

eip-agri
AGRICULTURE & INNOVATION



EIP-AGRI Workshop

Shaping the EU mission

'Caring for soil is caring for life'

WORKSHOP REPORT

20-21 October 2020



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1. Introduction

On 20 and 21 October 2020, the European Commission's Directorate-General for Agriculture and Rural Development (DG AGRI) and the EIP-AGRI Service Point organised an online workshop dedicated to the proposed EU mission 'Caring for soil is caring for life'. The aim of the workshop was to present the goals, objectives and targets of the mission and to get feedback from the participants on how to accomplish these objectives.

Soil is a non-renewable natural resource within the span of a human life, and a key component for many ecosystem services including biomass production and regulating nutrient and water cycles. It can serve as a large carbon sink and provide shelter for a very rich biodiversity out of which only 1% is known. Healthy soils are crucially important to produce healthy food and maintain agricultural productivity in the future. However, soils are under pressure, mostly due to unsustainable farming practices, contamination from industries, and indirect effects caused by climate change. As a result, up to 60-70% of European soils are currently unhealthy. This is a problem that needs urgent action.

"Climate change, biodiversity, food security, deforestation and land degradation go together. We need to change the way we produce, consume and trade. Preserving and restoring our ecosystem needs to guide all of our work."

Ursula von der Leyen, President of the European Commission

The European Commission (EC) identified restoring soil health in the EU and beyond as one of the areas for which a mission should be proposed under Horizon Europe. The Mission Board for Soil health and food, which is a group of high-level experts who are in charge of advising the EC on a specific mission, has proposed the mission: 'Caring for soil is caring for life'. This mission has a clear mandate to support sustainable soil use and management throughout the Union and beyond.

The overarching goal of the mission is that at least 75% of all soils in each Member State are healthy or show significant improvement by 2030. This will be achieved by accomplishing eight objectives that are strongly interlinked:

1. Reducing land degradation and desertification, and restoring 50% of the degraded lands;
2. Increasing soil organic carbon (SOC) stocks in forests, pastures, wetlands, and increasing it by 0.1-0.4 % / year in cultivated lands. Reducing carbon (C) loss in managed peatlands by 30-50%;
3. No net soil sealing (switching from 2.4% of existing rates to no net sealing, and increasing the current rate from 13% to 50% by 2050 on the re-use of urban lands);
4. Reduce soil pollution and enhancing restoration, reducing the land areas threatened by pesticides and contaminants by a further 5-25%, reducing nutrient losses by at least 50%; reducing fertiliser use by at least 20%;
5. Preventing soil erosion by 30-50%;
6. Improving soil structure to avoid compaction;
7. Reducing the EU global ecological footprint by 20-40%;
8. Increasing soil literacy in schools, training facilities and food consumer choices.

Soils are an integral part of the [European Green Deal](#), the [Farm to Fork strategy](#), [Biodiversity Strategy 2030](#), and [European Climate Law](#). These include actions to protect soils and meet the Sustainable Development Goals (SDGs), and ensure land degradation neutrality. The Farm to Fork strategy addresses soil pollution with a 50% reduction in the use of chemical pesticides, a 20% reduction in fertiliser use, and a decrease of nutrient losses

by at least 50%, putting forward 25% of the EU's agricultural land as organically farmed by 2030. The Biodiversity Strategy has the ambition to limit urban sprawl, reduce pesticide risks, make progress in the remediation of contaminated sites, and reduce land degradation. The maintenance of wetlands and the enhancement of soil organic carbon are also addressed in the European Climate Law. The EU Soil Observatory (EUSO), which was launched on 4 December 2020, will be crucial for collecting policy-relevant data and developing indicators for the regular assessment and progress towards the ambitious targets of the Green Deal regarding soil health. The Mission Board has set the main goals, designed a work plan, and defined research and innovation needs, which will provide the framework for the mission's activities. **The successful implementation of the mission's objectives will require a supportive environment that includes public policies, incentives, investments, information, society and the endorsement of a multi-stakeholder bottom-up approach in each phase of the proposed mission.**

The European Commission (DG AGRI) and EIP-AGRI Service Point joined forces to organise this online workshop to introduce the goals of the EU proposed mission and to consult primarily farmers and foresters, along with advisers and other stakeholders from different regions of Europe. Prior to this workshop, the mission itself organised a large public consultation survey which received more than 2 500 contributions. The same logic was also implemented by the workshop, which provided a platform for ample consultation, debate and fruitful suggestions for co-implementation.

The event consisted of plenary sessions, followed by interactive debates in smaller groups where participants had more in-depth discussions. This approach provided the opportunity to learn more about the Work Plan of the proposed mission as well as about some of its major building blocks. These include research and innovation priorities from practice, Living Labs and Lighthouse farms, and the creation of a supportive environment for implementing the mission's objectives. After each session, participants actively exchanged ideas, which are thoroughly reported on in this document.

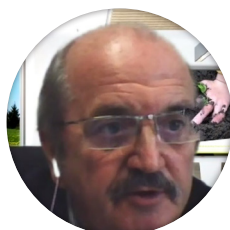
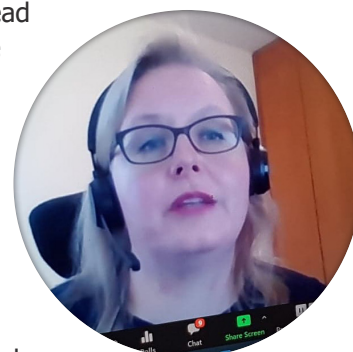
Prior to the opening of the workshop, a questionnaire was distributed to all participants. Their responses helped to generate constructive discussions on the goals, targets, objectives and the methods of implementation of the proposed mission, including shortcomings and feedback. The results of the questionnaire are reported on in [Annex 1](#).



Part I: Introduction to the online workshop and to the EU mission 'Caring for soil is caring for life'

Opening of the workshop

The workshop was opened with a welcome address by **Kerstin Rosenow** (Head of Unit B2 – Research and Innovation, DG AGRI) who explained the roles of the EU missions as new instruments for research and innovation under the Horizon Europe programme. Their main objective is to strengthen the links between research, policy and society. To design specific missions, the EC was supported by Mission Boards. In the case of the mission area Soil health and food, the Mission Board was composed of high-level experts who had been selected among research, farming, innovation, and business communities. Kerstin Rosenow emphasised the importance of soil health, which is essential to reach the objectives set by various EU initiatives, and to respond to major challenges of the other mission areas, such as cancer, climate change, ocean and water, and sustainable cities.



Pacôme Elouna Eyenga (Team leader, EIP-AGRI Service Point) welcomed participants, and **Pandi Zdruli** (EIP-AGRI Service Point and Coordinating Expert for the workshop) presented the results of the questionnaire.

Introduction to the EU mission 'Caring for soil is caring for life'

Prof. Bridget Emmett (Head of Soils and Land Use at UK Centre for Ecology and Hydrology, and member of the Mission Board for Soil health and food) introduced the proposed mission's objectives, goals and targets, which could be met only by endorsing and implementing a **new approach that considers soils as dynamic living systems and essential part of the ecosystems and landscapes**. Furthermore, she explained the specific actions defined by the proposed mission. These include **increasing soil organic carbon stocks, reducing erosion and compaction, no net sealing, restoring polluted sites, reducing the use of chemical fertilisers and pesticides, increasing organic farming areas, and improving soil literacy for schools and citizens at large**. Finally, she stressed that soil health should be monitored continuously and in a harmonised way. The mission has also identified five building blocks and supportive actions that are necessary to reach success. They include:



- ▶ a cross-scale inter- and transdisciplinary Research & Innovation (R&I) programme;
- ▶ co-creating knowledge and testing solutions in Living Labs and Lighthouses;
- ▶ a consistent set of 8 indicators to monitor soil health;
- ▶ training, education, communication and citizen engagement embedded in all activities;
- ▶ and a supporting environment that includes public policies, incentives, investments and soil-relevant information.

Breakout session 1: Feedback on the mission goals and implementation

Following the introductory presentation, breakout sessions were organised for participants to discuss the proposed mission and its implementation strategy in smaller groups. Participants discussed in detail: the feelings and emotions they have towards the proposed goals, the values they see in them, possible drawbacks and points of improvement. The main ideas raised during the discussions were often interlinked, showing the interconnectivity of issues dealing with soil health, such as carbon sequestration and no-till or reduced tillage. The main outcomes of the breakout sessions are summarised below.

Regarding the feelings on the proposed mission, participants were very enthusiastic that soil is finally receiving the attention it deserves. Given its importance for the sustainable development of the forestry and agricultural sectors, and the urgency that is imposed by the impacts of climate change and human activities on soils. Yet, some of the participants were also skeptical, as they considered some of the proposed mission's objectives too ambitious or unrealistic. Concerns were also raised about the general objectives of the mission, which may not address all the problems that EU soils are facing. To this regard, it was mentioned that soil dynamics are site-specific, and that this variability should be taken into account by the time solutions are provided. Therefore, caution is needed when promoting solutions that are based on specific practices, because these may not be as effective under different conditions.



Concerning the main positive aspects of the proposed mission, participants mentioned that it has clear, ambitious and measurable objectives that are linked to other EU strategic goals. These objectives allow the creation of indicators to measure the consequences that certain practices and habits have for soil health. They could therefore help to increase society's awareness on soils. Another positive aspect is that the mission has a multidisciplinary bottom-up approach and tries to involve all actors of the food value chain, as well as other chains, taking into account their interests to promote soil health. For example, farmers have an interest in keeping soils healthy because this supports farm productivity. In turn, consumers get healthier food from healthy soils. Participants also mentioned the importance of involving citizens in the mission, and raising their awareness on the consequences of consumption habits for soil health. Some participants indicated that education from early stages (primary schools) onwards is fundamental to achieve this objective. In addition, it has been pointed out that there is a political and social momentum to achieve the mission objectives, given the growing awareness on soil problems and their importance to the wellbeing of society.

Finally, it has been outlined that **there are already many good examples of keeping soils healthy while improving productivity, but these need to be better disseminated**. In fact, participants saw the increase in research and innovation efforts in the context of the mission as very positive. Moreover, soil health is a more understandable concept for farmers, because soil health is the basis for keeping farms productive. This can contribute to getting farmers engaged in fulfilling the mission's objectives.

In the group discussions, participants also identified some drawbacks of the proposed mission. First, some concerns were raised regarding the transition to sustainable soil management practices. This could take time, it is costly, complex and the benefits that pay back for this effort are mostly noticeable in the long term. This may discourage farmers to engage in accomplishing the mission objectives. Furthermore, many farmers work on rented land and they would be reluctant to invest money in improving soil health given that the land owner may terminate the contract and farmers can lose the investment. In addition, the proposed mission is foreseen for a 10-year period, which may not offer sufficient time for all the expected changes and impacts in soil health to be noticeable.

There were also concerns regarding organic farming. It was mentioned that the target to get 25% of farmland converted into organic farming is too ambitious. Consumer demand may not absorb this increase in offer, which could result in lower prices and economic losses for organic farmers. Furthermore, putting too much focus on organic farming as a solution may stigmatise conventional farmers, who form the majority and are in many cases already keeping their soils healthy. Therefore, conventional farmers should also get credit when they maintain or even improve soil health.

Another issue is that certain practices to improve soil health may create trade-offs. For example, no-till can increase the use of herbicides/pesticides, which can create soil pollution problems. In addition, putting too much focus on certain practices to improve soil health may be counterproductive, since they may not work or they may be difficult to apply in specific pedoclimatic conditions. Some participants were concerned that new technologies, such as no-till, minimum tillage, conservation and regenerative agriculture may not be profitable alternatives to some of the current management practices.

A number of participants mentioned that current farming systems are influenced by a number of factors, i.e. markets, subsidies, policies, lobbying, etc., which may hamper the change to more sustainable practices. Therefore, more research on social/political sciences would be needed to find ways to promote behavioural changes. Yet, **the proposed mission puts too much emphasis on technical research and neglects research on social issues**. Society's and farmers' lack of knowledge on the importance of soil health is also a drawback for change. More 'soil ambassadors' are needed to raise awareness on the topic. The usual top-down approaches adopted by politicians do not take full advantage of a bottom-up approach which mobilises society and farmers to promote soil health.

The possible solutions to problems that were previously mentioned by the participants entailed cooperation between all actors of the food value chain, as well as other chains, in order to raise awareness on the problems and to co-create possible holistic solutions. Living Labs were seen as a good initiative to provide a floor for cooperation between researchers and farmers, and to generate solutions at the local level, test them and spread knowledge on good practices to improve soil health. Other means to establish cooperation between farmers would be the creation of peer-to-peer learning schemes in order to exchange knowledge and experience. The establishment of channels to manage farm sources of organic matter at the local level and incorporating them into soil, could also create opportunities for knowledge exchange and cooperation. In any case, farmers cannot be asked to make the change on their own. They have to be supported and integrated in a long-term process led by research organisations. To this end, **farmers should be offered a wide range of possible solutions that could be integrated in their current practices and that could be adopted progressively in the long term. Some participants also mentioned that **improving local governance schemes to support farmers would be important.****

Another way of supporting farmers is by creating payments for ecosystem service schemes, which recognise the value of benefits generated by healthy soils, and provide sources of revenue for farmers who contribute to keeping soils healthy. Other economic incentives to support farmers can be provided through the Common Agricultural Policy (CAP), for instance through agro-environmental schemes, eco-schemes, enhanced conditionality. These incentives should be coupled with taxes that penalise practices that are unsustainable or that pollute soils. Furthermore, the CAP strategic plans should be used to support farmers who meet the proposed soil mission's objectives.

Participants pointed out that education and raising consumers' awareness on the importance of soil health are key issues. Activities such as community composting schemes could create more awareness about soil health issues among consumers, while the resulting compost could benefit the soils on farms, in which part of their food is produced. Participants also mentioned that consumers should be made aware of the costs and benefits of food that is produced on healthy soil. Soil health should be incorporated in agricultural training programmes, to increase young farmers' awareness and to acquaint them with possible solutions. These young farmers could act as multipliers and contribute to changing unsustainable management practices.

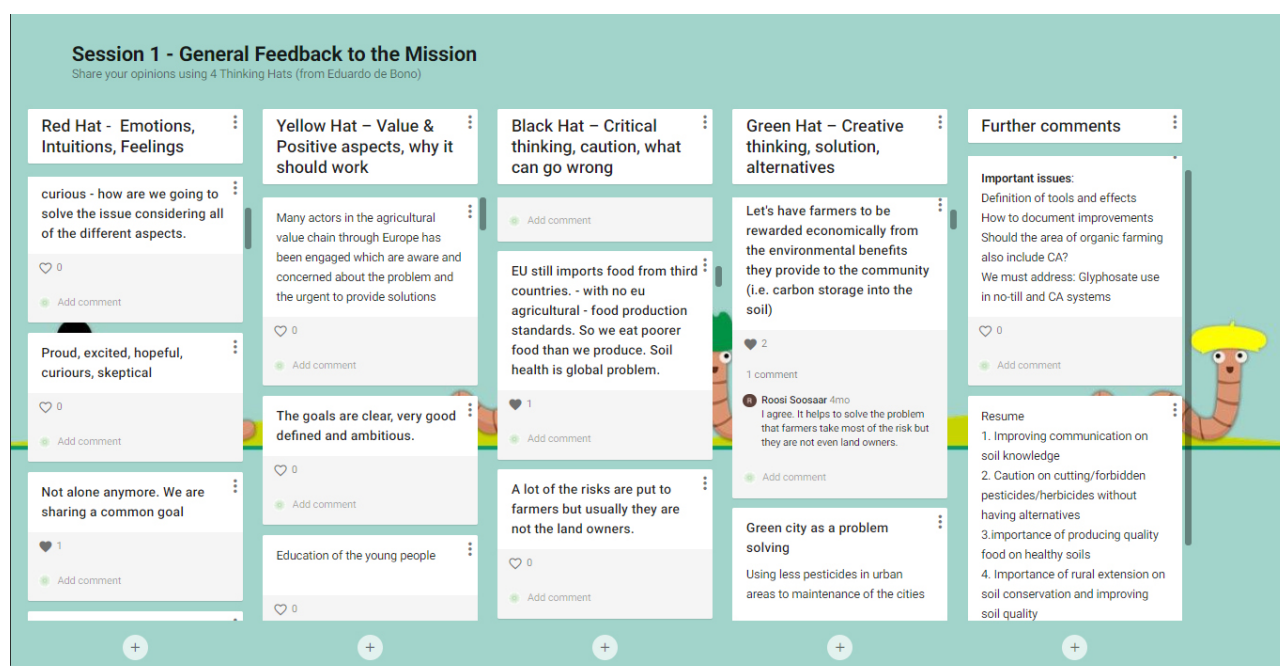


Figure 1: Participants used online 'padlets' to share their views and provide feedback on the proposed mission

Part II: Research and innovation needs

Introduction to the research and innovation needs proposed in the mission – from field scale to global level



Alfred Grand (organic farmer, Vermigrand, Grand Farm, member of the Mission Board for Soil health and food, Austria) presented the R&I needs put forward by the proposed mission from a farmer's perspective (See also the video from his farm: https://youtu.be/ZYON_aPSRgI).

In his presentation, Alfred Grand mentioned that even though plenty of knowledge is already available, it remains scattered and poorly integrated among various related disciplines. Therefore, there is the need to embark on systematic, interdisciplinary and transdisciplinary approaches to reach cross-scale integration and societal support. Furthermore, he elaborated on the Living Labs and Lighthouses, which are two of the main pillars of the proposed mission, and talked about his personal experience in running a lighthouse farm. Living Labs are spaces for co-innovation through participatory, transdisciplinary and systemic research, that allow stakeholders to work together to develop solutions and identify gaps in the knowledge on soil health. Lighthouses are places for demonstrating solutions, training and communication. It is very important to notice that Living Labs and Lighthouses will be key structures to identify research and innovation gaps, and to develop systems approaches in close collaboration with farmers and other practitioners. The proposed mission is based on **two fundamental dimensions. First, soil health should be measured and monitored, based on well-defined indicators and threshold values. And research should address various drivers of soil health, including management, farmers, social sciences, transition to sustainable land use, adaptation of advisory services to different levels and dissemination of existing best practices.**

Finally, Alfred Grand described the priorities (P) for each of the four building blocks. They comprise data availability and data platforms, identification of mechanisms that constrain implementation, and promoting implementation through Lighthouses (P1); Living Labs, incentives, markets, financial rules and policies, technological innovation, and collective actions at landscape level (P2); cooperation, co-creation of new markets, value chains and circular economy, supportive policies and incentives, communication, engagement mechanisms, and co-designing models for sustainable food production and less waste (P3); and creation of a Pan-European approach for soil health, improvement of soil monitoring systems, and providing open data platforms (P4).

Questions and discussions

Alfred Grand's presentation was followed by a number of questions and discussions. Primarily, it was emphasised that Living Labs and Lighthouses need to be implemented in a territorial approach involving a large number of stakeholders, including social scientists and not only farmers. Disseminating best management experiences in Living Labs and Lighthouses is crucial to convince other farmers to become part of the mission with their own farms, and to encourage them to share knowledge. Regarding soil health indicators, it was suggested that these should very carefully consider the ecological diversity and soil typology across Europe, because there is not a fit-for-all strategy that can equally work everywhere.

The main outcomes of the discussions are summarised as follows:

- ▶ Clarifying the role of Lighthouses and what they should provide for farmers;
- ▶ Soil health indicators should consider site-specific characteristics of soils that are very diverse throughout the EU;
- ▶ Citizen engagement should be based on cooperation between all stakeholders, and not in a one-direction flow of information (public opinion dictating what farmers should do);
- ▶ Establishing an online EU Advisory Service entity to assist all farmers on soil health management issues.

Interactive breakout session 2: Finding knowledge gaps and prioritising research needs from practice

After the introduction of the main research priorities identified by the Mission Board, participants discussed their relevance, additional important research needs that were not covered in the report, and how to achieve the proposed objectives. The outcomes of the discussions for each mission priority can be found below and in [Annex 2](#).

Summary of interactive breakout session 2

Priority 1: Integration and uptake of current knowledge

Overall, the priorities are pertinent and well-defined, but Living Labs and Lighthouses received most of the attention. However, further focus should be devoted to delivering quick and easy information to farmers. To reach this goal, the role of advisory services is also crucial, along with experience from other projects like EIP-AGRI Operational Groups and Horizon 2020 projects. The role of social sciences is also very important, especially when combined with political and cultural context that could constrain the uptake of already existing knowledge. Regarding the ways to achieve the proposed mission's objectives, participants suggested to combine agri-environmental measures with advisory services to facilitate the involvement of farmers. The suggestion for an online European Advisory service was reaffirmed. Initially this service could be in English, but later on it should also be in all EU official languages, in order to reach a broader audience in the Member States. Participants emphasised the efficiency of data platforms that should integrate and provide existing data in an effective and accessible way, through a close collaboration of various stakeholders. It was underlined that at present soil data are not easily available and understandable for farmers. Finally, it was highlighted that Living Labs and Lighthouses could play an important role in promoting soil health, by demonstrating crucially beneficial farming systems such as agro-ecological and organic farming practices, conservation agriculture, high nature value farming and land management, carbon farming, and sustainable and adaptive forestry.

The screenshot shows a Zoom meeting interface. On the left, there is a grid of 12 video thumbnails for participants from various countries (EE, PT, IT, ES, FR, NL, DE, UK, IT, ES, NL, DE). In the center, a chat window displays the following text:

LLs are definitely aligned and important. Translating the information from the projects into tools.

2. What other research and innovation needs exist? What is missing? (add to the list)
Linkage to the food (and therefore consumer) seems to be missing.
3. Which ones are more important? (3 votes each)
4. How to achieve these objectives?

Below the chat, there are sections for 'R&I Priorities':

a. Living Labs – Co-design and co-construction of demonstration platforms in farms, forestry and urban settings; innovative solutions and integrated local value chains which are immediately tested in a real-world setting. Includes novel crops, cultivars and their combinations; innovative organic and carbon farming; adaptive forestry practices supporting cropland, pastures and forestry biodiversity; exploration of the rhizosphere and soil biodiversity in restoration and novel remediation approaches; soil health and food quality; waste valorisation under a circular urban communities for urban greening.

b. Analysis, new design and monitoring of incentive, markets, financial, regulation and policy tools to prove what works where and why with respect to improving uptake of sustainable management practices. Assess models. Design, test and validate forms of collective actions and place based networks that effectively support business models in farm, forestry and other sectors.

c. Technological projects which develop and make operational new and existing proximal and remote sensors.

Priority 2: Accelerating innovation in technologies and practices

Priority 2 ranked first in all voting and evaluations of the respective groups. Particular interest was shown for Living Labs, which could be used as tools to disseminate information and to develop new innovative solutions that are immediately tested in a real-world setting. The main suggestions include:

- ▶ Crop diversification and inclusion of new cultivars and their combinations;
- ▶ Innovative organic and carbon farming;
- ▶ Adaptive cropland, pasture, biodiversity and forestry practices;
- ▶ Exploration of the rhizosphere and soil biodiversity including the microbiome;
- ▶ Soil restoration and novel remediation approaches;
- ▶ Soil health and food quality;
- ▶ Waste valorisation under a circular approach; and
- ▶ Engagement of urban communities for urban greening.

Discussions also pointed out the importance of an enabling environment to achieve the expected results. As farmers are not necessarily researchers, they must be convinced of the benefits of changing their farming practices, to ensure soil health and productivity.

In order to ensure the success of Lighthouses, it was suggested that they should be farmer-led or at least closer to farmers, as opposed to many current pilot farms that are run by fertiliser companies or research institutions. Also both Living Labs and Lighthouses should be well linked to the production system of the area.

The second most important priority identified is the need for technological projects that develop and make new and existing proximal and remote sensing technologies, agriculture machinery and Artificial Intelligence (AI) operational. It helps to further improve the tracking of soil health. Furthermore, remote sensing combined with AI is needed to process data in an efficient way and provide clear and easy-to-use tools.

Priority 3: Towards global resilience through circular bioeconomy and adaptation of food and biomass systems

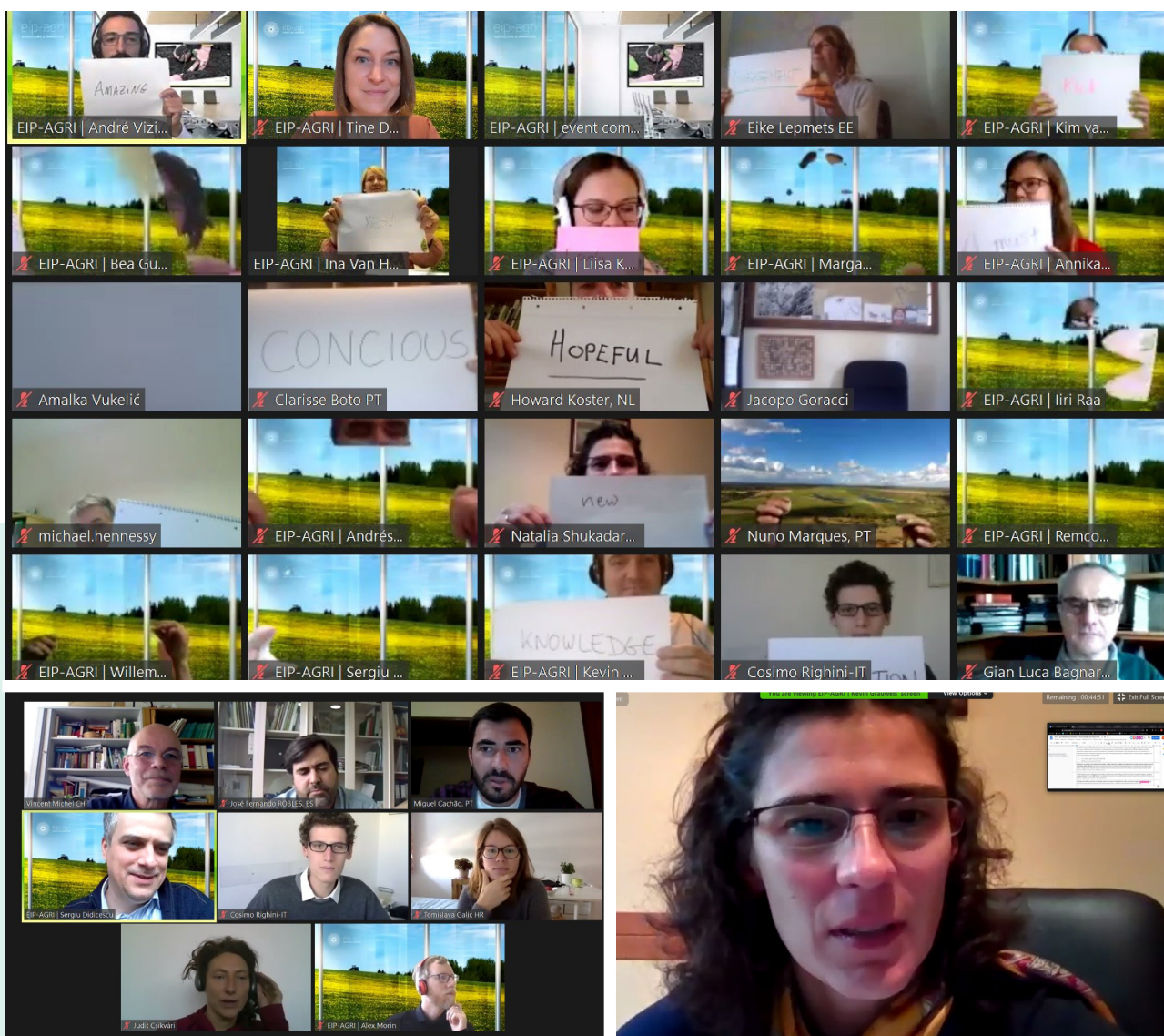
The EU is both a food importer and exporter. The proposed mission has clearly identified that, while improving European soil health, we should not contribute to land degradation in the rest of the world. The EU is committed to take action to fight climate change and contribute to sustainable development, through its commitment to the Sustainable Development Goals, the Paris Agreement and all other relevant international commitments. The participants of the workshop also recognised that the EU should not “export” soil degradation to the rest of the world. Apart from this international dimension, Priority 3 also has a number of sub-topics with great relevance to the implementation of the proposed mission. Among them, point d. (“Measuring the influence of agricultural practices (incl. soil management) on yield and crop performance and on the nutritional quality and safety of food and feed”) was ranked as the most important. One of the main concerns regarding this priority was the limited use of already available knowledge and equipment. This may be caused by moderate digital skills, and a lack of professional consultancy and assistance. It was also highlighted that, as soil issues are long-term, so should be the pilot sites and research projects that measure the influence of agricultural practices.

Discussions also focused on the support that farmers should receive from researchers and decision makers to be able to keep the soil healthy and increase yields. It should be noted that despite the fact that priority topics are well-defined in the mission report, several common issues were discussed in different groups due to their interconnectivity.

Priority 4: Next-generation monitoring and surveillance programmes

Discussions emphasised the need to link monitoring to the management of soil, and to establish very clear thresholds, standards and measurements, through a common approach. Europe has a great diversity of landscapes, climate, geomorphology and consequently soil types. Moreover, the status of soil information is not the same. Therefore, monitoring and surveillance systems should be tailored according to these characteristics. There are differences among Member States, as some countries are already in a very advanced status of soil monitoring and others are lagging behind and would need more assistance and investment. This was voted as the most important sub-priority. The LUCAS monitoring system is valid for the EU level, but must be accomplished with advanced and more detailed soil survey systems, that in many EU countries are either obsolete or missing. Moreover, soil sampling should be expanded also to deeper soil layers and not confined solely to the topsoil. Finally, the mission may need to consider developing a toolbox that is able to respond to local conditions since there is not one single solution that fits all.

For more detailed information on breakout session 2, please also see [Annex 2](#).



Part III: Living Labs and Lighthouse farms

Introducing the important role of Living Labs and Lighthouse farms in the EU proposed mission 'Caring for soil is caring for life'

Day 2 was opened with a presentation by **Alfred Grand**, who explained the concept of **Living Labs and Lighthouses** as spaces for co-innovation through participatory, transdisciplinary and systemic research. Their main purpose is to **bring all stakeholders, including consumers, together, and work jointly with researchers in various disciplines, to develop solutions and identify gaps in soil health maintenance.**

The proposed mission's ambition is to establish at least five, but preferably ten Living Labs and Lighthouses in each of the EU regions in the first years. It is expected that this will result in between 1000 to 2000 Living Labs and Lighthouses, serving as incubators of demonstration for change.

After the presentation, discussions were related to financial support to establish a Living Lab or a Lighthouse. It was clarified that they are mostly established without any external funding, on a voluntary basis. However, it was suggested that Living Labs and Lighthouses could also be created also in the context of research projects, such as Horizon 2020 or Horizon Europe, where some sort of funding could become available to conduct research. For example, the EU Horizon 2020 project Nutri2Cycle (<https://www.nutri2cycle.eu/>) is setting up 12-16 lighthouses around Europe, and another Horizon 2020 project called AgriDemo (<https://agridemo-h2020.eu/>) has a hub for demonstration farms (<https://farmdemo.eu/hub/>).

Living Labs are intended to co-design and co-construct innovative practices and research, based on a robust scientific approach beyond current knowledge, and including a wide range of activities. They bring together farmers, foresters, landscape managers, advisory services, bio-physical and social scientists, planners and policy makers as well as business people, educators and trainers. In contrast, **Lighthouses are places for demonstrating solutions, training and communication.** They showcase practices that are exemplary in terms of providing sustainable and healthy food, feed and fibre, while protecting ecosystems and linking them with local urban and rural communities. **Lighthouses are intended to demonstrate best management practices that improve soil health.**





Getting inspiration from existing Living Labs and Lighthouse farms

Agrilink by Herman Schoorlemmer

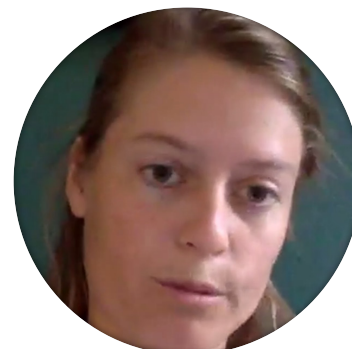
Agrilink (www.agrilink2020.eu) is a Horizon 2020 project that has established six Living Labs, with the intention to further expand this number. Two Living Labs were described in detail at the workshop – a Dutch and a Norwegian example. The goal of the Dutch Living Lab is to support sustainable maize production while reducing nitrate pollution, mostly in groundwater. This will enhance farmers' awareness on nitrate leaching. It will be accomplished through the active involvement of all stakeholders, including farmers, advisers, contractors and researchers. The main result is the creation of a Nitrate tour, which is based on the measurement of nitrate in the farmer's fields, and is followed by active discussions among all stakeholders. The next step is to use catch crops where each farmer develops and tests the results, and shares them with advisers so that the results can be widely disseminated.

The Norwegian Living Lab uses the same methodological approach regarding crop rotations. The aim is to improve the environmental quality of soil and water, and increase crop production. Another aim is to develop a new service to be delivered by advisers. The Living Lab focuses on crop rotations and its benefits, both for production and for the environment.

Finally, the dos and don'ts to consider when deciding to start a Living Lab were summarised. The dos include "be realistic". This means that it should be carefully evaluated what could be achieved, and that capacities, skills, needs and resources of all participants should be estimated. Progress must be checked and monitored, and skilled knowledgeable facilitators should disseminate results. Another "Do" is to use simple and clear language.

La Junquera by Yanniek Schoonhoven

La Junquera is a farm located in Murcia, South Eastern Spain (<https://lajunquera.com> – see [YouTube video](#)), characterised by a dry Mediterranean climate with an annual rainfall of 310 mm, high altitude of 1100-1500 m and alkaline soils. Its mission is to give an opportunity for farming and for creating a livelihood for farmers in the area, by endorsing and implementing the principles of regenerative agriculture. This is defined as a set of practices that increase biodiversity, soil quality, and water uptake by the plants, and that provides sustainable food production.



The innovative farming practices of La Junquera are based on an approach where a 'new' practice is first tried out on a small piece of land. If it works, it is implemented on a bigger scale. To make these practices accessible to other farmers, La Junquera has established the Regeneration Academy. This is a tool to regenerate land, increase production, disseminate and communicate knowledge, and provide a link for research and business opportunities. It consists of organising events and visits to the farm, combined with agro-experiences and 'Regeneration festivals'. Master students conduct research and internships for four months, while young entrepreneurs learn the basic principles of business, and local schools are invited to organise field visits that allow students to get to know soils, natural biodiversity, and regenerative farming practices. In this context, La Junquera is a real Lighthouse that has established collaboration with many research, education and rural development institutions, to share experiences and knowledge between farmers and researchers.



Lands at Dowth by John Gilliland

The Irish Devenish Lands at Dowth is a Lighthouse on a grassland farm. It started with the aim of changing the system of lamb and beef production, to make it more sustainable while maintaining profitability. To reach these goals the farm is implementing different actions, such as soil fertility management, measuring carbon, reducing nutrient losses, optimising biodiversity and managing a UNESCO world heritage site. One of the main problems that the farm had to address was poor soil fertility, which had been neglected for 40 years and was characterised by low pH (average 5.5) as well as low Potassium (K) and Phosphorus (P). Hence, a detailed soil sampling was conducted at 30 cm depth in 88 soil pits to estimate soil organic carbon. This showed a value of 2.1%, while the target was to increase it to 4 or 5%. The first action was to create a robust baseline on soil carbon and carbon in trees and hedges, by using LiDAR technology and by calculating carbon (t/ha) at biomass density in woods and hedges, calculating the total biomass at Dowth (t/C) and the carbon sequestration potential (t/C/Yr). Results are astonishing, and the farm is on the way to carbon neutrality through the implementation of sustainable grazing systems, and by planting hedges that increased root biomass and carbon stocks and, at the same time, infiltration and reduced water runoff. This prevented fields from getting damp, and therefore animals could graze for a longer time. The annual carbon sequestration at Dowth is estimated at 665 tonnes of CO₂ from above and below ground. Livestock density is used as parameter: to destock or not. Destocking can help to reach carbon sequestration objectives since the reduced number of animals allows for more biomass available, but this could impact food provision and profitability. Therefore, putting focus on soil carbon and on accelerating sequestration, e.g. through multi-species grasses, is a desired option. Good results were also reported by correcting soil pH from 5.5 in 2014 to 6.6 in 2020 through lime application. The Devenish Lighthouse is networking with many researchers and is accelerating knowledge creation and sharing. Organising peer-to-peer learning on the farm has had very positive impacts on accelerating uptake.

Interactive breakout session 3: Finding key components for successful living labs and lighthouse farms

Participants had the opportunity to discuss the possible ways of managing a Living Lab or a Lighthouse, and the needed prerequisites to make both the most effective.

Would you like to be part of a Living Lab or a Lighthouse? What would you get from it? What would be needed for a successful Living Lab or Lighthouse?

Most of the participants who provided feedback to the above questions mentioned that they would be willing to be part of a Living Lab or to become a Lighthouse farm. As the main potential benefits of Living Labs / Lighthouses, they identified knowledge exchange, peer-to-peer learning and networking opportunities, as well as receiving support to make decisions and find solutions. Others also mentioned that their visibility in the community would be increased and that they would offer a positive image towards consumers and thus have more access to different market opportunities.

Participants pointed out that Living Labs / Lighthouses should have a local perspective, and should contribute to testing and providing solutions to local soil health problems. Therefore, local farmers and local actors from several sectors should be involved in Living Labs / Lighthouses to provide support and agree on the measures to improve soil health at the local level. The actions of Living Labs / Lighthouses actions should have a community orientation

and contribute to raising awareness on soil health problems and on the need for restoration, by also providing education and dissemination activities. Bearing the local perspective in mind, some participants proposed to create Living Labs / Lighthouses in the framework of a local community, such as Community Cooperatives, Local producers or Biodistricts. In spite of the local perspective of Living Labs / Lighthouses, they should also disseminate their results and experience internationally by organising study visits.

Regarding the needs for establishing Living Labs / Lighthouses, participants identified funding, support from public institutions and research centres, a good methodological preparation and an understandable agenda with clear objectives to be addressed. This should also include training and provide rewards for involved farmers.

Are Living Labs / Lighthouses useful? How to make them most effective?

Most of the participants were supportive of the Living Lab and Lighthouse concepts. However, they highlighted that Living Labs / Lighthouses should also focus on forestry, because many forest land owners are not involved in agricultural activities and do not have easy access to innovation services. In fact, the proposed mission wants to go beyond Lighthouse farms, creating a concept of Lighthouses that is relevant for different types of soils, as in the case of forests, or urban land.

It was agreed in many groups that Living Labs should mainly test and provide solutions to soil health problems that are close to real conditions. Additionally, Living Labs should provide solutions to the problems of other sectors and should therefore also involve other actors from the food value chain (farmers, consumers, industries, researchers, etc.). Given that the solutions would be site-specific, Living Labs should work at a local scale and at field level. Living Labs should approach local soil health problems from a multidisciplinary perspective, involving all actors in a co-creation scheme to find solutions. They should work as innovation accelerators and venues for technical adaptation.

As regards to how Living Labs could be more effective to accomplish the aforementioned roles, participants stated that clear long-term plans with well-defined monitoring tools and indicators should be implemented. These plans should take into account the available resources, as well as the limitations of the local conditions that farmers face. The importance of the local scale and cooperation between actors of the food value chain was outlined, suggesting to create a wide network of Living Labs that covers the main environmental and soil conditions across Europe.

Lighthouses should be long term projects with an integrated perspective, and showcase several types of solutions that would address environmental, social and economic goals. They could also act as multipliers for other farmers to see how to adopt the solutions under local conditions. Therefore, Lighthouses would definitely need a local and territorial perspective. To increase the impact of Lighthouses in the region, it was suggested that farmers who are respected and known by their peers in the region would host the Lighthouse farms.

While Lighthouses are focusing on local conditions, many participants found that a large network of Lighthouse farms across Europe could further increase their effectiveness. Lighthouses should collaborate with research centres to test the good practices they are applying, and to affirm the solutions they are showcasing with convincing data. In this regard, indicators and benchmarks should be developed. Adequate funding should also be provided in order to avoid economic burdens to Lighthouse farmers (as for example, time spent on dissemination activities). In this line, advisory services should be created, to support the work of Lighthouses in disseminating the experience and knowledge they generate, or to set up stakeholder involvement activities. Lighthouses should also create networks of farmers who adopt good practices. This could provide a basis for applying standards and verification, and could optimise the adoption of these good practices. There should also be clear guidelines on the creation, functioning and monitoring of Lighthouse farms.

Part IV: Creating a supportive environment to implement the proposed soil mission

Introducing main priorities for action to support the goals of the proposed mission

In her opening presentation, **Prof. Bridget Emmett** strongly emphasised the importance of establishing a supportive environment to achieve the proposed mission's objectives. To reach these objectives, it was emphasised that there is a need to update existing policies and legislation, including financial de-risking, guarantee mechanisms, as well as public and private investments in soil health. In addition, the new CAP and its relevant aspects on soil health promotion should be implemented, along with the dissemination of Knowledge and Innovation systems for sustainable soil management.

Experience shows that agri-environmental policies that have been put in place in the past have achieved impact. For instance, sustainable management practices in drylands were able to reduce soil losses by 20-50% in the last 10 years, and they have reduced losses in arable lands by 20%. The introduction of cover crops has increased carbon stocks by 6%, and phosphorous reduction measures have reduced phosphorous losses by more than 50%.

The proposed mission has paid particular attention to establishing precise indicators to measure the success of soil protection policies. They include a number of biophysical, land cover and landscape / territorial indicators. If one of them is below the threshold value, the whole area is classified as unhealthy.

The policy framework is being updated particularly under the EU Green Deal, and the interest for soils is increasing. For instance, in 2021 the European Commission will launch the updated Soil Thematic Strategy, and also the new Common Agricultural Policy pays particular attention to soils. Finally, the very important role of training, education and communication activities to reach a large number of students, land managers, farmers, foresters, urban planners, practitioners, advisory services and citizens was emphasised.

Discussions after the presentation addressed the diversity of existing supportive soil policies throughout the EU, and the need to respond to their particular settings. It was underlined that despite the Soil Directive being withdrawn, the new updated Soil Thematic Strategy will fill in this policy gap. Furthermore, in 2021 the European Environment Agency (EEA) will release a new report on the Status of Soils in Europe, prepared in close collaboration with the Joint Research Centre (JRC) and the European Environment Information and Observation Network (EIONET). Mention was made also to the European Joint Programme – Soil, a big research project on soil. These are all indices that attention for soil health and management is increasing, and the hopes are that they will have a great impact towards meeting the proposed mission's overarching goal to make at least 75% of the EU soils healthy by 2030.



Interactive breakout session 4: Creating a supportive environment: prioritising needs for the successful implementation of the proposed mission

Breakout session 4 was sub-divided into 2 groups, to discuss the actions that need to be undertaken to support the implementation of the proposed mission, at the regional and the farm levels respectively.

Summary of interactive breakout session 4

Session 4A: Supportive environment for the proposed mission - What is needed in my region/country?

Three questions were put forward: A) "What do we have to let go / stop doing in order to implement the proposed mission"; B) "What do we need to start doing / do more in order to implement the proposed mission"; C) "What do you see as the main priorities for a supportive environment in your region / country".

A) "What do we have to let go / stop doing in order to implement the proposed mission?"

In answer to this question, people suggested that the CAP payment structure also focuses on measures that preserve and improve soil health, and that increased attention to soils is given in the EU. If compared with livestock, it is evident that soils have received less attention in the past at the EU level. Furthermore, the reduction of fertilisers and pesticides used in agriculture will have a better impact on soil health, which must include the whole soil profile and not only the topsoil. Finally, a comprehensive strategy that incorporates forestry, agriculture, landscape, and water management, would help to reach the targets proposed by the mission.

B) "What do we need to start doing / do more in order to implement the proposed mission?"

Regarding question B, the most useful and promising farming practices are crop rotations, cover crops, and incorporating crop residues in the form of compost into the soil. Furthermore, valorising local food, even in monetary terms, especially when it is produced with sustainable soil management practices, would enhance the implementation of the proposed mission. Engaging farmers and informing them about the positive aspects of the mission in regard to long-term sustainability of their farms would be a fruitful participatory approach. In addition, farmers should also get credit for carbon sequestration in their fields. Finally, reinforcing dissemination, training and knowledge exchange will fill the gap between science and practice.

C) "What do you see as the main priorities for a supportive environment in your region / country?"

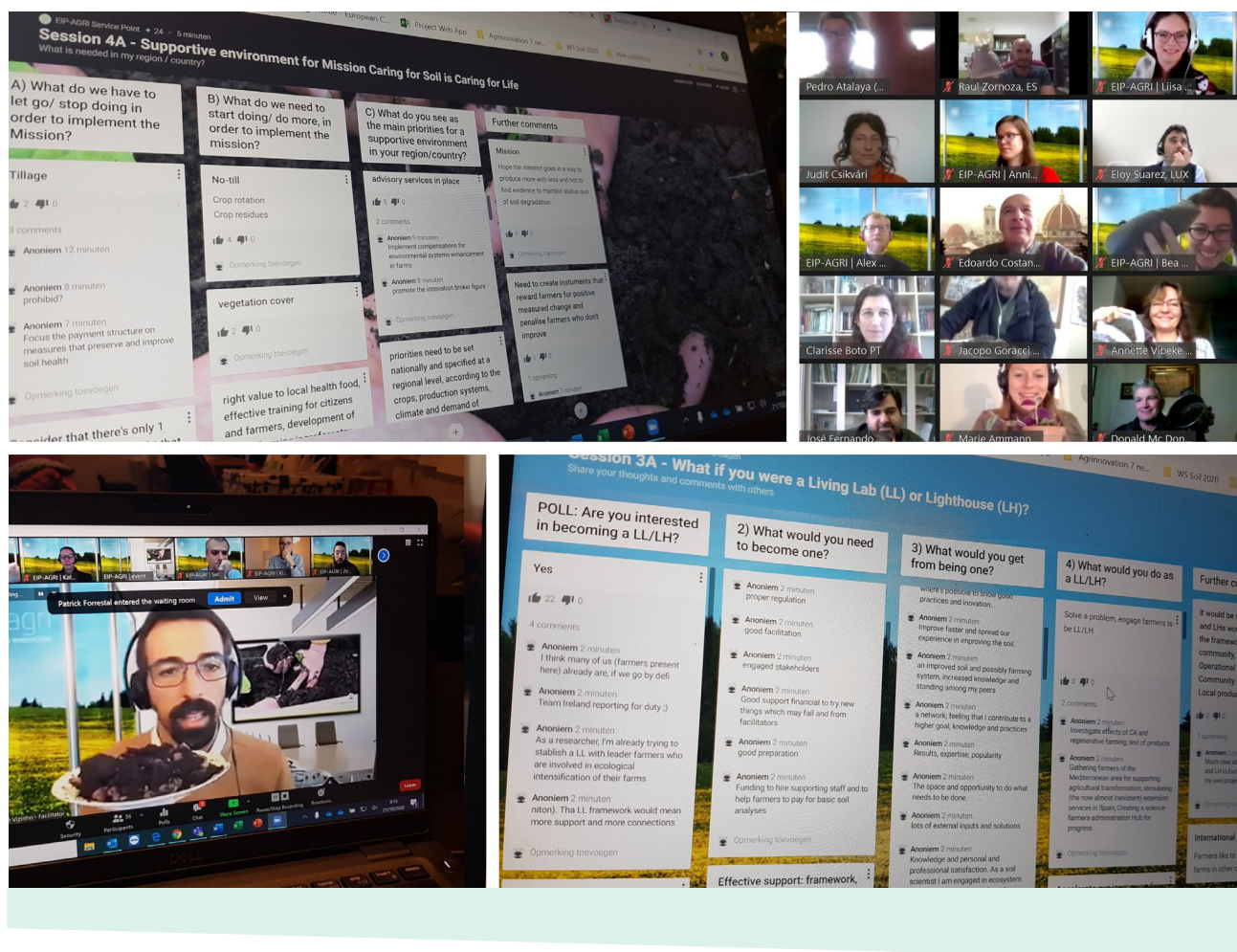
For this question, coherent policies for rural development, crop production, and environmental protection were strongly emphasised. If they are scattered and not integrated, their impacts will be less evident. These policy priorities need to be set nationally, and be specified at a regional level, according to the crops, production systems, climate and consumer demands for food products. Farmers are the cornerstone for the mission's implementation. Therefore a comprehensive and collaborative approach between all stakeholders, with farmers at the centre, should be adopted. This should emphasise the positive value of farming and farmers. Farmers should be aware that cooperation, co-creation and co-innovation are essential for economic growth and better environmental impacts.

Further comments: the proposed mission should support farmers who produce more with less environmental impacts on soil health, and needs to establish mechanisms to reward farmers who implement sustainable soil management practices.

Priorities related to policy and knowledge sharing

The awareness on the important role of soil for society, and not only for farmers, needs to be increased and strengthened. The CAP is also a good opportunity to create supporting proactive measures for soil conservation, which need to be adjusted specifically for different European regions, to assess their environmental and economic efficacy. This will also require improving coherence between different existing policies, such as those dealing with forestry, water and biodiversity. Long-term policies are very important, if we consider that soils form over long periods of time, that they will serve humanity for centuries to come, but that they could be destroyed in short periods of time, especially by human mismanagement and adverse agricultural practices.

The Agricultural Knowledge Information System (AKIS) development would act as the key instrument to reach out to farmers. AKIS should address the soil topic better, and emphasise the important role of soils in providing crucial ecosystem services. Living labs and Lighthouses are very effective to accelerate knowledge sharing. Often there is no need for new data, but for clear regulations on data sharing and better coordination between data owners. In sustainable soil management, knowledge sharing works better through peer-to-peer learning, which means that a farmer-to-farmer approach becomes very relevant and effective. Above all, it should be emphasised that soils are an integral part of natural and human ecosystems. Therefore, they must be managed through comprehensive ecosystem-based approaches, and not separately.



Session 4B: A supportive environment for the proposed mission: what is needed at farm level / individual level

Five questions were included in this session. Question A: "What is giving you motivation to care for soil", Question B: "What is giving you support to improve farming practices (for farmers)", Question C: "What is giving you support to promote soil health (for non-farmers)", Question D: "Will you make this mission your own", and Question E: "What will you do to make it real".

Overall, the participants were very well aware of the links between soil health, production of healthy food, and consumer choice responsibilities to keep soils healthy for the next generations. However, they put farmers at the centre of these efforts, and suggest an increased dialogue with researchers. Furthermore, these partnerships should establish multi-stakeholder forums, including policy and decision makers, NGOs and environmental associations. Close links with existing Horizon 2020 research projects dealing with soils and those upcoming under Horizon Europe were also emphasised as crucially important. Short summaries of the major outcomes from the padlet discussions for each question are given below.

A) "What is giving you motivation to care for soil?"

The common understanding and agreement was that caring for soil is good for present and future generations. For many farmers, soil is part of their lives and it is very gratifying when soil is healthy. A living soil is key for the provision of ecosystem services and higher yields, and each farmer would feel proud if his/her soil remains healthy for a long time.

B) "What is giving you support to improve farming practices (for farmers)?"

Farmers mentioned a number of sustainable farming systems such as conservation agriculture, organic farming and agro-ecology as best practices that sustain soil health. They also pointed out that the dialogue and trials with researchers in for instance Horizon 2020 projects (i.e. EJP-Soil, Nutri2Cycle and INTERREG ReNu2Farm) should be strengthened.

C) "What is giving you support to promote soil health (for non-farmers)?"

Networking with farmers, growers, advisers, researchers, policy makers, educators and interested citizens is very needed to promote soil health. Sharing knowledge and raising awareness on the work done by farmers as custodians of soil health is very important, as is support for monitoring and continuous testing of soil quality.

D) "Will you make this mission your own?"

The large majority of participants were confident that they will make this mission their own.

E) "What will you do to make it real?"

The best way to convey the message about the proposed mission is to disseminate it among all relevant stakeholders, talk to them and explain why soils are so important. Humanity depends on soils not only for food, but for the endless number of ecosystem services they provide to society. Therefore, it is very important to stimulate proactive farming practices that reward soil conservation within the new CAP. This is best described by the words of a farmer attending the workshop: "As a Lighthouse farmer, I will continue to be a thought leader and share my experience with my farming peers, with the hope of catalysing their positive change too".

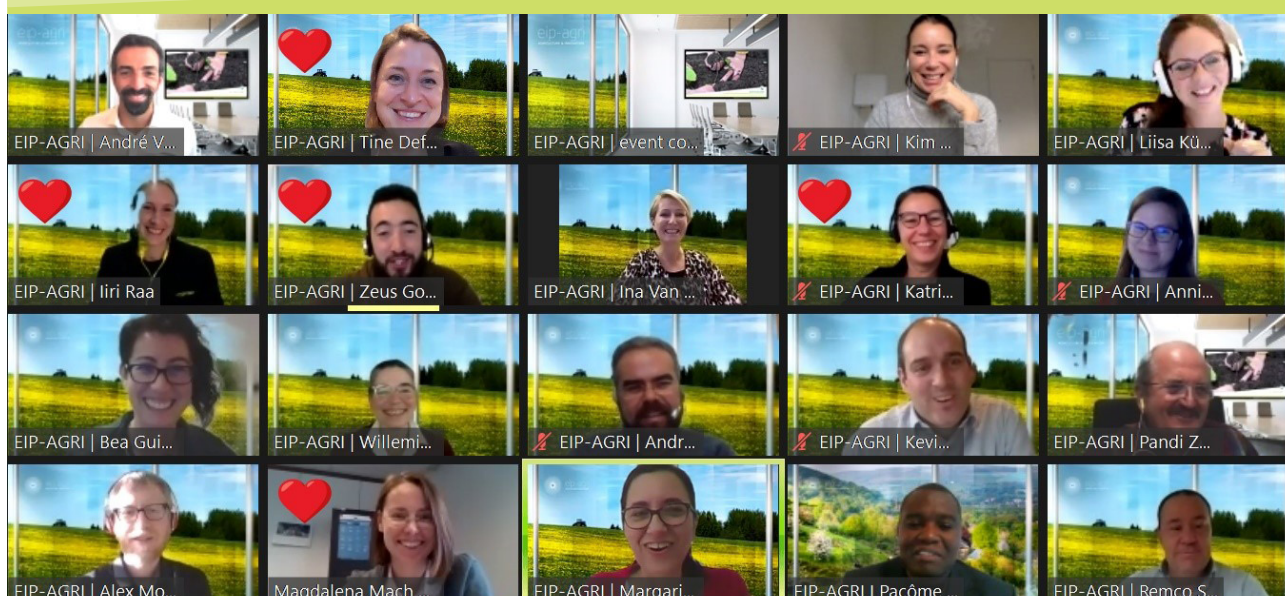
Summary and closing of the workshop

Closing remarks were provided by **Annette Schneegans** (Senior expert, Unit B2 – Research and Innovation, DG AGRI), **Pandi Zdruli** and **Pacôme Elouna Eyenga**.

Annette Schneegans said that this event provided very fruitful feedback to the proposed mission, as participants discussed it in detail. The timing of this workshop was good, before the implementation period, allowing the workshop outcomes to be taken up. The start of Horizon Europe and its Work Programme, which may be published in spring 2021, will also benefit from this workshop. Finally, the proposed mission has already started to be taken up in political agendas, and there is confidence that this will also lead to real soil improvement.

Pandi Zdruli and **Pacôme Elouna Eyenga** highlighted that there is a lot to be done by farmers and other stakeholders to achieve the proposed mission's goal. The workshop showed very good examples of Living Labs and Lighthouses, along with research and innovation activities. Participants are all aware that there is no single solution that fits all conditions. These solutions have to be adapted to different areas of Europe and to local conditions, also taking into consideration the socio-economic context of each area. Past experience demonstrates that when solid cooperation between farmers, researchers, advisers and policy makers of all levels is put in place, results are evident. The final conclusion that this workshop conveys is optimistic for the EU soil science community and for other stakeholders, with farmers in the frontline. The tasks ahead are challenging, but they can become reality, thanks to concerted efforts of all stakeholders.

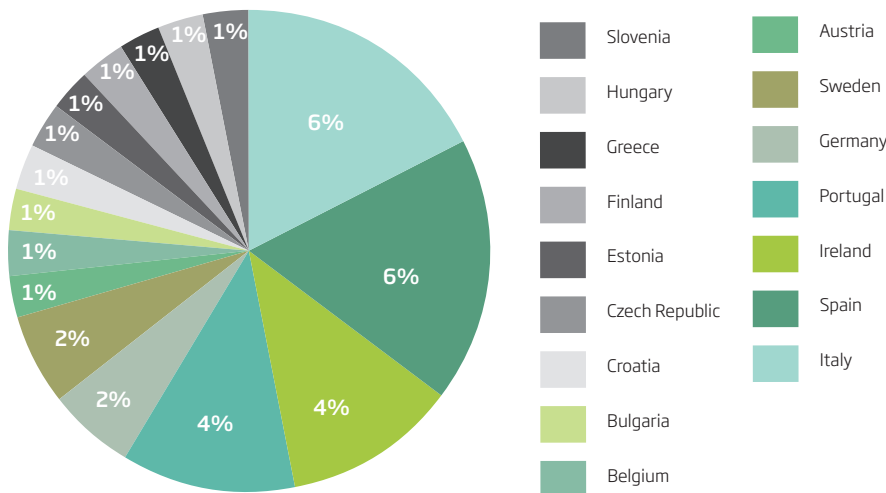
All presentations, both in pdf and videoformat and background documents are available on the EIP-AGRI website: <https://ec.europa.eu/eip/agriculture/en/event/eip-agri-workshop-shaping-eu-mission-soil>



Annex 1. Questionnaire and its results

1. Which country are you from?

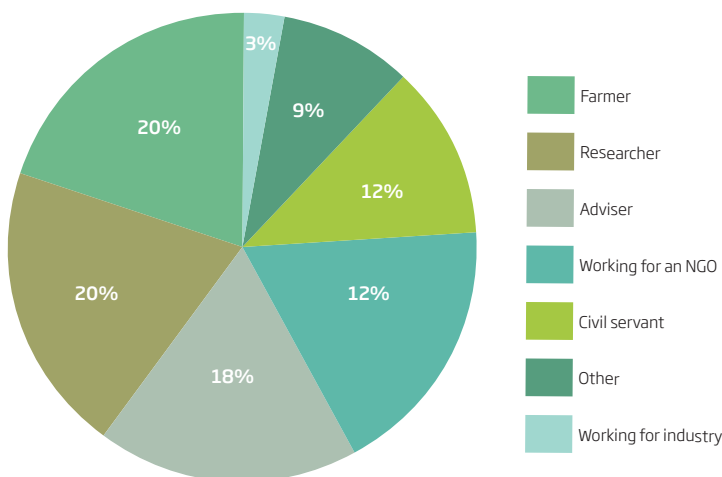
In total 34 people responded, coming from 16 countries.



2. Which region are you from?

In many cases, for people coming from the same country, there was a good distribution of different regions.

3. What is your main profession?



It should be mentioned that there was also a mixed category, including both farmers and other professions that listed farming as a second activity. Therefore, the total number of farming-related stakeholders was 60%.

4. Are you involved in other relevant activities?

Many of the participants were involved in several relevant activities, such as farming and research, or farming and advisory services. Also see the comment above under question 3.

5. During the workshop we will discuss the four priorities in research and innovation needs (pages 19-25 of the Mission Report). Which of these priorities are you most interested in?

- ▶ 38% rank priority 2, "Integration and uptake of current knowledge", as the 1st most important
- ▶ 35% rank priority 3, "Accelerating innovation in technologies and practices", as the 2nd most important
- ▶ 18% rank the priority "Towards global resilience through circular eco-economy and adaptation of food and biomass systems" as the 3rd most important
- ▶ 9% rank the priority "Next-generation monitoring and surveillance programmes" as the 4th most important

6. Having read the Report of the Mission, do you think that the eight objectives and targets identified on pages 6-7 of the report are feasible?

65% say Yes, and 35% say No. This could be an issue of concern, showing a lack of confidence in achieving the Mission's objectives

7. Implementing management practices that promote soil health may reduce profit in the first years, but pay off in the medium and long term. Would you consider implementing these practices on your farm, or encourage farmers in your region to implement these practices?

It is very encouraging that 100% of the respondents said 'yes'. This could be interpreted as a willingness of stakeholders and farmers in the first place to endorse sustainable soil management practices that are both beneficial for soil health and sustained yields in the long term.

8. Would you consider converting your farm into an organic farm (OF), or would you advise farmers in your region to do so?

Altogether 6 respondents said 'I'm considering or maybe', 2 said 'to be in transition to OF', 6 were 'already OF farmers' and another 6 said 'No'. However, the largest number of respondents said that they would support the transition to OF. Nevertheless, this high number should be taken with care as this category also includes stakeholders that do not have farming as their main income-generating activity. They may represent advisers or researchers that do not necessarily own a farm of their own. These responses are to be taken strongly into consideration especially for the Mission implementation, following the target to convert at least 25% of farming in the EU to organic.

9. How much do you agree that caring for soil is caring for life?

From the total number of people who responded to this question, 29 say Yes and only 1 says No. Hence it is assumed that the title reflects the mission's goals and targets very well.

10. What actions have you taken to promote soil health?

Respondents said that they were growing cover crops, keeping a permanent soil cover, implementing crop rotations, agroforestry and rotation of grazing animals, using less chemical fertilisers and pesticides, using bio-based fertilisers, avoiding deep plowing, and practising reduced or no-till. These are all good practices that should be widely disseminated and implemented.

11. What actions would you like to take in the future to promote soil health?

All the soil and crop management practices mentioned above were re-emphasised, including reducing heavy machinery to avoid compaction (one of the targets of the Mission). However, the main message that respondents conveyed in regard to this question was that better communication, more demonstration farms and cooperation between stakeholders was considered as very important.

12. Which barriers, if any, could stop you from doing so?

Respondents said that there was a problem with maintaining the economic profitability and sustainability of the farm in the first place, as implementing new technologies (such as reduced tillage or no-till cultivation) would need initial investments for new machinery. Especially for small-scale farmers, this might be a strong limitation, if no support would come from public funds. Other people mentioned the bureaucratic process and the lack of a political framework.

Nonetheless, many participants, practising conventional as well as organic farming, pointed out that they had been taking actions to promote soil health for a long time, and well before the start of the Mission. They remain committed to doing so in the future.

13. What type of support would you need to further engage in activities promoting soil health?

The large majority of respondents pointed out that there was a need for successful examples, more demonstration and education of farmers and advisers with the help of the research community. Other important issues were related to an increased focus on developing new technologies, sensors and precision agriculture. Furthermore, there is the need to collect more data on soil characteristics and biodiversity. Many also saw the support from new payment schemes that are needed to make the initial transition to soil-friendly agricultural practices.

14. If you are a farmer, are you interested in making (part of) your farm a Living Lab or Lighthouse farm (pages 16-18 of the Mission Report)? (see pp. 16 -18 in the report for further details on Living Labs and Lighthouse farms)

It was very encouraging that most of the farmers who responded were interested and pro-active to make their own farm a Living Lab or Lighthouse). Furthermore, many advisers who responded expressed their support for the Living Labs and Lighthouses, and showed their support and interest to disseminate these ideas to farmers they work with.

15. Having read the research needs (report pages 19-25), which ones do you identify as the most important? Would you suggest any changes?

Many people said they considered all the identified research and innovation needs very important, and highlighted that they are strongly interlinked. Additionally, many of them pointed out the needs for communication and citizen engagement, whereas for others accelerating technological innovation was more important. There were also many who considered advancements in soil monitoring as crucially important. Living Labs and Lighthouse farms as tools of innovation were pointed out as very important, and this is very encouraging.

The outcomes of the questionnaire were very useful to accelerate the debate and discussions during the workshop. It should be noted however, that the number of people who participated in the survey was rather low. Therefore, it is suggested that a similar exercise could be repeated at a much larger scale, to be able to collect the opinions of many stakeholders throughout the EU. The EIP-AGRI could organise this in the near future.

Annex 2. Summary of the findings from breakout session 2 – on research and innovation needs from practice

The tables below list the findings of breakout session 2. In this session, the workshop participants ranked research and innovation needs from the proposed soil mission (see the [Mission report, Research and Innovation priorities, p. 22 onwards](#)) according to their relevance. The tables also list additional comments made by the groups, important research needs that were not covered in the report, or ways to achieve the proposed objectives. The tables are listed per individual mission priority.

R&I Priorities P1: Integration and uptake of current knowledge

ranking	Proposed research and innovation need	Additions/comments by the breakout group
1	Creation and promotion of Lighthouses to be drivers for the wider uptake of already existing knowledge: e.g. agro-ecological and organic farming practices; conservation agriculture; high nature value farming and land management; carbon farming; sustainable and adaptive forestry, urban planning and greening, urban-rural nexus, information and communication technologies, decision support systems, shorter value chains, improved nutrition and health.	<ul style="list-style-type: none"> • Build on projects like NEFERTITI, FARMDEMOHUB • How many are already in action? • What kind of support for a network of lighthouses? • Very important to involve and work with farmers • Lighthouses should be regional - there are many differences between regions. • This might be something for the advisers - to collect the information coming from the Lighthouses and bring it to farmers, or bring farmers to the Lighthouses.
2	Design and improvement of extension and advisory services, adapted to each regional context and targeting all producers and land managers.	<p>It is important</p> <ul style="list-style-type: none"> • to build trust and a confidential relationship with farmers • to have impartial advisers (that keep the interests of farmers as a priority) • to have local advisers from the region
3.	Linking data and providing outputs from models; long-term field experiments and current monitoring data showing soil health impacts.	<ul style="list-style-type: none"> • Take advantage of long-term projects and facilities for soil research funded by the EC
4.	Data platforms that integrate and provide existing data in an effective and accessible way. This requires close collaboration between a range of actors.	<ul style="list-style-type: none"> • It is very important to collect all the existing data and make knowledge accessible - building on EU projects like EURAKNOS and EUREKA • Data needs to be available, organised, easily understandable and accessible to farmers. E.g. create interactive tools, make videos (made by farmers, on a peer-to-peer basis), etc. to deliver information.

5.	<p>Identify the social and human mechanisms that, in each socio-economic, political and cultural context, constrain the uptake of already existing knowledge by producers and land managers, e.g. producers' path dependencies, key processes to unlock supporting mechanisms, key actors to mobilise and invest in, potential for collective actions, and opportunities for the efficient spread of innovation.</p>	<ul style="list-style-type: none"> • Quite often, a barrier is that there is no free access to information for farmers • Language barrier - farmers need information in their native language to foster the uptake of knowledge • Digital divide
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R&I Priorities P2: Accelerating innovation in technologies and practices

ranking	Proposed research and innovation need	Additions/comments by the breakout group
1.	<p>Living Labs – Co-design and co-construction of demonstration platforms in farms, forestry and urban settings to develop new innovative solutions and integrated local value chains which are immediately tested in a real-world setting. Issues include diversification, novel crops, cultivars and their combinations; innovative organic and carbon farming; adaptive forestry practices; adaptive practices supporting cropland, pastures and forestry biodiversity; exploration of the rhizosphere and soil biodiversity incl. the microbiome; soil restoration and novel remediation approaches; soil health and food quality; waste valorisation under a circular approach; engagement of urban communities for urban greening.</p>	<ul style="list-style-type: none"> • Build on projects like NEFERTITI, FARMDEMO • Citizen science for soil health and food quality questions is a positive aspect: co-creation, logical step forward after OG; importance of demonstration • Missing ideas on measuring and metrics <p>How to achieve:</p> <ul style="list-style-type: none"> • providing a framework with incentives and challenges; take into account that a farmer is not a researcher • integrate Living Labs with OGs • make it concrete and close to the farmer (in contrast to current pilot farms such as those run by e.g. fertiliser companies, research institutions, etc.) • Lighthouse farms could evolve naturally into Living Labs • criteria for Living Labs • link with the production system of the area • work around a dedicated question • farmer-led • keep it simple
2.	<p>Technological projects which develop and make new and existing proximal and remote sensing technologies, agriculture machinery and AI operational. This will help to make tracking soil health changes more effective and efficient, so as to better target soil management practices. Testing within Lighthouses and Living Labs where appropriate.</p>	<ul style="list-style-type: none"> • We need to track soil health much better than we do now. • Remote sensing is used but artificial Intelligence (AI) is missing. • Need for integrated tools / platform (e.g. fertiliser plan, harvest, remote sensing date). Automatisation of big data is needed for this; smart decision support

3.	<p>Analysis, new design and monitoring of incentives, markets, financial, regulation and policy tools to provide a robust evidence base of what works where and why, with respect to improving the uptake of sustainable management practices. Assessment of sustainable business models. Design, test and validate forms of collective actions and place-based networks that effectively support changes in practices and business models in farm, forestry and other sectors.</p>	<ul style="list-style-type: none"> Emphasis is needed on the costs of new technologies for farmers - investments will be needed - how to eliminate these barriers? Especially in Eastern countries - what is financed through Rural Development Programmes will influence what farmers can invest in.
4.	<p>Design and validate new forms of collective actions that improve integrated soil, water and waste management at landscape scale</p>	<ul style="list-style-type: none"> Simple monitoring systems in irrigated areas for example (Portugal)

R&I Priorities P3: Towards global resilience through circular eco-economy and adaptation of food and biomass systems

ranking	Proposed research and innovation need	Additions/comments by the breakout group
1.	<p>Measuring the influence of agricultural practices (incl. soil management) on yield and crop performance and on the nutritional quality and safety of food and feed.</p>	<p>The main question is how to implement this; a lot of knowledge and equipment is available. Why are farmers not using it?</p> <ul style="list-style-type: none"> Ease of use of the equipment (digital literacy) Need of consultancy. Digital assistance? Soil issues are long-term issues, need for long-term pilot sites and research results in the long term.
2.	<p>Development of supportive policies and incentives for sustainable agri-food systems that improve soil health and reduce their global footprint.</p>	<p>Concentrate supportive incentive and policies in the most needed areas. Communication on the footprint needs the results from topic A (assessing the footprint).</p>
3.	<p>Best information, communication, and education mechanisms to the wider public/ consumers, and to companies, to encourage consumption of sustainably produced food, biomass and bio-based solutions.</p>	<ul style="list-style-type: none"> Information and communication: most people (especially younger) don't know what soil is, and therefore don't relate and are not interested. How to involve city habitants? Garden in schools? Sharing knowledge for the younger generation (schools, university ...). Lack of demonstration cases for students and field trips in agricultural studies: soil is not well learned from a book. Changing the negative perception of soil.
4.	<p>Development and testing of footprint analysis tools which can help to assess the global soil health footprint of food and feed, wood and biomass use in the EU.</p>	

5.	Co-creation of new market mechanisms, business and governance models and training tools that support sustainability in production, including soil health.	Example of methodology involving market
6.	Co-design of new community-based models in cooperation with social sciences and humanities towards more sustainable food production, dietary habits, and waste reduction.	It is a key point but there are two aspects here: social approaches to communication to farmers, and addressing a society paradigm shift as a whole (not only farmers, although they are citizens as well).
7.	Development of international research cooperation on soil health monitoring, including soil carbon stocks, land degradation, net soil sealing, contaminants and habitat quality.	
8.	Promotion of shorter value chains and circular (bio-)economy to improve soil health, creating rural-urban synergies comprising safe reduction of organic waste.	What exactly is the link with soil issues?

R&I Priorities P4: Next-generation monitoring and surveillance programmes

ranking	Proposed research and innovation need	Additions/comments by the breakout group
1.	Creation of a robust pan-EU approach for setting national and regional standards for good soil health (equivalent to that for the Water Framework Directive and other policies) using the suite of indicators defined by the MB. Standards to be created to take account of the 25 different requirements for soil health by soil type, land use and climate zone combinations.	<p>There is a great variability across countries (and in the case of regional countries at regional level) in the national soil monitoring level, both in extent (e.g. number of samples) and timescale to track changes. There is great variability also in utilisation of the monitoring results. In some countries soil monitoring results are used to deliver knowledge to different target groups (advisory services, national authorities, also used for designing national policies). They also use monitoring results to track changes and create a stronger supporting environment via advisory services, who are interpreting the soil sampling results and are advising farmers on fertilisation (plans) according to the soil samples.</p> <p>There is a difference also in the supporting environments. In some countries it is rather supportive, in some countries it needs some development. It is essential to connect advisers, scientists and farmers for a real knowledge transfer. For the farmer it is important to be explained why she/he needs to make efforts, what are the scientists doing (also in his/her field) in easy practical language, what do the indicators show for the farmer exactly and why are they needed - interpretation from the scientific language to farmers' language.</p>

		<ul style="list-style-type: none"> Engaging farmers for new actions is a bit difficult as they don't have time for administrative things or to search themselves for new options to implement, what would be best in their fields. There would be no time left for farming. They don't need to know all the details of soil monitoring; they need good advisers to guide them. If self-monitoring by farmers is required, they need simple, handy and clear tools to do this (e.g. guidance and equipment needs to be simple and understandable).
2.	Improvement or establishment of national-scale monitoring programmes to track changes in soil health using a standardised approach to better support national policies but also local management approaches, and to support self-assessment by land managers.	
3.	Provision of data and services into accessible open data platforms.	<p>Different target groups use and need different data and data sources. There are different data levels needed for land management and land planning. For analysing the success of the Soil Mission, different scales are needed.</p> <p>Farmers don't know about remote sensing technologies, or platforms. These are more for researchers / other levels.</p> <ul style="list-style-type: none"> There is a need for a link between labs and farmers. E.g. the EU level LUCAS programme is good for the EU level, but not for a national level. However, national soil monitoring results should be integrated into LUCAS. A lack of demonstration cases for students and field trips in agricultural studies: soil is not well learned from a book. Changing the negative perception of soil.
4.	Proximal and remote sensing and citizen science.	

Additional research and innovation needs identified by priorities

R&I Priorities P1: Integration and uptake of current knowledge Additional research needs

1. **Need for more soil maps** - especially for forest areas. This is the baseline - you need to know what you are starting from, and we do not need just maps, we need good and easy-to-use monitoring systems for farmers to receive feedback on their soil management.
2. Transforming **knowledge to information**, and making that information accessible is important to farmers and advisers.
3. **LUCAS soil survey** – at the moment many countries are no longer regularly collecting soil information. We need a renewed drive to collect these data – e.g. by EJP soil.
4. Make positive and negative externalities visible - and accountable - so that **farmers can be rewarded for their ecosystem services**, for instance.
5. Plenty of data are available, but situations change drastically with **climate change**. This has to be taken into account.
6. Work on **carbon sequestration** - instruments that can measure the carbon footprint of products, to give consumers a choice
7. **Communication channels** - soil needs to become more prominent in information channels for practitioners; need for better interlinkage between the research and the practice-oriented need - needs an active support and needs acknowledgement that it won't happen by itself.
8. It is also important that **researchers listen to farmers**. If this does not happen, farmers lose interest and will not be able to use the research results. Motivate farmers to get involved in research → R&I needed on methodologies on how to do this, on how to show the value of research.
9. Programmes in **soil education** need to tackle soil issues - dealing with the relevance of soils, need to keep soils in good condition, etc.
10. Consider **different sources of funding** and support, and create awareness on them - e.g. ERASMUS
11. **Universities** outside of agricultural-related fields **should be involved, including social sciences**

R&I Priorities P2: Accelerating innovation in technologies and practices Additional research and innovation needs

1. **Link with food** (and therefore consumers) should be added.
2. Overcome the **gap in technology uptake**. Innovation and research is often done **for** the farmer, but not **with** the farmer.
3. **More solutions around soil compaction, especially important in wet areas. More information on carbon sequestration.**

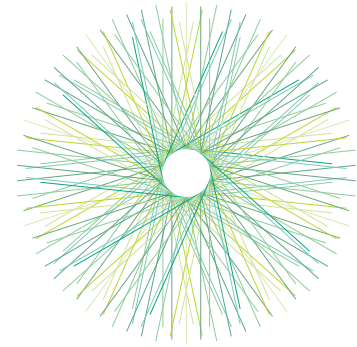
-
4. How to **keep soil quality in organic farming**? To improve soil health and not drain the soil (nutrients, pH).
-
5. **Better use of soil data** for managing decisions.
-
6. Need for **integrated tools/platforms** where big data is automatically analysed and fed into smart decision support tools.
-
- 7. What could replace glyphosates?**
-
8. Need for **measuring and metrics**. How to measure progress, e.g. carbon stocks, carbon balances. Parallel approaches: detailed approach for monitoring (policy) - need for parallel circuit of “quick and dirty” tests for farmers and advisers.
-
9. Not only soil data, also **real-time information on manure composition** (NIR)
-

R&I Priorities P3:
**Towards global resilience through circular eco-economy
 and adaptation of food and biomass systems**
Additional research and innovation needs

-
1. How to **gather more data on soil health** (link to digitalisation priorities from current programmes)
-
2. Links to **soil biodiversity** - analysis on microbiological life in soil and its dynamics. Further research is needed on this topic.
-
3. **Transfer of existing know-how from research to farmers**. Understanding the barriers for farmers and their tech support to take up the existing knowledge. Need of **social sciences** for background research on why and how farmers integrate innovation.
-

R&I Priorities P4:
Next-generation monitoring and surveillance programmes
Additional research and innovation needs

-
1. **Deeper layers of soil need to be included** in the monitoring as well.
-
2. **More information on Mediterranean soils** (most of the indicators are worked out based on Central-Northern soils)
-
3. Monitoring and **relating soil diversity with soil biodiversity** (relating soil health to soil type)
-
4. **Establish clear thresholds, standards, indicators** to have clear indications of what the baseline is and where to move ahead, can't have any management plans without this.
-
5. **Connect advisers and farmers** to accelerate knowledge transfer.
-



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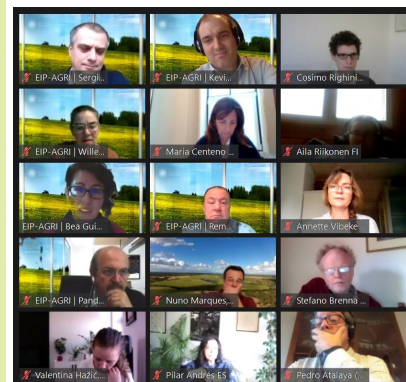


The European Innovation Partnership 'Agricultural Productivity and Sustainability' (EIP-AGRI) is one of five EIPs launched by the European Commission in a bid to promote rapid modernisation by stepping up innovation efforts.

The **EIP-AGRI** aims to catalyse the innovation process in the **agricultural and forestry sectors** by bringing **research and practice closer together** – in research and innovation projects as well as through the EIP-AGRI network.

EIPs aim to streamline, simplify and better coordinate existing instruments and initiatives and complement them with actions where necessary. Two specific funding sources are particularly important for the EIP-AGRI:

- the EU Research and Innovation framework, Horizon 2020
- the EU Rural Development Policy



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servicepoint@eip-agri.eu | +32 2 543 73 48 | Koning Albert II laan 15 | Conscience Building | 1210 Brussels | Belgium