

ARE WE LOOKING AFTER OUR SOIL?

Meeting of the Parliamentary and Scientific Committee on Tuesday 3rd November

SOIL

7.3 billion users worldwide



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The British Society of Soil Science (BSSS) was founded in 1947 with the aims of advancing the study of soil. It is a charity open to membership from all those with an interest in the study and uses of soil, and it currently publishes two scientific journals; the *European Journal of Soil Science* and *Soil Use and Management*. The Society represents the views of many of the world's leading soil scientists, promotes education through initiatives in schools, colleges and universities and also organises a varied programme of events on a wide range of soil-related issues. Prof Ian Boyd, Chief Scientific Officer at Defra, recently launched the latest BSSS professional competency document under the 'Working with Soil' initiative that provides guidance and training in key soil science skills for professionals. The Society will be hosting the prestigious World Congress of Soil Science in Glasgow in 2022 and will showcase our

internationally recognised soil research institutions and visit our unique soil landscapes.

Soil is fundamental to life on earth. It provides a variety of crucial functions and services to society. The most obvious is supporting the vegetation and crops that underpin our agricultural systems that provide us with around 95% of the food we eat. With the global population predicted to exceed 9 billion by 2050 there is pressure to increase food production on a limited land

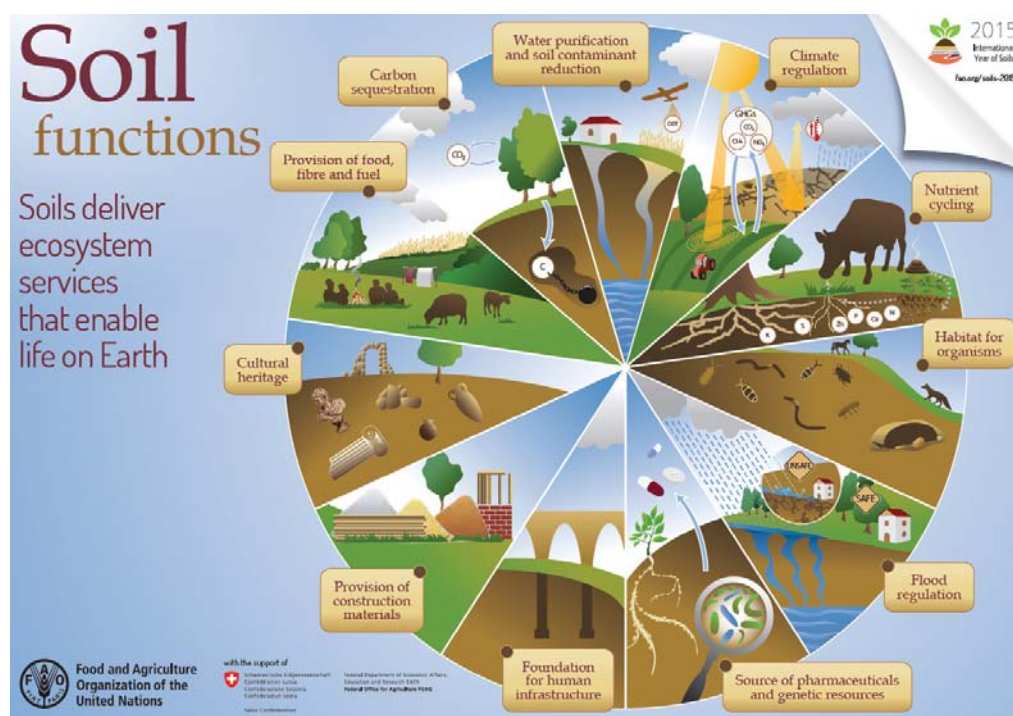
flooding. They support a large and diverse community of soil organisms – there are more microorganisms in a teaspoon of soil than there are people on earth. These organisms help to

... a reservoir for new antibiotics ...

cycle the essential nutrients for plant growth and are a reservoir for new antibiotics. Soils provide the foundations for our expanding built environment and also protect our history by preserving and protecting cultural artefacts.

the National Soil map of England and Wales², originally commissioned by MAFF. This provides us with a national baseline of our soil resources and crucially identifies where

they are different, how this impacts on their key functions (ie whether they are good for agriculture) and how they can be effectively managed. Innovation in soil mapping methods have the potential to upscale these original maps



Soil functions (FAO)

area. In addition to supporting agriculture soil also filters and regulates the water that moves through it. This improves our water quality and slows water movement in river catchments that can regulate downstream

There is an incredible diversity of soils in the UK. Over 700 soil types are recognised in England and Wales alone¹. In the mid 1980s the Soil Survey of England and Wales published

using geostatistical models to predict soil properties in two and three dimensions. Data at the field scale is being acquired in the agricultural sector by deploying remote (eg using satellite imagery or images taken

with drones) and proximal sensing (eg using geophysical mapping). These techniques are used to infer soil properties, and the resulting maps can be used to guide more effective crop and soil management. Agrimetrics³, a new scheme launched this year, aims to provide a platform for innovation in data science in the agri-food industry – soil data should be central to this initiative. After all, soil is where food begins.

... promotes education through initiatives in schools ...

Our soils are under enormous pressure due to demands for increased food production and external pressures such as climate change. The result is a degradation of global soil resources. A recent assessment indicates the majority of the world's soil resources are only in a 'fair', 'poor' or 'very poor' state⁴. Degradation impacts on soil functions and consequently the ability of soil to provide the essential services to society. In England and Wales soil degradation is estimated to have an annual cost of between £0.9 and £1.4 billion⁵. These costs include on-site impacts such as a loss in crop yield and off-site impacts such as the cost for water treatment. The key threats to the functioning of soils in the UK are:

1) Loss of organic matter which means a reduction in fuel for soil biology, diminishing provision of nutrients and a degradation of soil structure.

... demands for increased food production ...

2) Soil erosion is a loss of soil through detachment and movement of soil by water, wind and cultivation.

3) Compaction, from the increasingly large size and weight of farm machinery,

decreases the spaces between soil particles and reduces the capacity of the soil to receive and transmit water and gasses.

4) Loss to construction, where soil is sealed by man-made surfaces, essentially reducing all functions except providing a foundation for built structures.

Different types of soil will have different responses to these threats. Many impacts can be managed or mitigated by changing soil management

practices but the response of the soil system is often only apparent after years or decades. This requires continued investment in the national scale monitoring⁶ of soil quality indicators. However, significant new investment in soil monitoring at local levels is required particularly where mitigation measures are starting to be implemented. Some of these measures include recommendations in the new Cross Compliance rules for soil protection but specific management practices include:

- Conservation tillage (eg minimising ploughing)
- Timing and direction of field operations (eg avoid compacting soil when wet and ploughing down slopes)
- Changes in crop agronomy (eg different rotational crops and introducing cover crops)
- Adding organic matter (eg through application of compost and manures)

There is no "magic bullet" to solving the impacts of soil degradation, what is needed is a mix of the complimentary measures listed above and a robust mechanism in place to monitor the response and

Soil types in England and Wales
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recovery of soil in the UK. Effective soil protection and the potential remediation of degraded systems requires an understanding of where these measures are most needed and what will be most effective.

5 Graves A. R. et al., 2015. The total costs of soil degradation in England and Wales. *Ecological Economics*. 119. 399-413.

6 <http://www.ceh.ac.uk/our-science/projects/countryside-survey>

... monitor the response and recovery of soil ...

Otherwise we are unable to meet the target set in 2009 in the Soil strategy for England: "By 2030, all of England's soils will be managed sustainably and degradation threats tackled successfully".

For more information please visit:
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<http://www.cranfield.ac.uk/About/Cranfield/Themes/Agrifood> or follow us on twitter @CranfieldAgrifo

References

- 1 www.landis.org.uk
- 2 <http://www.landis.org.uk/data/nmsoilscapes.cfm>
- 3 <http://www.agrimetrics.co.uk/>
- 4 FAO 2015 Status of the Worlds Soil Resources FAO Rome.

Other speakers at the meeting on 3rd November were Helen Browning OBE, Chief Executive, Soil Association, and Chris Collins, Professor of Environmental Chemistry, University of Reading. Recordings of their presentations, together with the powerpoint files can be found at www.scienceinparliament.org.uk. We hope to publish summaries of their talks in a future issue of *Science in Parliament*.



World Congress of Soil Science comes to Glasgow in 2022 © BSSS