

Environment, Food and Rural Affairs Committee

Oral evidence: Soil Health, HC 963

Tuesday 13 June 2023

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[Watch the meeting](#)

Members present: Sir Robert Goodwill (Chair); Steven Bonnar; Ian Byrne; Rosie Duffield; Barry Gardiner; Dr Neil Hudson; Robbie Moore; Mrs Sheryll Murray; Julian Sturdy.

Questions 251 - 338

Witnesses

I: Tony Grayling, Director of Sustainable Business and Development, Environment Agency; Dr Eleanor Reed, Principal Specialist in Soils, Natural England; and Professor John Gilliland OBE, Special Adviser, Agriculture and Horticulture Development Board.

Written evidence from witnesses:

- [Environment Agency](#)
- [Natural England](#)
- [Agriculture and Horticulture Development Board.](#)



Examination of witnesses

Witnesses: Tony Grayling, Dr Eleanor Reed and Professor John Gilliland OBE.

Q251 **Chair:** Welcome to this penultimate session of the Environment, Food and Rural Affairs Committee's inquiry into soil health. The next session will be with the Minister. We are looking forward to that and no doubt today's session will throw up some questions that we can ask the Minister, particularly as we know you are not politically active or motivated, so we are here for scientific and professional advice rather than political advice.

Perhaps I could ask you—our three witnesses—to introduce yourselves with a short synopsis of who you are and why you are here, starting with John Gilliland.

Professor Gilliland: Thank you, Chairman. I am John Gilliland. I am here as a special adviser to the Agriculture and Horticulture Development Board. Outside that role, I am a practising farmer. I chaired the Northern Ireland expert working group that wrote the sustainable land management strategy that led to the soil nutrient health scheme being created in Northern Ireland. I am a member of the European soil mission board, so I am one of 15 people who lead the debate on soils in Europe, and I am a Professor of Practice at Queen's University Belfast.

Chair: And the AHDB is an industry-funded body—funded by a levy on most things, but not potatoes any more.

Professor Gilliland: That is correct. It is a non-departmental public body. It is not an NGO. We are not here to lobby; we are here to look at the evidence and support that.

Dr Reed: Hi. I am Eleanor Reed. I am a senior soil specialist at Natural England.

Tony Grayling: Good afternoon. I am Tony Grayling. I am the director of sustainable business and development at the Environment Agency.

Q252 **Chair:** Thank you. I will start with a question about trying to establish a baseline. The Environment Agency last estimated the impact of soil degradation in 2019. How critical is the soil health situation in the UK now and what does that mean for the economy, human health, food production and our wider environmental goals?

Tony Grayling: Thank you for the reference to our "The state of the environment: soil" report. I think that shows that our soils are not in a good state and have been heavily degraded over time. The costs to society and the economy are quite significant and the contribution that soils could make to mitigating and adapting to climate change is also at risk.



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Along with others—including Natural England and the AHDB—we are very much of the view that establishing a baseline for soil health is critical for getting a handle on the current state of soil health across agricultural and non-agricultural soils, and then using that as a basis for taking action to start to improve soil health, which will have a variety of benefits.

Q253 **Chair:** So we are talking about structure, drainage, nutrients, carbon—all of the above, basically, and the rest?

Tony Grayling: We are talking about all of the above. Soils provide essential ecosystem services to us and include all the things that you mention. The danger is that those services are being degraded.

Dr Reed: I completely agree. It is important to set the context that soil health is fundamental to nature recovery. The concept of good soil health includes providing those societal benefits from carbon sequestration to reducing flood risk and providing clean water. Poor soil health does the opposite; it can increase erosion and contamination downstream, which have added societal costs.

Q254 **Chair:** John, particularly from a devolved point of view—agriculture is devolved, so we have different situations in the different parts of our country—does your experience in Northern Ireland give you some insight?

Professor Gilliland: First, from AHDB's point of view, we are very keen on baselines because we want to help levy payers understand the soil that they manage. To do that, we want to help farmers understand their own numbers. We have some very good soil maps but they are not necessarily at the right resolution for individual decision makers to form an educated opinion of their own farms.

When I chaired Northern Ireland's sustainable land management strategy, our recommendation to the Government was to help farmers know their own numbers. We recommended that every field in the country should be baselined, and we put forward the evidence for that. Back in 2018 to 2021, we ran—when I say “we” I mean DAERA, AFBI and the industry together in partnership—three catchment pilots in the upper River Bann, the River Colebrook and the River Strule. We managed to get 80% of farmers to engage. That in itself was huge.

Q255 **Chair:** Was there a financial incentive to do that?

Professor Gilliland: No. The scheme was free—there was no cost to them—but they had to give access to independent people to sample it. The journey that we need to go on has to be a journey of integrity, and we want to ensure that when we do our baseline, when the soils are sampled, they are sampled to one protocol so that we can compare apples with apples and not apples with oranges. In the pilots, we outsourced to a particular company that had the job of doing all the soil samples to a protocol so that, when all the results came in, we could see



that the results were the results; there were no variables in there because the methodology was separate.

After two years, when we went back and did a social survey of farmers, we found that up to 80% had changed their behaviour constructively. That is based on the premise that to manage you first have to measure, but if you empower land managers with really good information about their own farm—not their neighbour's farm but their own farm—they will rise to the challenge.

On the back of the success of the three river catchment pilots, a business plan was put forward to the Department of Finance and that secured £45 million to baseline every field in Northern Ireland over four years. The first zone has been completed and we had a 92% farmer uptake in that first zone. The second zone opens at the end of this month.

Q256 Chair: Was that predominantly grasslands? We have had evidence in the past that arable farmers are very good at measuring, in particular, their phosphate, potash, magnesium and so on.

Professor Gilliland: This is a particular issue we have. Livestock farmers are very good at looking after their animals but maybe less so at looking at the soil that those animals stand within. In Northern Ireland we found that only 18% of our soils were in good health. That was mostly just because nobody was sampling or, if they were sampling, they were doing it to different methodologies.

This was a harmonisation into one framework. In Northern Ireland, we have one framework: there is one protocol, there is one team that lifts the samples, and there is one laboratory that does all the analysis. We are making sure that we can compare apples with apples and not apples with oranges.

Q257 Chair: Was carbon/organic matter part of that?

Professor Gilliland: The initial survey—it is twofold—was soil pH, phosphate, potash, calcium, magnesium, sulphur and soil organic matter. With soil organic carbon, we are still working out how best to do that. I chair an EIP-AGRI operational group of seven farms where we have sat down and looked at wider measurements of soil health, looking at earthworm populations and soil respiration.

One of the key things that AHDB has designed is a soil health scorecard. It is designed particularly for individual land managers, to try to get them to engage with their soil and look at the soil structure, fertility and health as one of the tools to empower themselves. But it does not take away from having one credible baseline done to the same standard.

The plan in Northern Ireland is that that will be repeated every five years. It is done with a digital technology in parallel—LiDAR, which is a bit like RADAR. It is an aerial digital survey that does 15 scans per square metre and gives you the topography. Because everything is on a GIS



framework, we can layer it, and each farm can then be given a run-off risk map. How do you mitigate run-off into watercourses? We know we have a real issue about water quality. What we are trying to do in our job in soil health and improving soil health is ask: are there other public goods that we could do at the same time?

Q258 **Chair:** Was this an initiative of AHDB, or DAERA?

Professor Gilliland: No, this was a DAERA initiative.

Q259 **Chair:** Was it at a time when there was no functioning Executive? Was it official-led?

Professor Gilliland: We started this journey in 2014. I was asked by the then Permanent Secretary to put together a multi-stakeholder group of experts. We had members of the NGO community, farmers, policymakers and retailers, all sitting round the table asking, "How do we do this?" and 18 months later we published our strategy. There was collective buy-in. When we handed the strategy to the Government, we had a signed letter from the Ulster Farmers Union and Northern Ireland Environment Link saying, "We support this," so we managed to get consensus across the stakeholders.

The Permanent Secretary did say that I was a bit ambitious in what we were planning, which was to baseline every field. We agreed that we would do a pilot first and, if we could prove that if you empower farmers with really good information they do change their behaviour positively, that we would go back and seek further funding to do the whole of Northern Ireland.

Chair: Thank you. I am pleased you came today, John. I think we have one or things to learn from Northern Ireland to apply to the rest of the country.

Q260 **Rosie Duffield:** Is the Government's current soils strategy in its environmental improvement plan comprehensive enough? Could it go further?

Tony Grayling: I think it is a good start. There are some key elements included in the environmental improvement plan, including some good ambitions, and some of the measures that have been put in place through the environmental land management schemes are also a good start. But as the Environment Agency, we would see merit in bringing together a more complete and holistic plan for soils, which could be an offspring of the environmental improvement plan, similar to the plan for water being an offspring of that document.

We think this is a really important environmental medium that we need to be focused on and there are no simple solutions. It is going to require a variety of solutions, which will include, from our perspective, better regulation but also the right sorts of incentives and planning frameworks. We do see merit in bringing that together in a plan.



Dr Reed: Adding to what Tony said, Natural England would like to see all soils to be in good soil health. The EIP sets out a number of targets and commitments, including a commitment to updating the construction code of practice for the sustainable use of soils on construction sites and to reduce the amount of soil going to landfill. That is really tying in the importance of soils away from agricultural land, highlighting the importance of all soils. We need a really clear strategy to set about how to deliver those targets and commitments to bring all our soils from the current state of soil health, which is unknown—as has been mentioned, we do not have that baseline yet—to good soil health.

Q261 **Rosie Duffield:** How could the Government's soils strategy link with other environmental policies, such as on air quality, net zero, water, food security and biodiversity? Could it? Is that realistic?

Tony Grayling: There are absolutely huge links between all of those agenda. Soils are a very big store of carbon, even now, when you have seen great degradation of soil carbon in arable fields. They are very important for water management. They are in themselves, if healthy, biodiverse. They help with water quality issues if well managed. As Eleanor was saying, they contribute to flood risk management. Looking at the environment holistically, soils are an important part and there are big links to be made.

Q262 **Rosie Duffield:** Do you think that DEFRA is looking at that, or is it something that DEFRA needs nudging on?

Tony Grayling: Yes, I think my colleagues in DEFRA, with whom we work very closely, are very much looking at all the services, if you like, that healthy soils provide. They recognise the need to get a good handle on the current state of our soils and take a variety of actions to bring them to better health, to ensure that in future they store more carbon, not less, and make a bigger contribution to water management and flood risk management as well as, of course, supporting the production of food.

Q263 **Rosie Duffield:** Would a land use strategy be an effective way to combine these policies and manage trade-offs between them? We heard earlier that 58% of landfill is soil, which is a bit mind-blowing if you have not heard that statistic before. It seems to be about joining things up. As a message to the public, it does not sound like a sexy headline but it would be informing everyone that these things are all linked. Could a strategy like that help?

Dr Reed: A land use framework would absolutely be critical. It is about identifying soil capability. Different soils can deliver different functions to different degrees. That is their inherent capability. It is being able to understand what that is through a baseline and then being able to tailor the land use to the soil type. That type of land use framework can set out the overarching strategy to deliver that.

Professor Gilliland: AHDB represents a lot of levy payers. We are not lobbyists. We look at evidence and we help them make better-quality



decisions for their business. We are not involved in the landfill side but we do not have the luxury of looking at soils in isolation. Anything that we do to help our levy payers is looking in the round at how they can deliver multiple wins: water retention, carbon stocks, increasing biodiversity and so on. People forget that more than half the world's biodiversity is under the soil, so good soil health is about driving biodiversity; it is just not visible to the naked eye. We are always trying to help bring forward recommendations and suggestions to levy payers about how they look at it in its totality.

There is a lot of public debate about land use. I would make two points. One is that it is very important that we do not do this in isolation from the current land managers, because the land use debate could run the risk of being top down rather than bottom up. We would much prefer to empower current land managers with really good information about the asset they have today—where is it good; where is it not so good?—and show them how they might make it better so they can make better-quality decisions. Hopefully the outcome would be that you would still get some land use change.

It is really important in this journey that we evidence. I am very privileged: my own personal farm has five historic land uses and they are totally different. I have had a master's student from Wageningen University and Research analyse the soil health and the soil organic carbon on my five different land uses, and we got an answer that did surprise us all. That is that single uses of land, whether it is cattle grazing or just deciduous woodland, were the two extremes. Things like silvopasture came way up the middle, because it delivers multiple public goods—it delivers food, ecosystem services, and carbon sequestration.

It is really good, if you can get the baseline and do it across the land uses, that we evidence the decision about where we want to go with land use. Before AHDB encourages levy payers to go in a direction, we would like it to be evidenced, and it is important that policymakers go with us. Our journey is to help get the evidence and fill the knowledge gaps so that, when policymakers are making a decision, it is an informed decision.

Q264 **Rosie Duffield:** Getting evidence sounds like taking a more measured and slightly long-term look, whereas we often hear that farmers are under so much pressure to sign up to the latest scheme. Things change really fast, don't they? Perhaps that is reassuring people to take their time.

Professor Gilliland: One thing that I think we all have to respect is that improving soil health is a slow game. If we are going to make a commitment and build an ambition about improving soil health, we need to stand by it. We need to ringfence the vehicle that is going to help us on that. I would highlight that it is important that we look at this right through all the regions of the UK and actually look across the sea.



I mentioned that I sit on the EU soil mission board. There are various things that it is looking to do, but its ambition to fill the knowledge gaps is quite extraordinary. It will be spending between €350 million and €450 million over the next five years to fill the knowledge gaps to help it deliver its targets on soil health. That is a big ambition, to fill the knowledge gaps, and it will be really interesting. I will argue that we should be looking at a similar ambition—how do we evidence the journey that we need to go on?

Dr Reed: Can I jump back to your question about landfill? I think it is quite important with regard to construction sites. Natural England provides advice on soil handling, and we rely on the DEFRA construction code of practice, which is currently being updated. A large amount of soil currently ends up going to landfill, largely because it is not considered early on in the planning process. We would like to see stronger policy setting out the requirement for soil management and linking it to the landscaping and the masterplanning of development sites.

The EA is currently running a feasibility study for a sort of earth bank/soil storage facility, where soils from construction sites are stored for use on other construction sites. Soils are a finite resource. We have been talking about their ecosystem services and how important they are for nature and societal benefits. It is critical that we keep them out of landfill and maximise their sustainable reuse.

Chair: We are expecting Divisions later, so we need to try to make some progress through concise questions and answers. If anyone else wants to take their jacket off, including witnesses, please feel free. Obviously, coming from Scarborough, I am used to these balmy temperatures all year round.

Q265 **Steven Bonnar:** We have heard a lot that there is a lack of data around soil health, which in turn makes it difficult to design and monitor soil health interventions. Why do you think that is a problem? What needs to change to make sure it is addressed?

Professor Gilliland: In the case of our levy payers who are farmer decision makers, we would always encourage them to try to evidence any decision they make to ensure that it will send them in the right direction. Our difficulty in advising them is that our knowledge of soil health is not good. We do not have a single set of metrics that we currently judge our soils by. We do not have a single framework. There are lots of different organisations suggesting different ways to do it. We need to have a conversation that brings it down to one.

But we also need a degree of expediency. That is why the journey I have been on in Northern Ireland is about pilots: "Let's go and have a go at it." It is not until you have a go at it that you find the right things and make the argument less academic and more practical. Land managers would like some practical guidance, and the direction that AHDB is going is to try to help them know their numbers so that, when they make a decision



on how they are going to manage their soils, it is from a position of knowledge.

Q266 **Steven Bonnar:** Having heard that, I wonder what steps Natural England, the Environment Agency and the Government are taking to address the deficiencies that have been outlined, especially in the data.

Dr Reed: Natural England, in partnership with the EA, the JNCC, the MMO and Forest Research, is currently undertaking a large-scale programme called the natural capital and ecosystem assessment. That is looking at the extent, condition and change over time of habitats. Part of that study is the England ecosystem survey, which is a soil survey. We are testing soils across multiple different habitats, and the number of properties that we are looking at in those soil samples is vast. We are looking at the physical, chemical and, importantly, biological properties. It is collecting all of that that, which will feed into the healthy soil indicator, which is one of the commitments in the EIP.

Q267 **Steven Bonnar:** Do you have any idea when that will be ready? You are developing the soil health indicator and gathering the data. Can you tell us what that will cover and when it will be ready, because time is of the essence?

Dr Reed: Absolutely. The survey has just commenced, this summer. It has had two years of development, making sure that the methodologies are robust and up to date—using the most state-of-the-art methodologies. As John mentioned, having really robust data is essential. With regard to the roll-out of the healthy soil indicator, if you are happy, that is something I can provide to you as written evidence after this session.

Tony Grayling: My understanding on that front is that it should be available within about 18 months, so towards the end of next year.

Professor Gilliland: Running in parallel to that, there are a collection of companies in this space. One of the best companies that I have used is a company in Dundee. Wearing my farmer hat, what I like is watching the process. This company in Dundee—it is called Agricarbon—can take soil samples to 1 metre. Watching a core coming out of your ground to show your topsoil, your subsoil, your C horizon, it is like, “Wow. Now I understand why that doesn’t drain but that bit does drain.” Nothing beats it.

Not only do we need indicators but we need behavioural change. The best way to get behavioural change is through pilots where you do peer-to-peer learning and knowledge exchange. We have a demo network within AHDB and we sweat that to try to help practitioners to see this. Using companies like that to demonstrate their soil—it is like a “Hallelujah!” moment. If your soil is compacted and is an iron pan, you will see it as the soil core comes out and say, “Ah, now I know why that bit doesn’t drain.” We need to encourage that running in parallel with the



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development of the metrics and the indices: real, live work on our soils where practitioners get to eyeball it for themselves.

Q268 **Ian Byrne:** Building on what Steven talked about, to what extent is the soil monitoring regime adequately funded, and how secure is that funding?

Dr Reed: Having the commitment is really important. The monitoring scheme is based on five-yearly cycles of sampling, so it would be great if the funding could be secured for the long term. As has been mentioned, soil properties change very slowly over time, so we do need that long-term commitment.

Ian Byrne: Tony?

Tony Grayling: Only to add that that means that we would want to see commitments in future spending reviews to continue the funding so that it is not just a one-off exercise.

Q269 **Ian Byrne:** Let me build on that with an observation. I was chatting to someone the other week and he was asking me about the EFRA Committee and I said, "We're doing soil health," and the eyes rolled. Then I told him about the Natural Capital Committee's statement that soils are critical to human existence. You get the same reaction from politicians, and it is not sectarian; it is right across the board. Do politicians and the public put enough importance on this issue? It is such an important common good. How do we make sure that we get it to the top of the agenda? You are talking about funding potentially not being sustainable. John has just said that it is a long-term project, looking at what has happened in Northern Ireland.

Professor Gilliland: The scheme in Northern Ireland is costing £45 million over four years, so £11 million a year. We are doing 1 million hectares, or thereabouts, so you can do the sums, and the plan is to repeat it. We are doing more than soil. We are doing the LiDAR, the run-off risk, and we are looking at improving water quality. We have decided to take a holistic view, in which soils are pivotal. It is costing us roughly £11 million a year. The total subvention annually to agriculture in Northern Ireland is roughly £310 million to £330 million, so the scheme is costing us about 3.5% of the total subvention.

What are we getting? We are getting integrity. We are empowering land managers to make better jobs. We are also giving reassurance to concerned society that, as custodians of the landscape, we have a robust, rigorous and credible scheme that land managers like because they are getting something out of it too—they are getting better knowledge and becoming better land managers—and society is getting something out of it because land managers are managing the environment better.

It is about putting your trust and faith in land managers. You are basically looking to empower them with better knowledge to become better decision makers. They are winners, but we as society are winners



too. It is about hearts and minds—getting the psychology that this is a public good. But the key thing that we succeeded with in Northern Ireland is recognising the measuring, reporting and verification of the baseline as a public good. The behavioural change is up to me as a land manager but to build the integrity, if we want integrity in our journey, that measurement is a public good.

It is very expensive to do; it is not cheap—I have given you an idea of the cost—but the measuring, reporting and verification of this baseline and repeating it every five years is now deemed a public good in Northern Ireland and it has been ringfenced to do that. When you repeat it successively, you get incredible evidence of behavioural change delivering hard results in more soil biology and more fertility. The great thing we found in our catchments was that we improved the environment and our productivity improved too. We used more lime and less fertiliser, which is a straight win to reduce greenhouse gas emissions and a straight win to the land manager's profitability.

Ian Byrne: It pays for itself.

Professor Gilliland: If you want the integrity, what we have done is a public-private partnership. Subbing this out to the private sector, it just will not happen. You will not get one framework and you will not get it all together. This way, we now have a credible vehicle that society is happy with, retailers are happy with and farmers are happy with.

Q270 **Ian Byrne:** Tony, the Government have promised a baseline map by 2028. Why would that take so long, and how open and accessible will it be, building on what John has just said about Northern Ireland?

Tony Grayling: I think the reason it takes that length of time is that it is a complex and intensive exercise. I will have to defer to Eleanor on how publicly available the data will be, but I think it will be publicly available.

I think it needs to demonstrate its value. The evidence we presented in our report, which dated back to 2010, was that the cost of soil degradation to the economy overall was over £1 billion a year. That is not sustainable. If we have a better understanding of the health of our soils and start to manage them better and improve their health, perhaps that will be turned around and, instead of there being a net cost to society, there will be a net benefit. I suspect that is something the Treasury would understand.

Dr Reed: It will be completely accessible. That is one of the really important points about all this data collection, that it is available for landowners and land managers to utilise, but they do need help in the form of a decision-support tool that pulls together all the information we already have. While there are gaps in our data and mapping, we do have a lot of knowledge about what sustainable soil management is in certain soil types and certain land uses. Lots of different initiatives are going on and it is about pulling all that together into some sort of system that land



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users can use to identify the best management to get the most out of their land.

Q271 **Ian Byrne:** How will this new soil monitoring programme compare to the soil monitoring that took place under the countryside survey?

Dr Reed: This will take account of many more properties of soils, so we will be able to really drill down into soil health and what needs to be done to improve it. The countryside survey measured fewer properties.

Ian Byrne: It is more comprehensive.

Dr Reed: Absolutely.

Professor Gilliland: Can I clarify the issue about resolution here? What my two colleagues are talking about is quite high level. The resolution for the blocks of land you are doing it for is going to be quite detailed, but it is a small part of the whole country. We were talking about the resolution of every field, and that goes to data ownership and how data is managed. The deal we did with land managers in Northern Ireland, because we are doing it right down to individual fields, is that the data are looked after by a non-departmental public body in Northern Ireland, the Agri-Food and Biosciences Institute.

The Minister gave every applicant a letter of undertaking that it would be ringfenced—that the data belongs to the land manager—but, at catchment levels, there would be a collective of the data given to policy and regulatory bodies so that they could make helpful regulatory decisions. But the data from an individual field would remain the property of the farmer and the custodian of that would be the Agri-Food and Biosciences Institute, a non-departmental public body, where it would be ringfenced.

It is really important to look at the difference in resolutions and the data. When you go to this level of detail, you will not get access to land unless—farmers are canny people. They will not give away their data. That was the deal we did: we ringfenced the ownership of the data. Otherwise, we would not have got access to land; we would not have got the 92% uptake by farmers. They have been reassured.

Q272 **Chair:** John, I think you said the budget for Northern Ireland was £11 million a year.

Professor Gilliland: The cost of the whole scheme, over four years, is £45 million.

Chair: Do we know what the budget is for England?

Tony Grayling: I am afraid I don't.

Chair: I am sure someone in the bowels of DEFRA is listening to this session, so when Minister Spencer comes he can probably give us a figure, which will be very helpful. Given the relative sizes of England and



Northern Ireland, I suspect it pales into insignificance compared with the investment in Northern Ireland.

Professor Gilliland: And, Chairman, it is about ambition. We decided that we wanted to take soil health, water quality and habitat quality and protection seriously. We felt that this was helping people to know their numbers, and then the revisiting of that allowed them to become better land managers and deliver multiple public goods in a credible way.

Chair: A lot of soil testing has been done in England but that data is stuck in filing cabinets in individual farmers' offices; it has not been passed on. That is something that, no doubt, we will be putting in our report.

Q273 **Dr Hudson:** John, can I quickly follow up the points you made about the granularity and the resolution? We heard about that on our visits to Rothamsted and the LEAF-accredited Barfoots premises, when there was a roundtable there, and also in our evidence sessions. If access to the data is restricted—and I do get the point that individual land managers and farmers will want it protected to their field level. You said that that information will be transferred to policymakers and so on. Will there be any scope for open access to more regional datasets, for catchment areas or regions, so that people can access those data without going through the policymakers?

Dr Reed: We are looking at two different types of data here. There is the soil health data looking at the current state of the soils, but then there is soil mapping, which looks at the inherent soil properties. We have mapping for the entirety of England and Wales but only about a quarter of the country is mapped at a detailed level.

Q274 **Dr Hudson:** How recently was it mapped?

Dr Reed: That was back in the '70s, but that is inherent properties that do not change that much: your texture, for example. There are other datasets. Natural England holds a lot of agricultural land classification data, which is available, and as part of that data there is soil profile information, which is currently being digitised. That is the type of data that could also be integrated into a wider, more detailed soil map.

Q275 **Dr Hudson:** That is helpful. I will get on to the main body of my question now. A recurrent theme of our inquiry is the importance of data collection and how valuable an asset it would be. How important is it for landowners to be able to measure their own soils and how can that be facilitated? John, you were talking about a company from Scotland coming in and doing it for you. Is it something that landowners can be encouraged to do themselves or will they have to get contractors in? How can we facilitate more data collection?

Professor Gilliland: I think you have to decide why you are doing it. We want the soils to be managed better and managed with integrity. Our difficulty at the moment is that there are a lot of private sector



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companies doing a lot of good jobs, but you can end up comparing apples with oranges. If I get one company this time and three years later I get another company, and its lab is slightly different or how it samples the soil is slightly different, that will create a lot of noise, so your decision making is blurred because you do not have the same accuracy.

This structure has a controlled methodology, so there is a way that the overall trends can come out and we can see, "The train has left the station. Is it going the right way or the wrong way, and at what speed?" It is publishable and peer-reviewable. We think that is really important.

Q276 Dr Hudson: Is that going to be a harder ask for England, given the geographical area compared with Northern Ireland, in terms of getting a number of contractors to do it to a single matrix, so it is apples and apples?

Professor Gilliland: It is important to AHDB to make sure that when our levy payers make decisions they are based on good information. There will always be many players, but at least can we agree the metrics and the protocols so that we are comparing apples with apples?

On my farm, I have taken one soil sample, divided it in five and sent it to five accredited laboratories and I have had five different answers. From my experience, what I would do is pick my sampling regime, pick my lab and stay with it, so that every time I repeat it, whatever inconsistency there is it is the same inconsistency, I am minimising the noise, and if there is a trend there, I am seeing it better.

Q277 Dr Hudson: If we are going to get a good dataset, is it down to the Government to decide on the matrix and say, "You have to test it this way"?

Professor Gilliland: The Government or organisations like the three of ours. AHDB is the non-departmental public body looking after levy payers. Most soils in England are managed by people who pay a levy to AHDB. It is a role for us as a thought leader to help and give guidance. I don't see AHDB putting boots on the ground but at least overseeing the methodologies and being the honest broker. It is a non-partisan, not-for-profit organisation.

Q278 Dr Hudson: Can I pivot to Eleanor and Tony for the next part of my questioning? How will you and the Government ensure that future soil health indicators are easy to use and affordable for landowners and managers?

Tony Grayling: The truth is that it is not an easy question for me to answer, because soil health is a complex issue. I think that is part of the challenge of developing the soil health indicator, which we are currently doing in partnership. It needs to be replicable and understandable but it also needs to reflect the diversity of soils with different characteristics. I hope we will be able to crack that, but it is not my area of expertise so I wouldn't be able to say any more.



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Dr Reed: I can provide a current example of an existing capability map, and that is the agricultural land classification. It is a really complex system, where you are getting data about your soils, the climate and the site. You pull it together and get a grade giving an indication of how productive that land could be and a map. As a user, you just need to see that map and see what grade your land is; you do not necessarily need to understand how it has all been calculated behind the scenes. The trick of this healthy soils indicator, or soil health map, is that there will be a lot of complexity in the layers beneath what you see, but hopefully we can provide something simple for the user to use practically.

Q279 **Dr Hudson:** Moving forward, how can we, you, the Government, encourage more landowners to monitor their soils' health? Do we do that with a carrot or say, "You're not going to get some of this grant funding if you don't do this"?

Dr Reed: It is a balance. I think that we need to emphasise and acknowledge how important soils are. They are fundamental for nature and the delivery of these ecosystem services. It is highlighting that soils in good health can deliver those ecosystem services better if the right land use is in place, and that includes food productivity. The SFI schemes are there at the moment to provide that incentive to improve soil health. Those are being iteratively altered as new data is coming in. It will be a balance going forward whether we need to bring regulation in to improve the worst-performing soils so we are bringing those into good health.

Q280 **Dr Hudson:** It is being evolved in an iterative process. I think that we all acknowledge that good soil health is a public good. On that score, should soil testing become a prerequisite for some of the ELM schemes? Should it become compulsory for large landowners, for instance? Is that something that this Committee should recommend?

Professor Gilliland: In Northern Ireland, we did not make the soil nutrient health scheme mandatory—it is a voluntary scheme—but we did make it a gateway that you have to go through to gain entry to other schemes.

Q281 **Dr Hudson:** So it is not mandatory but it is very attractive if you come in.

Professor Gilliland: It is based on the principle that knowing your numbers on your soil health and water quality is a public good. If you are serious about taking public money there is a minimum criteria, and that is that you enter the voluntary scheme. Once you are through the voluntary scheme and you do the training—because part of this is not just about the data; it is being trained on how to interpret the data—that allows you to open the other funding doors that you might want to apply for. It is carrot and stick. The carrot is you get an awful lot of really good information about your farm you have never seen before. The stick is that it is the gateway if you want to get into anything else.



Tony Grayling: Like Eleanor, I think that it is a balance. It will be a mixture of incentives, advice and guidance as well as regulation. Over time, we would like to see a regulatory baseline developed for soil health that sets out some basic expectations for soil management. The bottom line is that it is in the interests of the land manager to understand their soils because that helps them to manage them better and make them more productive at lower cost. You would think it would be in the self-interest of land managers.

Q282 **Dr Hudson:** We have touched on the data collection and having it as an accessible scheme, bearing in mind your comments about granularity. Have you made an assessment—John, you have looked at this in Northern Ireland—about the feasibility, benefits and risks of getting landowners to actually feed their soil data into this national scheme? Have you looked at that? That would help with the caveats about resolution and granularity, wouldn't it? Have you looked at that at all? Certainly, in Northern Ireland, it sounds like you have.

Tony Grayling: I am not aware that we have specifically looked at private data being part of it, and I do not think that is what has happened in Northern Ireland either. I think that it has been a public survey.

Professor Gilliland: The public are paying for it. The quid pro quo is that we need access to land that most landowners own or are tenants of. You have to get in to do it, so there has to be a quid pro quo. We want land managers to do a better job, so the deal is, "By the way, we will come back every five years and this is about empowering you. We are putting our faith back in you as the farmer, as the land manager. You are making the decisions, but we will be back every five years and this becomes part of your measuring, reporting and verification of the job you are doing as a land manager around soils, water quality and habitats." That means there is a journey of integrity.

The difficulty I have as a farmer is that we seem to be the pariahs of all society. Everything we do is wrong in the eyes of the world and the media. Yet, actually, on my farm I manage 24,500 tonnes of carbon dioxide equivalents. I get no thanks for it—I never get acknowledged for it—and I have to manage it every year before I produce one ounce of food off that landscape. It is about bringing true transparency and integrity to the role that land managers do to provide healthy food but also to manage their soils, the water and the habitats. It is about giving integrity to that journey.

Dr Hudson: Thank you. That is very helpful.

Chair: Before we go to Barry, Julian has a short supplementary.

Q283 **Julian Sturdy:** We know that the vast majority of land managers look after their soils very carefully. There are lots of schemes out there now. There are the different stewardship schemes, the Red Tractor scheme, where you are meant to test soils on a regular basis. A lot of big food



manufacturers—McCain and British Sugar, for example—require farmers to test their soils and that data is stored by them. My question is: how do we bring all this together?

Eleanor, there was a key point where you said “worst-performing soils”. There are some soils that have very high organic matter, for example, and very little has to be done to them, and then there are other soils that naturally have very low organic matter, low indices, and we need to do a lot more to them. It is all about this benchmarking. Where do we start? Soils are so different right across the board. Some land managers might be managing them extremely well but their indices are still low and the organic matter is still low because they physically cannot raise it. Other soils have not been touched but are naturally high in organic matter.

Dr Reed: There are over 700 different soil types in England and Wales and they all have different capabilities and different properties. I think your point is that some soils may still have really low carbon despite lots of inputs. Maybe we should be looking at whether that soil is in the right land use. A healthy soil will need fewer interventions and fewer inputs, and that includes fertilisers, pesticides and cultivation. That will be a cost benefit for the farmer; if they have to do less to their land and put less in, it is a cost saving. It is going back to knowing what soil types you have and knowing what they are best suited to deliver in terms of land use.

Tony Grayling: I will pick up on your mention of assurance schemes. We certainly see those as part of the picture. It is a complex issue where there is not one silver bullet. We see a good role for assurance schemes and for the role supermarket supply chains can play in raising the bar in terms of soil management. We worked closely with Red Tractor, for example, as they developed the standards in their scheme, and have done so in relation to water quality and other matters as well. We would see that as part of the picture alongside incentives, regulation, advice and guidance.

Q284 **Barry Gardiner:** Tony, when you were asked by Rosie Duffield about the latest soil health strategy, you said it is “a good start”. Am I right that you were talking about the soil health strategy and not the 25-year environment plan in 2018?

Tony Grayling: I was talking about the environmental improvement plan and the commitments that have been incorporated into that.

Q285 **Barry Gardiner:** Yes—the latest 23 targets. In 2018, DEFRA said that all soils should be managed sustainably by 2030. The latest targets are that 60%, not of all soils but of agricultural soils, should be under sustainable management by 2030. We had a good start, but the latest is receding from it, is it not?

Tony Grayling: I am really not in a position to answer that particular question. I think that needs to be put to the Government rather than to a non-policymaking arm’s length body.



Barry Gardiner: Well, you made a qualitative assessment.

Tony Grayling: The additional comment I would make is that from where we start, which is a picture of degrading soils overall across the country, the aspirations and ambitions in the environmental improvement plan are a good start. If we could get to there from where we are now, that would be a good start. Obviously, if we could get to a place where all soils are being sustainably managed by 2030, that would be even better.

Q286 **Barry Gardiner:** We thought we could in 2018 under the 25-year environment plan. That is the point. That is what the target was then.

Tony Grayling: I think that is a question that you need to put to DEFRA and Ministers.

Q287 **Barry Gardiner:** It is certainly one that I shall, but I wondered if you could enlighten us on it—but fair enough. You say that it is a good start. Is that because you believe we might manage to achieve it without too much effort? A lot of organisations have said that this is an unambitious target. The Soil Association, the Sustainable Soils Alliance, National Trust—there have been lots of comments that this is very unambitious. When you say that it is a good start, is that because you believe it is something that could be achieved rather easily and therefore we can chalk that one up?

Tony Grayling: I actually do not think that it will be easy to achieve from where we start from. The overall picture is not of sustainable management of our soils. That said, unless and until we get a proper picture of the baseline of soil health from the work that we are doing in partnership with Natural England and others, it is difficult to assess how ambitious it is. My guess is that it is quite ambitious. Of course, we would like to be more ambitious, but I guess that I am probably more in under-promise and over-deliver territory than I am in over-promise and under-deliver territory.

Q288 **Barry Gardiner:** Right. Dr Reed, I will turn to you. In chorus with the Environment Agency in 2018 on the publication of the 25-year plan, did you say, “Look, this is just not achievable” to Ministers? Did you caution them that a target of 100% of soils being sustainably managed by 2030 was over-egging the pudding?

Dr Reed: We need to be ambitious, and John has reaped the benefits of posing that really ambitious task in Northern Ireland. Where we are right now with the targets set out in the environmental improvement plan, I think it is a starting point. The fact that soils have been recognised and are included as a stand-alone resource—up to this point they had not been. There are no direct policies regarding soils, their protection is fairly indirect and piecemeal. It is something that we can have as an interim target and we can build on that. We can build that up to all of our soils being sustainably managed: our urban soils, our peri-urban soils and our agricultural soils.



Q289 **Barry Gardiner:** Would it be sensible to get some more specific targets across different land and soil types? John, thank you; it reminds me how much I enjoyed my time in Northern Ireland when I hear you talking to the Committee. You spoke of different land types and the importance of multipurpose. You gave the example of not just woodland, not just dairy, but silvopasture and so on. Would it be sensible to have specific targets for those different land and soil types?

Professor Gilliland: I do agree with my colleagues to my left. When you go on this journey, you need to know where you are starting from.

Barry Gardiner: I will get to that.

Professor Gilliland: I was a policy adviser, and it is always important that when you bring policy forward, you look at how you will measure success. My difficulty is that in AHDB it is not our role to comment on policy. It is our role to look at the evidence. Our issue around this is that soil health is not in a good state, but it varies, with different land use. In the east of the country, where we have a lot of arable land, we have really low soil organic matters. In the west, where we have a lot of livestock production, we have real problems with soil pH. It is about what is the right use for the right land, and allowing decision makers to make that decision themselves.

Q290 **Barry Gardiner:** I think that one of the things you may have enlightened the Committee about this afternoon is that we do not have the baseline in place before we set the target. It seems to me that the reason your colleagues to your left are perhaps not so happy with my line of questioning is that they know that that baseline is not in place and that we need to do something like you have done in Northern Ireland as the groundwork from which we can begin to measure what is going on.

That prompts a further question: what does “under sustainable management” mean? Nobody has given a definition to this Committee of what sustainable management is or looks like. That is why the National Trust has said that ELM schemes may become a tick-box exercise, because there is no clear motivation to farmers as to why they are doing it other than to get the payment. John, you talked about the integrity of the scheme. It is not there at the moment.

Professor Gilliland: I do think in the farming community you are pushing an open door. There are things happening—

Barry Gardiner: I am not blaming the farmers for this.

Professor Gilliland: No, but take climate change and adapting. We are going through droughts and floods. There are a lot of people in livestock production now looking at switching from perennial rye-grass to multi-species swards because they are drought resistant. They are also looking at them because the water percolates quicker so they have more trafficability.



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The farming community are absolutely looking at this. AHDB has a stand at an event called Groundswell and it is specifically around trying to help people look at regenerative agriculture and how we use biology to help us. Certainly, the Home-Grown Cereals Authority are very interested to try to wean ourselves off nitrogen agriculture and get on to legumes and what legumes can do to help us on this journey.

Chair: We could, of course, argue about how it is better than the old scheme, under the CAP, where you were just given money because you happened to be at Agincourt and the king gave you an estate.

Barry Gardiner: Chair, you argued for Brexit. You have got Brexit. Now we have to build from where we are.

Chair: I couldn't resist.

Q291 **Barry Gardiner:** I was a great critic of that old scheme as well, as you well know.

We have heard from the Soil Association that they believe that a lot could be delivered and improved in terms of soil diversity and biodiversity in the soil. Are there packages of measures that we know improve soil health and soil quality that could be delivered now through these schemes? I asked you what you mean by "sustainable soil management". Give me some practical things from Natural England that you would like to see as part of this programme that farmers are delivering for the money they are getting.

Dr Reed: To go back to your earlier comments about definitions, we absolutely need a clear definition of what soil health is and what sustainable soil management is. Those are two things that Natural England would really like to see.

Q292 **Barry Gardiner:** Do you guys not have one?

Dr Reed: We have a definition of soil health. In the 25-year environment plan, there was a definition; it set out that it was the ability of a soil to function and provide ecosystem services. Natural England has gone one step further and defined it as how well a soil delivers the functions that are best suited to its inherent properties, so it is going back to capability. That needs to be universally adopted, and we also need a clear definition of sustainable soil health.

The easy way to improve soil health, which is already an action in the SFI soil standards, is to apply organic matter to your land. That could be through various mechanisms—either growing cover crops and having living roots in the soil, providing root exudates into the soil, or bringing material on to your land. Organic matter is beneficial for all soils. It improves soil structure and improves the nutrient hold. That would be the No. 1 thing to improve soils in agricultural systems.

Q293 **Barry Gardiner:** Finally, what about making a target of a certain



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percentage of farmers or areas of land that could join, in particular, ELM schemes?

Dr Reed: We would like to see an ambition for sustainable soil management to be applied to all land so we are improving soil health across the board.

Tony Grayling: I do not have anything different to say on that. Again, it would be a matter for Government whether they want to set a target in relation to the coverage of particular ELM schemes.

Professor Gilliland: Our view from AHDB, and my experience in Northern Ireland, is that we want to do it from the bottom up. AHDB's levy payers are active decision makers. There are solutions out there as this wider policy conversation takes place. Farmers are at it; they are trying to do it. I ran a research farm where we switched from a monoculture of perennial rye-grass with a lot of synthetic nitrogen to putting herbs and legumes back in again. In four years, we reduced our nitrogen use by 70%. We saw earthworms increase by 300%. We saw water infiltration of the soil improve by 14 times. Most interestingly, we produced more herbage and more animals from a better and healthier soil.

Q294 **Barry Gardiner:** And it cost you less.

Professor Gilliland: It cost us less and we reduced our greenhouse gas footprint per kilo of beef and lamb by 26%.

Q295 **Julian Sturdy:** You covered the first part of my question in response to Barry's question, because it was trying to drill down into the environmental land management schemes and how many farmers need to get involved in those schemes to ensure that soil health is improving. Tony and Eleanor, you have said that you would not put a target on that.

Tony Grayling: I think that I said it is not the role of the Environment Agency to set a target.

Q296 **Julian Sturdy:** Okay, but what would you personally put on that, with your expertise? You are here as an expert, so come on, tell us what you would like to see.

Tony Grayling: Well, I would be in agreement with my colleague from Natural England that our aspiration would be for all soils to be sustainably managed over time.

Q297 **Julian Sturdy:** Within the environmental land management scheme?

Tony Grayling: I think that ultimately it is partly a matter of a regulatory baseline for soil management, as well as incentivisation through payments through environmental land management schemes.

Julian Sturdy: Eleanor?

Dr Reed: I have nothing further to add.



Julian Sturdy: Okay. John?

Professor Gilliland: AHDB does not make comment on making targets. In my experience in Northern Ireland, we have not made targets, but we have better farmer engagement than we expected because the bottom-up approach of empowering people with better information wins their hearts and minds once they see this working for them. Most times they will start with the field furthest away from the road so their neighbours cannot see them. Once they find it is a success, suddenly it spreads across many—

Q298 **Julian Sturdy:** That is where the data will be so important, isn't it—to prove it?

Professor Gilliland: Correct. Right at the heart of where AHDB is and where we are going is about helping levy payers know their own numbers. When they know their own numbers, they make better-quality decisions, but they also see the results better—they see that this is working for them, that they can improve soil health and they can have better productivity at lesser cost and a lesser footprint.

I think that part of their frustration at the moment is that their current positive change is not being recognised. If we talk about greenhouse gas emissions, for example, the system is not sophisticated enough to pick this up. One of the reasons it is in the farmer's interests to do a baseline is that as you change your behaviour, you want to revisit the baseline to capture your behavioural change.

You have to put your mind into the eyes of levy payers out there. Every day they open a broadsheet, every time they switch on the TV, society thinks they are a pariah. There is a real issue. Their heads are down and morale is low because they can do no right. Actually, we cannot do without land managers. They are the solution, but we have to do our job better and we want to empower them to do that.

I am a grandfather and I look at my grandchildren; it is incumbent for our generation to try to sort this out and move the dial. The best way to do that is to empower people to make better-quality decisions. That needs not only data, but knowledge exchange. When you get this database and you do the baselines and you send out reams of spreadsheets, it is double Dutch. We have had success by pictorialising it. When you go to do your training, you go on to a website and do your training online, and you get your full map package of every farm. It is done in colour and it jumps off the page at you. People get that. They see it as very visual. When you politely remind them, "By the way, we will be back in five years and we will do it again," they say, "Oh, so you mean we have to do something?" "Yes. You do need to do something, but this is for your own benefit."

If you look at the passion that sits within regenerative agriculture, most of the people who have led on that are passionate because they have



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seen the benefit on their own farm. There is peer-to-peer learning—farmers are good at looking over the hedge at their neighbours, and if the neighbours are getting one better than them, they will soon find out how to do it. That is the community I live in. I am really proud of that. That is what we are trying to support—that peer-to-peer learning through demo networks, going out and getting this done and then bringing other farmers to see it in practice.

We need two approaches. We need the policy and regulatory approach, and we need the bottom-up approach. That is where AHDB wants to help levy payers know their numbers so they farm better and produce good-quality food in an environment that is in better health.

Q299 **Julian Sturdy:** I think that we would all agree with that. At the beginning you said we all have to think better and improve how we do things. Do you think that the Government need to think better and improve how it does things? When you look at the ELM scheme, is that attractive enough for land managers, farmers, to go into and invest in?

Professor Gilliland: It is not the AHDB's position to stand on the toes of the NFU and other organisations. At the end of the day, AHDB will continue regardless of the policy.

Q300 **Julian Sturdy:** As a Committee, we have to look at the policy as well. That is why we would like to hear your views on that policy.

Professor Gilliland: With respect, I am out of my remit. As a non-departmental public body, my job is not to make comment on policy, but it is to use levy payers' money as constructively as possible to leverage the benefit to them and deliver a public good at the same time. Our focus at the moment is trying to help farmers on the ground.

You talked earlier about soil testing. I look at the opposite end. There are several soil labs in the country. One in particular gives an annual report that pictorialises things like soil pH and soil organic matter. It does it right across England so you can see trends. It does not give people's individual information but you can see there that our knowledge on soils is not as good as we would like it to be. This is about getting to understand that better.

Q301 **Julian Sturdy:** That is a good baseline to go from, then, and say, "Right, okay. We need to lift that." Surely we need a policy that encourages that.

Professor Gilliland: From our point of view, we would like to see a single framework around having good measuring, reporting and verification. Whatever we do, it needs to be evidenced and it needs to have integrity so that you, as the critical friends of the policy, are happy with it, concerned citizens are happy with it, and there is a benefit to the land manager because they are doing a better job.

Q302 **Julian Sturdy:** Eleanor and Tony, do you want to comment on where ELMS is on delivering that and whether the scheme needs more financial



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incentive for farmers to get involved and deliver it?

Tony Grayling: I don't feel I have new evidence to bring on that, except to say that it is not just about the sustainable farming incentive; it is also about building good measures for soil health in countryside stewardship and also the landscape-scale scheme. We think that there is great potential for that scheme to develop in a way that enhances soil health for the areas that participate.

Dr Reed: It is that balance between financial incentives and the uptake of farmers in delivering the environmental benefits that can be achieved through sustainable soil management.

Q303 **Julian Sturdy:** How do you feel the countryside stewardship scheme will work alongside the sustainable farming incentive on landscape recovery?

Dr Reed: It is unprecedented having live iterations of schemes as we go along, but I believe that DEFRA is hoping to be feeding in new evidence as we go along to get the best out of these schemes. It is just seeing how these are developed over time.

Q304 **Chair:** Would you say new evidence as they go along or making it up as they go along, which is what some farmers say to us?

Dr Reed: Natural England is currently undertaking a lot of evidence projects looking at different management practices. While I said before that there is a lot of information and evidence out there, there are still a lot of gaps. One particular project is looking at how to remediate soil compaction, looking at different soil types, different climatic variability and being able to identify exactly what combination of management practices to put in place to alleviate that compaction but also to improve soil health. Mechanical decompaction just fluffs up the soil; it does not improve the structure at all. It is looking at that and trying to get the evidence to feed back into the guidance for the SFI and ELM schemes.

Q305 **Julian Sturdy:** On the countryside stewardship scheme and the evidence that has been learned from that, there have been some very good parts of that, but there have been some elements that have not worked so well. Do you feel that the knowledge that has been gained from that is going into the sustainable farming incentive? Is there the crossover? The stewardship scheme has been in place a long time and there have been some good elements of that, which have done a lot of good in nature recovery and so on, but there have been some elements of the scheme that have not worked so well and it has been very rigid. Do you think that the lessons have been learned and we are seeing a more flexible scheme within the sustainable farming incentive? I know there is more information to come out; what I am trying to get at is that there have to be lessons learned. The good management and good environmental standards should be carried over, but there need to be additions to that. Do you think that is coming through or not?



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Dr Reed: In the first release of the SFI standards, two of the three were soil-specific standards. The previous countryside stewardship scheme did not have any soil standards at all—it was all biodiversity and water quality. The fact that we started with two soil-specific standards highlighted how important soils are from a land management perspective.

Chair: It is interesting that you talk about soil compaction. I think the key element is, “Don’t grow potatoes if it’s going to be a wet autumn.” I think everything else is out the window there.

Q306 **Mrs Murray:** I will ask you, as the Chair did, for succinct responses, because we have votes to come and we still have a lot of questions to get through.

Tony, I will start with you because I noticed that you previously led on the environmental work on EU exit and you also look at resilience and sustainable business. How can we best motivate farmers to take ambitious steps towards improving their soil? I am sure that this is something that is relevant to your role. How do you think we can best motivate farmers to take ambitious steps towards improving their roles?

Tony Grayling: I think that it goes back to providing them with good information or encouraging them to seek good information about the health of their soils themselves. That is the basis of good soil management. Alongside that, I think that we need to provide good advice and guidance. There is a role for incentives such as those being put in place through the ELM schemes. I also think that it is an iterative process whereby we learn as we go along. It is an important part of the policy cycle that you see how policies work in practice, learn from that and adjust them accordingly. I think that is good policymaking rather than a sign of failure.

I think that it is a combination of things but, fundamentally, we need to have a conversation whereby they understand that it is in their own interest, not just in the national interest. It definitely is in the national interests, because they are stewards of vital natural resources in our soils, but I think that it starts from self-interest.

Q307 **Mrs Murray:** Do you have any ideas how we could do that? I noticed you lead the Environment Agency’s work on strategic policy issues, including sustainable growth. How would you go out there and persuade farmers?

Tony Grayling: I think that it is not one thing. It is a holistic package of measures, which is why it is worth considering bringing that together into a single coherent plan, involving all the things I have mentioned. It involves good advice and guidance, good incentives, good regulation, assurance schemes, working in partnership with schemes such as Red Tractor and LEAF and with the people who they supply. I do not think that it is just one thing.

Q308 **Mrs Murray:** Thank you. Eleanor, we have heard that the ELM scheme lacks ambition. Are there any elements missing from the range of actions



under ELMS to improve soil health? How could we make the bundling of different practices more attractive to farmers?

Dr Reed: This goes back to what I was saying to Robert earlier about the research that Natural England is currently undertaking. We are feeding that information back to DEFRA, as and when the information comes to us on the completion of those projects. Because these schemes are iterative, they are learning and feeding in that information. It is just a matter of identifying best land management practices, but that baseline and soil mapping would really help with that.

Q309 **Mrs Murray:** Thank you. John, how should the impact of the ELM schemes be monitored and evaluated? If we could keep the answer fairly short because we are short of time.

Professor Gilliland: My difficulty when I look at ELMS is that unless you know where you start from, how will you know where you will finish? The key thing from AHDB's point of view is that we need the baseline and we need to revisit that baseline. ELMS should fit within that because then the taxpayer has transparency, society has transparency and so does the farmer.

A lot has happened. A year ago, when fertiliser prices went to £1,000 a tonne for nitrogen, that created an economic shock through the industry. A lot of farmers sat up and said, "What could we do?" You could not buy a bag of legume seed because everyone was trying to plant legumes to try to displace nitrogen. The downside of that is we did not capture that because we did not have a baseline before and we did not have a baseline afterwards.

I am sorry that I am a cracked record on this. To measure and evaluate ELMS properly, you need to know where you start and you need to know where you have got to at the end of ELMS so you can do a proper appraisal. At AHDB, we want to help in how we can work collectively to get that baseline, see the behavioural change and measure it again, because then it will have rigour.

Q310 **Mrs Murray:** Thank you. You do not need to apologise for trying to put in common sense.

One final question for you, Eleanor. We have heard that countryside stewardship does not focus on soil health and its most popular measures have less impact on soils. What plans are there to make soils a greater focus for the countryside stewardship scheme?

Dr Reed: It goes back to soil health underpinning terrestrial ecosystems and nature recovery. It will be the flexible approach that we are taking to ELMS, identifying soil health practices at each level of those schemes and integrating it. It is providing that advice to DEFRA and having that fed into the schemes.

Mrs Murray: Thank you—and thank you for being succinct.



Chair: Of course, ammonium nitrate is down to £330 a tonne for next year, although I know you cannot buy that in Northern Ireland, for reasons that we will not go into.

Q311 **Robbie Moore:** A slight change of tack: I am going to ask about ecosystem marketplaces. John, what potential do ecosystem marketplaces have for improving soil health, and should we be relying on private sector initiatives to fund sustainable land management rather than just relying on the public sector?

Professor Gilliland: The scale of change that we are asking of the land management and soil sector is such that the sector needs whatever money it can get from both public and private purses. The key thing in this discussion—and it is a public discussion—is that it is done with integrity. My concern with the private sector is that they have not worked out consistently how they will measure, report and verify to one standard.

From AHDB's point of view, can we at least bottom out how we will measure, report and verify? Whether it is the public purse or private purse that pays for the change, I am less worried about, but I am absolutely worried that we do not have enough integrity in the journey that we are embarking on without that framework, agreement and certification process.

Q312 **Robbie Moore:** Eleanor, what is Natural England's point of view on that, maybe picking up on what John said about measurables?

Dr Reed: From the Natural England perspective, it is the need to consider all ecosystem services. There are currently various carbon marketplaces available but at the moment there are concerns about the additionality and the permanence of those schemes. Natural England is not involved in measuring or verifying any of those at present, but that would need to be something that is robust and reportable.

Q313 **Robbie Moore:** Tony, do you have anything to add?

Tony Grayling: I think that the markets do have a role to play. They need to be put in the right framework—that is, in a way, a regulatory role—that solves some of these problems around measurability and standards. For example, as we know, peat soils are a huge store of carbon. You can see the carbon benefits of managing peat soils in a different way and moving to wetter forms of agriculture that grow the amount of carbon they are storing rather than losing it, as at present. You can see that sources of green finance may be able to support such schemes. It is about having the right codes of practice and working out how to stack things so that participation in one scheme does not necessarily rule out—as it sometimes does at the minute—getting additional finance from elsewhere if there is an additional benefit to be achieved. That additionality needs to be there.



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Professor Gilliland: There is always some nervousness in this conversation that everyone goes straight to peat soils. All soils hold carbon and I do not think we should be differentiating. Yes, you manage different soils with different organic matters in different ways. All farmers have the ability to store soil.

When it comes to the private sector, whoever does the measuring, reporting and verification should be separate to and independent from the organisation that is paying. It is absolutely fundamental that the journey that we take here has integrity.

The last thing I would say, to my fellow farmers who are flirting with this as it emerges, is: be careful that you don't sell too soon, because you may find you need it. That is particularly with carbon and climate-smart farming. When you look at the whole system of your farm business, you might need some of your carbon stocks to offset the unavoidable emissions that your farm also produces. I would always encourage farmers and levy payers to know your numbers first, before you go and sell the crown jewels.

Q314 **Robbie Moore:** Finally, John, do you feel that because the measurables have not been properly set and there is no independent body monitoring this, there is effectively poor advice being given in this marketplace at the moment?

Professor Gilliland: Some people have said that we have created a bit of a wild west. I used to be an energy regulator and I was involved in putting the power stations in Northern Ireland into the European emissions trading scheme. We did that because there was a heap of private sector mechanisms all coming from different directions. If you look at what happened 20-plus years ago when we brought energy into the scheme, the reason we did it was to bring integrity.

If you look at carbon prices, for example, the statutory market is somewhere between £70 and £90 a tonne. The voluntary market, which the land-based sector is in, is somewhere between £10 and £30 a tonne. The reason it is discounted is that the marketplace is discounting it, because it does not believe the voluntary market has the same integrity as the statutory market.

Farmers are not silly. I drive past a coal-fired power station every day and that coal-fired power station, if it produces electricity but burns less coal, gets £90 a tonne. If I work my backside and use my legumes, build my organic manures and build my carbon, I will get £20 to £30 a tonne if I am lucky. Where is the fairness in that? To get that to a more even platform you need to have integrity in the system that you are asking us to go on. At the moment, I do not believe we have that. If we had, then the market price would be closer to parity, and it is not.

Q315 **Robbie Moore:** Thank you. Another slight change of tack: what role could food labelling schemes have in communicating with consumers



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about the sustainability of the food that they buy, linked to the discussion around soil health.

Tony Grayling: I think they have a role to play, but the information needs to be in a very accessible and simplified form, and then you are really putting the onus on the supermarket to understand the complexity of that in how they deal with their supply chain. It goes back to the standards that they require of people who supply them, farm assurance schemes and so on. Labelling has a role to play at the end of the chain because there are consumers who want to be able to choose more sustainable products, but it is only one element of it.

Robbie Moore: Eleanor, do you have anything to add?

Dr Reed: Only that it is a positive measure to incentivise farmers to choose the right management options to be able to label their end products in that way.

Q316 **Robbie Moore:** Should legislation be getting involved in this area?

Chair: I think that is a no.

Robbie Moore: I will leave it there.

Q317 **Barry Gardiner:** Tony, I understand that between 2020 and 2021 the Environment Agency identified 1,021 breaches of three key regulations over a total of 2,213 inspection visits. You issued one single civil sanction. Why was that?

Chair: Are we talking about sewage treatment works here, or farmers?

Barry Gardiner: We are talking about compliance with limited soil regulation legislation. I think the EA has accepted that 31% of farmers are not complying and are unable to demonstrate adequate soil testing. That is a direct quote from the EA. These were key breaches of the regulations that are still in place—cross-compliance, FRfW.

Tony Grayling: The answer to your question, Barry, is that we have an approach to enforcement that does not start with issuing fines, obviously. It starts with informal conversation to see if the issue can be resolved that way, through to writing letters requiring specific things. Issuing fines is the last resort. I think it is a situation that will evolve over time as the farming rules for water become more established.

Q318 **Barry Gardiner:** The trouble is I have heard that argument before—I have heard it for many years—and over time it has not worked and the numbers have not changed significantly. Do you not think that part of putting people off from not obeying the rules is knowing that they are going to get more than a good talking to from you or some other nice person from the EA, and that there is a real sanction at the end of it? Given that you have said that 31% of farmers who have been inspected are unable to demonstrate adequate soil testing or compliance with limited soil-related legislation, I find it extraordinary that you are not



laying down a marker.

Tony Grayling: If you can take actions that are short of that and bring the farm into compliance, that is surely preferable. One of things is, of course, that we now have significantly more resources for monitoring and enforcement than we previously did as a result of extra funding through the last spending review. We are doing a very much greater number of farm inspections than we were previously, which is providing some of the evidence that you are rightly quoting back at us. I suppose I think you have a point in a sense, Barry, in that as these rules become more established and better understood, over time we should perhaps get less accommodating in our approach.

Q319 **Barry Gardiner:** Could I ask you perhaps to provide to the Committee the data on breaches that you have identified from 2016 onwards? As you will recall, 2016 was when the Environmental Audit Committee produced its report on soil health and found that cross-compliance rules were not being enforced. If we could see that the approach that you are talking about has actually worked—that maybe 60% were not complying at that stage and now it is down to 30% because you have talked to them and persuaded them to get better—that would be great. I would come back to you and say, “Yes, okay, I accept there is real evidence that there has been improvement over time.” If you could provide that data to the Committee, that would be really helpful.

Tony Grayling: I can certainly take that away.

Q320 **Barry Gardiner:** Thank you. Some of the written evidence that we have had, and indeed some of the oral evidence that we have had, has called for a new regulatory baseline—some people have called for primary legislation—to protect soils and ensure that the polluter pays. Do you think that is an approach that should be taken?

Tony Grayling: I do think we need to look at a new regulatory baseline for soils because, as you describe, there is very little legislative protection for soils as it currently stands. That needs to be done with great care and possibly not all at once, but you could look at extending the principle of farming rules for water to farming rules for soil. There are some elements of farming rules for water that matter for soil health, but they are not comprehensive in that respect, because they are really about nutrient management and trying to prevent diffuse pollution from agriculture. Yes, that is something that we think should be looked at.

Q321 **Barry Gardiner:** You have given a bit of an outline of what that new legislative framework might look like. When might it be feasible to introduce it? Obviously, we have the ELMS programme going forward. Synchronicity here would be a good thing, wouldn't it?

Tony Grayling: I suppose one answer to that is that we are an advisory body in that respect, so we need to work with our Government partners in persuading them of the case for a change in legislation. Then, of course, you need an appropriate Bill, even if you have got as far as



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persuading the Government of the merits of the case. I do not think it is possible for me to give you a timescale, I am afraid.

Q322 **Barry Gardiner:** Is it clear to you and the EA—and indeed to Natural England—how compliance will be monitored and enforced under ELMS?

Tony Grayling: Part of the scheme is that people have to report on whether they have implemented the measures or not, and there will be audits, as I understand it.

Q323 **Barry Gardiner:** You are part of the enforcement, aren't you?

Tony Grayling: We are not directly part of the enforcement of ELMS per se. We undertake farm inspections with respect to regulation but not so much with respect to ELMS.

Dr Reed: The landowners involved in the SFI schemes have to submit their evidence, but as far as I am aware the enforcement is not direct.

Tony Grayling: It is possibly something we would have to get you a better answer on.

Barry Gardiner: Okay. I am always happy for you to write to the Committee and set that out more clearly.

Chair: We probably have about half an hour until the Divisions, so let us try to rattle through reasonably quickly. If you agree with your colleagues, don't be frightened to say so.

Q324 **Dr Hudson:** Starter for 10: what are the current trends for the use of fertilisers and plant protection products and what do you think is driving these trends or changes?

Tony Grayling: I'm afraid I don't know. That is the honest answer to your question.

Dr Hudson: John, do you have any feel for the current usage or trends in the types of products that are being used?

Professor Gilliland: AHDB would be happy to furnish information later. I don't know the scale of trends. What you absolutely saw was a shock that went through the system because of the Ukraine war. That certainly made a huge impact on how people view fertilisers. In regard to pesticides, one of the challenges is the availability of chemistry. The amount of chemistry available now has greatly reduced. The quantity of reduction I couldn't say here today, but I can ask our market information—

Q325 **Dr Hudson:** Do we have robust data on the usage of these chemicals?

Professor Gilliland: The Agricultural Industries Confederation are probably the better people to ask, because they are the people who either manufacture it or import it. Again, I will confer with some of the



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better knowledge within AHDB market information. It may monitor this. I don't actually know, so I will ask.

Chair: One of the problems with pesticides is that with CMPP you get 25 litres in a drum and that will do a field, whereas you have things like Ally now where you get the amount that is left in my water glass to do the same field. You could dramatically reduce the amount you use but you are just using a more potent active ingredient. We used to use sulphuric acid—tonnes of it. On our farm we have reduced pesticides probably by 10,000% but that is only because we stopped using sulphuric acid as a desiccant.

Q326 **Dr Hudson:** If there are no robust data out there, any recommendations you can make to the Committee about what we could suggest to get improvements to the dataset for usage of chemicals, pesticides and fertilisers in the environment would be helpful.

Professor Gilliland: We have funded work on integrated pest management too, to try to find alternatives. As I say, one of the biggest drivers is the withdrawal of certain chemistry of pesticides from the marketplace. That is driving the requirement for alternatives.

Q327 **Dr Hudson:** You mentioned integrated pest management standards. What is your assessment of the nutrient management standard and the integrated pest management standards in the new sustainable farming incentive? Do you have any thoughts on that?

Professor Gilliland: I would need to take that—I don't know, is the answer.

Q328 **Dr Hudson:** That is fine. We are able to rattle through now—that's good. Are the proposals in the draft national action plan for sustainable use of pesticides any good? Are they sufficient?

Tony Grayling: It is not a plan I am familiar with, I'm afraid.

Professor Gilliland: You are looking at three people who are interested in soils.

Dr Hudson: Fine—we can go on to the next question. How is that for rattling through?

Chair: Thank you very much. Pesticides are very expensive so farmers use them as sparingly as they can, but that is difficult to measure.

Q329 **Robbie Moore:** Moving on to biosolids and issues with how they interact with soil, how real is the risk of soil contamination through biosolids and organic inputs, and should we be encouraging a circular economy for such wastes?

Tony Grayling: Those risks have grown over time as the nature of the work that sewage works undertake has changed, taking on more treatment of industrial sources of effluent and not simply household



waste. Of course, household waste has also become more complex in terms of the chemicals, pharmaceuticals, microplastics and so on that end up in sewage systems.

Our view is that the regulation of sewage sludge does need to be updated. The current regulations were framed over 30 years ago in a slightly different world. We would like to see regulation of sewage sludge brought within the environmental permitting regulations to enable us to ensure that the biosolids that are put to land are not manifesting the risks that people fear they might be, in terms of things going on to land and getting into food chains that we would not want to see.

Q330 **Robbie Moore:** Eleanor, from a Natural England point of view, the same question, but I want to tease out—as Tony has picked up on—what changes are needed to ensure that biodigestate, manure, compost and so on is safe to be interacting with soil to improve its organic matter.

Dr Reed: It is knowing what is in that material, so testing your organic material. The benefits of having that material applied to the land are great. We really need to know what is in that material, make sure it is safe and apply it to maximise the benefits.

Q331 **Robbie Moore:** Is that something that Natural England sees itself having a role in?

Dr Reed: The testing of the digestate?

Robbie Moore: And how it interacts—whether there is any soil contamination issue.

Dr Reed: Anything with the contamination would sit with EA.

Tony Grayling: We always work in partnership with Natural England and others, and if they have concerns or advice to give us in how we develop the regulations and apply them then we would take that very seriously.

Q332 **Robbie Moore:** John?

Professor Gilliland: We are very keen on circular agricultural systems but our priority is to try to help one set of levy payers with another. We represent the pork industry as well as cereals and oilseeds, dairy, beef and lamb. How do we get animal manures to land that would be most advantageous? We deal less with biosolids but our priority at the moment within circular agriculture is how best to use agricultural manures—which are a great resource, not a waste—and how to make sure we take it to soils that need it the most. Alas, in England a lot of our livestock sit on the west and a lot of our arable land sits on the east. It is a different matter with the integrated sector; a lot of pork production is in the middle of arable land.

We need to get our head around how best to leverage our organic materials. There is no better way to build soil health than to have organic manures back in the soil. The best way to do it is having animals



defecating on the soil because in that case you have minimal ammonia emissions. Ammonia is sore on soil biology, so having faeces and urine separate when it goes on to the land is better than having it together.

From AHDB's point of view, we are trying to help levy payers with how to optimise the value of manures, whether they are slurries or farmyard manures, and how to drive soil health, whether it is bacterial/fungal ratios, respiration or building soil organic carbon. We need to get smarter in how we do that.

Chair: Chickens have not quite got the hang of managing to defecate and urinate separately—that is a problem they have.

Q333 Julian Sturdy: We have touched on how sustainable soil management and agricultural inputs for farmers could be better tailored to specific regions, soil types, crops and farming systems. As a Committee we have already taken evidence on that. Is there the knowledge and funding available to deliver this?

Tony Grayling: The work that is being done to develop the baseline is critical for that because that is going to help us to develop the underlying knowledge that we need to manage what is a very complex system, as you describe, with very different soil types across the country. The funding is there at this stage but it will need to be sustained over time.

Dr Reed: The knowledge exchange part is really important to get the information from the people who are doing the research and collating the evidence to the landowners. At Natural England we have 125 catchment-sensitive farming advisers. They go out and provide advice to landowners on the best land management practices to reduce water pollution. Almost a quarter of their recommendations have related to soil management to improve their land. That is something that we have in place.

Professor Gilliland: We were talking about circular agriculture a moment ago. One of the big issues—AHDB is helping and supporting in this—is knowing, if you are going to put organic manures on land, what is in that organic manure, whether the land actually needs it, and what the temperature and moisture content of that land is. It is not just about soil organic carbon. If we take nitrous oxide emissions, nitrous oxide is 260 or 280 times more potent as a greenhouse gas. If we put nutrient on to land when the soil is either too wet or too cold, a lot of it is lost as nitrous oxide and not as nitrates going into the plant.

There is work that we as an industry need to continue to develop to become smarter in how we manage that cycle. A lot of that is what our levy payers' funds go into. Our sector councils determine where research will be spent and how to help. There are still wider knowledge gaps around the measurement and we would absolutely appreciate support from Government in making sure that we get that forensic measurement right.



Q334 **Julian Sturdy:** That is crucial, isn't it? I think that is what has come out of this meeting today and the evidence we have taken—getting that baseline and getting the science to it. Do you think that there are effective local advice services for farmers? If not, how could they be improved?

Professor Gilliland: If we go on this journey and we do not beef up our knowledge exchange and our mentoring, we will fail. We do need to focus on this. It is an area that certainly AHDB is active in and we would like to do more in this area. I am passionate about baselines, but if we do the baselines and then do not do the training and interpretation around those baselines, we will have wasted our time. That knowledge exchange is absolutely fundamental but it needs to be from a common dataset.

Julian Sturdy: Eleanor and Tony, do you have anything to add?

Dr Reed: I agree with John.

Tony Grayling: Nothing further to add.

Q335 **Julian Sturdy:** I would just use one example—and this is where we have to be a bit careful. You have all touched on cover crops and what they do, nitrogen fixing, and the opportunity to put organic matter in the soils. They are not as good as farmyard manure, as we all know, but it is very difficult for farmers to get data and evidence on the best mixes to grow, because the people they are buying them from are pushing the data. It is not very independent. It is about getting independent data for farmers to use.

Professor Gilliland: You have absolutely put your finger on the nail here. We are looking at more regenerative agriculture. The people who drive regenerative agriculture are very passionate but we do need to evidence it. The research farm I used to lead had five PhD students just quantifying this. That company will have 15 published peer-reviewed papers this year. In this case, it was not cover crops; it was integrating herbs and legumes into grassland, the benefit to the soils and to the herbage itself, the benefit to the animals, and then the benefit to ecosystem services. It was that holistic approach.

Regenerative agriculture is more complex, but complexity should not be an excuse not to do it. It delivers multiple wins. In our case, when we went on this journey, after four years we had increased output, we had reduced the nitrogen, we had reduced our footprint, we had increased water retention and we had increased biodiversity. It was a more complex system. That is where you need really good knowledge exchange to mentor as you go through, but you need to make sure that it has a grounding in good, published research.

Alas, regenerative agriculture has been driven by passionate people who observe and learn on observations, but our research institutes have been slow because it is about systems thinking rather than silo thinking. We have some fantastic scientists in this country, but a lot of them are



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trained to be deep and narrow, and when you go on a regenerative journey you are looking at something systems base where you need breadth. That is more expensive research and as a country we need to look at how we do that better. We do not do it overly well at the moment.

Q336 Julian Sturdy: Should Government policy put more into that, rather than something that could be argued to be more of a tick-box exercise?

Professor Gilliland: There are far fewer silver bullets out there now. For the scale of change we need, we need systems thinking. That is complex, expensive science, but it is really important that that science is done, because society needs convinced that the journey that we are looking to go on is better than the journey we have been on.

If we do not do it in a credible way where the science is published and peer-reviewed in the normal way, it is going to be hard to convince concerned citizens but also regulators—

Julian Sturdy: And taxpayers.

Professor Gilliland: And taxpayers—that the journey we are on now is correct. Regenerative agriculture, in my opinion, is the right way to go, but we need to do quite a bit more to evidence it. I am not disputing the delivery; it is just getting the evidence to reassure society that this journey is correct.

That is why I go back to my baselines. You do your baseline, change your behaviour, do your baseline again, tweak it again. Measure and manage, measure and manage, measure and manage. With things like soil and soil health I would be doing that every five years because change in soil is slow. While I do my lifecycle assessment calculator on emissions every two to three years because that is a quicker response, when measuring change in soil I will do it every five years, particularly around soil respiration and soil organic carbon.

Q337 Chair: What has been clear from this afternoon's evidence is how important the use of manures, slurries and sewage sludge are. I think, John, you made the point that dairy farming and grassland farming work very well because the animals are out in the summer but also, once you cut the silage, you have a good opportunity to put on the slurry that you have accumulated over the winter. For arable farming it is much more difficult, particularly as I think the guidance to farmers is that you should not be putting slurry on in the gap between harvest and drilling for winter crops, which of course is the traditional window for farmers to put that on.

We heard when we were down in Hampshire how some of the supermarkets and processors are very averse to human sewage sludge. Even with a crop like sweetcorn, which goes nowhere near the soil, or potato, which is never eaten raw, farmers were being restricted. Do you think we need to change our attitude a little bit to how we can utilise what were previously seen as waste products in a more positive way?



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Does that require a little bit of flexibility in terms of application times and trade-offs against things like water quality?

Tony Grayling: The answer is yes and no. Yes, I guess we do need to overcome the squeamishness that you describe, which some supermarkets feel that consumers have. To my mind, that means that we need to do our role properly as a regulator so that we can reassure the public that the biosolids that are being spread to land are safe and a good thing to do, rather than a risky thing to do. I am not sure I would go with you on the second part of your statement about flexibility because I do not quite know—

Q338 **Chair:** There is a quandary facing farmers in the east of the country where we have arable crops, where many farms have no livestock and it is very simple, but if they brought livestock on to the farm they would then have a problem with when to apply those wastes to the land. They have a very short window if it is winter cropping.

Tony Grayling: I don't think I know enough to comment on that part of it.

Chair: Well, thank you very much indeed to our witnesses. The Minister is on his feet, so we have got in before the votes, which is good news. Thank you very much indeed for your wisdom and knowledge, which have been very useful for the report, and I thank Members for attending.