



TUdi Newsletter for Operational Groups

2nd issue

Dear Operational Groups,

We are pleased to present the second issue of the TUdi Newsletter specifically addressed to the Operational Groups (OGs) of the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-Agri) within the EU CAP network.

TUdi is now facing its conclusion, and it is now in a position to demonstrate and disseminate the tools developed during the project.

This newsletter explains several decision support tools (DSTs) developed in TUdi to assess soil degradation processes on agricultural soils and to provide guidance on how best to restore degraded soil properties, including its economic implications.

It is intended to be a brief summary, with links to short videos and contact details, for anyone interested in testing these tools and getting in touch with the project team about new activities around these DSTs in the coming months.

If you are interested in learning more or participating in the testing of DSTs, please feel free to distribute this newsletter and write to the contacts listed in each section.

TUdi contact: David Diez, dvdiez@ias.csic.es



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1. TUDI Project

By José A. Gómez and Xiaoping Zhang

What is TUDI?

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 sixteen 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 Decision Support Tools (DSTs) described 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 disseminating full versions of the tools and supporting materials that will form the envisioned platform. Preliminary versions of the DSTs presented in this newsletter have been already tested internally by project participants and a selected team of stakeholders. There are now complete versions of the DSTs to be disseminated and used by interested parts.



2. DSTs for end users developed in TUDI

By Thomas Dostal, Laura Zavattaro, and Llanos López

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What are the DSTs?

Decision Support Tools (DST) 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.

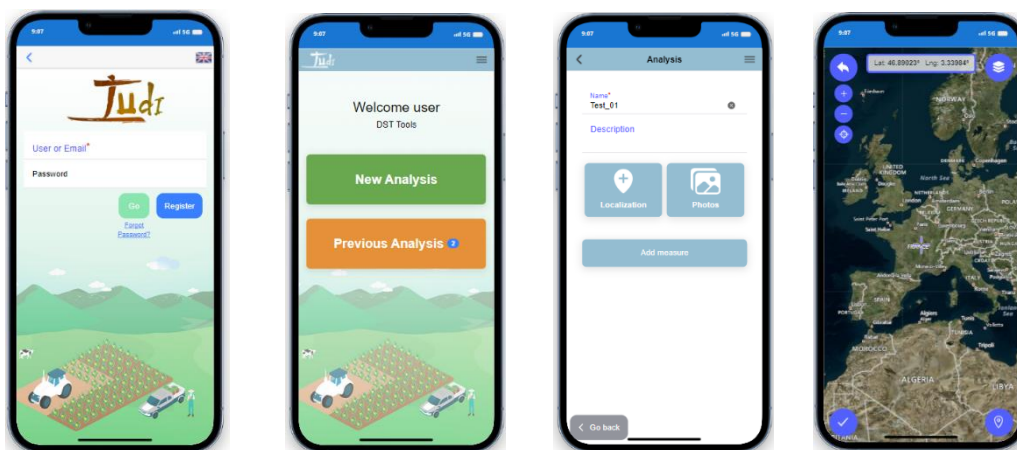
How do we envision their use?

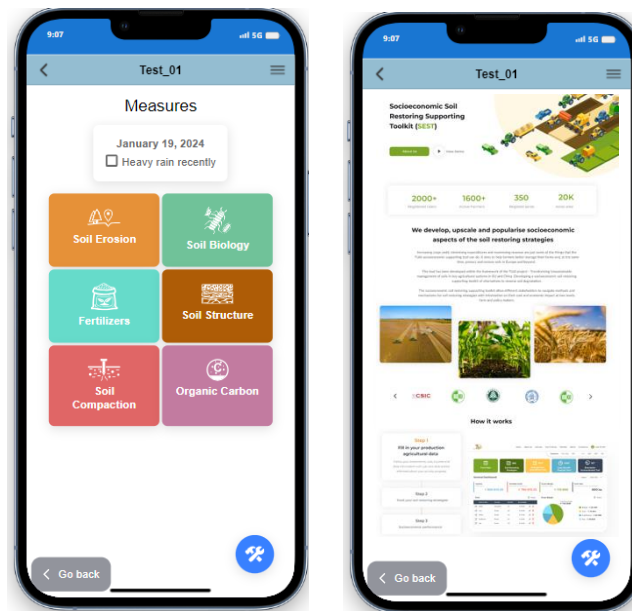
Each farmer will access the toolbox of DSTs developed by TUDI and select the tool(s) they want to use first. Information has to be inserted at a field level, with the possibility of uploading georeferenced photos for monitoring the change in soil status in time. Simple analysis based on visual assessment, widely used standard procedures but generally without any specific equipment or knowledge are used within any individual DSTs as a minimum baseline technology. From this, each DST provide more sophisticated evaluation technologies for end-users that have the possibility of implementing them. From this assessment, the DST will lead to a catalogue of restoration techniques specifically designed for them, in which the user will find the technologies best suited to the problems identified.

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

Full versions, based on earlier preliminary versions tested by the TUDI team and a network of stakeholders, are already available on this site (<https://tudi-soil.web.app/>).

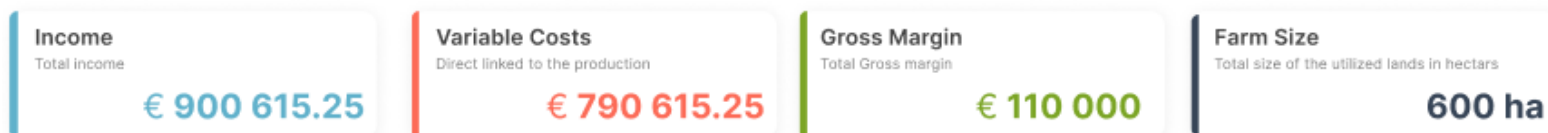
They are available in English and in some cases with a translation into some TUDI local languages (Spanish, German, Italian, etc..). These versions in local language will be available in the coming months.





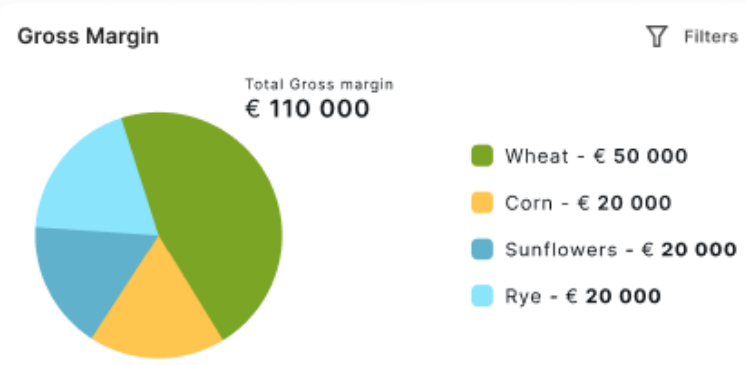
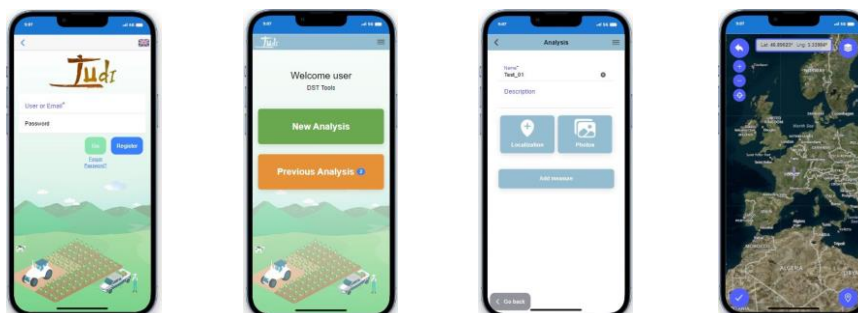
General Dashboard

Season: 2022-2023 ▼



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



3. DST on soil erosion

By Josef Krása and Raquel Falcao

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What is it, and what is it used for?

DST on soil erosion is a digital tool developed to identify and monitor erosion symptoms on farms. It allows the user to make an accurate and rapid assessment of the state of the soil in terms of erosion processes. The result is an integral erosion assessment, categorized in a traffic light system, together with specific recommendations. It is designed with two different specific sections, one for arable land and another for woody crops, for a tailored appraisal of erosion and recommendation of restoring measures.

What do you need to use it?

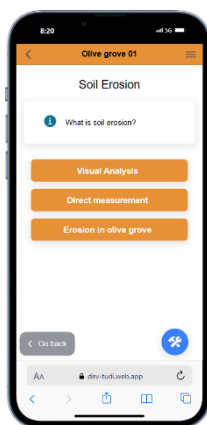
Users simply need to go to their field with their mobile phone and select the soil erosion assessment methods that suit them. The tool uses direct measurements (observation and measurement of rills, gullies, and elevation change), visual analysis (evidences of linear erosion, changes in soil colour, armour layer or surface crusting). These are used to estimate the erosion rate and/or indicate the severeness of observed soil erosion processes.

Where can it be found?

The DST on soil erosion has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: <https://youtu.be/Dyx4DcC7CkE>



4. DST on fertilisation

By Laura Zavattaro

✉ Contact: laura.zavattaro@unito.it

What is it and what is it used for?

DST on fertilisation is a digital tool designed to assist farmers in making informed decisions regarding crop fertilization management.

It facilitates the estimation of balanced NPK fertilization doses based on the crop's nutritional requirements while also providing an evaluation of current fertilization practices.

What do you need to use it?

The calculation of crop nutritional requirements relies on various data inputs, including:

- Current crop data (e.g., yield and species-specific nutritional needs).
- Previous crop information.
- Soil condition assessments.
- Site-specific climatic conditions.
- A balance analysis between nutrient inputs and removals through plant uptake and loss processes.

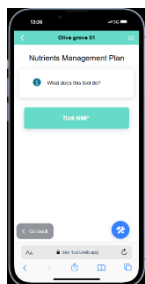
For fertilization management evaluation, the tool utilizes the nutrient surplus, but a set of indicators such as nutrient use efficiency, ammonia volatilization, nitrous oxide emission and nitrate leaching are also computed.

Where can it be found?

The DST on fertilisation has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: <https://youtu.be/EXXxeXXz0zY>



5. DST on soil compaction

By Gunther Carl Liebhard

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What is it, and what is it used for?

Soil compaction is a risk to soil health and the fulfilment of its functions. It is a form of soil structure degradation that affects fertility by reducing infiltration capacity, hydraulic conductivity, water storage capacity, and air permeability. The DST on soil compaction helps users detect the type and severity of compaction and provides personalized prevention and restoration recommendations.

What do you need to use it?

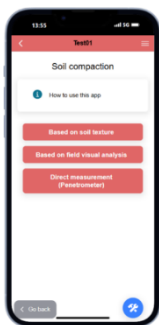
The DST on soil compaction offers three options for evaluating compaction. The first option allows the assessment of compaction risk based on soil texture – here the texture may already be known from laboratory analyses or soil maps or estimated by a simple and guided procedure in the field without any tools. The second option provides users with information about soil compaction based on a visual assessment – this means a guided visual assessment of signs and indicators of compaction (e.g., water stagnation, uneven germination). Lastly, compaction can also be evaluated through direct measurement using a (homemade) penetrometer and the evaluation app. Based on these evaluations, the tool provides customized management and restoration recommendations.

Where can it be found?

The DST on soil compaction has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: https://youtu.be/dp34uv_r6tA



6. DST on soil carbon

By Íria Benavente-Ferraces, César Plaza, and Juan Carlos García-Gil

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What is it, and what is it used for?

The DST on soil carbon is a digital tool designed to assist farmers in making informed decisions to promote practices that enhance soil health based on its carbon content and storage capacity.

It enables the estimation of soil quality by analysing its texture and organic carbon content. Additionally, it allows for the monthly estimation of organic carbon evolution in the soil over several years.

What do you need to use it?

To estimate soil quality, the DST requires soil data such as organic matter content or clay content, either as exact values or approximations based on visual colour indicators.

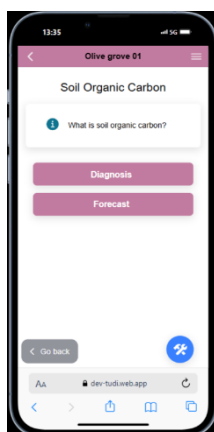
To estimate organic carbon evolution in the soil, the DST requires inputs such as crop type, specific management practices, soil characteristics, climatic data, and the period of time for carbon evolution estimation.

Where can it be found?

The DST on soil carbon has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: <https://youtu.be/9icj2RJgMHE>



7. DST on soil biology

By Csilla Hudek

✉ Contact: c.hudek@lancaster.ac.uk

What is it, and what is it used for?

Soil biological properties are very sensitive indicators of soil health. They play an important role in providing relatively quick information about the impact of soil management. The DST on soil biology helps and guides stakeholders in making decisions regarding soil management aimed at establishing a healthy soil ecosystem, which is the foundation for healthy food production and food security.

What do you need to use it?

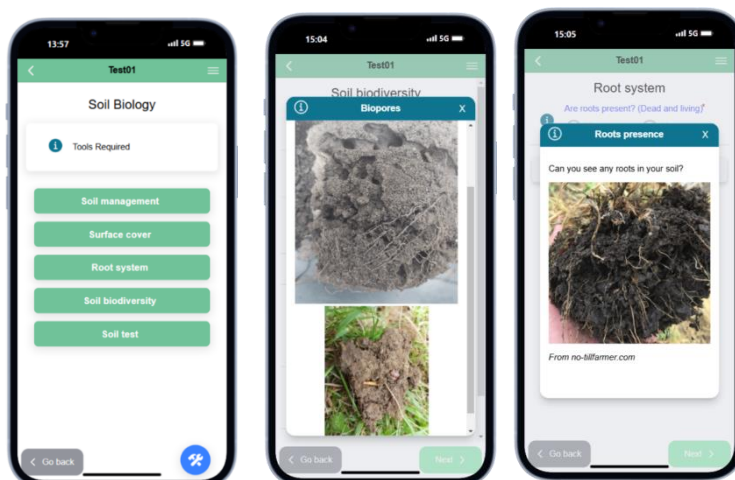
Soil biology depends on a number of factors e.g., soil management, vegetation cover, root systems, soil biodiversity, and other structural characteristics. The app guides the users through six categories of soil biological indicators. The required data obtained from field and soil observations as well as from soil testing. The categories then allocated a numerical score which indicates the impact of indicator inputs on soil biology. The results are reported with traffic light scorecards which indicate the current state of soil health, and recommendations to facilitate decision making for best management practices to improve soil health.

Where can it be found?

The DST on soil biology has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: <https://youtu.be/b2Vnrgzmv8Q>



8. DST on soil structure

By Gyongyi Barna and Zsolia Bakacsi

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What is it, and what is it used for?

Soil structure controls pore size distribution, water retention capacity, and water circulation pathways in the soil. It is influenced by the way soil particles of sand, silt, clay, and organic matter assemble into larger particles called soil aggregates. Soil structure determines the movement of water and nutrients to the plant. The DST on soil structure is used to evaluate soil structure and provide recommendations for improvement.

How do you need to use it?

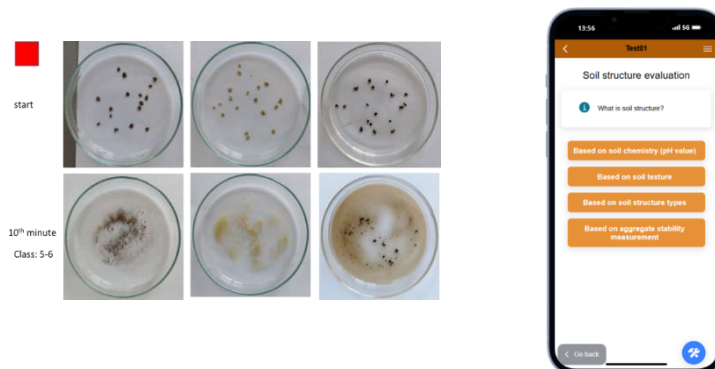
This tool allows user to assess soil structural conditions based on its chemical characteristics, particle size distribution, texture, and aggregate stability. Both highly acidic and highly alkaline conditions lead to poor soil structure and are weighted based on depth. It provides an estimate of soil texture and a field-testable measure of aggregate stability. To assess soil structural condition, you only need a soil sample and some water. The application guides the user through different tests to determine texture, structure, and aggregate stability, as well as the chemical condition (pH) of the soil.

Where can it be found?

The DST on soil structure has been integrated into the **TUdi app**, which is available for download on smartphones and can also be accessed via the web platform (<https://tudi-soil.web.app/>). To install it on your smartphone, once you've clicked on the link, click the download button next to your language flag.

Demonstration video

A short demonstration video can be found here: <https://youtu.be/Fb9BCM0SYY>



9. Socio-Economic Toolkit to Support Soil Restoration (SEST)

By Krasimir Kostenarov

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What is it, and what is it used for?

The Socio-Economic Toolkit to Support Soil Restoration (SEST) is a tool designed to meet the needs of farmers through detailed economic analysis, facilitating strategic decision-making by assessing the financial impact of soil restoration strategies and advanced fertilization practices.

Through SEST, farmers and other stakeholders in the agricultural sector can accurately assess the economic impact of different soil restoration mechanisms, enabling them to make informed and sustainable decisions. At the same time, it provides policy makers with key information to design more effective policies and governance strategies that promote sustainability and resilience in the agricultural sector.

What do you need to use it?

It is essential to identify and detail all variable and fixed costs associated with the farming practice in order to carry out an analysis using the Socio-Economic Toolkit for Supporting Soil Restoration (SEST). Income from crop yields and subsidies received should also be considered.

This enables the farmer to carry out a cost-benefit analysis and accurately assess the economic impact of soil restoration strategies.

Where can it be found?

SEST is integrated into a separate application, TUDi SEST, which you can access from your computer via the web platform (<https://tudisest.nbu.bg/login>).

Demonstration video

A short demonstration video can be found here: <https://youtu.be/6kxUwISSUFw>



10. To know more 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 fertilization strategies across the EU and China, and many other formats. All these materials can be obtained from the project website

<https://tudi-project.org/>

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.