AI4SoilHealth

International open conferences gathering key stakeholders #1

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Version 1.0
18.12.2024

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Action Number: 101086179

Action Acronym: AI4SoilHealth
Action title: Accelerating collection and use of soil health information using AI technology to support the Soil Deal for Europe and the EU Soil Observatory

HISTORY OF CHANGES		
Version	**Publication date**	**Changes**
1.0	4.04.25	

Summary report

On Wednesday 4th December AI4SoilHealth organised an international conference in Budapest, Hungary with the title **Artificial Intelligence for Soil Health.** This conference was organised in partnership with the Budapest Soil Health Forum and the closing events (05-06/12/2024) of the Agricultural Chapter of the Hungarian EU presidency.

The conference was organised to provide a forum to exchange information and views among scientists, policy makers and the wider stakeholder community involved across various aspects of land management, land use policy planning and land resources appraisal.

Main themes of the conference

1. Soil health indicators and their detection methods
2. AI solutions for (semi)automated soil monitoring
3. System approach and integrated soil health assessment
4. Data management and land information systems

Programme

8:00 – 09:00
Registration

Plenary Session (Chair: László Pásztor)

- 09:00 – 09:10
  Welcome / Opening
  Anikó Juhász, Deputy State Secretary, Ministry of Agriculture, Hungary
- 09:10 – 09:30
  László Pásztor, Director, HUN-REN ATK Institute for Soil Sciences
- 09:30 – 09:50
  Arwyn Jones, European Commission Joint Research Centre
  Supporting the Implementation of the Soil Monitoring Law
- 09:50 – 10:10
  Zsombor Diriczi, Demeéter Biosystems Kft.
  A Risk-Free Regenerative Transition – Supporting Farmers and Consultants with Soil Health-Related Data
- 10:10 – 10:30
  Tomislav Hengl, OpenGeoHub
  The 7-Step Framework for Soil Health Assessment in an Autonomous GIS Infrastructure
- 10:30 – 11:00
  Kakha Nadiradze, DesertNet International
  From Desert to Regenerated Healthy Soils

Coffee Break

Session 1: Soil Health Indicators, Monitoring, and Spatial Modeling

(Chair: Nándor Csikós)

- 11:00 – 11:15
  Grant Campbell, University of Aberdeen
  Developing an Innovative Soil Health Indicator Framework for Europe
- 11:15 – 11:30
  Daniel Kibirige, University of Cape Town
  From the Ground Up: A Comprehensive Review of Soil Health Indicators in South Africa
- 11:30 – 11:45
  Nasem Badreldin, University of Manitoba
  Integrating Artificial Intelligence with Spectral Analysis for Precision Soil Organic Carbon Estimation as a Soil Health Assessment Method
- 11:45 – 12:00
  Domagoj K. Hackenberger, BioQuant
  Leveraging Large Language Models (LLMs) for Automated Soil Health Data Extraction from Ecological Research Papers
- 12:00 – 12:15
  Lucas Gomes, Aarhus University
  A Pan-European Soil Monitoring System for Assessing Soil Health across Space and Time
- 12:15 – 13:30
  Lunch (Kossuth Klub)

Session 2: Novel In-Situ and Laboratory Techniques for Assessing Soil Health

(Chair: Grant Campbell)

- 13:30 – 13:45
  José A. Cayuela-Sanchez, Spanish National Council for Scientific Research
  A Compositional (CoDa) Approach for Soil Organic Carbon VIS-NIR Measurement Preventing Moisture Interference
- 13:45 – 14:00
  Jasmin Fetzer, Swiss Federal Institute for Forest, Snow, and Landscape Research
  A Novel, Laboratory-Independent Device to Measure Extracellular Enzymatic Activity in Soils

- 14:00 – 14:15
  Carlos Abrahams, Baker Consultants Ltd.
  A Sound Approach to Monitoring Soil Health Using Ecoacoustic Techniques
- 14:15 – 14:30
  Tamara Djerdj, Josip Juraj Strossmayer University of Osijek
  Application of an AI-Driven System for Monitoring Earthworm Behavior in Ecotoxicological Soil Health Assessments
- 14:30 – 14:45
  Fatemeh Hateffard, Stockholm University
  New Methods for In-Situ Soil Health Surveillance
- 14:45 – 15:45
  Coffee Break + Poster Session

Session 3: Poster Session

- Livio Antonielli, AIT Austrian Institute of Technology
  Microbial Community Prediction in Plant-Soil Systems Using Machine Learning
- Sarem Norouzi, Aarhus University
  Advanced Physics-Informed Machine Learning for Estimating Key Soil Properties Linked to Fundamental Soil Health: Particle Size Distribution and Water Retention Curves
- Robert Minarik, OpenGeoHub Foundation
  Mapping the WRB 2022 Soil Types of Europe at 30 m Resolution
- Thomas Oberleitner, International Institute for Applied Systems Analysis
  Polynomial Regression Ensembles for Predicting Crop Yield and Soil Quality Indicators: Towards a Future Soil Health Forecasting Service
- Xuemeng Tian, OpenGeoHub
  Spatiotemporal Prediction, Uncertainty Estimation and Their Assessment of Soil Organic Carbon Density (2000–2022) at 30 m Resolution for Europe
- Marko Reljic, University of Zagreb
  Predicting Soil Salinity Using Sensor Data and Machine Learning in a Hydro-Meliorated River Delta
- Marek Bednar, Palacky University in Olomouc
  Optimizing Soil Block Division to Minimize Erosion: A Comprehensive Simulation Approach Using Agent-Based Modeling
- Dominik Bittner, University of Aberdeen
  Towards the Use of AI-Powered Hybrid Soil Health Assessment to Design Nature-Based Solutions for Restoration of Degraded Soils in Sub-Saharan Africa

Session 4: From Degradation Assessment to Smart Farming

(Chair: Tamás Hermann)

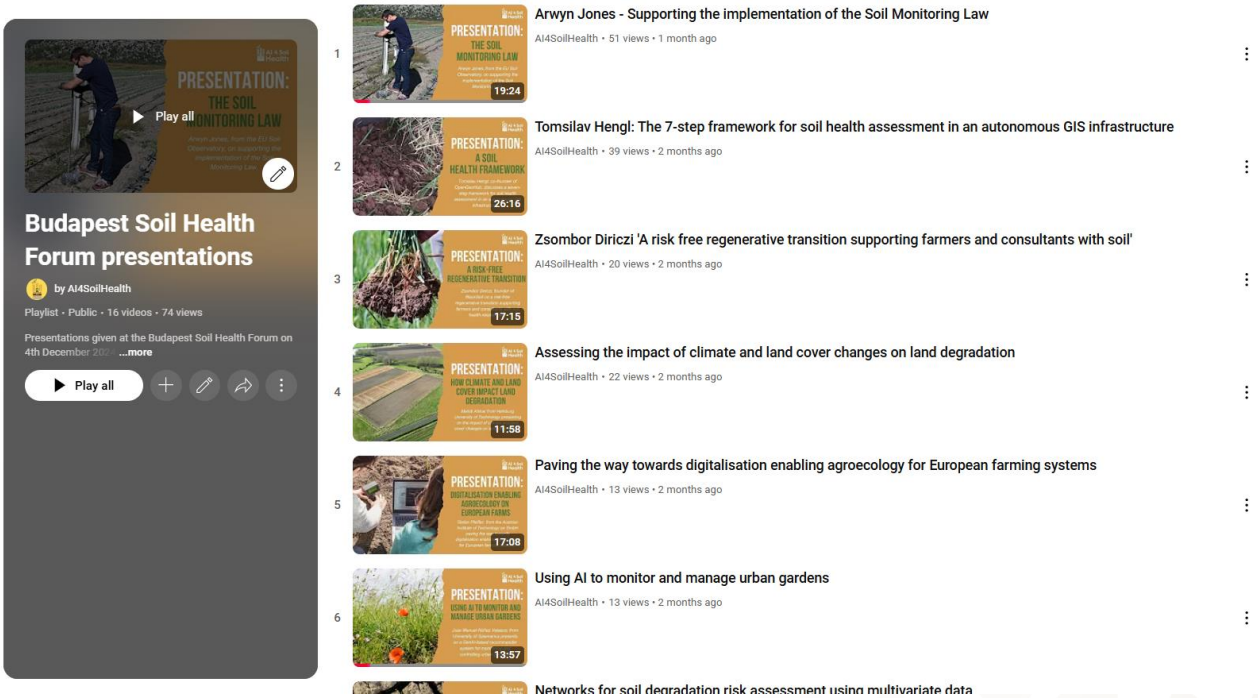
- 15:45 – 16:00
  Branimir K. Hackenberger, SCIOM Ltd.
  Bayesian Networks for Soil Degradation Risk Assessment Using Multivariate Data
- 16:00 – 16:15
  Mehdi Afshar, Hamburg University of Technology
  Assessment of the Impact of Climate and Land Cover Changes on Land Degradation
- 16:15 – 16:30
  Claudia Helena Ramirez Soler, University of Salamanca
  Vulnerability of Viticulture to Climate Change by Means of Satellite Remote Sensing Techniques in the DO Ribera del Duero
- 16:30 – 16:45
  Juan Manuel Nufiez Velasco, University of Salamanca
  GenAI-Based Recommender System for Monitoring and Control of Urban Gardens
- 16:45 – 17:00
  Stefan Pfeiffer, Austrian Institute of Technology GmbH
  Paving the Way towards Digitalisation Enabling Agroecology for European Farming Systems (PATH2DEA)
- 17:00 – 17:15
  Wrap Up, Closure

Photos from the event

More to be found here: https://www.soilhealthforum.hu/photos/

Online legacy

16 presentations and keynote speeches were uploaded to the project's YouTube channel and TIB AV Portal and have been shared across social media and other networks. The content has since been viewed 180 times across both platforms, and we will continue to share across the coming months.



TIB AV-PORTAL

Search for people, places, topics ...

Artificial Intelligence for Soil Health

Explore the transformative role of artificial intelligence (AI) in soil science with this exclusive video series from the Budapest Soil Health Forum. Featuring recorded sessions from the conference, these videos delve into cutting-edge AI technologies that enhance spatial prediction of soil processes, offering insights into how AI is shaping the future of soil health, monitoring, and management. Gain valuable perspectives from scientists, policymakers, and stakeholders on the integration of AI in soil data management, sustainable land use planning, and global soil health initiatives. Discover how these projects are leveraging digital twins, satellite mapping, and predictive analytics to revolutionize soil resource management and advance sustainable agriculture. Visit the conference's website to learn more: https://www.soilhealthforum.hu/artificial-intelligence-for-soil-health/

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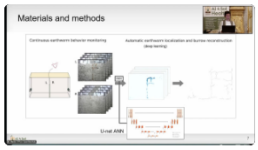

Application of AI-driven system for monitoring earthworm behaviour in ecotoxicological soil health assessments

09:10 Djerdj, Tamara et al.

The behaviour of earthworms is an important indicator for ecological and ecotoxicological studies, providing information on the organisms' responses to environmental stressors such as pollutants and changes in soil composition. However, conventional methods for monitoring soil organisms are problematic due to the opaque nature of the soil matrix. In this study...

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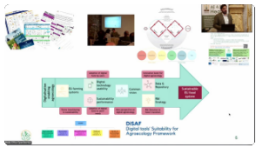

Paving the Way towards Digitalisation Enabling Agroecology for European Farming Systems (PATH2DEA)

16:53 2 Pfeiffer, Stefan

The potential of agroecological farming systems to master many of today's challenges to the environment, economy, health, and society can be significantly promoted by coupling with digital tools and technologies. The Horizon Europe project PATH2DEA (Grant Agreement Nr: 101060789 (EU) & 22.00535 (SERI)) is committed to unlocking digitalisation's catalysing power...

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Evaluation

Total registrations:

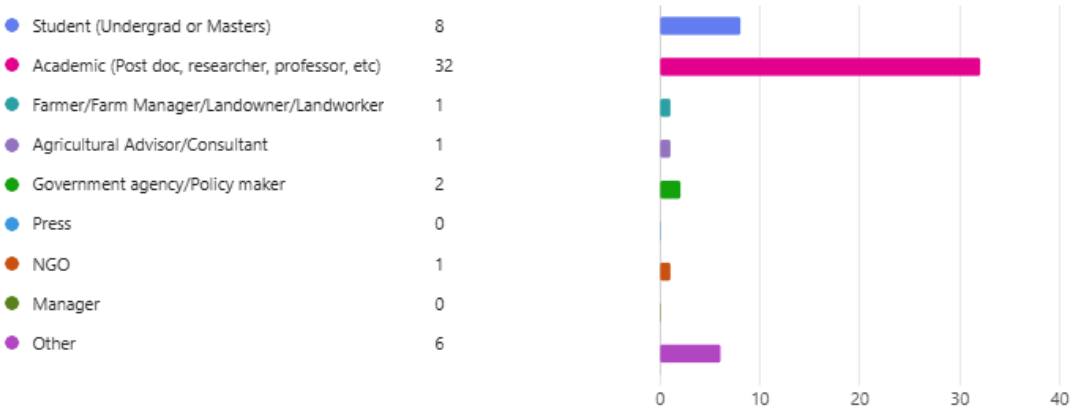
Total number registered online: 370

Total number of in-person sign-ins: 101 (49 were international participants, while 52 were from Hungary)

Survey

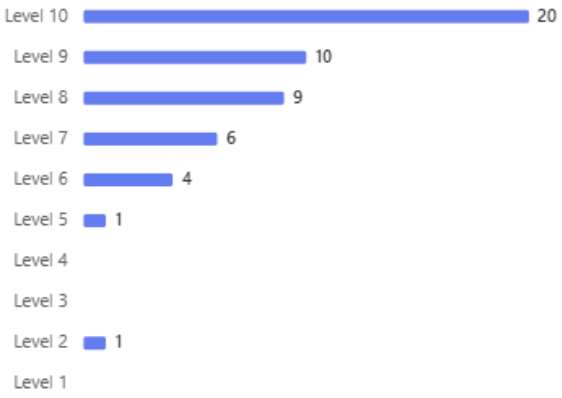
We surveyed all of those who registered for the event and 51 people responded.

1) Occupation of attendees

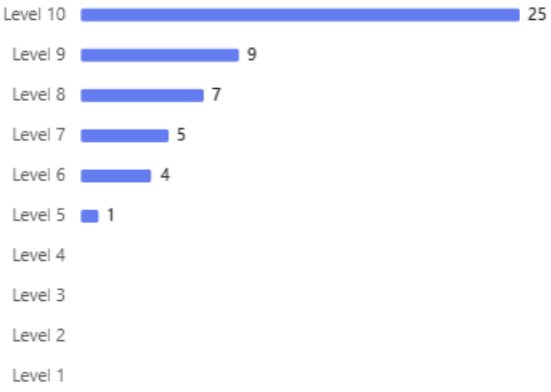


2) Word cloud of delegates country of residence

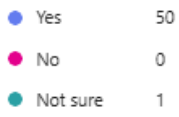
3) Rating for overall quality of the event (1 being the lowest and 10 being the highest)

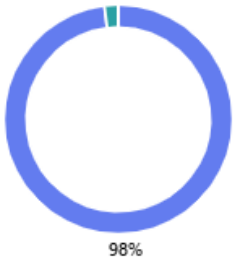


4) <u>Rating for overall quality of the content and speakers (1 being the lowest and 10 being the highest)</u>



5) <u>Percentage of attendees who said they learned something new</u>





6) Number of attendees who are interested in attending a future conference by AI4SoilHealth

Conclusion

Overall feedback was highly positive - the event received an 8/10 rating for quality, surpassing the KPI of above 80% satisfaction set out in the grant agreement.

With 370 people registering online we are one third of our way to reaching 1000 registrations by the end of the project with more expected for our final event at month 48.