TUdi Newsletter for Operational Groups

Dear TUdi Operational Groups,

We are glad to present you with the first edition of the TUdi project Newsletter, which is specifically aimed at Operational Groups (OGs) of the European Innovation Partnership (EIP-Agri). Our purpose is to introduce the status of several decision support tools (DSTs) developed in TUdi to evaluate soil degradation processes in farms and to provide guidance on how to best restore the degraded soil properties. Each of the different DSTs provides contact information for interested parties. Feel free to circulate this newsletter, and to write to the contacts provided in each section if you are interested in getting more information or in participating in the testing of the DSTs.

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1. TUdi Project Introduction

By Xiaoping Zhang and José A. Gómez

What is the TUdi Project?

TUdi is a collaborative project between the European Union and China funded by the European Commission and the Chinese Ministry of Science and Technology, within the Horizon 2020 programme. It integrates fifteen research teams and companies from Spain, the U.K., Italy, Austria, the Czech Republic, Bulgaria, Hungary, China and New Zealand. It is built around the concept of a multi-actor approach, and the project activities and results are coordinated and carried out in cooperation with a cooperative network of stakeholders from the agricultural sector in the participating countries.

Find out all about the project here: https://tudi-project.org/

What is the main objective of TUdi?

The main objective of TUdi is to help reverse the unsustainable management of soils in key agricultural systems in the EU and China, providing alternatives to farmers to maintain their profitability while restoring and improving their soils. Its final goal is to develop an integrated platform of alternatives to reverse soil degradation. The DSTs introduced in this newsletter are the core of this platform.

What is the current status of the project?

The project runs from July 2021 to July 2025, and it is now in the phase of testing and refining many of the preliminary versions of the tools and materials that will form the envisioned platform. Many of the DSTs presented in this newsletter will have their preliminary version for internal testing among a reduced number of stakeholders before the summer of 2024, with the final version envisioned by early 2025.

2. Decision support tools for end users developed by TUdi

By Tomas Dostal, Laura Zavattaro and Llanos López
Contact: mllanos.lopez@agrisat.es

What are the DSTs?

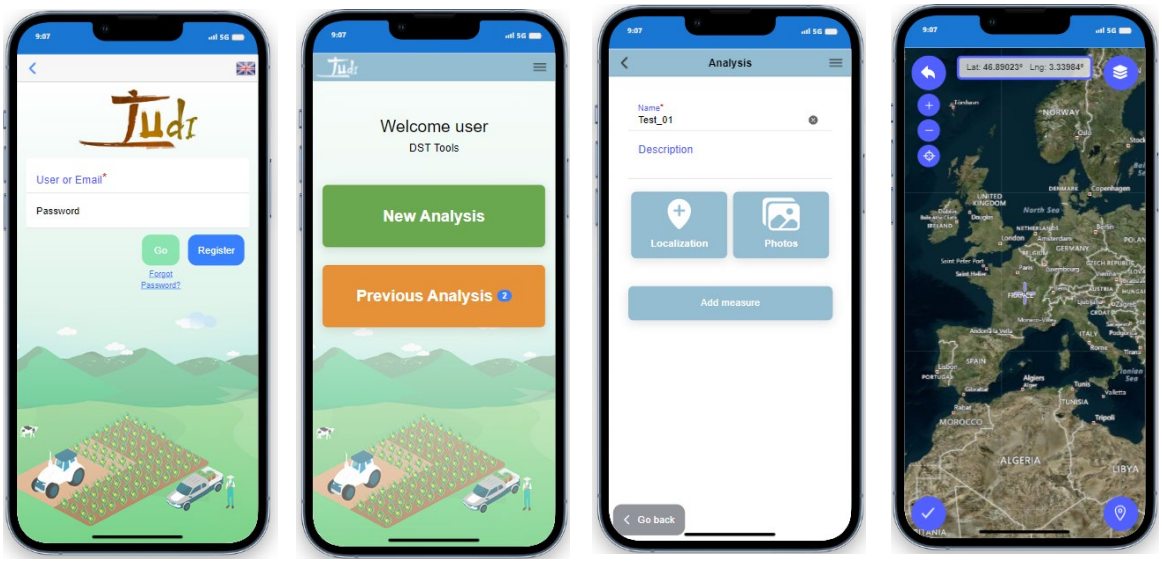
Decision Support Systems are tools accessible online that will help farmers by i) evidencing a possible problem in soil health status, ii) proposing agricultural practices to improve the situation, when degraded or at risk, and iii) monitoring the soil health status development in time.

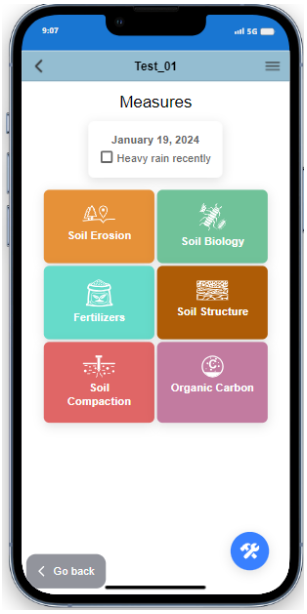
How do we envision their use?

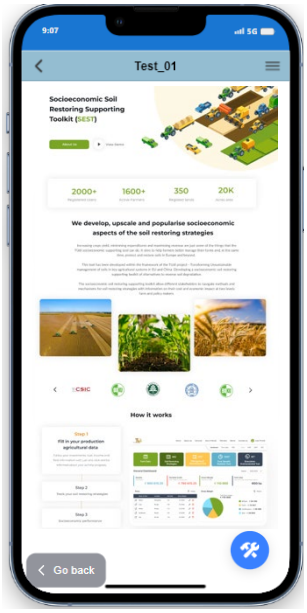
Each farmer will access the toolbox developed by TUdi and select the tool(s) they want to run first. Information will be inserted at a field level, including the possibility of uploading georeferenced photos for monitoring the change in soil status in time. Simple analysis based on visual assessment, widely used standard procedures but generally without any specific equipment or knowledge will be used within individual DSTs.

What is the stage of development and when will they be available?

Current DSTs function but require refinement for optimal use. They will soon be translated into national languages for TUdi network's pilot farmers. The final release for farmer use is set for the summer of 2024. Certain DSTs, like Soil Erosion and Soil Compaction, are already fully applicable, undergoing final polishing and translation to national languages.







Farm Data

SRS Soil Restoring Strategies

MOT Management Operational Tool

CBAT Cost-Benefit Analysis Tool

SET Simulation Environmental Tool

General Dashboard

Season: 2022-2023

Income	Variable Costs	Gross Margin	Farm Size
Total income	Direct linked to the production	Total Gross margin	Total size of the utilized lands in hectars
€ 900 615.25	€ 790 615.25	€ 110 000	600 ha

Plots

Filters

Name of field	Location	Size (ha)	Gross Margin
Wheat	Pazardzhik	120	€ 20 000
Corn	Plovdiv	120	€ 20 000
Wheat	Plovdiv	120	€ 30 000
Sunflowers	Plovdiv	120	€ 20 000
Rye	Plovdiv	120	€ 20 000

Gross Margin

Filters

Total Gross margin
€ 110 000

- Wheat - € 50 000
- Corn - € 20 000
- Sunflowers - € 20 000
- Rye - € 20 000

3. Decision support tools on erosion in arable farm

By Josef Krása and Raquel Falcao
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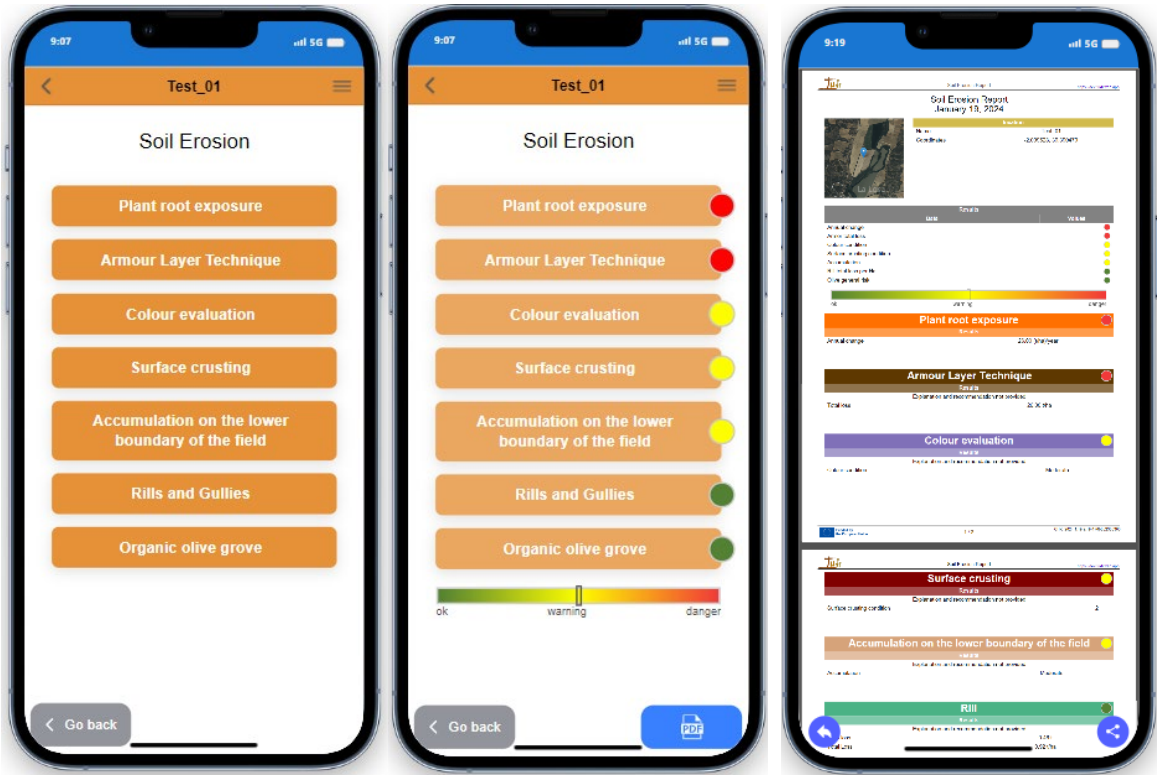
Why is this DST necessary?

The soil erosion process has been globally classified as the most serious soil degradation process on agricultural soils. Furthermore, this process has been classified as the most serious risk, perceived by farmers during the initial survey done at the beginning of the TUdi project. Soil erosion control also is included in most national strategies for soil conservation.

How does it work?

The users come to their field with their mobile phones, and then they select which methods of soil erosion assessment are appropriate for them, such as observation of rills, sedimentation cones or changes in soil colour. They feed data or capture images and receive a classification of the damage. Results can be saved with date and location for future comparisons during strategy implementation.



4. Decision support tool on fertiliser

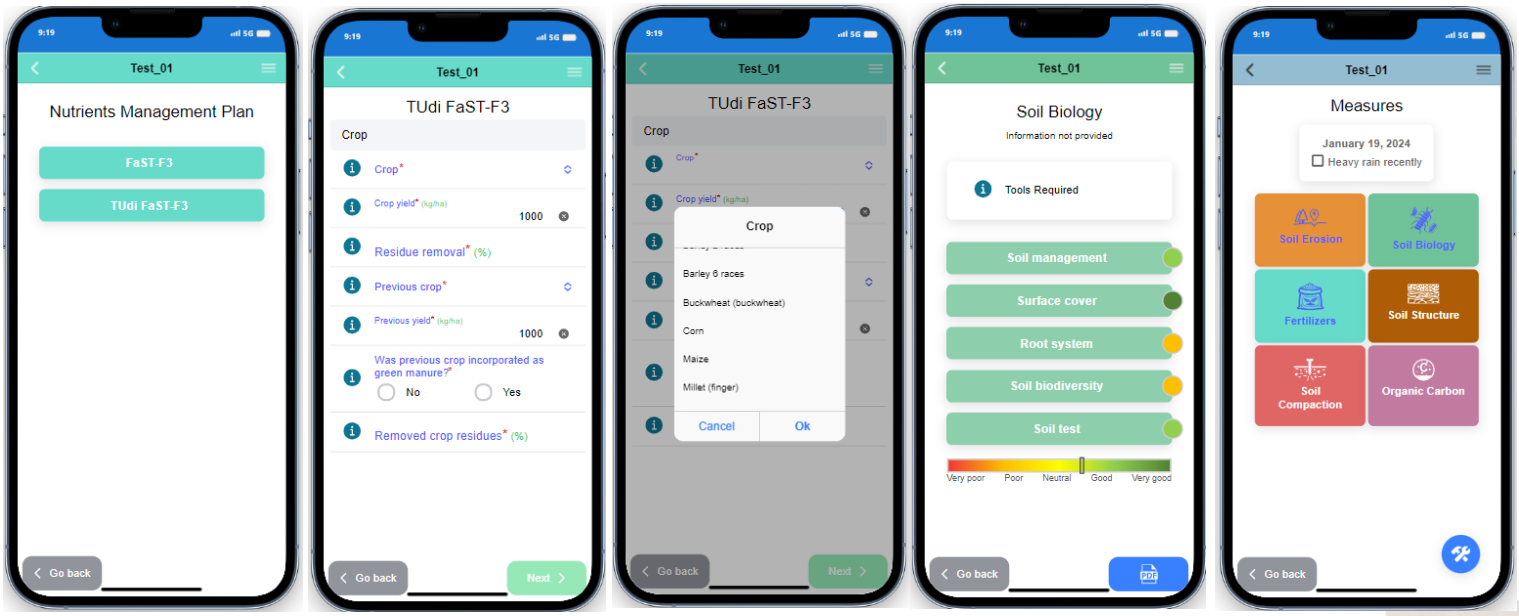
By Laura Zavattaro ✉ *Contact: laura.zavattaro@unito.it*

Why is this DST necessary?

The DST on fertilisation will help farmers decide on the amount of NPK fertilisers to supply to the crops, as nutrient surplus and deficit both affect the soil nutrient status and menace the equilibrium that keeps the soil alive without impacting the environment.

How does it work?

The DST is based on a mass-balance principle and estimated yields and contributions from the soil and environment. The farmer will input data regarding the crop, climate and soil status, plus a series of information regarding crop management, and the DST will calculate indicators of the provisional strategy and provide instead a suggestion on balanced amounts of NPK fertilisation to be supplied.



5. Decision support tool on compaction

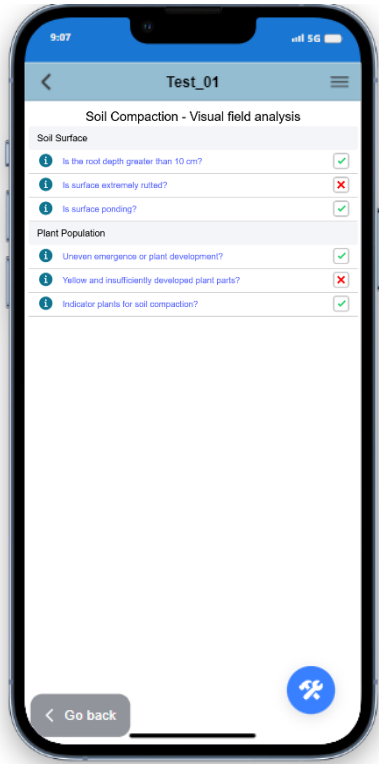
By Gunther Carl Liebhard ✉ *Contact: g.liebhard@boku.ac.at*

Why is this DST necessary?

Soil compaction is a risk to soil health and the fulfilment of soil functions. It is a form of soil structure degradation that affects the soil fertility by decreasing infiltration capability, hydraulic conductivity, water storage capacity, and air permeability. The soil compaction DST supports the user in detecting the type and severity of compaction and provides customised prevention and restoration recommendations.

How does it work?

The soil compaction DST provides three main functions. The first function allows to assess the compaction risk for the local soil. The second function gives the user information about the severity of degradation based on a visual assessment. The third function gives detailed information across the soil profile. Based on the assessments, the app provides customised management and restoration recommendations.



6. Decision support tool on soil carbon

By Íria Benavente-Ferraces, César Plaza, and Juan Carlos García-Gil
✉ Contact: i.benavente@ica.csic.es cesar.plaza@csic.es jcgarcia-gil@ica.csic.es

Why is this DST necessary?

Knowledge of soil carbon is essential for sustainable land management. Soil carbon plays a pivotal role in enhancing soil fertility, promoting plant growth, and mitigating climate change through carbon sequestration. The soil carbon DST empowers users to make informed decisions, promoting practices that enhance soil health while ensuring efficient resource use.

How does it work?

The DST is divided into two sections: one diagnoses soil structure quality based on its organic carbon content, and the other forecasts soil organic carbon evolution. The user-input data is analysed and categorised using a traffic light scoring system. The DST processes these inputs to assess current soil conditions, generating recommendations to enhance soil health through optimised organic carbon management.

7. Decision support tool on soil biology

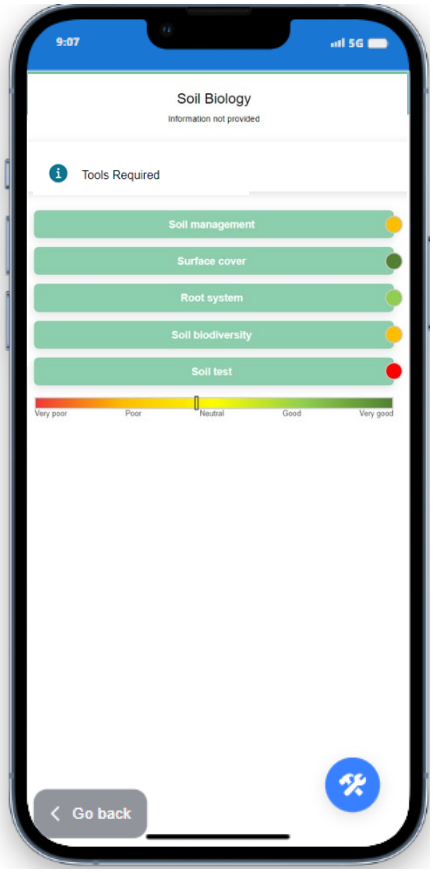
By Csilla Hudek ✉ *Contact: c.hudek@lancaster.ac.uk*

Why is this DST necessary?

Soil biological properties are highly sensitive indicators of soil health. They play an important role in providing relatively quick feedback on the impact of soil management. The soil biology DST supports and guides stakeholders in their decision-making on soil management towards establishing a healthy soil ecosystem which is the basis for healthy food production and food securing.

How does it work?

Soil biology indicators are inspected by the user carrying out visual field and soil observations, as well as soil testing at six indicator categories. Numerical evaluation of the indicators is reported with traffic light scorecards. A description of the present state of soil health and recommendations of best management practices for enhancing soil health from the soil biology perspective are incorporated.



8. Decision support tool on erosion in tree crops

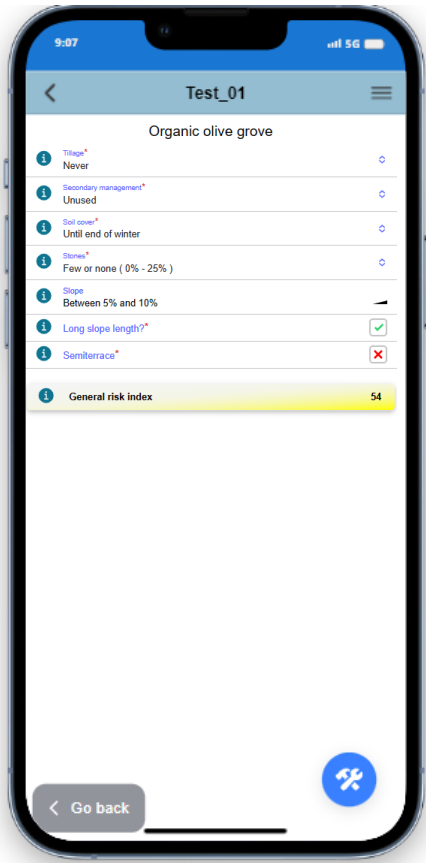
By Gema Guzmán ✉ *Contact: mariag.guzman@juntadeandalucia.es*

Why is this DST necessary?

The soil erosion DST has an extra component which is dedicated exclusively to tree crops, in particular organic olive orchards. This tool can be used to identify the risk of erosion easily at farm scale. With this tool, users can assess farm status and consult recommendations regarding soil conservation practices. This tool takes a step forward in terms of sustainable soil management and erosion risk reduction.

How does it work?

This simple tool allows the identification of soil erosion risk at farm scale. Through concise questions related to soil management and visual observations in the field, these seven indicators are recorded. Indicators are translated into one index which is categorised in a traffic light system. After this, a description of the current state of soil erosion risk and recommendations will be shown.



9. Decision support tools on cost benefit analysis

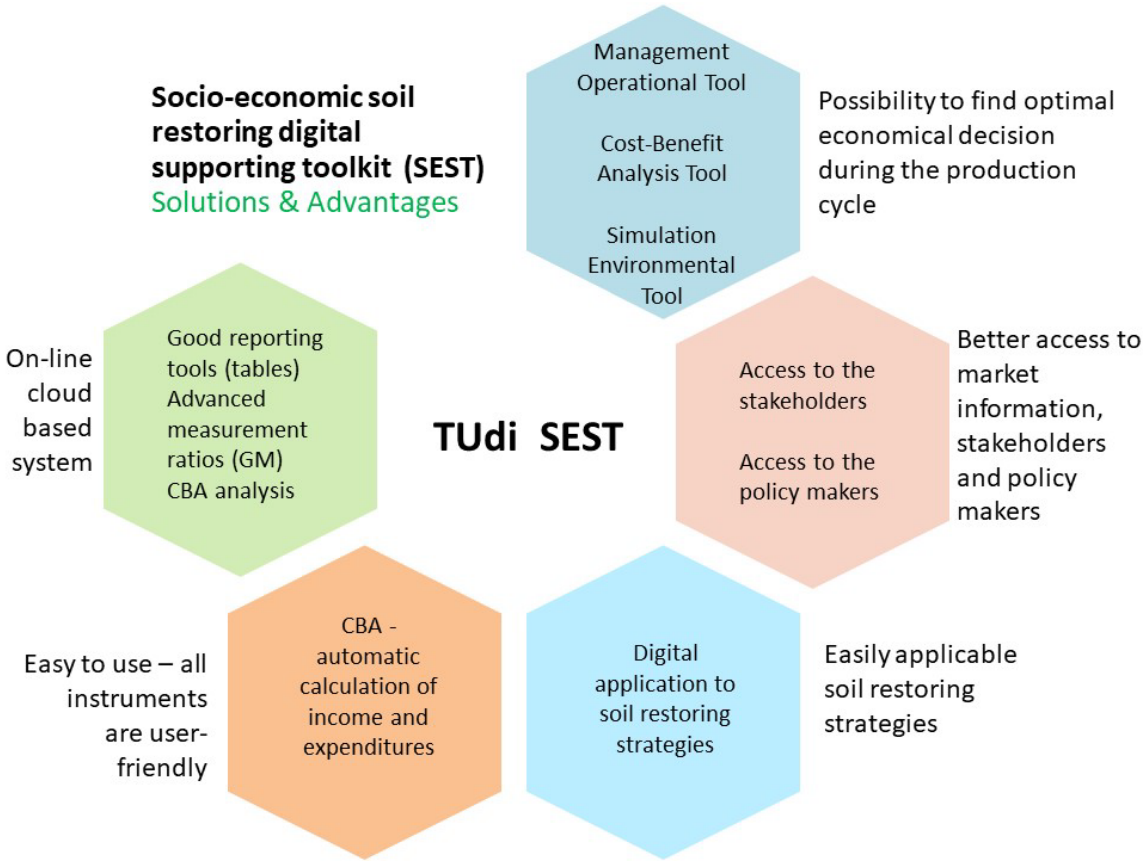
By Krasimir Kostenarov ✉ *Contact: kraskostenarov@yahoo.com*

Why is this DST necessary?

Socioeconomic soil restoring supporting toolkit (SEST) aims to meet the needs of farmers and policymakers. The SEST aims to fill the knowledge gap about the economic impact of soil-restoring strategies and improved fertilisation practices by enabling (i) farmers to evaluate the economic impact of different soil-restoration mechanisms and (ii) policymakers to draw policy and governance solutions.

How does it work?

SEST combines basic rigid calculations with additional information about the particular risks and connections of other DSTs for soil restoring strategies. Using this SEST, every farmer can perform a Cost-Benefit Analysis in order to identify the magnitude of variation in the present gross margin calculations depending on the specific risks considered based on soil restoring strategies.



10. Decision support tools on soil structure

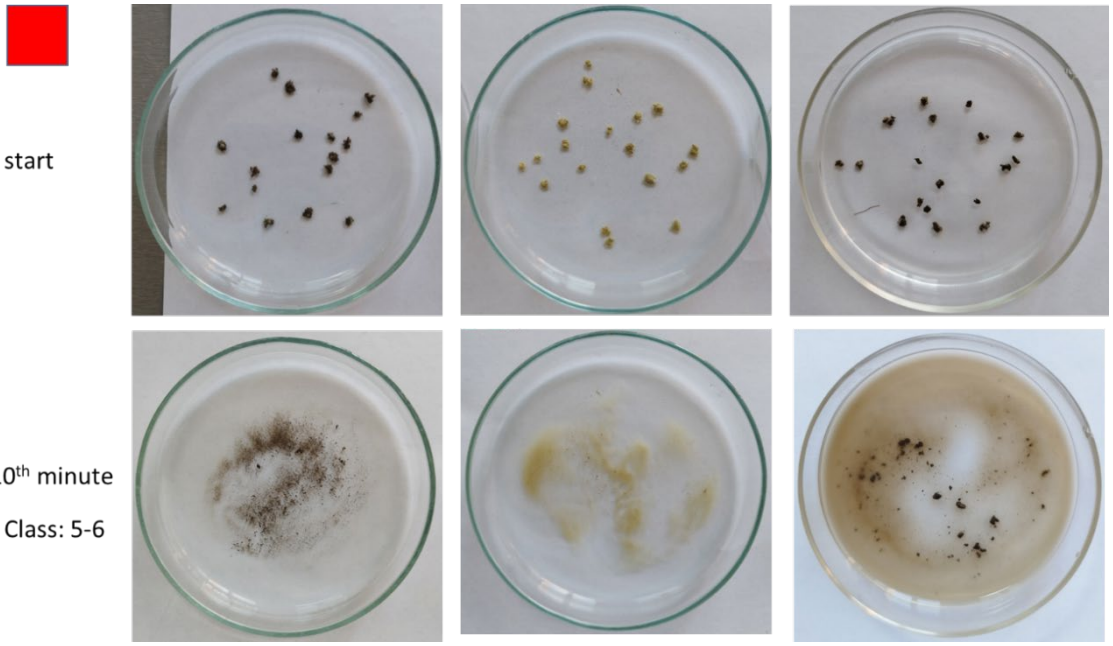
By Gyongyi Barna and Sándor Molnár
✉ *Contact: barna.gyongyi@atk.hu molnar.sandor@atk.hu*

Why is this DST necessary?

The soil structure controls the soil pore size distribution, soil water holding capacity and water pathways in the soil. Soil structure is affected by how particles of sand, silt, clay and soil organic matter are assembled into larger particles called soil aggregates. The stability of soil aggregates determines the resistance of soils to different moisture conditions.

How does it work?

It takes into account factors (chemistry, particle size distribution and/or texture) that influence soil structure and can be easily measured or even observed in the field. Both highly acidic and highly alkaline conditions result in poor soil structure and are therefore weighted by depth. It provides an estimate of the texture and a field-testable measure of aggregate stability.



11. Additional information on TUdi

By David Díez and Gunther Carl Liebhard
✉ Contact: g.liebhard@boku.ac.at

Where to find information on TUdi's activities and data?

There are several ways to find more information about TUdi activities and to assess data collected and used within the project TUdi. The central resource is the project website accessible at https://tudi-project.org/. You can further get information following us on X @Project_TUdi or see selected videos on YouTube @TUdiHorizon2020. Research (meta-)data is available from our partners or at https://tudi.helion.hu/tudi/.

Are there training materials from TUdi available?

A variety of training materials have been created and made available within the TUdi project. This includes teaching videos, leaflets on soil management and soil restoration strategies and techniques, webinar recordings of workshops and lectures, a catalogue of soil restoration and fertilisation strategies across the EU and China, and many other formats. All these materials can be obtained from the project website.

Can we propose activities regarding OG activities and TUdi?

Each scientific TUdi partner establishes national networks of stakeholders and thus links research to practice. Several of these stakeholder groups are engaged in the operational group of EIP-Agri. All TUdi partners are eager to include interested stakeholders and operational groups in their national networks of stakeholders. TUdi partners are listed on the project website and can be contacted directly via email.