

Sharing knowledge for greater soils power

“After years when it was only available commercially, it’s high time it was free for all to access to help drive land management decisions.”

PROFESSOR STEPHEN HALLETT

Baseline soils information collected since the 1970s is for the first time freely available for anyone to use. *CPM* talks to the custodian of the data to assess its significance.

By Mike Saul

With more than 250,000 observations and 30,000 soil samples from 12,000 profile pits, the UK’s largest soils database is now just one click away from a farm computer.

Thanks to collaboration between Defra and Cranfield University, all data collected as part of a major mapping programme started around 60 years ago, is now in the public domain. As a result, farmers, advisors and scientists can dig deep into a national archive detailing a host of soil properties from land right across England and Wales.

Originally produced by a dedicated group of soil surveyors – who worked actively across England and Wales to map and describe soil types and list their characteristics – the data has been digitised, so should now prove more useable.

Many farms may have an original soil map that’s faded and tucked away in an office drawer. This gave a host of details, for example, texture, organic matter, drainage and soil water availability – in

fact, all the baseline information on the varied soils across the farm’s landscape.

Cranfield University’s ‘Land Information System’ (LandIS) is the digital representation of all of this painstakingly collated information. According to its custodian, Professor Stephen Hallett, chair of applied environmental informatics at Cranfield’s Environment Centre, this poses the best and most comprehensive data on the top 2m of the UK’s land resource, and is a highly valuable record.

“It’s an exciting moment when a collection of national importance is openly available for free,” comments Stephen. “After years when it was only available commercially, it’s high time it was free for all to access to help drive land management decisions going forward.”

Access is via the LandIS Open Soil Data portal. To interrogate the data, individuals create a free account with a username and password. Farmers should then be able to locate their holding easily, then check on the

properties of their soils in further detail.

“Drill down into the map and you’ll discover the details of your soil type – either listed as a Soil Series or Soil Association,” explains Stephen.

Properties listed include each soil’s seasonal drainage risk or susceptibility to drought, the typical crops it can support, its inherent fertility and organic matter content and the types of natural habitats associated with the landscape being farmed.



Valuable tool

Professor Stephen Hallett says the LandIS soils database poses the best and most comprehensive data on the top 2m of the UK’s land resource.

New soil and landscape maps released

The UK Centre for Ecology and Hydrology (UKCEH) has developed a set of new high-resolution soil and landscape maps for Great Britain

The aim of a new series of soil and landscape maps is to provide additional data for current online tools used by farmers, land managers and scientists, that's more detailed, harmonised and easily updated.

The maps provide data from the AgZero+ research programme which helps to ensure domestic food production is sustainable, carbon-neutral and has a positive effect on nature.

In total, the maps divide the UK into 13 different soil classes such as 'freely draining light soils', 'heavy clays' and 'alluvial and coastal soils' (see image). Each class is derived by interrogating and overlaying a number of third-party datasets, including information such as soil organic carbon content and extent of peatland, terrain maps, and depth to groundwater and parent material.

"While looking at the bigger data sets on how land is managed nationally, we have to consider the drivers of production and environmental impacts at a farm level as well, and soils are a key part of this," says UKCEH spatial ecologist, Dr John Redhead.

Healthy soils play a critical role in supporting biodiversity, improving climate resilience and food production. But without accurate up-to-date mapping, land management practices risk contributing to soil erosion, compaction and the loss of organic matter – all key threats to long-term soil health, and ultimately, society and the wider environment.

John adds that by overlaying and interrogating different maps, they can be translated into useful insights for those managing or farming the landscape, supporting a wide range of other applications.

"We see them helping researchers to develop new datasets to better understand our landscapes and the risks to soil health. Also, by

UKCEH soil types

The maps divide the UK into 13 soil classes.

Soil Natural Capital Classes of Great Britain

- Light free-draining soil
- Light moderate to poorly draining soil
- Medium free-draining soil
- Medium moderately draining soil
- Medium poorly draining soil
- Heavy clay soil
- Shallow calcareous soil
- Shallow non-calcareous soil
- Alluvial and coastal soils
- Organo-mineral free-draining soil
- Organo-mineral moderate to poorly draining soil
- Peat
- Significantly disturbed or excavated soils

enhancing digital decision-making tools, the data will help farmers and other land managers to compare their soil health against nationally representative benchmarks and so consider improvements," he says.

UKCEH land-water systems scientist, Chris Feeney, explains: "We wanted a simplified, but harmonised, soil classification for England, Wales and Scotland and had hoped to do likewise for Northern Ireland as well."

In this instance, baseline soils information used for the different classes is derived from British Geological Society (BGS) surveys, purely because soils data from England and Wales is held in a separate database from that of Scotland and derived differently.

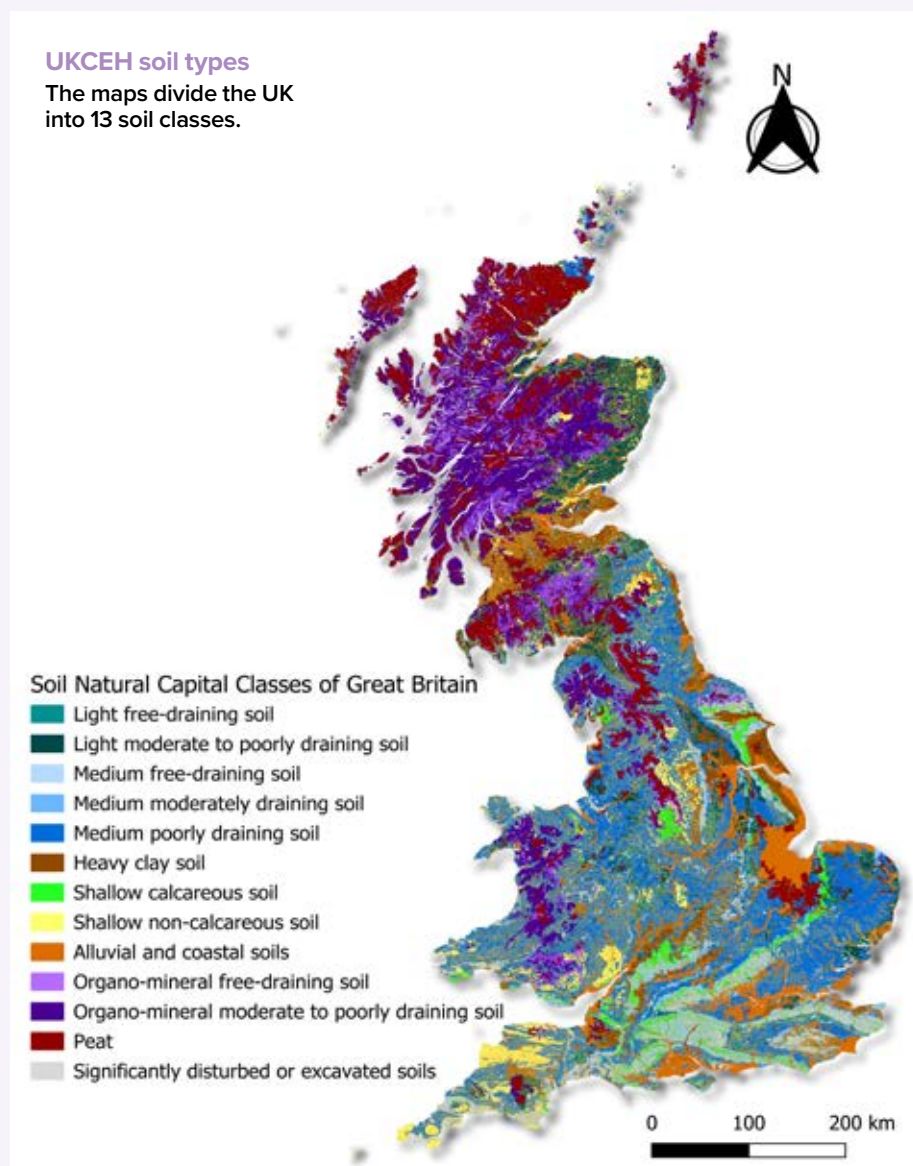
While accepting that the UK already holds extensive soil data, the new maps offer easy-to-interpret information at a finer level of spatial detail across Great

Britain and have a greater capacity for regular updates as environmental conditions change. This helps to ensure their long-term relevancy.

For several decades the BGS has been mapping bedrock and surface geology at 1:50,000 scale across all areas of GB and since the mid-2000s, it's been translating this raw data into classes of soil depth and texture, which have direct relevance to how soils function and by extension, can be managed.

The BGS data used for the new maps modelled soil classification related to depth, texture, calcium carbonate content, permeability, whether they are alluvial or coastal in nature, and their depth to groundwater.

The process also looks at broad textural and drainage differences and the risks of different cropping options, and digital terrain data on landform types from the Ordnance Survey Terrain





Versatile tool

John Redhead says by overlaying and interrogating the different maps, they can be translated into useful insights for those managing or farming the landscape.

data and occurrence of peatland.

“From a farming point of view, for example, if you’re on a medium soil with poor drainage, you’ll have to be aware of compaction risk on land that easily pools run-off water. Soils will also be heavier to work with than lighter soils that could occur in the same field,” says Chris.

“Those on lighter textured, free draining soils have different risks. For example, here you’re likely to have greater leaching of nutrients and pesticides into groundwater, as well as greater drought risk on these soils which may dry out more quickly.”

Chris argues that the classification of soils and landscape into 13 different classes is more functionally relevant for day-to-day management than previous maps. “The next step is to integrate it into the e-Planner tool available on our website which provides fine-scale maps of the suitability of land for environmental enhancement.

“This tool helps land users identify which areas of a farm can be managed differently to produce environmental opportunities, for example, that might suit the creation of flower-rich habitats for pollinators, where water resource protection could be carried out to reduce runoff, or maybe woodland created.

“By adding in the new soil and landscape data, users would have greater confidence in what land is suited for and the environmental risks that should be considered,” concludes Chris.

The new dataset is available for non-commercial use via the Environmental Information Data Centre on the CEH website.

► Detailed chemical and hydrological analyses are also available down to a sub-group level, and there’s even data on any original individual auger or soil pits taken across the area by each individual surveyor, including texture, colour, stoniness, depth of the different soil horizons and subsoil matrix colour and mottling.

While some of these characteristics will change over time, much of the baseline data is linked to the physical properties of the soil, notably its texture and position on the landscape and so should remain highly relevant, points out Stephen.

“By zooming in on an area you can look at the potential for the land and its pros and cons, giving you an insight into the natural order of soils,” he says. “We understand farmers know their own land better than anybody, but this data is a valuable source of information, helping to explain why, for example, one area lies wet for longer, or is quicker to dry out. It will also give perspective, placing individual blocks of land in a regional and national context.

“Hopefully, agronomists working across a wider region can log in to look at their area and be able to provide clearer advice that mirror local soils. Defra and other government agencies will be able to zoom out further and look at land-use frameworks.”

Stephen highlights that his team has been working with various companies and government bodies for some time, including those working in precision farming, helping to develop many soil-related products and turn-key assessments.

“Now, everyone can gain access to and customise the data which should help create a range of applications, and potentially attract new businesses who can apply it to the farming industry. In the first month of the release of the newly available map data, despite little publicity, more than 1000 users logged in, so there’s clear interest,” says Stephen.

He adds that in addition, Cranfield University will continue to offer other services, helping to utilise the data to its best advantage, drawing on the team’s deep-rooted soils knowledge. “Environmental consultants, geotechnology firms, policymakers and others with a broad interest in what’s the foundation block for all life, should also value the data.”

Dr David Smedley, head of soil and peatland science at Defra, heralds the widespread release of the soils data,



New dawn

Defra’s Dr David Smedley heralds the widespread release of the soils data, perceiving it as a significant milestone in how soils can be factored into policy, research and decision-making.

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He points out that the new Land Use Framework recognises soil as one of society’s greatest and most consequential natural assets. “Around 95% of our food depends on it, it regulates our water, and is arguably our most biodiverse ecosystem and our largest terrestrial carbon store,” he says.

The Land Use Framework also specifically commits to improving access to high-quality data, and for good reason – six of the 10 goals in the government’s Environment Improvement Plan make reference to soil, further underlining its importance in tackling a broad range of environmental challenges.

“Put simply, a resilient, sustainable food system and thriving natural environment can’t be achieved without healthy soil. Allowing access to the best soil data sets available is critical to ensuring soils are properly embedded in our thinking and decision-making, not just within government, but wherever land management decisions are made. Releasing the National Soil Map and LandIS datasets is a major step forward in achieving this.”

Releasing these datasets should unlock significant benefits for environmental management, research, innovation, and policy, and enable the development of new tools and decision-support systems to help deliver multiple Defra objectives, he concludes. ●