AI4SoilHealth

AI4SoilHealth campaign materials and impact analysis report

D7.6

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HISTORY OF CHANGES		
Version	**Publication date**	**Changes**
1.0	1st December 2025	• Initial version
2.0	9th December 2025	• Reviewed and signed off

1. Executive Summary

This report presents the AI4SoilHealth Campaign Materials and Impact Analysis, showing how the project's communication and engagement activities have advanced soil health awareness and supported the EU Soil Mission. It integrates outputs from four key tasks—stakeholder engagement (Task 2.2), indicator development (Task 3.2 and 3.7), and awareness-raising campaigns (Task 7.4)—to demonstrate how scientific credibility and collaboration, strategic outreach, and targeted messaging combined to deliver measurable impact.

Throughout the project, a multi-layered engagement strategy was implemented to ensure relevance and uptake of outcomes. This included a targeted soil health awareness campaign designed to generate broad yet focused impact across the European community, alongside workshops, webinars and high-level meetings that delivered timely, practical insights to key stakeholders.

The webinar series, held between July and November 2025, brought together policymakers, researchers, and practitioners to explore key topics at the intersection of soil science, digital innovation, and EU policy. Themes included open data, AI modelling, biological indicators, and the Soil Monitoring Law. The events fostered dialogue between science and policy, showcased project tools such as the Soil Health Data Cube, and encouraged uptake of innovative approaches to soil monitoring.

Complementing the webinars, the soil health awareness campaign used a multi-channel strategy to reach diverse audiences. Over 20 science communication videos generated more than 73,000 views, and social media channels achieved over 423,000 impressions. Podcasts, blogs, press articles, and offline materials further extended the project's visibility, helping to engage stakeholders across Europe.

AI4SoilHealth also played a leading role in the Mission Soil Indicators Cluster, contributing to the harmonisation of soil health indicators and supporting the development of practical frameworks for monitoring. Through Living Lab trainings and collaborative workshops, the project helped stakeholders select meaningful indicators tailored to local contexts and land-use systems.

Together, these activities have positioned AI4SoilHealth as a central actor in Europe's soil health landscape—bridging science, policy, and practice to promote sustainable soil management and inform future governance.

2. Stakeholder engagement: Building and refining the audience for scientific awareness campaigns

This section explains how stakeholder engagement activities created the foundation for the campaign's success by identifying and honing key stakeholder audiences, fostering trust, and shaping outreach strategies.

2.1 Strategic approach from outset

Task 2.2 overview as laid out in Grant Agreement:

Ensure stakeholders engagement throughout the project in order to promote the relevance, acceptance, use and update of project outcomes. The stakeholder engagement will differentiate, more specifically, among stakeholders that the AI4SoilHealth project will i) inform ii) activate, and iii) establish collaboration with. (lead: SAS; partners: UNIROMA3, AU, LUK, ISIN, INR; M1:M48):

- Stakeholder analysis to identify relevant stakeholders and map the outreach of partners to relevant experts/networks, especially with regard to the development of living labs.
- Assessment of existing soil related fora, events and networks of the European institutions and of other relevant fora at national or regional level.
- Elaboration of stakeholder engagement and dissemination plan, determining purpose, key messages, target audiences (based on stakeholder analysis), methodologies.
- Support to events and workshops under WP2, WP6, WP7;

Strategy summary

The WP2 stakeholder engagement task ensures that the AI 4 Soil Health project remains relevant and promotes uptake of its outcomes. The strategic approach to stakeholder engagement focuses on three levels of engagement: informing, activating, and collaborating with stakeholders across policy, research, industry, and practice. A stakeholder analysis has been carried out to identify key actors and map partner networks, forming the basis for targeted engagement activities. The other main activities that will be analysed in this report are a webinar series to share progress and gather feedback, and a Stakeholder Impact Calculator to monitor the reach and effectiveness of engagement across events and initiatives. This structured approach supports consistent, transparent engagement and ensures stakeholder input informs the development and delivery of project outputs.

2.2 Key stakeholders and engagement opportunities

A workshop with Task 2.2 contributors was held in February 2025 to build on the previous stakeholder analysis (Deliverable 2.2) and to inform the next phase of engagement within AI 4 Soil Health. The session reviewed the existing stakeholder mapping, applied stakeholder analysis practices collectively to identify engagement gaps, and planned future engagement and monitoring activities. It reaffirmed Task 2.2's role in analysing and monitoring stakeholder engagement and highlighted the need for a stronger framework to track who has been reached, what information was shared, and what has been learnt. This framework helped guide and align engagement activities across WP2, WP6, and WP7. The Miro platform allowed contributors to collaboratively map priority

levels for different stakeholder groups. The group identified: European policy stakeholders, National policy stakeholders/ civil servants, Agro-Industry and Research communities, and answered the following questions:

- **What are their needs?**
- **How do we reach them?**
- **What does the AI4SH project have to offer?**
- **Which partners / networks can reach them?**

The workshop also involved reflection on the Dynamic Spreadsheet developed alongside D2.2. The feedback reflected that this spreadsheet was too broad for AI4SH, and more targeted impact and stakeholder tracking would be required. The WP7 'Reporting communication and dissemination activities' and WP2 'Stakeholder impact calculator' were subsequently used to track outward facing activities that engaged stakeholders and communicated the outputs of the project. A number of stakeholder events were proposed in this workshop, including a series of online workshops and webinars, and overcoming language barriers with native language events hosted by various pilot sites. It was also highlighted that opportunities for collaboration with other Mission Soil projects should be considered.

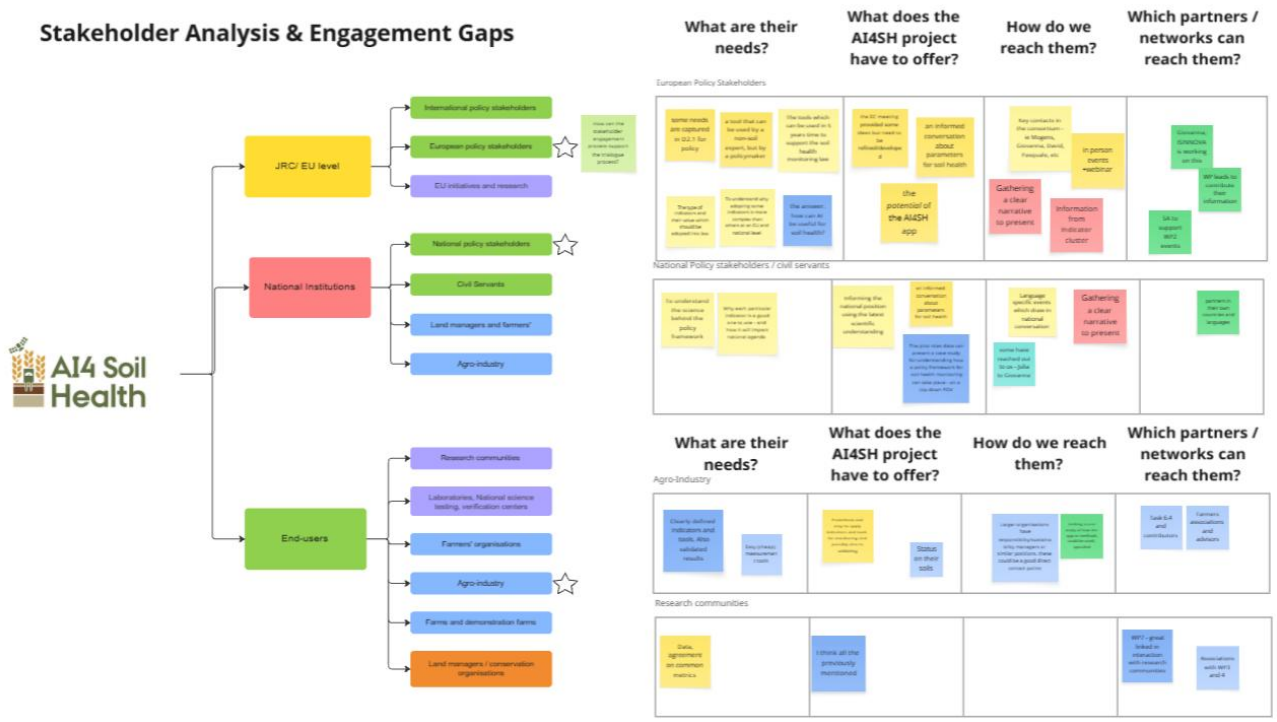


Figure 2.1: Miro board from T2.2 contributors workshop on stakeholder analysis and engagement gaps.

Webinar series ideation workshop April 2025

At the AI4SH AGM in Wageningen in April 2025, we hosted a workshop with representatives from across the consortium to gather ideas, knowledge, and audience priorities; develop the narrative for the project voice; and to understand the desired topics and speakers within the consortium for a proposed webinar series. Participants divided into three breakout rooms and proposed the topics in

Table 2.1. The themes highlighted yellow were included in the subsequent webinar series that took place between July and November 2025.

Table 2.1: Webinar theme summary from consortium ideation workshop April 2025

Theme	Description	Notes
Soil District / Soil Monitoring Units	*How is the AI4SH project proposing we look at Soil Health? What scale can we consider soil health at a pan-EU level, and what have scientists been working on to speak to policymakers effectively? Would redesigning soil monitoring zones change the game—or just the map? How do we trust soil data across Europe with different methods and tools? Is your soil in the wrong district?*	*Potential collaboration with PREPSOIL. Note that for policy audiences – policymakers don't use maps, they use robust statistics. Can we bring some robust statistics into these sessions? It is crucial to harmonise the datasets. Use of conversion tools. International bodies of reference such a EUROSO*
Feasibility of Satellite Technology for Soil Health	*Exploring use of satellite tech for soil monitoring*	*Potential collaboration with SOILCRATES*
Soil Health Management Practices on the Ground	*Case studies of actors and practices in pilot areas; how to measure them*	
Regenerative Farming & Agroecology	*Understanding changes and emerging movements in agri practices*	
Dialogue with Farmers	*Understanding farmer perspectives, concerns, and motivations*	
Frameworks, Tools & Indicators	*How to use the frameworks, tools, and indicators developed in both projects; includes outcomes from NEIKER training. Indicators that speak policy: myth or method? How to select the right soil indicator? One sample, many stories: can we compare what we measure?*	*Could align wuth broader stakeholder engagement work. Potential collabpration with BENCHMARKS. NEIKER hosting living lab training in September 2025.Standardisation of national methods.*
Toolbox on New Indicators and Technologies (WP3-WP4)	*Focused on indicators and technologies developed in WP3 and WP4. Overview of in-situ methods and new, affordable technologies.* *How is soil health monitoring useful on a EU scale, and how can it be practical and cost-effective and practical at the local scale?* *Practical how-to on AI4SH outputs: how to use soil health indicator toolbox, how to interpret the data cube, using the app*	*Would attract education foundations, living labs, farmer clusters, extension services for farmers. Language could be a potential barrier – could this be accompanied by an explainer in a couple of different languages? Some focus on farming advisors – they have connections with farming networks and a vested interest in soil health tech.*

Soil Monitoring Law / 'Getting the Soil Monitoring Law through' / the challenge of multi-level governance	*Where is the need for the soil health monitoring law? Who is implementing it? And what do projects like AI4SH have to support? Digging Into Responsibility: Unpacking Accountability in Soil Health Governance" "Governance of Soil Health: Mapping Roles, Responsibilities, and Accountability" "Accountable Ground: Clarifying Governance Roles in Soil Health"*	*Potential collaboration with DG Agri, JRC Nils Broothaerts, and another EU Mission soil project. Quite wide subject, we should try to narrow it down.Some focus on farming advisors – they have connections with farming networks and a vested interest in soil health tech.*
Opportunities of AI in Soil Health Monitoring	*Exciting opportunities of using local data to ground-truth and improve predictive modelling. How to integrate Artificial Intelligence with Collective Intelligence? Who uses my soil data?*	*Avoid focusing on the 'limits' of AI – we don't want to create a lot of noise around what's *not* possible, as we can't put across the message that the project may not have fulfilled its mission.*
App and technologies to monitor soil health	*What technology can do for you? Is your phone the future of soil science?*	*Explore the full potential of mobile phones. They should also be used to collect data. It should offer support, not just soil monitoring. Collect other types of info and data, not just the agreed set of indicators, e.g. pictures. Forecast service development for the future.*

It was noted that when creating a webinar about AI, we need to create a balance between what AI can and can't do without focusing too heavily on the negatives or what we are not capable of as a project. A clear message for each event would be communicated for speakers, so scientists would be wary of talking too much on the uncertainties or not-yet-concluded parts of their work - policymakers want clear answers. Participants reflected on audience groups again, finding that advisors are a missing target group. Advisors would be useful to work with on tech prototypes, have connections with farming networks, and a vested interest in new soil health tech. Farm associations are a useful group to raise awareness about the app, toolbox, and soil health monitoring techniques. Living labs and other soil health projects offer opportunity to engage their own stakeholder networks and have intrinsic interest in innovation.

Following these collaborative workshops, we identified the target audiences for the webinar series:

- Policymakers and civil servants at local, regional, national and EU levels who are engaged in soil-related strategies, projects or monitoring initiatives.
- Project coordinators and research leaders involved in soil monitoring programmes, development of research and innovation policy recommendations, and Living Labs.
- Private sector representatives (e.g. from agri-tech) contributing to or benefitting from soil health monitoring policies and innovations.
- Academic and scientific experts contributing to the evidence base on soil health.
- Stakeholders from civil society, NGOs and grassroots movements with active interest in soil health.

2.3 'Envisioning the future of soil health monitoring' webinar series

To build momentum around the project and engage a wide community of stakeholders, WP2 hosted a series of 5 online events in the '*Envisioning the future of soil health monitoring*' webinar series. Each webinar focused on a single "hot topic" at the intersection of soil science, digital innovation, and EU policy. The core aims of the series were to:

- Bridge the gap between science and policy by fostering dialogue around pressing soil health challenges and opportunities.
- Encourage cross-sector collaboration and mutual learning among soil-related communities across different regions, sectors, and governance levels.
- Promote awareness and uptake of the project's key outputs, tools, and innovative approaches to soil health monitoring and management.
- Contribute to critical reflection on current practices and future directions in soil governance, research, and implementation.

The webinar series showcased leading scientific voices in the project to a range of key stakeholders. Alongside the members of the consortium who gave presentations, we also invited external experts. At three of the webinars, project officers at the Joint Research centre and EU Soil Observatory (EUSO) gave presentations and joined the Q&A panel. As described in D2.2, JRC and EUSO are part of the *Soil Inner Circle* – vertical actors directly involved in soil regulation and research. By leveraging contacts amongst the consortium and engaging JRC and EUSO in the organisation of these events, the discussions of leading research and pressing policy challenges were enriched and pushed out to a wider audience.

Table 2.2: Envisioning the future of soil health monitoring webinar series summary

Date	Title & themes	Speakers	WPs communicated
Monday 7th July 2025	**Unlocking the Power of Open Data for Soil Health** *Why is open data essential for better soil stewardship?* *The Soil Health Data Cube: What is it and what can it do?* *What practical uses does open data have?* *How can this data support sustainable farming policies?*	Ichsani Wheeler, Tomislav Hengl (OpenGeoHub) Josiah Judson (Soil Association) Host: Katrin Hochberg (Soil Association)	WP5
Friday 25th July 2025	**Making the Case for Soil Health Monitoring** *Why monitor soil at all? Perspectives from both farmers (Karen Fisher) and policy (Nils Broothaerts).* *What indicators can we measure on the ground? Spectroscopy and beyond (Fatemeh Hateffard).*	*Karen Fisher (Soil Association), Nils Broothaerts (EU Soil Observatory, JRC),* Fatemeh Hateffard (Stockholm University)	WP2, 3, 4, 6

		Chair: Giovanna Giuffre (ISINNOVA)	
Monday 13th October 2025	**Predicting the future of soil health with AI** *What role can AI play in assessing soil degradation, mapping vulnerabilities, and identifying the drivers of soil health decline?* *Can machine learning and process-based models provide reliable insights into Soil Organic Carbon (SOC) dynamics?* *How can indicator frameworks be integrated into modelling projects to strengthen our ability to track and safeguard soil health?*	Mehdi Afshar (TUHH) David Robinson (UKCEH) Emanuele Lugato (JRC) Chair: Adrian Steele (Soil Association)	WP3, 4, 5
Wednesday 12th November 2025	**Building soil monitoring into policy** *What data do policymakers need to protect soils, and how will the new EU Soil Monitoring Law help deliver it?* *How can projects like AI4SH support member states in turning the Soil Monitoring Law into effective monitoring systems on the ground?* *What lessons can we learn from Denmark's approach to integrating soil monitoring into its national environmental monitoring programme?*	Giovanna Giuffre (ISINNOVA) Mogens Humlekrog Greve & Lucas de Carvalho Gomes (Aarhus University) Chair: Gareth Morgan (Soil Association)	WP2, 3, 6
Monday 24th November 2025	**Decoding the biology of soil health** *How can biological indicators, e.g. microbial communities and enzymatic activity, give us a clearer picture of soil health? Can real-time soil biology measurements combined with satellite data and models turn microbial signals into actionable intelligence for farm nutrient management? How do land use, climate and vegetation shape soil biodiversity and function across Europe, and what does that mean for monitoring and policy?*	Lur Epelde (NEIKER) Sonia Meller (Digit Soil) Maeva Labouyrie (EUSO, JRC) Chair: Joseph Gridley (Soil Association Exchange)	WP4, 6

Over the five webinars, there were 967 registrations, 3977 Eventbrite page views, and 451 attendees from 68 countries. Whilst the series was primarily aimed at European stakeholders, 25.3 % of attendees were from outside of the EU. Attendees also had a range of occupations, see Figures 2.2 and 2.3. 48.2% of attendees were researchers, 10.5% were policymakers / worked in government agencies and a range of other stakeholder groups attended also with varying proportions depending on the topic of the event. After each webinar we sent a follow up email to all who registered for the event, including a link to the recording uploaded to YouTube, links to AI4SH and external speaker resources and a link to the feedback form. Many of those registered emailed prior to the event to say they could not attend live but were very interested in recordings and online resources, so the follow up email and YouTube series meant we capitalised on engagement from the series. In the registration form we gave an option for consent to contact the guest about future events, thereby capturing 410 email addresses which will be used to promote future AI4SH events.

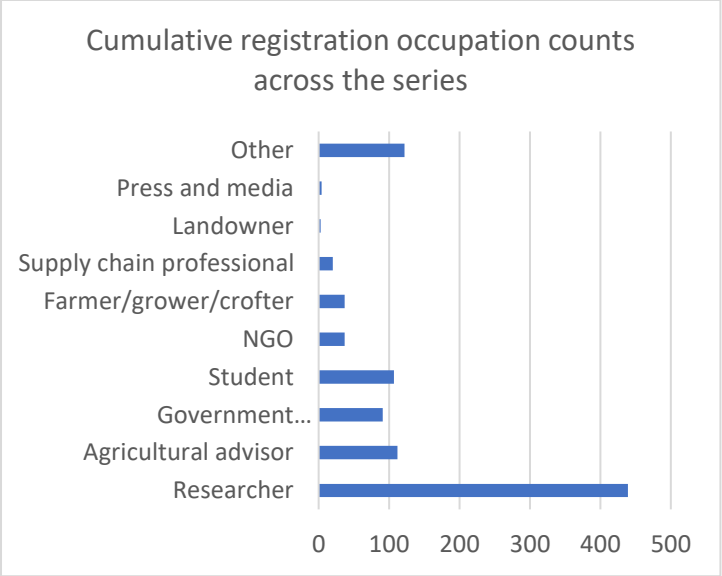


Figure 2.2: Breakdown of total registrations per occupation across the whole webinar series.

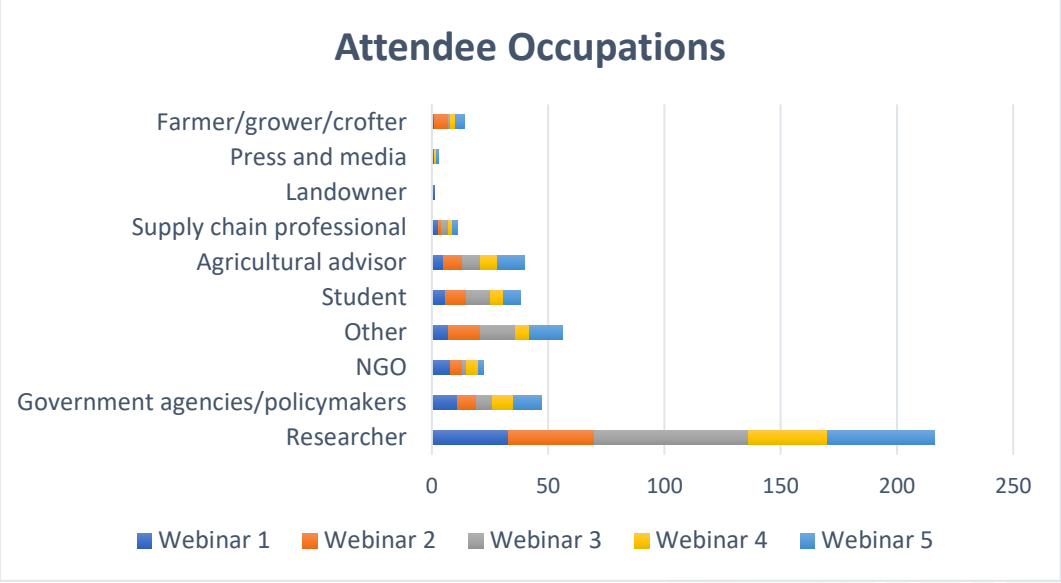


Figure 2.3: Breakdown of total attendees per occupation for each webinar.

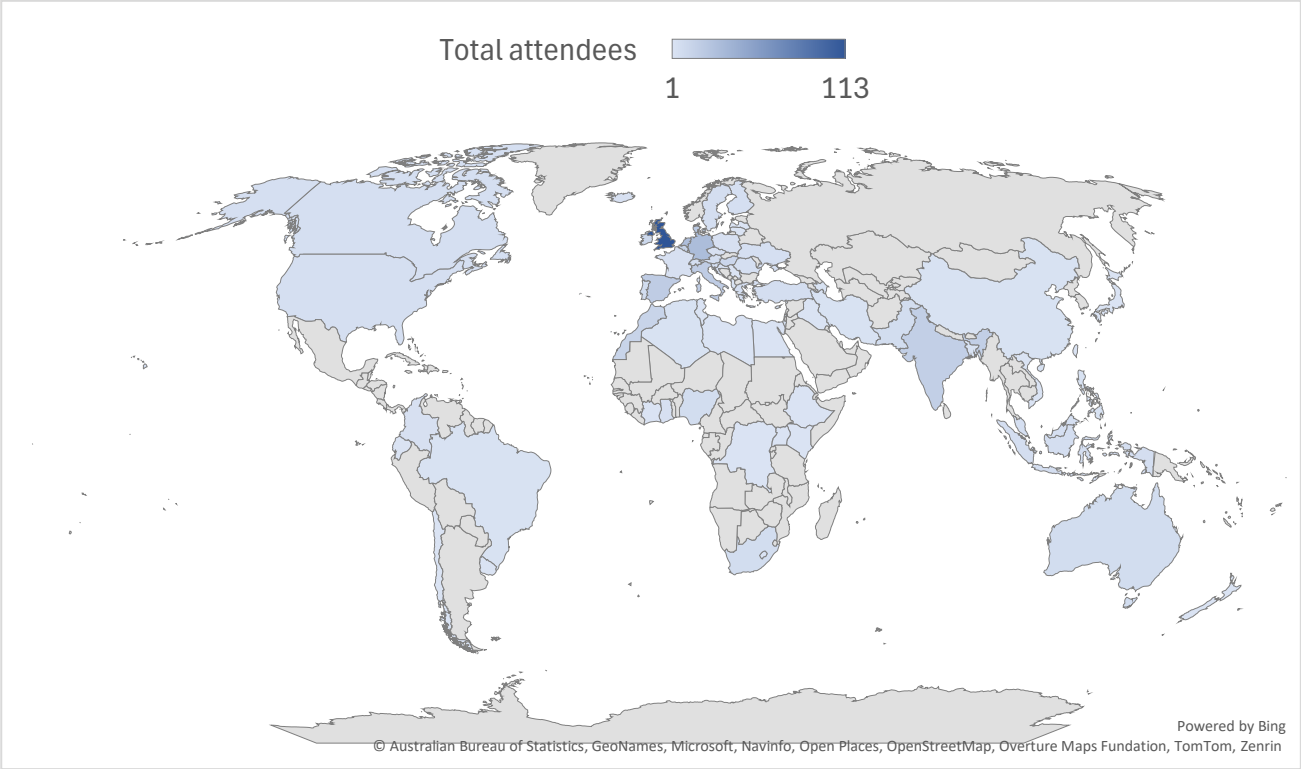


Figure 2.4: Map of countries for attendees of the webinar series.

Table 2.3: Government agencies that were represented in the attendees of the webinar series.

Government agencies which attended the webinar series		
Department of Agriculture Food and Marine (Ireland)	Scottish Environment Protection Agency (UK)	Central Government Real Estate Agency (Netherlands)
Met Eireann (Ireland)	Regione Lombardia (Italy)	Natural England
OVAM (Belgium)	Environment Agency (Austria)	Land and Forest Iceland
Department For Environment, Food & Rural Affairs (UK)	European Commission Joint Research Centre	Indian Institute of Technology Pallakad
Agriculture Data Center (State Enterprise Agricultural Data Center, Lithuania)	Directorate-General of the Forestry and Environmental Surveillance Corps (Sardinia	SGAV - Danish agency for green land conversion and water environment
DGM (Morocco national weather service)	Amelioration Scientific Research Institute – SMETi (Azerbaijan)	Cranborne Chase National Landscape (UK))
Federal Agency For Nature Conservation (BfN, Germany)	Inagro (Belgium)	Environment Agency (UK)
Administration de environment de Luxembourg	DGACTA (Directorate-General for Agricultural Land Planning and Conservation, Tunisia)	IUCN - International union for conservation of nature

To generate an interactive and collaborative environment for the webinars, the interactive presentation platform Mentimeter was used. Each webinar used the questions '*What are your domains of expertise?*', '*What scale do you predominantly work on / with?*' and '*What is your main motivation to join this discussion today?*', as well as 1-5 unique questions relating to the content of the presentations. Posing questions to the audience allowed the presenters to get a better gauge of the audiences' expertise and motivation for attending, alongside weaving insights into discussion

themes. At the end of the webinars and in a follow up email a feedback form hosted on MS forms was shared to gather further feedback related to the event itself, topics of interest for future events and, when relevant, feedback on the tools presented.

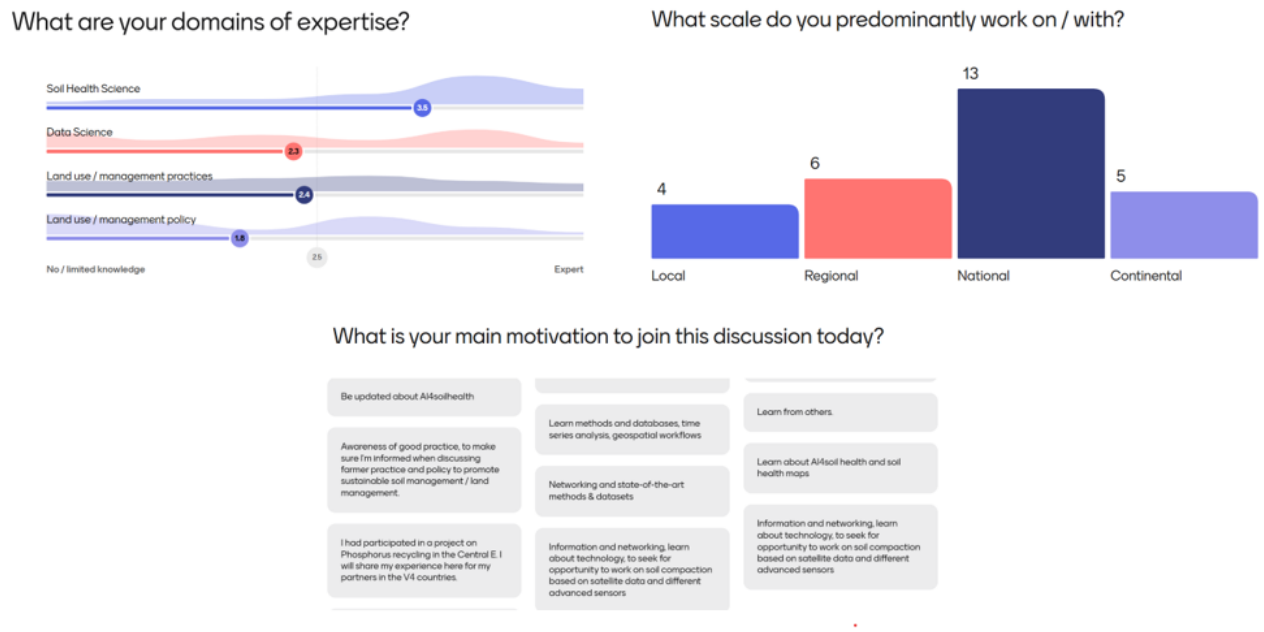


Figure 2.5: Introductory Mentimeter question results from 25th July 2025 'Making the case for soil health monitoring'

In the first webinar of the series, Tomislav Hengl demonstrated the Soil Health Data Cube and Ichsani Wheeler lead an interactive presentation discussing the audiences' views on the opportunities and challenges of open data. Using Mentimeter we gathered that the average understanding the audience had of the SHDC increased from 1.95 / 5 (or limited understanding) at the start of the session to 3.56 (or some / good understanding) at the end of the session. Table 2.4 details all of the Mentimeter questions that were posed to the audience across the webinars, excluding the introductory questions used across all events.

Table 2.4: Mentimeter questions to the audience across webinars.

Webinar	Questions posed
Unlocking the power of open data for soil health	How well do you currently understand the soil health data cube? How would you use the Soil Health Data Cube? How well do you understand the soil health data cube now?
Making the case for soil health monitoring	Are you actively involved in soil monitoring campaigns? What are the top 3 indicators you use to analyse the healthiness of soil? Let's discuss… Indexes are the best way of evaluating the health of soil across a region Assessing soil health should focus on management rather than outcomes Having joined today's discussion, how much has your understanding of soil health monitoring improved?

Predicting the future of soil health with AI	Do you use: ChatGPT/Copilot; Derived products e.g. maps; Image recognition e.g. disease detection What impact do you think AI will have on the future of soil health?
Building soil monitoring into policy	Have you been involved with the EU monitoring law? What do you think are the greatest barriers to implementing the EU soil monitoring law in practice? What activities does the soil care index fail to capture? How can science and soil scientists best support the transition to healthier soils by 2050?
Decoding soil biology for soil health	What soil biological indicators do you already measure / work with? What do you use biological indicators for? What barriers are there to you using soil biological indicators? What indicators would you like to start using?

At the end of each webinar a feedback form was shared. 27 responses were received with an average rating of 4.56 / 5 for satisfaction across the events. Overall, the attendees of the webinar series were very positive about the interactive nature of the events. One attendee said what they liked most about the event was '*How interactive it was. There was a lot of audience participation*.' Another attendee liked '*The really high quality and relevant science that was presented. There was also a balanced presentation of the potential of AI including limitations*.' See Appendix for a complete table of responses to *What did you like most about the event?, What could be improved about the event?* and *What information, advice or tools, if any, are you likely to take from this webinar into your place of work? And how do you think it will impact your work?*

By encouraging attendees to introduce themselves in the webinar chat, we saw opportunities for collaboration being shared and requests for involvement in the AI4SH project. The feedback form also took suggestions for topics of interest for future AI4SH events. The interest shown for soil microbiology and eDNA methods on the feedback form led to the addition of the fifth webinar '*Decoding soil biology for soil health'* in the webinar series. The themes of interest and learnings from the *Envisioning the future of soil health monitoring* webinar series will also feed into the development of a webinar series being organised by T2.4 in February to May 2026.

Table 2.5: Feedback form results for 'What topics, themes or questions would you like to see addressed in future events by AI 4 Soil Health?'

Biodiversity measures, vegetation trends, land use changes	eDNA metabarcoding including interpretation of results
Planets Boundaries for the types soil, its seem clear but can more specific	Probably feedback from users and their experience with the tools
Soil quality-based tools	Role of SOC to improve soil health.
How does the Soil Health Data Cube help in farmers' adoption of sustainable soil management practices on their farms.	more discussion of the most appropriate ways to assess soil health at different scales, particularly what is relevant at a field/farm scale to help guide farming practice.
Technical challanges of working with AI in soil science.	Impact of extreme events on Soil Health

My main interest is soil microbiology, but I accept that this topic is not interesting for everyone.	Challenges and solutions for open data sharing in soil science
Central European policy to protect or remediate soil health.	About soil and climate
Monitoring soil greenhouse gas fluxes and how to interpret the data	indicators for soil health (m.b. with a regional relevance)
Practical case studies of AI tools applied to soil monitoring	Mainly what are the process, tools or knowledge needed to accelerate the transition to healthy soils
Soil microbes	Predictive modelling of soil physicochemical properties
About Climate Change	

2.4 Stakeholder impact calculator

AI4SH's Stakeholder Impact Calculator is used by WP2 to monitor external stakeholder opportunities and events, track impact, and gather quantitative and qualitative data about what the project has communicated and achieved. The spreadsheet is used to log external events and major meetings with stakeholder-facing opportunities and a number of metrics(Tabble 2.6).

Table 2.6: Stakeholder impact calculator metric definitions.

What metric is being tracked?	How will the metric be used?
Event or meeting description	Provides context for the opportunity for engagement
Where did this take place?	Tracks the geographic distribution of our impact, identifies areas of success and high engagement, and highlights potential gaps
How many people attended?	Measures the reach and scale of the project's influence
Who was there? What type of policymaker, researcher, etc.	Identifies the categories of attendees (e.g., policymakers, researchers) to assess stakeholder engagement
Were any key EU stakeholders present?	Summarises how many opportunities we have used to speak to our key EU stakeholders
Level of interest of stakeholders involved?	Assesses the stakeholders' level of interest for interest-power analysis
Level of influence of stakeholders involved?	Evaluates influence of stakeholders involved for interest-power analysis

Description of the level of influence of the stakeholders present	Provides qualitative data into the level of power and influence held by stakeholders
Which work packages were communicated?	Illustrates which elements of the project have been most broadly communicated
What was presented or communicated?	Captures qualitative data onkey messages conveyed to stakeholders
Was feedback received?	Evaluates what percentage of opportunities produced feedback for project improvement and iteration
Description of impact and / or feedback	Provides qualitative insights into the impact of the engagement and key takeaways for stakeholders

Challenges with capacity amongst the consortium to retrospectively update the stakeholder impact calculator for all external engagements and account for all of the metrics, means the document is not comprehensive. However, the events that have been documented are useful for evaluating meaningful instances of stakeholder engagement.

Engagement spotlight:

Table 2.7: Extract from Stakeholder impact calculator.

Event or meeting description	Where did this take place?	How many people attended?	Who was there? What type of policymaker, researcher, etc.	Were any key EU stakeholders present?	Level of interest of stakeholders involved?	Level of influence of stakeholders involved?	Which work packages were communicated?	What was presented or communicated?	Description of impact and / or feedback
EGU General Assembly 2025 - Session SSS8.1: Soil health indicators – from a vague concept to the hard currency of soil monitoring	Austria	50-150	academic and research stakeholders	No	High	Medium	WP2, WP3, WP4, WP5, WP6, WP7	In an oral and a poster session, new findings on monitoring soil health indicators were presented. The session included studies on sensor developments, collection of legacy data, pan-european mapping and a presentation bridging the EU soil monitoring law and soil science.	No formal feedback received yet but informal feedback I received was very positive (Grant Campbell)
Mass experiment 25th Feb 2025	Denmark	300+	Student science outreach, 30000 students	No	High	High	WP7	Students taking soil sampling, doing measurement in the field and lab, report back results. 2000 school classes signed up.	Awareness raising about soil health for school kids

Workshop on LILAS4SOILS soil monitoring protocol. 17th Jun 2025	Online	10-50	Researchers, JRC, Soil Mission projects, living lab coordinators	Yes	High	Medium	WP4, WP5, WP6	Aspects of the project that could be useful for the living labs were presented, including: easy in situ methods being tested in WP4 (spectroscopy, DigitSoil, Slakes and Microbiometer); the SoilHealthDatacube in WP5; and the challenges posed by the biological properties measured in the WP6 pilot sites.	
Meeting during the field campaign on the Dutch pilot site	Netherlands	1-10	Researchers from project, Farmers (from the Boermarke Zeijen community), representatives of the local water authority (Dutch Waterboard)	No	High	Low	WP3, WP4 and WP6	We presented and discussed on the use of remote sensing based products (focus was on Planet products) to monitor soil health and agricultural activity over time. Uni Stockholm presented on the tools and measurements they are using in the project, cheaper devices they are developing	The main interest of the farmers is on soil moisture and the influence of weed (as it consumes soil moisture) in his arable crop fields (potatoes, sugar beet). Another farmer who focusses on grasslands has issues with phosphate: he would need to add synthetic fertilizer to get the biomass he needs but is not allowed because of an EU law and the fact that the phosphate level in the groundwater of his area is too high.

2.5 Future plans for engagement

As part of WP2 T2.4, AI4SH will organize a four-part webinar series (between February–May 2026) devoted to exploring existing EU policies with strong soil relevance. Each webinar will focus on a key policy domain. examining how enhanced soil monitoring, robust data infrastructure and AI-based tools can support policy design and implementation. The selected policy areas built on insights from D2.1 Priority areas and data needs for EU soil monitoring and information systems and will be refined in consultation with project partners through a survey collecting relevant policy angles, examples of case studies, potential speakers and emerging knowledge gaps across sectors. The target audience includes experts from EU institutions and Member States authorities, researchers and advisors, farmers and land managers, NGOs and civil society organizations and EU projects. The format of the webinar series will draw on lessons learned from webinar series Envisioning the future of soil health monitoring delivered within Task 2.2, incorporating participant evaluations and feedback.

In 2026, the T2.2 task contributors will develop a template for events to be hosted at the pilot sites to increase efforts to engage stakeholders in native languages and collect feedback specific to each national context on tools being developed. WP2 will work with WP3 to present the soil health index, WP5 to present the Soil Health Data Cube and AI4SH App, and WP6 to present key insights from pilot site sampling campaigns and collect user feedback to feed into tool development.

3. Scientific foundations: Building credible new soil health tools for stakeholder engagement

Here we show how the development of robust soil health indicators and innovative tools underpinned the credibility of campaign materials and informed the messages shared with stakeholders. This work, alongside the advancement of other scientific outputs in the project, ensured that the soil health awareness campaigns delivered authentic and valuable content.

3.1 Strategic approach

Designing new soil health variables and proxies is essential to ensure that indicators used in the Mission Soil framework are scientifically robust, policy-relevant, and practically measurable across diverse landscapes. Current indicators often lack harmonization or fail to capture emerging dimensions of soil health such as biological activity, resilience, and carbon dynamics. By creating innovative variables and proxies, we enable:

- Better alignment with policy goals to support evidence-based decision-making.
- Improved comparability and scalability across Living Labs and regions, ensuring consistent monitoring and reporting.
- Enhanced stakeholder engagement by providing indicators that are meaningful for scientists, policymakers, land managers, and citizens.
- Integration of novel data sources and technologies, such as AI-driven analytics, to make soil health assessment more efficient and actionable.

Three sets of stakeholders were targeted in this communications strand:

1. High-level stakeholders: The Living labs and policy focused groups from Directorate-General Joint Research Centre (JRC), Directorate-General Agriculture (DG Agri) and Rural Development, and Directorate-General Environment (DG Env). These audiences are reached by the development of policy briefings and via the communication of findings at joined meetings.
2. The Mission Soils Indicators Cluster: The cluster facilitates collaboration between Mission Soil's projects, Living Labs, and municipalities, encouraging co-creation of outputs and joint activities.
3. A wider stakeholder group is reached via the dissemination of scientific publications and other media in the form of e.g., videos, blogs and podcasts. These stakeholders could include scientists that are not directly connected to AI4SoilHealth, industry and soil managers, and informed citizens already aware of the importance of soil health.

3.2 Main stakeholders

3.2.1 High level stakeholders

The high-level stakeholders targeted were JRC, DG Agri and DG Env. The JRC is the European Commission's in-house science service, also known as the EU Science Hub. It delivers independent, evidence-based scientific and technical support throughout the EU policy cycle, including anticipation of future challenges, policy integration, and impact assessment. With multidisciplinary expertise across 25 portfolios, the JRC strengthens innovation and informs EU priorities like climate neutrality, digital transformation and sustainable food systems. DG Agri manages the Common

Agricultural Policy (CAP), which supports farmers and promotes rural development across Europe. It ensures food security, stabilizes farmers' incomes, and drives sustainable resource use. DG Agri also facilitates generational renewal of the farming population, oversees quality schemes, and supports rural communities via investment and innovation initiatives. DG Env is responsible for shaping and enforcing the EU's environmental policies. It oversees key Green Deal initiatives, ranging from biodiversity and air quality to water protection and circular economy, and ensures proper application of EU environmental law by member states. The department maintains a high level of environmental protection, integrates scientific evidence via platforms like *Science for Environment Policy*, and represents the EU in international environmental negotiations.

3.2.2 Mission soil platform and indicators cluster

AI4SoilHealth co-leads the **Mission Soil Indicators Cluster** alongside the Soil Health Benchmarks project. This cluster plays a pivotal role in harmonising soil health indicators across Europe, supporting the European Soil Observatory (EUSO), and informing key EU policies such as the Soil Health Law and the EU Soil Strategy for 2030.

The cluster facilitates collaboration between projects, Living Labs, and municipalities, encouraging co-creation of outputs and joint activities. It is supported by Ecorys, Ecologic Institute, and Ricardo under a European Commission service contract.

Cluster Objectives

- Standardisation: Develop consistent methodologies for soil health indicator selection and data collection.
- Policy Alignment: Provide robust evidence to support EU soil legislation and strategic goals.
- Knowledge Exchange: Enable cross-project learning and synergy through regular meetings and workshops.

Operational Structure

- 40 projects participate, with 40–60 attendees at regular meetings.
- Co-led by AI4SoilHealth and BENCHMARKS.
- Supported by DG Agri, REA, and JRC for strategic alignment.
- Topics include:
    - Integrating local and EU-level monitoring approaches.
    - Harmonising sampling methods across diverse contexts.
    - Defining thresholds and benchmarks for soil health indicators.

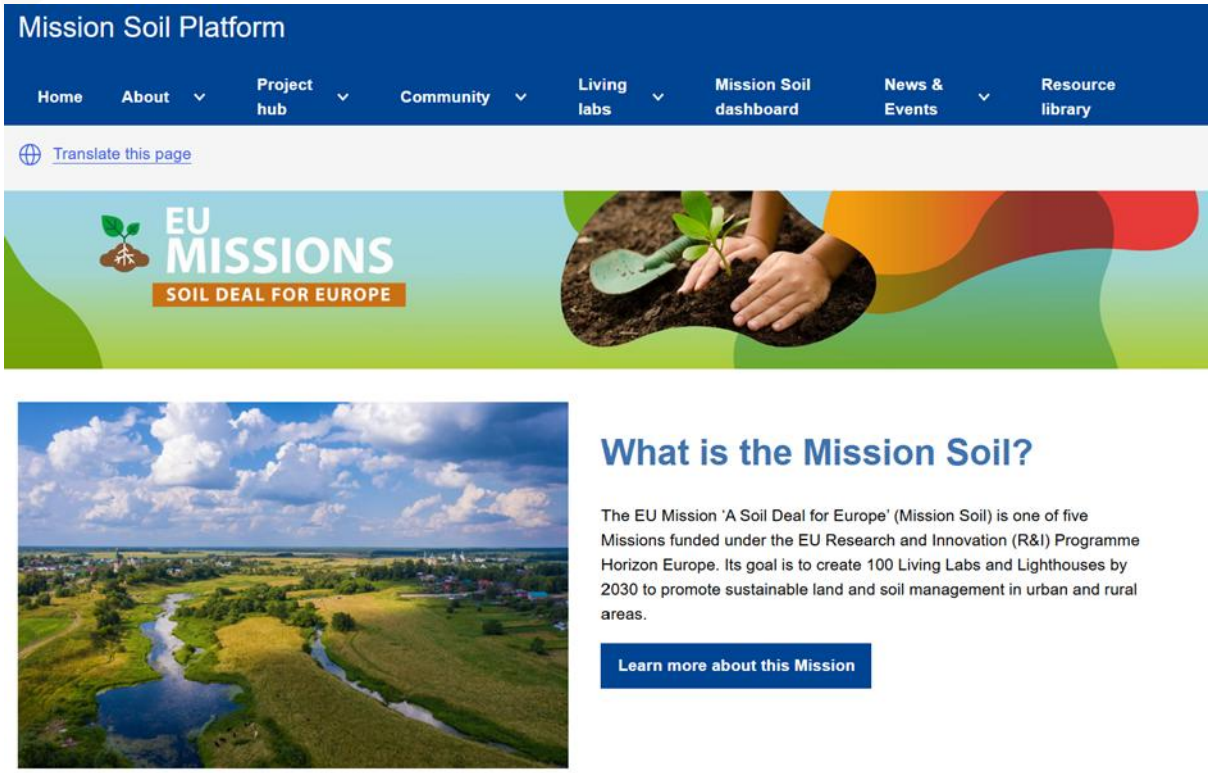


Figure 3.1: the Mission Platform Website https://mission-soil-platform.ec.europa.eu/

3.3 Main engagement methods

The project has organised a range of stakeholder events over the last few years, including online workshops, in person training and dissemination. Events described in this document include joint activities organised by the Mission Soil Indicators Cluster team lead by Soil Health Benchmarks and AI4SoilHealth.

Table 3.1: Calendar of events to communicate with stakeholders

Date	Event	Format
2024 March	Inception meeting	Online
2024 June	Indicator selection procedures	Online
2024 June	Meeting with JRC	Ispra, Italy
2024 November	In person training Soil Mission Week	Brussels, Belgium
2024 November	Presentations to the living labs and indicator selection and discussion for the living labs	Guadix, Spain
2025 April	Feedback on the training in Brussels and plans for the year	Online
2025 Sept	Training on indicator selection for living labs across scales and for defined purposes.	Vitoria, Spain
2025 Oct	Meeting with JRC	Ispra, Italy
2025 Nov	Meeting with JRC, DG Agri, DG Env	Online

3.4 Results and impact - people reached, what happened from meetings, real world changes

3.4.1. 2024 March inception meeting

The key points of the first cluster meeting communicated and explored revolved around the need for integrating diverse approaches, developing meaningful indicators, and fostering collaboration across different scales and projects, as follows:

- Local vs. European Scale Considerations: The importance of integrating monitoring activities of local management practices, linked to soil functionalities, with EU-level soil degradation assessment and the challenge of scaling indicators from local to EU levels.
- Simplification vs. Robustness of Indicators: the necessity of developing and simplifying Soil Health Indicators while ensuring they are robust enough to provide a comprehensive overview of soil status at the EU level.
- Question-led approach: a common ground should guide the selection and development of indicators and the design of an indicators roadmap by first reflecting on the policy questions and targets that need to be addressed.
- Harmonisation and Adaptation: The importance of harmonising data collection (including sampling) and adapting indicators to local conditions, suggesting a need for frameworks that can scale indicators effectively.
- Inter-Cluster Collaboration: The added value of collaboration among clusters (especially with the data cluster), i.e. in gathering metadata and sharing methodologies, was underlined as a key area for future focus.
- Thresholds and Benchmarks: Discussions on the importance of defining processes and criteria for establishing thresholds and benchmarks for soil health indicators, considering the variability across different geographical contexts.
- Knowledge Integration with Existing Projects and Infrastructures: The meeting suggested integrating efforts with existing infrastructures and projects (like ICOS and ALTER) and emphasised the importance of collaboration with environmental data agencies like the EEA. An important area for knowledge integration could be that of building on the work done in other contexts, i.e. by Eurostat, on defining the criteria that indicators shall have.
- Addressing Seasonality and Variability: The impact of seasonality on soil indicators and the suggestion of establishing specific sampling periods to ensure comparability of results were discussed.
- Public Engagement and Soil Literacy: Strategies combining less visible but effective indicators with appealing "headline" indicators were considered to enhance public interest and soil literacy, cautioning against prioritising aesthetics over substantive educational outcomes.

The Q&A session revolved around the following main points:

- Bottom-up vs Top-down Approaches: The conversation began with inquiries about integrating bottom-up approaches, as living labs (LLs) focused on soil functionalities, with top-down approaches aiming to assess degradation through the indicators foreseen for the Soil Monitoring Law.
- Local vs. European Considerations: Linked to the previous point, the conversation also touched upon the importance of integrating local management practices with broader-scale degradation processes. The JRC addressed the challenge of adapting indicators from local conditions to more broad ones, such as country or EU level, and the need for contributions to inform about the state's representation at the EU level.

- Wider Policy Alignment: Questions were raised about whether the indicators are aligned with major environmental strategies and whether they can effectively measure progress towards policy objectives. The JRC confirmed their alignment and discussed the growing demand for monitoring and policy indicators, particularly in the context of chemical and biodiversity strategies and carbon farming. On this topic, it has been proposed to have thematic sub-working groups.
- Simplification of Indicators: The relevance of streamlining and simplifying the number of soil health indicators to prevent overwhelming actors that actually carry out the monitoring activities was also mentioned. Nevertheless, it has also been emphasised that robust and measurable indicators should be prioritised rather than simple ones that do not provide a real overview of the Soil status at the EU level.
- Addressing Seasonality and Variability in sampling: Concerns were raised about the impact of seasonality on soil indicators and the suggestion of establishing specific sampling periods to ensure comparability of results. The JRC acknowledged these concerns.

3.4.2. 2024 June meeting Indicator selection procedures

The second cluster meeting focused on developing a roadmap for identifying meaningful soil descriptors/indicators and monitoring methods at the local scale, supporting activities such as the implementation of 100 Living Labs by 2030.

DG Agri introduced objectives and linked cluster work to the proposed Soil Monitoring and Resilience Directive. JRC outlined expected achievements and integration with EU-scale monitoring. DG CLIMA presented updates on the Carbon Removals and Carbon Farming (CRFC) Regulation and related Mission Soil contributions.

This was followed by a discussion on Soil Health Framing. BENCHMARKS initiated the discusion with the hypothesis that soil health is context-specific, influenced by pedo-climatic conditions and management practices. Indicators should therefore follow a fitness-for-purpose approach.

Breakout sessions addressed indicators for:

1. Soil Organic Carbon

2. Soil Biodiversity

3. Soil Contamination

Participants shared indicator measurements and scales used in their projects (though not all completed the survey).

The framing approaches identified were **Fitness for purpose**: Defines soil health relative to specific goals (e.g., agricultural productivity). Example: Cornell CASH framework, and **Zero Defects / Error-Free**: Sets minimum standards (soil without degradation = healthy), as in the Soil Monitoring Law.

Both approaches are complementary, requiring robust indicators for state and change, but differ in operationalization. The Mission must decide emphasis for each framework.

The next steps identified at the meeting were:

- Complete the indicator survey across projects
- Cluster coordination team to evaluate scales and commonly applied indicators.
- Use feedback to design training for the November 2024 Brussels meeting, focusing on scale and purpose in framework selection.

The clear outcome of the meeting was a need for training and discussion on scale and purpose for indicator frameworks.

3.4.3. 2024 November Living Lab training, Brussels, Belgium

Living lab training was undertaken at the cluster workshops organised in Brussels following the soil Mission week.

The cluster workshop was used to communicate concepts using 2 sessions. The first focused on indicator frameworks and the second on indicator selection according to fitness for purpose at local scales for living labs.

The session organised by AI4SoilHealth on frameworks is described below:

The purpose of the session was to assess frameworks that use soil indicators to assess the soil resource for different purposes with different stakeholders in mind. These frameworks generally operate at different scales. The participants were provided with 10 frameworks (Table 3.2) and asked to rank the frameworks in terms of operational scale, then determine which stakeholder groups they were developed for and focused on before deciding which indicator framework they fitted into.

Step 1: SCALE (10 minutes) the task is to review the frameworks and the rank them according to scale:

Rank the scale for which this framework is most appropriate, where a small number indicates a small scale, such as the field scale, and a large number indicates a big scale, e.g. global scale. Rank them all in order with no ties.

Global (High number), continental, national, regional, landscape, farm, field (low number).

Step 2 STAKEHOLDER (10 minutes) select a stakeholder group for which you think this framework is most suitable:

- **(P)** *Policy teams*: who can use the information for decision-making and policy development, especially developing interventions.
- **(M)** *Soil managers*: who can use the information to determine performance of the soil resource to get the best management for a purpose.
- **(E)** Soil enthusiast, citizen scientists: Members of the public who are interested in soils.

Step 3 FRAMEWORK (10 minutes) assign the framework to a quality assessment:

- **(F)** *Fit for purpose*: Indicators are interpreted on a continuous scale to determine if performance is better or worse in regard to a specific purpose. For example, is the soil pH at an optimal or sub optimal level for a specific function? This represents continuous scales that might be interpreted as, ‘More is better’, ‘Optimum curve’ or ‘Less is better’.
- **(D)** *Minimise degradation*: The aspiration of this framework is to prevent, minimise or restore degraded soils. Hence the indicators are used in conjunction with thresholds to determine trigger points. If an indicator is approaching a trigger-point, intervention can be undertaken to prevent degradation. If the soil is beyond a trigger-point, then restoration activities can be undertaken. For example, is soil erosion above or below a trigger point? This represents a binary choice, degraded or not degraded.
- **(V)** *Assign value*: Soil indicators are used to assess value, using some form of common currency, often money, in order to explore benefits and trade-offs with other choices or resources. Or to help make financial payments for benefits from resource management.

By filling in the table the workshop participants ranked the frameworks according to scale, identified the primary stakeholder group and determined how they think indicators will be used to assess soil quality / health.

Table 3.2: The framework table filled in by each of the groups.

	SCALE Global (High number) Field or garden (low number, 1)	**STAKEHOLDERS** (P) Policy teams (M) Soil managers (E) Soil enthusiasts	**INDICATOR** (F) Fit for purpose (D) Minimise degradation (V) Assign value
United Nations Sustainable Development Goals	10	P	D
The Soil Natural Capital Framework			
The Soil Vulnerability Index (SVI) Framework			
The Soil Health Scorecard Framework			
The Earthwatch Citizen Science Soil Framework			
The FAO Land Degradation Framework			
The Soil Fertility Framework			
The India Soil Card Framework			
The EU Soil Thematic Strategy Framework			
The Payments for Soil Ecosystem Services (PES) Framework			

It was agreed that the results from the workshop would be synthesised by the cluster team for feedback in an online meeting in 2025.

3.4.4. 2024 November Living lab KE Guadix, Spain

Benchmarks and AI4SoilHealth were invited to the GOV4ALL living lab project, specifically to take part in a session on soil monitoring and soil health indicators that also included the living lab iCOSHELL. The workshop included a range of living lab stakeholders from across Spain, Greece and France. An overview of AI4SoilHealth was given and the range of work on indicator development. The workshop was used to review indicator selection undertaken by the GOV4ALL project.

3.4.5. 2025 Online Cluster meeting

The first cluster meeting of 2025 set the scene for the year, reviewed outcomes from the November 2024 in-person meeting, and outlined next steps for implementation. The meeting was opened by Luis Sanchez (DG AGRI) who welcomed new members and announced the recent Council-Parliament agreement on the Soil Monitoring and Resilience Directive, expected to be formally adopted soon. This directive will establish a harmonised EU framework for soil health monitoring, supporting the Soil Strategy goal of healthy soils by 2050. He also confirmed that European Mission Soil Week 2025 will take place at Aarhus University, Denmark, on 5-6 November 2025, during the Danish EU Council Presidency. Sanchez stressed leveraging the new legislative framework to amplify soil health monitoring efforts.

David Robinson (AI4SoilHealth) then summarised conclusions from the first session that took place during the Mission of Soil Cluster meeting in November in Brussels:

- Soil quality frameworks strongly influence indicator selection and interpretation.
- Ten frameworks were classified by scale, stakeholder relevance, and framework type (fit for purpose, minimise degradation, assign value).
- Large-scale frameworks (e.g., UN SDGs) suit policymakers; small-scale frameworks (e.g., Soil Health Scorecards) suit land managers and citizen science.
- Framework types vary: global frameworks often aim to minimise degradation, while local ones are fit-for-purpose; valuation frameworks link to ecosystem services.

Key insights were that no single farming fits all contexts – alignment with purpose, scale and stakeholder needs is essential. These findings will guide living labs in indicator selection and tool development in 2025.

Paolo Di Lonardo (BENCHMARKS) summarised conclusions from the second session that took place during the Mission of Soil Cluster meeting in November in Brussels:

- Four case studies: local agriculture, European agriculture, forestry, and urban land.
- Indicators could draw from the proposed Directive or Mission Soil projects.
- Each group developed tailored soil health goals and indicator sets.

Recurring indicators (e.g., soil organic carbon) appeared across contexts, but interpretation must remain context-specific. A nuanced understanding of indicator relevance was emphasised.

3.4.6. 2025 Living lab indicator training, Vitoria, Spain

The Mission Soil Living Labs Indicator Training, held on 15–17 September in Vitoria-Gasteiz, Basque Country, Spain, was developed in response to a need identified by Mission Soil Living Labs: practical guidance on selecting relevant soil health indicators tailored to local contexts and land-use systems. Many practitioners face challenges in choosing indicators that are meaningful, measurable, and aligned with both local objectives and broader monitoring frameworks.

Living Labs are a central element of the Mission Soil initiative. They are open, collaborative spaces, such as farms, forests, or urban areas, where stakeholders co-create and test solutions for soil health. The training aimed to make soil health monitoring more practical and approachable, and to connect local action with European ambitions. The event was jointly organised by BENCHMARKS and AI4SoilHealth, with the valued contribution of NEIKER, the JRC, and the Mission Soil Platform.

The Mission Soil Living Lab Indicator Training brought together over 20 participants from across Europe who work with soil health at the local scale, i.e. in Living Labs. Over three days at NEIKER Arkaute campus in Vitoria-Gasteiz, the programme combined practical sessions, fieldwork, and peer exchange.

Key activities included:

- Setting clear soil monitoring goals
- Using digital tools (e.g., Eco Data Cube) to identify local challenges
- Selecting indicators relevant to farms, forests, or urban spaces
- Hands-on soil sampling and adapting protocols to local needs
- Comparing physical, chemical, and biological indicators
- Linking monitoring to management decisions
- Introducing remote sensing and landscape-scale monitoring

The emphasis was on making monitoring relevant for practitioners, not just researchers. Participants shared experiences from diverse soils and climates, discussed challenges, and explored practical solutions. Participants gained practical skills for indicator selection and linking practices to soil functions, insights on harmonising methods across projects for comparable data, field-based examples (e.g., NEIKER vineyard) addressing crop-specific issues and climate impacts, and inspiration to develop new guidelines and tools for their Living Labs. The training also strengthened connections between local action and EU policy, showing how Living Lab efforts contribute to soil health across Europe.

By the end of the workshop indicators were grouped into three categories (Table 3.3).

Table 3.3: Indicator grouping by priority for living labs

Group	Indicators
Always consider	pH (EC measured with pH) SOM (and carbonate measured together) SOC Bulk density
Optionally consider depending on purpose of monitoring	Nutrients Metals Organics Erosion Biodiversity

Bespoke indicators for local scale living lab assessment. More suited to rapid assessment.	Area of bare soil Area of cover crops Number of erosion features Area of animal poaching or machinery compaction Earth worm counts

3.4.7. Summary of the new or proxy indicators and related stakeholder meetings

JRC – AI4SoilHealth meetings to guide development

Two meetings were held at the JRC in Ispra, in June 2024 and October 2025, to guide the AI4SoilHealth project from a policy perspective. These meetings provided opportunities to communicate project progress and engage with representatives from the Directorates-General (DGs) and the Research Executive Agency (REA), broadening stakeholder involvement. In addition to sharing updates, JRC and DG participants offered feedback and steerage to ensure alignment with policy priorities.

A key theme emerging from these discussions was the development of a soil health index, which remains a challenging and contested topic. Under Task 3.7, several approaches are being explored to summarize soil health indicators into an index, focusing either on soil degradation or on a quantitative evaluation of soil health. Another approach involves creating a soil health index framework to support decision-making at multiple scales, providing EU or Member States policymakers with strategic insights while offering practical guidance for local soil management.

Although the initial JRC meetings touched briefly on this topic, they highlighted the need for deeper consideration. Consequently, a dedicated meeting was held in November 2025 with DG Agri, DG Env, and JRC to discuss specific issues and the need for a more holistic approach. These discussions helped steer the work toward such an approach, and an in-person meeting is planned for early spring 2026 to refine the framework further. Looking ahead, the project aims to present the soil health index framework to additional stakeholders, including land managers and farmers, to gather feedback and explore its practical application at the local scale.

3.4.8 Summaries of papers published on indicator frameworks for use by stakeholders

Campbell, G.A., Smith, P., Broothaerts, N., Panagos, P., Jones, A., Ballabio, C., De Rosa, D., de Jonge, L.W., Arthur, E., Gomes, L. and Shokri, N., Afshar, M., Tóth, G., Lehmann, P., Borrelli, P., Alewell, C., Minarik, R., Hengl, T., Wheeler, I., Maskell, L., Nussbaum, M., Jones, L., Feeney, C., and Robinson D.A., 2025. **Continental Scale Soil Monitoring: A Proposed Multi-Scale Framing of Soil Quality.** European Journal of Soil Science, 76(4), p.e70174.

ABSTRACT

Globally, soils are subjected to various management practices and stressors which can lead to degradation. This makes their protection essential for sustaining many functions and services as well as maintaining the overall life support system of Earth. National monitoring programmes are increasingly implemented to evaluate the state and trend of soils, a move which has been advocated by the Mission Soil in Europe. In soil science, frameworks have been established to interpret and communicate soil monitoring results, concentrating on the concept of quality, a term which can be interpreted in many ways. This paper explores the multifaceted meaning of soil quality, addressing its implications for future soil health assessments. It achieves this by focusing on the context of the Mission Soil. Soil health is a holistic concept embracing emergence, complexity and highlighting

long-term vitality and resilience. In contrast, soil quality is often viewed through the lens of its capacity to meet specific human needs and functions, typically in a shorter timeframe. The concept of quality is assessed through indicators where the choice of framework significantly influences selection and interpretation. However, selecting appropriate soil indicators across Europe is challenging due to diverse climate, topography, geology and soil types, resulting in varied soil processes. Therefore, establishing clear principles and criteria for soil indicator selection is essential. Our paper identifies four distinct frameworks for soil quality assessment: 'Fitness for Purpose', 'Free from Degradation', 'External Benchmarking' and 'Value Assessment', with each possessing a unique role and application. Notably, the 'Free from Degradation' framework is emphasised for its alignment with soil protection efforts and its relevance to soil threats. This makes it particularly suitable for pan-European assessments conducted by the European Union Soil Observatory (EUSO)

Matson, A., Fantappiè, M., Campbell, G.A., Miranda-Vélez, J.F., Faber, J.H., Gomes, L.C., Hessel, R., Lana, M., Mocali, S., Smith, P. and Robinson, D.A., 2024. **Four approaches to setting soil health targets and thresholds in agricultural soils**. Journal of Environmental Management, 371, p.123141.

ABSTRACT

Soil health is a key concept in worldwide efforts to reverse soil degradation, but to be used as a tool to improve soils, it must be definable at a policy level and quantifiable in some way. Soil indicators can be used to define soil health and quantify the degree to which soils fulfil expected functions. Indicators are assessed using target and/or threshold values, which define achievable levels of the indicators or functions. However, defining robust targets and thresholds is not a trivial task, as they should account for soil, climate, land-use, management, and history, among others. This paper introduces and discusses (through theory and stakeholder feedback) four approaches to setting targets and thresholds: fixed, reference, distribution and relative change. Three approaches (not including relative change) are then illustrated using a case study, located in Denmark, Italy, and France, which highlights key strengths and weaknesses of each approach. Finally, a framework is presented that facilitates both choosing the most appropriate target/threshold method for a given context, and using targets/thresholds to trigger follow-up actions to promote soil health.

Robinson, D.A., Bentley, L., Jones, L., Feeney, C., Garbutt, A., Tandy, S., Lebron, I., Thomas, A., Reinsch, S., Norton, L. and Maskell, L., 2024. **Five decades' experience of long-term soil monitoring, and key design principles, to assist the EU soil health mission.** European Journal of Soil Science, 75(5), p.e13570.

ABSTRACT

The European Union has a long-term objective to achieve healthy soils by 2050. The European Commission has proposed a Directive of the European Parliament and of the Council on Soil Monitoring and Resilience (Soil Monitoring Law, SML), the first stage of which is to focus on setting up a soil monitoring framework and assessing soils throughout the EU. Situated in NW Europe, the UK has substantial experience in soil monitoring over the last half century which may usefully contribute to this wider EU effort. A set of overarching principles have and continue to guide design of national soil monitoring and may prove helpful as other European countries embark on similar monitoring programmes. Therefore, we present the principles of design from five decades of national soil monitoring. The monitoring discussed is based on a stratified-random design, has matured in support of policy questions, and operates over space and time scales relevant to the SML. The UK

Centre for Ecology & Hydrology (UKCEH) Countryside Surveys (CS) of Great Britain and Northern Ireland, Welsh Government, Environment and Rural Affairs Monitoring and Modelling Programme (ERAMMP) and the England Ecosystem Survey (EES) monitoring programme are national programmes currently operating in the UK. Some important lessons learnt include: adopting a question-based approach; having a clear robust statistical design for the purpose; selecting indicators that address policy and underlying scientific questions; and selecting indicators that can detect change and use robust and well tested methodologies across a wide range of soil and land use types, remaining valid over long time scales, supporting thinking long-term. Technical lessons learned include the proven cost effectiveness of a stratified-random design including replication, while adopting a common stratification layer of stable environmental attributes aids comparability between monitoring programmes. Common protocols are vital for future intercomparisons, but a full ecosystem approach that includes co-located soil and vegetation samples for interpreting a co-evolving system has proved hugely advantageous. UK monitoring programmes offer a range of experience that may prove valuable to future soil monitoring design to address the major societal challenges of our time, such as maintaining food production and addressing climate change and biodiversity loss.

Panagos, P., Borrelli, P., Jones, A. and Robinson, D.A., 2024. **A 1 billion euro mission: A Soil Deal for Europe.** European Journal of Soil Science, 75(1), p.e13466.

ABSTRACT

Soils have achieved prominence in the political agenda of the European Commission with the proposal for a Soil Monitoring Law and the ambitious Soil Mission research framework. The EU Soil Observatory (EUSO) used the latest state-of-the-art pan-European datasets to propose a preliminary assessment of soil health in the EU based on 18 soil degradation proxy indicators. The body of knowledge will soon be enriched thanks to the investment of 1 billion euros towards the Mission 'A Soil Deal for Europe', which has the ambition to promote the development of new harmonized bottom-up and top-down soil health indicators. New data and knowledge are also anticipated through the national soil monitoring schemes to support the implementation of the Soil Monitoring Law. We present the Soil Mission roadmap towards assessing and achieving soil health in the EU by 2030 to meet Green Deal objectives. We introduce the EUSO Soil Health Dashboard, a soil degradation indicator tool using soil health indicators developed by the European Soil Data Centre (ESDAC) (2012–2023) that will contribute to Soil Monitoring Law assessments.

Policy briefs

Grant Campbell, David Robinson, Pete Smith, Lis Wollesen de Jonge, and Trine Nørgaard. 2024. "**Developing a robust soil health indicator selection framework**", Open Access Government July 2024, pp.378-379. Available at: https://www.openaccessgovernment.org/article/developing-a-robust-soil-health-indicator-selection-framework/178004/. (Accessed: 09 Dec 2024).

Amanda Matson, Maria Fantappiè, Grant A. Campbell, Jorge F. Miranda-Vélez, Jack H. Faber, Lucas Carvalho Gomes, Rudi Hessel, Marcos Lana, Stefano Mocali, Pete Smith, David Robinson, Antonio Bispo, Fenny van Egmond, Saskia Keesstra, Nicolas P.A. Saby, Bozena Smreczak, Claire Froger, Azamat Suleymanov, and Claire Chenu. 2024. **A framework for setting soil health targets and thresholds in agricultural soils.** May 2024 EJP Policy brief.

https://ejpsoil.eu/fileadmin/projects/ejpsoil/WP8/Policy_briefs/EJPSOIL_Policy_Brief_Targets_and_Thresholds.pdf

3.5 Future plans for engagement.

AI4SoilHealth plans to continue to engage with the indicator cluster and the living labs network throughout 2026. We are also hoping to build better bridges with the commercial components of the mission.

4. Soil Health awareness campaign: materials, channels and measured impact

This section details the design and delivery of the AI4SoilHealth awareness campaign, highlighting the materials produced, channels used, and the measurable impact achieved across Europe.

4.1 Strategic approach

Aim: To contribute to the international dialogue on best practices for soil health monitoring and to present the project's key scientific findings as focal points for discussion.

Task 7.4 overview as laid out in Grant Agreement:

> Devise and launch a coordinated digital campaign strategy focusing on: (a) benefits and impact of improved soil health monitoring, (b) links between soil health, soil functions and ecosystem services and (c) making the case to incentivise soil health management utilizing (T2.3) economic analysis findings. Activity will be amplified by the effective harnessing of stakeholder networks and communities cultivated by WP2 and WP6 with a specific focus on policy-makers.

Soil health campaign objectives:

1. Inform the EU soil mission community with digestible and practical scientific outputs from the project.
2. Reach outside the “usual suspects” to influence key advisors, environment agencies, civil servants and agricultural industry groups, specifically those likely to implement the Directive on Soil Monitoring and Resilience at a Member State level.

We will achieve this by:

- Producing new and valuable content which contributes to increased awareness of the importance of soil health monitoring and analysis in Europe.
- Increasing the visibility of the AI4SoilHealth brand, building the reach of our channels, and making more people aware of the projects planned scientific outputs and goals through:
    - Regular posts across digital platforms on the website, LinkedIn, X, BlueSky & YouTube aimed at engagement.
    - Creating catchy offline materials to disseminate at events
    - Breaking down the science into accessible and sharable blog, podcast and video content.
    - Creating effective communications strategies to promote the projects events – webinars and international conferences.

- To empower partner organisations to share their own soil health awareness content to boost our dissemination goals.
- Targeted ad campaigns to promote key awareness raising events in the project to relevant stakeholders – specifically those looking at implementing the 'Directive on Soil Monitoring and Resilience'.

4.2 Main stakeholders

Aim: We focused on selecting informed audiences to ensure the technical outputs of AI4SoilHealth could be fully appreciated and avoiding oversimplification that would dilute the project's unique scientific value. The communication strategy prioritises maintaining scientific accuracy while making the information practically accessible and easy to understand.

Table 4.1: Main stakeholders and their area of interest, communication needs and media.

Stakeholder Group	Area of interest	Communication needs	Media
Policy Makers and national governments	How AI tools and other measurement indicators can support agricultural policy objectives for net zero, soil health and biodiversity outcomes. Specifically, how can these tools be used to fast-track outcomes by enabling land managers to have the confidence to make changes to their practices.	Evidence they can trust. Good summaries of information that get them up to speed without needing to understand the detail. Case studies which they can point to which support their policy decisions.	Broadsheet news Social media Policy conferences Influencer networks National and regional policy boards
Farmers / landowners and managers	How new tools can support business decisions in practical ways. Needs to know why measurement is important and what immediate benefits it will bring to the farm/land business. Low risk entry points to new technology and technical support to understand how it can be adapted to their specific business model and land.	Farmer and land manager summaries of our outputs which get to the practical outcomes straight away. Ambassadors of information they can relate to. I.e. Other land managers they trust using this new technology. Peer to peer networks to discuss outcomes.	Social media and WhatsApp communities Video platform like YouTube Farming press Farmer and forestry learning networks Farming and forestry conferences

			Interest groups Agricultural advice sector Regional and local innovation support services
Soil Scientists and researchers	How can new measurement tools support my research objectives?	Detailed information and data which supports the benefits of new tools. Peer reviewed scientific studies.	Research conferences Social media NGO networks National and regional policy boards
Universities, teachers and students	What are the key indicators of Soil health that should be taught in the University? How should we be teaching soil health be measured to meet the EU 2030 climate and biodiversity goals? What tools are available to access the latest available soil health measures and data?	Step by step learning guides with tiered levels of complexity to match different levels of understanding. Attractive resources which explain the power of measurement for soil health outcomes.	Social media Classrooms Student societies Educational resources Popular digital content platforms
Informed citizens (general public)	How can good soil health measurement make a positive change in the world around me? What positive stories are out there which explain the relevance of soil health measurement tools.	Simplified, clear and short explanations of the importance of measurement and how it can change the world.	Social media Broadsheet media And broadcast media

4.3 Main engagement methods

Aim: To implement a comprehensive, multi-channel engagement strategy that strategically uses digital platforms (website, social media, paid media), specialised content (podcasts, science videos, blogs), and offline materials to translate AI4SoilHealth's technical findings into practically accessible knowledge. This approach is designed to target, inform, and equip diverse stakeholders to drive the uptake of novel soil health monitoring tools and convene an international discussion on future best practice and policy implementation.

1. Podcast

Objectives:

- To create podcasts about the project within an existing platform (Investing in Regenerative Agriculture) to reach a wider audience interested in regenerative agriculture and soil.
- To showcase key voices in the project and associated community to a warm audience.

2. Science communications videos

Objectives:

- Introduce the importance of using soil health evaluation tools and how they can effectively guide decision making in agricultural and policy settings.
- Provide an overview of the pilot sites for AI4SoilHealth and explain how they are working towards the overall ambitions of the project.
- Identify the different indicator landscape of particular regions of Europe and how to create tools that are useful to pan European policy in this context.
- Grow the following of AI4SoilHealth channels and attract more scientists and policy makers to our community.

3. Offline materials for stakeholder engagement at events

Objectives:

- To create a range of visually engaging postcards with catchy and snappy introductions to the key scientific outputs from the project.
- To link the reader to the website with measurable QR codes.
- To create a resource which can be easily shared across the consortium for sharing at member state level.

4. Press and blogs

Objectives

- To use blogs to breakdown the technical language in published science into readable and accessible content which relays useful knowledge to non-academic audiences.
- Deliver a programme of PR activity to generate positive PR coverage for the AI4 Soil Health – to raise awareness of the programme and its objectives and to meet our Horizon project KPIs for external media coverage.
- To equip consortium partners with press skills so they can identify useful stories and share them with WP7 or through their own organisational AI4SoilHealth press activity.

5. Website

Objectives:

- To act as the go to place for knowledge, resources and perspectives on monitoring soil health for the scientific and academic community.

6. Social media

Objectives:

- To disseminate deliverables from the AI4SoilHealth project to our target audiences in order to generate interest, encourage feedback and inspire take up.
- To raise awareness of the AI4SoilHealth brand and inspire our target audiences of the potential of AI powered soil health technology and it's benefits.
- To collaborate with the other Soil Health Mission projects by amplifying their voice with a particular focus on communicating the link between soil health, soil function and environmental services.
- To facilitate, inspire and urge all partners to post about AI4SoilHealth's activity on their channels when disseminating their deliverables.
- To convene a scientific and policy discussion about the latest soil health monitoring frameworks, the best new and old indicators to use and novel soil health technologies that make use of Artificial Intelligence.

7. Paid media (targeted ads)

Objectives:

- To create targeted communications to inform and equip decision makers across the EU member states who will be looking to implement their own soil monitoring programmes when the soil monitoring legislation passes into law.

4.4 Results and impact (Jan 2023 – October 2025)

Key performance indicator tracker:

KPI: The grant agreement set a KPI of 2,000 average number of views for videos produced as part of Task 7.4.
Result: There are a total of 20 science communications videos shared across our platforms. With a total of 73,484 views across all platforms. This means we are currently achieving the KPI with an average of 3,674 per video.

KPI: The grant agreement set a KPI of 300,000 unique website visitors over the duration of the project.
Result: As of the 1st November, we have attracted 47,467 unique pageviews to the website. There has been an 85.7% increase in unique pageviews between 2024 and 2025 (Nov – Nov). If numbers continue to rise exponentially then we can expect circa 88,000 unique pageviews next year. This means we are currently projected to come below the KPI with 135,000 unique page views.

KPI: The grant agreement set a KPI of 50,000 followers across all social media platforms – Task 7.4 is a significant contributing force to the drive for followers.
Result: As of 1st November, we have a total of 4,312 followers across LinkedIn, X, YouTube and Bluesky. While this is considerably off target, we believe we have some of the most followed channels of all Mission Soil projects.

Detailed summary

1. Podcasts

Hosted on the Investing in Regenerative Agriculture platform, the podcast amplifies project insights through conversations with leading experts and practitioners. The same content has been repurposed in shorter accessible formats which are then shared on AI4SoilHealth channels.

Table 4.2: List of podcasts available on Investing in Regenerative Agriculture' channel

Title of podcast	Date released	Downloads/ Listens	Link
Alfred Grand – Why an Austrian farmer and researcher trained by earthworms is very excited about AI	12 March 2024	2670	Link
Mateusz Ciasnocha and Maria Virginia Solis Wahnish – From EU Soil Mission to Pope Francis, how to change local and state agriculture and food policies	16 April 2024	1750	Link
Bridget Emmett – Moving over carbon soil compaction is the real issue in agriculture	21 June 2024	1970	Link
Jason Hayward-Jones – Corporates paying for low carbon grains and why virtual twins are key in gaming and Scottish whiskey	25 June 2024	1720	Link
Paul Clarke – Smart Machines, AI and Modeling: engineering our way out	4 February 2025	2030	Link
Tom Hengl – We should reward the stewards of the land like we celebrate Olympic champions	4 March 2025	1730	Link

Table 4.3: Podcasts on AI4SoilHealth YouTube (long form)

Title of podcast	Listens to date	Link
Alfred Grand: Why an Austrian farmer and researcher trained by earthworms is very excited about AI	143	https://www.youtube.com/watch?v=phhjF1KQLBY
From EU Soil Mission to Pope Francis, how to change local and state agriculture and food policies	37	https://www.youtube.com/watch?v=s0mpCcC7Dkc
Bridget Emmett: A conversation with one of the leading soil scientists in Europe	73	https://www.youtube.com/watch?v=p9aZkk4pbVY
Jason Hayward Jones podcast: The transition to regenerative agriculture and how technology can help	38	https://www.youtube.com/watch?v=2nNBJ4dKOE4
Paul Clarke: How AI, smart machines, digital twins and modelling can revolutionise food production	46	https://www.youtube.com/watch?v=ZljF-VYLwDs
Tom Hengl: Why don't we celebrate the champions of land restoration?	39	https://www.youtube.com/watch?v=_VW7B7wlVoM

2. Science communications videos

One of the most effective communication mediums has been video. Videos have been successful on all platforms but LinkedIn has achieved the most video views.

Table 4.4: Total video views across platforms

	YouTube shorts	**LinkedIn**	**X**	**Total across all platforms**
Total views across all videos	4,342	64,454	4,688	73,484

Shared on YouTube

Soil health awareness campaign films posted on YouTube Shorts Figure 4.1

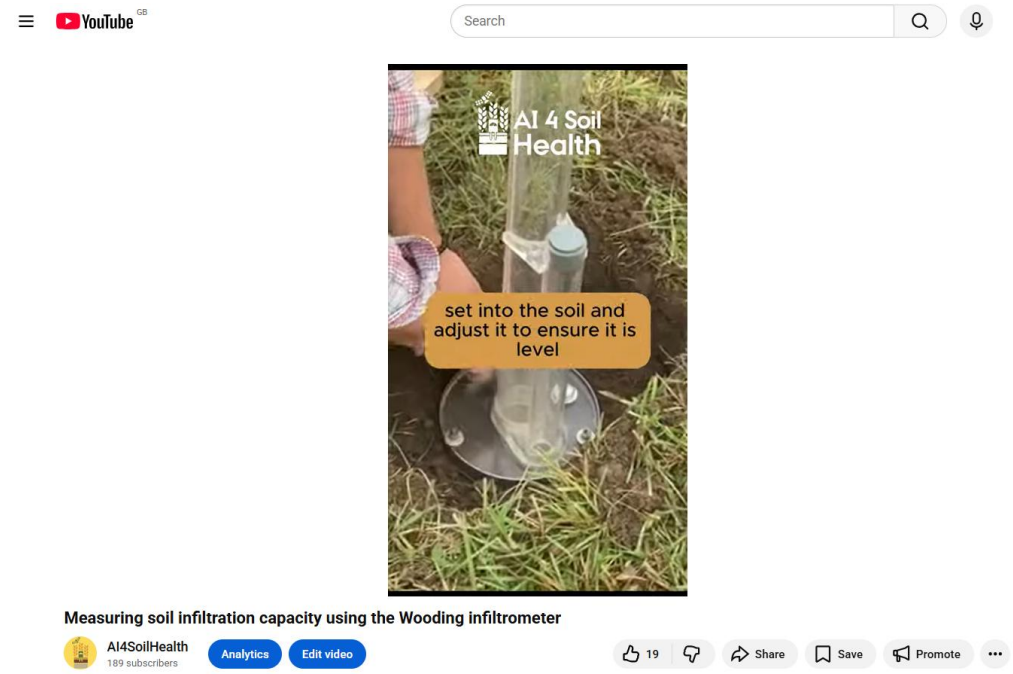


Figure 4.1: Example of Soil health awareness campaign film

Table 4.5: Video topics and outreach

Video topic	Views	Likes	Impressions	Link
Measuring soil infiltration capacity using the Wooding infiltrometer	1095	19	4562	Link
How to nail a soil bulk density measurement	721	7	3928	Link
Measuring soil infiltration with the Beerkan Method	585	6	4372	Link
Analysing soil aggregate stability using the SLAKES app	281	6	1807	Link
Measuring soil respiration using an infrared gas analyser	202	7	949	Link
An introduction to soil salinisation in deltaic regions	198	6	713	Link
How to take a soil sample in salt affected areas	191	7	626	Link
How to read a soil horizon	182	8	1279	Link

How can we help soil managers use the latest soil science?	154	8	648	Link
How our Croatian pilot site processes saline soil samples in the laboratory	151	6	427	Link
Join soil scientists in the field in Sweden	116	4	870	Link
How to plan soil sampling in salt affected areas	76	6	518	Link
What can soil microbes teach us about rotational grazing?	72	3	590	Link
Chemical vs biological indicators for soil health	69	1	627	Link
How farmers can use biological soil sensors	59	1	507	Link
Join soil scientists in Wales at the Plynlimon Research Catchments	53	1	561	Link
Why understanding biology is critical for monitoring soil health	50	0	430	Link
Why its important to measure soil biology	49	1	458	Link
New tools advance understanding of soil health	34	2	320	Link
Total	**4342**	**99**	**24204**	

Shared on LinkedIn

Soil health awareness campaign films posted on LinkedIn (Figure 4.2)

Figure 4.2: Soil health awareness campaign films posted on LinkedIn

Table 4.6: Video topics and outreach of films posted on LinkedIn

Video topic	Impressions	Likes	Comments	Video views	LinkedIn URL
AI 4 Soil Health's revolutionary Soil Health Data Cube …	2687	64	0	1013	Link
Want to see how well water moves through your soil? 💧 Soil infiltration capacity is crucial …	100381	458	9	57201	Link
How much do you know about bulk density?...	1405	22	1	503	Link
Want to know more about soil salinisation in deltaic regions? The team in Croatia's Neretva River Delta explore the topic in this new video…	837	19	1	3343	Link
Curious about how to take a soil sample in salt affected areas? …	647	12	0	289	Link
Want to know how to plan sampling in saline soil?...	857	13	0	311	Link
New tools for understanding soil biology, such as metagenomics…	983	22	0	507	Link
Soil organisms are like the residents of a city. When you want a quick way of finding out the quality of a city, you ask them. It's the same with assessing soil biology….	1394	31	1	1287	Link

Why is understanding soil biology critical for monitoring soil health?...	1257	19	0	0	Link
Biological soil sensors are an important device to help farmers and land managers understand how nutrients are cycled in their soil…	818	18	0	0	Link
Why is it important to measure soil biology?...	884	10	0	0	Link
Want a quick and simple way to measure soil infiltration? 🌱💧…	5874	171	6	0	Link
Soil aggregate stability refers to how well soil particles stay bound together…	1411	54	3	0	Link
How well does water move through your soil? 💧🌱…	7405	229	13	0	Link
Soil bulk density can, together with information on texture and organic matter content, indicate soil compaction status….	1355	40	1	0	Link
🪱 What can soil microbes teach us about rotational grazing?...	972	31	0	0	Link
Ever wondered what a soil scientist gets up to out in the field?...	836	33	0	0	Link

There's more life in a teaspoon of soil than people on Earth…	1402	35	3	0	Link
If you look at a vertical cross-section of soil, you will notice layers. These layers – known as the soil horizon…	3195	96	2	0	Link
🌰 The Plynlimon catchment in Wales is known for its stunning landscapes, but beneath the surface lies a world of fascinating soil science….	1006	31	0	0	Link
The Artificial Intelligence for Soil Health conference is almost here 🌍 📡 …	766	16	0	0	Link
If you're curious about AI's potential to revolutionise soil health, make sure to join the session on "novel in-situ and laboratory techniques to assess soil health" at the upcoming Artificial Intelligence for Soil Health conference….	996	23	1	0	Link
Total	**137368**	**1447**	**41**	**64454**	

Shared on X

Soil health awareness campaign films posted on X (Figure 4.3).

Figure 4.3: Example of film posted on X

Table 4.7: Video subjects and outreach of films posted on X

Video subject	Video Views	Impressions	Engagements	Likes	Comments	Link
This is probably the most sophisticated soil health modelling framework to date	756	2,198	173	42	0	Link
How well does water move through your soil	737	1,758	118	43	0	Link
Want a quick and simple way to measure soil infiltration?	418	1,089	110	46	1	Link
Want to know how to measure soil infiltration with a Wooding infiltrometer?...	373	861	56	25	0	Link

Measuring soil bulk density can indicate soil compaction status…	309	654	24	5	0	Link
The Plynlimon catchment in Wales is known for its stunning landscapes….	223	720	31	10	1	Link
By creating new #soilhealth tools we want to support the farmers…	218	592	79	13	0	Link
The Artificial Intelligence for Soil Health conference is almost here…	184	560	46	8	0	Link
If you look at a vertical cross-section of soil, you'll notice layers…	175	396	33	13	0	Link
Why is it important to measure soil biology…	173	488	48	11	1	Link
Want to explore our Soil Health Data Cube?…	169	460	32	7	0	Link
Curious about AI4SoilHealth's potential to revolutionise soil health?...	159	573	34	3	2	Link
Interested in how AI can help protect and monitor soils?...	129	554	39	9	0	Link
Soil organisms are like the residents of a city. To assess soil health, we find out if theyre thriving in their city of soil…	93	253	15	7	1	Link
Ever wondered what a soil scientist gets up to out in the field?...	89	244	11	6	0	Link
Join us for a free webinar exploring how AI…	81	257	16	3	0	Link

AI 4 Soil Healths Soil Health Data Cube…	70	186	27	13	1	Link
Want to know more about #SoilSalinisation in deltaic regions?...	70	179	6	4	1	Link
Want to know how to plan sampling in saline soil?...	69	200	11	5	0	Link
Soil aggregate stability refers to how well soil particles stay bound together…	69	173	11	4	0	Link
What can soil microbes teach us about rotational grazing?...	66	187	15	8	0	Link
Just like us, soil microbes live, breathe, and leave traces of their activity….	58	191	16	6	1	Link
Curious about how to take a soil sample in salt affected areas?...	56	141	2	1	0	Link
"Innovations are shifting the paradigm from the physical chemical assessment of soil health…	51	141	11	4	0	Link
For farmers and land managers, its important to understand how nutrients are cycled in #soil…	50	170	6	2	0	Link
Today is the International Day for Biological Diversity!...	49	220	3	1	0	Link
Were back from soil sampling @FarmWoodoaks…	46	111	14	4	0	Link
Understanding soil biology is critical for monitoring #soilhealth…	18	43	1	0	0	Link
Total	**4688**	**12,773**	**951**	**291**	**9**	

3. Offline materials for stakeholder engagement at events

Postcards, flyers and leaflets have been an excellent way of engaging with stakeholders at international and local events.

Table 4.8: List of offline materials

Name of material	Format	Rough number disseminated at events e.g. Mission Soil Week, Groundswell Agriculture, etc
Building a robust soil health indicator selection framework for Europe	A6 card	300
Understanding status and change in Europe's soils	A6 card	300
What are the soil sampling methods of the future?	A6 card	300
SOIL HEALTH NOW! (event promo card)	A6 card	200
Artificial Intelligence for soil health International Conference (event promo card)	A6 card	200
Business card	Business card	Unknown
Harnessing AI to enable land managers to measure soil health	A5 leaflet	Unknown

4. Press and blogs

Press releases and blogs have been used to breakdown the technical language in published science into readable and accessible content which relays useful knowledge to non-academic audiences. This is then amplified by digital and media campaigns.

Table 4.9: List of press releases and blogs

Title of blog/press release	Reach to date	Link
new-map-of-soil-health-set-to-revolutionise-how-we-manage-soil-in-europe-and-allow-us-to-peer-into-the-future	927	https://ai4soilhealth.eu/new-map-of-soil-health-set-to-revolutionise-how-we-manage-soil-in-europe-and-allow-us-to-peer-into-the-future/
artificial-intelligence-to-support-european-transition-to-healthy-soils	742	https://ai4soilhealth.eu/artificial-intelligence-to-support-european-transition-to-healthy-soils/
how-edna-reveals-hidden-life-in-soil	664	https://ai4soilhealth.eu/how-edna-reveals-hidden-life-in-soil/
the-scientific-challenge-behind-ai4soilhealth	621	https://ai4soilhealth.eu/the-scientific-challenge-behind-ai4soilhealth/
a-new-approach-to-measuring-soil-organic-carbon	475	https://ai4soilhealth.eu/a-new-approach-to-measuring-soil-organic-carbon/

how-lucas-soil-is-supporting-eu-policy	449	https://ai4soilhealth.eu/how-lucas-soil-is-supporting-eu-policy/
new-in-situ-methods-for-soil-analysis-tested-at-swedish-pilot-site	295	https://ai4soilhealth.eu/new-in-situ-methods-for-soil-analysis-tested-at-swedish-pilot-site/
building-common-approaches-to-soil-investigation-across-europe	273	https://ai4soilhealth.eu/building-common-approaches-to-soil-investigation-across-europe/
a-framework-for-monitoring-and-assessing-soil-health-at-national-level	268	https://ai4soilhealth.eu/a-framework-for-monitoring-and-assessing-soil-health-at-national-level/
understanding-soil-with-spectroscopy-a-game-changer-for-sustainable-farming	241	https://ai4soilhealth.eu/understanding-soil-with-spectroscopy-a-game-changer-for-sustainable-farming/
innovation-to-protect-soil	231	https://ai4soilhealth.eu/innovation-to-protect-soil/
a-new-european-map-of-soil-water-retention-curves	174	https://ai4soilhealth.eu/a-new-european-map-of-soil-water-retention-curves/
ai4soilhealth-launches-in-denmark	161	https://ai4soilhealth.eu/ai4soilhealth-launches-in-denmark/
important-considerations-for-designing-digital-twins	140	https://ai4soilhealth.eu/important-considerations-for-designing-digital-twins/
the-hidden-wealth-of-soil-a-natural-capital-perspective	119	https://ai4soilhealth.eu/the-hidden-wealth-of-soil-a-natural-capital-perspective/
eu-soil-law-proposal-landed-in-brussels	85	https://ai4soilhealth.eu/eu-soil-law-proposal-landed-in-brussels/
soil-health-now-but-when-why-we-need-to-consider-the-timing-of-indicators-like-infiltration-in-forest-soils	82	https://ai4soilhealth.eu/soil-health-now-but-when-why-we-need-to-consider-the-timing-of-indicators-like-infiltration-in-forest-soils/
eastern-europes-soil-health-crisis-a-call-for-data-driven-solutions	87	https://ai4soilhealth.eu/eastern-europes-soil-health-crisis-a-call-for-data-driven-solutions/
europe-adopts-its-first-soil-health-law	10	https://ai4soilhealth.eu/europe-adopts-its-first-soil-health-law/
Total	**6,044**	

5. Website

The website continues to develop and now has over 50 pages dedicated to showcasing the outputs from the project as well as pursuing the scientific conversations that surround them. As of 1st November it has achieved over 47,000 unique page views from 157 distinct countries.

Total unique views across the website to date (1st November 2025): 47,216.

Table 4.10: List of campaign pages and outreach

Campaign page created	Page views to date (October 2025) since Jan 2023	Average time spent on page (minutes)	Link
Pilot sites	2,517	1:04	https://ai4soilhealth.eu/pilot-sites/
Soil Health Data Cube	1,760	1:52	https://ai4soilhealth.eu/soil-health-data-cube/
Novel in field soil sampling tools	952	1:26	https://ai4soilhealth.eu/novel-in-field-soil-sampling-tools/
robust-indicator-framework	704	1:28	https://ai4soilhealth.eu/novel-in-field-soil-sampling-tools/
Spain	284	1:12	https://ai4soilhealth.eu/spain/
England	261	0:54	https://ai4soilhealth.eu/england/
Denmark	249	1:03	https://ai4soilhealth.eu/denmark/
Switzerland	224	1:03	https://ai4soilhealth.eu/switzerland/
Netherlands	205	1:03	https://ai4soilhealth.eu/netherlands/
Sweden	203	0:36	https://ai4soilhealth.eu/sweden/
Croatia	193	1:09	https://ai4soilhealth.eu/croatia/
Greece	165	0:56	https://ai4soilhealth.eu/greece/
Italy	153	1:41	https://ai4soilhealth.eu/italy/
Finland	157	0:40	https://ai4soilhealth.eu/finland/
Germany	147	1:01	https://ai4soilhealth.eu/germany/
France	103	0:57	https://ai4soilhealth.eu/france/
Wales	96	1:37	https://ai4soilhealth.eu/wales/
Total/Average	**8,373**	**1:09**	

6. Social media

The soil health awareness campaign has driven impressive growth in reach and engagement for the AI4SoilHealth channels.

Table 4.11: Total outreach for social media channels

Social media channel	Impressions to date (October 2025)	Engagement to date (October 2025)	Clicks on links to date (October 2025)	Followers as of 1st November
LinkedIn	270,900	22,232	17,300	3215
BlueSky	Data unavailable	Data unavailable	Data unavailable	150
X	106,104	8,148	1,202	756
YouTube	46,790	160	n/a	191
Total	**423,794**	**30,540**	**18,502**	**4,312**

LinkedIn follower demographics

A snapshot of the top follower demographics (from new followers between October 2024 – October 2025) on LinkedIn to show the impact of our outreach strategy. While academia and research remain our top stakeholders, we are starting to collect significant numbers of people in environmental services, NGOs, farming and Government agencies.

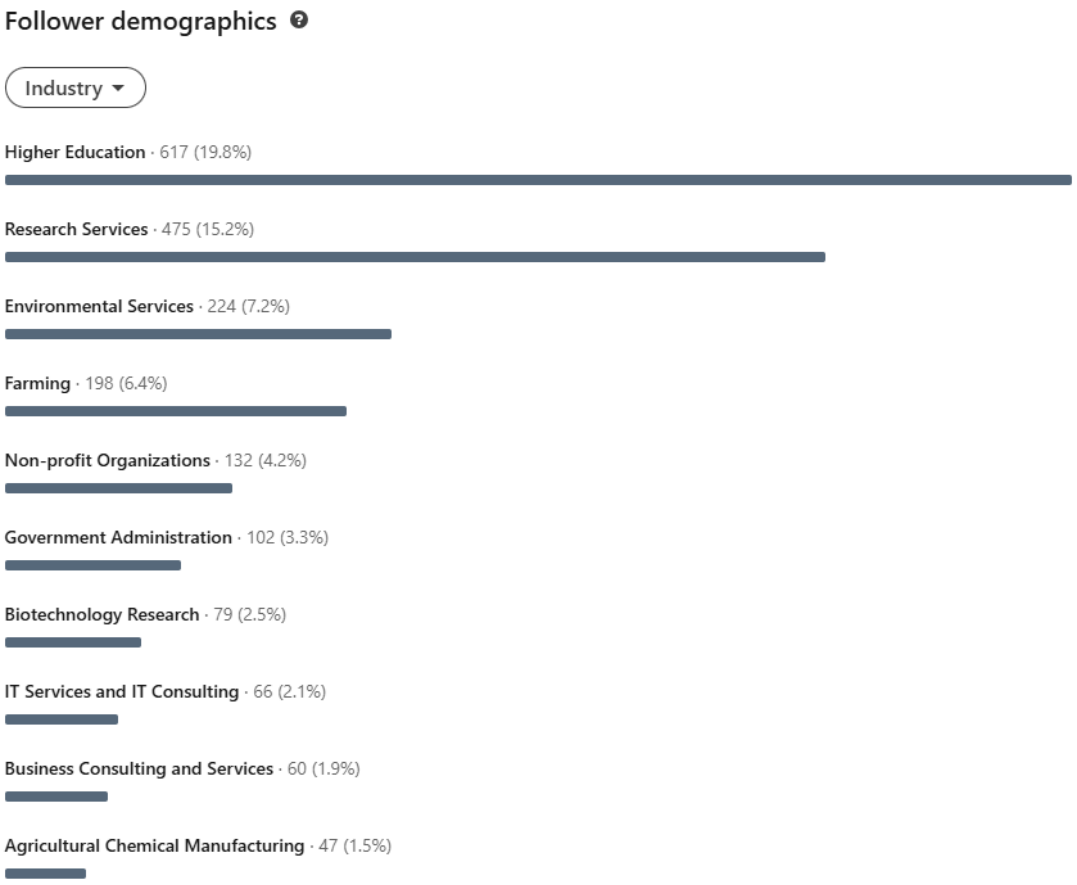


Figure 4.4: LinkedIn top follower demographics 1

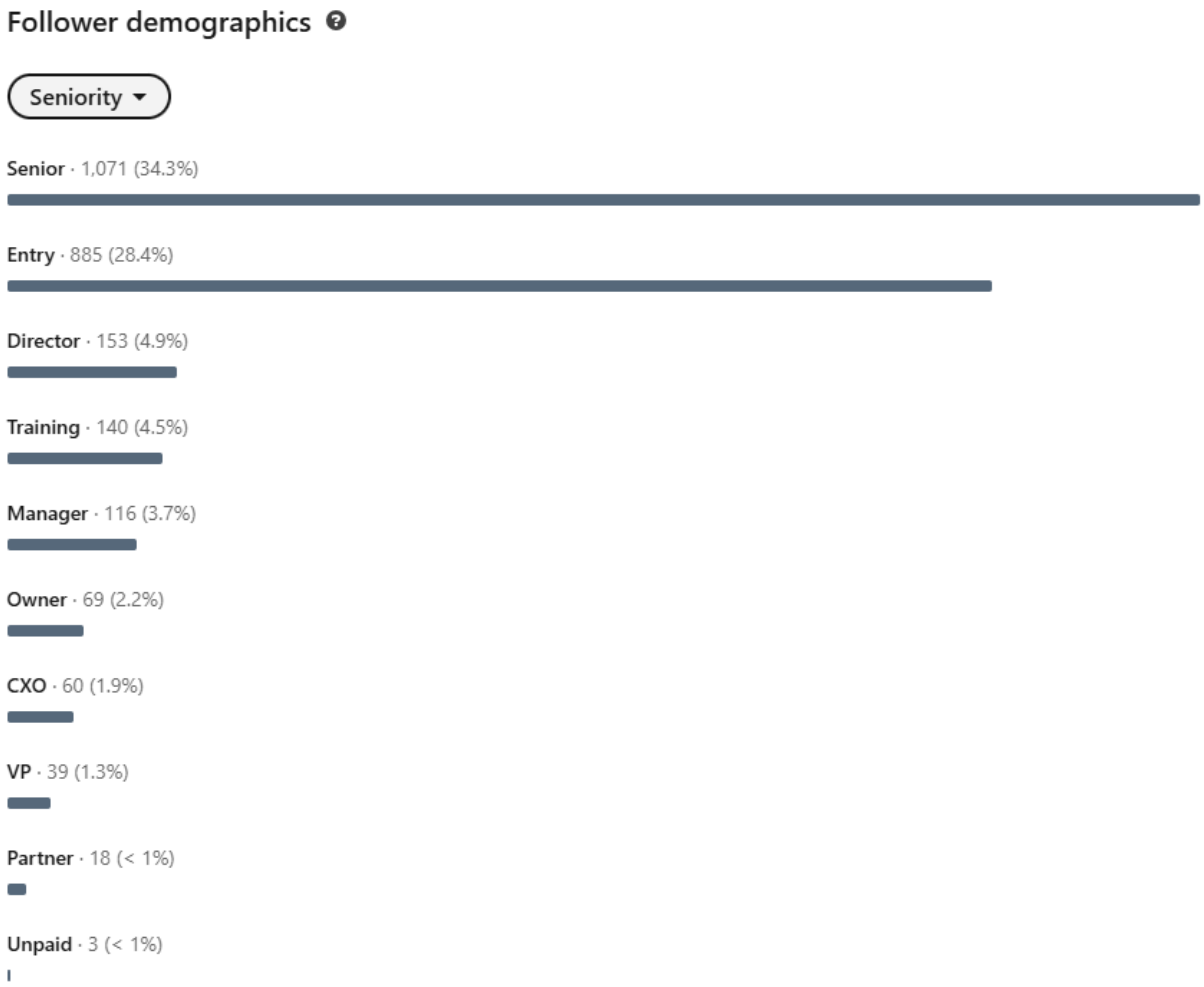
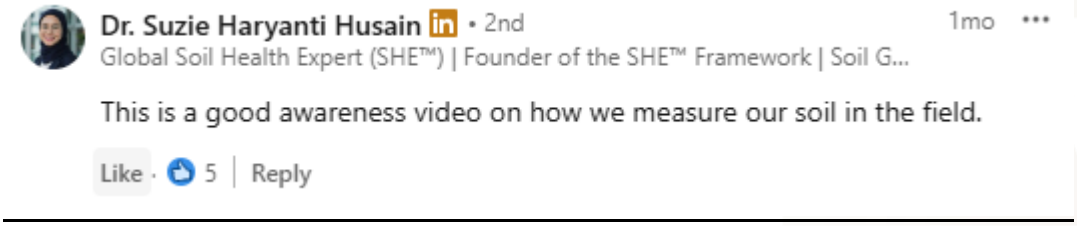


Figure 4.5: top follower demographics 2

Examples of comments and engagement on LinkedIn

LinkedIn has been a particularly impactful platform for discussion, and we have received over 106 comments on our posts from the soil health community. Below are a few examples:

On video about soil infiltration capacity



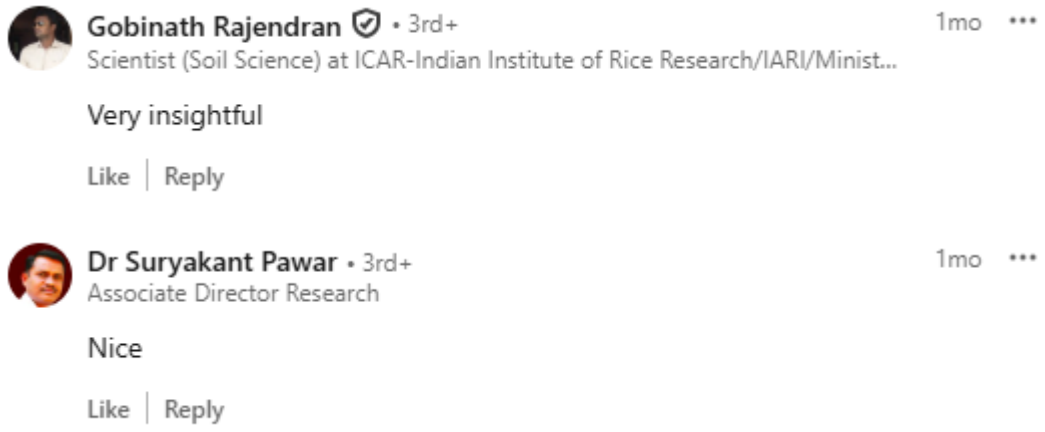


Figure 4.6: Example 1 of comments and engagement on LinkedIn – Soil infiltration capacity

On a video of the Soil Health Data Cube

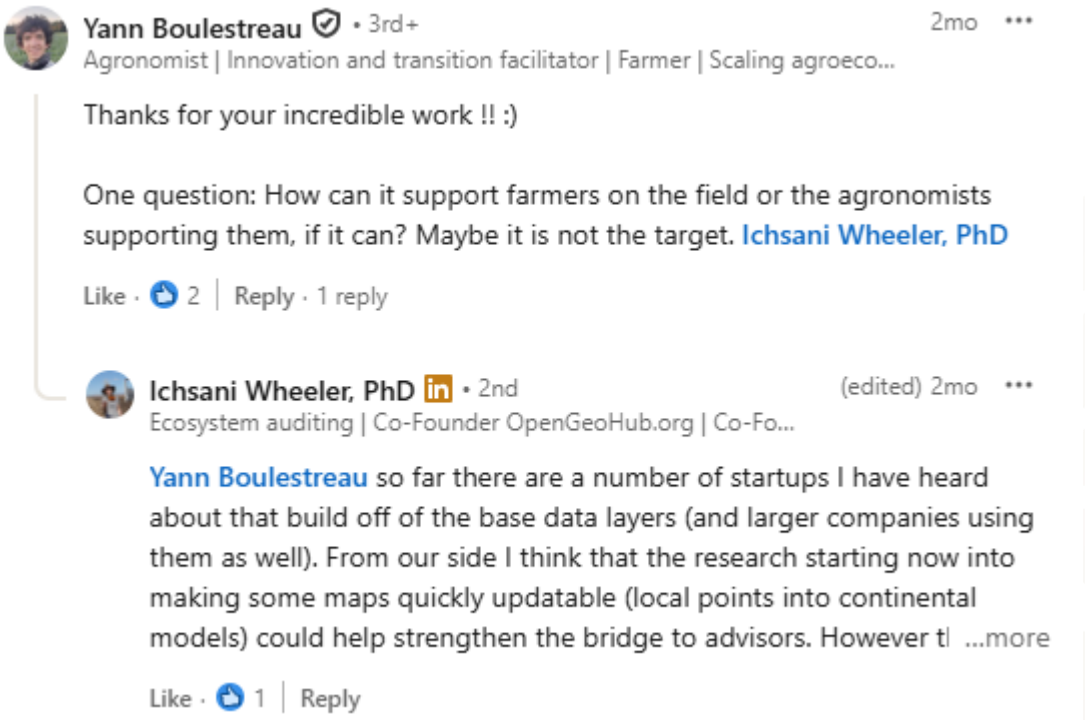


Figure 4.7: Example 2 of comments and engagement on LinkedIn – Soil Health Data Cube

On a post about spectroscopy:

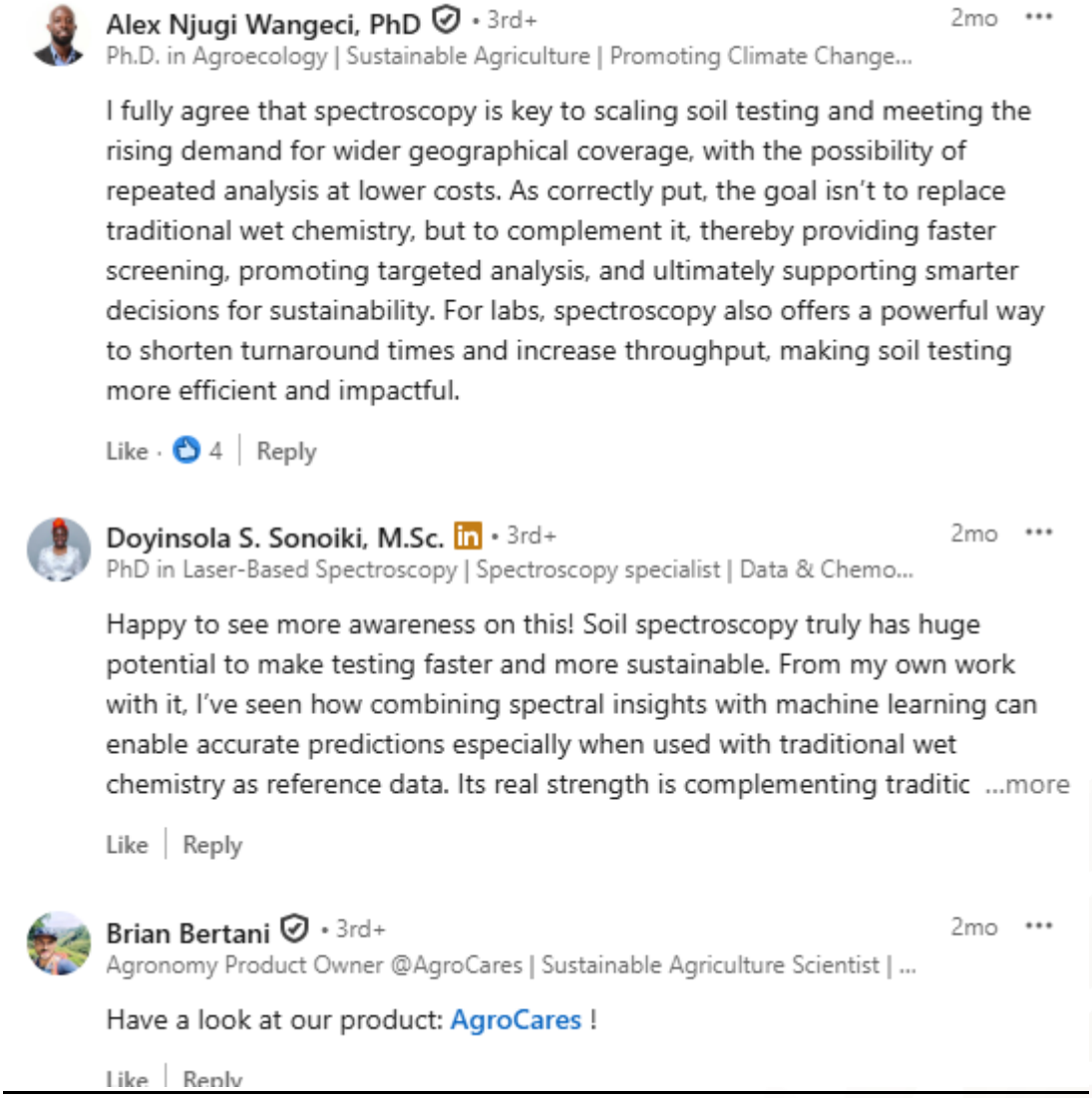


Figure 4.8: Example 3 of comments and engagement on LinkedIn – Spectroscopy

Top performing posts of partner organisations

Table 4.12 shows the top performing posts published by NEIKER.

Table 4.12: NEIKER top performing posts by social media channel

Social media channel	Impressions for AI4SoilHealth T.7.4 posts - to date (Oct 2025)	Engagement for AI4SoilHealth T.7.4 posts to date (Oct 2025)
LinkedIn	6226	107
Facebook	1860	37
Instagram	2681	134
X	2095	15
Total across all platforms	12853	293

Table 4.13 shows the top performing posts published by Open Geo Hub

Table 4.13: Open Geo Hub top performing posts by social media channel

Social media channel	Impressions for AI4SoilHealth T.7.4 posts - to date (Oct 2025)	Engagement for AI4SoilHealth T.7.4 posts to date (Oct 2025)
@OpengeohubFoundation (LinkedIn)	13,042	981
@Opengeohub (X.com)	3,787	216
Total across all platforms	16,829	1,197

7. Paid media (targeted ads)

We worked with science policy platform Open Access Government to disseminate the latest thinking on our key content pillars to a wider audience.

Open Access Government statistics

Overall reach of media where our articles appeared:

- Reach: 1,424,995

AI4SoilHealth banner on Open Access Government website:

- Reach: 1,048,391
- Clicks on banner leading to AI4SoilHealth website: 1,634.

Table 4.14: List of paid for articles and views

Title of paid for article	Page views	Link
Developing a robust soil health indicator selection framework	1,345	https://www.openaccessgovernment.org/article/developing-a-robust-soil-health-indicator-selection-framework/178004/
Soil health monitoring through iterative analysis of soil's past, present, and future	1,063	https://www.openaccessgovernment.org/article/soil-health-monitoring-through-iterative-analysis-of-soils-past-present-and-future/175424/
The dynamics of soil health	308	https://www.openaccessgovernment.org/article/the-dynamics-of-soil-health/182743/

4.5 Future plans for engagement in final year – 2026

1. Phase 2 of stakeholder mapping

Aim: Create a detailed map of key advisors, civil servants, environment agencies and other policy makers across all EU member states who will benefit from learning about AI4SoilHealths key scientific outputs – especially after the passing of the Directive on Soil Monitoring and Resilience.

2. Ongoing channel campaign

Aim: To continue to grow channels using authentic and practical content that translates complex issues into easily understood inspiration and knowledge.

3. Targeted advertorial content

Aim: To develop and place sponsored content in a selection of niche outlets read by the project's target audience (e.g. civil servants, environment agencies, policymakers).

4. New media

Aim: To use influencers and other forms of new media to reach 'easy to reach' and 'medium effort' stakeholders and inform them so they learn about and interact with AI4SoilHealth's scientific outputs.

5. Press and blog activity

Aim: To leverage the scientific outputs of AI4SoilHealth to secure high-trust, editorial coverage in specialist EU and environmental media, validating the project's work and directly informing key policy contacts who rely on these outlets for news.

Key areas of work:

1. Proactive press material creation (Press Releases, Opinion-Editorials, human interest stories).

2. Targeted media pitching and relationship management with specialist EU/environmental journalists.
3. Secure publication in relevant high-authority outlets.
4. App dissemination campaign

5. Conclusion

Engaging Soil Stakeholders Across Europe

AI4SoilHealth has implemented a broad set of stakeholder engagement, communication and capacity-building activities that collectively support greater awareness and understanding of soil health monitoring across Europe. Through coordinated efforts, concentrated especially in Work Packages 2, 3, and 7, the project has built a growing community focused on soil indicators, digital tools, and evidence-based policymaking.

Who We've Reached

The project has connected with a wide variety of stakeholders, including EU and national policymakers, civil servants, researchers, Living Lab practitioners, farmers, advisors, students, and engaged citizens.

Task 2.2 workshops in early 2025 confirmed the importance of these audiences and helped fine-tune stakeholder mapping, highlight engagement gaps, and align outreach strategies across related work packages. A five-part webinar series attracted 451 attendees from 68 countries, nearly half from research institutions and over 10% from government agencies.

Living Lab representatives from several EU Member States participated in workshops and trainings held in Brussels, Guadix, and Vitoria. The project also engaged with high-level EU bodies such as JRC, DG AGRI, and DG ENV through meetings and joint sessions.

A strong communications campaign further extended the project's reach via social media, press coverage, podcasts, and educational content with hundreds of thousands of impressions, views and website visits.

How We Engaged

AI4SoilHealth combined a range of engagement methods, each contributing to the accessibility and uptake of scientific outputs and designed to encourage meaningful interaction and promote understanding of soil health monitoring:

Webinars: Five interactive online events explored open data, indicator selection, monitoring approaches, AI modelling, and policy needs. Tools like Mentimeter helped presenters assess participants' backgrounds and track learning outcomes (e.g., average Soil Health Data Cube understanding increased from 1.95/5 to 3.56/5 during the first webinar).
Mission Soil Indicator Cluster: Collaborative sessions addressed indicator frameworks, scaling challenges, threshold setting, and alignment with policy priorities, bringing together expertise from across Soil Mission projects.
Living Lab Trainings: In-person and virtual sessions offered practical exercises in selecting indicators, sampling strategies, digital tools, and using data to guide land management.
Communications Campaign: Over 20 project videos generated more than 73,000 views, backed by blogs, podcasts, press articles, printed materials, and social media activity that reached over 423,000 impressions.

Stakeholder Impact Calculator: Though still being populated, the tool is capturing key examples of engagement and communication across work packages.

What We've Achieved

The impact of these outreach efforts is already visible:

- Participants reported increased understanding of soil health tools demonstrated by webinar learning metrics and consistent positive feedback after events (average event satisfaction 4.56/5).
- Engagement in project activities from significant government agencies and EU-level bodies, including JRC, EUSO, Environment Agencies and ministries from several countries.
- Strengthened harmonisation efforts through the Indicators Cluster, which addressed indicator selection, scaling, and policy alignment across 40 projects.
- Living Lab teams developed practical skills in soil health monitoring, especially in applying indicators across different contexts and scales.
- The communications campaign helped share scientific insights with a wider audience through digital campaigns, press articles, podcasts and blogs, increasing visibility among targeted audiences and broadening awareness of the project's goals and outcomes.

Lessons Learned

Feedback from participants to the project's outreach events and activities has highlighted some opportunities for improvement:

- Many asked for longer sessions with more real-world examples and live demonstrations.
- Clearer summaries and takeaways at the end of events were requested.
- Attendees suggested more expert-to-expert interaction during sessions.
- A need for more national-language events and better audience targeting was identified, , particularly around pilot-site events and tool demonstrations.
- Documentation and systematic use of the Stakeholder Impact Calculator should be strengthened moving forward.

Next Steps in 2026

Looking ahead, AI4SoilHealth plans to:

- Deliver a four-part webinar series focused on EU policy.
- Create a template for pilot-site events to support local-language engagement and hands-on demonstrations.
- Continue collaboration across work packages to present new tools like the Soil Health Data Cube and share findings from pilot sites.
- Expand its communications reach through new media and targeted outreach strategies.

AI4SoilHealth has taken a holistic and multi-level approach to engagement, communication, and capacity building. The project has strengthened stakeholder understanding of soil health indicators, monitoring challenges and emerging AI-enabled methods. Through coordinated digital

communication, policy-focused events, scientific collaboration and practical training, AI4SoilHealth has contributed significantly to shared knowledge and practice within the Mission Soil community. By connecting science, policy, and practice, the project is helping build a stronger, more informed community dedicated to improving soil health across Europe.

6. Annexes

Envisioning the future of soil health monitoring **webinar series feedback from responses.**

What did you like most about the event?	What could be improved about the event?	What information, advice or tools, if any, are you likely to take from this webinar into your place of work? And how do you think it will impact your work?
Interactive using polls.		
clarity and openness	More detail on the satellite imagery, what it means and how it is being interpreted	I will share it with various other stakeholder groups that we are already working with recommending that they explore how it might help them in other contexts
It could be relevant to share the API integration codes to annexer functionalities, for example there is a page about the chemical reasons of various organic components that could harmonize with its tool providing a critical element to the analysis on the soils that its platform provides in an efficient way, and I consider there may be more similar practices than in last would strengthen its Platform Platform, obvious if possible. Thanks and discuss the discomfort.		The layers to work for analysis, thats great.
soil health data cube	Longer session with live examples, i.e. in the EcoDataCube	Not really sure about the impact yet, but the concept of Soil Health Data Cube is my take from this webinar
Being interactive with the audience using poll apps .		
Discussion and case studies.	Another 2 hours....	Reinforces for me how important monitoring is for soil health.
Effective handling of questions and the 55 participants	The timing in july is really too summer	I will share the project link in my linkedin page
About the third presentation on instruments		The various instrument to test soil management
extensive range of topics and issues. Interactivity on chat and menti	Maybe fewer presenters to focus more on each topic	Links to work of other participants. Opportunities to engage with wider programmes of monitoring soil health eg MicroBiometer

The diversity of expert perspectives and the clear emphasis on linking soil health monitoring to practical, policy-relevant outcomes. The presentations were well-structured, insightful, and easy to follow.	A brief summary or key takeaways at the end would help reinforce the main messages.	The emphasis on integrating management practices into soil health frameworks is particularly relevant to my research. It has inspired me to explore how AI-based monitoring can support evidence-based decision-making in sustainable land use.
Soil microbes	Help to our field advice	Impact of soil interaction of microbes
Mixture of different perspectives and relatively short presentations saving time for discussions		Soil data cube, new methods for soil monitoring
Interactive sessions, short and easy understanding presentations		New tools that have not been seen about soil DNA and tools associated with it.
The topic is very relevant.	Involve more experts.	I would like to improve my current work based on the is webinar.
How interactive it was. There was a lot of audience participation.		Information regarding process-based modeling is helpful for my master's thesis
Gave me ideas for my thesis, and also interesting ideas to develop later		SDP Value gives an insite about the Land use Condition
The really high quality and relevant science that was presented. There was also a balanced presentation of the potential of AI including limitations.	nothing	links to key references, the soil health framework, the EcoDataCube platform
Opportunities for future	The presentation structure	I will do research in it first
Coordination	Structure	Integration of Ai in Agriculture
Very interesting to hear the different perspectives as to what is going on - I am a recent resident of the UK setting up our company ops here (we operate in US, Canada, Aust) so very useful just to understand the state of play here and the objectives	Nothing - it was well run - interesting speakers, well moderated	as per 4 above
It was interactive	Providing certificate of attendance	Precision tools for soils data collection
Competent and diverse group of presenters.	More interaction and debate among experts.	Thoughts on how to build a soil health monitoring system for Europe.
Novel method of measuring soil enzyme activity		Employ soil enzyme measurements

New method shared by Sonia Meller from DIGITSoil	better description of potential target audience (it's really not easy to describe research of soil biodiversity and make the results digestible for broader audience)	soil enzyme assay methodology