## S©ILGUARD

### The SOILGUARDIANS App Predicting the benefits of sustainable soil management in Europe

#### Background:

Farms provide a multitude of benefits to society, including food production, climate mitigation, and flood regulation. A lot of these benefits are dependent on the soil and how it is managed and are therefore called "Soil-mediated Contributions to People" or SmCP.

The EU has aspirations for 25% of agricultural land to be organic by 2030, but we don't know what the consequences will be. We modelled how SmCP benefits in Europe might change with a shift in soil management from conventional to organic farming systems. These models are incorporated into the SOILGUARDIANS app, aimed at farmers and policymakers. The soil organic carbon model is an example of the SmCP models that are incorporated into the SOILGUARDIANS app.



#### Key takeaways:

The SOILGUARDIANS app can be used by farmers to understand how their farm compares to other farms on a similar soil type and how the delivery of SmCPs is expected to change when converting their farming system from conventional to organic.

Policy makers can use the SOILGUARDIANS app to better understand how different targets of agricultural land under organic farming impact the delivery of SmCPs at a regional level and how their region compares to the rest of Europe.



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**Key Outcomes** 

In the Soilguardians App, users can assess the following SmCP benefits: soil carbon stored (1), agricultural yield (2), greenhouse gas emissions, water storage, and risk of surface water flow.

1)Farmers can view soil properties at specific point locations and assess the impacts of management practices on SmCPs.

2)Policymakers can analyze regional soil differences, evaluate sustainability policies and estimate the impact of transitioning to organic farming.

3)Benchmarking enables comparison to farms with a comparable soil type to assess soil quality and SmCPs.(3)



- Conventional - Organic

Predicted SmCP values under a conventional and organic farming system for a point location in Bourgogne, France. The SmCP values are relative to the predicted SmCP values across the entire region. Therefore, a value for yield of 100% would mean that the yield is equal to the yield in the most productive fields in the region.





Distribution of modelled barley yield across arable land in Bourgogne, France, under a conventional (blue) and organic (brown) farming system. The distribution of barley yield is lower on average under organic farming systems.

Read more about our results on the website:





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Carbon stock under conventional farming (tonne per hectare)



Map of predicted soil organic carbon stock under a conventional farming system.

Benchmarking your soil against real observations across Europe with a similar soil type on arable land. In this example the soil pH falls in the yellow zone or typical range. The below and above typical ranges indicate the 10% of arable land on medium fine soils with the lowest and highest pH respectively.

#### Modelled Outcomes:

Looking at our modeled predictions of SmCPs across Europe, we found that under organic farming, on average:

- Soil organic carbon stock increases by 7%
- Crop yield of wheat is 28% lower
- Hydraulic conductivity, which increases water infiltration, is 35% higher
- Saturated water content is 3% higher.



Map of the predicted soil organic carbon stock change from conventional farming to organic farming.

#### Key messages:

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Sustainable soil management to unleash soil biodiversity potential and increase environmental, economic, and social well-being