SUSTAINABLE SOILS ALLIANCE

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Investment in evidence to substantiate that regenerative farming will result in improvements in soil health and increase soil carbon sequestration

Research Funding Proposal

1. Summary

- Efforts to scale up regenerative farming practice across the UK are hampered by a lack of evidence to underpin its impact on crop yields, soil health, climate mitigation, inputs use or farm productivity.
- There is an urgent need for the government and food and drink industry to fill this knowledge gap – accelerating understanding among farmers and stakeholders and addressing accusations of greenwashing.
- Two options are already open to businesses that plan to transition to regenerative agriculture and help build an improved knowledge-base for UK transition:
  (1) Establish robust soil health and soil carbon baselines for fields, farms and projects looking to transition in/over the next 5 years.
  (2) Initiate benchmarking of soils in established regenerative farms, ideally combined with 'matched' conventional farms.
- This proposal focuses on the two options above with an emphasis on soil testing, but should be seen as an initial step which can later be built out to include gathering data from farmers on yields, inputs and productivity, which require much more of farmers' time.
- Innovations in new technology make these options increasingly affordable, especially if shared among food and drink businesses who are already piloting regenerative farming through their supply chains.

2. The regenerative research gap

- Evidence demonstrating the impact of regenerative farming on UK agriculture is thin, with little data about the impact on soil health, soil carbon balance (i.e. soil carbon stocks versus GHG emissions), inputs use or yield, especially over a full farming system rotational system. Similarly, information on the economics of this transition e.g. capital investment and de-risking/increased resilience measures, which are necessary to drive this transition, are scarce.
- Research to date has mainly focused on individual practice (e.g. conventional tillage to direct drill or introduction of cover crops), mostly at plot scale not using commercial machinery. Very little demonstrates the potential of changing 'farming systems' – i.e. what happens when you change numerous practices simultaneously to transition to a new farming system.
- Existing evidence relevant to UK farming systems tends to come from broader agroecological systems studies and from specific studies into organic farming, while evidence supporting regenerative agriculture is primarily from US rangeland systems which do not reflect the complexity of UK farming systems, whether arable or grassland. The positive data from these systems cannot be used to support quantification of soil carbon in UK systems for Monitoring, Reporting and Verification (MRV), whether for Scope 3 reporting or other schemes including carbon markets.

- The UK research community is actively implementing relevant experimental studies to address the evidence gaps[1], but it will be some years before they can report from long-term studies.
- Some businesses are carrying out their own assessments on the impact of regenerative, however this tends to be individual crop/region-specific. Results are rarely published or publicly available.

3. The need to fill this evidence gap

- There are a number of reasons why the evidence gap around both soil carbon and soil health needs to be filled as a matter of urgency.
  - **Sustainable farming needs more than practice changes:** The emphasis on farming 'systems' rather than 'practices' will help move the debate from individual regenerative practice interventions whose impact might be limited, to an all-farm approach. This is where genuinely sustainable, environmental and economic gains are to be made under a changing climate.
  - **Supporting the transition of UK agriculture to Net Zero:** Consistent and clear information on the environmental and economic impacts of transitioning UK agriculture to regenerative systems will enable the delivery of suitable Government policies to support the wholesale transition of the UK farming sector and focus minds on soil carbon removals to contribute to Net Zero.
  - **Building climate resilience:** Better soil health is key to ensuring that agricultural production is resilient to increasingly frequent extreme weather, which is already experienced by some farmers and projected by climate modellers to become more significant even if Paris Agreement targets are met internationally, let alone if we overshoot those.
  - **Market growth:** Improved knowledge and hard data for UK farming systems will accelerate investment from other sources (e.g. ecosystem service markets including VCM and BNG) especially where soil health co-benefits (water filtration, biodiversity) can be demonstrated and, critically, quantified.
  - **Carbon myth-busting:** The potential for climate mitigation from soil carbon for regenerative farming is at risk from claims of "green-washing" without hard data from field sampling and reliable modelling to support reliable MRV, whether for Scope 3 reporting or private finance schemes (voluntary carbon market). The debate is currently characterised by both scepticism and exaggeration, often caused by misunderstandings around critical terms, and inappropriate use of existing data and models. This divergence confuses many and risks undermining the potential to benefit from the short-term climate mitigation potential from initiating regenerative agriculture.
  - **Reliable predictions of the future:** There is increasing reliance on data and models to predict how changes to (regenerative) farming will impact social, economic and environmental conditions within and beyond the farmgate. Local data with relevant models are now key to unlocking private investment in the ecosystem service marketplace. Reliable, consistent and extensive data across UK soils and farming systems could help unblock a key gap. It would enable more accurate quantification of soil carbon potential from regenerative agriculture in different UK regions.
  - **'Glocal' leadership:** there is global interest in regenerative agriculture, including efforts in Europe to legislate carbon removal certification and a Soil Health Law. Developing knowledge and expertise by investing in a UK evidence base will create a competitive advantage to UK companies, many of them having supply chains also in other parts of Europe and globally. On the flip side, low-carbon farming will likely become a competitiveness issue, with businesses looking to source from the most

[1] An example is a regenerative agriculture block trial set up as part of the FixOurFood project by the University of Leeds

sustainable farms possible. UK farms will be at a competitive disadvantage if they cannot demonstrate the same evidence to underpin low carbon farming reporting as the EU, Australia and US.

4. Proposal: A regenerative baseline

We call on food and drink businesses to invest in a one-off country-wide comparative survey to benchmark regenerative farming systems versus conventional systems. The output of this work would help build a UK specific model for soil health and soil carbon stock change when adopting regenerative agriculture at farm level.

- Benchmarking: Selection of comparable farms and fields across the country that reflect regenerative farming and conventional farming in the same regions where there are similar soil types and other environmental conditions.
- Farming systems: The survey would sample arable and grassland fields where available and appropriate, and incorporate rotational management where appropriate.
- Soil specific: Similarly the research should reflect different soil, landscape and climate types across England.
- Collaborative: This needs to be a collaborative exercise.
    - Costs are too great for a single organisation.
    - Regenerative should be a pre-competitive issue benefiting all supply-chain players. Businesses source from the same farmers/fields/soil.
    - Research should capitalise on available farming systems/practise specific knowledge/research held by businesses.
    - Support is needed from multiple companies to access and get buy-in from regenerative and conventional farmers.
- Participating farmers should ideally be those engaged directly with businesses/customers on regenerative projects. Ideally, if they will already be using tools such as Farm Carbon Toolkit or others to report via their supply chain, providing more context to the measurements (see section 6).
- There is a precedent for this model such as Australia's Full Carbon Accounting Model (FullCAM) and the USA COMET-Farm tool which use recent and historic farm management practices, such as cultivation methods, fertiliser use and cropping history, with the help of underlying research and soil, weather and remote sensing data, to calculate the likely change in soil carbon.

5. Costs and technology

The components of a credible, high-impact research study should incorporate as a minimum:

- Scale: 60 fields (30 regenerative, 30 conventional) across 8 representative farming regions/pedoclimates/systems = 480 fields, average field size: 12 ha.
- Cost:
    - £30 per ha for soil health assessment, including soil C stock (AgriCarbon), nutrients, pH, VESS, = £360 per field
    - Worm counts
    - + £40 (sampling costs) = £400 per field, total budget of ~£200,000
    - Including six month post-doc time for data analysis £60,000
    - **Total = £250,000***

**If split between e.g. 10 businesses= £25,000 per business*

The costs above are based on the use of Agicarbon technology (industrialised robotics process replicating soil testing lab) which enables affordable testing at the required level of rigour to comply with the (draft) GHG protocol (i.e. measuring to depth, dumas dry combustion for every sample and depth, full measure of bulk density, analysis for every sample to understand granularity and detect changes).

6. Expansion options

The initial focus of this exercise is soil carbon/health, however it should be seen as the start of a potentially recurring monitoring programme that could expand to include other metrics/indicators to highlight that the transition to regenerative agriculture will impact on more than just soil, but also yields, input use, productivity and farm economics. These should all be considered as part of the future roll-out of the research, and might include:

- There is limited information on 'system transition' to regenerative agriculture within the UK and its impact on farm productivity as a whole.
- Trade-offs, for example decrease in GHG emissions or any savings in reduction due to direct drilling may be offset by using more pesticides.
- Measurements of co-benefits, such as water infiltration and biodiversity.

Collecting and measuring information from fields and farmers on these other aspects will need additional resources, including research assistants/technicians to go to farms and gather the data, more resources for data analysis, and likely compensating participating farmers for their time. The work can be made more efficient if the farmers whose fields are sampled already provide such information to the supply chain via tools such as Farm Carbon Toolkit or other calculators.

There would also likely be a need for an academic partner to carry out data analysis and farmer engagement, including joint commitments regarding data aggregation and anonymisation.