going back onto fields.
3. Encourage soil life by reducing tillage and chemicals.
4. Cover up bare soil with continuous plant cover.
5. Bring more trees onto farmland.
6. Reduce soil compaction from machinery and livestock.
7. Design crop rotations to improve soil health.

To do this, we need National Soil Strategies to bring clarity, vision and impact.

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