

Soil Health & Soil Heritage

Briefing Document – Spring 2022

Produced by the ipaast-czo project on interoperable precision agricultural & archaeological sensing technologies

Soil Health and Soil Heritage are connected

- Contemporary farming practices including adding nutrients and water, tilling and ploughing, and planting crops all affect soil health by altering basic properties of agricultural soil systems.
- Soils farmed today inherit the long-term impacts of past actions. People in the past, living and working in what are now agricultural fields, changed the properties of the soil, adding materials, removing and replacing nutrients, compacting the layers of soil underfoot, and reshaping the surface.
- While some effects of the past have faded, some are persistent and measurably change present-day soil properties.
- Environmental processes also play a central role in forming soils, shaping their properties, and influencing their health.

The UK's 17.7 million Ha of agricultural soils play a central role in:

- food production,
- food security
- maintaining biodiversity
- expanding carbon sequestration
- natural and cultural heritage

To understand and model what affects soil health accurately and robustly, it is important to account for the interactions between environmental processes, soils' human heritage, and the current farming practices.

Policy Factors

The [2020 Agriculture Act](#), the [2021 Environment Bill](#), and the [2022 Levelling Up Bill](#) together represent a significant change in policy around the management of soils in farmland. The Agriculture Act commits to paying farmers to protect and improve soils on their land, with *outcome-based* payments made under the [Environmental Land Management schemes \(ELMs\)](#). From 2021-2027, specific evidence and payment mechanisms are being trialled through the [Sustainable Farming Incentive \(SFI\)](#) programme¹ to meet the objectives of the Agriculture and Environment Bills. Under the SFI programme, farmers can receive payments for demonstrated maintenance or improvement of the condition and structure of their soil, and for measures taken to improve its sustainable management and capacity to deliver ecosystem services, including those related to natural and cultural heritage.

Social and Technology Factors

Policy incentives are driving the farming sector to manage their soils more carefully and creating the need for more detailed baseline and monitoring data on a range of soil properties.¹ The precision agricultural sensing sector is working to enable farmers to meet these emerging needs. Consequently, the availability of technologies and services which provide data on soils and the wider systems in which they are embedded is increasing.

The growth in sensing technologies and data which inform on soils in greater detail and with more nuances is occurring at a moment when the narrative about soils needs to change to engage people with the transition to sustainable agriculture. Using sensing data from precision agriculture to convey the connection between soil health and soil heritage will enable this transition

Policy Options

- Highlight maintaining the natural and cultural heritage of agricultural soil as an ecosystem service in future application rounds under the SFI programme.
- Enable expert communities to develop clear examples of how to evidence the Natural and Cultural Heritage of soils using sensing data.
- Inform technology and service providers operating in precision agriculture about data requirements for cultural and natural heritage surveys and monitoring through professional development and education.
- Incentivise the public presentation of results of sensing projects which highlight natural and cultural heritage of agricultural soils.

Sensing technologies link evidence for Soil Health and Soil Heritage

Sensing technologies used in precision agriculture, including satellite, aerial, towed, mounted and in situ IoT sensors, can provide detailed data on a range of soil properties. These data on the geophysical, geotechnical and geochemical properties of soils, as well as proxy data on plant growth, water conditions, and the wider soil system, are interpreted by agri-environment experts to support their assessments of soil health. The same data can also inform on the human heritage of soil. Archaeologists interpret sensing data to identify the locations and character of modified soil deposits or materials buried in the soil which indicate past human activities and interactions with the environment.

Routes to Action

Bringing together insights from agri-environment and archaeological experts to analyse and interpret sensing data from precision agricultural sources can better inform land management plans designed to improve soil health by accounting for the complex connections between people's actions and environmental processes over time.

- Support cross-agency planning for sensing data acquisitions where possible
- Promote the development of platforms for precision agricultural data exchange between private landowners and public sector land management organisations
- Incorporate sensing technologies and soil heritage assessments into more farm trials and agricultural experiments

Combining Soil Heritage & Health can reshape narratives

Effectively communicating evidence of the heritage of agricultural soils can improve public consciousness of the long-term role people play in maintaining their health. It is easier to grasp the long-term effects people can have on soils when the material evidence of them is presented through pictures and information about a specific place.

The appearance of archaeological features in sensing data can provide compelling visual evidence and gives us the information on which new narratives can be built.

