

#### **Soil Navigator Decision Support System**

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# SOIL NAVIGATOR DSS

# A Decision Support System for assessing and optimizing soil functions

#### What is the Soil Navigator?

The Soil Navigator decision support system (DSS) was developed in the Horizon 2020 project LANDMARK. It assesses the initial capacity of five soil functions within a field including primary productivity, nutrient cycling, water purification and regulation, carbon sequestration and climate regulation, and biodiversity and habitat provision. In addition, this evidence based DSS offers targeted solutions and management recommendations to improve the capacity of several soil functions simultaneously and assisting farmers and farm advisors to make the right decisions for long term sustainability.



## How it works:

# How can I make the most of my land with the Soil Navigator?

- By assessing the initial capacity of the five main soil functions based on data obtained from the LANDMARK database coupled with data entered by the user
- By providing recommendations for the management practices required to achieve the desired capacity of the soil functions as specified by the user
- By showing the resulting capacity of the soil functions based on the management recommendations selected by the user

#### Soil Agroecosystem Management **Environment** Run Soil Soil physical properties Farm management Country • Specific climate data **Primary** Navigator Soil chemical properties Livestock management • Climatic zone Field topography **Productivity** and stoichiometry • Land use (crop or grassland) Crop management Produce plant biomass for Soil biology Fertilization human use Water management Providing food, feed, fiber Pest management and fuel Harvest data **START Data Input** Water The Soil Navigator begins by prompting the user for information and data specific to the chosen purification and field for analysis. The required data input is divided into the four categories featured here. regulation Remove harmful compounds • Store and conduct water Prevention of droughts, **Management Recommendations** flooding and erosion After optimization the Soil Navigator provides a list of management Soil recommendations required for achieving the desired capacity **FINISH** of the soil functions. The user can then select which of these Navigator Initial recommendations to follow and view the achieved capacities for **Biodiversity Assessment** DSS the field. and habitat The Soil Navigator will assess provision Road Map the initial capacity of each of Apply more Apply / Apply manure varing • Multitude of soil organisms the five soil functions in the increase organic leafy crop amounts of ammonium and processes field as either high, medium fertilizer residues (NH4+) or low. **Nutrient** Use of catch Increased Use of cycling crops/cover pest control intercropping Receive nutrients from bycrops products **Optimisation** Aquire nutrients from Artificial Apply The Soil Navigator interface proresources vides an interactive graphical display nitrification drainage Provide nutrients for of the initial capacity and allows the user to inhibitors system crops make real-time adjustments to desired capacity for each of the soil functions. Reduce tillage Diversify Climate Intensity / regulation crop rotation frequency • Reduce the negative impact **Desired capacity** of increased greenhouse gas Based on the initial assessment of the capacity of the emissions five soil functions, the user decides which soil function(s) **Suggested Management** Select Run Recommendations to improve and selects the desired capacity and Optimization Improvements importance for the(se) soil functions capacities.

### **Key Features**

- Knowledge driven: The DSS integrates five DEX (Decision Expert) models, developed by domain experts within each of the five soil functions
- Real-data validation: The DEX models are validated against real data collected on more than 90 sites across Europe from the LANDMARK project.
- All enriched the decision making process is supported using optimization of targets driven by emerging All technologies for qualitative and quantitative modeling.
- User-friendly: The Soil Navigator is available as an intuitive web-based graphical interface complete with video tutorials in four languages, inbuilt help icons and explanatory texts.

## **The Soil Navigator DSS Potential**

- The Soil Navigator DSS has a great potential to complement the Farm Sustainability Tool for Nutrients included in the Common Agricultural Policy 2021-2027 proposal adopted by the European Commission.
- The Soil Navigator DSS has potential to be spatially upgraded to assist decisions on which soil functions to prioritize in a specific region or EU member state.
- The Soil Navigator DSS could be used as an educational tool for farmers, farm advisors and students, and its potential should be further exploited for the benefit of farmers and the society as a whole.





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