

# **ELMs-Exchange: Evidencing how the Sustainable Farming Incentive (SFI) delivers for soil health and food security - 23 November 2022**

## *Workshop Report*

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## 1. Introduction

In November 2022 the Sustainable Soils Alliance and the University of Plymouth co-created a workshop exploring research priorities to help build the evidence base for soil health improvement through practices and actions undertaken as part of the Sustainable Farming Incentive (SFI). The workshop formed part of [ELMs Exchange](#), a University of Plymouth-funded programme designed to kick-start collaborative, cross-sector research and innovation initiatives, specifically designed to help farmers and Defra evaluate how SFI will deliver for the environment, farm productivity and food security.

The workshop was attended by over 50 experts, policymakers and practitioners, bringing together a spectrum of organisations from farming, science, government and NGOs to discuss research needs, form collaborations and propose future projects.

Following introductory speeches that set out the policy, agricultural and farm business context of the SFI, delegates broke up into groups to discuss the key challenges, knowledge gaps, and research priorities around evidencing SFI, and the wider knowledge and practice context needed for its success.

This was followed by an explanation of how cross-sector collaborative research funding can be applied, and a second breakout in which the research priorities identified earlier were built upon to develop key themes for collaborations and projects. The slides from these sessions can be found [here](#).

This report starts with a summary of the key priorities drawn out from discussions, and a background to the policy setting of SFI. It then lays out the themes raised in the small-table breakout sessions and the broader ideas that emerged in whole-group discussions. The SSA and UoP intend to use the report going forward to help define research and policy objectives, so that the opportunities around SFI can be realised to the benefit of all those involved in soil health. Following from this report, options for collaborative projects that investigate the themes raised here will be proposed and hopefully funded.

## 2. Headline themes

The workshop discussions covered a wide range of subjects relating to the SFI, spanning uptake to evidencing, and numerous fundamental questions were raised over the course of the workshop: What are the aims and goals of the scheme? How will success or failure of the scheme be measured beyond simple farmer-participation / land areas included in the scheme? What improvements in environmental sustainability and soil health are anticipated to follow uptake of the scheme and how will this be evidenced- including baseline and response data?

The objective of this report is to draw out the most pertinent themes from this dialogue in order to inform future research to both support and evaluate SFI implementation. Below is a summary of the critical recurring priorities which fall roughly into five groups, the detail of which is further developed and categorised in throughout this report:

- 1) **Clarity around SFI's overarching objectives is needed.** The current scheme lacks clarity and specific targets or thresholds in relation to vital interventions such as increasing organic matter inputs to soils. Input targets or minimum requirements are unspecified, making guidance on the one hand prescriptive, on the other vague. Given the SFI focusses on practices not outcomes, more clarity about how specific interventions will deliver improvements in environmental sustainability and soil health is needed.

- II) **An agreed framework to deliver consistent soil assessment is needed.** The key to all future progress in delivering improvements to soil health will be to establish an agreed framework for assessing soils. This needs to apply agreed metrics and benchmarks within one system for describing soils and include standardised protocols for carrying out soil assessment.
  
- III) **Robust monitoring of outcomes to demonstrate effectiveness is needed.** This includes for example collation of data on soil assessment at the start and after some years of participation in the scheme. As well as evidencing the need for and effectiveness of SFI itself, this would help build the evidence base for what constitutes sustainable management of soils, which in turn will enable ELM/SFI to deliver into wider government and sector ambitions and targets. Such evidence is still needed to safeguard soil as a national environmental priority and demonstrate the role of the farming sector in delivering for it.
  
- IV) **SFI is unlikely to achieve significant improvements in soil health or evidence of this without far greater participation rates.** Current payment rates are too low to be attractive to farmers, in many cases not fully covering the costs of the interventions required by the scheme. There is an urgent need to establish what level of payments will be required to achieve sufficient uptake and ultimately have an impact on soil health. More clarity is also needed about how Defra has calculated the payment rates. This would help build trust and foster more confidence about the process and intentions behind it.
  
- V) **Data sharing issues around soil health monitoring need to be addressed.** The public good element of soil health data has not been recognised, and without curation of the testing data, the effectiveness of interventions cannot be properly assessed. Resolving how to use this data while protecting farmers rights and understanding their wariness about sharing data is critical. This is needed to demonstrate delivery of public value for public money, communicate the value of farming and soil to the public and demonstrate to treasury the value of supporting ELM and SFI.

### 3. Policy background

In 2018, the 25 Year Plan for the Environment was published, setting explicit goals for direction of travel needed for the environment – including for soil. This was further detailed in the 2020 Agriculture Act, which included a commitment to government investment in soil health that is almost unique around the world in that it allows government to pay farmers to improve their soils. Putting this into practice, the government set out three Environmental Land Management schemes (ELM) within the Agricultural Transition Plan, that will be the basis for future rural payments, following the shift away from the EU system of basic payments (BPS).

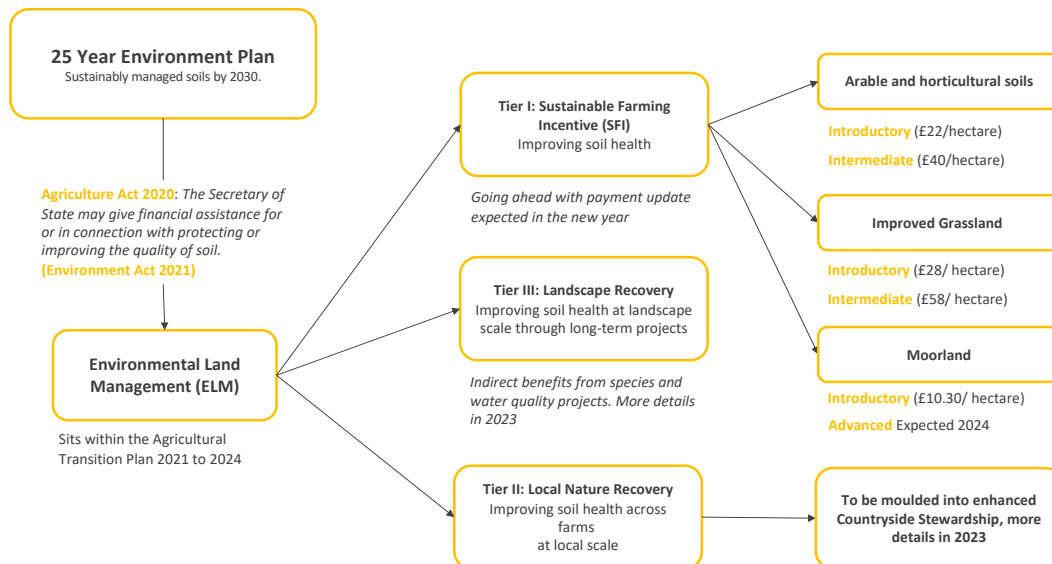
At the time of the workshop these three schemes (Sustainable Farming Incentive (SFI), Local Nature Recovery (LNR) and Landscape Recovery (LR) were in development, although we now know LNR will be moulded into an enhanced countryside stewardship (CS) scheme, in which roughly half of UK farmers

are already involved. Trials have been continuing with LR, and more are expected soon, but of the three schemes only SFI has been detailed (although not comprehensively), and fully opened for applications.

After a trial starting in 2021, the full scheme was launched this year, with payments for practices focussed on soil at its heart. As of October this year, according to Mark Spencer the Secretary of State, 1,980 farmers have signed up through the Rural Payments Agency, or roughly 2%, well below the 70% target Defra set for farmer engagement. This is a serious concern, as the scheme will not be able to deliver national improvements in soil health and the associated delivery of public goods and services unless a high proportion of farmers engage with changing away from unsustainable practices.

The SFI is currently available under three land use brackets – (1) Arable and horticultural soils, (2) Improved Grassland, and (3) Moorland. The first two currently hold introductory and intermediate standards, with advanced standards expected next year, while moorland has the option of additional standalone agreements. The former two require that farmers complete a soil assessment, produce a soil management plan and test soil organic matter for the introductory level. Further standards include more extensive green cover and herbal leys at the intermediate level. The SFI will expand in coming years, and further standards and levels expected to be finalised by 2025. We understand this is to include nutrient, integrated pest management and hedgerow standards next year; agroforestry and water buffering standards in 2023; and organic and orchard standards in 2025.

### Policy context for Soil in Environmental Land Management (ELM)



## Sustainable Farming Incentive – actions and payments

### Arable and horticultural soils

#### Introductory (£22/hectare)

- Complete a soil assessment and produce a soil management plan
- Test soil organic matter
- Add organic matter to all land in the standard at least once during the 3-year SFI standards agreement
- Have green cover on at least 70% of land in the standard over winter

#### Intermediate (£40/hectare)

- First 3 introductory measures +
- Have green cover on at least 50% of land in this level of the standard over winter and multi-species cover crops on an additional 20% of the land

### Improved Grassland

#### Introductory (£28/hectare)

- Complete a soil assessment and produce a soil management plan
- Test soil organic matter
- Minimise bare ground by having no more than 5% of the total area of land entered into the standard left bare over winter

#### Intermediate (£58/hectare)

- All Introductory measures
- Establish and maintain herbal leys on at least 15% of land in this level of the standard

### Moorland

#### Introductory (£10.30/hectare)

- Identify and record the soil and vegetation types and condition, and presence of historic and archaeological features
- Assess the public goods the moorland is already providing
- Identify opportunities to maintain or enhance the public goods provided by the moorland

#### Example guidance on the actions

##### Produce soil management plan

- soil type, structure and composition
- risks and problems that need to be addressed
- how you currently manage the area
- proposed management actions to improve soil health

##### Test and add organic matter

- take soil samples and analyse, which will usually be done by a commercial laboratory
- apply organic manure
- use green manures, catch crops or cover crops
- chop or leave, or incorporate, straw
- introduce grass or herbal leys into an arable rotation
- include legume species or legume rich mixes in rotations

##### Details of soil actions found via

- AHDB characteristics of different soils
- Natural England's Technical Information Note about soil texture
- Environment Agency's 'think soils'
- SRUC Visual Evaluation of Soil Structure (VESS)

Running parallel and underpinning the outcomes of soil policies such as those in ELM, are the mechanisms for monitoring soil health. There are now four principal soil monitoring initiatives in England, three of which are government and one of which is developed by industry – although AHDB has aspects of an arms-length government body. Following decades of [minimal or inconsistent investment](#) in soil health monitoring, there was not enough soil data to embed a target for soil in the Environment Act of 2021. These monitoring initiatives are being developed to rectify this, and we hope will pave the way to legally binding targets for soil in England. The last policy development relevant to soil is the Soil Health Action Plan for England (the SHAPE) announced last year, and more details on which we hope will follow in the New Year.

## Principal soil health monitoring initiatives in England

	<b>National Soil Monitoring (NCEA)</b> (Defra)	<b>Soil Health Indicator</b> (Defra)	<b>Soil Structure Monitoring</b> (Defra)	<b>Soil Health Scorecard</b> (Industry)
<b>Provider:</b>	Natural England Subcontracted to FERA/ UKCEH	JNCC Subcontracted to Cranfield	Environment Agency, UKCEH, SSA	AHDB Subcontracted to NIAB, ADAS, SRUC
<b>Purpose:</b>	To provide data for baselines and track changes in soil health nationally	Developing a mechanism to measure soil health. Multiple indicators may be required	Provide data on and benchmarking for soil structure across all soil types and land uses	Provide consistency in how mineral soils under lowland agricultural management are measured and benchmarked at field scale
<b>Considers:</b>	Topsoil	Topsoil and subsoil	Topsoil and subsoil	Topsoil
<b>Data collected by:</b>	Specialist scientists	Works with data from the other initiatives	Farmers / land managers	Farmers / land managers
<b>Applications:</b>	Monitoring, reporting, target setting, modelling	Reporting, target setting	Farmer / land manager assessment, national monitoring and target setting, evidencing SFI	Farmer / industry target setting, monitoring soil health response, supporting soil health discussions, identify management options, evidencing SFI

## 4. Breakout session 1: Key challenges, knowledge gaps, and research priorities around evidencing SFI

### 4.1. Key challenges

#### Lack of clarity

- The most frequently raised challenge, that has implications for many of the other themes below, was a lack of clarity around questions of soils policy as a whole. This was identified in discussions on the ELM schemes themselves, as well as broader agricultural policy, with many participants indicating that they, and the practitioners they work with, have a generally poor understanding of what is involved in the new schemes. This was loosely described as a lack of ‘decision-grade information’, especially relevant to possibly higher payment rates expected in the future but without a clear commitment from government about when this will be.
- At the broader scale, there was uncertainty about the overall aim and direction of current agricultural and environmental policies. Although policy documents explain priorities for a sustainable transition, the guiding information of how this translates to farm practices and payments has not been well communicated to the sector, leaving NGOs feeling unassured in advising farmers.
- This lack of clarity is linked to wider unpredictability of government, with many delegates expressing uncertainty about whether the current schemes would last through political instability that has already seen significant shifts in farming policy. This was demonstrated in the

lack of uptake of SFI, with many arguing that farmers are waiting to see how policies settle before engaging with a scheme that might be scrapped or altered thereafter.

- Adding to the confusion are a proliferation of NGO schemes that are working to enhance, reward or monitor soil health (RSPB, council-led, catchment-based) which has already resulted in inconsistent results being collected and siloed thinking about how to manage soils.
- Within SFI specifically, it was felt that there is not sufficiently clear guidance on what is required in order to receive payments. Although it was acknowledged that SFI is more accessible than some environmental schemes, many delegates described farmers' incomprehension of how to actually carry out the actions prescribed, such as SOM analysis, or the 'stackability' of tiers.

### Farmer Pressures and Engagement

- The second set of challenges identified concerned the difficulty in convincing farmers that SFI is a worthwhile scheme to engage with, and especially in detailing how SFI can improve farmland productivity, rather than be a simple box ticking exercise. The actions laid out are intended to improve soil health and it is hoped that they would hence have benefits for farmers beyond the actual payments. It was questioned whether this had been fully explained by government, or whether farmers understood this but still didn't consider the measures justifiable.
- The relative lack of engagement with SFI noted in the policy background above was highlighted repeatedly. Several principal barriers to uptake were highlighted:
  - The money offered is not attractive or potentially not even feasible for farmers, given the resource needed (time and costs) for data collection and soil testing.
  - The flexible start date, which has meant many farmers who are able to operate with outgoing BPS are simply waiting to see what more may be offered.
  - Constantly changing information and the perception of shifting goal posts means that some have stopped listening and are trying to continue regardless of payments.
  - The online application process may also be off putting for some, and although there may be less paperwork than previous payment mechanisms, applying is still a significant strain on farmers' time.
- Another key aspect of farmer engagement highlighted was the relationships between farmers themselves. In some cases this can be beneficial for uptake, as in the potential for farmers to observe neighbouring fields and, for example, see the good herbal leys can do. Conversely it can also mean if one farmer dismisses SFI as too complex or not worthwhile, this may have an influence among their immediate farming community.
- A final point raised was how inclusive the scheme is for the wide range of farms across the country, as it is possible the scheme is currently too nationally orientated, and so not adequate to meet regional needs. It is also possible certain farms will be more able to engage and hence maintain profitability, while those less able might be put at a disadvantage, with potentially severe implications for some rural communities.
- Overall, it is important to note that many farmers are already carrying out the actions outlined in SFI, but have yet to sign up, indicating there are significant engagement challenges.

### Practices

- As one of the reasons behind limited uptake, an especially important underlying question is whether SFI will actually deliver for soil health. It was questioned whether the ultimate objective

of the government is to improve practices, or go further and improve soil itself, and what this would mean for farmers engagement.

- There has been a wider awareness of soil health over the last 5-10 years and farmers know it is important, yet there may yet be a shortage of people who have been farming specifically with soil health in mind. Added to this is a tangible lack of expertise – both at in-field and corporate level – when it comes to soil knowledge. This has left farmers poorly informed, and the actual level of soil literacy among farmers is unknown. In parallel farmers are being pushed to find alternatives to historically used chemicals which are perceived to be becoming both less effective and more expensive. This is against a background of increasing pressure from the market at a wider level.
- The lack of trust in government suggests farmers don't necessarily believe the actions outlined will provide for their soils, and ultimately improve productivity, but it is less known how other stakeholders, such as agronomists and environmental NGOs view the outcomes of SFI.
- Although there is guidance linked to SFI through AHDB resources, it has not been presented in a uniform manner that would allow consistent testing. Farmers need to be supported to feel competent with qualitative soil measurements. An issue with the indicators as currently laid out is that some are objective (laboratory tests) and some are subjective (broad texture, colour).
- These points sit within a broader problem, which is lack of holistic and consistent farm advice and people qualified to deliver it. Seeing the benefits of practices outlined in the context of a whole farm system has been difficult for farmers, and there is no nationally respected body to advise on how SFI can be beneficial at the wider scale.

#### Monitoring methods

- Critical to the conversation about whether the aim of SFI is to simply improve practices or to deliver improvements to soil health are questions around how to baseline and monitor progress. Especially pertinent is the lack of a single accepted protocol for soil assessment, which was raised numerous times over the course of the workshop and blamed for hindering progress on all fronts. The AHDB Nutrient Management Guide (RB209) is a good example of where an universal protocol has been established, although it should be noted that this is a single point of guidance that can sometimes be unsuitable, as in supporting greater use of fertilizer than may be optimal for farmers' incomes or the environment.
- Farmers do not know where, how or what to monitor for consistency and usefulness. This lack of consistency means results cannot add up to give a national picture of soil health nor can they be meaningfully measured against others. Both would be invaluable for future policy.
- Interpretation of soil tests is also an issue in that it is not clear what constitutes a sustainable healthy soil. Herein there is an urgent need to consider soil standards in the context of the local environment (e.g., soil type, climate). In addition, benchmarks need to be established against which to assess change; How will these benchmarks be established i.e. with historic or recent data? It is also important to standardise soil carbon measurements to enable spatial and temporal comparison.

#### Data Transparency



- Beyond the data collection methods, there is concern about how the increasing amount of data that will be collected if uptake of SFI improves will be used and by whom.
- Clarity is needed about what the data will be used for, and who will own it. If uptake increases, then data collected will become a hugely valuable resource for government, but there are concerns that there isn't the expertise or oversight to collect this appropriately and effectively to realise its true value to the industry and wider society.
- Following from this are questions over data stewardship and sharing. It was stated that SFI supported data should be shared and considered a public good in itself i.e. be open access. However, making it both anonymous to avoid farmers singling themselves out for poor quality soil, and accessible so that it can be used effectively at both the national and local scale, presents a considerable challenge.
- In addition to this it was questioned whether the skillset – and indeed the capacity – exists within the country to interpret the results from all these soils tests raising questions about collection of contextualizing meta data from the start. The question was also asked who will be responsible for collating the information to understand implications for holistic farm management.
- There were repeated calls for better and free access to soil maps and their underlying data as well as the need for these to be updated to a more user-friendly and intuitive interface.

#### Enforcement and evidence of actual delivery of public money for public goods outcomes

- There is already very limited enforcement of the conditions needed to receive rural payments, and it has been made clear by Defra that future schemes will be about encouraging good practice rather than tripping farmers up. This was a concern for some, as if farmers won't be penalized for poor soil management there's little reason to improve soils, especially where there are doubts about payments not being attractive enough.
- Lack of enforcement results in lack of compliance, and no repercussions could have consequences for soil health, with some farmers potentially inclined to exploit the system by degrading land in order to be paid to improve it.
- Ultimately there is also concern over how SFI will demonstrate the delivery of public goods, and how this information can be shared with the wider public so they in turn can be supportive of rural payments.

#### Finances

- Following on from the points raised about engagement, the financial viability of SFI is critical to evidencing how it can deliver for soil health. Currently, the payments are perceived as not nearly enough to make up shortfall in basic payments and cover the increased costs of soil testing. This lack of sufficient financial support results in undesirable practices continuing and hinders uptake of the practices to protect soils.
- This could be compounded by the nationwide nature of SFI. Farmers more limited by their location who are already farming in alignment with the environment may need more support, without which they could move to less sustainable practices or be forced to stop farming. If farms go on to close in less populated areas the wider social impact can be significant.
- Understanding the return on investment, at the farm scale, for such actions is also important, and again has not been effectively communicated. For example, arguments have been made for

expecting a long-term reduction in the need for fertiliser if soils are better managed, but financial aspects of this have either not been evaluated or not shared widely.

- Closely linked to the overall need for improved clarity are questions around stacking, double paying, and compatibility with other schemes. It is not sufficiently clear how SFI will link with CS, or what the payments and implications are for tenant farmers and private finance, such as ecosystem markets.
- The question of private finance came up time and again. There is very little detail about how it will be encouraged or enabled, whether engagement with it might preclude engagement with SFI – or vice versa –, or how the rates might differ to those offered by SFI. Currently several different ‘packages’ of soil testing are being advertised within the private sector, which has added to the overall lack of clarity about how to define soil health.

## 4.2. Knowledge gaps

### Data

- There is lack of information from Defra about how well historic and current schemes operate and crucially, what environmental improvement data has been collected from them. This represents an important gap in understanding and a missed opportunity, permeating all agricultural policy decision. Shining a light on this would help better inform future schemes. It is expected that these data exist to an extent, but limited provision has led to a blurred picture of prior scheme results, as data are often not specific in terms of farm type, soil type, location etc.
- Soil maps were highlighted by many as a key gap. Open access mapping of soils that is user friendly and can underpin monitoring in different contexts is needed.
- Lastly there are some specific gaps within SFI that need further exploration and clarification. While an emphasis on practices such as cover cropping may seem simple, this would be impossible/inappropriate for some crops (e.g. sugar beet).

### Farming methods

- Schemes including CS have been running for several years, but detailed data on how these practice-incentivized programs have impacted soil health hasn't been made widely or clearly available, and so it is opaque whether they have been successful at the national scale. Long-term information on whether actions like herbal leys or minimum tillage make a difference in the context of drought and flood resilience would be highly beneficial if incorporated into the design of new policy.
- Looking beyond SFI, there were still significant questions over which farming system actually works best for which soils and in what context. SFI looks to certain actions that are designed to improve soils, but there is still debate over what defines soil health, and so more collaboration is needed to define this and then understand the best methods to reach it by farm type, soil type etc.
- There is no better time than now to start collection and standardisation of data about how already-active SFI schemes are progressing.
- Lastly it was noted that currently much SFI focus on soil testing is on texture and organic matter, with less attention paid to soil biology (roots, fungi, bacteria, microbes, worms). Although there

has been considerable recent research on the importance of good management of the microbiome and fungi, this has not been recognised in policy incentives.

### Participation

- Following from the challenge of engagement, a key knowledge gap is understanding better what drives participation in SFI, and more broadly agri-environment schemes in general. Without clarity on this subject, it is hard to direct future efforts. Part of this is understanding what farmers need or want in order to engage, and what their priorities are for soils. Is the main need information, financial stimulus, or something else?
- Appropriately attractive financial reward is critical - the research need is to establish the threshold levels of payments required for the new schemes to be attractive to most farmers, and secondly, to properly evaluate the public goods benefits of the farmer's actions justifying the payment rates with evidence of their downstream cost-benefits.
- Some farmers will be more able to afford to engage in trials, and so reaching those farmers that are least engaged will be critical – geography, income, farm size could all influence uptake and this should be captured and mapped.
- One aspect influencing engagement is also likely to be around data collection itself. It will be important to target and upskill land agents as they are in a position of trust, as well as skilled agronomists working from a common set of guidance and protocols. Farmer-collected data can supplement that collected by experts at the national level for the nationwide picture, but this needs connecting effectively. A barrier to this is potentially the knowledge gap around the difference between an outcome (e.g., carbon sequestration) and an output (e.g., a cover crop).

### Wider system

- There is no wide scale understanding of what constitutes a 'public good'. This may be the cornerstone of environmental policy and much discussed but may mean different things to different people. Water, air, nutritious food, carbon and biodiversity could be prioritised, and there are likely trade-offs when looking at each. For example, switching from cows to sheep could be beneficial for greenhouse gas balances but not necessarily beneficial to that specific soil.
- Evidence and data for supporting this environmental decision-making that takes trade-offs and unintended consequences into account is needed. For this, evidencing benefits of change at scale that also understands trade-offs and how to balance them needs de-siloing. This could only be achieved through multi-university collaboration and would show the evidence behind results of shifting from one system to another in order to engage with SFI. An example may be a shift from arable to grazing, and how meeting some objectives may mean missing others (e.g. pursuing soil carbon to the detriment of another 'indicator' such as skylarks).
- Farm level innovation should be supported as much as possible and peer-to-peer learning should also be encouraged and supported, so knowledge can be effectively shared. Many farmers are innovators and experiences from early adopters will be valuable.
- There are also questions over how much farmers know about their soils. Although many are well aware of risks to soil health and approaches to remedy them, there is a lack of general and detailed soil knowledge running right through the entire education system.

### Measurements

- There is a clear need for a soil measurement protocol, something that is simple, clear and replicable. Such a protocol might have different expectations for different standards. For example, in introductory standards, the metrics might be cheap and have a low expertise bar – higher levels might require third-party expertise and costs, laboratories etc. A one-size-fits-all approach would not be appropriate, as different options and landscape/farming specific guidance will be needed. However, the underlying framework, benchmarks and metrics should be universal and able to deliver data/results that are applicable for other schemes.
- Making this contextual framework collaborative with common shared standards will likewise be important. This would give confidence and help target regional and local objectives. The AHDB Soil Health Scorecard is an example of a good start for a framework as might be Local Nature Recovery Strategy methodologies.
- As noted earlier, that lack of consistent baselines is hampering joined-up action. The question is not what baseline, as there already are baselines, but making these consistent. It may be that aggregated benchmarking at a local or regional level will be needed. The term baselines itself does not mean the same thing to everyone, this again requires consensus and agreement.
- Mapping is really needed. Cornwall habitat mapping is a good example, but we need an open-source tool to zoom into detail on areas with a larger variety of habitats and soils, that links to standards. Part of this could incorporate an independent government advice tool to enable farmers to take action on the results of soils tests.

### **4.3. R&D priorities**

#### What works best for soil

- There are still considerable gaps in knowledge and a critical need for understanding the farming systems that are most effective for restoring soil health. Although there are numerous studies on how particular actions can have positive impacts, this is not joined up by peer-to-peer information sharing to create effective holistic advice.
- Research is needed which should also take into account the economic viability of a farm and be both wide enough and detailed enough to cover the variety of soil types and farm situations.
- As repeatedly noted above, a standardised framework to underpin protocols and methodologies for soil health assessment are essential. Research into what this could look like is paramount, and a manual like RB209 for soils was brought up several times thought the workshop.

#### Cost-Benefit of SFI

- Key to improving uptake and evidencing SFI success will be a full cost-benefit analysis of the scheme, which needs to include potential long-term benefits to soil, and how that fits into farm economics. Building a clear and realistic picture of the time, energy and financial costs of engaging with SFI and assessing whether the payments both cover and fully compensate this is needed.
- As noted above, there also needs to be cost-benefit evaluation of financial incentives for changing management practices- what works and how much are the benefits worth not only to farmers but in terms of public goods and benefits such as reduced flood risks. The current rates of funding appear to under-value both the farmer's costs and time, and the public goods benefits of SFI changes to management.

- At the other end of the spectrum, we need to understand what the impacts would be of low SFI take up – nationally, locally, and in relation to wider environmental and food security objectives. What would it mean for the public, government and farmers, and what other options are there?

### Education and Knowledge-Exchange

- The current lack of cohesive soils education is a major block to better soils management and policy. Understanding where soils are in the education system and working to embed them in the curriculum from primary school is an important starting block to ensure better understanding among future generations. There is a need to embed soil science in agriculture and farm business management courses, and in vocational courses for farmers.
- Providing better soils education and sharing knowledge among farmers will be important for better practices to take hold, and research into how to best disseminate this information could be valuable, as currently conduits between academia and farmers are not necessarily well established. Farmer-oriented media and workshops among farmer groups could be options, but research is needed to investigate the most trusted sources of information for farmers.
- Also raised were options for communicating to farmers more general business advice for the actions detailed in SFI. Part of this could be a modelling tool to examine the place of different systems/crops/livestock in improving soils health – as well as the specific risks associated with these for specific soils under specific circumstances. This last nuance is critical and should not be shied away from.
- Lastly, it will be vital to support communication between farmers to enable collaboration in any transition towards different farming systems, as well as between farmers and government to allow feedback exchanges whilst recognizing the changing political landscape. This could be from a top-down, bottom-up body or even a collaboration between the two.

### Data

- Before considering new data, there is a policy challenge around using existing data (UKCEH Countryside Survey, Cranfield University National Soils Inventory and RPA data). A valuable research opportunity would be to map all the available data sets and understand how they inter-relate to give a full picture – some are public, some are proprietary. This could then feed into baselining and development of benchmarks, but there are questions about who will have access to the information.
- With increasing uptake of SFI, considerably more soil data will become available, and there are numerous research options relating to the collection, storage and usage of this resource. For data to be useful in guiding policy and practice the sampling and analysis methods need to be standardized - inappropriate or inconsistent sampling approaches and different analytical methods can give results that are not comparable or equivalent.
- Before considering what could be done with data, it is firstly important to understand how farmers feel about mandatory data collection, their appetite for sharing it at different levels, and the potential for rewarding those who upload farm data as a delivery of public good in itself.
- If made available to government, establishing how to make the most of new data, to ensure it effectively informs decisions should be a priority. Part of this is exploring who will have access and which body will have overall responsibility for it.

- There could be opportunity for broad scale data analytics to provide a wealth of information for policymakers, but how to statistically compare data from the wide range of farms and schemes, and recognising differences between the regional and national picture will be a challenge.
- The local aspect of this is key, and options for research could consist of developing localized land use frameworks that translate standardised protocols, taking into account regional flexibility around soil structure and soil biology.
- It is essential common sampling, analytical and reporting methods are established to underpin all this, even if they are not perfect, to allow for comparison across farms.

### Engagement and Behaviours

- There was wide agreement that research should be farmer-led as much as possible. There was a feeling that much of the research on agriculture has no real implications on farm because it is not useful to practitioners. Soil Association Innovative Farmers and Farm Carbon Toolkit are good examples of where this does work well.
- Farmers conducting robustly designed and executed trials and sharing these findings need to be financially rewarded, for the costs, risks and time involved. Farmers may need help from experienced field-trials research teams to design and run high quality trials.
- A major question already noted is what drives engagement in agri-environment schemes. Qualitative understanding of farmer experience in past schemes is needed here, and comprehensive research establishing barriers to uptake. Part of this is understanding the role of various stakeholders, especially agronomists and retailers, who are drivers of farmer decisions.
- Ensuring farmers are engaged in the process of understanding their soils is important, so this job is not always passed on to land agents who takes agency away from the farmer.

### Technology

- The cost of sampling was proposed as a major barrier to engagement. One option to address this would be to look at low-cost testing technology, and potentially developing in-situ testing so soils aren't altered on their way to lab. This could be more reliable, more representative, cost-effective and potentially engage farmers more with their soils.
- Linked to this is the role of wider technology, and options for tools that collect soil assessment information and record it centrally.
- There were further suggestions around how technology can help provide advice directly to farmers, as for example species ID apps do.

### Integration and wider impact

- The question of how to make soils a business priority was highlighted as critical and one that could be approached very differently from how it often is now.
- A recurring point throughout the workshop was how schemes will fit together, and with the wider farm business. This is especially relevant to private markets, such as carbon and biodiversity, where there is potential for offsetting to compete with SFI actions and supply chain objectives. Understanding how initiatives interrelate is a considerable research challenge and an ultimately there is a case for a government extension service to take this on.

- This relates to much wider integration of environment, economic and food production goods, which are sometimes perceived to be competing between themselves. Making improved soil health a key aim of the whole food system may be a way to bridge trade-offs. There is research going into these subjects, but a considerable lack of aggregation, which is needed for this to add up to the sum of its parts. Monitoring of public goods delivered from this scheme (i.e., establishing the value of public goods from soil health, and updating the [Total Cost of Soil Degradation in England and Wales](#)) will be important. This brings up research options on methodologies for monitoring/recording and verification in the field. Equally important is refining these kinds of assessments to regional scales and different farming landscapes, and in relation to different management practices. One of the weaknesses of the previous economic evaluation of soil degradation was uncertainty regarding the extent of soil erosion losses- since there is incomplete data available on that. Refining the economic costs with more robust data on soil erosion will be key.
- More practical knowledge about natural capital outcomes is needed. This should include baseline and contextual benchmarks for what good looks like and therefore possible targets, clarity about what levers are needed to action natural capital outputs and what practices will actually will lift a baseline.

## **5. Breakout session 2: Key themes for collaborations and projects**

### **5.1. Barriers to uptake**

#### **Participatory and co-created research and public understanding**

In carrying out research about soils and agricultural policy it is essential farmers are involved at every step. Part of this, and the most important step for many participants, is asking farmers what they need to succeed as a resilient business, regardless of ELMs/SFI. Therefore, while the questions identified here can form the basis of initial investigations, it was agreed that farmers should be involved from the beginning, which would include asking questions such as:

- What is working on your farm?
- What has been your experience with other environmental schemes?
- What has driven past engagement
- What might affect your decision to get involved with SFI?
- What concerns do you have about data sharing?
- What are your broader motivations for farming (care for the land, for place, for the environment, questions of personal identity, lifestyle, community, etc)?
- Use virtual reality to help visualise possible changing practices over time and highlight the importance of environmentally conscious decisions
- What do you need to operate a sustainable business?

Looking further there are questions around the outputs from SFI actions:

- What training or understanding of soil health and soil functions is needed to help farmers better understand how to improve soils and how should this be developed?
- How much more can a farmer do in an environmentally saturated landscape?

- How can we make data accessible and usable for farmers?
- How can we help provide open-access maps to communicate data better?

The approach to this research needs to be simple and accessible, with a focus on bridging the understanding gap. Investigating other farmer-led research can inform this process, as can working together through citizen science to build trust. Looking beyond farmers alone, research could investigate:

- Citizen science style projects involving bringing people closer to the land, this could be broken down to communication gaps and preconceptions
- One idea was 'adopt a farm' to bridge dialogue between the city and the farm
- Research into education and integrating soil health knowledge into the curriculum
- Partnerships with schools on soil projects, encouraging understanding from a young age
- Wider research into science communication, with focus on translating test and trial results for the public audience
- Generating understanding of public perception of soils
  - Questions to the public (e.g. through supermarkets) 'What is your perceived idea of good soil?'
  - Questions to supply chains 'What do you want from countryside rural business?'

## 5.2. Optimal Systems

### **What is the optimal farming system balancing environmental improvement and farm economics? What is the cultural heritage?**

This is a very broad question that needs a local context to fully understand the structure of a farm business alongside natural capital and ecosystem services. If successful, developing this answer will greatly contribute to the appropriate advice and guidance needed by farmers. The approach should be holistic, balancing environmental improvement with better soil and better productivity, but needs to be detailed enough to apply to individual farm situations. The barriers to this understanding that research can look to overcome include:

- Investigating funding, that is currently inadequate, but equally does not show the huge value to society of the value of those activities as ecosystem services.
- Maintaining a local focus without ignoring wider geography
  - Top of the catchment may improve ecosystem services, but lower down the catchment, change may not occur/may decline due to pressure
- Looking at historic optimal farming systems, future proposed systems taking into account scientific and technical advances and what farmers see as the optimal
  - Use of livestock to 'condition' the soil
  - Input systems of nutrients (compost) from urban to rural.
  - Vertical farming systems
  - Upload what you have now/what you do/current finances. Then design in a playful/engaging way what the government agenda seeks to see, and visualise as a sliding scale of what change could look like
- Evaluating what society currently values. E.g. local jobs/price?



- How this relates to a level of payments that would keep farming sustainable
- Evaluating trade-offs in carrying out actions
  - E.g., less soil erosion but more chemical use
- Examining who dictates what environmental improvement is

Anecdotal evidence is there to support different farm systems, but it is not at the level needed. Options to address this and challenges in sustainable farming include:

- Analysis of the benefits of systems such as mob grazing (ley pasture/forage)
- Questioning any conflict between public access and conservation
- Possible increased labour requirements in organic systems
- Ecological consequences of peatland degradation and rewetting
- An aging farming population due to lack of farmer pension schemes
- How to account for beneficial ecosystem services
  - New funding stream to account for improved environmental services
  - Understanding of stacking payments
- Differing standards based on farm size to balance the economic 'viability' of smaller farms

Key to research on local context will be:

- The need to geographically manage nutrients and consider biodiversity across regions.
  - Understanding changes in farming patterns that particular to regions. For example, understanding the impact of a decline in mixed farming in the South West for regenerative farming targets.
- Recognition of existing regional baseline
  - For example, in Devon farmers may have invested in caring for hedges for many years, whereas in East Anglia farmers may suddenly benefit financially from planting a new hedge.
- Incorporating Natural Capital Accounting.

Options for research around the wider farm business might include:

- The role of alternative supply chains that can incorporate supermarkets, local processing or local sales
- Options for non-farming diversification, including tourism and accommodation.
- Cultural heritage and working woodlands. What is the cost of the loss of eg. the Lake District farm-scape to Society?

### **5.3. Baselines, guidance and standards**

#### **Collation and dissemination of knowledge to those who need it**

Here there are questions about the production of data and who owns it, with one key topic being how to combine farmer data to be put into the public domain and how to address possible farmer distrust when it comes to providing their data to Defra. If farmers are receiving public funds for public goods, there is an argument that they should then evidence this. Options for research could include:

- Methods for combining and sharing data

- Farm business survey
- Investigating issues of farmers trust when it comes to sharing data with Defra
- Small cluster trials of data sharing
- Investigating options for insurance
  - Farmers are going to be moving into a more volatile market in terms of prices received for commodities (because we no longer effectively are subject to CAP). Therefore, they will have to think about risk management in new ways. Insurance companies may then have an interest in understanding what 'good' management/soil looks like.
- Considering the value of soils data as a public good

Linked to this is the challenge of uncertainty, which brings further research questions:

- Social science investigation could consider what certainty is needed for farmers to really engage in schemes, as well as to innovate: how policy uncertainty correlates to uptake.
- Economic and social science investigation into transparency about how payment rates are calculated can give farmers assurance they are being paid for the right action, and confidence in examining cost-benefit.
- Harmonisation of existing and upcoming baseline assessments, e.g. soil frameworks, methodology, sampling depth etc.

## 5.4. Big data

### Its use for benchmarks, baselines and standards

With the collection of more data comes the question of who will aggregate and share it. Consistency is a key challenge, and there are several barriers that provide research opportunities:

- Are comparisons to be made with neighbouring farms, or at the local or national scale.
  - Systems level thinking should guide the use of data
- How to create a system by which farms can be fed back data in a useful way.
  - Farmers are consistently asked to share more and more, but what could be the positive feedback for them?
- How to reconcile the short-term cost with a long-term reward for collecting and sharing data
- Best approaches to anonymising data without losing its valuable geographical context
- How much data to collect, and the aggregation scale – theme/system/space geography/soil type
  - Identify boundaries, characteristics separating them, and parameters from farm to farm for data to then be useful
- Understanding how to describe the monetary value of soil, and the role of supply chains in incentivising soil testing
- Farmer willingness to give data, and making clear the value in understanding their farm relative to other farms

Making that data useful relies on standardised frameworks, benchmarks, baselines and standards.

Options for research into these include:

- Understanding whether farmers would be better off with a solid protocol behind soil assessment and data collection backed up by clear guidance.
- Synthesis of monitoring initiatives
  - including academic, farmer-led research and common protocols
  - What these initiatives already do and how they vary
- Literature review and collation of information to feed to advisors
- Online tools that can be easily used by practitioners
  - Cross reference with soil benchmarks
- How to model land use and land use change

## 5.5. Testing Methods

### **What works, what do we need (on site, farmer led/friendly)? Optimising frequency and spacing of sampling to understand improvement in an economical and efficient way**

Several ideas were developed around testing methods, with a common theme that involving farmers as much as possible in, for example counting worms, can be very informative for farmers themselves and gets them thinking more about their soil. On-site farmer-led methods are most effective. Further research options included:

- Investigating the possibility of establishing demonstration centres to train farmers in soils.
- Recognition that several seasons of information will be needed to draw a clear picture
- Looking at cheaper, rapid and more accessible testing to encourage uptake
  - Success of low-tech testing methods, for example Vidacycle
  - Ideally free testing would be in the guidelines to maintain accessibility
- Tech tools that could make it easy for farmers to submit their soil data and see where they sit in a box and whisker plot of their soils type, with links for improvement.
- Integrating smartphone app usage with social media
- Limiting metrics to the essentials that give the clearest picture of farm situation.
- Whether it would be valuable to narrow down to one or two parameters which give a really good adequate overview of soil health and how soil can be fit for purpose on a farm scale.
- Validation of novel approaches, about which little is known in terms of their actual usefulness
  - Especially those relating to microbiology

## 5.6. Participation

### **How does it change farmer behaviour and improve soil and add value?**

### **What are the indicators of these?**

Any results, data, indicators from the scheme will need to be collected with two different constituent groups in mind: farmers who need to see the scheme is working for them, and the general public who need to know their money is being well spent.

- Farmers will be interested in a number of data outputs. These will be on a sliding scale of direct to indirect impacts, including:
  - Income (£)
  - Immediate impact on their soil health (in particular organic matter change)
  - Impact on farm productivity
  - Impact on their costs – especially where nutrient costs and machinery are taken into consideration
- More broadly, Defra needs to understand how engagement with SFI might be changing business operations
  - Is there a positive feedback loop whereby introductory standards lead to more ambitious standards and overall sustainable farming pathways?
- For the public, there needs to be research into perceptions of farming and what a well-farmed landscape looks like
  - E.g. moving from neat hedges towards a greater tolerance of more naturally occurring vegetation

Looking at resilience could be a starting point for investigation. As an example, Yeo Valley shared their experience of showing the impact of certain practices on soil structure which led to roots better accessing water and this being a vital tool for driving enthusiasm. Potential research opportunities around this can include:

- Using local and national data to establish benchmarks that can then be rolled out through local clusters
- Using farm insights to suggest and recommend what should be in future standards – particularly crop and landscape specific

With regards to public results and indicators of the scheme, there is a concern that as it stands taxpayers do not value soil as much as they should. This needs to be addressed if the SFI is going to report on progress over time and gain public support for investing in soil.

- The public will want to know what all the money was spent on.
  - The public understand carbon and biodiversity increases; however this needs to be clearly explained and connected with soil
- Other areas where research is needed are around tenancy agreements, ownership of carbon and the incorporation of woodland into the schemes