Written Evidence submitted by MK Soil Science Ltd (SH0046)

Introduction

MK Soil Science Ltd is small business established in 2014, based in Beaminster, Dorset, and providing scientific support for soil policy and management. Its principal is Professor Mark Kibblewhite FRSC, FIAgrE, FISoilSci. Recent assignments have supported the Horizon Europe "A soil deal for Europe", working for the European Commission, and the development of a holistic soil protection framework for the Grand Duchy of Luxembourg. In addition, *pro bono* practical advice on soil management is provided in the West Country.

This submission is in two parts. Part A addresses the monitoring of soil health. Part B focuses on an urgent requirement to better match land use to soil capability.

Part A

Soil Health

What are the challenges in gathering data to measure soil health and how can these barriers be overcome?

Measuring soil health can be made unnecessarily complicated and consequently become overly costly and too complex to interpret straightforwardly.

A problem is the many viewing points on soil health - including within the scientific community - resulting in competing suites of preferred measurements.

A difficulty is the widespread confusion between soil health and soil quality. Soil quality is a measure of a particular soil's potential utility for a defined purpose, such as crop production. Soil health refers to the actual condition of a soil of given quality, relative to an optimum state when its potential utility would be fully delivered.

A key overarching measure of a soil's health is the level of soil organic carbon within the expected range for the particular soil type. This is a workable national indicator.

The soil system is a biological engine that does work to maintain itself and to support the wider ecosystem. It needs fuel to continue working optimally, including when inputs of carbon to the soil from vegetation are constrained. Soil organic carbon provides the fuel reserves for the soil system, which is why its level is an indicator of soil health. An analogy is the importance of metabolic energy reserves to the health and performance of an athlete.

Expected ranges of soil organic carbon in different soils can be predicted from their clay content. The current level within this range, and whether the level is rising or falling, provides an effective indicator of soil health.

The technical infrastructure for measuring soil organic carbon is well-developed. Testing laboratories routinely measure soil organic carbon in soil samples and their charges are not prohibitive. Well-established sampling protocols exist for sampling soils, prior to measuring

soil organic carbon in the laboratory. These can reliably measure regional and national changes in soil organic carbon levels at intervals of about 5 years. Furthermore, there are some existing national schemes and initiatives to build on.

Part B

Sustainable land use

Commentary

The key to sustainable soil management is doing the right thing in the right place, by making sure that land use is properly matched to soil capability – as defined by its inherent characteristics, moderated by knowledge about how soil conditions are affected by land use. Currently, soil degradation often arises because this matching process is not followed correctly. Secondary degradation may then arise from poor soil management within a given land use, for example because of inappropriate tillage, cropping and grazing. Whereas policy measures of varying effectiveness exist to mitigate this secondary degradation, the primary driver of incorrect land use is largely overlooked.

A national assessment is required to define which soils are suitable for which land uses, to inform restrictions on land use to protect soil resources.

Examples of unacceptable risks of soil degradation from poor matching of land use to soil capability follow.

- Sandy loam soils that erode easily should have a permanent vegetative cover. However, many of them are in continuous or near continuous arable production with poor soil cover and excessive tillage.
- Seasonally wet soils are widely exploited for animal and dairy production, often with high stock levels and untimely manure spreading leading to soil compaction, soil erosion, and excess nutrients. A better land use for many of them would be as wet woodland, the more so as their agricultural productivity is relatively poor, or where they are productive, this depends on energy intensive drainage that drives losses of soil organic carbon.

The political barriers to introducing new controls on agricultural land use are clear. Property rights over agricultural land give wide-ranging freedom to landowners and managers to use it as they decide. Any loss of these rights will be contested. However, with property rights also come duties to the wider community. And the case for strengthening the legal underpinning of these duties in relation to agricultural land use is strong, because of the high costs to the wider community of soil degradation. A Defra commissioned study has estimated the costs of agricultural soil degradation in England and Wales at £1.2 billion per year, with 80% of these costs falling on the wider community rather than the soil user. Much of these very substantial economic damage costs occur because land use not being matched properly to soil capability.

Specific responses related to the above commentary on land use

1a. How can the Government measure progress towards its goal of making all soils sustainably managed by 2030?

Sufficient national soil data exists to identify areas where specific land uses present unacceptable risks of soil degradation.

Remote-sensed monitoring of land use is mature, powerful, and cost-effective. It can be used to assess current land use in soil protection zones to provide a base line, and subsequently to observe and report improved land use.

1b. What are the challenges in gathering data to measure soil health how can these barriers be overcome?

Sufficient relevant remote-sensed data is available now to support required land use monitoring with high spatial and temporal precision.

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

Current regulation of land use within agriculture is very limited. This allows inappropriate land use that causes soil degradation, which should be prohibited.

3. "Will the standards under Environmental Land Management schemes have sufficient ambition and flexibility to restore soils across different types of agricultural land?"

Standards and criteria for eligibility should require correct matching of agricultural and use and soil capability, as a pre-condition for participation in ELMs.

February 2023