



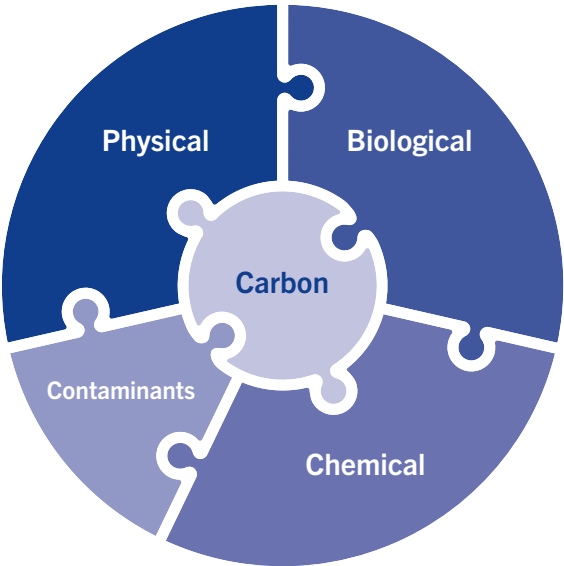
Healthy soil

Working towards healthy soil in agriculture is like solving a complex jigsaw puzzle, where all the pieces must fit together and be balanced.

Farmers and land managers can benefit from understanding soil health by using accurate data from detailed analyses.

Healthy soil is the foundation of food quality and food security. It also contributes to more resilient crops, cleaner water, sustainable production, greater biodiversity, and helps to store carbon and reduce CO₂ emissions. These are all factors that help farmers and land managers run businesses that are more environmentally and financially sustainable.

Soil Health Indicator helps you gain control of the complex jigsaw puzzle of soil health. It provides accurate data to tackle these challenges; from nutrient management planning to carbon sequestration.



New in Soil Health Indicator

SALT INDICES

Soil Health Indicator offers detailed salinisation indicators, not only ideal for soils in coastal areas but also for identifying the risk of salinisation problems during dry periods. The report provides insight into various sodium indicators (plant-available sodium (Na), Sodium Absorption Ratio (SAR), and the percentage of exchangeable sodium (ESP)). In addition to sodium, other salts are also reported, summarised in electrical conductivity (EC). All this data helps in taking measures such as crop selection or applying gypsum to prevent damage.

PHOSPHATE INDICES

New indicators for P-saturation and P-binding capacity. High phosphate saturation can lead to runoff and water pollution, while good phosphate binding is essential for nutrient availability to plants.

HEAVY METALS

New to Soil Health Indicator are the biologically available heavy metals. This is the amount of heavy metals available to the crop that can accumulate. There can be a significant difference between the total amount of heavy metals and their biological availability. Due to soil properties, such as pH, a large portion of the metals may not be absorbed by the crop, which may cause health issues for plants and animals.

SOIL LIFE

Insight into biological soil quality has been enhanced by displaying a total of 13 soil life parameters. Soil Health Indicator provides a fingerprint of the existing microbial soil food web, as well as its diversity and activity. New parameters include arbuscular mycorrhiza, fungi that form a symbiosis with the crop and exchange nutrients and water, and actinomycetes, filamentous bacteria that have a direct relationship with disease suppression.

SOIL HEALTH SCORE A-B-C-D-E: PROOF OF IMPROVEMENT AT A GLANCE

A	A: Excellent soil health: ideal for sustainable agricultural practices and soil management.
B	B: Good soil health: minor improvements are possible.
C	C: Average soil health: improvements are needed to achieve optimal yields.
D	D: Moderate soil health: measures needed for recovery.
E	E: Poor soil health: various improvements required to prevent further damage.

By regularly evaluating soil health using Soil Health Indicator and assigning a score, you can monitor the effectiveness of your soil management practices and provide evidence of progress of soil improvement. The A-B-C-D-E score is thus a valuable tool for both making strategic decisions and demonstrating sustainable performance, for example in reports or certifications for the agri-food industry.



Soil Health Indicator

Understand, monitor and improve soil health

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Testing for Life



Carbon

Soil stores carbon (C) in organic matter. This has two benefits. First, sufficient organic matter ensures healthy soil. Second, sequestering carbon in soil helps reduce the amount of CO₂ in the atmosphere.

Carbon

Chemical

Soil Chemistry

In healthy soil, macro and micronutrients are present in the right amounts, allowing for optimal plant growth. Macronutrients include nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), sulfur (S), and magnesium (Mg). Micronutrients include manganese (Mn), iron (Fe), copper (Cu), zinc (Zn), and boron (B). All these elements are present in different fractions in the soil and can be made directly available to plants or stored in the soil reserve.

Soil Physics

Physical properties of the soil include water retention capacity, the clay-humus complex (CEC), texture, and acidity (pH). These factors are essential for soil health as they determine soil structure and the amount of water and available nutrients.

Physical

Soil Biology

In healthy soil, there is an active and diverse soil life. Microorganisms such as fungi and bacteria convert plant residues into humus and nutrients. A diverse soil life also ensures a resilient soil where diseases and pests have less chance.

Biological

Contaminants

Contaminants in the soil disrupt soil health. Measuring the amount of biologically available heavy metals is essential. Depending on the soil pH, certain metals can be absorbed by crops to a greater or lesser extent. These harmful substances can threaten plant health and food safety, for example when aluminium causes root damage.

Contaminants

1. A-B-C-D-E Score

A simple and powerful method to assess the health of your soil. The A-B-C-D-E score provides quick insight into the current soil health status, and the impact of any actions taken or improvements made. Each letter represents a specific soil health condition.

2. Cation Exchange Capacity (CEC):

The cation exchange capacity (CEC), also known as the clay-humus complex, determines how well the soil retains and exchanges nutrients with the soil solution. A high CEC means that the soil can hold many essential nutrients such as calcium (Ca²⁺), magnesium (Mg²⁺), and potassium (K⁺). However, when the CEC is occupied by elements like aluminum (Al³⁺) and hydrogen (H⁺), it can negatively affect soil fertility. The size and occupation of the CEC with useful nutrients is a measure of soil fertility.

3. Soil and Crop-based recommendations

1. Crop-based recommendations:

Fertilisation advice for up to six crops is generated, based on all analysis results in the package. By working with expected yields, advice can be tailored and adjusted up or down if necessary. This ensures more efficient use of inputs and better-aligned fertilisation. There are also different recommendations for different varieties of crops.

2. Soil-based recommendations:

These recommendations can help you to invest in healthy and resilient soil for the future. This includes improving pH, optimising soil fertility, balancing the nutrients bound to the CEC to improve soil structure, and guidelines to maintain or improve the soil's organic matter status.

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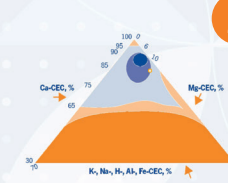
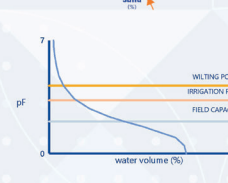
Soil Health Indicator

Soil Health Indicator is part of Eurofins Soil Health Solutions. The healthier the soil, the better the contribution to Sustainable Development Goals.

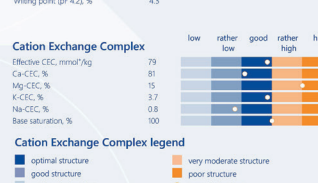
1

A B C D E

The Foundation



Prudent use of water and nutrients



AR-25-T1-000066-01

Page 1/4

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Crop based guidelines		Optimise crop yield and quality					
Main nutrients	Ware potatoes	Winter wheat	Sugarbeet	Alfalfa	Silage maize	Leek	
Exp. yield (t/ha)	50	9	82	20	50	43	
N, kg/ha	210	180	160	25	140	120	
S, kg/ha	32	28	37	35	36	41	
P, kg/ha	0	0	0	0	0	0	
K, kg/ha	300	94	120	90	200	140	
Ca, kg/ha	60	15	52	37	37	97	
Mg, kg/ha	29	12	18	12	35	18	

Micro nutrients		Rather low					
Fe, kg/ha		Rather low	Rather low	Rather low	Rather low	Rather low	
Zn, kg/ha	0.0	0.0	0.0	0.0	0.0	0.0	
Mn, kg/ha	Rather low	Rather low	Rather low	Rather low	Rather low	Rather low	
Cu, kg/ha	0.4	0.4	0.4	0.4	0.4	0.4	
Ni, kg/ha	Very low	Very low	Very low	Very low	Very low	Very low	
B, kg/ha	0.5	0.5	1.4	1.4	0.5	0.5	
Mo, kg/ha	Very low	Very low	Very low	Very low	Very low	Very low	

Beneficial nutrients		Good					
Si, kg/ha		Good	Good	Good	Good	Good	
Co, kg/ha	Rather high	Rather high	Rather high	Rather high	Rather high	Rather high	
Se, g/ha	Very low	Very low	Very low	Very low	Very low	Very low	
Na, kg/ha	0	0	100	0	0	0	

Bio available heavy metals		Low amounts - no effect on crop growth and/or health risks are expected.					
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Soil based guidelines		Year					
P, kg/ha		19	75	19	75	19	75
K, kg/ha		0	0	0	0	0	0
Ca, kg/ha		62	250	62	250	62	250
Mg, kg/ha		0	0	0	0	0	0
Target pH (5.7, kg N/ha)		370	370	370	370	370	370
Q1 pH increase, kg N/ha		230	230	230	230	230	230
Max. irrigation recommendation, mm		36	36	36	36	36	36
Fungi/Bacteria ratio							

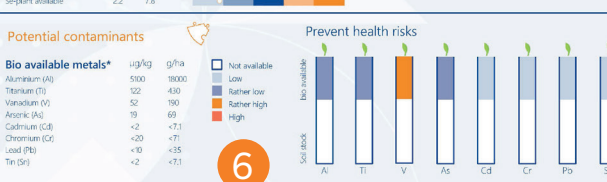
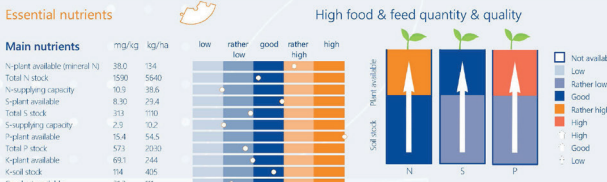
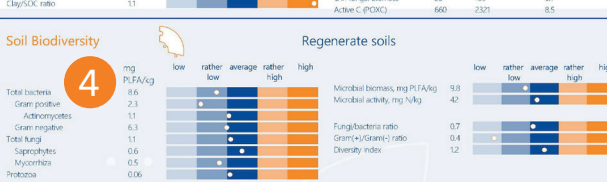
AR-25-T1-000066-01

Page 3/4

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AR-25-T1-000066-01

Page 2/4

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3. Soil Organic Carbon Balance		-					
Current soil carbon status:	79969	kg C per hectare	= 293.5	ton CO ₂ per hectare			
Output: expected breakdown (mineralisation)	1839	kg C per hectare	= 6.7	ton CO ₂ per hectare			
Input: Needed to maintain soil organic carbon status	1839	kg C per hectare	= 6.7	ton CO ₂ per hectare			
Additional input needed to improve by 4 per 1000	329	kg C per hectare	= 12	ton CO ₂ per hectare			
Net required carbon input	2159	kg C per hectare	= 7.9	ton CO ₂ per hectare			

Risk of P-leaching		Low					
P-leaching capacity, kg/ha		Low	Low	Low	Low	Low	
P-saturation, %	51	51	51	51	51	51	
P-saturation water							

Methods		Low					
Low		Low	Low	Low	Low	Low	
High		High	High	High	High	High	

Contact Eurofins:		Low					
Low		Low	Low	Low	Low	Low	
High		High	High	High	High	High	

AR-25-T1-000066-01

Page 4/4

4. Soil life

A diverse and active soil life is essential for healthy and resilient soil. Microorganisms play an important role in the buildup or breakdown of organic material, as well as in the release of nutrients and the improvement of soil structure. A rich soil life also helps make the soil more resilient against diseases and pests.

5. Micronutrients

Micronutrients are essential nutrients that plants and micro-organisms need for growth and development. Elements such as zinc, copper, iron, and manganese play a crucial role in photosynthesis, enzyme activity, and the uptake of other nutrients. A balanced presence of micronutrients contributes to higher crop yields and makes plants more resilient to diseases and stress factors. However, an excess can be harmful. Therefore understanding both is important.

6. Heavy metals

Soil contamination by heavy metals such as lead, cadmium, and chromium can severely affect soil health. These metals can be toxic to beneficial soil organisms and disrupt the uptake of essential nutrients by plants. This can lead to reduced crop yields, deteriorated soil structure, and long-term damage to the soil ecosystem. Additionally, heavy metals can accumulate in crops and pose a risk to human and animal health through the food chain.