

Digit Soil: Expand Knowledge on Healthy Soil

Meller Sonia, Normak Karl, Růžička Vít, Iven Hélène - Project started in Spring 2019 at the Student Project House (SPH)

The project: Provide reliable Data on Soil Health

Healthy soils are of major importance for resilient farming systems since it provides balanced nutrient availability, good soil structure, and high microbial activity.¹ Many important soil processes still remain poorly understood and it remains difficult to reliably advise farmers on soil management.² In microbiology robust measurements of soil are important to precisely model the underlying processes, however due to equipment limitations they tend to be only possible in laboratories. Samples taken in remote areas can degrade over time which makes these measurements less reliable. Our project is to create a device that assess soil health on-site, providing reliable data to soil scientists and finally gives practical advices to farmers.

The Method: A Tool to Stick right into the Ground!

We propose an idea for a new device which would be capable of doing robust measurements in situ and therefore alleviate this problem. This device measures the microbial activity in soil by recording the response of a photoreactive substrate which interacts with the soil. The more microbial activity in the soil, the brighter the captured image.

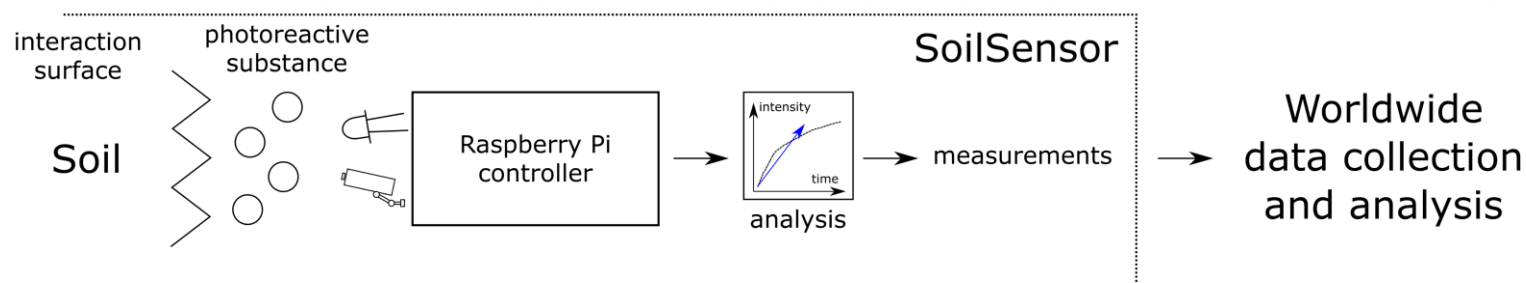


Fig. 1. The mechanism of our tool. The microbial activity is detected by a camera through fluorescence and is sent to a device (phone, computer), recording the intensity of microbial activity and the type of microbial enzyme present in the soil.

Where we are know: Prototyping Phase

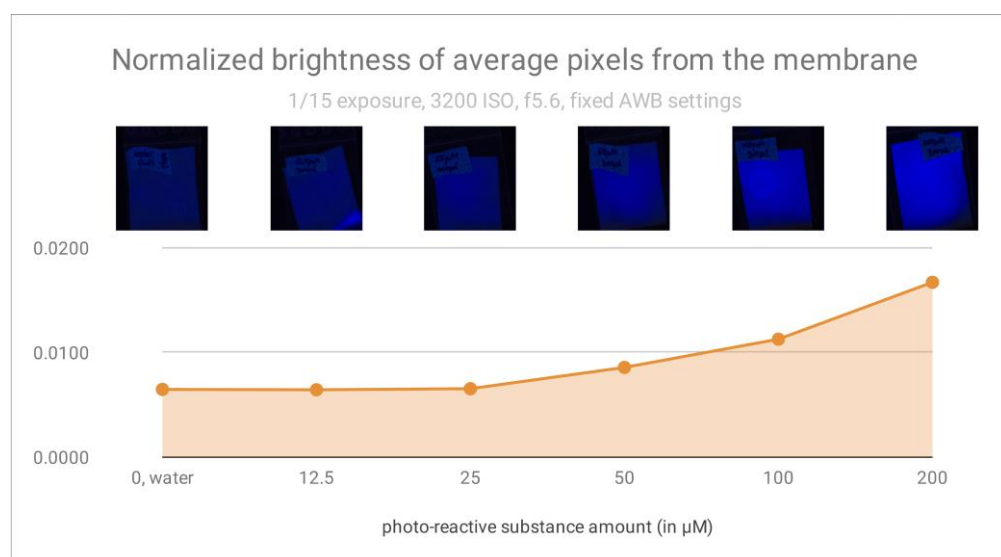


Fig. 2. Measurement of the brightness of different amount of substrates reacting with the photoreactive substance on a membrane. The more substrate there were, the more the fluorescence increased and the brighter the membrane became. The first picture represents the control where there were only water.

Where we aim at:

1. Worldwide Web of Soil Data



Fig. 3. The use of such a tool would enable more reliable comparison between different soil studies gathered all around the world. This would give scientists the means to improve their understanding of important soil mechanisms.

2. Practical Advices

The long-term objective of Digit Soil is to improve farming practices and agricultural policies through these new more reliable data.



Sources

1. FOEN, Federal Office for the Environment. 2015. "Soil – A Precious Natural Resource." Federal Office for the Environment FOEN, Federal Office for Agriculture FOAG, Federal Office for Spatial Development ARE, National Research Programme NRP 68 32.
2. Deng, Shiping, Richard Dick, Christopher Freeman, Ellen Kandeler, and Michael N. Weintraub. 2017. "Comparison and Standardization of Soil Enzyme Assay for Meaningful Data Interpretation." *Journal of Microbiological Methods* 133:32–34.

Partners

Digit Soil is an official project of the Student Project House of the ETH. It is also in collaboration with Prof. Dr. Emmanuel Frossard (Plant Nutrition).