Sustainable Soils Alliance – Written evidence (NSD0033)

Response from the Sustainable Soils Alliance, with input from members of the Consortium developing a Farm Soil Carbon Code.

The Sustainable Soils Alliance (SSA) was launched in 2017 to address the current crisis in our soils. Its aim is to campaign to restore UK soils to health within one generation by seeing soil health elevated to where it belongs as a priority alongside clean air and clean water. The SSA is a non-profit organisation (CIC number 10802764). For further information, visit: https://sustainablesoils.org/

As part of this work, the SSA is the host and co-founder of a consortium of academics, farming organisations, businesses and international code experts looking to develop a UK Farm Soil Carbon Code, a set of formal protocols that will allow farmers to quantify and verify reduced greenhouse gas emissions and/or soil carbon capture as a result of adopting regenerative farming practices. Further information about the Code can be found here. The SSA also responded to the Department for Business, Energy and Industrial Strategy (BEIS) Greenhouse gas removals call for evidence in February 2021.

1. What is the potential scale of the contribution that nature-based solutions can make to decarbonisation in the UK?

- The dynamics of carbon in ecosystems is fundamental to the success of nature-based solutions and nature-based decarbonisation. British ecosystems store c. 80 times more carbon in the soil than in the above ground vegetation (Milne and Brown, 1997 – see below; 113.8 x 10^{12} vs 9838 x 10^{12} g).
- Thus the effective management of soils will be critical in the successful delivery of nature-based solutions from any terrestrial ecosystem in the UK.
- There is c. 2.3 times more carbon in the world's soils than in the atmosphere (2000 - 2500 Pg C) and 3.5 times more than in the world's plants.
    - Lal, R. (2004) Soil carbon sequestration impacts on global climate change and food security. *Science 304,* 1623–1627.
    - See also Yang, Y. et al (2019) Soil carbon sequestration accelerated by restoration of grassland biodiversity. *Nature Comms.*
- The total amount of carbon stored in Britain's soils is c. 9.8 billion tonnes. Just over half (c.52%) is found in peatlands, which are already a focus for restoration with contributions to decarbonisation. The remaining 48% of carbon is mainly stored in managed ecosystems where the carbon storage potential offers a rapid opportunity for ecosystem-based decarbonisation (see Dawson et al. 2007 and Milne et al. 1995).
- On average, agricultural soils have lost more than 50% of their carbon as a result of human activity (primarily from land clearing, development and agriculture). This loss has been estimated at c. 130 to 176 Gt since the beginning of agriculture, which is the equivalent of 22% of the carbon in the atmosphere. On a field basis this is c. 30–40 t C/ha (see Lal, 2004).

- The losses of carbon from UK soils is well established. For example, the longitudinal Countryside Survey reports that arable soils in Great Britain have lost significant carbon between 1978 and 2007. Soil carbon continues to be degraded at exceptional rates due to land use change and management pressures. This carbon loss is not only significant for climate change, it is also linked to greater soil erosion, increased flooding, biodiversity losses and vegetation growth, including crop yields.
- Intensive agriculture has caused arable soils to lose about 40 to 60% of their organic carbon (Environment Agency, 2019 State of the Environment Report). Similarly, the Countryside Survey reports that hedgerow length in Great Britain agricultural landscapes has strongly decreased between 1978 and 2007, causing the rapid loss of soil organic carbon stocks associated with hedgerows.
- Re-carbonisation of agricultural soils is therefore an obvious climate change mitigation opportunity. The vital role of soils in carbon storage and sequestration and the potential to manage soils to increase carbon sequestration are well established. The Royal Society Greenhouse Gas Removal report (2018) estimated that soil carbon sequestration had the potential to remove up to 10 MtCO2e per year up to 2050 if the majority of farms adopted practices to increase soil carbon sequestration (pg 96 upwards of 10 $MtCO_2e$ per year or pg108 between 20 to 100 Gt CO_2 by 2050).
- Given the nature-based nature of regenerative farming practices and comparatively little capital required to deploy them, costs per tonne of CO_2 removed through soil carbon sequestration could be relatively low – especially in comparison with engineering-based solutions. Smith et al. (2016) estimated that by 2050 soil carbon sequestration could cost up to $40 per tonne CO_2eq, but could be cost negative, saving up to £165 per tonne CO_2eq as a result of productivity co-benefits. They concluded that soil carbon sequestration was the least expensive of six land-based negative emissions technologies they reviewed, and that it and biochar had fewer potential disadvantages compared to other technologies. Experience from the US indicates that in reality costs can be as low as $6 per tonne, with the potential to reduce this further – increased scale can lead to dramatic reductions in the cost to both implement and track practices.
- The cost/tonne of removals will be location/environmental conditions specific and dependent on farm-level management. When considering cost-benefits, it is worth noting that soil carbon sequestration in agricultural soils could be accomplished within a relatively short period of time (10-20 years), thus buying time for other reduction strategies to come online.
- The economic and ecosystem benefits from improving soil carbon in agricultural systems are well characterised (Pascual et al. (2015) The Economic Value of Soil Carbon. Soil Carbon: Science, Management and Policy for Multiple Benefits. *SCOPE Series*. Volume 71. 179-187). Increasing soil carbon can increase crop yields (Lal, 2004), reduce soil erosion and flood risks and support biodiversity.

2. What major scientific uncertainties persist in understanding the effects of nature-based solutions and affect their inclusion in carbon accounting, and how can these uncertainties be addressed?

- Rapid evidence syntheses conducted by the NERC-funded iCASP and BBSRC-funded Resilient Dairy Landscapes projects in 2020 showed strong evidence across multiple studies and context for soil carbon gains arising from converting arable land to woodland, conservation tillage, hedges in arable land and organic amendments.
- There is scientific consensus over certain land management practices that will increase organic matter and thus soil carbon. Practices with strong evidence for soil carbon sequestration benefits include land use change (arable-grassland and/or forest), grass-clover leys in arable rotation, hedgerow planting, conservation tillage and organic amendments (Chapman et al. 2020 iCASP).
- A University of Leeds study to quantify the soil carbon sequestration of planting hedges in agricultural landscapes showed that increasing hedgerow length across England by 40%, as indicated by the Climate Change Committee, will allow the annual off-setting of 4.7% of present-day agricultural emissions for several decades. This study, titled "Soil carbon sequestration potential of planting hedgerows in agricultural landscapes" is due for publication shortly.
- There is a need for studies quantifying carbon sequestration potential of these land management practices across a range of soil types and climatic conditions across the UK, as these inherently affect the capacity of soils to store carbon.
- Any carbon sequestration gains remain permanent over a long term if land management practices are maintained, however, given the dynamic nature of soils and rotational farming systems, we need to accept that it will take several years if not decades to be able to effectively measure a consistent increase in soil carbon stocks or decrease in soil derived greenhouse gas emissions.

3. What frameworks already exist for the regulation and financing of nature-based solutions?

What can be learned from the implementation of the Woodland and Peatland Codes for the regulation and financing of nature-based solutions?

The Woodland Carbon Code and Peatland Code have demonstrated the potential for robust standards to stimulate markets for nature-based solutions, and these are now being replicated through the development of similar standards for farm soil carbon, kelp, saltmarsh and rewilding through the Environment Agency's Natural Environment Investment Readiness Fund.

Demand for peatland carbon now exceeds the available supply of Peatland Code projects. Key supply-side issues include:

1. Lack of awareness among the land management community of the Code

2. Uncertainty from Government around future eligibility for agri-environment schemes
3. Complexity and red tape associated with developing projects for the Code
4. Too few advisors with necessary project development skills
5. Length of contracts and fears that entering into a long-term commitment may depress land values
6. Insufficiently attractive financial incentives available via the Code
7. A limited number of skilled contractors available to do restoration works

Based on the above, we would propose the following potential solutions:

- Clear messaging from UK governments is needed about eligibility for future agri-environment schemes if land is entered into the Code (whether eligible or ineligible – certainty needed). Post-Brexit agri-environment schemes should integrate the Peatland Code (and other ecosystem markets) into their application procedures, signposting specialist help where needed, to make the Code more accessible to landowners and simplify the integration of public funding with the Code. Ideally, there needs to be a consistent interface between publicly funded agri-environment schemes and the Peatland Code across all four UK countries.
- A new more attractive funding model for Peatland Code projects that pays for capital works while letting landowners hold onto Peatland Carbon Units as they are verified, with a guaranteed (and attractive) floor price at which they can sell PCUs to the Government if the carbon market can't pay higher.
- Once the financial opportunity is strong enough, it should be possible to mobilise the land advising community to raise awareness of Code opportunities and develop projects (training needed), and the impact on land value likely to be positive. Potential for publicly funded project developers being considered in Scotland and England.
- One potential solution to the supply challenge is to acquire land with the goal of restoring it through the Code. Some pension funds are looking at land acquisition for carbon, projecting strong returns for investors based on land and carbon values. Peatland sites may be more attractive than tree planting sites because entering them to the Code does not result in a loss of land value (unlike changing productive farmland to forest). However, feedback from local communities and professionals about the recent Brewdog acquisition in Scotland has been mixed, and there is already evidence (presented by Savills to the Scottish Land Commission's round-table on land acquisition for carbon) that interest from natural capital buyers in upland estates is pushing land prices up.
- The Nestlé/First Milk 'Milk Plan' initiative in Cumbria is an example of Landscape Enterprise Network (LEN) promoting the adoption of nature-based solutions in agricultural landscapes. Members from the First milk co-operative are offered a premium for adopting environmentally friendly practices on their land, such as hedgerow planting. The Resilient Dairy Landscapes is researching 'Milk Plan' as an established system of nature-based solutions. A study from the University of Leeds showed that the total hedgerow planting uptake in 'Milk Plan' was comparable to public agri-environmental schemes in the region, and that the planting rate was

considerably faster under the private sector initiative. This suggests that the private sector has the potential to support public schemes, enhancing the reach of nature-based solutions across the country.

How should a hybrid public-private financing model be regulated?

- Reed et al. (2020) highlighted a number of potential areas of conflict between public funding for natural capital and privately funded ecosystem markets. These included the potential for public funds to outcompete private funds (e.g., where public schemes offer more attractive terms including shorter contract lengths and simpler or more familiar application processes), that would otherwise have enabled the market to deliver the public good. There was also considerable uncertainty over future public schemes as the UK develops and trials post-Brexit policy over a relatively long time-frame, which could freeze the market, with potential sellers withholding projects until they know whether they will get a better price or terms under existing private schemes versus future public schemes.
- There are currently two frameworks for the regulation and financing of nature-based solutions in the UK land use sector namely the Woodland Carbon Code and the Peatland Code - however neither enables investment in agricultural soil carbon sequestration.
- A UK Farm Soil Carbon Code is therefore needed to provide the third, and most significant 'pillar' of existing nature-based market infrastructure. Such a Code would consist of a set of formal protocols that allow farmers to quantify, qualify and verify reduced GHG emissions and/or soil carbon capture as a result of adopting regenerative farming practices. It would address both of the 'needs' listed above (regulated and science-based) and generate the necessary levels of robustness, integrity and consistency for all stakeholders as follows:

1. Making sure removals are verifiable and quantifiable;

- The development of a successful Code hinges on the accurate, verified and affordable measurements of soil carbon as a result of adopting regenerative farming practices.
- Quantification: It is essential that GGR projects, be they woodland, soil-based or operating within another ecosystem are constantly monitored.
- Verification: A quality check is a critical component to ensuring that farmers implement regenerative agriculture practices and project proponents accurately calculate the benefits.

2. Instilling confidence in investors;

- Permanence: Carbon sequestration is reversible. To retain stored carbon, practices must either be continued or maintained to retain the carbon in the soil over an agreed period of time.
- Saturation: When a sequestering practice is adopted, carbon storage typically increases, but at a diminishing rate through time until it plateaus at a new steady-state equilibrium. Consequently, only a finite amount of sequestration is possible in a particular location.

- Additionality: Carbon sequestration rewarded via a code must be additional to what would have occurred anyway under business-as-usual conditions.
- Leakage: Investors need reassurance that any activities they incentivise do not result in, for soil carbon, CO2 or GHG increases elsewhere - in another location, time, and/or form of GHG. This might be 'market shifting leakage' or 'activity shifting leakage'. This is typically built into standards and protocols and would be enforced via contracts .
- Transparency: Regarding pricing, auditing, verification, administration of the relevant carbon standard(s), so as to avoid double-counting.
- Independent Verification: By an independent 3rd-party (e.g. UKAS or ISO).

3. Technology Neutral

- New technology solutions are becoming available that integrate airborne-satellite remote sensing, process-based modelling, deep learning, field-level sensing, and high-performance computing. This technology will allow for the calculation of carbon flux in the soil.
- New, simple, transparent financial products, facilitated marketplaces and trading platforms to enable landowners and investors to participate in soil carbon sequestration markets. These need to embed emerging offset principles and guidance, (underpinned by a Farm and Soil Carbon Code) embodying the features set out in this section.
- The Sustainable Soils Alliance is currently working with a consortium of leading experts to develop a UK Farm Soil Carbon Code, built around the principles listed above. The Code will be open access to all farmers and robust enough to be adopted by operators of carbon offset registries, carbon capture incentive schemes (offsets, payments for ecosystem services and environmental investment products).
- In July, one of the Consortium members, Farming and Wildlife Advisory Group South-West (FWAG) was awarded a grant under the Environment Agency's Investment Readiness Fund to develop and pilot the code, with additional funding from the Natural Environment Research Council's iCASP programme to review soil science evidence another member (University of Leeds) received funding from the Yorkshire Integrated Catchment Solutions Programme (iCASP) to perform related evidence synthesis. Additional financial support is currently being sought by the consortium from individual, public and private sources to fill additional knowledge and research gaps.

5. How should implementation of nature-based solutions be integrated with other government policies for landscapes and seascapes, for example, agricultural, forestry, and land-use planning policies?

- Soil sits at the heart of the Sustainable Farming Incentive (SFI), one of the three pillars of Environmental Land Management, the scheme that will replace EU CAP funding, and be rolled out from 2022 (England). The scheme consists of two Soils Standards (Arable and Horticultural Soils and Improved Grassland Soils) which will reward farmers for management practices that improve soil health by improving soil structure, soil organic matter, and soil biology.

- Defra have made it clear that they want to see the SFI and private schemes operating alongside one another. The challenge is how to strike the balance between ensuring the government pays for additional benefits and avoids paying for the same thing twice, whilst not 'crowding out' private funding and investment in nature-based solutions.
- This is where the proposed Farm Soil Carbon Code will step in. Through extensive policy-maker engagement, led by the Sustainable Soils Alliance, throughout the Code's development, we will provide the platform to discuss how best to mesh private and public funding for climate mitigation on agricultural land or the new subsidy regimes across the UK.
- This is equally true of other ecosystem services. It would be preferable to design schemes to allow stacking of payments for multiple services, as has been successfully done in Landscape Enterprise Networks. By aggregating demand for multiple services, it is possible to design packages of measures including those that sequester and store soil carbon that provide multiple co-benefits including improved water quality, biodiversity, resilience to drought, and improved yields (see Reed et al. 2020).

6. How should nature-based solutions be planned and monitored at the national level?

- New technologies and modelling approaches are being developed that can measure carbon and carbon flux with higher accuracy at low operational cost. These fall into three broad categories: Modelling, Proxy measurements (e.g. sensors, imagery, spectroscopy) and Direct soil sample testing.

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