Soil Health Inquiry - Response

Executive Summary

Soil makes important contributions to the goods and services needed by society, plays a key role in protecting and enhancing biodiversity and mitigating climate change, and together this ensures our sustainable future.

For all soils to be sustainably managed, there is a need to develop an overarching policy for soils to set and implement clear strategic targets, across all types of land use, against which soil health could be enhanced and maintained.

In practice, this will need the scientific community to work closely together to identify these targets and undertake a strategic programme of research to fill these gaps. This research programme needs to be informed by evidence, gained from the UK's excellent capacity in soil science. It should work alongside land managers and policy makers so that our most up-to-date evidence is integrated into both policy and practice.

This should be supported by a systematic monitoring programme at different scales, which identifies soil health changes over time, to inform future approaches to sustainable soil management, locally, nationally and internationally.

Land managers must be part of the monitoring process and in tandem, should be supported through outreach and engagement activities delivered by advisory services that have recognised expertise in soil science, so that sustainable soil management is embraced as a positive activity for the benefit of all.

British Society of Soil Science Cranfield University, Building 42a, Cranfield, Bedfordshire MK43 0AL

T: +44 (0)1234 752 983 **F:** +44 (0)1234 752 970 **E:** admin@soils.org.uk **W:** www.soils.org.uk

1. How can the Government measure progress towards its goal of making all soils sustainably managed by 2030? What are the challenges in gathering data to measure soil health and how can these barriers be overcome?

1.1 Strategically, air, water quality and biodiversity are routinely monitored, as globally we recognise the positive impact which clean air and water have on human and planetary health, and the importance of protecting and enhancing biodiversity in ensuring our sustainable future.

1.2 Soil has a similar impact on human and planetary health and our ability to achieve a sustainable future. The importance of soil functions, for example in delivering the UN Sustainable Development Goals[1], is well understood. Soils support food production and biodiversity; both as a platform for above ground biodiversity and for the biodiversity within soils, much of which is still to be fully understood. Soils play a fundamental role in the quality and availability of water and in pollution control, are the foundation for construction and infrastructure and preserve the earth's history and cultural heritage. Importantly, soils are now recognised for their role in climate change mitigation and adaptation as set out in our Science Note on Soil Carbon[2].

1.3 Despite this, there are few nationally or internationally agreed legal protections for soils which would allow governments to monitor soil health. In the UK there is no distinct soil policy that can bring together the necessary ambition for achieving sustainable soil management. Moreover, the evidence base from soil health surveys of UK land is fragmented and incomplete[3]. Soil monitoring and legal protections should not be limited to the agricultural sector and should be extended to horticulture, conservation, amenity, construction and development.

R1. We recommend that the government develop an overarching soil policy that gives soils a similar legal status to air and water.

R2. We recommend that the government sets and implements clear strategic targets, across all types of land use, against which soil health could be measured, and once these targets have been developed works with the international community to ensure the are aligned to an international cooperative agreement.

1.4 To do this, the soil science community would need to work together to agree soil health and quality indicators and terminology to ensure all parties are using the same base data. These indicators would need to include assessment of soil organic carbon. However, there is capacity and knowledge in UK

soil science to deliver a much more comprehensive and informed understanding of soil health that goes beyond assessing single indicators such as soil carbon.

1.5 We know that soil health can change over time depending on the management practices being used.

R3. We recommend a mechanism for regular monitoring, recording and assessment of data against historical datasets to ascertain a direction of travel for soil health.

1.6 The soil surveys carried out in the UK, which culminated in the late 1980s, provide valuable information and a partial baseline which current and future soil health could be mapped against. Resampling activities which took place in Scotland between 2007 - 2010[4] and sampling activities taking place in Northern Ireland under the Zone 1 Soil Nutrient Health Scheme[5], will provide an opportunity to undertake this valuable comparison in these locations, and to analyse carbon stocks held within the soil. Making these comparisons will allow experts to analyse the data, identify trends and make targeted recommendations for local soil, as well as strategic regulatory recommendations.

1.7 Soil monitoring would require:

i. the identification of soil quality and health indicators to ascertain if soils are being sustainably managed, and
ii. a national, or finer scale, monitoring scheme that can track progress over time.

1.8 There has been significant work over the last decades to identify suitable indicators for soil quality and health, including in our journals the *European Journal of Soil Science*[678] and *Soil Use and Management*[910], several reports to government[11121314], and recently by the European Environment Agency[15]. Although the England Ecosystem Survey, part of the Natural Capital and Ecosystem Assessment Programme (NCEA), may go some way to achieving this, there has been no government implementation of these indicators in a monitoring framework.

1.9 There are significant challenges to developing benchmarks for indicators due to inherent differences in both the baseline and capacity to improve soil indicators between soil types, land uses and climate. Thus, a 'one size fits all approach' would not be suitable.

R4. To support our continuous understanding of soil processes and their interaction with the environment, we recommend a strategic programme of research which aims to fill the current knowledge gaps.

1.10 Challenges to gathering qualitative and quantitative data include the different scales required for reporting from national level perspectives to on-farm assessments. Clearly these require different

measurements for identified indicators. Some will require accredited approaches delivered by professionals, but there is considerable advantage to complementing this with observations that can be recorded by a land manager directly. Ensuring standard protocols are developed is key for consistency and for informative observations to be developed. Incentivising land managers, which will include farmers, wildlife organisations, developers and many others, to undertake measurements themselves could overcome this barrier to some extent; however, these data should ultimately be of direct benefit so it can be used for local soil management decision making.

1.11 As set out in this response, the exact targets and requirements will be different depending on the land being monitored. Practically, there is no 'one size fits all' for ensuring that soils are sustainably managed. Different soils will require different types of management depending on the outcome being sought. For example, agricultural soils could be sustainably managed via regenerative agricultural techniques; however, contaminated land, such as on some brownfield sites, would have different challenges and require different management techniques.

2. Do current regulations ensure that all landowners/land managers maintain and/or improve soil health? If not, how should they be improved?

2.1 There are few regulations that landowners or managers, regardless of sector, are required to adhere to, when considering how to manage their soils. Farmers do have obligations to protect soil organic matter and prevent erosion as part of cross compliance requirements linked to the basic farm payment and farming rules for water.

The Existing Environment

2.2 Agriculture

2.2.1 Schemes such as the *Environmental Land Management Schemes (ELMS)* will provide incentives for farmers and landowners to meet minimum standards of soil care. However, uptake of the Sustainable Farming Incentive (SFI) soil standards is currently low, indicating that payments may not be sufficient for widespread adoption. Other agri-environment schemes such as Countryside Stewardship or Catchment Sensitive Farming require soil monitoring by a suite of simple lab tests but entry to these schemes is voluntary.

2.3 Construction

2.3.1 The Defra *Code of practice for the sustainable use of soils on construction sites* provides guidance for how soils should be handled and re-used on construction sites. However, it is guidance and whilst many projects follow this and create soil management plans, the guidance does not set out how soil monitoring should be undertaken. Many soil management plans are not implemented or monitored by properly experienced and trained individuals. The ongoing review of this code must set out clear guidance on how monitoring should be undertaken, what should be monitored, the expertise needed to undertake this work and support legal protection for soils, and obligations to follow appropriate guidance.

2.3.2 In development situations on large greenfield sites, surplus topsoil is often formed into large bunds on site and referred to as landscaping to avoid the transport costs of export and re-use off site. In the medium to long-term this leads to loss of soil function but there could be significant scope for re-use on nearby restored or derelict land, possibly with subsequent tree planting, if grant funding or planning policy could incentivise this. A requirement within the planning system for development projects to set out a soil strategy, written by a competent individual[16], detailing what soil resources

are present and how they will be re-used on- or off-site, would support the need for more focus on how soils, soil function and soil health are maintained and enhanced.

2.4 Forestry

2.4.1 The UK Forestry Standard includes good practice on protection of soils during woodland creation and management and is referred to by forestry professionals in planning these operations, but again is not monitored or enforced.

2.5 Meaningful monitoring is essential and will be expensive to achieve. Incentivising farmers to adopt more sympathetic practices, such as regenerative agriculture which includes minimum tillage and cover cropping, or foresters to adopt tree planting within agricultural land both as pure woodland but also as agro-forestry techniques to stabilise soils and reduce runoff, may be an effective short-term approach. We know that sustainable soil management practices could improve yield over the long-term[17]. In situations such as farming where cost, yield and output are often the driving factor for amending production techniques, focusing on the reduced costs and potential financial benefits associated with sustainable soil management practices, rather than the environmental benefits, may support individuals and organisations who would not have previously seen the value in changing practice.

2.6 To achieve systemic change, **we recommend that:**

R5. regulation is introduced which maps to the clear strategic targets recommended in our response to question one.

R6. government work with relevant advisory organisations that have recognised expertise in soil science, to deliver extensive outreach and engagement activities which support land managers in adopting practices which would support soil health.

2.7 Receiving trusted advice is a fundamental part of changing practice and it is key that advisory organisations and individuals working with soil have recognised expertise in soil science through for example, membership of the British Society of Soil Science or other professional body, chartership and regular training.

2.8 In the long-term, legal protection for soils, which recognises a minimum level of soil health, will be a part of driving behaviour change. Combining the regulation with legal enforcement powers for

organisations such as Natural England and local planning authorities, together with incentive mechanisms will ensure that we all work together to secure our soil health.

3. Will the standards under Environmental Land Management schemes have sufficient ambition and flexibility to restore soils across different types of agricultural land? What are the threats and opportunities for soil health as ELMs are introduced?

3.1 *Sustainable Farming Incentive (SFI)* requirements will not guarantee that soil health is maintained or improved. Introductory level actions under the SFI require adding organic matter to the land at least once every three years which can result in improvements in soil physical quality over time[18]. Incentives such as the SFI should be based on the scientific evidence to ensure that maximum results can be achieved in the shortest time frame and with minimum financial impact to farmers. Such an evidence base is currently lacking, but this could be addressed by soil monitoring and greater support of field-based research on soil management.

3.2 Opportunities for soil health under ELMs

3.2.1 Evidence from ADAS[19] and AHDB[20] on reduced cropping and tillage suggests that these techniques, which are part of a sustainable soil management approach, can produce higher yields. Extensive outreach and engagement activities, as set out in our answer to question two, will support land managers across all sectors to understand the benefits of the techniques for them.

3.2.2 Sustainable soil management techniques which limit soil disturbance can also have a positive impact on carbon storage[2]. However this should be viewed with caution as benefits may only be realised in the medium to long-term. Much more research is needed as additional soil carbon sequestered can easily be reversed. However, whilst more research is needed this should not limit the implementation of such techniques which are widely recognised as very likely to have a range of positive environmental benefits.

3.3 Threats to soil health under ELMs include:

3.3.1 The unknown. Landowners may give up if they don't experience a perceived benefit from changing their practices. Any initial financial incentive may need to be significant to gain medium-term commitment to improving and maintaining soil health, which is when the indirect benefits may be seen.

3.3.2 Not everyone will enter the scheme so this means that there could be a gap in the uptake of sustainable soil management, unless there are other mechanisms or incentives available, such as from the private sector.

3.3.3 The scheme does not cover all potential negative impacts to soil health arising from agricultural practices. This includes using machinery or grazing livestock in wet conditions resulting in significant soil compaction or incorrect timing of cultivations leading to erosion of soil by wind or water.

3.3.4 ELMs does not consider emerging threats to soil health such as from microplastics.

R7. We therefore recommend that initial incentives should be combined with a medium to long-term outcome-oriented approach, evidenced through robust and detailed sampling and which accounts for both the starting point and direction of travel for each measured soil health metric.

4. What changes do we need to see in the wider food and agriculture sector to encourage better soil management and how can the Government support this transition?

4.1 Elevating soils to the same level as air and water, which have specific metrics such as PM2.5, and introducing minimum levels of soil health, would allow the whole supply chain from farmer, supermarket chain and consumer, to understand soil's importance.

4.2 Increased funding for soil management planning on farms and tighter planning conditions requiring the same for development sites, would in combination incentivise better management. Increased internal government funding for monitoring and regulation would provide the framework for audit and assessment and for schemes which would allow consumers and government to robustly monitor achievement. Any such schemes, whether government or privately run, must consider the farmer's time and resource against the objectives of the regulations. For a sector which already faces significant cost and time pressures, regulation should not be seen as an additional burden.

4.3 A greater understanding of soil health and the link to food quality, environmental benefits and human health and wellbeing is needed to increase the incentive for all parts of the sector to be positively influencing how soils are treated.

4.4 More widely, supermarkets and consumers must be responsible partners. Investing in our soil health will lead to better human health[21]. However, for those farmers not already monitoring their soil health, this may lead to additional local investment and a price increase if consumers seek a more environmentally sustainable end product.

5. What does UK Government need to do to tackle other stressors on soil health such as soil contamination?

5.1 Introducing a regulatory framework for soil health, combined with a long-term monitoring programme will provide the framework needed to tackle issues such as soil degradation. A considerable stressor of soil degradation comes from construction activities, with soil-related activities often undertaken by those without the required knowledge and training to do so.

5.2 To support this, the introduced regulatory framework must make landowners and local authorities accountable for the activities that take place on their land, and organisations such as the Environment Agency, Natural England or local councils must be able to regulate and prosecute organisations not adhering to the framework.

5.3 The activities which take place on land are disparate and may include construction and infrastructure, manufacturing or refuse collection for example. The minimum levels of soil health will be different in each of these scenarios and the monitoring and management techniques will need to reflect this.

5.4 Soil contamination is mostly from accidental spills or legacy contamination from historical sources and there are legal obligations on polluters or landowners to remediate. Conservatively, most contaminated soil is dug up and taken to landfill, whereas other means of improving contaminated soils should be incentivised in order to reduce the waste of soils. Waste and material management legislation could be reviewed to consider allowing opportunities for salvaging soil. However currently the liability risk, cost and time is too great for industry to consider remediation over the 'dig and dump' approach.

5.5 Increased funding, over and above grants for greenfield land, for restoration of historically restored or derelict land to woodland or other green habitat, would incentivise site owners to create a positive natural end use, creating scope for phytoremediation of previous contamination.

R8. We recommend developing clear strategic targets which soil health could be measured against, including identifying soil health indicators for different scenarios.

Final recommendations

We recommend that:

1. **government develop an overarching soil policy that gives soils a similar legal status to air and water.**
2. **government sets and implements clear strategic targets, across all types of land use, against which soil health could be measured, and once these targets have been developed works with the international community to ensure the are aligned to an international cooperative agreement.**
3. **a mechanism for regular monitoring, recording and assessment of data against historical datasets to ascertain a direction of travel for soil health.**
4. **to support our continuous understanding of soil processes and their interaction with the environment, a strategic programme of research is established, which aims to fill the current knowledge gaps.**
5. **regulation is introduced which maps to the clear strategic targets proposed.**
6. **government work with relevant advisory organisations that have recognised expertise in soil science, to deliver extensive outreach and engagement activities which support land managers in adopting practices which would support soil health.**
7. **initial incentives should be combined with a medium to long-term outcome-oriented approach, evidenced through robust and detailed sampling and which accounts for both the starting point and direction of travel for each measured soil health metric.**
8. **clear strategic targets are developed which soil health could be measured against, including identifying soil health indicators for different scenarios.**

About Us

The British Society of Soil Science (BSSS) was founded in 1947 and is an established international membership organisation and charity committed to the study of soil in its widest aspects. The society has 900 members and brings together those working within academia, practitioners implementing soil science in industry and all those working with, or with an interest in soils.

We promote research and education, both academically and in practice, and build collaborative partnerships to help safeguard our soil for the future. This includes hosting the World Congress of Soil Science 2022 in Glasgow, where 1,700 delegates from around the world, met to discuss the critical global issues relating to soil.

BSSS is a partner of the Coalition of Action 4 Soil Health (CA4SH) a collaboration of international organisations. The overarching goal of CA4SH is to improve soil health globally by addressing critical implementation, monitoring, policy and public and private investment barriers that constrain farmers and land owners from adopting and scaling healthy soil practices. We support its Draft Soil Health Resolution and would encourage the UK government to support a formal international process for soil health regulation at COP 28.

For further information regarding this response, please contact:

Sarah Garry
Executive Officer
British Society of Soil Science

sarahgarry@soils.org.uk

References

[1] Bouma, J., Montanarella, L., Evanylo, G. (2019) The Challenge for the soil science community to contribute to the implementation of the UN Sustainable Development Goals. *European Journal of Soil Science, 35(9),* pp.538-546 doi.org/10.1111/sum.12518

[2] Science Note: Soil Carbon (2021) British Society of Soil Science https://soils.org.uk/wp-content/uploads/2022/05/BSSS_Science-Note_Soil-Carbon_Final_May22_75YRS_DIGITAL.pdf

[3] Soil Policy Legacy Report (2022) British Society of Soil Science https://soils.org.uk/wp-content/uploads/2023/02/BSSS_WCSS-Soil-Policy-Legacy-Report_Jan-2023_Final_no-crops-compressed.pdf

[4] Resampling the National Soils Invesntory of Scotland. Accessed 1 February 2023. https://www.hutton.ac.uk/about/facilities/national-soils-archive/resampling-soils-inventory

[5] Update on DAERA's Zone 1 Soil Nutrient Health Scheme (2023) Accessed 1 February 2023 https://www.daera-ni.gov.uk/news/update-daeras-zone-1-soil-nutrient-health-scheme-0

[6] Seaton, F.M., Barrett, G., Burden, A., Creer, S., Fitos, E., Garbutt, A., Griffiths, R.I., Henrys, P., Jones, D.L., Keenan, P., Keith, A., Lebron, I., Maskell, L., Gloria Pereira, M., Reinsch, S., Smart, S.M., Williams, B., Emmett, B.A., Robinson, D.A. (2021) Soil health cluster analysis based on national monitoring of soil indicators. *European Journal of Soil Science*, *72*(6), pp.2414-2429. doi.org/10.1111/ejss.12958

[7] Harris, J.A., Evans, D.L. and Mooney, S.J. (2022) A new theory for soil health. *European Journal of Soil Science*, *73*(4), e13292 doi.org/10.1111/ejss.13292

[8] Brevik, E.C., Steffan, J.J., Rodrigo-Comino, J., Neubert, D., Burgess, L.C. and Cerdà, A. (2019) Connecting the public with soil to improve human health. *European Journal of Soil Science*, *70*(4), pp.898-910 doi.org/10.1111/ejss.12764

[9] Baveye, P. (2021) Soil health at a crossroad *Soil Use and Management 37(2)* pp.215-219 doi.org/10.1111/sum.12703

[10] Wood, M., Litterick, A. (2017) Soil health – what should the doctor order? (2017) *Soil Use and Management 33(2)* pp. 339 – 245 doi.org/10.1111/sum.12344

[11] National Soil Monitoring Network: Review and Assessment Study (2006) https://nora.nerc.ac.uk/id/eprint/3317/1/Final_report_to_SNIFFER_181206_v1.pdf

[12] Black, H., Ritz, J., Harris, J., Cameron, C., Campbell, C., Chamberlain, P., Creamer, R., Pawlett, M., Wood, C., Singh (2011) Scoping Biological Indicators of Soil Quality – Phase II. Defra Final Contract Report SP0534. https://core.ac.uk/download/pdf/16748966.pdf

[13] Soil Organic Matter as a Headline Indicator of Soil Health (2005) Defra Final Contract Report https://randd.defra.gov.uk/ProjectDetails?ProjectID=13155&FromSearch=Y&Publisher=1&SearchText=SP0546&SortString=ProjectCode&SortOrder=Asc&Paging=10

[14] Indicators of Soil Quality – Physical Properties (2012) Defra Final Contract Report https://dspace.lib.cranfield.ac.uk/handle/1826/12873

[15] European Environment Agency (2023) Soil monitoring in Europe – Indicators and thresholds for soil health assessments pp.181 https://www.eea.europa.eu/publications/soil-monitoring-in-europe

[16] The British Society of Soil Science has set out the competencies required for those working with soil in the *10 Working with Soil Professional Competencies* (2018) https://soils.org.uk/education/guidance-and-science-notes/professional-competencies/

[17] *Zoom into Soil: Regenerative Agriculture* (2022) British Society of Soil Science: https://soils.org.uk/videos/zoom-into-soil-regenerative-agriculture/

[18] Bhogal *et al* (2009) Organic carbon additions: effects on soil bio-physical and physico-chemical properties. *European Journal of Soil Science*, *60*(2), pp.276-286 https://doi.org/10.1111/j.1365-2389.2008.01105.x

[19] Zoom into Soil: Regenerative Agriculture (2022) *British Society of Soil Science*: https://soils.org.uk/videos/zoom-into-soil-regenerative-agriculture/

[20] Platforms to test and demonstrate sustainable soil management: integration of major UK field experiments (2012) Final Report to AHDB https://www.gwct.org.uk/media/841575/AHDB-Tillage-Report-2017.pdf

[21] Brevik, E., Steffan, J., Rodrigo-Comino, J., Neubert, D., Burgess, L., Cerdà, A. (2019) Connecting the public with soil to improve human health *European Journal of Soil Science 70(4)* pp. 898 – 910 doi.org/10.1111/ejss.12764