iSQAPER
Interactive Soil Quality Assessment

Deliverable 8.3. Short report on applying the soil quality tool to different policy challenges and settings: SQAPP for policy makers

Authors: Thorfinn Stainforth, Luuk Fleskens

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Project Scientific Coordinator	Dr. L. Fleskens
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Author	T. Stainforth & L. Fleskens
Author email	tstainforth@ieep.eu
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1. Introduction to the App

The Soil Quality App (SQAPP) is the flagship deliverable of the EU-Horizon 2020 iSQAPER project. The SQAPP was designed with the idea that it should provide the user with the opportunity to access fragmented data on soil quality and soil threats in an easy-to-use way. Moreover, the user should not only receive indicator values, but be guided in interpreting these values by providing more contextual information: is a certain indicator value high or low in a given context. The system is set up to use soil quality and soil threat indicators for which spatial data exist as a first estimation for soil quality parameters in a given location, but these values can be replaced with more accurate own data by the app user. Ultimately, the user receives, based on an assessment of the most critical issues, management recommendations on how soil quality can be improved and soil threats be overcome.

This app may be of interest and have a number of possible applications for policy makers, elaborated in more detail in the following section. In general, the most interesting aspects of the app for policy makers are the option to have bidirectional exchange of soil data with farmers and land users, and the relative quality and soil threat information the app provides, allowing to plan priority interventions.

Contextual information is provided through analysing indicators within 2098 pedoclimatic zones build up from all relevant combinations of climate zones (n=29) and soil types (n=118), and by distinguishing between arable land and grazing land. The comparative aspect of the soil indicator data is then realized by calculating cumulative probability density functions for each pedo-climatic zone. All indicator values are given as 'best guestimate' for the location. The user can, after specifying some details on crops grown and pest management applied, proceed with generating management recommendations based on these standard values, or replace some or all indicator values with own data to get more accurate recommendations. This design helps to make the SQAPP directly helpful by visualizing available soil information in a systematic and easy-to-access way.

Thirdly, the SQAPP recommends agricultural management practices to improve soil quality and/or mitigate soil threats based on an integrated assessment of the aspects most urgently needing attention. This integrated way of considering soil quality indicators is new in comparison to existing soil apps and indicator systems. This integration avoids consideration of poor single indicator scores in isolation, which could have trade-offs with other soil quality indicators that are also suboptimal.

Fourthly, although the iSQAPER project focuses on Europe and China, it quickly became clear that the amount of work required to develop SQAPP would be more appropriately justified by building an app with global coverage. This inclination to go global was reinforced by some

hurdles experienced along the way to harmonise European and Chinese data. As a consequence, the pilot app was designed with global functionality in mind.

When looking at previously existing soil apps, they were mainly intended to provide information about the soil. There was limited focus on providing management advice on improving soil quality, and if such focus existed, it was either narrowly focused on particular aspects of soil quality (SOC), or required payment of a fee. Moreover, none of the apps reviewed by the project explicitly considered soil threats and management advice on how to mitigate them. Thus, ISQAPER aimed to develop a mobile app, referred to as the Soil Quality Assessment Application (SQAPP) by integrating existing soil quality data consisting of a range of physical, chemical and biological soil quality indicators and associated soil threats to go beyond the functionalities offered by existing soil apps.

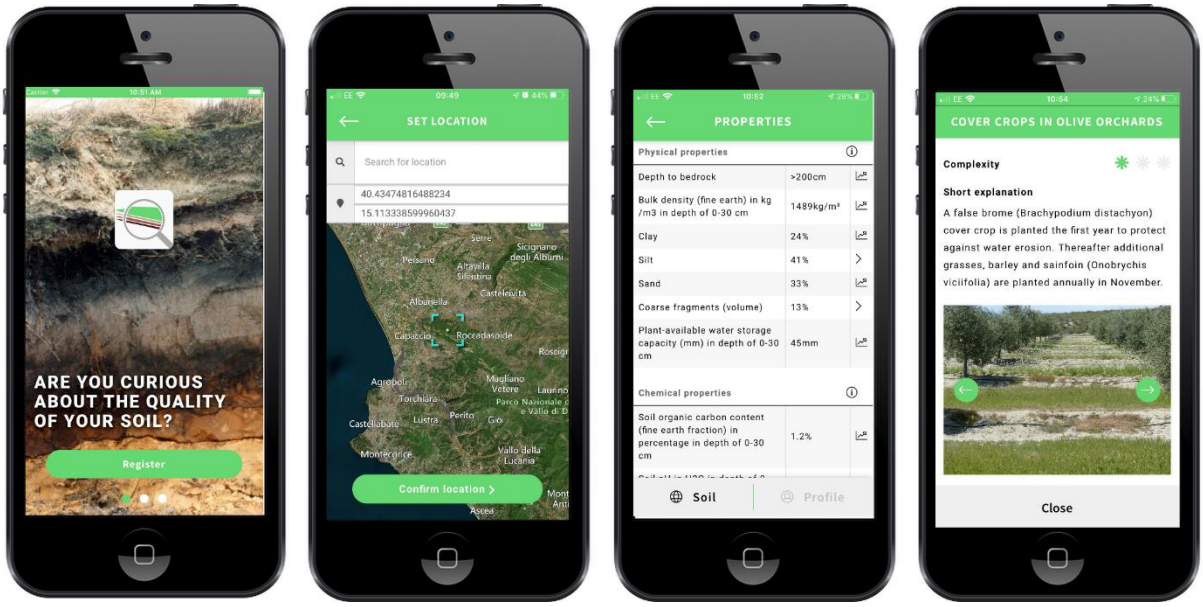

Figure 1 - Screen shots of SQAPP

SQAPP for Policy Makers

Policy makers may not be core users of the app themselves, but awareness of soil quality, soil threats and Agricultural Management Practices (AMPs) that can be implemented to improve poor conditions is essential in order to make the right policy decisions. They may furthermore be interested in the potential of SQAPP to act as an interactive soil quality assessment tool, i.e. its potential for self-reporting.

The main features of interest for policy makers are thus:

a) option to have bidirectional exchange of soil data with farmers and land users;
b) relative quality and soil threat information, allowing to plan priority interventions.

Policy makers may not directly use SQAPP themselves, but often, farmers and land users will have data about their fields' soil. Entering those data is directly relevant for farmers and land users in order to get more tailored AMP recommendations, and indispensable in case of data about land management, e.g. about (rotational) crops grown on a field and pesticides applied as there are no global datasets available about such management information. This aggregation of user input about field data and relevant AMPs recommended based on the best available data could potentially be used to help formulate policy. The SQAPP could help to fill some gaps in granular, field level data. This could potentially be a significant assistance in future planning and policy formulation.

Gathering more information about the farmers' and land users' viewpoint on AMPs suggested by SQAPP is another important aspect of interest for policy makers. As farmers and land users can evaluate the AMPs suggested, indicating which ones they have already implemented, deem inappropriate, or find potentially or definitively interesting, new data is being generated on the relevance of AMPs. If a large number of app users evaluate AMP suggestions, researchers can analyse the data and improve the AMP recommendations, e.g. by removing those that are consistently evaluated as inappropriate. This information could be useful in the formulation of future policy initiatives and serve as useful quantitative feedback on the utility and desirability of certain AMPs.

SQAPP can provide tailored advice to farmers and land managers. The advice is taken from a database on AMPs available as a portal in a dedicated iSQAPERis section on agricultural management practices recommended by SQAPP (https://www.isqaper-is.eu/sqapp-the-soil-quality-app/amps-in-sqapp). Here, links to websites with more details are provided. This portal and the app could serve as the basis for decision support to farmers and land managers in future.

The rules used in SQAPP to calculate the potential for soil quality improvement and overall soil threat level, and the ranking of AMPs have also been worked out in a spatial model. Policy makers may be particularly interested in such a spatial representation as it allows the assessment of priority areas for soil quality improvement, and the most important AMPs recommended to address site-specific combinations of poor scores on soil quality parameters and high soil threat risks.

Next Steps

SQAPP represents an important new tool for farmers, land managers, researchers, and policy makers. Policy makers can use the data from the app as outlined above to help gather

information about the soil quality and the AMPs that farmers are employing, or not employing. In addition, it is a tool that can be employed to help inform the farmers and land managers of their options for sustainable soil management. If this tool could be promoted by agricultural policy makers and the implementing authorities for agricultural and land management policy it could be an important step forward.

In terms of next steps, the following steps could be taken to provide a more robust mobile app for reporting on soil quality and providing policy recommendations:

- Link the data in the app to national greening measures support information to help inform land mangers about their options. As these tend to change a support strategy to keep this information updated is necessary
- Enhance the reporting functions of the app in terms of submitting information directly to ministries for compliance and monitoring purposes (this is not currently intended function of the app)
- Export data
- Import data sets
- Develop a portal site for viewing and downloading spatial information on the potential for improvement of soil quality, overall soil threat level, and AMP rankings to address poor soil quality.
- One problem is the baseline of poor quality data availability for soil quality. Enhanced, systematic soil quality data gathering and monitoring is needed at European (and international) level.

If such steps were taken the app, or a successor app, could become a more robust tool for policy advice and soil quality monitoring.

Figure 2: Below are screen shots or possible recommendations presented by the app.