



Editorial

Activity update of the Mission Board of European Union on soil health and food



HIGHLIGHTS

- The Mission Board on Soil Health and Food is formed by the European Commission.
- Reviewed the key elements of the Soil Mission under the Horizon Europe (2022–2027) Framework Program.
- Some considerations about the new approach and its future application in science and practice.
- Transition to make soil healthy for safe food production via living labs and lighthouses.

GRAPHICAL ABSTRACT



ABSTRACT

It is not widely known that a handful of soil contains more living creatures of all kinds than there are humans living on the globe. The conditions on which all these creatures (fungi, bacteria, and worms) are able to thrive determine soil health, thereby crop production and food safety. In this contribution, I will present and clarify the concept of the Mission Board on Soil Health and Food, which serves the backgrounds and activities during the past three years. I will also explain the possible consequences for future research funding by the European Union (EU). Essentially, the work of the Mission Board focuses on: 1) the relationship between the well-developed and highly-respected discipline of Soil Science, 2) the vast body of knowledge and vested scientific authority it represents and 3) the relationship with the ongoing process of deterioration of soil health in daily use and exploitation. In other words, soil science versus soil health, is there an issue?

1. Introduction

The fact is that ~60–70% of the soil in the EU can be qualified as unhealthy (Veerman et al., 2020), which serves as the real driver for some actions. As such, the help of science and research is needed. The gap should be bridged between interests of people to earn a living by exploiting the soil and those who simply want to have physical space for their activities. Further, the impacts on the natural environment, biodiversity, landscape values and the social fabric of country life are also important (Figs. 1 and 2).

Although these are certainly major questions, they are not the only ones. Other problems include climate change, worsening condition of oceans and coastal waters and the need for climate-resilient, adaptive cities and fight against cancer, which are the subjects of the four other

missions. As a result, the role and impact of science in contributing towards solutions that are effective and socially and economically feasible must be considered.

2. The Mission Board

The current situation has prompted the European Commission to seek advice on how to fund research in the Horizon Europe 2022–2027 Framework Program. The Commission asked Mariana Mazzucato, a leading economist on Innovation and Public Value, for her advice on these questions. Her recommendations are clear and transparent, which were used as a Mission Approach, similar to the NASA Moonshot Mission in the 70's. Missions should have a special character and should focus on solving important questions faced by society. The Missions should be

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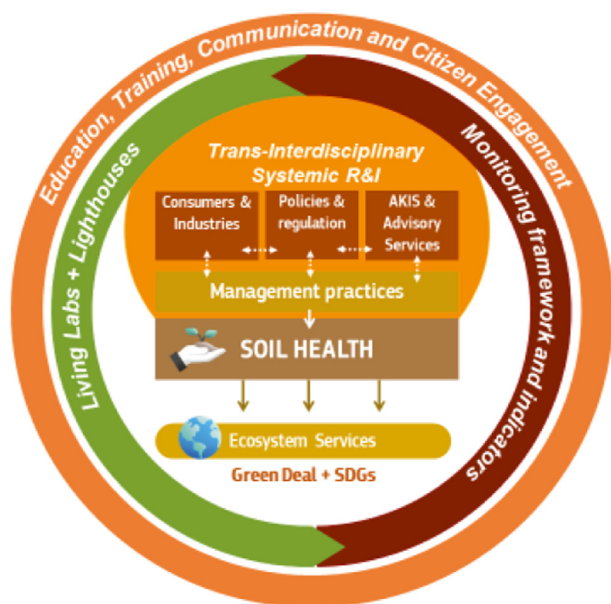


Fig. 1. Soil Health drivers and impacts (center of the figure), and the mission building blocks (in italics). Adapted from Veerman et al. (2020).

ambitious, bold, timely, well-focused, systemic and urgent. In other words, unorthodox. The Commission approved these recommendations and installed five Mission Boards consisting of 15 experts from different scientific fields, business environment and people familiar with everyday practice. The Boards were chaired by people experienced in political matters, public management, science and were actually engaged in discussions in society about these issues, which started in the fall of 2019. Although COVID had slowed down the activities of the Mission Board, the Mission reports were completed two years later. The reports were discussed and ultimately approved by the Commission. It was considered a sound basis for a new approach in funding research in these five fields.

Aided by the Board members, the Commission finalized the assignment to bring forward the so-called Implementation Plan, in order to create the basis for future assessments of research calls in the framework of Horizon Europe 2022–2027. This concludes the institutional side.

What does this mean for the relationship between scientific research and the academic and institutional community applying for research funding related to soils in the years to come? This means nothing less than a paradigm shift. The explicit necessity for closer ties between scientific research and practical applications in a focused and bold way of approaching them, is surely going to be one of the most important criteria for positive decisions of funding research plans and projects. It represents a breach with the usual accessing procedures. Of course not all the applications should be assessed in the context of the five missions. There will be room left for free research in the more mono-disciplinary oriented approaches.

The essential methodological elements of the Mission approach are three-fold. Firstly, it should be systemic, i.e., treating all the elements of the problems in direct relation to each other. Secondly, the input of different scientific disciplines should be molded interdisciplinary and transdisciplinary. Lastly, and probably the most important one, it is to have and to adopt a holistic rather than a reductive cosmic view. In short, the Mission approach is to shunt the normal science research approach on a new track. A track that leads towards new combinations of scientific cooperation and integration with society. Clearly showing tax payers how their money is spent on research in the field of soil science is a good idea. This also sustains the basis of funding research in the future, making the public recognize that well-founded scientific research related and targeted to demand and needs of the society are an indispensable basis for rational discussion, well-considered opinions, and bold and wise political decisions. We certainly cannot do without it. This covers the segment about the rigor of methodology and relevance for policy making and democratic decision processes.

3. The mission approach to soil health

The work of the Mission Board titled “Caring for soil, is caring for life” was published in 2022. Here are highlights and some important elements

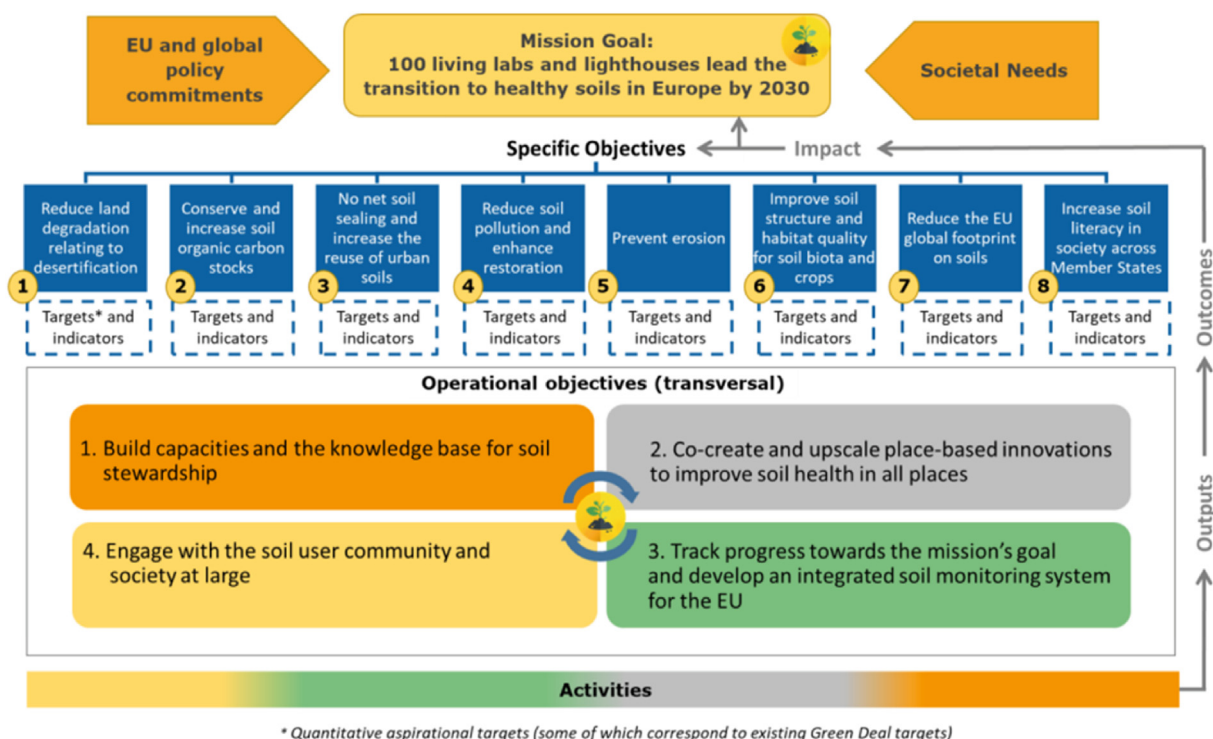


Fig. 2. Schematic view of the Mission's intervention logic. Adapted from Bouma (2022).

and comment. Firstly, we as a team realized the enormous extent of soil health problem. We all know that soil is essential for all creatures. Soil should not be considered a source of wealth like a mine or a well, but be seen as a self-regenerating organism delivering products and services that will endure time, given a good state of maintenance and care (Georgescu-Roegen, 1981).

The need for sound definition of soil health starts with the basic point of view on soil nature. Soil is vulnerable, silent and easily forgotten in economic calculations. Depleting the soil by overexploitation jeopardizes the continuation of its services. On this basis, Soil Health is the continuous capacity of soil to deliver its ecosystem services (Bouma, 2022).

This definition automatically poses the question to whom these services should be delivered and by what kind of mechanisms. The internationally-accepted 17 UN Sustainable Development Goal (SDGs) are the first basic point of reference in valuating soil ecosystem services. Ecosystem services, in a broad sense, serve not only to mankind but for the ecosystem at large. At least seven of the SDGs can be considered as relevant for services of the soil (Bouma, 2014).

Soon after the start of activities of the Mission Board, the European Commission launched the Green Deal. A grand design for the future, and a plan to tackle climate change and bring about the necessary changes in practically all the basic elementary processes in modern society. Climate change has a major impact on Soil Health. For this reason, this political program is the second fundamental point for our mission. Soil health is also very relevant for the relationship with the other Missions. Quality of oceans, creating climate-resilient cities and improvement of human health are directly linked to soil ecosystem services. Some argue that soil health is at the heart of all the other Missions. This not only enhances the importance of the Soil Mission, but more importantly it may contribute to an integrated and systemic approach of the combined mission areas and combinations of interdisciplinary research trajectories for future research. Last but not least, the Soil Mission is directly related to the upcoming changes in the Common Agricultural Policy, as they are laid down in the various strategic plans like the From Farm To Fork, Water Framework Directive, Habitat Directive and Circular Economic Action Plan and Soil Thematic Strategy.

The objectives and targets should be clarified in relation to the overall ambitions of our mission. That is “by 2030 at least 75% of the soil in the Member States should be healthy or show a significant improvement towards acceptable threshold indicators to support ecosystems services”. It goes without saying that this ambition stimulates the discussion about what objectives could be formulated and specified, which could contribute to soil health improvement. These objectives need to be made measurable, so targets should be set and a monitoring system with indicators need to be put in place. The intense and very constructive discussions held by our Mission Board reaped great benefits in the end. Eight objectives and 14 targets were formulated with accompanying eight indicators in qualitative categories (Veerman et al., 2020). This approach enabled us to come to a systematic and manageable framework to structure the necessary measures and to also evaluate the effectiveness of the instruments that can be implemented and made operational. An important decision has to be made concerning the relative weight and quantification of each indicator. We decided on a simple but effective criterion that gives well-founded threshold values for each indicator. That is ‘the one out, all out rule’. This rule is for now adequate enough to qualify the difference between healthy and unhealthy soil. It is clear that more research on this question of improving the measurability and quantification should be undertaken, an interesting and challenging task for all soil scientists.

4. The Mission Board implementation approach

The next phase in the discussions is how to get the transition process towards improving soil health in practice going. First of all, it should be investigated what parties and what degree of interest should be involved in this endeavor, which include land users, farmers and foresters as well

as “city greeners”, nature conservationists, consumers and the public at large. These are very different interest groups that call for different ways to involve them. We ultimately came up with the following instrumental solutions, which are split up into three categories.

First, physical locations and field stations are places where scientists of different disciplines and practitioners (farmers and foresters) come in direct working relation with each other. So ‘the boots on the ground’ people meet directly with researchers from universities and institutions. This is an open system, an organism and not a static, relatively closed-off institute where it is free to take part in it, which necessarily positively motivated people, cooperatively sharing knowledge and experiential results. In other words, it is a ‘Living Lab’ in its essential nature. An environment without much hierarchy, open to new ways of thinking, keen on developing new combinations of resources at hand, or making them free by changing the ways in which they are used. Inspired people tend to generate inspiration, free the blocked minds, and melt the frozen opinions. In short, it is an incubator for finding new ways of making sustainable use of the soil and securing an ongoing flow of ecosystems services in all its different forms. This idea is not new, there are already a number of places where this is practiced, which is a good model of what we want to promote. Our ambition, as accepted in the implementation plan of the Commission, is to create at least a hundred Living Labs in the Member States by 2030. Results obtained in Living Labs at the stage of well-being established and documented, should be made easily accessible for land-users and other parties who can all benefit to improve soil health.

Secondly, for that reason we recommended the installation of ‘Lighthouses’ as showcases to distribute new and current information, which can also serve as a physical place where free information and real-time demonstrations are available for everybody.

The third type supporting the dissemination and communication of information is to create all types of material to improve soil literacy. This could include organizing specific manifestations, exhibitions, tailor-made educational material for school children and stimulating school and city gardening. All these down-to-earth promotion materials and initiatives could help to broaden general awareness of the role and importance of healthy soil. This also will certainly be supported by the ever-growing flow of scientific results concerning the relationship between healthy soil, the production of safe food, and environmental health as an essential common good.

5. Mission Board: the next phase

This concludes the work of the Mission Board whose activities ended in May 2022. After the Implementation Plan had been drawn up, the Commission decided to change the title of The Mission to: “A Soil Deal For Europe”, making it an integral part of the Green Deal Strategy. In September 2022, the next phase of The Mission was initiated by installing a new group of experts to continue the implementation by acting as ambassadors for the Missions, thereby supporting, organizing and facilitating all activities recommended by the first Mission Board. The creation of Living Labs and the development of Lighthouses are vital for making progress. Going forward, combinations of activities in several Member States should be an important step in an EU-wide movement to raise awareness and start finalize activities to be funded by the EU.

According to the Plan, the Commission will evaluate the work of the second Mission Board before or during summer of 2023. Given the evaluation results of all five Missions, the Commission is expected to continue with the mission approach as the basis for decisions of funding research applications. If not for all, it is at least for some of the five Missions. It is therefore my expectation that the Mission approach is here to stay.

The Mission Board on Soil Health and Food produced only the framework by specifying the basic concepts for goals, objectives, targets, indicators, monitoring and new instruments. The Implementation Plan built on these recommendations by specifying the instruments for

practical ways of doing, which is only the beginning. It is a unique opportunity, not only for soil scientists, but other scientists too to take part in this process of further developing and finding ways of implementing these concepts, thereby helping to bridge the gap between science and practice. In times when the authority of science as being useful to solve social issues is under siege, joining the approach of the Missions that we are advocating could surely benefit the prestige of the profession itself.

6. Mission Board approach: lessons learned

Two lessons can be learned from these five Mission processes. First and foremost, the necessity to act on all the subjects of the five Missions is prominent. Secondly, scientific research is one of the most important instruments to help mankind overcome imminent threats or at least to reduce the suffering, which can be expected in many places worldwide.

As for the Soil Mission, these two basic conclusions bring us to advocate for the soil science community, not to dwell solely or mainly in the comfort zone of the single-disciplinary approach. So, a step out of the soil science bubble in some cases is necessary. Do we not really know 'enough' or at least enough to devote more of our time and intelligence to contribute to solve the problem of Soil Health? When facing the huge challenges, scientists as well as managers of universities and research institutes should be aware of the following question. That is whether the path of an academic career, that nowadays mainly proceeds along the lines of disciplinary approaches, should be continued as it is or allow for more room and attention for problem solving in society, as an essential part of the evaluation of scientific work for their career prospects. This is not a plea for a radical turn or away from pure disciplinary, fundamental or free research. It is a plea to take more responsibility for cooperation with the people at grassroots level of society who struggle to find new ways of doing their jobs and earning an income and striving to find methods for sustainable land use. This allows them to get into contact to develop relationships with motivated citizens to help to improve soil health as a common value in our interest.

7. Mission Board approach: some final remarks

Finally, some thoughts about the legal framework for a Soil Directive to be discussed again in the coming years. As well-known earlier concepts of a framework were outvoted by some Member States in the last decade. Serious evaluation is needed before preparations of a new effort starts. We should learn from the experiences of the effectiveness and implementation of other Directives. Take one of the oldest for example, i.e., the Nitrate Directive, which is firm in its intentions and global in its 'one size fits all' criteria. Specifying obligatory stringent means to reach the goals instead of setting clear targets that should be realized. It is the wrong way to promote and achieve the desired results based on the good intentions that should realize the necessary improvements. Prescribing means of how to manage, stimulate the negative creativity to circumvent the rule of law or even to take the path of deceptive actions or fraud. In any case, it requires an intensive and costly control system.

An alternative is to formulate clear objectives and set targets as a fundamental goal that should lead to concrete improvements. This is a better approach because it stimulates positive creativity to be successful and to prevent fines or other painful consequences. It encourages the land-users and managers to use their professional expertise to find new ways that bring them closer to the targets that need to be achieved. Moreover, the 'one sizes fits all' principle is not adequate, effective or even efficient, because the conditions in Member States, regions, and soil

and water conditions show significant differences. This can only be accommodated by more tailor-made solutions or specific management measures. What we experience in the Netherlands underlines and confirms these two fundamentally inadequate starting points (Bouma, 2016). Not to even mention the fact that the Nitrate Directive only pertains to animal manure, leaving the possibility of unlimited use of nitrogen fertilizer intact, which could have the same unfavorable effects on water quality. In the Netherlands, animal farmers have to pay to get rid of the manure while at the same time having to invest in fertilizer to optimize their forage production.

The Water Directive is instead based on specified targets and a firm corresponding timeframe. If eventually a new draft Soil Directive is to be developed that has a real chance to be accepted by all the Member States, there are lessons to be learned from the past.

The EU represents a historical movement towards ongoing cooperation between very different countries, cultures and histories. Like it or not, it is mainly held together by economic interests and also by unexpected violent outside threats. The Union is structured around a vast array of legal agreements. But essential as they may be, these will never be sufficient to serve or to hold the cooperation if it is not fundamentally vested in the hearts and minds of ordinary people.

Implementing the necessary measures to improve soil health or any other goal, brought forward with the best intentions, will only be acceptable and effective if their practical consequences for the people in the street are openly and transparently communicated. Since the task of improving soil health is inevitable and huge, the consequences for all land-users and consumers will be extensive and costly, causing a decrease in the level of material wealth as we currently enjoy. But a new concept of wealth is already being discussed in many places, so soil health will be one of the most important sustaining elements in representing the future content essential for a sustainable society.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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