Llywodraeth Cymru
Welsh Government

Agricultural Soil Policy Statement

Farmer Engagement Research Report

2025

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01

Executive Summary

The withdrawal from the EU has created an opportunity to develop agricultural policy tailored to Wales, that can address the Climate and Nature Emergencies. In this context, the Welsh Government Agricultural Soil Policy Statement (ASPS) is being created to set out an overarching vision for the protection and sustainable management of agricultural soils in Wales and shape future policy impacting on them.

The development of the ASPS has involved an evidence review[1] which identified key priorities specific to Wales that need addressing to achieve sustainable use and management of agricultural soils. This formed the basis of an initial draft of the ASPS (See Appendix 1). The next phase of development involved stakeholder engagement, gathering further evidence and feedback on the draft, to refine the statement and ensure it is fit for purpose and shared vision for soil policy in Wales.

The report captures the insight, feedback and considerations highlighted in a series of engagement workshops with Welsh farmers.

Research aims

The aims of the research were:

— To explore farmers' experiences and current practices of soil management and any related challenges they face.

— To gather feedback on the current draft of the Agricultural Soil Policy Statement (ASPS) and identify opportunities for developing it further.

1 Review of Welsh Soil Evidence: Review of Welsh soil evidence | GOV.WALES

Key findings

The findings from this research support Welsh Government's understanding of farmers and land managers' current experiences and practices of managing agricultural soils in Wales. These insights contribute to the evidence base for the Agricultural Soil Policy Statement (ASPS) and have contributed directly to shaping the final statement, as described in the ASPS Stakeholder Engagement Findings and Response document[2].

How do farmers understand and value soils?

The majority of the workshop participants undertook some kind of regular soil testing or analysis to monitor soils' condition. Participants highlighted that some soil properties (e.g., soil carbon, soil biodiversity) are much more difficult, costly, or unreliable to assess, resulting in gaps in farmer understanding of their soils.

Most participants thought their soils were generally in a good or healthy condition. Nevertheless, most of the farmers engaged with had encountered some soil degradation on their farms at some point. Several participants suggested a degree of degradation was an unfortunate but unavoidable consequence of some farming practices or weather conditions (e.g., heavy rainfall). Practices that were frequently mentioned as involving a degree of soil degradation were outwintering livestock, growing root crops or maize, and cultivation for reseeding, which farmers adopted or continued to use due to pressures on the farm business. In these situations, many farmers utilised strategies to minimise the negative impacts of such practices on soils where possible.

Most participants recognised the importance of soils to ecosystems, to their farms, and to Wales. The majority of farmers acknowledged that, while Welsh soils were in a good state, there was a need to protect, maintain, and apply targeted improvements to soils to ensure economic and environmental sustainability.

How do farmers practice "good soil management" and what are the benefits?

Farmers said they practiced 'good soil management' primarily though practices of:

— Nutrient management – particularly through reducing off-farm inputs, effective use of manure and slurry, and targeted nutrient application.

— Livestock management – through techniques like rotational and mob grazing.

— Improving soil structure – through practices like aerating soils using both mechanical and botanical means.

— Testing and observation – to understand the overall condition of soils and the differences in soil properties across different areas of a farm.

— Managing soil disturbance – either by reducing or even eliminating tillage or carefully managing the timings of cultivations in order to minimise impacts on soils.

Maintaining healthy soils was recognized as beneficial by all participants in the workshops, and crucial to the successful functioning of the farming system. The benefits of 'good soil management' expressed by farmers are summarized below. A few participants also mentioned the social benefit of leaving a legacy for future generations.

2 ASPS Stakeholder Engagement Findings and Response Document: both documents available at www.gov.wales/agricultural-soil-policy-statement

Table 1: Benefits of 'good soil management' identified by participants.

Economic benefits	Functional benefits	Ecosystem benefits
Improved yields Reduced input costs Greater efficiency and profitability More sustainable farm business in the long-term	Improved nutrient retention Improved water infiltration and retention Improved workability Increased soil fertility Healthier crops and grasses Healthier livestock Greater farm resilience to extreme weather events	Carbon sequestration Supports biodiversity Greater ecosystem resilience Improved ecosystem function

What do farmers see as key soil-related challenges and how do they overcome these?

The most common soil-related challenges highlighted by participants were adverse weather effects, compaction, and maintaining soil fertility. Strategies for dealing with adverse weather-related challenges were varied, but one key strategy for minimising erosion mentioned by many farmers was to reduce tillage and/or carefully manage cultivations in response to soil and weather conditions. Participants utilised a range of solutions for compaction, the number and diversity of these indicating the prevalence of this challenge and the importance farmers engaged with placed on improving soil structure. The most popular solutions involved utilising machinery to break up compacted layers of soil. Farmers maintained soil fertility by managing the pH of their soils through lime application, careful management of manure and slurry, and utilising nutrient management plans.

Participants also discussed how a lack of knowledge and/or data and conflicts or trade-offs between different soil functions limited their ability to manage soils sustainably. A lack of reporting of soil organic matter content in soil analysis and a lack of access to knowledge and/or data to assess soil biodiversity were highlighted as challenges for several farmers to monitoring and managing these elements on their farms. Many farmers expressed that they found it challenging to balance supporting soil ecological functions, which didn't generate immediate benefits for the farmer with the shorter-term needs for agricultural productivity and profit.

How do farmers get information and advice on soil management, and how can this be improved?

Participants reported that they got information and advice on soil management from a wide range of different sources. These included peer-to-peer networks, media and social media, academia, businesses, consultants, governmental and non-governmental organisations. One of the major pieces of feedback received from participants was that they were happy to take information and advice from a variety of sources but valued unbiased sources and those based on trusted, ongoing relationships.

The main areas highlighted for improvement were increasing information on Welsh soils through research and monitoring and providing specific training and support to farmers to enable them to conduct soil analysis and put any data collected into practice. Many participants expressed a desire for financial support for costs and equipment for soil analysis and monitoring. Farmers expressed a desire for data to be made available in more accessible formats, and a timelier manner, for it to be most useful.

Direct feedback on the ASPS

Most farmers expressed support for the development of the Welsh Government Agricultural Soil Policy Statement in general and stated that the objectives identified were similar to experiences on their farms. In addition, some suggestions and areas for improvement were offered by participants:

— Incorporate more positive language and framing reflecting the good current condition of Welsh soils and presenting more positive ambitions for the future.

— Present a more interconnected view of soils and soil health, as the separation of issues into objectives and priorities artificially separates them out.

— Include more explicit references to water management.

— Demonstrate how the statement integrates with other existing policies and regulations that impact on soils and farmers to avoid conflicts in practice.

— Consider how the policy objectives will be delivered in practice.

Key points to consider for the ASPS

Soil condition

Participants generally thought their soils were in a good condition, which aligns with evidence on a national scale from the Review of Welsh Soil Evidence[3]. Several farmers suggested that the framing and wording of the statement could be altered to better reflect this generally good condition of Welsh soils.

Interconnectedness of soils

Participants valued their soils as important to ecosystems, their farms and to Wales, and expressed views in alignment with the broad aims of the ASPS to protect, maintain, and improve agricultural soils to ensure economic and environmental sustainability. However, several participants viewed soil health and management as holistic in nature, rather than being easily separated out into different aspects, and wanted this to be more clearly articulated in the statement, including elements like water management and climate change more explicitly.

3 Review of Welsh Soil Evidence: Review of Welsh soil evidence | GOV.WALES

Benefits of and incentives for 'good soil management'

Farmers were predominantly focused on the economic and functional benefits of 'good soil management' practices for the farm business, which may reflect the immediate pressures farmers experience to ensure they have a viable business and livelihood. There was widespread agreement that incentivisation for ecosystem benefits would further support and encourage farmers to manage their soils sustainably.

Soil-related challenges and objectives

Some of the challenges outlined by farmers were closely linked to the threats and challenges highlighted in the ASPS, indicating their relevance to Welsh soils and Welsh farmers. This is particularly true for compaction, which many farming participants identified as their key challenge, and adverse weather effects, which is linked to the emerging threat of climate change. Farmers highlighted that they were concerned about maintaining and improving soil organic matter and soil biodiversity but there were knowledge barriers which posed a challenge to monitoring and managing these factors on their farms. One notable challenge raised by farmers that had not been addressed in the draft ASPS is maintaining soil fertility. Farmer workshop feedback also highlighted that balancing different priorities and/or soil functions can be a challenge in practice (e.g., maintaining livestock productivity whilst avoiding compaction).

Knowledge sharing

Participants were happy to draw on information and advice from a range of sources but expressed a preference for sharing of practical experience and unbiased information and advice from sources with which they had trusting, ongoing relationships.

Information on soils

Farmers felt that they could be better supported by access to more information on Welsh soils from further research and monitoring (particularly long-term and farm-scale, however several participants expressed concern over how monitoring would be delivered in practice. Participants also wanted further support to enable them to conduct soil analysis, understand related data and put it into practice, including presenting information in more accessible and meaningful ways for farmers and land managers.

02

Introduction

Policy context

Three important recent events have driven widespread changes in the soil-related policy landscape in Wales. These are:

1. Establishment of the UK Agriculture Act (2020) following the withdrawal from the European Union (EU Exit) in January 2020 – leading to the development of the Agriculture Act (Wales) and Sustainable Farming Scheme (SFS)[4] for Wales.
2. The declaration of a Climate Emergency in Wales in April 2019 – acknowledging the challenge of climate change and its threats on the health, economy, infrastructure and natural environment of Wales.
3. The declaration of a Nature Emergency in Wales in June 2021 – aiming to initiate the halt and reverse of biodiversity decline.

The climate and nature emergencies are interlinked and with the withdrawal from the EU an opportunity has arisen to address these with agricultural policy tailored to Wales.

The policy landscape is also framed by the landmark legislation the Well-Being of Future Generations Act (2015) and the Environment Act (2016) which promote the sustainable management of natural resources (SMNR), addressing their long-term decline without compromising the needs of future generations.

Within this context, Welsh Government Soils and Land Use Team have worked with a Research Fellow to develop an Agricultural Soil Policy Statement (ASPS) for Wales. There is currently no overarching soil policy or specific regulation for soil protection in Wales. There are policies relevant to soils in place, but they are spread across many policy areas and generally limited to specific functions or impacts of soils. The Agricultural Soil Policy Statement (ASPS) is intended to set out the overarching vision for sustainable management and protection of agricultural soils in Wales, and the scope for considering soils within policy and delivery interventions.

To inform the ASPS development, the Soils and Land Use Team in the Welsh Government have undertaken work to review existing evidence and collect new evidence from stakeholders.

Previous research

The Soils and Land Use Team produced a Review of Welsh Soil Evidence[5] highlighting the policy context, current status, future threats, and opportunities facing agricultural soils in Wales. This evidence review found that soils in Wales are high in carbon and generally at low risk of degradation, when managed within dominant grassland systems. However, soil carbon and biodiversity loss, soil erosion and compaction can occur in areas where there is inappropriate land management or land use has changed.

4 The Sustainable Farming Scheme (SFS) will be the new agricultural support scheme in Wales, replacing the Basic Payment Scheme which has been UK funded since the withdrawal from the EU in 2021. BPS will be secured until 2023 where after the transition to the SFS will begin with it officially opening in January 2026.

5 Review of Welsh Soil Evidence: Review of Welsh soil evidence | GOV.WALES

The review also highlighted that climate change is likely to impact Welsh soils in the future, and drivers for land use change will become more intense. These findings helped identify the key priorities specific to Wales that need addressing to achieve an overall vision of sustainable use and management of agricultural soils.

This evidence formed the basis of an initial draft of the ASPS (See Appendix 1). To refine this statement, the need to gather feedback from stakeholders on the ASPS draft was identified.

Current research

This research was intended to gather additional information and insight from farmers to contribute to the evidence base for, and inform the development of, the ASPS.

Whilst the evidence review provided a national scale picture of Welsh soils, further evidence from farmers' experience was required to understand if and how these findings were reflected at a local level, and how soil-related challenges were overcome in practice.

In Summer 2022, ADAS were commissioned to undertake a series of workshops with individual farmers and land managers. The objectives of the workshops are set out in the sub-section below. In August 2023, a PhD student placement in the Soils and Land Use Team analysed the data from the workshop transcripts and the findings of the analysis are summarised in this report.

Research aims

This piece of research had the following aims:

— To explore farmers' experiences and current practices of soil management and any related challenges they face.

— To gather feedback on the current draft of the Agricultural Soil Policy Statement (ASPS) and identify opportunities for developing it further.

To achieve these aims, workshops intended to answer the following research objectives:

1. Gain insight into how farmers understand and value soils.
2. Understand how farmers practiced "good soil management" and what they saw as the benefits of this.
3. Identify what farmers see as key soil-related challenges, based on their own experience, and what they do to overcome these.
4. Explore where farmers get advice on soil management, the factors that influence this, and how they could be better supported with information.
5. Gather direct feedback on the Agricultural Soil Policy Statement and its objectives.

This report details the findings from these workshops exploring farmers' experiences and practices of managing agricultural soils in Wales. This report captures the insight, feedback and considerations highlighted during engagement with farmers and land managers to contribute to the evidence base for, and inform the development of, the Welsh Government Agricultural Soil Policy Statement (ASPS).

03
Research Methodology

Study design and choice of methods

This research is descriptive in that it aimed to generate in-depth insights into farmers' experiences and practices that could be used to inform the Agricultural Soil Policy Statement.

This research utilised qualitative methods. Qualitative methods are most appropriate for research exploring first-hand experiences, attitudes, and beliefs because they allow for rich and in-depth exploration of subjective viewpoints (Silverman, 2013[6]). They also allow for the preservation of participant voices which is important in stakeholder engagement.

In line with the descriptive aims, the study used online focus groups. The rationale for using focus groups was that they would allow the gathering of a diverse range of perspectives and would encourage detailed discussion between participants.

Sampling

The initial aim was to obtain a sample of 63 participants (approximately 0.25% of the 24,677 farms in Wales) that broadly reflected the proportion of farm demographics including main activity and economic size from the Welsh Agricultural Survey, June 2020[7]. The survey data suggests that economically micro farms make up the greatest proportion of farms in Wales while economically small and economically large farms make up the majority of land used for farming[8]. However, the research team felt farmers would be reluctant to provide data on economic size so this information was not used to inform the sample. For the purposes of the ASPS, farm type and land size (Ha) was considered more relevant to the topic and therefore prioritised when recruiting the sample. For instance, the Agricultural Survey data (June 2020) demonstrated how farms whose dominant activity relates to grazing made up the highest proportion of land used on Welsh farms. As a result, the suggested sample (table 2) included greater coverage of grazing farms.

6 Silverman, D. (2013). Doing Qualitative Research (4th ed.). London: Sage.
7 Welsh Agricultural Survey, June 2020. Survey of agriculture and horticulture: June 2020 | GOV.WALES
8 For information, farms by economic size (Welsh Agricultural Survey, 2020):
Micro farms (with a standard output under €25,000)
Small farms (with a standard output of over €25,000 but under €125,000)
Large farms (with a standard output of above €125,000)

Table 2: Suggested research sample based on Welsh Agricultural Survey 2020

	Micro farm (<25 ha)	Small farm (25-99 ha)	Large farm (100+ ha)	Total
Dairy	1	1	8	**10**
Grazing (Sheep and Beef)	9	22	13	**44**
Arable, Horticulture, Pigs & Poultry	1	1	2	**4**
Other	4	0	1	**5**
Total	**15**	**24**	**24**	**63**

The sample was recruited through non-randomised self-selection. The Soils and Land Use Team circulated a flyer to farmers through existing Welsh Government engagement routes, including Farming Connect, the SFS newsletter and the Farm Liaison Service. Anyone interested in participating could follow a link to complete a short online survey. Approximately 80 farmers and land managers expressed interest in participating and were subsequently contacted by ADAS to check their availability for the workshops. The approach was to prioritise numbers of participants aiming to achieve a sample that covered a good range of farm types and size (in Ha). Of those who expressed an interest, 31 individuals were able to attend the workshop dates. This sample represents approximately 0.125% of the total farm population. Each workshop was originally designed to focus on specific agricultural sectors to increase representativeness, however the mixed nature of many farms limited the practicality of this.

The final sample consisted of 31 participants (across 5 workshops) from a range of farm types, sizes and geographical locations that though not representative did broadly reflect farm types across Wales with grazing the dominant activity. Farm types included sheep, beef, dairy, arable, horticulture, poultry, and pig farming. Most participants had a mixed farming system and therefore represented more than one sector on their farm, with the majority indicating that their farming system included Sheep (88.9%) followed by Beef (67.7%).

Table 3: Workshop attendee information

Workshop number	Sectors represented	Micro farm (<25 ha)	Small farm (25-99 ha)	Large farm (100+ ha)	Total no. of attendees
Workshop 1	Sheep, Beef	2	3	1	**6**
Workshop 2	Sheep, Beef		6	1	**7**
Workshop 3	Sheep, Beef, Dairy, Arable, Horticulture, Poultry, Pigs		2	3	**5**
Workshop 4	Sheep, Beef, Dairy, Arable, Other		1	5	**6**
Workshop 5	Sheep, Beef, Dairy, Arable, Horticulture, Poultry, Other		2	5	**7**
Total		**2**	**14**	**15**	**31**

Development of research instruments

Before the research commenced, a pilot workshop was conducted to help inform the workshop design in terms of format, timing, structure, and content. ADAS invited five farmers to provide input on the format of the workshops and review relevance of topics for discussion. The workshop Topic Guide was developed by ADAS with input from the Soils and Land Use Team and informed by feedback from the pilot workshop (see Appendix 2). The workshop topic guide is included in Appendix 3.

Workshop content and delivery

The five workshops were delivered online on the Microsoft Teams platform. The decision to use online methods was both practical and ethical. Online interviews made participation accessible without undue inconvenience or travel costs for participants and therefore reduced participant burden.

The workshops were structured to (1) explore farmers' experiences and current practices of soil management and any related challenges they face and (2) share the draft Agricultural Soil Policy Statement (ASPS) and gather feedback.

The workshops were led by a facilitator and captured through audio recording and notes made by scribes present in the workshop. Workshops lasted two hours and covered topics outlined in the semi-structured topic guide (see Appendix 3).

Workshops commenced with a presentation on the draft Soil Policy Statement, introduced by a Welsh Government official, who then left to enable participants to engage in discussion as openly and honestly as possible. A second presentation, delivered by an ADAS soil expert, explored common soil-related challenges in Wales, to prompt discussion around the regional and local challenges experienced by farmers in managing their soils, and how they overcame these.

Topics discussed were:

1. Farmers responses and feedback to the ASPS.
2. How farmers assessed their soils and how they compared with soils across Wales.
3. What soil-related challenges farmers faced locally and how they dealt with them.
4. How farmers practiced "good soil management" on their farms and the benefits of this.
5. Where farmers got their current information and advice on soils and how they could be better supported.

The workshops were transcribed and anonymised to enable analysis whilst ensuring participant confidentiality.

Analysis

A thematic approach was used to analyse the evidence from the workshop transcripts, plus any additional written comments provided by participants after the workshops. The PhD intern researcher analysed participants' responses through the process of reduction, segmentation, and categorisation (Braun and Clarke, 2006[9]) to highlight key themes that appeared in the data in relation to the research objectives.

The following process was followed:

1. **Familiarisation with the data** – reading through the transcripts and highlighting key comments or phrases in relation to the research objectives.
2. **Generating initial codes** – categorising text into codes through initial comparison and contrast of the transcripts.
3. **Searching for themes** – reviewing coding and combining or recoding areas of similarity/ overlap into broader categories to identify underlying themes of the data.
4. **Reviewing and refining themes** – reviewing and refining themes to represent unique and specific findings from the data and considering them in relation to the research objectives.

9 Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', Qualitative Research in Psychology, 3(2), pp. 77–101.

Follow-up workshop

After the ASPS was redrafted, participants in the original workshops were invited to a follow-up workshop, facilitated by ADAS, in which they were shown a presentation outlining how their feedback had shaped the new statement and inviting further comments. Twelve of the original thirty-one participants attended this follow-up workshop.

The primary feedback that emerged from this workshop was that the farmers wanted additional information to fully understand how their engagement had shaped the ASPS. In response to this feedback the Soils and Land Use Team sent attendees a copy of the re-drafted ASPS, a summary of the initial farmer feedback, and more information on the potential delivery mechanisms for the statement's objectives (See Appendix 5). No further feedback was received from participants after this information had been shared.

04
Findings

The findings have been summarised to convey the level of agreement or support amongst participants on different issues.

For example:

- **Most Many/All** – are used to convey that the majority of farmers have commented on or raised an issue, across most or all workshops.
- **Few/Some** – are used to convey that a minority of farmers have commented on or raised an issue, often only in one or two workshops.

The findings are set out by research objective and provide quotes to illustrate the points being made.

How do farmers understand and value their soils?

Participants were asked how healthy the soil was on their farms, and how they thought this compared to soils across Wales. They were also asked what methods they used to assess their soils and soil health.

Soil condition

Most participants thought their soils were generally in a good or healthy condition.

"I think our soils are pretty good".
Participant 21

“The soils are in good health”.
Participant 28

Some were unsure as to the state of their soils as they felt they lacked benchmarks to indicate what a ‘healthy’ soil is. A few felt that their soils were not very healthy, primarily due to historic agricultural management that had degraded the soil or topography of the land that increased pressures like soil erosion or waterlogging.

"We have... not very healthy soils here, the previous tenant liked to drive around alot and take a lot of bail cuts and not put anything back on the land... ".
Participant 5

Most participants identified the importance of soils to ecosystems, to their farms, and to Wales.

“Soils feed life!”
Participant 12

"We know that soils are the key ingredient for prosperity".
Participant 24

"We don't do anything in Wales, or we certainly don't try to do anything in Wales, to damage our most important resource."
Participant 1

Most of workshop farmers acknowledged that, while they believed Welsh soils were in a good state, there was a need to protect, maintain, and apply targeted improvements to soils to ensure economic and environmental sustainability. Most were actively looking for solutions and support with this.

"Our soils, I think are fairly good, but obviously we can always improve them and we're looking to improve all the time".
Participant 22

Most of the workshop farmers had encountered some soil degradation on their farms at some point. Some participants suggested a degree of degradation was an unfortunate but unavoidable consequence of some farming practices or weather conditions (e.g., heavy rainfall). Practices which were frequently mentioned as involving a degree of soil degradation were outwintering livestock, growing root crops or maize, and cultivation for reseeding. The reasons for adopting or continuing these practices varied amongst the farmers participating in the workshops. Many participants expressed a tension of balancing other pressures with maintaining soil health.

"We tend to outwinter a fair bit of stock, so occasionally we do have [soil-related] problems with that. But then how do we square the circle of reducing inputs, and being a mixed unit, and keeping livestock out as much as we can through the year, which is a lot healthier for them and, in the most part as long as we don't have these severe weather events, is better for the farm as a whole?"
Participant 22

Whilst others mentioned strategies they were utilising to minimise the negative impacts of practices on soils where possible.

"With maize, I think what you have to be very mindful of is obviously when you're taking the crop off, if you can try and remove that crop when the weather is good and the ground conditions are good and fair, that is gonna hopefully reduce the amount of compaction."
Participant 16

Assessing soils and soil health

Most of the farmers engaged with undertook some kind of regular soil testing or analysis to monitor their soils' condition.

"We're testing every five years, in some cases we test every three years".
Participant 15

Testing and analysis ranged from lab testing for factors like soil nutrient levels, soil organic matter, soil organic carbon, and soil pH to visual analysis of factors like soil structure and soil biodiversity.

"Mostly I do visual soil analysis. I go out with a spade and then, as it says in the book, take a nice big spadeful down, have a look at the roots... It gives you a flavour of what the fields are like".
Participant 25

Participants highlighted that some soil properties are much more difficult, costly, or unreliable to assess, resulting in gaps in farmers' understanding of their soils. Specific factors that were highlighted included soil carbon and soil biodiversity.

"Carbon (testing) is expensive... if you think how many land parcels I've got here, if I have to do every one, that's expensive".
Participant 16

Other soil properties are more straightforward for farmers to assess, and one participant suggested that this may be why compaction, for example, was a key concern for many farmers.

"I think compaction is probably seen as the one the most important [soil-related challenges], because that's the most visible to everyone on a day-to-day basis. You know, you don't really go and dig up your field... on a day-to-day basis to see what the soil's looking like. But if you're walking around a field or you're driving over field and you can see there's water standing, then you know in an instant".
Participant 7

How do farmers practice "good soil management" and what are the benefits?

How do farmers practice "good soil management"?

Participants were asked what 'good soil management' looked like on their farms and which aspects of this they felt were most important. The most commonly identified themes from participants related to nutrient management, livestock management, improving soil structure, testing and observation, and managing soil disturbance. The remainder of this sub-section discusses responses relating to each theme.

Nutrient management

Most of the participants were very concerned with maintaining soil fertility and said they practiced nutrient management as a part of 'good soil management'. Some mentioned having a nutrient management plan, whilst others spoke more generally about these practices. There was a particular focus on reducing off-farm inputs, often through effective use of manure and slurry, and on targeted rather than blanket nutrient application, tailored to the needs of different areas of the farm.

"I think it's having good use of your farmyard manure and your slurry... Just utilising all those nutrients that you've got... which will help create better soil health".
Participant 16

"I don't use any synthetics at all in our soils. Because the synthetic inputs will be the biggest thing that will have the biggest damage on your soil biology".
Participant 26

"All our soil testing is done within zones... then P&K and lime are spread variably.... We actually sort of spread it where it's needed on the zones within the field".
Participant 21

Livestock management

Many farmers said that careful livestock management was an important way that they practiced 'good soil management'. These farmers predominantly discussed ways that they managed or would like to manage livestock grazing to minimise possible negative impacts (e.g., compaction) and increase benefits (e.g., manure) to soils, including techniques like rotational and mob grazing.

"I'm mob grazing to improve topsoil... Increased manure directly onto the land... Increased microbial activity. Increased carbon in the soil for water retention. I'm sure there's more".
Participant 18

"What I would love to be doing is very, very precise rotational grazing because my understanding is that would increase the soil fertility and the structure and everything in the soil".
Participant 23

One farmer also mentioned that they limited livestock medications to minimise impacts on soil biodiversity.

"We try to use as few doses as we can, with some of them being more harsh to soil than others, like the mectins... that then go into the manure that lands on the field, which then doesn't get degraded by all the bugs and things... that does have quite a dramatic effect on the ability of nature to work in the soil... it's not altogether just what you're actually doing to the soil, but it's what you're doing to the animals that are on the soil".
Participant 8

Improving soil structure

Many farmers mentioned maintaining and improving soil structure as one way that they practice 'good soil management' on their farms. In particular, participants described aerating soils using both mechanical and botanical means (e.g., utilising the action of deep taproots to get aeration into the soil) to improve soil structure.

"We've done a bit of work on the farm with aeration and counting earthworms. All these things are important, unless you got that soil structure working properly, you're not going to get the benefits of anything like regeneration, lime, and re-seeding".
Participant 12

Testing and observation

Some participants said that they practiced 'good soil management' through regular observation and testing of their soils. This was important to understanding the overall condition of their soils and the differences in soil properties across different areas of their farms.

"It really is incumbent and imperative I think as a farmer [that] you walk the fields regularly, both during the winter and at every other time of the year... those fields tell you something. And for my part, what I tend to do is keep an active eye on it. In fact, I was in one pasture this morning and I'm not very happy at all with it because I noticed the dung isn't breaking down as it should. Have I lost some of my dung beetles? What's going on underneath with the biology of that soil?"
Participant 25

Managing soil disturbance

Some farmers said they had made changes, or were in the process of making changes, to tillage practices to support soil health. Many of these farmers had reduced or even eliminated tillage to protect soil organic matter and biodiversity, maintain soil structure, minimise compaction and erosion. Some others mentioned carefully managing the timings of cultivations,

in relation to factors like weather, to minimise their impacts.

"We've seen a great improvement from less tillage. Not no-till but just managing tillage, doing what's needed".
Participant 22

"My main one would be managing those cultivations, managing those soils, doing it at the right time, whether that be weather events or, you know, soil conditions".
Participant 21

What are the benefits of "good soil management"?

Participants were asked about key benefits to them of practicing 'good soil management.'

Maintaining healthy soils was recognized as beneficial by all participants in the workshops, and crucial to the successful functioning of the farming system.

"If we don't look after the soils, the farm's not gonna look after us. That's it at the end of the day".
Participant 16

The responses received across the workshop groups and participants were very similar, and can be loosely grouped into economic benefits, functional benefits, and ecosystem benefits. A few participants also mentioned the social benefit of leaving a legacy for future generations. Table 4 sets out the kinds of benefits identified by participants. The remainder of this section then explores participants views on these benefits in more detail.

Table 4: Benefits of 'good soil management' identified by participants.

Economic benefits	Functional benefits	Ecosystem benefits
Improved yields	Improved nutrient retention	Carbon sequestration
Reduced input costs	Improved water infiltration and retention	Supports biodiversity
Greater efficiency and profitability	Improved workability	Greater ecosystem resilience
More sustainable farm business in the long-term	Increased soil fertility	Improved ecosystem function
	Healthier crops and grasses	
	Healthier livestock	
	Greater farm resilience to extreme weather events	

Economic benefits

Participants particularly emphasised the economic benefits of 'good soil management', which is likely related to how all participants represented commercial farming businesses. Most farmers emphasised productivity gains as a key benefit, as well as improved efficiency through minimising costly inputs such as fertilisers.

"If a farmer does [good soil management] or any farmer is mildly engaged their yields will increase. So therefore, there's an automatic reason to do those things".
Participant 14

"If your soils are working, some of the more costly inputs, you're not going to require... good soils, good soil management, equals profit. Because if you can reduce those synthetic inputs... you are going to have a win-win".
Participant 25

Some farmers also raised that maintaining and improving soils resulted in a more sustainable farm business in the long-term, because of the view that the productive function of soils can be sustained without having to resort to greater interventions and investments over time.

"It's protecting and enhancing your farm for the future".
Participant 16

One farmer suggested that maintaining healthy soils could also increase farm profitability in indirect ways by increasing the marketability of products (e.g., carbon net zero meat/dairy) and bringing in secondary income through carbon sequestration.

Functional benefits

Most farmers also mentioned functional benefits of 'good soil management' to soil properties, crops, forage, and livestock. The category of functional benefits is intended to encompass those improvements which support fewer interventions, production of higher quality agricultural products (crops, meat, milk), and/or greater farm productivity or efficiency.

The farmers engaged with highlighted how they found that healthy soils require fewer off-farm inputs, less irrigation, less tillage, and have greater resilience in the face of a changing climate. Participants also viewed healthy soils as producing healthier crops, forage, and livestock, requiring fewer pesticides and antibiotics, leading to potentially higher yields and higher quality products for sale.

"A healthy soil brings healthy grass which brings through healthy animals".
Participant 12

"We just have better grass growth, better cover and improving for any weather implications, be it flood or drought... and we can work towards a lower cost system long term then".
Participant 17

Ecosystem benefits

Many participants referred to the ecosystem benefits of sustainable soil management, in terms of overall improvements in ecosystem functions and resilience, and more specific factors like carbon sequestration and increased biodiversity.

Some farmers took a holistic view by linking these ecosystem benefits to functional and economic benefits discussed above.

"The biodiversity is healthier and that does seem to show in the animals themselves, because what they're eating seems to be doing more good... it's a life cycle that's working for the land and the animals and nature".
Participant 8

Some participants expressed the view that ecosystem impacts like increased biodiversity were not necessarily beneficial for farmers unless they also translated into economic benefits.

"Biodiversity and above and below ground, not necessarily any benefit unless we get paid for it".
Participant 25

"Whatever the government does it needs to realize that it has to pay the bills on the farm. If it doesn't, then it's just it's not going to work".
Participant 11

Some farmers suggested that more indirect or long-term ecosystem benefits may not be able to motivate farmers to prioritise sustainable soil management when faced with shorter-term pressures or conflicting priorities like increasing costs, and that these should therefore be incentivised.

Social benefits

A few farmers also mentioned that maintaining healthy soils has social benefits, highlighting that this enables them to leave a legacy of a healthy and productive farm to future generations.

"It's protecting and enhancing your farm for the future. And for me it's for the future generations that are coming in now and wanting to take that challenge on, and it's for us to be profitable and have a sound business".
Participant 16

"We've tried to maintain the soils to the best of our ability... We obviously want to keep everything maintained or better it for the next generation".
Participant 22

What do farmers see as key soil-related challenges and how do they overcome these?

The most common soil-related challenges highlighted by workshop farmers were adverse weather effects, compaction, and maintaining soil fertility. Participants also discussed how a lack of knowledge and/or data as well as conflicts or trade-offs between different soil functions limited their ability to manage soils sustainably.

Adverse weather effects

Many farmers said they were experiencing increased adverse weather conditions which were impacting soils and their ability to manage them sustainably. Some participants linked these weather events explicitly to climate change, but many did not. The effects of adverse weather events were seen as major challenges for participants, particularly erosion, waterlogging, and the impacts of drought.

"We're having increased adverse and intense weather conditions which we perhaps weren't used to having so much. I have to be very careful now when I do my re-seeding that if I leave it a bit late in the summer, say after the spring barley crop has been taken off, there's a risk of runoff, of heavy water washing away the almost bare soil, as the re-seeding is only just taking root".
Participant 19

"We've had an incredibly hot summer which has really affected our soils because it's been incredibly dry. The ground has been cracked and it's been some time before we could even cultivate because the ground's been too hard to work".
Participant 16

Strategies for dealing with these adverse weather-related challenges were very varied. One farmer explained that they try to keep their ditches clear to reduce waterlogging in wet weather. Another emphasised that responsive livestock management was a key strategy for them to deal with droughts.

"We try not to overgraze. We try and leave more than I was taught in college because in a dry summer, if you've grazed too low, the ground will dry very quickly".
Participant 8

A key strategy for minimising erosion, mentioned by many farmers, was to reduce tillage and/or carefully manage cultivations in response to soil and weather conditions.

"My main one would be managing those cultivations, managing those soils, doing it at the right time, whether that be weather events or, you know, soil conditions. It's just got to be managed correctly and I think that if you go when it's too wet... You got more work to do to make it better again. It's just trying to do whatever you do at the right time with the right kit to get the right result".
Participant 21

Compaction

Many participants indicated that soil compaction was a key challenge on their farms. Compaction was mainly attributed to livestock grazing and machinery use during wetter months.
Some participants also mentioned storing manure in fields before spreading and heavy rain on bare soils as contributing factors. Because of the high rainfall in Wales, and limitations such as lack of winter housing for livestock, many participants saw compaction as an unavoidable outcome which must therefore be continually addressed.

"We [use an aerator] every 2-3 years as routine because, however good you are, you go on the land with wet, with the tractors or trailers or machinery, or you got cattle and sheep out there. So... the compaction starts building up again".
Participant 12

Participants utilised a range of solutions for compaction, the number and diversity of these indicated the prevalence of this challenge and the importance participants placed on improving soil structure. The most popular solutions utilised machinery to break up compacted layers of soil, including harrowing, subsoiling, and mole ploughing.

“I tend to use different methods to relieve the compaction, and some of them solve drainage issues as well, like mole ploughing or subsoiling”.
Participant 14

"We find that we've got a very big chain harrow that we use when conditions are right, and we find that's very good for the soils”.
Participant 27

Some participants also mentioned altering their livestock management practices to minimise compaction, for example by mob grazing or selectively outwintering.

"My cattle are moving very quickly. So, if it's wet, they might move every 12 hours. If it's drier, they might move in 36 hours, I'm monitoring that... if the cattle are moving quickly, that's not a poaching issue”.
Participant 26

"We have fields that we don't really graze in the winter with cattle, just with sheep, and we manage it according to the soil depth in the fields or whether they're wet fields or dry fields... Sensible farming and not too many, you know?"
Participant 27

Some farmers combatted compaction by growing cover crops and deep rooting plants to stabilise and aerate the soil. This approach was often used in conjunction with machinery, sometimes to protect and maintain soils after deeper compaction had been addressed. Other solutions mentioned by some participants included limiting and managing vehicle and machinery access during wetter months, transitioning to minimum tillage systems, and changing agricultural land use (e.g., stopping growing maize).

Maintaining soil fertility

Maintaining soil fertility was highlighted by many participants as a priority and a challenge, especially when faced with adverse weather conditions and economic constraints.

"Soil fertility is obviously the number one priority for a farmer, and very often we are guided by other incentives or negative price rises so, for example... since last year, the price of fertiliser has made it impossible to use fertilizer so there will be some change I suspect in in soil qualities over the next five years as we try to live without fertilizer or with less fertilizer".
Participant 19

"Our soils, because they've been tested, we realized that fertility is the issue, but one of the problems is the heavy rainfall so it's always going to be an issue that has to be maintained".
Participant 8

Many of the farmers referred to managing the pH of their soils through lime application as a strategy to limit nutrient loss.

“Liming, it's a no brainer. I mean, why the hell is anybody putting fertilizer on if your pH is too low. You know, especially at the price that it is, I think it's something that's got to be done. Should be encouraged more”.
Participant 6

Some participants also described careful management of manure and slurry as a strategy to improve soil fertility, whilst a few referred to utilising a nutrient management plan.

“We have improved the P&K on this farm quite significantly. This has been done purely by doing a lot of slurry injection into the fields before we've actually ploughed and then put different leys in. So that's made a big impact on our soils here, making them healthier”.
Participant 16

Measuring soil organic matter

A few participants had specifically tested their soil organic matter (SOM) levels, and a lack of soil organic matter reporting in soil analysis was highlighted as a challenge for some farmers to monitoring and managing SOM levels on their farms. There was also some doubt amongst participants about the reliability of SOM data when it was available.

Whilst the majority of participants assumed their organic matter levels were high due to low intensity grassland management, there were a few farmers who felt flow levels of organic matter was a challenge on their farms. These participants were mostly farming on steep-sided slopes vulnerable to erosion and this demonstrates how localised soil-related challenges can be.

There was little discussion of strategies for increasing SOM, besides one farmer who was looking to add manure from other farms, but some farmers said they had reduced tillage as a strategy to protect and maintain the existing levels of organic matter in their soils.

"We haven't touched the plough for eight to 10 years... So that's less carbon taken out, less carbon burnt to put something back in”.
Participant 1

Measuring soil biodiversity

Many participants suggested that a lack of access to knowledge and/or data to assess soil biodiversity posed a challenge to monitoring and managing soil biodiversity on their farms.

"How do you measure it? I don't know. Although I believe people are actually doing DNA analysis of soil samples to try and pick out what's going on, but this is this is very much a cutting edge of research. This is not the sort of thing that you can do on a farm level”.
Participant 2

"The difficulty I found in the past is that if you can get the chemical and the physical right, then it's not easy to get biology right because the bog-standard soil samples don't tell me what bacteria and fungi I have got in those soils, and indeed how to get them back with certain management. I have in the past even sent them over to places like Laverstoke Park to get them checked there, you know, to get a full biological breakdown. But it is very expensive”.
Participant 25

Some farmers dealt with this challenge by focusing on visual soil analyses like earthworm counts, but there was general demand for more training and tools for monitoring soil biodiversity on farms.

Balancing different priorities

The final challenging aspect of soil management that was raised by some participants was balancing different soil functions, as they sometimes encountered conflicts or trade-offs between them. For example, one farmer was concerned that applying lime to increase soil fertility could have a negative impact on soil biodiversity. Many participants found it challenging to balance supporting soil ecological functions which didn't generate immediate benefits for the farmer with short-term agricultural productivity and profit.

"It comes to this thing of the cost of doing it and the economics of doing it. And I know what I'd like to be [doing], but can I afford to change things and do things to get there... we've got it when we look towards different ways of cultivation or should we be looking at some sort of subsoiling or... producing this more diverse sward. It's how we can do it and at what cost?"
Participant 22

One farmer raised that this may be especially challenging for tenant farmers because they are under pressure to achieve short-term results.

"If you're trying to improve soil, it's quite a long-term resource, and a lot of my friends are on one year rolling tenancies, three years, five years... when they're very short-term tenancies, there's not as much of a motivation I guess to really to really think long-term".
Participant 5

How do farmers get information and advice on soil management, and how can this be improved?

Where do farmers get information and advice on soil management?

Participants reported that they got information and advice on soil management from a wide range of different sources. These included peer-to-peer networks, media and social media, academia, businesses, consultants, governmental and non-governmental organisations.

Peer-to-peer networks

Most farmers expressed a preference for peer-to-peer knowledge exchange through formal and informal networks. Several participants suggested that these networks were most effective when made up of farmers with similar farm types or from a local area, whilst some others emphasised the importance of including older generations of farmers who had historical knowledge and experience of different land types and agricultural practices.

"Farmer exchange, I think it's really important. I think that's where you tend to get most value and you're more likely to change your habits because you've seen someone doing it successfully or unsuccessfully".
Participant 5

[Having farmers' groups] "really does work because you share experiences with your neighbours or other farmers as has been said before. It's not always what works. You learn more probably from what doesn't work... just by listening to the people around the table makes a heck of a difference".
Participant 1

Media and social media

Many participants also utilised print, online, and social media as important sources of information and advice, with examples mentioned including magazines, podcasts, videos, and social media platforms. Farmers mentioned various benefits of utilising media sources such as accessing information about farming practices in other countries, accessing specialist or niche advice, and the convenience and accessibility of formats like podcasts.

"I just look online for a lot of stuff. So like Farmers Weekly have really good advice, articles, and stuff. We looked up a lot of our reseeding stuff on Farmers Weekly. And there's quite a lot of, if you're that way inclined, there's a lot of quite good YouTube stuff out there as well".
Participant 5

"I occasionally use social media to understand what other practices are going on with other farmers, particularly outside Wales, because I'm considering trialling mob grazing and things like that. So, I'm looking at things like YouTube, also looking at Twitter".
Participant 15

Government and NGOs

Many of the farmers said they had accessed some information and advice from governmental and/or non-governmental agricultural organisations. There was positive feedback from some participants on The Welsh Government's Farming Connect programme, whilst non-governmental organisations mentioned included Nature Friendly Farming Network, Soil Association, and FarmEd.

"From my point of view farming connect has been invaluable... ".
Participant 7

"I've taken part in the Farming Connectsoil samples for quite some time now. And I think it is the backup and the follow up... that's important, isn't it?"
Participant 3

Academia

A few farmers mentioned academic research and links with academic institutions as sources of information and advice, whilst some others suggested that this was an underutilised resource that should be made more accessible to farmers.

"We've been on the pro-soil project with Aberystwyth University. We've been very fortunate to link in there and get some absolutely super advice".
Participant 25

"We went for a visit up to the grass plots at Aberystwyth and the Bayo Innovation Centre... they're doing trials on min-till methods and different crops to get better root depth. And I just think more of that could be publicized and made available for farmers, so they can adapt what they've got at home to what their own challenges are".
Participant 17

Consultants

Some participants said they had received advice from agricultural consultants such as ADAS and other independent consultants. They mentioned that a benefit of this kind of advice was that it was tailored to their farm, specific fields or even parts of fields and therefore was highly specific and practicable.

Businesses

A few participants mentioned getting information and advice from the commercial sector, particularly seed companies, but there was a general concern expressed that advice given by companies could be biased.

> **"[we] traditionally have had a lot of information from the commercial sector, but then sometimes I'm a little bit concerned... I think that we got to be looking now to reduce as much as we can of outside inputs... but it's getting the information and the knowledge of doing that that hasn't got a commercial interest in it".**
> Participant 22

This highlights one of the major pieces of feedback received from participants, that they were happy to take information and advice from a variety of sources but valued that which was unbiased and based on trusting, ongoing relationships.

> **"What I would say would be independence, and respect, in other words you come to identify and know the person giving you advice, whether it's a commercial piece of advice or it's independent. If you work with somebody for some time and you've found that the advice that you were given was honest and made the difference, then you will stand by and be loyal to that person or to that company".**
> Participant 19

How can farmers be better supported with information and advice?

Participants were asked how they could be better supported to understand their soils and practice sustainable soil management. The main areas that were highlighted were increasing information on Welsh soils through research and monitoring as well as providing specific training and support to farmers to enable them to conduct soil analysis and put any data collected into practice.

Research and monitoring

Many workshop farmers highlighted a need for more research and soil monitoring, both on a national and a local scale. Some participants felt there was currently a lack of research, monitoring, and mapping based on the Welsh context, and that this needed to be addressed to provide information and advice which was relevant and useful to Welsh farmers. In the case of academic research, a few participants felt that this should be more widely publicised and made accessible to farmers and land managers.

> **"There has to be basic research on farms in Wales and that understand the climate in Wales, understand the farming patterns and the mixed farming that we have. If you don't have those... spaces, then the advice that we'll get will be flawed".**
> Participant 19

Some participants highlighted the need for long-term soil monitoring on a local scale to track trends and changes at farm level over time.

"I think truthfully we should try and engage for the long term. So, if organic matter goes up, then its repeatedly testing possibly the same fields in the same areas and over a 5-year period and seeing how the changes happen in specifics rather than in general terms".
Participant 14

"I think far too many projects have been done on the one-year basis rather than a five-year basis... there's no depth to it. You gotta have four or five years to get everything into the pot".
Participant 12

Training and support

Many participants expressed a desire for financial support for costs and equipment for soil analysis and monitoring. There were several suggestions for developing apps or other technological solutions to streamline and increase access to soil analysis for farmers, distributing equipment for soil analysis, and providing funding for more costly tests like soil carbon analysis.

"If there is a scheme to maintain and develop soil monitoring then government should help or assist in farms having detailed soil analysis".
Participant 20

"I think we need some investment in some tech to help us to get a broadline base and to help us monitor... ".
Participant 25

Many farmers said they experienced difficulties in interpreting data from soil analysis and wanted support with this to enable them to translate data into practice. Farmers expressed a desire for data to be made available in more accessible formats, and a timelier manner, for it to be most useful. Participants specifically mentioned benchmarking as useful for enabling them to compare their soils to other farms and/or to an optimal baseline. Training in soil science was also flagged as something which could enable farmers to interpret and utilise data independently.

"I guess what would be important to me would be, if we're going to be asked to monitor our soils – fantastic – but I would like to understand what the heck the results are of any testing, and I'm wondering who is going to provide that information in a way that I can understand and act on. So that seems to be very important".
Participant 23

"I'm trying to assess where [my soils] are within the range of where they need to be. I know the pH is OK. I've had some carbon nitrogen levels or ratios, but I'm not very good at interpreting what that means. It's difficult. I don't think my soils are particularly poor, but I don't know to what extent I'm under a benchmark or over a benchmark".
Participant 11

Some farmers said that they would benefit most from practical demonstrations of sustainable soil management and solutions to soil-related challenges through farm visits and access to demonstration farms. Being able to see advice put into action was perceived as particularly valuable versus abstract advice.

"I think what is really important is demonstrable evidence of what works and what doesn't... So, I think it'd be really valuable to have more demonstration farms... that farmers can then visit and learn from, because I think we all accept much more when we can see it in action".
Participant 18

Direct feedback on the Agricultural Soil Policy Statement

The draft ASPS was shared with participants during a presentation at the start of the workshops and farmers were asked if they had any direct feedback on the statement.

Most farmers engaged with expressed support for the development of the Welsh Government Agricultural Soil Policy Statement in general, and some participants stated that the assessment of the state of Welsh soils and the objectives identified chimed with their experience on their farms.

"I'm thrilled that the Welsh Government is thinking of giving much more prominence and attention to soil".
Participant 23

"I'm quite heartened by it because it's all positive by the looks of it already and I suppose it's what we already know".
Participant 11

In addition, some suggestions and areas for improvement were offered by participants.

Positive language

Some farmers suggested that the wording of Objective 1 'Reduce soil degradation' could be altered to better reflect the generally good current condition of Welsh soils and to present a more positive ambition for the future.

"That objective one, I tend to want to change that from reduce soil degradation to either mitigate or avoid soil degradation, because that indicates that there is a problem with soil degradation in Wales, which I don't think there is".
Participant 1

Holistic framing

A few participants expressed that the holistic nature of soil health could be more clearly emphasised in the statement, as the separation of issues into objectives and priorities artificially separated them out. One farmer also highlighted that climate change could be further emphasised as an increasing overall pressure on soils.

"I think it's got to be looked at as more of a whole rather than individual compaction issues and carbon issues. I think it needs to be looked at more as one aspect, as in good soil health, rather than individual aspects".
Participant 14

Water

A few farmers suggested that water management should be more explicitly covered in the statement objectives.

"I'm surprised that within the key objectives that Welsh Government have identified that with water holding capacity is not on there for flood alleviation... I'm surprised it isn't down there as an objective".
Participant 25

Policy integration

A few participants highlighted the need for the statement to integrate with other existing policies and regulations that impact on soils and farmers to avoid conflicts in practice.

> **"If the government are looking for an overarching policy, it has to marry into every other thing that they apply onto the industry. So, they can't take with one hand and ask us to give on the other, you know it doesn't work like that".**
> Participant 1

One farmer also suggested that there needed to be consideration of policy timescales to ensure that any statement produced was still relevant by the time it was published.

Delivery

Some participants expressed concern over how the policy objectives would be delivered in practice, particularly Objective 3 concerning soil monitoring. Farmers wanted more concrete information on targets, timeframes, and so on. They also pointed out that issues like a lack of existing infrastructure for increased soil analysis could be barriers to achieving the statement's aims.

05
Conclusion

The findings from this research contribute to a greater understanding of farmers and land managers' current experiences and practices of managing agricultural soils in Wales. These insights strengthen the evidence base for and have contributed directly to shaping the final Agricultural Soil Policy Statement, as described in the ASPS Stakeholder Engagement Findings and Response document[10].

Soil condition and degradation

The research shows that the majority of farmers and land managers engaged with tested their soils regularly to monitor their condition, but found it easier to assess some soil properties (e.g., nutrients, compaction) versus others (e.g. soil carbon, soil biodiversity). This sometimes resulted in gaps in farmers' understanding of their soils. Participants generally thought their soils were in a good condition, which aligns with evidence on a national scale from the Review of Welsh Soil Evidence[11]. Some farmers suggested that the wording of Objective 1 in the ASPS draft 'Reduce soil degradation' could be altered to better reflect the generally good condition of Welsh soils. Nevertheless, most farmers engaged with had encountered some soil degradation on a farm scale. This was often seen as an unavoidable consequence of factors like weather, or specific farming practices which farmers adopted or continued due to pressures on the farm business. In these situations, many farmers utilised strategies to minimise the negative impacts of such practices on soils where possible.

Participants valued their soils as important to ecosystems, their farms and to Wales, and expressed views in alignment with the broad aims of the ASPS to protect, maintain, and improve agricultural soils to ensure economic and environmental sustainability. Some participants viewed soil health and management as holistic in nature, rather than being easily separated out into different aspects, and wanted this to be more clearly articulated in the statement, including elements like water management and climate change more explicitly.

Benefits of and incentives for 'good soil management'

Farming participants reported practicing many aspects of "good soil management", including regular testing and observation, nutrient management, managing livestock grazing, improving soil structure, and minimising soil disturbance. They were predominantly focused on the economic and functional benefits of these practices for the farm business, which may reflect the immediate pressures farmers experience to ensure they have a viable business and livelihood. However, they also recognised a variety of benefits to ecosystems, nature, and climate, and the social benefit that comes from leaving a legacy for future generations. There was widespread agreement that incentivisation for ecosystem benefits would further support and encourage farmers to manage their soils sustainably.

10 ASPS Stakeholder Engagement Findings and Response Document: both documents available at www.gov.wales/agricultural-soil-policy-statement

11 Review of Welsh Soil Evidence: Review of Welsh soil evidence | GOV.WALES

Soil-related challenges and objectives

Some of the challenges outlined by farming participants were closely linked to the threats and challenges highlighted in the ASPS, affirming their relevance to Welsh soils and Welsh farmers. This is particularly true for compaction, which many farmers identified as their key challenge, and adverse weather effects, which is linked to the emerging threat of climate change. Farmers engaged with highlighted that they were concerned about maintaining and improving soil organic matter and soil biodiversity but there were knowledge barriers which posed a challenge to monitoring and managing these factors on their farms. There was demand amongst participants for access to more comprehensive soil analyses, and support with understanding these, to progress further with these priorities. One notable challenge raised by workshop farmers that had not been addressed in the draft ASPS is maintaining soil fertility. Farmer feedback also highlighted that balancing different priorities and/or soil functions can be a challenge in practice (e.g., maintaining livestock productivity whilst avoiding compaction).

Knowledge sharing

Farmers engaged with highlighted the importance of knowledge sharing for supporting sustainable soil management. They said that they currently got information and advice about soil management from peer-to-peer networks, media and social media, government and NGOs, academia, consultants, and businesses. Participants were happy to draw on information and advice from a range of sources, but expressed a preference for sharing of practical experience and unbiased information and advice (e.g., without vested commercial interests) from sources with which they had trusting, ongoing relationships.

Information on soils

Farming participants felt that they could be better supported by access to more information on Welsh soils from further research and monitoring (particularly long-term and farm-scale), however several expressed concern over how monitoring would be delivered in practice. They pointed out that issues like a lack of existing infrastructure for increased soil analysis could be barriers to achieving this objective. Participants also wanted further support to enable them to conduct soil analysis, understand related data and put it into practice, including presenting information in more accessible and meaningful ways for farmers and land managers.

Appendix 1

Draft Soil Policy Statement

The Challenge – Soil is a valuable, threatened and finite resource

Soil is an ecologically and economically valuable resource that sustains life and provides crucial ecosystem services to Wales. These services include providing food and timber, regulating and purifying water, and making important contributions to climate regulation, biodiversity and protection from natural disasters. Due to a slow formation process, soil is considered a finite resource.

Soils in Wales are distinctive. They have greater carbon content than most soils in England and Europe. This is due to the wet climatic conditions, extensive areas of managed grassland systems, and the resulting large extent of organic soils (peat and organo-mineral soil). Whilst some risks to soils are currently medium to low, others are higher, or can occur in localised areas, or are predicted to increase. These threats impact the ability of soil to effectively deliver the crucial services we rely on. In addition, changing climate, a growing population and shifting land use demands are expected to increase the pressure on soil resources.

The vision

Our vision is for resilient agricultural soils, providing services for current and future generations through sustainable use and management.

Why a Soil Policy Statement?

Management of agricultural soils are directly relevant to the forthcoming Agriculture Bill and Sustainable Farming Scheme in Wales. Agricultural soils are considered in this draft Soil Policy Statement as they represent 90% of the land area in Wales. Agricultural soils are defined as soils under agricultural management for crops, grasslands and semi-natural habitats. Other soils will be considered in future updates of the Welsh Government soil policy statement.

The Welsh Government 'embeds our response to the climate and nature emergency in everything we do' (May 2021). A soil policy statement has direct relevance to addressing the national declarations of the Climate (2019) and Nature (2021) Emergencies. Future soil policy will be framed within the overarching Well-Being of Future Generations (Wales) Act (2015) and the Environment (Wales) Act (2016). These promote the sustainable management of natural resources (SMNR) to address their long-term decline, without compromising needs of future generations.

Currently, there is no overarching soil policy or specific regulation for soil protection in Wales. Wales is developing a bespoke agricultural policy since the UK withdrawal from the European Union. In this context it is timely and important to develop a soil policy statement, to underpin the sustainable management of soils in Wales.

Overarching Objectives

The Welsh Government have produced a soil evidence review that indicated the current status and future threats and opportunities facing agricultural soils in Wales. The evidence review identified key areas specific to Wales that need addressing, including evidence gaps, to achieve the overall vision of sustainable use and management of agricultural soils in Wales. Several objectives for the soil policy statement are proposed from the outcomes of the research soil evidence review. These objectives will be refined as additional evidence is obtained through stakeholder engagement. This stakeholder engagement will co-produce the policy statement by providing additional sources of knowledge and evidence to ensure the statement is fit for purpose and is a shared vision for soil policy in Wales.

In the interest of maintaining and sustaining agricultural soil and its services, the following overarching draft objectives are proposed:

Maintain and enhance the soil resource, soil functions and services by:

- **Reducing soil degradation**
- **Exchanging knowledge on the value and vulnerability of soils**
- **Maintaining and developing soil monitoring and modelling**

Objective 1: Reduce soil degradation

Challenge

— Ensure soil delivers future resilience in Wales by maintaining and enhancing the functions and services from soil.

— Ensure the impacts of future land use change and climate change do not increase soil degradation.

Soil degradation impacts the ability of soil to provide multiple services and functions, including food production, water quality, habitat provision and climate regulation.

The following focus areas are identified to reduce the degradation of agricultural soil in Wales to ultimately deliver soil functions and services:

Objective 1a Maintaining and enhancing soil organic matter

Challenge

— Current stores of soil organic matter should be maintained and increased where possible through effective soil management.

Soil organic matter levels are typically high in Wales due to large extents of organic-rich soil (peat and organo-mineral soil) and land managed under low intensity grasslands. Careful consideration is needed when proposing land use change to ensure it does not trigger a loss in soil organic matter. Increasing the storage of organic matter where it has been depleted has multiple benefits to soil fertility, soil biodiversity, soil water retention and reducing greenhouse gas emissions.

Objective 1b Minimising soil erosion

Challenge

— In areas at high risk to soil erosion actions should be adopted at a local scale to reduce erosion risk.

Most Welsh soils are under permanent grassland, which is beneficial for preventing erosion, if managed appropriately. However, erosion processes can be highly local and intense, resulting in hotspots where significant soil loss can occur, such as in areas with little vegetation cover. The predicted increase in extreme weather events under climate change is expected to increase the risk of soil erosion and landslips. The erosion risk is greater if land use and land management changes increase areas of higher risk such as bare soil on arable land.

Objective 1c Minimising soil compaction

Challenge

— Minimise soil compaction through appropriate machinery use and management of grazing type and duration during high-risk wet conditions.

Many Welsh soils for most of the year are predominantly wet due to slow permeability and high rainfall, or high groundwater. As compaction risk increases with soil wetness, Welsh agricultural soil has a high vulnerability to compaction. As a result, a quarter of grasslands in Wales are liable to compaction from heavy machinery and livestock. Compaction can be considered temporary as it can be alleviated through management. Soil in good structural condition has more efficient fertiliser uptake, better yields and reduced run-off generation.

Objective 1d Fostering soil biodiversity

Challenge

— Increase understanding and reduce losses in soil biodiversity in Wales.

Soil biota accounts for around a quarter of global biodiversity and supports the multifunctionality of land ecosystems to cycle nutrients, produce food, store carbon and support habitats. Limited evidence exists on the trends in soil biodiversity in Wales but changes can occur as a consequence of land use change, loss of organic matter, extreme weather and land management. Threat of soil biodiversity loss is generally lower in low intensity systems compared to high intensity systems. The increase in extreme events due to climate change are likely to alter the abundance and diversity of soil organisms, and their interactions between each other and with plants.

Objective 2: Exchange knowledge on the value and vulnerability of soils

Challenge

— Enhance effective exchange of knowledge between farmers, decision makers and scientists to provide the best possible information for optimal solutions and opportunities for sustainable management of Welsh agricultural soils.

— Embed research and development evidence into knowledge exchange activities.

Welsh farmers have managed most of the soil in Wales for generations and have a good understanding of their local soils. Effective knowledge exchange on sustainable soil management is a two way process that by working together will benefit farmers, researchers and the wider environment.

Objective 3: Maintain and develop soil monitoring and modelling

Challenge

— Additional monitoring of soil at local as well as national scales, and in near-real time, can add detail of current trends in soil properties and functions to reduce soil degradation.

— Ensure monitoring is at the same scale as farm level soil management interventions and the data outcomes are fed back to land managers to support farming decisions for the best outcomes.

Evidence from data and modelling has provided important information through a national level snapshot of the current state of soil resources in Wales (e.g. current stable trend in soil organic matter content). More detailed data will provide more specific information on the amount, location, and risks to soil organic matter, erosion, compaction and soil biodiversity in Welsh soils. The soil, land use and climate of Wales is different to most of the UK. Variations in soil and land management can occur at local scales. At field and farm scale, there can be large differences in soil properties, and this will guide the resulting response to soil management and other pressures. Integrating new data with historical data and other climatic variables to model future changes in soils will provide the best possible evidence to inform soil future policy and sustainable management.

Appendix 2

Pilot Workshop

Pilot Workshop Guide

Part A: Structure of further workshops		
1.	What is the best time for farmers to attend workshops?	— Time of day — Best days for it — When would they likely attend in August?
2.	How many farmers do you think would be good for a group discussion?	— 1-5 — 5+
3.	Do you think a mixture of farm types/ practices are better or would you like to discuss with farmers of the same farm type as you?	— Do you think it would hinder your ability to talk about topics if the farmer had a different farm type?
4.	How long do you think workshops should last?	— Is 2 hours (with a break) a good amount? — Is there a point you would lose interest?
5.	How much moderation involvement is a good level?	— Would you prefer a fluid discussion without much mod involvement? — Would you like mods to steer conversation?
6.	What would be the best format for a workshop?	— Would more interaction be better? — Would you prefer discussion over a question or tasks? — Would a presentation followed by a discussion be better or discuss in between?

Part A: Structure of further workshops		
7.	Would you rather have open questions or closed questions?	— Is a mixture better? — Would you like a voting system or questionnaire? — How often would you like to discuss a topic (should there be a limit)?
8.	What would you hope to get out of attending a soil policy workshop?	— Are you happy to talk about your personal soils or keep it general? — Would you prefer topics to be more of a learning exercise or general discussion?

Part B: Soil Policy Related topics		
9.	What topics would you be most interested in talking about in relation to Soils and Soil Policy?	— General Question – (no prompts to give unbiased answers).
10.	What do you think is the best way to approach soil issues/risks with farmers?	— Is it better to give a list of topics? — Would visual aids help to elicit conversation?
11.	What are the main pressures and challenges farmers face in farmland management?	— Do you respond more negatively or positively to X pressure/challenge? — Do you have the capacity to respond to these challenges?
12.	What do you think are the costs and or benefits for implementing measures/ practices that protect your soils/keep them healthy?	— Are their more costs than benefits? — Are these more overt/covert costs and benefits?
13.	Do you think most farmers see a connection between their farm outputs and soil management?	— In what way? — Are there direct connections (hesitation to link)?
14.	What characteristics do you think make up a ‘good farmer’?	— Does soils factor into this? — Are farmers motivated to be good farmers/value their soils?

Part B: Soil Policy Related topics		
15.	What policies or support do you think farmers need to encourage 'good' behaviors/ farming practices?	— Focus on soils — Are you given the motivation/opportunity from current policy or where is it inadequate?
16.	Where do farmers get most of their current support/information concerning farming practices?	— Focus on soils — Does the information/advice impact your current practice? — What would make it more influential?

Thank you for taking part in the workshop

Pilot Workshop Findings

Introduction

Introductions – farmers and ADAS

Background on Welsh soils – 90% agricultural, high carbon, good condition. WG wish to engage with farmers on soils to produce an overarching soils policy.

Invited to help design the way we engage with farmers via virtual means. 65 farmers will be asked to participate in workshops. They can join the call again if they wish to. Two parts to call- technical and practical.

Technical matters

- How to stop degradation of Welsh soils
- How to communicate with the industry
- How to monitor and maintain soils

Question 1 – What topics would you be most interested in hearing about if you attend these workshops? And what are the main threats to Welsh soils?

Threats

- **R – Outwintering** of stock, poaching run off and how to repair soil structure? In particular if direct drilling is used and ploughing is discouraged.
- **R – Carbon sequestration.** Should this be part of the topic/position statement? Yes. More scope to put carbon into grassland/ livestock farms than for arable units. Farmers see this a better way of 'adding carbon' than by planting trees. This depends on the carbon assessment toll being used and their understanding of how carbon is sequestered and stored. The Carbon tool being used is important as not all measure this and some make assumptions.
- **R – Future of phosphates in soils?** This is locked up well if soil biology is geed. Need to be careful on how much is applied in vulnerable areas/systems. Poultry industry seen as the issue/culprit. Farmers should test their soils every year and adapt. Removal by crops/livestock will stop the build-up If soil biology is good then it should not be an issue.
- **Q – Should we discuss in future workshops?** Yes, for poultry and dairy sectors in particular. Pollution Regs seen as more of an issue though. Good soil biology seen as the answer for beef and sheep farmers, but others need to consider phosphate losses.
- **Climate change** – more winter rain and dry summers. Deep rooting plants and infiltration will be important. Need to be able to measure and monitor organic matter in soil structure to reduce risk.

Question 2 – What do toy see as the key barriers/enablers to getting sustainable soils in Wales?

- **R –** Historic mindset, traditional farming systems, engrained need to lough mentality, policy changes will impose.
- Tree planting a worry – land lord tenant issues, more pressure on productive land is proportion is planted with trees.
- Set stocking v rotational grazing and deep rooting of grass. 80 % of farmers still set stocking and grass being wasted and not deep rooting.

Question 3 – What do you see as the benefit of a sustainable soil management policy?

— **R –** Increased profitability – everything functions properly. Plants are resilient to dry weather/wet conditions and climate change. Organic matter increases and erosion decreases. Opportunity to store more carbon. Costs v benefits to sustainable soils gives a win/win situation. Longer term benefit but communication needs to be of long-term benefits worm counts, deep roots etc.

Question 4 – Are farmers seeing pressure from supply chains to produce more food per area?

— **R –** No but pressure on cost of production and need to justify/demonstrate. Individuals are deciding on their own situation and responding. Framers don't think that food security is an issue now but might be in the future.

Practical matters

— Best time? 11-2

— How long? Max 3 hrs. If practical could be longer.

— Which day? Not Mondays but other than this miss market days and silage/harvest.

— Presentation – want practical farming input too even if virtual. Not too many boffins! Not too scientific.

— Number in workshop? Put livestock farmers together and poultry/dairy farmers on another workshop.

Other issues

The need to integrate organic manures without ploughing. Food security also needs to be higher up WG Agenda.

Appendix 3
Workshop Guides

Workshop Guide – Full

Soil Policy Statement (SPS) 2022 Presentation – 20 minutes

1. Outline workshop objectives and format (i.e., how long each section is and requirements).
2. Outline how SPS fits with existing and proposed policy and regulatory frameworks, which will deliver on objectives. Note where supporting policy is still in development/ scope for additional delivery mechanisms is an option.
3. Introduction to Soils Policy Statement, presenting state of evidence on Welsh soils and connect this to resulting priorities for soils management.

Notes/Reminders from WG on presentation

— Emphasise the codesign approach being taken and note previous/other efforts to engage farmers in this way – and how it works alongside this workshop.

— Their feedback has and is being used. Give concrete examples in the workshop e.g., challenges raised in SFS codesign 1. Previous SFS codesign 1 and the current SFS codesign 2 feedback will be used alongside their comments in this workshop to inform both the soils policy statement and different delivery mechanisms (i.e., the SFS) to then achieve desired policy outcomes.

— The policy is at the draft stage and need their help to design it, can only be finalised with their input.

— We want to be clear to farmers taking part that the evidence review is a national scale picture. We want to know how the findings fit at a local level, through their own experiences.

— Need their ideas on how to overcome challenges from evidence review and that they encounter.

— Ensure enough time for the detail of the SPS which farmers will then discuss. Consider whether there is a need to emphasize certain aspects depending on sector/workshop attendees.

Discussion – 20 minutes: How Farmers Understand and Value Soils

Gain insight on how farmers understand and value soils, and the extent of alignment between their perspectives and those presented in the statement.

Question Number	Discussion question	Follow up questions and prompts These are to be used if not covered by general discussion question
1.	How does your soil compare with the evidence we have just seen in the Soils Policy Statement presentation? Prompts: Soil erosion/Compaction/etc. (Soil Health – good water retention, good earthworm activity, low erosion, good NPK levels)	1. How healthy is the soil on your farm? 2. How does your soil health compare to soils across Wales? 3. What methods do you use to assess your soils and their health? a. Soil tests b. Animal health 4. Have you seen any changes in your farm that can be related to the soil condition? a. Prompt: (e.g., livestock, income change etc.)
2.	Are there any soil related challenges you have had to address in your farming practice or on your farm?	1. Are they still an issue? 2. Have these issues been mentioned in the Welsh SPS presentation?

Discussion – 20 minutes: 'Good' Soil Management

Question Number	Discussion question	Follow up questions and prompts
3.	**Activity** – For you, as a farmer, what are the benefits of sustainable quality soils? **Teams Polls** – word cloud. The respondents may have the option to talk or write in the chat for topics to be added to the word cloud.	1. What does good soils management look like on your farm? 2. What are the benefits of good soils management? 3. From what you've described as 'good soil management' are there any aspects that are more important to consider than others? 4. Are there some things you do to look after the soil that work better than others, and why?

Break – 5 minutes

1. Reminder to mute and turn off cameras but don't leave the call.

2. Describe what next topics are and presentation to come on key challenges and information.

Presentation – 15 minutes: Challenges

1. Outline key material and areas relating to important topics (from the pre-pilot) around soil/ soil management and the challenges associated with them.

2. Enable discussion around the Welsh SPS and link to the challenges.

The presentation will show key topics of interest to farmers outlined by the pre-pilot and briefly discuss them in relation to challenges. The presentation will change depending on sector to make challenges relatable:

— soil compaction

— soil erosion

— soil organic matter

— get soil structure back sooner (practical solutions)

— carbon sequestration (using farm carbon tool kit)

— outwintering stock

— incorporating Organic matter with no plough/ minimum tillage operations

— differences within sectors i.e., phosphates seen as an issue in dairy/pig/poultry sectors only.

Discussion – 20 minutes: Challenges

Question Number	Discussion question	Follow up questions and prompts
4.	From the presented challenges, what do you think are the most important to you?	1. Are there any topics you would like to hear more about? 2. Are there any challenges not covered by the presentation that are important to you?
5.	How would you tackle the challenges presented to you today by the Welsh government SPS and our presentations?	1. Do you have the capacity to respond to these challenges? 2. Are you currently doing anything to combat these challenges? (Emphasise this as a codesign point – what are they already doing/trying? What is attractive to them?) 3. What might change other farmers mindset to keeping a positive on addressing these challenges? a. e.g., SFS/regulation/peer and media pressure etc.

Discussion – 20 minutes: Knowledge Exchange

Question Number	Questions/Activity	Follow up questions
6.	Where do farmers get most of their current advice/information concerning soils? The respondents may have the option to talk or write in the chat for topics to be added to the word cloud.	1. Has any of the advice you have received impacted your current practice? 2. What are your preferred information sources/methods for soil advice and why? 3. What would make it more influential or relatable to you?
7.	How could you be better supported to understand your soil health and good farming practices?	1. Link to policy mechanisms a. Sustainable Farming Scheme b. Farming connect c. Any other support 2. Are you given the motivation/opportunity from current policy or where is it inadequate?

Workshop Guide – Summary

Workshop Guide	Objectives	Time
Presentation 1	1. Outline workshop objectives, Co-design and format (i.e., how long each section is and requirements). 2. Outline how SPS fits with existing and proposed policy and regulatory frameworks, which will deliver on objectives. Note where supporting policy is still in development/scope for additional delivery mechanisms is an option. 3. Introduction to Soils Policy Statement, presenting state of evidence on Welsh soils and connect this to resulting priorities for soils management.	20 minutes 12:00 – 12:20
Their Knowledge on Soils	1. Gain insight on how farmers understand and value soils, and the extent of alignment between their perspectives and those presented in the statement.	20 minutes 12:20 – 12:40
'Good' Soil' Management	1. Understand what a 'good farmer' is, and the benefits associated with it in terms of soils. 2. Understand what good soil management looks like on farms and current/future practices.	20 minutes 12:40 – 1:00
Break		5 minutes 1:00 – 1:05

Workshop Guide	Objectives	Time
Presentation 2	1. Outline key material and areas relating to important topics around soil management. 2. Enable discussion around the topics and link to following section.	15 minutes 1:15 – 1:20
Challenges	1. What do farmers see as the key challenges to sustainable soils management on farms in Wales?	20 minutes 1:20 – 1:40
Knowledge Exchange	1. Understand where farmers get their advice on soils from and what sources of information influence how they manage soils. 2. Outline how farmers could be better supported through information.	20 minutes 1:40 – 2:00

Appendix 4

Participant Overview

Overview

Workshop Number	No. of attendees	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other
Workshop 1	6	5	5	0	0	0	0	0	0
Workshop 2	7	7	5	0	0	0	0	0	0
Workshop 3	5	4	3	2	2	2	2	2	0
Workshop 4	6	4	3	1	3	0	0	0	2
Workshop 5	7	6	5	2	1	2	2	0	2
Total	**31**	**26**	**21**	**5**	**6**	**4**	**4**	**2**	**4**

Note: Most participants who have attended the workshops have come from mixed farms. We are under the assumption that these categories are all relevant enterprises on the participants farm as they data provided does not specify the farmers main enterprise.

Farm type by percentage

Farm Type	Number	Percentage
Sheep	26	88.9%
Beef	21	67.7%
Dairy	5	16.1%
Arable	6	19.4%
Horticulture	4	12.9%
Poultry	4	16.1%
Pigs	2	6.5%
Other	4	12.9%
Total	**31**	

Workshop 1

Occupation	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other	Farm Size
Farmer & policy officer	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	No	No	No	No	No	No	No	Less than 25 ha (60 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	25 to 49 ha (61-120 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	Less than 25 ha (60 acres)
Farmer	No	Yes	No	No	No	No	No	No	100 to 199 ha (246-490 acres)
Total	**5**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**–**

Workshop 2

Occupation	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other	Farm Size
Farmer	Yes	Yes	No	No	No	No	No	No	25 to 49 ha (61-120 acres)
Farmer	Yes	No	No	No	No	No	No	No	25 to 49 ha (61-120 acres)
Business Development Manager	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	No	No	No	No	No	No	No	100 to 199 ha (246-490 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Total	**7**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**–**

Workshop 3

Occupation	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other	Farm Size
Farmer	Yes	No	Yes	Yes	No	No	No	No	100 to 199 ha (246-490 acres)
Farmer	Yes	Yes	No	Yes	Yes	No	Yes	No	200+ ha (491+ acres)
Both Farmer and work for NRW	Yes	Yes	Yes	No	No	Yes	No	No	25 to 49 ha (61-120 acres)
Farmer	No	Yes	No	No	Yes	Yes	Yes	No	25 to 49 ha (61-120 acres)
Farming partner and Agricultural advisor	Yes	No	No	No	No	No	No	No	100 to 199 ha (246-490 acres)
Total	**4**	**3**	**2**	**2**	**2**	**2**	**2**	**0**	**–**

Workshop 4

Occupation	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other	Farm Size
Farmer	Yes	Yes	No	No	No	No	No	No	200+ ha (491+ acres)
Farmer	No	No	Yes	No	No	No	No	No	100 to 199 ha (246-490 acres)
Farmer	No	No	No	Yes	No	No	No	No	200+ ha (491+ acres)
Farmer	Yes	Yes	No	Yes	No	No	No	No	200+ ha (491+ acres)
Farmer	Yes	No	No	No	No	No	No	looking to diversity into horticulture	50 to 99 ha (121-245 acres)
Farmer	Yes	Yes	No	Yes	No	No	No	property	200+ ha (491+ acres)
Total	**4**	**3**	**1**	**3**	**0**	**0**	**0**	**2**	**–**

Workshop 5

Occupation	Sheep	Beef	Dairy	Arable	Horticulture	Poultry	Pigs	Other	Farm Size
Farmer	No	No	Yes	No	No	No	No	No	100 to 199 ha (246-490 acres)
Farmer	Yes	Yes	No	No	Yes	No	No	Orchards	200+ ha (491+ acres)
Farmer	Yes	Yes	No	No	No	Yes	No	No	100 to 199 ha (246-490 acres)
Farmer	Yes	Yes	Yes	No	Yes	Yes	No	No	25 to 49 ha (61-120 acres)
Farmer	Yes	Yes	No	No	No	No	No	No	100 to 199 ha (246-490 acres)
Farmer	Yes	No	No	No	No	No	No	No	50 to 99 ha (121-245 acres)
Farmer	Yes	Yes	No	Yes	No	No	No	community-led interest group and tourism	100 to 199 ha (246-490 acres)
Total	**6**	**5**	**2**	**1**	**2**	**2**	**0**	**2**	**–**

Appendix 5

Documents sent to farmers after follow-up workshop

Welsh Government Agricultural Soil Policy Statement 2023

Agricultural soils are an ecologically, economically, and socially valuable resource for Wales. They are considered a finite resource, due to slow formation rates. This agricultural soil policy statement sets out the vision for protection and sustainable management of soils in Wales and acknowledges the crucial functions and services soils provide:

- providing the basis for food, biomass derived energy, and raw materials
- regulating environmental cycles of nutrients and carbon
- providing valued habitats and sustaining biodiversity
- regulating water flow and quality
- regulating climate and mitigating some impacts of climate change
- preserving cultural and archaeological heritage
- providing a platform for infrastructure

Agricultural soils are defined as soils under agricultural management for crops, grasslands and semi-natural habitats.

This definition includes all grasslands; semi-natural habitats (including peat soil under restoration and peat under intensive agriculture); arable, bioenergy and fodder crops; horticulture; agroforestry; paddocks; all nature conservation designated sites (e.g. SSSI, SAC) under agricultural management; and, all areas under agri-environment scheme agreements.

Farmers wanted recognition that soils in Wales are generally in good condition and this wasn't recognised in the initial draft. We have also shifted the language throughout the statement to be more positively framed, changing words such as degradation, reduce and minimise into protect, enhance, and encourage.

Why do Welsh soils need protecting?

Agricultural soils in Wales are distinctive and are generally in good condition. Large areas of managed grassland and wet climatic conditions (which generated large areas of peat and organo-mineral soil) have resulted in a greater carbon content than most soils in England and Europe. Soil changes slowly, and the impacts of our actions today may not be seen for many years. There is also much that we still do not know about soil. To prevent future degradation of our soils we need to develop knowledge and start taking action now to build resilience.

The soil evidence review identified a number of current threats to the ability of soil to effectively deliver the services we rely on and others which are emerging. Current threats include loss of soil organic matter, soil erosion, loss of soil structure and compaction, reduced soil biodiversity and imbalanced soil nutrient cycles. Key emerging threats are climate change and agricultural management change, which are interconnected and are expected to further increase pressures on soils.

Many farmers said they were experiencing increased adverse weather conditions which were impacting soils and their ability to manage them sustainably, and/or highlighted that climate change could be further emphasised as an increasing overall pressure on soils. The evidence shows that adverse/extreme weather events will become more frequent due to climate change. To address this feedback and evidence we have highlighted climate change as a key threat to agricultural soils in Wales and addressed it in the priority areas in objective three.

Climate Change

Climate has a direct influence on processes of soil formation and affects soil properties and functions. Climate change is already impacting soils through extreme events like floods, fires and droughts, and is anticipated to have a greater impact on the functionality and agricultural potential of Welsh soils in the future. Changing climate is expected to cause changes to soil wetness, soil organic matter and carbon stocks, the structure and function of soil biological communities, and nutrient cycling. These changes are expected to drive shifts in agricultural management (e.g. increasing viability of arable farming). Management of soils should aim to protect and maintain soils' function of climate regulation and enhance soils' capacity to adapt to pressures under a changing climate.

Agricultural Management Change

Agricultural management change refers to shifts in soil use and management within agriculture; for example, changing from less intensive soil uses (e.g semi-natural grassland) to more intensive soil uses (e.g. arable), or changing practices like tillage or fertiliser use. Evidence shows that changes towards agricultural intensification result in negative effects on fundamental soil properties and functions, for example carbon storage. Additionally, management changes can influence climate, e.g. through increasing greenhouse gas emissions. Careful consideration is needed when proposing an agricultural management change to ensure soil functions are not impaired and soils maintain resilience.

What is our vision for agricultural soils?

Vision

Resilient agricultural soils providing functions and services for current and future generations, nature, and climate through sustainable use and management.

Farmers highlighted the need for the statement to be integrated with other existing policies and regulations. We added this diagram to frame how the ASPS fits into the existing policy landscape. We will also be publishing a separate document with more detailed information.

Why an Agricultural Soil Policy Statement?

There is currently no overarching soil policy or specific regulation for soil protection in Wales. There are policies relevant to soils in place, but they are spread across many policy areas, and generally limited to specific functions or impacts of soils. This limits their combined effectiveness to protect soils. This soil policy statement provides a coherent vision and broad ambitions for sustainable soil management to address this gap. It does not set out new policy measures or contain detailed guidance for practitioners, but it will help shape and guide future policy.

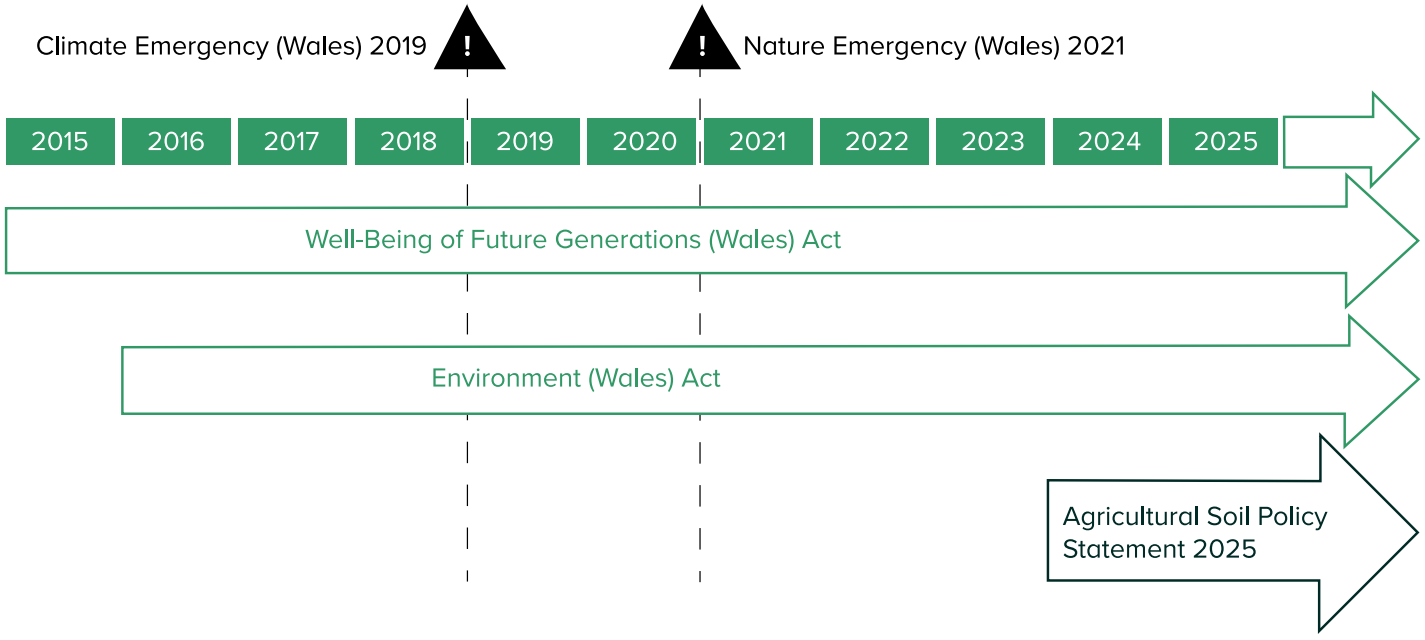
This soil policy statement focuses on agricultural soils as they represent 90% of the land area in Wales, and their management is directly relevant to The Agriculture (Wales) Act and Sustainable Farming Scheme in Wales. The ambition is to review this statement periodically and consider other soil types for inclusion in future updates.

For more detailed information see the ASPS Policy Response.

The Current Policy Landscape

The Welsh Government 'embeds our response to the climate and nature emergency in everything we do'. The soil policy statement has direct relevance to addressing the national declarations of Climate (2019) and Nature (2021) Emergencies. The statement is framed within the Well-Being of Future Generations (Wales) Act (2015) and the Environment (Wales) Act (2016). These promote the sustainable management of natural resources (SMNR) to address their long-term decline, without compromising needs of future generations.

Figure 1:



For more detailed information on the policy context, see the ASPS Policy Landscape Figure available at www.gov.wales/agricultural-soil-policy-statement.

Several participants expressed some concern over how the policy objectives would be delivered in practice. Farmers wanted more concrete information on targets, timeframes, and so on. We have addressed this feedback by highlighting the purpose of the statement, as an ambition for Welsh Government to be used to guide future policy. As a result of the feedback additional supporting documents were developed and will be published with the statement to address delivery.

How will we move towards our vision?

Vision

Resilient agricultural soils providing functions and services for current and future generations, nature, and climate through sustainable use and management.

Objectives

- Increase information on Welsh soils
- Encourage sharing of information on soils
- Protect, maintain and enhance soil functions & services

The soil policy statement has been developed through extensive evidence review and stakeholder engagement. All documents available at: www.gov.wales/agricultural-soil-policy-statement.

The objectives laid out in this statement are interconnected. Each objective is important for protecting against current and emerging threats and achieving resilient agricultural soils for current and future generations, nature, and climate.

Figure 2:

Farmers expressed that the holistic nature of soil health could be more clearly emphasised in the statement, as the separation of issues into objectives and priorities artificially separated them out. Here we emphasise that all of the identified objectives and priorities are interconnected and important in achieving our vision for healthy Welsh soils.

The engagement with farmers shaped this objective by highlighting that research and monitoring needed to be long term and at a farm scale. They also highlighted having data that is presented in accessible, meaningful ways for them to use.

Objective 1: Increase information on Welsh soils

Promote monitoring of soil, at local as well as national scales, to enhance understanding of trends, threats, and opportunities for achieving resilient soils.

The soil, land use and climate of Wales is different to most of the UK. Existing data has provided an important national snapshot of the current state of soils in Wales (e.g. stable trend in soil organic matter content). Collecting more detailed, long-term information on Welsh soils would help to track trends, target interventions, assess the effectiveness of policies and practices for protecting soils, and shape future approaches. Filling the gaps in knowledge will also be important in light of the new challenges soils may face from climate change.

Our engagement with farmers has highlighted the importance of collecting data at field and farm scales, as this is most relevant to inform farm-level interventions. Feedback also indicated that data must be shared in a timely, accessible and meaningful way to effectively support sustainable soil management.

The farmers highlighted knowledge exchange as important for supporting sustainable management of soils. The engagement with farmers shaped this objective by highlighting that the best way to support knowledge exchange is by sharing practical experience and quality unbiased information.

Objective 2: Encourage sharing of information on soils

Promote effective exchange of knowledge between farmers, land managers, decision makers, advisors, and researchers, to enable optimal decision-making for resilient soils.

Welsh farmers have managed most of the soil in Wales for generations and have a good understanding of what's beneath their feet. They have crucial knowledge to share and can also benefit from information and advice from a range of sources.

Our engagement with farmers indicates that the most effective knowledge exchange involves sharing practical experience and quality unbiased information in accessible ways. This can enable all parties to make effective decisions to protect and maintain agricultural soils, in policy and practice. Effective knowledge exchange will be critical to mitigate and adapt to increasing pressures in a changing climate.

Several farmers suggested that the previous wording of this objective 'Reduce soil degradation' could be altered to better reflect the generally good current condition of Welsh soils and to present a more positive ambition for the future.

Objective 3: Protect, maintain and enhance soils, soil functions and services

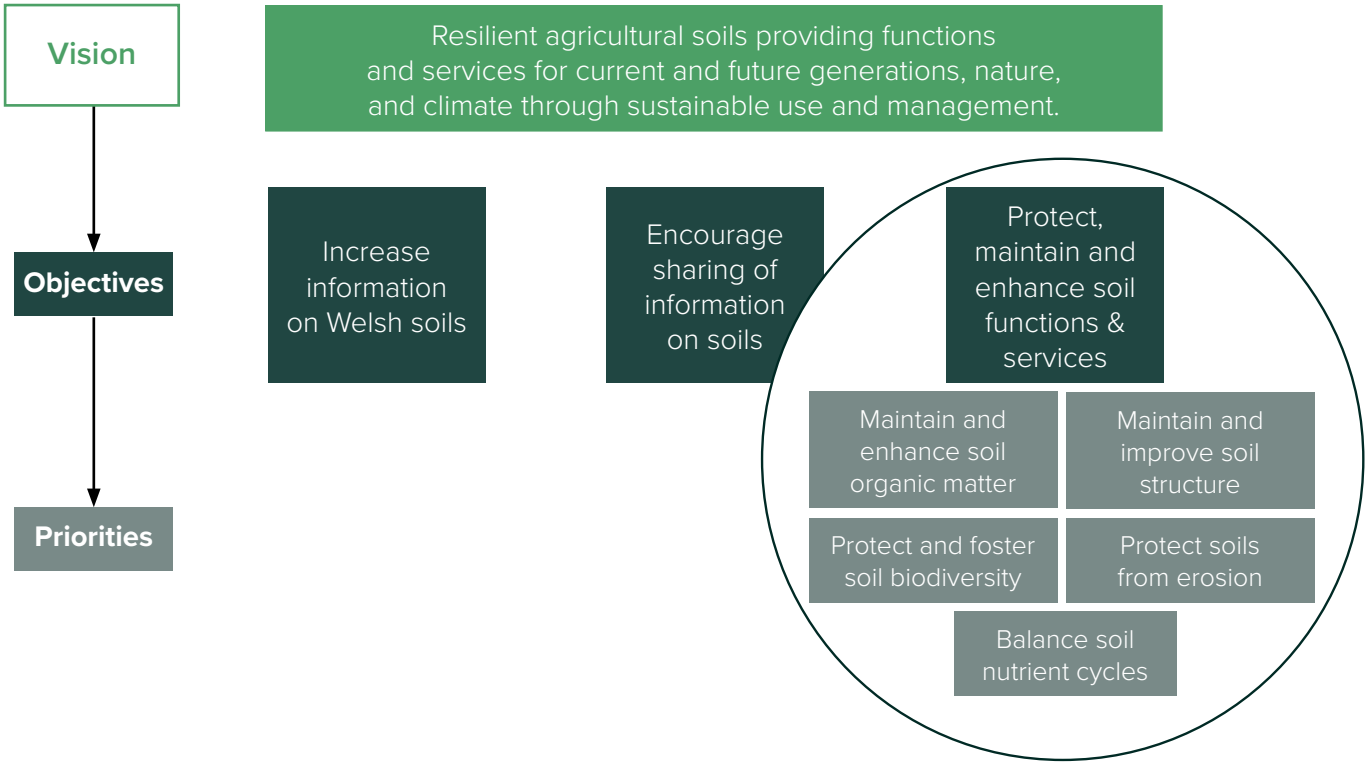
- **Protect soils and their functions from existing and emerging threats.**
- **Maintain and enhance soil functions and services to ensure future soil resilience.**

Five priorities for this objective have been identified from the evidence review and stakeholder engagement. As soils and soil functions are complex and interconnected, there may be overlaps or trade-offs between priorities, and other ways to protect, maintain and enhance soils which have not been highlighted.

Farmers wanted an acknowledgement that management practices might conflict with the priorities areas as they sometimes encounter trade-offs when making management decisions.

A few farmers suggested that water management should be more explicitly covered in the statement objectives. Water sits outside the scope of the statement which focuses on soil, so we have not addressed water directly as a priority. However, we have highlighted in the priority areas how good soil management addresses water quality, water pollution and alleviating flood risk.

Figure 3:



The table below illustrates the benefits to soil functions that each of the identified priorities can achieve:

Table 1:

Soil function benefited	Priority to protect, maintain and enhance soils: Maintain and enhance soil organic matter	Balance nutrient cycling	Protect soils from erosion	Maintain and improve soil structure	Protect and foster soil biodiversity
Food and biomass production	Strong benefit	Moderate or localised benefit	Moderate or localised benefit	Strong benefit	Moderate or localised benefit
Regulating environmental cycles	Strong benefit	Strong benefit	Slight benefit	Slight benefit	Strong benefit
Habitats and biodiversity	Strong benefit	Strong benefit	Moderate or localised benefit	Moderate or localised benefit	Strong benefit
Regulating water flow and quality	Strong benefit	Strong benefit	Strong benefit	Strong benefit	Slight benefit
Climate change mitigation and adaptation	Strong benefit	Strong benefit	Slight benefit	Moderate or localised benefit	Moderate or localised benefit
Cultural and Historical	Slight benefit	Slight benefit	Moderate or localised benefit	Slight benefit	Slight benefit

Strong benefit Moderate or localised benefit Slight benefit

Most farmers recognised the functional benefits of good soil management, in particular the benefits to food and biomass production which provides an economic benefit to farmers. This was not recognised in the first draft. Here we have highlighted how the priorities set for good soil management support soil functions.

Maintain and enhance soil organic matter

Maintain current stores of soil organic matter, and increase where appropriate, through effective soil management.

Soil organic matter has multiple benefits to soil fertility, soil biodiversity, soil structure, soil water retention and reducing greenhouse gas emissions. It also contains a large proportion of soil carbon (60%). Soil organic matter levels are typically high in Wales due to large extents of organic-rich soil (peat and organo-mineral soil) and land managed under low intensity grasslands. Careful consideration is needed when proposing agricultural management change which could trigger a loss of soil organic matter. Increasing the storage of organic matter where it has been depleted can be beneficial, provided this is managed in a way which minimises risks of nutrient build-up and pollution. Maintaining and increasing soil organic matter can also increase soils' resilience to impacts of climate change.

Protect soils from erosion

Protect soils from erosion through appropriate management in areas at risk.

Most Welsh soils are under permanent grassland, which is beneficial for preventing erosion, if managed appropriately. However, erosion processes can be localised and intense, resulting in hotspots where significant soil loss can occur. Sloping areas and sandy/silty or organic soils are at a higher risk to erosion from water or wind. The predicted rise in frequency and severity of extreme weather events under climate change is expected to increase the risk of soil erosion. Agricultural management choices can exacerbate or reduce erosion risk, such as by increasing or decreasing areas of exposed soil. Reducing erosion has multiple benefits to soil structure, agricultural productivity, air and water quality, soil biodiversity and climate regulation.

Farmers highlighted the importance of good soil structure for good infiltration, water holding capacity and aeration of soils for productivity. We have changed the priority from 'minimise compaction', to 'improve soil structure'. This objective is now less limited, encompassing all of the benefits of good soil structure and is also more positively framed addressing feedback to increase the use of positive language throughout the statement.

Maintain and improve soil structure

Maintain and improve soil structure, with a focus on minimising soil compaction through appropriate management during high-risk wet conditions.

Agricultural soil in good structural condition allows drainage of water, movement of air and unrestricted growth of roots. This supports greater agricultural productivity, more efficient fertiliser uptake, reduced water pollution and flooding, as well as increasing soils resilience to the impacts of climate change (such as increased extreme weather events).

A key threat to soil structure is soil compaction and wet soils are particularly susceptible. There is a potential high risk of compaction in Welsh soils as many are wet for most of the year due to slow permeability and high rainfall, or high groundwater. Our engagement indicated that compaction is a key problem for many Welsh farmers and that careful agricultural management is needed during high-risk wet conditions. Although compaction can be alleviated this can be costly, complex and challenging, particularly for sub-surface layers.

Protect and foster soil biodiversity

Protect and foster soil biodiversity through appropriate management.

Soil biodiversity refers to the quantity and variety of organisms, such as earthworms and microbes, that live in soil. Soil organisms account for around a quarter of global biodiversity and support the multifunctionality of land ecosystems to cycle nutrients, produce food, store carbon and support habitats. Given that soil organisms are the driving force behind most soil processes, decline in soil biodiversity is thought to be a significant threat. Limited evidence exists on the trends in soil biodiversity in Wales, but changes can occur because of agricultural management, loss of organic matter, extreme weather and soil pollution. Threat of losses to soil biodiversity and its associated functions is generally lower in low intensity compared to high intensity agricultural systems. Climate change is likely to alter the abundance and diversity of soil organisms, and their interactions between each other and with plants.

Farmers recognised soil fertility as a priority for soil health that was not addressed in the first draft of the statement. They highlighted with the instability of fertiliser prices, maintaining soil fertility and improving nutrient use efficiency should be featured in the statement. We have addressed this consideration by including a new priority, on balancing soil nutrients. This priority highlights that farmers have a need for good soil fertility for productivity but also addresses the negative effects that can arise from nutrient loading both on the soil itself and the wider environment.

Balance soil nutrient cycles

Balance soils' nutrient cycling to ensure the effective delivery of soil functions and services.

Nutrient cycles describe the storage, use, movement, and recycling of nutrients like nitrogen and phosphorus in the environment. During these processes nutrients can be transformed into plant available forms, held in the soil, or lost to air or water. Balanced nutrient cycling provides sufficient nutrients to deliver soil functions and maintain soil fertility whilst minimising losses to the environment. This has benefits in terms of agricultural efficiency, nutritional quality of food, minimising water and air pollution and climate impacts.

Although there is limited evidence for Wales, evidence from across the UK shows that the majority of agricultural soils have an excess of nitrogen and phosphorus. The main disruptor of nutrient cycles on agricultural soils is nutrient loading. Whilst inputs of nutrients are important in farming systems for maintaining productivity, build-up in excess of the needs of the system can cause imbalance. Nutrient cycling can also be disrupted by agricultural management change, loss of soil biodiversity, erosion, and climate change.

Feedback from farmers highlighted the need for the statement to be integrated with other existing policies and explanation of how the policy objectives would be delivered in practice. The following tables form part of a larger Agricultural Soils Policy Landscape document to be published alongside the Agricultural Soil Policy Statement (ASPS) addressing this feedback.

Table 1 shows the framework of Welsh government policies related to agricultural soils including overarching acts, targets and obligations which act as drivers for the development of new policies, agricultural policies and soil related regulations as well as soil monitoring programmes and sources of information on agricultural soils.

Table 1

Agricultural Soil Policy Framework in Wales (May 2025)							
Policy Drivers	Well-being of Future Generations (Wales) Act 2015	Environment (Wales) Act 2016	The Natural Resources Policy 2017	Net Zero Target by 2050 (Wales)	Kunming-Montreal Global Biodiversity Framework 2022		
Agricultural Policy	Agriculture (Wales) Act 2023	Cross Compliance 2023	Glastir Scheme (Ending 31st December 2023)	Habitat Wales Scheme (Interim scheme between Glastir ending and full introduction of SFS)	Sustainable Farming Scheme (Beginning 2026)		
Soil Related Regulations	The Sludge (Use in Agriculture) Regulations 1989	Environmental Permitting (England and Wales) Regulations 2016	Environmental Impact Assessment (EIA) (Agriculture) (Wales) Regulations 2017	Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021	Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	National Emission Ceilings Regulations (UK) 2018	Planning Policy Wales (PPW) 2024, Future Wales – The National Plan 2040 and Environmental Assessments
Soil Monitoring Programmes, Information and Advice	Environment and Rural Affairs Monitoring and Modelling Programme (ERAMMP)	The State of Natural Resources Report (SoNaRR)	Farming Connect	Code of Good Agricultural Practice (COGAP)			

Red – not directly linked to Agricultural soils

Table 2 shows the policies which act as delivery mechanisms for the objectives of the Agricultural Soil Policy Statement (ASPS). Where an objective is supported by a delivery mechanism it is shaded green, where it is not it is left blank. Not all of the policies listed in the framework above (Table 1) are included as delivery mechanisms. This is because they **a.)** act as drivers for policy development, rather than specific delivery mechanisms **b.)** haven't been finalised yet (as in the case of the Sustainable Farming Scheme) or **c.)** they protect soils more broadly and don't address the specific objectives of the ASPS.

Table 2

Key delivery mechanisms of the Agricultural Soil Policy Statement (May 2025)							
Delivery mechanisms	Objective 1: Increase information on Welsh Soils	Objective 2: Encourage sharing of information on soils	Objective 3 – Protect, maintain and enhance soils:				
			Maintain and enhance soil organic matter	Protect soils from erosion	Maintain and improve soil structure	Protect and foster soil biodiversity	Balance soil nutrient cycles
Environment and Rural Affairs Monitoring and Modelling Programme (ERAMMP National Soil Monitoring)							
The State of Natural Resources Report (SoNaRR)							
Cross Compliance 2023							
Habitat Wales Scheme (Interim scheme between Glastir ending and full introduction of SFS)							
National Peatland Acton Programme							
Farming Connect							
The Sludge (Use in Agriculture) Regulations 1989							

Key delivery mechanisms of the Agricultural Soil Policy Statement (May 2025)							
Delivery mechanisms	Objective 1: Increase information on Welsh Soils	Objective 2: Encourage sharing of information on soils	Objective 3 – Protect, maintain and enhance soils:				
			Maintain and enhance soil organic matter	Protect soils from erosion	Maintain and improve soil structure	Protect and foster soil biodiversity	Balance soil nutrient cycles
Environmental Permitting (England and Wales) Regulations 2016							
Environmental Impact Assessment (EIA) (Agriculture) (Wales) Regulations 2017							
Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021							