



Thematic Area:

Environmental Sustainability.

Priority: Management of resources and adaptation of practices to climate changes.

Need: Ecological footprint of farms: what practices to reduce it on our farms? What are the negative impacts of the sector on climate change, and how can they be limited?

Solution EU Number: CC-3.

Content of the Solution:

Analysing soil properties through scans and laboratory tests to enable site-specific fertilisation, improving forage quality while reducing fertiliser use and environmental impact.

Key Contacts:

- Agricultural chambers, advisors.

Case Study: Not available.

Reasons for Implementing this Solution

Knowing the properties of the soil enables field-specific and efficient fertilisation. This reduces the use of fertilisers, avoids overfertilization, lowers costs and minimises nutrient losses to the environment.

Description of Solution Strategies

To apply fertiliser efficiently, it is essential to know the soil's physical and chemical properties. Within one field, conditions can vary in terms of soil texture, water holding capacity, acidity (pH) and nutrient content.

Soil scans can provide a detailed view of parameters such as electrical conductivity (EC), pH and organic matter content. These measurements can be used to estimate local soil texture and cation exchange capacity (CEC), to assess a soil's ability to hold positively charged ions which are essential plant nutrients like potassium (K⁺), calcium (Ca²⁺), and magnesium (Mg²⁺). They influence nutrient availability and fertilisation needs.

However, soil scans alone do not provide full information about available nutrients. Therefore, soil sampling and laboratory analyses are necessary to determine nutrient levels (e.g. phosphorus, potassium, magnesium) and to define the exact fertiliser requirements.

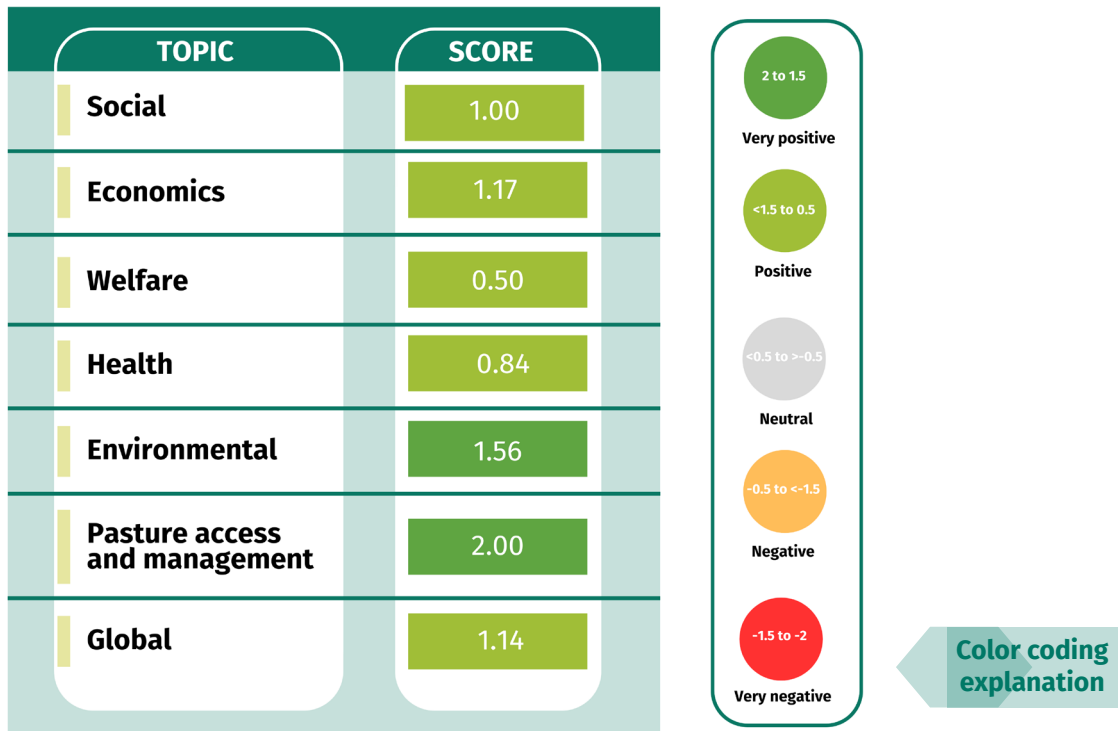
A combined approach – using both soil scanning and periodic laboratory analysis – enables site-specific fertilisation planning. This improves plant productivity, optimises fertiliser use and reduces the risk of nutrient losses to water or air.

Regular soil sampling is recommended every 5–10 years, depending on national regulations and farm management goals. The cost per sample varies by country and the type of analysis performed, but in general, the investment is small compared to the potential savings in fertiliser use and environmental benefits.

Implementation Steps

1. Assess the field conditions and objectives
 - Define which paddocks or fields should be analysed.
 - Decide the main goals: improving pasture productivity, reducing fertiliser costs, or meeting environmental standards.
2. Collect soil information
 - Perform a soil scan to map parameters such as EC, pH and organic matter.
 - Divide the field into zones if strong variability is expected.
3. Take representative soil samples
 - Collect soil samples from each zone following best practice (correct depth, mixing subsamples).
 - Send samples to a certified laboratory for nutrient analysis.
4. Interpret results
 - Combine scan and lab results to estimate soil texture, CEC and available nutrient levels.
 - Identify nutrient deficiencies or surpluses.
5. Create a site-specific fertilisation plan
 - Adjust fertiliser type, amount and timing based on the results.
 - Apply manure or mineral fertiliser only where needed.
6. Review and update regularly
 - Repeat soil analyses every 5–10 years (or as required by national rules).
 - Monitor pasture condition and adapt fertilisation if necessary.

How Will this Solution Impact the Performance of your Farm ?



Socioeconomics: This solution will support the social performance of the farm because it shows responsibility toward the environment by reducing fertilizer use, which builds public trust. It enhances the farm’s image through greener production and better soil management, though costly labour needs should be considered. Overall, it reinforces credibility and positive outreach within the community.

This solution will support the economic performance of the farm because reducing fertilizer use can lower input costs, improve fodder quality and the self-sufficiency of the farm. Better yields contribute to profitability and may affect land value, either positively or negatively. However, costly labour needs can slightly reduce the overall financial advantage.

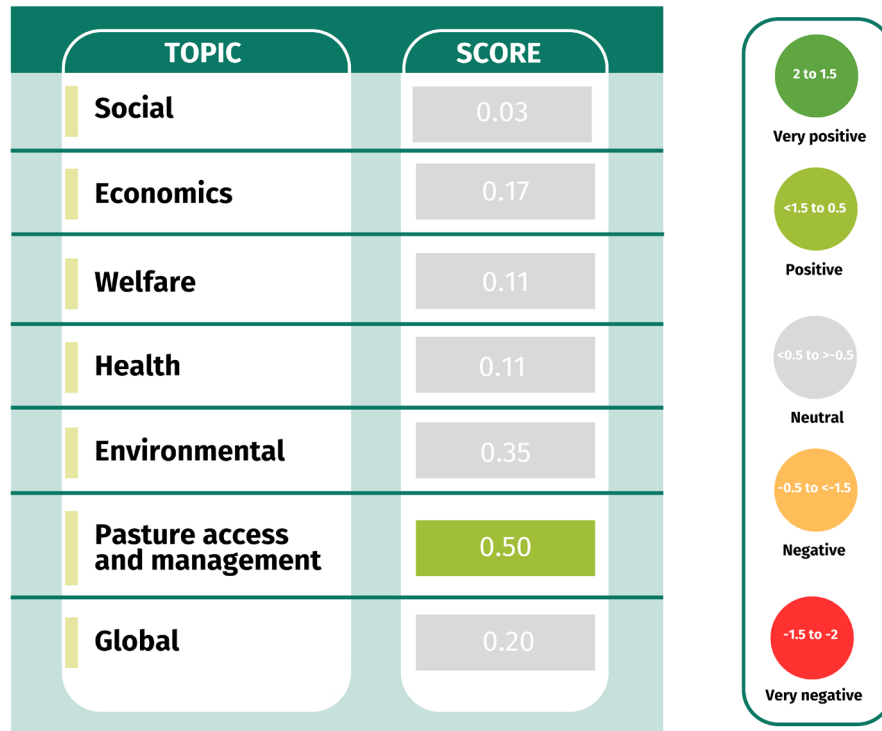


Health & Welfare: This solution will support the health of animals since they could be provided with the forage well-balanced in nutrients. It can have also a positive effect on horse welfare when good quality forage, especially pasture and hay, can be eaten by the animals for long periods of time.



Environmental Sustainability: this solution will support the environmental performance of the farm because it allows fertilization to be adapted to the soil, thus limiting soil and water pollution and preserving biodiversity. This solution will support the land access or management performance of the farm because by optimal soil management the organic matter of fields is increased, and optimal fertilization is realized.

How Will this Solution Impact the Resilience of your Farm?



Socioeconomics: This solution will not impact socio-economic performance of the farm facing external challenges assessed because its influence on resilience remains modest overall. It may slightly reduce vulnerability to inflation by lowering dependence on fertilizers and supporting more efficient soil management. During extreme weather or limited land access, it can also bring marginal benefits by helping maintain yields, fodder quality, and healthier conditions for horses. However, in the face of pandemics, welfare standards, or disease outbreaks, its effect is largely neutral, with no major socio-economic advantages. Overall, the contribution remains limited, with some small supportive effects but no significant influence on global socio-economic resilience.

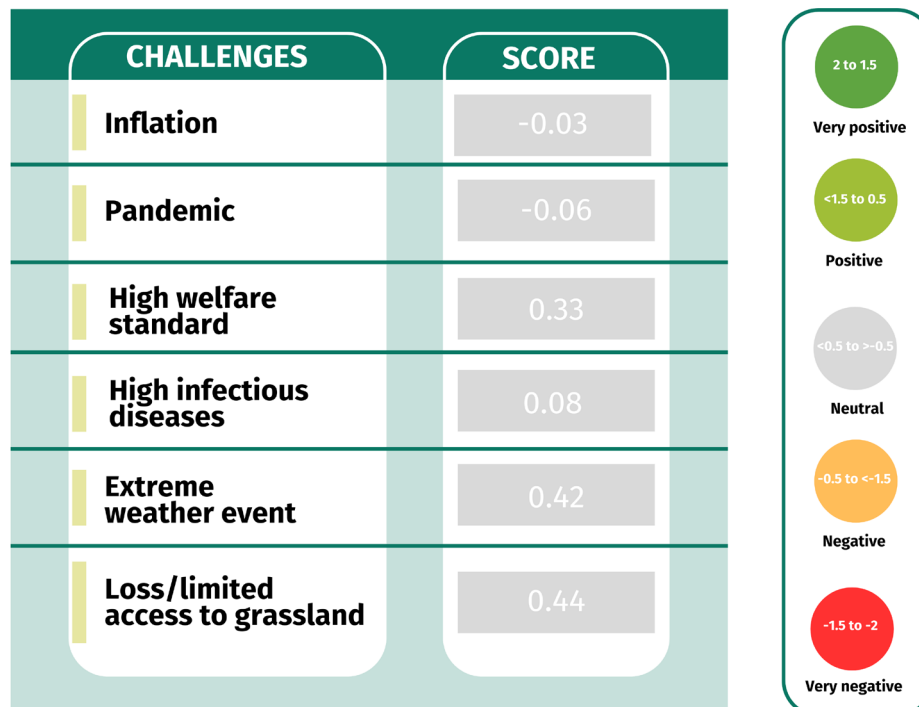


Health & Welfare: When the farm faces external challenges, its health performance will be supported only minimally by this solution, as it has little effect on the reduction of pain, mortality, and the need for medication. Also, this solution does not directly enhance the welfare performance of the farm when faced with external challenges since it does not necessarily translate into an improved emotional state for the horses or better living conditions.



Environmental Sustainability: This solution will not impact environmental performance of the farm facing external challenges assessed because effects are quite small, if solution is already in use. This solution will support land access or management performance of the farm facing external challenges assessed because even there can be better quality and yield with the solution.

How Can this Solution Help your Farm Cope with Specific External Challenges to Become More Resilient?



Inflation & Social Crises: This solution will not impact the global performance of the farm facing inflation because its overall socio-economic influence is limited. It may slightly reduce dependency on fertilizers and ease cost pressures, but these positive effects can be counterbalanced by additional labour costs and management demands, resulting in only a marginal improvement in resilience.

This solution will not impact the global performance of the farm facing pandemics because it does not directly support continuity of operations or social cohesion. Its effect remains neutral, with no significant advantages for global resilience under such conditions.



Welfare & Diseases: This solution will actually not impact the global performance of the farm across all three areas when facing infectious disease challenges because it does not support the sanitary protection of the farm.

Also, it has a neutral impact on welfare the global performance of the farm when adapting to compulsory high welfare standards, because it does not relate to welfare legislation.



Climate Change & Access to Land: Environmental challenge: this solution will not impact the global performance of the farm facing extreme weather events (abnormally high or low temperatures, drought, excessive rain, windstorm and/or flood) because it does, however, allow farm to be a little more resilient in the face of an extreme climate event, since the solution enables farmer to know the effect of this change on the soil and therefore to respond appropriately.

Land access/management challenge: this solution does not impact the global performance of the farm facing loss or limited access to agricultural land because it does not compensate the loss. However, even if there is limited access to grasslands, the solution helps to maintain accessible surfaces in good condition and to maintain better quality and quantity of the yield.



Cost-Benefit Analysis

Costs

Socioeconomics:

- Costs for soil scans, sampling and laboratory analyses.
- Possible additional management activities to improve soil quality.
- The ability of the farmer to utilize the results is important. There are possible need and costs for advisory services.
- Costs are mainly related to management activities (e.g. adapted machinery use).

Health & Welfare:

- No direct costs, as the benefits arise indirectly via better forage.

Environmental Sustainability :

- No direct costs.

Cooperation between Farms:

- Coordination efforts for cooperation (time, organisation).
- Possible shared costs for machinery or analysis services.

Benefits

- Optimised fertiliser use → lower input costs and better profitability.
- More efficient planning and decision-making.
- Professional development for farmers and better farm image.
- Soil analyses may be required for agricultural subsidies.

- Better feed quality and quantity through improved soil fertility.
- More balanced nutrient content in forage → improved equine health and welfare.
- Reduced risk of nutritional deficiencies.

- Less nutrient leakage into water bodies.
- Reduced greenhouse gas emissions by increasing fertiliser use efficiency.
- Improved soil structure, organic matter content and biodiversity.
- Preservation of water quality and ecosystems.

- Possibility for joint soil analyses or shared use of machinery.
- Farmers can exchange knowledge on soil management practices.
- Owners of equines benefit from better quality forage produced by cooperating farms.





Technical Sheet for Solution Implementation

Soil Diagnosis for Sustainable Fertilizer Use

Additional Resources

Publications

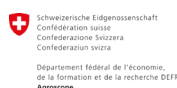
- Gao, Y., & Cabrera Serrenho, A. (2023). Greenhouse gas emissions from nitrogen fertilizers could be reduced by up to one-fifth of current levels by 2050 with combined interventions. *Nature Food*, 4(2), 170–178. <https://doi.org/10.1038/s43016-023-00698-w>

Websites

- <https://www.vantage-agrometius.nl/> (English, French, German)
- Equine Permaculture: <https://equinepermaculture.com/blog/2020/03/11/all-about-soil-part-5-using-soil-tests-to-improve-horse-pastures/>

Further Information

- European Academies, Regenerative agriculture in Europe: https://easac.eu/fileadmin/PDF_s/reports_statements/Regenerative_Agriculture/EASAC_RegAgri_Web_290422.pdf
- European Commission, Farmers of the future: https://www.europarl.europa.eu/cmsdata/232686/farmers_of_the_future_final_online.pdf



Funded by
the European Union

This project has received funding from the European Union under Grant Agreement No. 101086551.



Ideas to Animate a Workshop About the Solution

- Ask an agricultural advisor, soil analysis laboratory, or fertiliser company to sponsor the workshop.
- Find a model equine farm or equestrian facility where soil scans and sampling can be demonstrated.
- Perform soil sampling and scanning as part of the workshop, allowing participants to try out equipment and see how analyses are performed.

Proposed Structure for the Workshop on Know the Properties of the Soil to Reduce Fertiliser Use in Equines Farms:

1. Introduction to Soil Analysis for Efficient Fertilisation

- What is soil analysis and why is it important for equine farms?
- Key features: soil scans, sampling, laboratory analysis.
- Overview of available methods (e.g. EC and pH scans, nutrient analysis in the lab).

2. Benefits of Soil Analysis in Equine Farms

- Economic: Optimised fertiliser use, lower costs, better planning.
- Animal welfare: Better forage quality, more balanced nutrition for equines.
- Environmental: Less nutrient leakage, improved soil health and biodiversity.

3. Practical Applications on Equine Farms

- How to integrate soil scans and sampling into regular farm management.
- Using results to plan site-specific fertilisation.
- Examples of how this improves pasture productivity and feed quality

4. How to Choose the Most Suitable *System/Machine/Approach*

- Evaluating the farm's needs (size, paddock conditions, goals).
- Assessing required sampling frequency and type of analysis.
- Comparing services (local labs, mobile scanning services).

5. Hands-On Demonstration

- Live demonstration of soil scanning equipment.
- Participants collect soil samples and prepare them for lab analysis.
- Discussion of how to interpret basic results.

6. Maintenance and Troubleshooting

- Best practices for storing and handling sampling equipment.
- Common mistakes when sampling (depth, mixing, labelling).
- How to ensure reliable analysis results.



7. Case Studies and Real-World Examples

- Examples of equine farms that have optimised fertilisation through soil analysis.
- Lessons learned from farmers and advisors.
- How results influenced fertiliser use and forage quality.

8. Cost Analysis and Return on Investment (ROI)

- Typical costs of soil scans and analyses (without giving fixed numbers).
- Examples of savings through reduced fertiliser use.
- Long-term benefits: better pasture yield, healthier horses, less environmental impact.

9. Q&A Session

- Open discussion of participants' questions, experiences and challenges.

10. Wrap-Up and Resources

- Summary of key points.
- Provide resources: local labs, equipment suppliers, online tools.
- Networking opportunity for potential cooperation between farms.