HOUSE OF COMMONS

# Environment, Food and Rural Affairs Committee

## Oral evidence: Soil Health, HC 963

Tuesday 7 March 2023

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Watch the meeting

Members present: Sir Robert Goodwill (Chair); Rosie Duffield; Dr Neil Hudson; Robbie Moore; Mrs Sheryll Murray; Julian Sturdy; Derek Thomas.

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### Witnesses

I: Martin Ballard, Group Head of Environment, Society for the Environment; Professor Bridget Emmett, Science Area Head for Soils and Land Use, UK Centre for Ecology and Hydrology; and Dr Jacqueline [Jack] Hannam, Senior Lecturer in Pedology, Cranfield University, and President of the British Society of Soil Science.

II: Kyle Lischak, Head of UK, ClientEarth; Matthew Orman, Executive Director, Sustainable Soils Alliance; and Graeme Willis, Agricultural Lead, CPRE.

Written evidence from witnesses:

– Society for the Environment

- UK Centre for Ecology and Hydrology

- ClientEarth

- Sustainable Soils Alliance

- CPRE

# Examination of witnesses

Witnesses: Martin Ballard, Professor Bridget Emmett and Dr Jacqueline Hannam.

Q1 **Chair:** Welcome to our latest meeting of the Environment, Food and Rural Affairs Select Committee where we are continuing our inquiry into soil health. Our first panel is eminent scientists and our second panel will be those representing NGOs—I think that is the best way of describing them. I will ask our first panel to introduce themselves, and then we will get into the questioning.

***Martin Ballard:*** I am Martin Ballard. I am a chartered environmentalist and fellow of the Institute of Environmental Management and Assessment. I am representing the Society for the Environment, having led on its soil and stones programme since 2019.

***Professor Emmett:*** My name is Bridget Emmett. I am head of soils at the UK Centre for Ecology and Hydrology. I was the specialist adviser to the last soil inquiry in 2016 carried out by the Environmental Audit Committee.

***Dr Hannam:*** I am Jack Hannam. I am current president of the British Society of Soil Science, and I am also a lecturer at Cranfield University.

Q2 **Chair:** Jack is already a friend of the Committee. You were there when we did our field trip to Rothamsted to look at some of the research in action and some of the history of Rothamsted as well.

I should declare an interest as a farmer. I googled it and apparently I have 250,000 tonnes of topsoil on my farm to plough depth, so that is a lot of soil to be responsible for.

I will start the questions with Bridget. Why is it important to understand soil health and the extent of soil degradation in the UK? That is like an exam question.

***Professor Emmett:*** Soil is absolutely critical for producing our food—our farmers do a grand job there—but it also stores carbon, which helps mitigate climate change. It helps regulate water flow, and if we can keep soil on the land and not in the water, that is also a good thing.

Critically—and this is what we often forget—it is an important habitat for a huge array of organisms. It is estimated that 25% of all global biodiversity is in our soil, yet we just forget that. From those organisms we get things like antibiotics, and who knows what else we could get from them. When we are thinking of the biodiversity crisis, soils must be part of that solution as well.

In the UK we must lead from the front. We must look after our soil. We are a small island with a lot of people, and we need to look after our soil to be able to encourage others to do the same.

Q3 **Chair:** Thank you. I will ask you a second question, and if the other

panellists do not agree, they can chip in, but if you agree either just say so or say that you have nothing to add.

Given that we are in a state of flux in the way that we support our farmers and a lot is changing, has soil health across England been changing for the better or worse? What is the outlook for the future, or do we not have enough data to really know what is going on?

***Professor Emmett:*** We have no idea. There has been no data since 2007 on the state of England's soil at a national robust metric. The Environment Agency produced a state of nature report, which estimated that 25% of soil is at risk from compaction and 15% is at risk from erosion. If you go back to 2007, year on year carbon loss from our arable soil is due to the tillage, but since that date—it is 15 years—we do not have any data. The Natural Capital Ecosystem Assessment has put a large monitoring programme in place, starting this year. In five years it will do the baseline, which will mean that we still will not have the change data. It is challenging for us to know. From the signals we were getting before that our soils are compacting, and we are getting erosion and losing carbon, our best guess is that that is ongoing, and that is why we need action. That is why the focus on soil from ELM and the SFI is to be welcomed, but I am sure we will move on to whether it is sufficient.

Q4 **Chair:** That would certainly be seen as justification for the Government bringing in a soil monitoring programme and having a tick box of soil health indicators. What key indicators will we need to see from that toolbox that we can use to assess what is going on?

***Professor Emmett:*** We have been measuring soil condition for 40 years, and all the monitoring community came together in 2008 to agree that mix. It is soil organic matter, soil ph, compaction rates, evidence of erosion—erosion scars and poaching on the land—and we need to look at contaminants; we have quite a mix of controlled chemicals, pesticides and the like that go on soil. I am sure I have missed something out. There is also the biodiversity itself.

We have a mix of things. We know what to do. We have been measuring, and Cranfield has been measuring. We know what to measure, and from what I can see that mix is in the new England soil monitoring programme. It is just that we are only starting now, and it is a shame that we did not build on some of the monitoring programmes from before. We know what to measure, and we directly know what that means for soil function. If you have compacted soil, you have rapid rain runoff into your rivers and erosion. If you do not have a good organic matter in your soil, that soil is susceptible to erosion, and it cannot hold the water that crops need during the increasing number of droughts that we are having. We know what to measure. They are measuring the right thing; they are measuring not just topsoil but subsoil, so we are getting there. I do not think there is any debate in the soil community about what we should measure.

Q5 **Chair:** Jack, I want to bring you in. When I did soil science at university in the 1970s, all the talk was about the ploughing out campaign in the second world war and how we were still seeing nitrates being leached into watercourses and the soil carbon levels going down because of something that happened 30 or 40 years previously. Are they the sort of timescales we are looking at to try to change the nature of our soils?

***Dr Hannam:*** Some things change relatively slowly. With something like carbon, we need to be looking at monitoring programmes over longer time periods. If, for example, you change practice and you stop tilling, that carbon will take some years to recover—it will be five years before you start to see a change in the direction of travel. We need to have different scales of monitoring programmes for different types of indicators as well.

There are other things that can change quite rapidly. The biodiversity can respond quite quickly to things. For example, if you think back to the droughts that we had last summer, we will see a signal from the biology in the soils from there. We need a different scale of granularity in our monitoring as well as the national programme—something in between that can measure the response of soils to these sorts of infrequent events and look at their resilience.

Q6 **Chair:** Thank you. Before I bring in Julian Sturdy for a supplementary, I would like to ask Martin to give his view of where we are in this situation.

***Martin Ballard:*** The challenge with soils is the scope of how we consider soils and whether we just think of agricultural farmland or the whole breadth of soils in the UK. We know that 63% of the UK is farmed in one form or another, but there is a vast array of other land management types and land uses that we need to consider, with 5% of that being gardens. The vast majority of us have some opportunity to add value in our space, let alone in the broader built environment, where there is a heritage of brownfield or other legacy challenges that we need to address to recover soil as well as to protect the valuable soil that is in the other 33% of the land types that we are accountable for in the UK.

The work that the Society for the Environment has been involved in since 2019 has involved chartered environmentalists from across the land use spectrum. It has been fascinating to hear the commonality of the issues and challenges that all soil practitioners are facing and that we need to understand. While food health is absolutely vital for our sustainable future and all the issues that colleagues have mentioned already, we need to look at the commonality with a risk-based approach so that we can manage soil in its totality in a consistent and common way.

Q7 **Chair:** While I was digging half a tonne of well-rotted farmyard manure into my kitchen garden on Saturday, I was wondering what the impact on any nitrate leaching might be from that, given that the crop was not in the ground yet, and we are expecting rain this week. We often forget about gardens, and particularly runoff, where a lot of concreting is going

over it. That is a different subject altogether.

***Martin Ballard:*** Absolutely, and there are some newer challenges that we know in recent times are on the horizon with plastics. The microplastic prevalence in soils in our rivers and in the river sludges, as well as in our gardens—if we have composted teabags over the years, they have a microplastic element in them as well. We need to understand the spectrum of risk and opportunity that we all have to face.

**Chair:** I will bring in Julian first, and if what you want to say is not covered by what Julian is asking, please come in.

Q8 **Julian Sturdy:** I should probably declare my interest as well, Chair, like you, as a farmer and a manager of soils.

I want to come back to something you said earlier, Bridget. You talked about organic matter, and you have rightly stressed how important that is. Farmers and landowners are becoming more and more aware of how important organic matter is to producing healthy crops but also how they manage their land and water runoff, hold nutrients in the soil and so on. How do you benchmark that, or how do you feel we should benchmark that? The UK is full of varied soils, right across the country. Some are hugely rich in organic matter, and some are quite depleted in organic matter. That is probably down to the soil type and soil structure. How do you benchmark that? How do you manage to increase those organic matters in areas where you can? There are some areas where you might not be able to because they are at a peak already.

***Professor Emmett:*** That benchmarking is really important, because we know that people get a number back from a lab and go, "And? Is that good or not good?" AHDB have produced a scorecard that helps people understand where they sit in the population. We have produced something that does not just farmland but also the semi-natural land—the nature land. In that work, you can separate it. We understand that arable soils are different to grassland and different to woodland—broadleaf or conifer woodland. It is also different for the soil type, so you can discriminate by soil type and also by rainfall.

We have the data to be able to give relatively narrow windows of, "I am this soil type. I am on this land use type, and I am this amount of rainfall, therefore this is the population and, oh my goodness, I am in the bottom 10%. In five years, let's have an ambition to get to the top end." We can now provide that level of information. There is a plethora of these scorecards from the AHDB; it is great, and it is being recommended by DEFRA. We can enhance it with some of our data from the more natural land and perhaps put climate in there, but we have the data to be able to help people understand where they sit and, therefore, what opportunity they have to improve. That improvement is manures, although we do not have enough of them. Green cover crops is one of the main things that the SFI is encouraging; by just ploughing in green cover crops, that is an organic matter input. Does that help?

**Julian Sturdy:** Yes, it is very helpful; thank you.

Q9 **Chair:** Do you think that farmers will have the ability to make these assessments, in terms of the citizen science aspect? Obviously, it would be great if every farm had a soil scientist to come along and do all that work for them, but given that we hope every single farm in the country will be engaging in these schemes, is it realistic to think that farmers will be able to make those assessments, make those changes and then presumably assess the outcomes?

***Professor Emmett:*** I personally do not understand why we would not do it. It is the main asset that farmers have. That is the one thing that will stay there to pass on to the next generation and the next generation. In this really challenging, changing environment, what a grandfather or mother might have done in the past might no longer be sustainable going forward. We need to track change over time to understand if the practices we have now are sustainable going forward, and not just sustainable—you will all have heard of regenerative farming. It is not just about holding the line; it is about restoring some of our soils. We know that we have lost more than 10% of the carbon. The numbers vary in our arable soils. We need to build that back up. It is not just about holding the line now; it is about restoring and regenerating.

We need training and advisers, and there are now companies coming out to help do this, but there is guidance on how to do it. There are commercial labs that are accredited that can help. I have to do an MOT in my car every day to show it is fit for purpose, not polluting and not damaging anyone else. I know it is private land, but it is good for the business, it provides more resilience to the crops with climate change, it hopefully in time will reduce inputs, and it will mean that you hand on your land to the next generation in hopefully a better state than you inherited it.

Q10 **Chair:** Jack and Martin, do you concur with that?

***Dr Hannam:*** Yes. There may be an opportunity, perhaps in the SFI, to think about this initial engagement. One of the actions is a soil management plan. Perhaps that should be done first, and then you get the subsidy for the actions on top of that, so you are able to change. This then provides a local baseline for the farmer to assess the soils—their asset—to understand which management practices are appropriate for the soil type, the climate and the cropping on that farm. After that, those actions can be incorporated into the subsidy schemes.

**Chair:** We will come on to the payments by results outlook.

***Martin Ballard:*** I will just add to that. If we look at other land management types, there are a number of opportunities for land managers to take from the approaches that are being piloted, especially with biodiversity net gain on the horizon, in terms of how you look at a site and take in the best practices that are coming forward with the ELMs approach. For example, taking corners of land, leaving that as a smart

turn on the machinery and leaving that corner as a habitat benefit has the same opportunities across any land type. That is just one simple example.

It is about how we look at soils and land management in the whole. There is tremendous knowledge when it comes to soil science, but it is not equally managed and spread across all land types. There are pockets of good practice—certainly what has come up through the "Soils and Stones" report that SocEnv has produced. There is good practice, but there is inconsistency across all sectors, partly because the regulatory framework is disparate. We have some fantastic soil scientists, but there is no clear, strong spotlight on that capability in the UK, which is probably of world recognition. It seems a crying shame that we cannot take the great, strong competence that we have in this country and apply that learning equally between all land management types, so that we can be the best for the soil that we are each custodians of.

Q11 **Mrs Sheryll Murray:** You have very nicely moved us on to the regulatory framework. You have given us your answer to this question, Martin, but I will ask Bridget and Jack. Is the current regulatory framework for soil fit for purpose?

***Professor Emmett:*** We do not really have one, if I am honest. There are the farming rules for water, but that just breaks my heart; that is all about, "Soil is not for itself; it is to clean and protect water." We know that that does not tell us about loss of carbon and biodiversity or what have you. By the time something has come through soil into water, you have over-enriched your soil and you have changed a lot of things. We have to get it before that and think of soil in its own right. It is not just about it as a big carbon bucket, because it is way more than that. Organic matter is important, and with that comes carbon.

We did have cross-compliance, and that is going to phase out but, as you will have read in the last inquiry, without policing, it did not have any teeth. At the moment, soil is falling through the cracks. Some people thought, "If we check the water, the soil will be okay," or, "If we check the carbon, that will be okay," but we do need an overall framework that takes soil as an asset in its own right. We do not have many assets. We have water, air, biodiversity, the oceans and soil—land. And yet it has just fallen through the cracks. In the last inquiry we called it the Cinderella of natural resources. I come back to that. When is its time going to come? It is great that you have called us back in and are tackling it. We can see progress. We all welcome the focus on soils and the SFI, but we need it better protected and regulated in an overarching soil strategy that has teeth to make sure there is a baseline that everyone has to do, and if you do not do it, there is trouble, with encouragement at the top end.

**Mrs Sheryll Murray:** Jack, do you have anything to add to that?

***Dr Hannam:*** I would echo that point on the strategy. At the moment, there are many disparate elements where soil sits, from regulation right through to voluntary initiatives, but we do not have a central ambition or framework that has come from the Government specifically related to soil. The Welsh Government are developing one at the moment; Australia released their national soil strategy in 2021; the Swiss did it in 2020. There are nations doing this already that we can get some advice from.

Q12 **Mrs Sheryll Murray:** Martin, some stakeholders have argued that current regulations at best aim to only maintain rather than restore soil health. Do you agree with that assessment?

***Martin Ballard:*** I think that is a fair recognition of the situation. We have pockets of great legislation, but they are isolated. We have a good heritage of dealing with contaminated land, and we have fantastic remediation capabilities. That capability in the legislative framework is one small aspect, but it is often looked at as the largest problem we have. The largest problem we have is that we do not look at soils in the round. We do not have a robust, singular framework that clearly focuses on our most valuable asset. It takes hundreds of years to produce a couple of centimetres of good topsoil. It takes millennia to produce decent subsoil, and yet all of that can be destroyed in a moment's poor practice. That is a crying shame.

Our focus must be on how we recognise the capabilities that we already have. Examples have been given of frameworks that are out there globally and that we have contributed to in part. We are seen by others as leaders in some aspects of soil reuse and materials management plans, but we do not consistently apply it ourselves on our own island. That does not seem right. Anything that we can do to consolidate and be the best that we can without legal framework would be absolutely the right thing to do.

Q13 **Mrs Sheryll Murray:** Is primary legislation for soil health necessary, or do you think that would be overkill?

***Dr Hannam:*** That is a difficult one to answer. I think the framework and strategy is a good place to start, so that we look at what exists already and where we can attach different parts of legislation or voluntary initiatives to that framework and that ambition for the soil strategy. There should be a review and an assessment after that, to decide whether we need something that is more overarching in a Bill, for example.

**Mrs Sheryll Murray:** Do you all agree with that?

***Professor Emmett:*** I would probably go a bit further. I agree that we need to bring people on board. It is a difficult time for a lot of people—I totally get that—but we are in a bit of a sweet spot, which sounds bizarre. The cost of feed is going up, the cost of fertiliser is going up, and the cost of pesticides is going up. Everyone is trying to find other ways, and there is more and more evidence that farmers and even urban

centres are doing it for themselves, recognising that we need to look after this.

With some engagement, the SFI and some money to get people on board, perhaps in 10 years—why, when we need to regulate for air quality, biodiversity and water, would we not regulate for soil? It is as much of an asset. It should not be the Cinderella. Just like there are limits to what you can do with air emissions, there are constraints on your biodiversity and your water. I personally think soil should get there, but I understand that if we did it immediately, it would seem, "Well, we don't even have the baseline data at the moment." We do, from when we produced it 20 years ago, and we will be reporting ours in two years—you are not going to have no data—but it would be for a research organisation to produce your soil status. I personally think we should get there, to align it and make it of equal status so that it never drops off our radar again.

Q14 **Mrs Sheryll Murray:** Martin, do you think primary legislation is necessary, or do you think it would be overkill?

***Martin Ballard:*** I think it is absolutely needed. You manage what you measure and focus on. The fact that we have not focused on soil in a consistent collective manner has led us to this disparate position of failed soil health. There are some pockets of fantastic progress. Unless we act swiftly on what is a most urgent issue, we will flounder.

**Chair:** The good news—I think it is good news—is that fertiliser is coming back down in price. It is still not down to where it used to be, but everything fluctuates at the moment.

Q15 **Derek Thomas:** Can I come in briefly on that? Treatment plants obviously produce a lot of biosolids or sewage sludge. There are some thoughts about how that can be used to address some of the concerns about the price of fertiliser. Martin, you talked about microplastics, which is an issue in relation to biosolids. What needs to change in the use of biosolids to support the sustainability of soil? Is it something we should do more of?

***Martin Ballard:*** I have a little bit of heritage and should probably declare that I have worked in the water industry for 15 years and operated sludge treatment centres over that time, and I have seen, over a 25-year period, a tremendous improvement in sludge treatment standards. What has come out specifically with plastics has blindsided a lot of sectors, and it is something that we must address urgently. That is not to say that sewage sludge cannot be improved, but there is a burden to society in terms of cost and the environment that needs to be well considered.

We must not confuse fertilisers with biosolids. Obviously biosolids do not have the potash additive and therefore are very carefully not managed as fertilisers, to avoid the regulations therein. But as with any silts and soil composites, it is a valuable component of a circular economy, having a valuable material that we use in a common way for the betterment—for

the additive and the structure—of soils, which is done in many agricultural settings to add that organic structure.

There are other silts and solids that we have to manage within the waste industry that perhaps are not being managed in a clear and consistent way and could be done far more efficiently. Local authorities have highways drains to manage. The silts and sludges that come from those have an organic component, and we must manage those to make sure they do not add to the burden on our rivers. At the moment they are managed inconsistently between different urban areas. There is both a risk and opportunity. As with any fertiliser or silt organic matter, it has a value but only if processed in the right way to draw out the plastics and other pollutants that might be found within them.

It is not just a biosolids issue when it comes to the array of waste streams that we manage as a society. We need to understand the technical aspects of each of those as well as the opportunity of recovering sands, aggregates and secondary aggregates from those different particulates.

Q16 **Derek Thomas:** The opportunity is what I was trying to explore. I hear what you say about the fertiliser—I apologise for that—but is there an opportunity that is not being properly exploited in sewage treatment plants having a huge quantity of this stuff? At the moment the politics of it, or maybe the public perception, means that we do not use it to full effect. Is that a fair observation?

***Martin Ballard:*** Any organic wastes are probably not managed in a consistent manner. If you take food waste from our own homes, there are different attempts in different parts of the country to manage those, and the most effective way of dealing with those is through anaerobic digestion. That is done well in some parts of the country and mixed with agricultural organic waste. The problem is the economic structures in which those wastes are managed. Obviously the water industry has an asset that is there to deal with biosolid mass, and another part of the community has an organic mass to digest. The logical thing to do would be to combine those in one waste centre, but the economics and the economic models of how that is currently structured is disassociated. There is a huge economic gain in our society to aligning that, which would then deal with some of the contaminant issues—without getting too specific—in biosolids that would dilute that risk potential.

**Derek Thomas:** That makes sense. I do not want to hog the meeting, but is there anything else to be said on that?

***Professor Emmett:*** I do not know whether you have an opportunity to have another session, but I think we all know people who specialise in the area of waste and contaminants, and they would welcome coming to ask, "What are the needs?" We need to have better approaches to recycling and reuse, because these resources are finite, and to just consider them as waste is not right. It does not come at no cost, which I

think is Martin's point; nothing is for nothing. We have to develop the methods. We have to invest. We have to put things where we need to have them. It is not my area of specialisation, but chemicals, contaminants and waste is a massive area that would be worthwhile considering.

**Chair:** We will come on to land that is contaminated.

***Professor Emmett:*** That is a separate thing in itself. We have a legacy of 2% of our land—300,000 hectares—that we know is already contaminated, and how do we deal with that?

Q17 **Derek Thomas:** What I was trying to get to is how we restore soil health and whether biosolids is part of that.

***Professor Emmett:*** It is part of the solution.

***Martin Ballard:*** Absolutely, it is part of the solution, but I agree that it is a technical area that deserves its own spotlight. There are some wonderful ways contractors are doing some great work to recover these materials from all manner of sectors, but they can only invest if they have the contracted streams to help them manage the soil dredging. It has a market in its own right, but in the circular economy that we are gladly moving to rapidly, it needs that support and recognition.

**Derek Thomas:** Thank you.

Q18 **Dr Neil Hudson:** In a follow-up to Sheryll's line of questioning about the regulatory and legislative framework, the Environment Act 2021 had a statutory requirement to produce the Environmental Improvement Plan. I want to pursue the line of questioning about targets. Some of the targets that I will ask you about relate to the level of soils being "under sustainable management". First, I want to get your thoughts on that term and any definitions that you could provide to us. It looks quite vague and hard to pin something on. What are your thoughts on what "under sustainable management" means?

***Professor Emmett:*** It is very disappointing that there is not a definition there, because we all know that no policy can be reached if you do not know what you are measuring. It has to be smart, specific, measurable, time-bound and so on.

I make the point again that "sustainably managed" does not mean we are restoring. "Sustainably managed" means you are holding the line, so that is a little unambitious before we even start, one could argue. For me, "sustainably managed" means that soils are able to deliver and continue to deliver the functions that we need. You can think of it as them not losing organic manner, not being acidified, not being nutrified, not being compacted and not eroding. If they are holding their own and not doing any of that, they are being sustainably managed.

However, as we have mentioned, we want to restore some as well. Therefore, sustainable management should be the absolute minimum, and then we need to do more for soils to continue to do the functions at the level they are doing in supporting crops, habitats and so on. We know the metrics to measure to be able to report on that.

Q19 **Dr Neil Hudson:** Jack and Martin, do you have anything to add to that? I am going to get on to the targets for the amount of soil that needs to be under sustainable management. If it is poorly defined, it begs the question, how will it be measured to fulfil those targets?

***Dr Hannam:*** I guess it is part of the indicator programme, which you might come on to later. It is coming up. We are then looking at developing the indicator soils that can indicate whether that soil is functioning properly—is it delivering good food production, is it regulating the climate, is it regulating water and so on?

***Martin Ballard:*** It is certainly encouraging to see that the value of soil and stones is recognised in the EIP, for a start. That is a good step forward, but certainly from the Society for the Environment's perspective, the commitments made remain disproportionately weak to the scope needed.

Q20 **Dr Neil Hudson:** I want to probe you on that point. The target in the EIP is for 60% of England's agricultural soil to be under sustainable management by 2030. Is that the right target, and is it achievable?

***Martin Ballard:*** It perhaps ought to be the other way around, so at least 40% of England's agricultural soil in sustainable management by 2025. Perhaps that should be increased to 60% by 2030. That would be far stronger.

Q21 **Dr Neil Hudson:** All right. The Government said back in 2018 that they wanted 100% of all soils to be under sustainable management by 2030. We now have a new target of 60%, and we are not sure how we will be measuring it. What does that tell us? Is this achievable, and is it the right direction of travel?

***Professor Emmett:*** For a start, it is only agricultural soils and, as Martin pointed out, we have our urban soils. The biggest thing that goes to landfill is soil, which is madness when you think how long it takes to make soil; 58% of what goes to landfill is soil.

One of the points I was going to make before is that it is about management, but we also manage in an indirect way. Even some of our nature land—conservation land—has problems because of air pollution. You might put a fence around a nature reserve and go, "Yes, we are doing all right" but actually nitrogen pollution comes in, climate change is happening, and a lot of control chemicals are now hopping across the landscape and end up in our nature reserve. That ends up in the soil and impacts on the habitat.

I come back to Martin's point, which is that it is about soils in the round. I get why we have focused on agriculture, because we have the mechanism—we have the ELM—and the tool to try to sort that out, but we need a definition of what sustainable management is, and we need to agree what the indicators are at the national scale. Are the ELM, the SFI and the NCEA, which is the national monitoring programme, all aligned? Are we all in the same bucket? Do we have one overall framework and strategy where we are all working in the same way?

Q22 **Dr Neil Hudson:** In terms of recommendations that we can make as a Committee, should the Government start looking at setting more measurable components and targets, as well as making them binding? If the definition is quite nebulous, should we be suggesting more fixed and binding measurements?

***Dr Hannam:*** Exactly, because you will not know whether you are reaching those. We are scientists, so we would say that, but without measuring and monitoring something, you do not know whether you are hitting those targets. It seems that they have retrofitted that ambition in the Environmental Improvement Plan with the likely uptake of the delivery mechanisms, the primary one of which is ELMs, rather than thinking about soils first—the potential ambition of that delivery mechanism, rather than setting out an ambition for soil sustainability.

Q23 **Dr Neil Hudson:** I do not want to take up too much time on this but, as experts, if you have any recommendations to send to us in writing on what those measurements could be, that would be helpful for us.

The Government have announced plans to restore peatland, plant forests and restore habitats, all of which could potentially benefit soil. Do you feel that the Government have a clear vision of what lands should be used for which purpose, and does soils policy need to be linked to the land use framework that we expect later this year?

***Professor Emmett:*** One of the most fundamental things we do to land is change its land use. When we seal to extend our cities and produce housing, that fundamentally affects our soil, or when we convert grassland to arable to grow more food. The biggest single thing you can do to soil is land use, so absolutely those two strategies need to be together.

We need to recognise that there is land use where you change from one land use to another, and then within land use, there is arable and the management practices you do within one. That land use is massive, and we have big ambitions for woodlands, increasing diversity of hedges and all those kinds of things. I agree that it needs to be embedded within the land use.

**Dr Neil Hudson:** Jack and Martin, do you have anything to add to that?

***Dr Hannam:*** As a soil scientist, I say that soil sits under that land use framework. The inherent capacity of different soil types—we touched on

this earlier—will mean that they will deliver particular functions or specialist habitats, for example, or things that you can do with them. You want to try to avoid any unintended consequences of changing land use that will impact on the soil health and its ability to deliver those functions.

***Martin Ballard:*** It is about understanding the different land use and the risk-based approach that is needed against that. Land can be redesignated, and it may be beneficial for the soil health over time if it is managed for that in-parallel benefit, but if it is locked in, that will have the risk of degrading. The economic value of the soil as part of that land framework is critical. To a certain degree, soil is valued by land commercial values by current gradings, but that does not go far enough to understand the fiscal benefit of the ecological value as well as the soil health.

For example, the biodiversity net gain, which comes into effect this November for new developments coming through planning, considers the habitat on top but not the ecological value of the soil beneath. I appreciate that BNG has to make a step forward, and it has certainly made great inroads, but as an evolution, the soil health and the soil value must be part of that going forward.

**Dr Neil Hudson:** Thank you. That is very helpful.

Q24 **Chair:** Following on from that, I want to ask Jack this question. One feature of a healthy soil seems to be good soil structure and good drainage. On the other hand, we are trying to say to farmers, "Maybe you should be holding water back. You shouldn't be allowing rainfall to quickly permeate the soil, get into the rivers and potentially cause flooding." Do we have a situation where some of the things we are asking farmers to do will not necessarily help the soil but might help other objectives?

***Dr Hannam:*** This is where we need to look at it within the land use framework: what do you want the soil to be doing? What is the primary function at that point, and does that change over time? You want to grow food, but in areas where you might want to hold the water back to mitigate flooding down catchment, is the farmer able to do that? Rather than just looking at it from one point of view, you start to think of the multifunctionality of the soils, depending on how you are managing that land.

Q25 **Dr Neil Hudson:** Can I come back on that point? I declare an interest as a Cumbrian MP, where flooding is a huge issue. To me, there is a public good in the soil mitigating floods, but how do you measure the land management of that? Is it the porosity of the soil?

***Dr Hannam:*** Exactly. There are sophisticated techniques where you can take an X-ray of the soil to look inside the soil. Some 50% of soil is just space—it is the pore space—and it is really important, as well as the solid things around it, for the capacity of soil to store water.

Q26 **Rosie Duffield:** We have covered a lot of this, and it sounds like a very simple question, but to have it explained might help people who are not necessarily experts in this. Can you explain conservation, organic and regenerative agriculture and what role might they have in improving soil health? Martin has touched on what we need organic practices to do in drawing out plastics, but is there a simple way you can say how they might help?

***Professor Emmett:*** I will start with regenerative. There is no absolute definition. If you google it, you will find a few others but, in simple terms, one of the key things with regenerative is that it is not just sustaining; it is restoring. It is basically low-input systems, more biodiversity and more organic matter going in. I suppose one way of thinking about it is working with nature and trying to minimise the external tillage, so it is low tillage, with less input from the outside and more biodiversity.

Organic has a strict definition, which I will probably get wrong if I try to do it. It is about limiting the chemicals that are going on. Frankly, I am not sure about conservation agriculture. What might be the definition? Jack, can you help me?

***Dr Hannam:*** I think it has become regenerative. This is a term that was used before regenerative agriculture became popular.

***Professor Emmett:*** These phrases come and go. Sustainable intensification came up for a while, and integrated farming systems was also there, but in the end it seems to be about more mixed systems, less input, working more with nature, more diversity and more rotations. That is generally what we are talking about with all of these. Organic is the main one, which has quite a strict box around it compared to the others, which are more fluid.

**Rosie Duffield:** Thank you. Martin, would you like to add to that?

***Martin Ballard:*** I do not think I would be best placed to add to that, other than a personal view, but I think there are different levels of passiveness to active management.

**Chair:** Our second panel may have some views on that as well.

Q27 **Rosie Duffield:** How strong is the evidence base behind these practices, and how do we tackle areas of conflict between them? That is a toughie.

***Professor Emmett:*** There is some evidence. We can always do with more. It is quite fast moving, and some of the evidence is sometimes in a blog that, as scientists, we might not see, but it is evidence.

If you said, "Do you have 100 trials across the country that absolutely prove it?" I might have to say no. However, if you say, "Do you have some examples?" I would say yes. If you go to the experts—sorry to put ourselves on that pedestal—and say, "Does it make logical sense? Does it make sense?" we would say that it makes logical sense. It fits within our

science understanding, and we have some case studies, and therefore there is no excuse not to get on and do it, because we do not have time to wait until the science is perfect.

There is something called adaptive management, which is, "Let's get on with the best of what we know." That is why monitoring and measuring is so important. We keep needing to monitor and measure and go, "With climate change, are those practices still as good as we can do, or do we need more than that to keep ahead of the curve that we seem to be on now?"

Q28 **Rosie Duffield:** You mentioned the lack of data since 2007. That is a long time, if you look at all the trends that have been happening, with the ELM scheme and the schemes farmer get offered all the time that change sometimes month to month. There is a big gap there, isn't there?

***Professor Emmett:*** Yes. I was talking to the Office for National Statistics, and it was asking me when our data is coming out because it does not have any national soils data since Cranfield published in 2004, and we published in 2007. We highlighted this in the 2016 inquiry. We now have it, but it has taken seven years to find the money and do it, and I would encourage you to make sure it never falls off the budget again. The baseline is just the start and how we will link back to the historic datasets where we are not very sure we will be able to do it. We will have the historic datasets, we will have an amount of data showing change, and then we will have a new dataset going forward. It is a bit of a lost opportunity that was not better brought together.

Q29 **Rosie Duffield:** To what extent should the Government encourage the use of newer technologies, such as gene editing and vertical farming, to reduce the pressure on the soils?

***Professor Emmett:*** Vertical farming has a role, but you cannot grow potatoes in vertical farming. Carol Wagstaff at the University of Reading has a fantastic talk where she basically says it has a role, but soil saving technology is not going to do everything. It has a bit of a role. As I understand it, the biggest issue is about the energy sources. At the moment, if we are also keeping in our heads net zero, there is a bit of a challenge there. It does have a role, particularly for high-cost, high-value crops—lettuces, herbs and some of those things—but for some of our other things, perhaps not. I am trying to remember the second part of your question. It was vertical farming and—

**Rosie Duffield:** Gene editing.

***Professor Emmett:*** Who is an expert in gene editing here?

***Martin Ballard:*** I am not able to add to that. One of the Society for the Environment's four task groups is around R&D. It is one of the areas that has been looked at to see what the evidence is to support hydroponics and other such techniques of vertical farming playing their part, certainly in an urbanised environment where there is demand for perishable

products—strawberries, mushrooms and other such crops—so that they can be produced closer to the point of need. There are some great examples, even here in the city of London, that have been successful to that degree. It definitely has a place.

***Dr Hannam:*** On gene editing, if we think about these practices, we are trying to increase the diversity of cropping. If you are producing particular plants for a particular purpose, you are reducing the diversity, so we need to think about some of the potential unintended consequences of that.

Q30 **Robbie Moore:** This section of questions relates to ELMs—environmental land management schemes—but before I get on to that I want to explore the issue around primary legislation that you touched on, Martin. You were the only one of the panellists who said that primary legislation is absolutely what we want to explore. That all sounds very good, and it is okay bringing out legislation, but it has to be practical. How can you practically implement primary legislation to deal with soil health?

***Martin Ballard:*** If the legislation is in disparate pockets across the legislative framework, what is the likelihood of robust and consistent success across all land types? At the moment, we have aspects—sewage sludge, which we have mentioned, and contaminated land regulations—but it is not there for soil regeneration and improvement and driving a sustainable improvement in soil health.

***Professor Emmett:*** There is nothing fundamentally different to trying to manage and regulate soil than there is for biodiversity, if you think about the complexity of biodiversity, and yet we have tried to manage that. With air quality, we have air masses coming across the country from Europe, from the Atlantic. Soil is no more variable; it is not harder to measure or monitor. As Jack said, some things are slow to change, and some things are fast to change. That is exactly the same as water. You have tides, you have floods, you have droughts, and you have different contaminants. If we say we cannot do it for soil, I am not quite sure how we can do it for water, air and biodiversity. It is no more variable; it is no different. It is another natural resource. We have just never invested in it to the same level.

**Robbie Moore:** Great, but what I am not hearing from you is, how do we practically implement that? I see that we want to move in the direction of primary legislation being introduced, but I am not seeing examples of how you would see that worked out on land.

Q31 **Chair:** We have a regulated water industry where you can set the price of water at a level that allows investment in improving that water and having less pollution. You also have penalties and fines. Legislation generally means that either the person responsible is fined—that is, the farmer—or the Government are penalised for not meeting a national target. How is legislation going to incentivise farmers? Are we going to have a great big stick to beat them with if they do not do what they are

being told to do, particularly as cross-compliance is now disappearing?

***Professor Emmett:*** With carrot and stick, generally, you need a stick for the bottom end saying, "Here is the baseline. You cannot drop below that, but we will encourage more." Every other industry has to report on the current state, so it goes back to the monitoring—we need to measure it to be able to have robust measurements. When the Sustainable Soils Alliance asked how much we are spending on soil monitoring, it was 0.4% of the monitoring budget. It might be that we do not have the data. We need to invest.

Just like we monitor air, we monitor biodiversity and water so that we know when things are not going right and then we say, "You cannot do slurry tips, and you will be fined if you do that." Likewise for soils, we could say, "That is an absolute no, and we will fine you for doing it, and we will incentivise you to do really top-end stuff over here."

I come back to the point that I do not see what the difference is. If we measure it, monitor it and know it, we can basically say, "That is below the line, and we will incentivise at that end," just as we do for other things. If people go and cut down an ancient woodland, they will be in trouble. We also provide incentives for building new woodlands. It is stick and carrot.

Q32 **Robbie Moore:** Do you accept that with soil, it is a lot more complex? There are a lot more added issues—for example, how land tenure is occupied, the occupation arrangements that might exist around how the soil is farmed and managed and so on. We have already recognised that there is no data there, and it sounds as if there is an expectation that individual landowners—farmers—would have to self-regulate almost to meet that.

That brings me nicely on to ELMs, because that is a voluntary scheme that farmers can enter if they want to. Some people have said that paid-for measures under ELMs to enhance soil health should be a basic requirement for all land managers. Do you agree with that?

***Professor Emmett:*** We need to get everyone in the boat first. The evidence is that we have stopped looking at our soils. Some farmers are absolutely fantastic; they love, look after and measure their soil, and that is great, but we have lost a bit of the skills. We do not have the measurement. There are two levels: one is where farmers are measuring their own land themselves so they know what to do with that field, and then there is the national monitoring. We should not muddle them up. They can come together.

Let's get people in the boat, which is what the SFI is doing. We are encouraging measurement of the soil. The farming rules for water insist that they measure for NPK and those kind of things. In time, perhaps you should not get a public payment—I am going out on a limb here—for doing something that is causing harm to others off the land. One of the

estimates is that 70% of land degradation impacts are felt and experienced off the farm boundaries.

I come back to my car analogy. I have a private car. It is mine. I do not know how many cars we have in the UK. I still have to pay to prove that my car is not polluting and being a danger to everyone else. I understand that it is every field, but the SFI has suggested, "In five years we want an organic matter measurement for every field, and here is the suggestion for how to measure it." Let's get everyone used to doing that. In time, perhaps it would be a requirement, and then the incentive is to regenerate and to improve the organic matter. That would be one approach.

Q33 **Robbie Moore:** Please comment if you do not agree with what has been said, because we want to keep moving on. With their current structure, do you think the ELMs are open enough to address soil health issues to do with organic inputs, reducing tillage, crop rotation, diversity of inputs, with a combination of livestock, arable and so on?

***Dr Hannam:*** It is not there yet. It is a good start. We talk about this engagement to get going, but certainly there should be more ambition. It would be good to see what that ambition is in the future. It is about bringing people on board and starting that journey but also then starting to think about adding on some of these other things and being more specific in terms of key management that we know has an impact in a good way on soil health and start to recognise that through the payment system.

***Professor Emmett:*** There are some fantastic advisers out there, but there is a missing bit where farmers want to do the right thing but just need more help, whether that is from accredited advisers or someone else. We lost that about 10 to 20 years ago—advisers with specialist knowledge in soils that you can call on to help. To come back to Martin's point, we have huge skills in this country. Help for people who want to do the right thing but are not quite sure where to go and get advice from is something we encourage you to suggest.

Q34 **Chair:** The point was certainly made at Rothamsted that the ADAS advice is not there as it was for free.

***Professor Emmett:*** Yes, sometimes we hear that we lost the ADAS advisers.

Q35 **Julian Sturdy:** I have a very brief question on something Bridget said about testing organic matter every five years on soils. There is a lot of soil testing going on already, and there are different ways that food producers are asked to deliver soil testing. For example, if you have contracts with certain food producers, they expect the soil to be tested. I will use potatoes as an example. I have a contract with a potato chip supplier—I will not name it—and we are expected to test the soils. We have to input those regularly, and that is part of the process of the

contract. Farm assured schemes are operating now, and within that you are expected to test the soils regularly. Can you see a lot of this coming through that as well? There is a lot of data already there, and some of these food producers and assurance schemes will be expecting organic matter to form part of those tests going forward.

***Professor Emmett:*** It would be great if they did, because currently we know that organic matter is not part of a lot of the tests; I think it is only 20%.

Q36 **Julian Sturdy:** Correct, it is not, but should it be going forward?

***Professor Emmett:*** It should be—that would be great—but then you get into data ownership issues and GDPR stuff. In some of the responses to the consultation, people are saying that farmers need to be reassured about what will happen to their data and how that then might combine with Government data. We need to think that through.

The SFI at the moment says that the organic matter numbers will have to be provided because it is considered a public good, but there is no detail as to what that will mean. Are you going to be put up on a public website—"Here is your organic matter data"—or will it be hidden behind a wall for one of your agencies to basically be able to integrate the data with the NCEA? It is not clear at the moment. For that, we need to talk to the labs. They see as a valuable asset the data they have from the half a million soil samples they analyse every year. That is a discussion that needs to happen. That is what is somewhat frustrating. There is quite a lot of data being collected, but we come back to there being no overall strategy or framework to pull this together so that we can manage our land and our soil on an evidence base going forward.

Q37 **Chair:** We also have the law of unintended consequences. For example, the easiest way to improve the soil organic matter on my farm would be to incorporate the straw rather than bale it and sell it to a livestock farmer. I could do that, but how is he going to bed his livestock? That will have animal welfare implications. The west of the country does not have much straw, so a lot goes across east to west. We need to be careful, I suspect, that we do not do things that mean we upset the balance of the livestock sector and the arable sector and the way that we are all interdependent. Do you agree?

***Professor Emmett:*** We definitely have an east-west where all the organic wastes are over on this side, and we have depletion on the other side. Is there a role to try to get more mixed systems? Is the land capability appropriate for that? There might not be enough rainfall to support livestock in parts of the east of the country. Is that where more green manures come in, so we are not talking about the manures in the straw? Absolutely, you still need bedding, but are there other alternatives for bedding in technologies going forward? I do not know. We must not just think of what we have now; there is amazing stuff that might come through. It is not easy. Things are in the wrong place, and it takes a lot

of fossil fuels to move things around the country. We are not going to get our net zero then, are we?

Q38 **Derek Thomas:** Future planning policy is trying to address this, to a point. Do you feel it is going far enough? Is the Government's plan for biodiversity net gain and the rollout of local nature recovery strategies enough to protect soil health in future planning legislation?

***Dr Hannam:*** There needs to be more of a joined-up approach. The problem we have in the planning process at the moment is that when we are thinking about soils in construction projects, for example, there are various aspects of that. We look at risk assessment at the beginning and how soils are handled within the construction project, and then we also think about soils being reused post construction, to recreate some habitats, for example. At the moment, we are often looking at just the above-ground biodiversity or the habitat that has potentially been recreated, but we are not really looking at monitoring the soils that are being used in those projects where we have started to create new habitats. There is a bit missing there about monitoring those soils across the chain of those different aspects of the planning process.

**Derek Thomas:** During the construction process and the landscaping—not indefinitely.

***Dr Hannam:*** Yes, across the whole of that. Martin will probably give you a better idea of that component in the middle, but we also need to think about what happens post construction, particularly if we are recreating habitats to meet biodiversity net gain and we are reusing those soils. Are they fit for purpose? Could we create calcareous grassland from the soils that we have taken from that site? We need to make sure that they can do that and can support that habitat. We have seen lots of failures in habitat recreation where they have not considered whether the soils are functional to create that specific habitat.

Q39 **Derek Thomas:** That makes sense. Martin, you were talking about soil health and whether it is suitable soil to deliver the biodiversity net gain, but what would be the value of monitoring that for the next 30 years? I think that net gain has to be measured over 30 years in the future planning framework.

***Martin Ballard:*** Yes, in the BNG—biodiversity net gain—requirements there is a degree of perpetuity, which is encouraging. The ongoing monitoring at the moment just includes what you see above ground and not below, as I mentioned earlier. The planning process helps to consider that now. The environmental impact assessment, if that applies for the larger projects, will consider soils to a degree, but the continuity of the soil value through the planning, delivery and then the asset ownership—the land ownership—and custodial duties after it has been completed is not well aligned in all cases. The larger, nationally significant schemes will have a spotlight on them, you would hope, but the larger volume of schemes would not have that continuity. Again, it comes down to the

legislative framework and the risk-based approach for soil health that is very much needed.

On remediation and reuse of soils, we have some fantastic codes. We have the DoW:CoP—the Definition of Waste: Code of Practice—that is managed by CL:AIRE on behalf of the development construction sector. We have the aggregates quality protocol specifically about stones, but both of those are inconsistent in their application. Some clarity is needed, and hopefully that will be forthcoming in the very near future with works going on in both those areas. Unless we have consistency that values the soil within those frameworks and across all land management, we will be continuing as we are.

Q40 **Derek Thomas:** I have a brief question. With the environmental impact assessments that happen today, on a controversial site, several different people or groups might take a view on whether it is effective and is a good, robust environmental impact assessment. As we move into this more robust measure, do local authorities in particular have the resources and the expertise to manage the requirements for soil health in planning? Are councils prepared for this?

***Martin Ballard:*** I think, sadly, that is not the case. There might be pockets of experiential practice that has been learnt through professional experience, but for the consistent robust approach for soil health in planning, the skills are just not there. Whether they are in our regulators is another matter. The standard competences for understanding, given the complexities of soil health that we have spoken about, possibly are not there in all aspects and are very much needed to manage this. There is a big skills gap there.

Q41 **Derek Thomas:** Given that we want to avoid a token bit of legislation that says, "Here we have the biodiversity bit ticked", what is your solution to that to make sure we do something that is worthwhile?

***Martin Ballard:*** It comes back to whether we have primary legislation or a framework. If we have a framework that can give us a spotlight on it, that will hopefully break the inertia and create the focus to make sure that we have the learning and development across the value chain. It is not in any particular group. It is about bringing consistency for all land management, so that we have that depth of competence in soil science, not just in one land type.

**Derek Thomas:** That is helpful. Thanks very much.

**Chair:** We are overrunning a little bit, and we might have some Divisions that will interrupt us, so if we can try to rattle through the last couple of questions, it would be helpful.

Q42 **Julian Sturdy:** The millions of tonnes of soil that are thrown into landfill every year was touched on earlier. How can we stop that and try to reduce that being wasted? It is a potentially huge resource that is being thrown away, in a way.

***Professor Emmett:*** I am going to point to Martin again; sorry.

***Martin Ballard:*** That is fine, I am happy to help address that. Waste soil is designated as one bucket predominantly—17 05 04 in the construction industry or ubiquitously as 20 02 02. Like you say, it is a significant volume of material. Some of it is non-hazardous, so it is all naturally occurring and has not been applied through one of the codes of practice, specifically the Definition of Waste: Code of Practice. Do we highlight the value of soil and, if we do, why are we not measuring the reuse of that? If we were to celebrate, manage and value the reuse of soils, we might avoid the volume of it going to landfill. Of course, the other side of it is that landfills subject to remediation need inert soils to make up the levels.

**Julian Sturdy:** Yes, that is true.

***Martin Ballard:*** Indeed, many landfills need particularly clay soils for lining and capping, which, ironically, they take as a waste and are paid for as a waste but they need as a material. There is a rather bitter irony there for some in the industry.

Q43 **Julian Sturdy:** I am sorry to interrupt, but I know we are a bit short of time. The Government are reviewing voluntary codes of practice for sustainable use of soils on construction sites. What needs to improve? What should the Government be looking to change in that system?

***Martin Ballard:*** The legislation favours recognising these valuable materials as waste and, as you mentioned, it seems a crying shame that a huge volume of very valuable soils and stone end up in the wrong place. If there was a better focus on soils and stones as a material as a default, with it managed as a material and only as a last resort ending up as waste, we would be in a far better place.

Q44 **Julian Sturdy:** Any contaminated is waste, but non-contaminated technically should not be classed as waste—is that what you are saying?

***Martin Ballard:*** Yes, and contaminated that can be remediated and then treated as a soil in the right place should be treated as a material as well. Unfortunately, the legislative focus for waste law is on it being waste, and that seems odd.

**Julian Sturdy:** That is interesting. Thank you.

Q45 **Chair:** I have one last point on soil contamination. We are all very conversant with the problem that when builders want to build on brownfield sites, it can be contaminated, and it is very expensive to clean up. How widespread a problem is soil contamination? Is it purely restricted to former industrial sites, or is there agricultural land or other land in the country that would be deemed contaminated and might need cleaning up?

***Professor Emmett:*** The answer is that we do not know because there has not been an audit of everything. Basically, you test the land when you want to develop it. I do not think it is just urban. There is also land with old sheep dips and agricultural chemicals and spillages. I think the answer is—and this came out in the last inquiry—that it is a guess how many contaminated sites we currently have at the moment, because there is no one going out and capturing all the data. You just do it when you want to use it. You then have to test it and say, "Right, I have this. Now what do I do? Do I take it off and put it in landfill? Do I try to remediate it? What do I do with it?" That is my understanding.

Q46 **Chair:** Is the situation better now than it was in 2016 when the Environmental Audit Committee found that contaminated soils were not being dealt with properly or equitably by local authorities and developers?

***Martin Ballard:*** With the contaminated land register that is managed by each of the local authorities, there has certainly been an improvement. Where there is contaminated land, often the best solution is to keep that contaminant in situ if it is not causing any harm to health, property or environment further from where it is, to in effect lock it in situ as part of the planning approach in the urban area. That is predominantly an urban challenge. As Bridget said, the land contamination spectrum is probably far broader, but it comes down to the definition and a better understanding of the science behind different contaminants that we now know are prevalent.

Q47 **Chair:** Do we need a specific policy for contaminated land that would apply to local authorities and developers, or is the current situation of cleaning it up when land is identified sufficiently robust?

***Professor Emmett:*** From my point of view, there are real specialists in this area, and it goes from the cocktail of controlled chemicals that farmers often have to use to control the crops right the way to the contamination and waste issue. I encourage the Committee to get some real specialists in, because I feel at the edge of my expertise here. Martin is the main person.

***Martin Ballard:*** CL:AIRE is an organisation that manages a number of the frameworks that we have. We have the SuRF-UK, which has the indicators for soil health. We have the national quality mark scheme for land contamination management. We have some good mechanisms in the UK that are seen as world-leading. We know this because other countries are actively consulting CL:AIRE on this experience and these matters.

The challenge is that we do not necessarily encourage the investment and the resources to better manage and use the mechanisms that we have across the value chain, nor do we mandate the verification of materials management plans on completion of remediation and reuse. If we did that, we would have a far stronger perspective of the huge good news story that we do not know about how much soil we are reusing positively in the right way—sometimes not in quite the right way, and

that is where having a better spotlight on it would certainly help. That goes back to the spectrum of having a soil health risk-based approach for different land types and encouraging further up the resource efficiency hierarchy celebrating what we want to see, not reporting what comes off the conveyor belt at the end. If we were reporting how much soil we were remediating and protecting of the UK mass, not shifting in the first place, that is important, and we do not have that information. We should celebrate the positives.

**Chair:** Thank you very much. I always like evidence sessions that are fact-heavy and opinion-light, which is what this Committee likes to see.

## Examination of witnesses

Witnesses: Kyle Lischak, Matthew Orman and Graeme Willis.

Q48 **Chair:** Welcome to the second panel. I ask our three witnesses to introduce themselves and the organisations they represent.

***Kyle Lischak:*** I am Kyle Lischak. I am currently working as head of UK geography at ClientEarth in London. I have previous experience in the civil service as a lawyer in the previous BEIS and Natural England, where I did a lot of work with farmers and work around the agri-environment policy.

***Matthew Orman:*** I am Matthew Orman. I am director of the Sustainable Soils Alliance. We are an NGO, a campaigning organisation and think-tank, campaigning for Government and corporate policies that achieve the goal of sustainably managed soils within the space of a generation.

**Chair:** You used to work in the European Parliament.

***Matthew Orman:*** I did. I started my career working on the Environment Committee with the European Parliament when I was working with John Bowis.

**Chair:** Fantastic. We are almost old friends.

***Matthew Orman:*** Very old friends.

***Graeme Willis:*** I am Graeme Willis. I am agricultural lead at CPRE, the countryside charity. We campaign for a living, thriving countryside. I have worked in farming since 2013 at CPRE, and I was on the Soils Advisory Forum when that used to sit in the 2000s. I wrote a report on soils in 2018 called "Back to the Land". I currently also sit on the ELM engagement stakeholder group and have done so for some three years. It seems to have been quite a long time.

Q49 **Chair:** If you agree with what your colleagues have said, do not be frightened to say, "Yes, I agree with that." We are a bit under pressure, because we might have a vote.

I can guess what the answer to my first question might be. Is the current

regulatory framework for soil fit for purpose? We will start with Matthew, as we are old friends.

***Matthew Orman:*** No is the answer. I echo a lot of the comments from the previous panel. The current regulatory framework, as you refer to it, essentially derives from the eight farming rules for water, which were introduced in 2018 to achieve compliance with the water framework directive. The cross-compliance GAECs are falling away next year. Between them, they really do not cover not only the importance of soils but also the different roles that soils play, as we heard earlier, in carbon sequestration, flood risk management and so on. What is needed is for us to take a step back, examine the regulatory framework through the prism of soils, identify gaps and address them.

***Kyle Lischak:*** In our written evidence, I did a table where I put together some of the regulations that involve soil, which are quite sporadic and spread out among other environmental topics. It is sparse, and there are issues, which we might come on to, around implementation and enforcement of those regulations that cause a current issue.

Beyond that, one of the reasons why I wanted to appear today was to highlight a couple of additional threats if things are not looked at sensibly. First, in addition to the agricultural post-CAP transition policy regulatory review, there is the presence of the Retained EU Law (Revocation and Reform) Bill at the moment, which—and we have put this in our evidence—maybe not surprisingly affects quite a few of these regulations. Quite a number of them, particularly around agriculture, are retained EU law. It is not that regulatory reform is a bad thing—it could be a very good thing in some respects—but are Government proceeding with their eyes open on what they have in the basket now around soil and how that might come out the back of a REUL Act?

Q50 **Chair:** It could be an opportunity to improve the situation, could it not? A regulation that applies equally in Spain or Greece may be tailormade to the UK situation.

***Kyle Lischak:*** There certainly is a possibility of that, and that would be welcome. The problem is that we have the sunset clause, as you probably know, in the REUL Bill at present. We have a civil service, which I can speak for because I used to work in it, that is stretched and remains stretched and has a lot of other things to deliver. I think the fear is that the entirety of the situation around the framework might not be carried through or thought through before the end of the sunset period as a potential outcome. I am just highlighting that situation.

Cross-compliance is a funny one, because it is not only in focus in terms of the post-CAP agricultural transition, which was the original initiative, but also in itself is retained EU law. What was talked about in the previous panel around cross-compliance is quite important, because it sets up a whole-farm framework at the moment for those recipients of basic farm payment and the other agri-environmental schemes that are

spread out across an enormous area of land in England. Some elements of that are underpinned by existing regulations. For example, there are bits of the nitrates regulations that are reflected in cross-compliance that will remain. However, the bits that remain are subject to no longer perhaps being in the attention of the Rural Payments Agency in the new ELM scheme and being left to the Environment Agency, let's say, entirely. In other words, whereas in the current programme the RPA will go out and have a close look at cross-compliance and what is going on there, it is not clear that in future it will have that role of flagging the problems with the independent remaining regulations. That will be left to the Environment Agency or others.

Q51 **Chair:** Presumably, if a farmer opted out of ELMs altogether and decided he could produce 4 tonnes an acre on the whole farm and did not want to sacrifice any land or be bothered with it, there would be no cross-compliance at all. He could do pretty much what he could within the law.

***Kyle Lischak:*** That comes back to the attractiveness of the ELM scheme, which we will get to. If it gets good uptake, the farming community is more likely to accept conditionality in the form of a whole-farm approach as part of an incentive. At the moment, it is still in a formative state. Payment rates are in question, and there is no certainty that it will have the uptake that is needed to deliver a national-level output.

What I am flagging is that if regulation on soil—the limited amount that is there—goes, whether inadvertently or intentionally, or it is not enforced properly, you are left with voluntary measures. At the moment, voluntary measures are still in a very early phase around ELMs. My point as far as soil goes is that this is a pivotal moment where it could go either way. There is potential for it to go towards ambitious targets, or there is potential for soil and other environmental standards to slip quite dramatically.

***Graeme Willis:*** Reference was made to the lack of an overarching framework, which is part of the lack of directives in the European Union. There was not a soil directive. There was a framework proposal, and that was abandoned, I think in 2014, so it did not get carried across. The most important part of that is what it signals about how important soils are in the general policy and regulatory framework. We certainly lack the focus that people have referred to for soils as a critical natural asset. That is one critical part.

In terms of what Kyle was just saying about cross-compliance, which is an area I am particularly concerned about, it is the lack of clear information on when, if we are going to have a regulatory framework that underpins ELM, that is due to come. We have been reassured that it will be coming. In a meeting with Mark Spencer, he said that we would have a strong regulatory framework, but we have no information coming forward on when that will be or what it will look like and how it will pick up and be a strong baseline linked into the GAECs that Kyle referred to.

The GAECs themselves are a fairly basic framework. The one on soil organic matter—this goes back to what you were saying about burning straw residues—essentially is about burning residues on the land. It does not say anything more about soil organic matter than that as a way of retaining organic matter. They are minimal as they stand, and they need to be stronger.

Going back to something that Bridget Emmett was saying, it will be really important that farmers are supported and incentivised to take up ELM and go down the voluntary route and be very ambitious in that, and that the regulatory baseline comes along as a backstop and is ratcheted up over time so that it fills the space, and the incentives move forward to deliver more and greater and better public goods over time.

Q52 **Chair:** How well are the current regulations, whether they are statutory regulation or cross-compliance or advice on best practice, being enforced or policed, or are farmers being helped at the moment?

***Graeme Willis:*** I am not sure how well they are being enforced. I take the point that the Environment Agency is underfunded in checking that. The RPA does a sampling. I am not sure about the evidence of how many farmer infractions there are. I certainly take the view that it would be better to incentivise farmers and give farmers advice and support them in understanding their soils better.

Q53 **Chair:** When Minister Spencer was here, he said it was about advising and encouraging rather than just penalising people for genuine mistakes or for when the situation is difficult because of weather conditions, for example.

***Graeme Willis:*** Yes, you would want to encourage farmers to understand their soils better. Going back to the issue of what we know about soil health, do we understand what farmers know about their soils? There are some fantastic farmers doing great things with their soils, going down the regenerative route, but I do not think we know the current state of the soils or how farmers are managing them, so it is very hard to say.

***Matthew Orman:*** One of the challenges we have is that we do not know how well the rules are understood or how well they have been disseminated because there has been no effort made to collect it. Our submission included a number of whistleblowing studies that relate to the Environment Agency inspection numbers and farmer awareness from events and so on. It does not paint a particularly rosy picture. When the rules came out in 2018, there was not a huge amount of clamour around the announcement, partly because they were successful and they were introduced to fulfil the criteria of the water framework directive at a time when Brexit was hotly debated.

There is a real confusion, as we see it. There are essentially gaps between the farming rules for water and the sustainable farming

incentive. There is also a crossover. If you look at the eight farming rules for water and the advice that it gives about how farms can achieve compliance, it refers to reasonable precautions, which include a cover crop over the winter. Well, a cover crop over the winter is one of the things that is being paid for under—

**Chair:** I am currently getting paid to have overwinter stubble on my farm. We cannot understand it either. It seems strange that some of the things farmers are being paid to do sound like they are exactly the opposite to what would benefit soils.

***Matthew Orman:*** We see a real role for ELM in establishing a regulatory baseline, but we are also realistic that you cannot just launch in with a stick, bearing in mind that we have had very low awareness levels and understanding of what the rules themselves are all about. We see potential for some kind of transitionary period, at the end of which there could be expectations of at least awareness and understanding of the rules, and then demonstration of how they are being implemented.

Q54 **Chair:** We talked about carrots and sticks in the first session, and one stick is the polluter pays principle, as water companies have found out to their cost. As a farmer myself, I would not necessarily encourage this, but to what extent is there a role to be played by that stick, as well as the carrots of financial incentives?

***Matthew Orman:*** There is, and I echo Bridget Emmett's use of the statistic earlier that 70% or 80% of the damage caused by degraded soil happens off farm, so it is invisible to the farmer. More important, though, is the need to explain to farmers the merits for their own farm productivity of the regulations. We are finding more and more that when you talk to farmers about the regulations, in particular around structure, they are more interested and responsive when you point out the impact that the recent droughts in the UK have had on water holding and the cost of lost added nitrogen to their soil. If your soils are in a poor state, you are losing that nitrogen. There is a very clear economic message behind the importance of the regulations that needs to be made alongside the stick.

**Chair:** Yes. It is a good opportunity for subsoiling when it is dry, though, as well.

Q55 **Mrs Sheryll Murray:** The soil health action plan for England was rolled into the Environmental Improvement Plan published earlier this year. Does the EIP set out a clear strategy for improving and monitoring soils in England?

***Graeme Willis:*** The target was discussed earlier, and that is a key point for me. We do not have a clear sense of what that target means or what sustainable soils management or sustainable management of soils means. The target itself has been weakened from the Natural Environment White Paper in 2011 and previously the soils strategy in

2009. It went to, "We want to," and now it has been downgraded again. In terms of defining what sustainable management actually means, my fear is that the main tool to deliver it, other than the monitoring, will be the ELM, and we do not really know how they will define the different practices. My fear is that it will become a bit of a circular argument—that what is in ELM will be described as sustainable practices, and that will justify meeting the target without any sense of whether it is sufficient. As Bridget and others have said, we are looking at holding the line rather than deriving soil improvement and regeneration, which is what we need.

On the monitoring side, there are some welcome things coming into play, which is good to see, but broadly we are extremely disappointed that the soil health action plan has just been folded into what is essentially half a dozen pages in the EIP. It may have some statutory backing, but we would like to see something that is stronger and gives the due emphasis and the cohesion to soil policy that is needed.

Q56 **Mrs Sheryll Murray:** Kyle, do you think the Government were right not to produce a dedicated soil action plan? Are you concerned that without it, soil health will not get sufficient political recognition?

***Kyle Lischak:*** I do not agree with the fact that there was a rowing back on the promise to deliver a soil health action plan for England. That is one of the symptoms of there not being primary legislation in place, which is the ideal outcome here. The effect of not taking it seriously at the primary legislation level is to get what we see in the EIP, which is less than half a dozen pages; my recollection is that it is half a page. That is disappointing, and a good, solid strategy that is backed with statutory requirement could set out some very important things that set in motion a much more effective approach to the issue. It could consolidate or identify a lead public agency to take a steer on soil targets, monitoring progress and how other agencies co-ordinate together around that. It could examine bits of legislation that pertain to soil that we might lose when cross-compliance goes. One thing to remember about cross-compliance is that it has a very specific part in it that is just around soil that is not replicated elsewhere.

That is not even getting to the points around how soil could contribute to not only environmental targets under the Environment Act but the climate target. The net zero strategy revision update is meant to come out shortly. How does soil play a role in that? Something more robust is not going to be accomplished on half a page of A4; that is my point.

Q57 **Mrs Sheryll Murray:** Thank you. I would also like to hear from you, Matthew. The aim now is for 60% of soils to be sustainably managed by 2030 as part of the ELM schemes, alongside the restoration of 280,000 hectares of peatland. Does this put us back on track to restoring soil health?

***Matthew Orman:*** It is a solid start, and we were delighted to see soils placed at the heart of the sustainable farming incentive, because it is a

long overdue recognition of their importance. The actions that were included as part of the initial standards—beginners and intermediary—are, broadly speaking, the right ones. We look forward to seeing a future standard on minimum and low tillage later on this year, which will be very important. The scheme has to evolve over time. We would like to see additional standards around things like herbal leys and conversion of arable into grassland. It needs to be nimble, flexible and responsive to changes in the marketplace.

I want to make two points. At the moment, it is very hard to detect whether the ELM is having any impact because of the lack of consistent data being, first, collected and, secondly, shared at a Government level that can be used in the future to, for example, justify to the Treasury how this scheme is delivering national targets.

The other thing to refer to is the rates of payment. It has been very unclear exactly how the sums £22 and £40—£28 and £58 for grassland—for the soil standards were reached, because these do not reflect either the environmental costs of degraded soils or the costs required for implementing the changes needed and performing the actions needed to meet the standards. I urge this Committee to put pressure on the Government to be more transparent about how these numbers are reached and how they can evolve over time.

Q58 **Mrs Sheryll Murray:** Basically, you believe that the Government should look at setting more measurable as well as binding national targets. Am I right?

***Matthew Orman:*** I certainly agree with binding national targets that the Government can be held accountable for.

**Mrs Sheryll Murray:** Kyle and Graeme, do you believe that as well?

***Graeme Willis:*** Yes, and I was disappointed that there was not one in the Environment Act. Soils is not in there alongside all the other very globally important targets.

***Kyle Lischak:*** There is also something peculiar about that 60% target stated in the EIP, which I think one of my colleagues pointed out in their evidence. It says something like 60% sustainable soils by 2030, meaning that 40% will not be. Is that a target for improvement, or is it a target that allows for regression from 100 to 60? It is unclear.

**Mrs Sheryll Murray:** That is something we can perhaps ask. Thank you very much, gentlemen.

Q59 **Dr Neil Hudson:** Some of the plans to improve soil health could involve taking land out of food production. In these challenging times of food security, how can that be achieved so that we are not compromising food security?

***Kyle Lischak:*** The starting place is to hopefully anticipate the Government's movement around a national land use framework that was proposed. A paper came out of the Lords in December on that, which I am sure you have seen. In my experience on this, between public incentive schemes and private trading schemes there is a bit of randomness. There is a bit of "everything everywhere all at once"—that is a film that is out right now. It is, "How much can we load on to this particular holding in getting all outcomes?" Rationalising it in the national land use framework would identify the places that are best suited for the best kinds of environmental and social outcomes. Speaking as a lawyer who used to do work around what was called state aid and is now subsidy control, it also sets a nice platform for how you target public money in certain places and not others and do it in a legally compliant way. The link between a soil strategy and a national land use strategy is key.

Q60 **Dr Neil Hudson:** A lot of the roads seem to be leading back to this land use framework that we are waiting for. You referred to the Lords Committee report. We asked the Minister and the DEFRA officials about their initial response to that and when we would see the land use framework. We need to wait and see what they say, but a lot of the answers could be within that. Do you think that soil health needs to be a big part of that land use framework project or document or whatever they put out in the end?

***Graeme Willis:*** It is absolutely essential, because you are looking at what land can provide. It is under lots of different pressures. We know that there is the need to provide for food security, but there are all the other multifunctions of soil, carbon, supporting biodiversity, recreation, development and so forth. You have to manage those different pressures. Soil will be fundamental because its functionality will help deliver those different benefits, and if it is not functional, it will not.

What we are concerned about is what that will look like as a framework. The most important thing is that we have very little indication of where it is going. There is a key challenge: will it read across to what DLUHC does, and will it link into planning? You have land use planning from the urban to the rural, which will be a critical connect. I do not see any evidence that that will be happening or that there is much communication. That is certainly an important thing to look at.

Secondly, on the land use framework, we pushed for a land use strategy many years ago. Scotland had one in about 2011, and we pushed for a strategy. It has now become a framework, so we need to interrogate what a strategy versus a framework is. It would be interesting if one looks from the national down to the local at how you have a structure that works at governance at those different levels. It needs, in the end, to guide strategic planning for land use that makes sense of all the things we are talking about—where do you put the right things in the right places to get the optimal results, but also how do you support land managers at their field scale to do the right thing again to deliver what is

needed in that particular area? That is quite a challenge. I am not sure where it is going at the moment. We have no intelligence on this in CPRE. We certainly look forward to seeing it, but I am not sure that it will be coming out in May; we suspect later.

Q61 **Dr Neil Hudson:** Can I focus on a phrase you used there about putting the right things in the right places? That came out in our tree planting inquiry, about the right trees in the right places. I think it will be horses for courses in terms of the land use. Do you think the Government need to look at more multi-use in lands and land sharing, so that you can combine food production with enhancing the environment or, in my part of the world, flood mitigation? These things can go hand in hand without losing good agricultural land.

***Graeme Willis:*** They should go hand in hand. I made the point in my submission that soil is nature and it is habitat, so to say that you have areas where nature is not would be very odd. You would be mismanaging the soils.

There are a lot of models around that are about taking land out of production. The most important thing will be to manage that carefully. Farmers in certain parts of the country—in the uplands, which you talked about—do not want to stop farming and producing food, but they could be producing a lot of other benefits as well and maybe producing different high-quality food using rare breeds, getting more money for their production through adding value and doing things differently but still producing food. Those uplands are critical because they are social and cultural landscapes, but they also deliver greater biodiversity through food production, not only through reverting to nature.

In the lowlands, it is critical we take into account that with food security, it is not where we are now but where we project we will be in the future—in the next 10, 20, 30 or 40 years' time—and managing the soils so that they can be productive, but they may be flooded and we may lose them, so how do we manage that? That is certainly a national strategic issue that we need to handle through the land use framework, with food security very much in mind and where the best soils are for producing the foods we will need in future, which will be vegetable production, maybe more pulses and nuts, as well as meat and dairy.

***Matthew Orman:*** A big driver of what you are talking about is the emerging market for ecosystem services, whereby farmers and landowners are being paid for a number of different services that their lands can provide. We know that the Government are looking at an ecosystems market framework this year, which we hope will bring some clarity to the question of how you stack and bundle different ecosystems on the same parcel of land so that a landowner can generate as many economic and environmental benefits as possible.

There is one challenge with that, which is how the emerging private market for farm soil carbon aligns with the sustainable farming incentive

and this critical issue of additionality, whereby you have to prove if you are a private market that any farm soil carbon you are paying for would not have been sequestered and added.

**Chair:** We will come on to that in the last question if we get time, but I am pleased we have touched on it.

**Dr Neil Hudson:** Thank you very much.

Q62 **Robbie Moore:** We have touched on this a bit, but the Government have announced which measures they will pay for under ELMs. Are the different elements within ELMs enough, and is it clear how they are expected to achieve the Government's aims?

***Kyle Lischak:*** One thing that immediately pops into my mind is that when I prepared the written evidence, I had a read of the Baroness Rock review, which goes into some very interesting issues around long-term solutions for environmental issues, including soil health improvement. I know that there has been some movement recently by the Government to make ELMs more attractive for tenant farmers, but there are core issues that remain. We need to get into the weeds of why, when you have tenant farmers on nearly 50% of the agricultural land, there are still major barriers to longer-term, more ambitious projects like agroforestry. That is not rewilding; it is food production, carbon sequestration, biodiversity and everything else. I have been on one of the farms where there was a pilot, and it is very impressive. That is a barrier for a lot of folks right now. Looking at something like that is a point for ELMs.

The other thing—and I keep banging on about it, but I will come back to it—is that whether you call it regulation or cross-compliance, the fact is that, as the farmers themselves have said in various places, ELMs is referred to as a pick and mix system; it is purely voluntary. Whether it is contractual or regulatory, there does not seem to be an underpinning whole-farm minimum standard that comes along with the agreement, like there is now with cross-compliance, that is actively looked at by the RPA. It should be, at least. If that is not there any more, you are truly into a landscape where it is purely voluntary. How can we have assurance that any Government target that relies on ELMs will stack up enough options to get anywhere close to what it needs to deliver?

I have one last point. A good example of this is when the ELMs payment was increased in January to £20 per hectare, up to £1,000. It would have been good to see some element of conditionality around that. For example, we are going to have a set of minimum standards on the farm—good practice that has been around for a long while and is perhaps reflected in current arrangements around cross-compliance. They make sense, and they are updated. In exchange for the conditional payment, you have to maintain the standard. Then your innovative options go from there into a pick and mix landscape, just to get that baseline across a large area, like there should be in theory now.

I am worried about what Natural England said in the "Health and Harmony" review a couple of years ago. There has not been a true environmental assessment of the current state of delivery of the old CAP schemes, including cross-compliance, against what is coming. It is like pulling the tablecloth out from under the expensive tableware and hoping that it all stays there when you go to the next programme. That assessment should be done.

Q63 **Robbie Moore:** Of course, the basic payment scheme was voluntary as well; you were not obligated to enter it.

***Kyle Lischak:*** It was, but it certainly seemed to attract entrants.

Q64 **Robbie Moore:** Is it right that we should rely on financial incentivisation alone?

***Kyle Lischak:*** No. I will start with the fact that, as was mentioned by Sir Robert, under the Environment Act, there is the environmental principles policy statement, which will come into effect in the coming months, including the polluter pays principle. Somewhere in agricultural policy, that has to be embedded in law to achieve what it is meant to achieve. Going back through previous Secretaries of State and policy statements, there has always been a line that says—even currently; I just saw it today on the DEFRA website—that the worst offenders, who are the polluters who violate long-standing best practice standards, will be taken to task. That remains a line, and that is right. That accords with the polluter pays principle. The baseline of what has been out there for a long time and reflects minimum standards should be encompassed in regulation, and public taxpayer money should be used to pay for innovative things that are new or things that the sector has to get used to because it has not seen them before. There is a real place for a baseline.

Q65 **Chair:** The people who are likely to fall foul of this are probably those with intensive livestock that are putting nitrates into water, but on the other hand, we are being told that arable farmers like me should have some livestock to improve their soil carbon and make the thing more sustainable. It seems that once again we are being pulled in two different directions.

***Kyle Lischak:*** There are not clearcut lines. The DEFRA code of practice is from 2009. It goes back to the mid-1980s or even earlier. Some of these things are settled. They have been around for a long time. They should properly be the subject of regulation. Other things are public asks—public money for public goods—that are brand new and perhaps the public should fund through incentive for a long time to come. There is a hybrid situation where, if activity is found to be harmful but the sector is not ready for it yet, perhaps subsidy or incentive is the right intermediate approach before it becomes regulation. The point is that this has to be sensibly laid out and considered to get to where we want to go.

Q66 **Robbie Moore:** Matthew and Graeme, do you want to add anything on

the primary questions I asked?

***Matthew Orman:*** I certainly agree that ELM is not enough, not least because of the number of farmers who will not be going into the sustainable farming incentive, and those who do go into the sustainable farming incentive but choose not to use the soil standards—because, quite frankly, it does not pay nearly as well as a lot of the others—might look at the cost of soil measurement and monitoring, the cost of cover crop seeds and the £22 per hectare and say it is just not worth it. That means that soil essentially falls out of the whole SFI because there is no baseline expectation of all participants that whatever they are doing, they should be measuring their soil. There is absolutely a role for a soil-relevant baseline in there.

***Graeme Willis:*** Clearly, what the recent analysis of the ELM prospectus in January seems to be doing is maximising flexibility, because there was a real concern that farmers were not going to sign up. As Kyle said, it is a pick and mix approach. It is a bit split because some of the soil standards are a suite of actions that have to be all done together, and the later options are now on an asset basis, and you can pick across different options. I think DEFRA is very concerned that they are not going to deliver. We think that a couple of thousand farmers have signed up to SFI 2022.

We know the direction of travel is right, and we take on board that farmers need to get on board and engage, but the worry is how far and how rapidly that can change and how it can be accelerated. As Matthew said, the problem is not only that you may not need to sign up to the standard; with the options, you may not even need to sign up to specific options. Also, it was only finally established in conversation last year that it does not have to be all your land anyway. It only has to be a part of your holding, and there are good reasons for that.

I would like to see some bundling together. As Matthew said, you could have stacking of options and linking that to markets. I am a firm believer that regenerative farming is an interesting way to go, because it gives a clear sense of where farming could go that works for farmers and works for the environment. George Eustice said in several conferences I have been to that it is at the heart of ELM, but I do not see that being said. We need to be clear whether there could be a whole-farm standard that is a regenerative standard that links the different options.

One of the key things about regenerative farming is that it clearly links some principles. You mentioned livestock integration, Sir Robert. There is minimum soil disturbance. There is crop diversity. There is maintaining soil cover. You have living roots. Those are the Groundswell principles, and they work synergistically. If you just have a pick and mix and have one option, you might find you do no tillage, and then you have all kinds of other problems and two or three years later your soils are not working, you do not get the yields and you abandon it. If you bring them all together synergistically, there is much better hope that those work much

better together to deliver much better results in maintaining yield, reducing your traction power, your diesel use, your labour charge and your inputs of nitrogen, so you get a good win-win result. There is a much better chance of doing that.

We need not only the incentives; we need the options, the advice package, the training and the peer-to-peer learning to do that. Farmers are great at talking to each other and learning from each other. They not only need that for their mental health benefit but to engage with other people and see what other farmers are doing in their situ. Groundswell is a fantastic example. I think there were 7,000 farmers there last year, which is amazing.

**Chair:** We are looking at possibly visiting that as a Committee. We have been in conversation. I have been before, when I was Minister.

***Graeme Willis:*** It is a fabulous conference. It is inspiring.

**Chair:** It is very kind land, though; it does not work on every farm, I suspect.

***Graeme Willis:*** The challenge, as Bridget Emmett referred to, is how farmers make sense of how all these things work for themselves on their patch. That is where it gets very difficult setting very firm structures. Farmers need to be supported to learn.

This is a personal thing, but I would love for there to be a patch of their farm where they are supported to do innovation and try something new—start from where you are, as Martin Lines always says. ELMs is supporting farmers from where they are, and it is important that they then get led through to a better place, but give them the chance to say, "Try something different on the farm. Don't put so much nitrogen on that bit of land. Do a different cover crop, and experiment," so that farmers, who are hugely entrepreneurial, can experiment in how they manage their land and their soils and try a few different things. They need some input to do that.

***Matthew Orman:*** I have a quick point on that. I totally agree with what Graeme says: it is only when you implement a number of practices all at once that you get this explosion of benefits from regenerative, carbon, biodiversity and so on. We are seeing that from results in the US. At the moment we do not have the evidence base about the impact of these interventions in an English setting. A very important ask for this Committee is for the Government to invest in building that evidence base to see what impact different regenerative interventions can have, not just individually through the SFI but as a whole package. We have done some back-of-an-envelope costs on that, which I will share with you. It is a very affordable and very good value for money piece of research.

Q67 **Chair:** Thank you. Matthew, you touched briefly on carbon trading, and there is other nutrient trading that may be quite important. How will the

emergence of this new way of making money out of sticking carbon in the soil or in a tree impact on some of the other measures that we want to introduce to improve soil health? Is there a danger that we might find farmers being double paid—getting paid under ELMs but also selling the carbon to British Airways so that they can fly across to New York?

***Matthew Orman:*** There is a danger of that. The soil carbon marketplace is emerging. It is often described as a wild west. Different programmes and projects are operating to very diverse and different rules and requirements.

Q68 **Chair:** Some of the carbon is abroad as well, where it is even more likely to be a wild west, I suspect.

***Matthew Orman:*** It is a very unregulated market. In fact, we understand that the British Standards Institution is about to be given the brief to start attaching some standards to this market, which will be a small but useful step in the right direction.

It is important to understand that when we talk about a market for ecosystem services and a market for carbon, we are talking about lots of different markets. You referred to offsetting and the voluntary carbon market, which is the eye of the storm at the moment and attracting a lot of controversy—a lot of it well founded. As I say, that is the offsets market, so that is where you have British Airways involved. You have a growing interest, however, in what we call the insets market, which is where food businesses are increasingly seeing farm soil carbon as a way to reduce and mitigate their scope 3 net zero emissions. We think that will be the driver of this marketplace more than offsets in the years to come. Alongside that, you have the ecosystems marketplace, which might be driven by water companies looking to improve local soil structure because it reduces costs for them. Finally, you have the public marketplace—the sustainable farming incentive—which is also paying farmers to improve their soils.

There are gaps, there are contradictions and, as I alluded to earlier, there is a problem at the moment with this issue of additionality. If a farmer is going into the SFI, can they also benefit from the private marketplace? At the moment the answer is probably no, and there needs to be some clarification from the SFI about the boundaries between—

Q69 **Chair:** Could carbon trading in effect crowd out the SFI and the other ELMs aspects, so that farmers abandon that, and we therefore lose some of the cross-compliance or some of the other regulations that are attached to ELMs?

***Matthew Orman:*** At the rate that the SFI is currently paying for soil, it is more likely to be the other way around.

***Kyle Lischak:*** There is a fundamental issue between the terminology around offset, which is a neutralisation of an impact, and what ELMs is trying to accomplish, which is environmental gain, ultimately, and

improvement towards a target. There is a real question as to what the public interest is in these trading schemes from the perspective of whether they can help to deliver net gain as well as make offsets. From a data perspective, Government have these important climate and Environment Act targets now. Why shouldn't the data associated with those schemes be used to report progress and paint a national picture around how targets are being achieved or not achieved?

Going back to the primary legislation question for soil, or any other form of legislation for that matter, the questions are: is there a public interest in the private schemes? What is it, and is there a role for some form of intervention in those schemes to tie in with the bigger picture?

Q70 **Chair:** Is there a danger that the need to fix carbon and sell that on to a market could crowd out other objectives like biodiversity? For example, while softwood planting is pretty good for the environment for the first few years, it soon becomes pretty much a monoculture with nothing living underneath it of any size. Is there a worry that the dash for carbon could crowd out all the other objectives that we are trying to achieve?

***Matthew Orman:*** Absolutely. We published last year a set of minimum requirements—it was an Environment Agency funded project—for farm soil carbon projects. That included issues like additionality but also monitoring, reporting and verification, permanence period and the issue of leakage, to make sure that any interventions—any soil carbon projects—did not inadvertently lead to an increase in emissions elsewhere as a result. We are hoping that the British Standards Institution will take some of our work on board and incorporate it into its own standards, but you are right to suggest that that includes leakage on outcomes like biodiversity as well.

Q71 **Chair:** We are probably straying a little bit beyond soils, but you talked about the wild west. Is there a need to have some sort of Government stamp or international stamp, to ensure that if I am paying people in Bolivia, Brazil or Sri Lanka to fix carbon, that is internationally sustainable and it is not just somebody bribing an official somewhere to sign a bit of paper?

***Matthew Orman:*** Absolutely, and the British Standards Institution work is a step in the right direction. Often BSI standards get converted into international standards. As you alluded to, it is driven as much by the international marketplace, and there you find that the standards and the roles of the different standards—for example, the IPCC—are very patchy. If you look at a farm soil carbon project, there is quite a variance in the number of samples taken from a field to demonstrate change over time, the depth of those samples, and so on. Some degree of consistency is needed quite urgently.

Q72 **Chair:** Thank you very much. We seem to have managed to conclude before democracy has intervened, so are there any points we have not asked about that you think would be useful to raise for our report?

***Graeme Willis:*** I would certainly like to mention planning again. CPRE has concerns about the national planning policy framework and how well that protects soils and soil sealing. It needs to be stronger policy, because it tends to be guidance about protecting soils well, and the real pressure in the NPPF is to deliver housing targets.

We are very keen that brownfield is used better to protect greenfield, particularly high-quality agricultural land. There is quite a lot of such land coming forward in different projects in Kent and just near me in Colchester, and it is hundreds of hectares involved of very high-quality land. That raises questions about the protection of those best-quality soils for food production over the long term and the mapping that underpins our understanding of where those soils are. The mapping goes back to pre-1988 provisional reconnaissance mapping, and we only have a limited area under the more modern mapping. Understanding what soils are under threat and their quality is quite difficult for areas where they are now extending beyond the curtilage or peri-urban areas around large towns where the more detailed mapping is covering.

To link that to the worry about flood threats, we know that 60% of grade 1 land is in zone 3 flood risk, and although we have some projections of flood level rises, some of those are looking decidedly shaky with some of the things coming forward from—

**Chair:** It is already below sea level.

***Graeme Willis:*** Yes, it is already below sea level, so there is a big question about where we produce our food in the future if those lands are lost and development continues to lose soils.

Lastly on the monitoring, the land use change statistics were changed in 2013, and they took out from that things like pavements and car parks, which are also being sealed so are hampering soil function. They are not now monitored in land use change statistics, so we have less of an idea—probably an underestimate—of the amount of soils that are sealed.

***Kyle Lischak:*** We did not mention when I went through my list focused on agricultural regulation that the environmental impact assessment regulations for housing development, agriculture and forestry are also retained EU law legacy. I know that at least as far as some of that is concerned, there are proposals in the levelling-up Bill to have a replacement scheme, but all those regulations deal with soil as a criterion for land use change. It is important to get a message across in this change of law and rules context about what will become of EIA vis-à-vis soils for different land uses in this country.

**Chair:** Thank you very much, gentlemen. It has been a very helpful session.