

# PHENET – Advancing Phenotyping and Envirotyping for Sustainable Agriculture



**PHENET**  
PHENOTYPING & ENVIROTYPING  
SOLUTIONS FOR AGROECOLOGY

# About PHENET

PHENET is an EU-funded project driving methodological advancements in European research infrastructures. By integrating new sensors and vectors from within the soil up to the satellites, AI-driven image analysis, data science and AI models, PHENET advances multi-scale phenotyping and envirotyping, and therefore the characterization and prediction of agroecosystems' performances and resilience.

The project fosters broad collaboration across sectors, including agricultural, crop breeders, technology developers, research infrastructures, industry, and farming communities to develop practical solutions to support European Research in addressing key societal, economic and environmental challenges.



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# Key Insights



## **Innovative Phenotyping –**

Utilizing AI, close-range and remote sensing, and high-throughput technologies to study plant and ecosystem traits.

## **Innovative Envirotyping –**

Supporting climate adaptation through data-driven innovative breeding and crop management practices.

## **Collaborative Research –**

Connecting scientists, farmers, and policymakers to bridge the gap between research and application.

# PHENET Work Packages – Unlocking bottlenecks

To enlarge the range of data used for agro-ecosystems assessment, PHENET's tasks aim to develop new phenotyping and envirotyping devices, satellite-based services, data exchange workflows and digital twins, which can be used to study natural and agricultural ecosystems. PHENET also promotes training on and dissemination of the tools and methods developed.



# PHENET Use Cases – Bringing Innovation To The Field

PHENET's 9 Use Cases showcase how advanced phenotyping and envirotyping technologies can be applied in real-world agricultural research:



Detection of Fusarium Head Blight in Wheat Ear (FHB)

## Biotic Interactions in Agroecosystems

- **AI-Driven Plant Stress Detection**

Using AI to identify plants' early signs of biotic stress.

- **Bumble Bee Colonies Activity as Bioindicators**

Bees react faster than trees, making them early warning sensors of forest health

- **Intercropping database**

Performing a meta-analysis to better understand constraints and opportunities for intercropping deployment.



Phenomobile at work in the Apple Refpop at Laimburg Research Centre

## Across-Scale Genotype X Environment Interactions

- **Genotype X environment interactions in perennial orchards**

Deploying phenotyping robots in the same apple tree reference population across several sites in Europe.

- **Genotype X environment interactions in cereal plants**

Integrating ground-based, drone, and satellite imaging for phenotyping and envirotyping data fusion across scales in wheat.



Subterra Green (S4 Labs): mobile 3D soil carbon mapping to 90 cm using VNIR and force sensing.

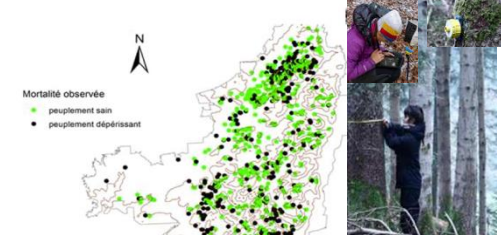
## Digging into the complexity of soil components

- **Soil Health**

Developing a portable sensor for in situ soil organic carbon and soil health evaluation.

- **Soil Phenology**

Developing methods to capture soil phenological mismatch among organisms under climate change.



Vosges and Doller data collection: 2000 plots, Satellite + Aerial photo

## Towards sustainable practices with farmers and foresters

- **Farms-2-Platform**

Leveraging on a network of farmers in transition towards agroecology to challenge RI services for practical solutions.

- **Doller Valley**

Digging into the challenges faced by the Vosges valley, facing climate change and land use transitions.

# PHENET Partners & Involved Research Infrastructures (RIs)

PHENET is a collaborative effort involving key research infrastructures and institutions across Europe. The project integrates expertise from multiple domains to enhance phenotyping and envirotyping capabilities and drive agricultural innovation through research.

**Join the conversation on PHENET's Slack workspace and collaborate with experts in plant phenotyping and envirotyping.**



Scan the QR Code to join!



## Research Infrastructures (RIs) Supporting PHENET

### EMPHASIS –

European infrastructure for multi-scale plant phenotyping.



### AnaEE-ERIC –

Analysis and experimentation on ecosystems



### eLTER –

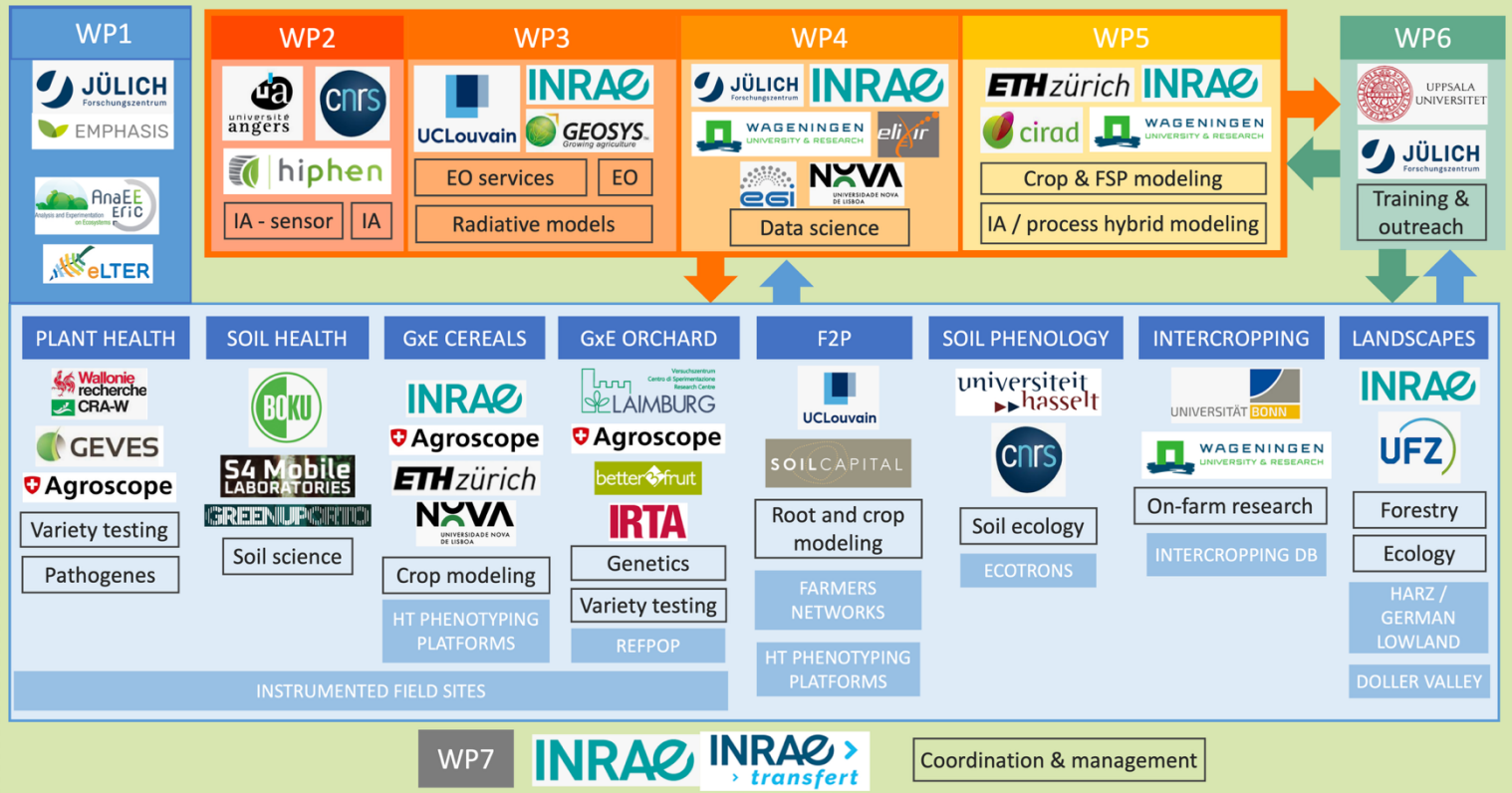
Integrated European long-term ecosystem, critical zone and socio-ecological research.



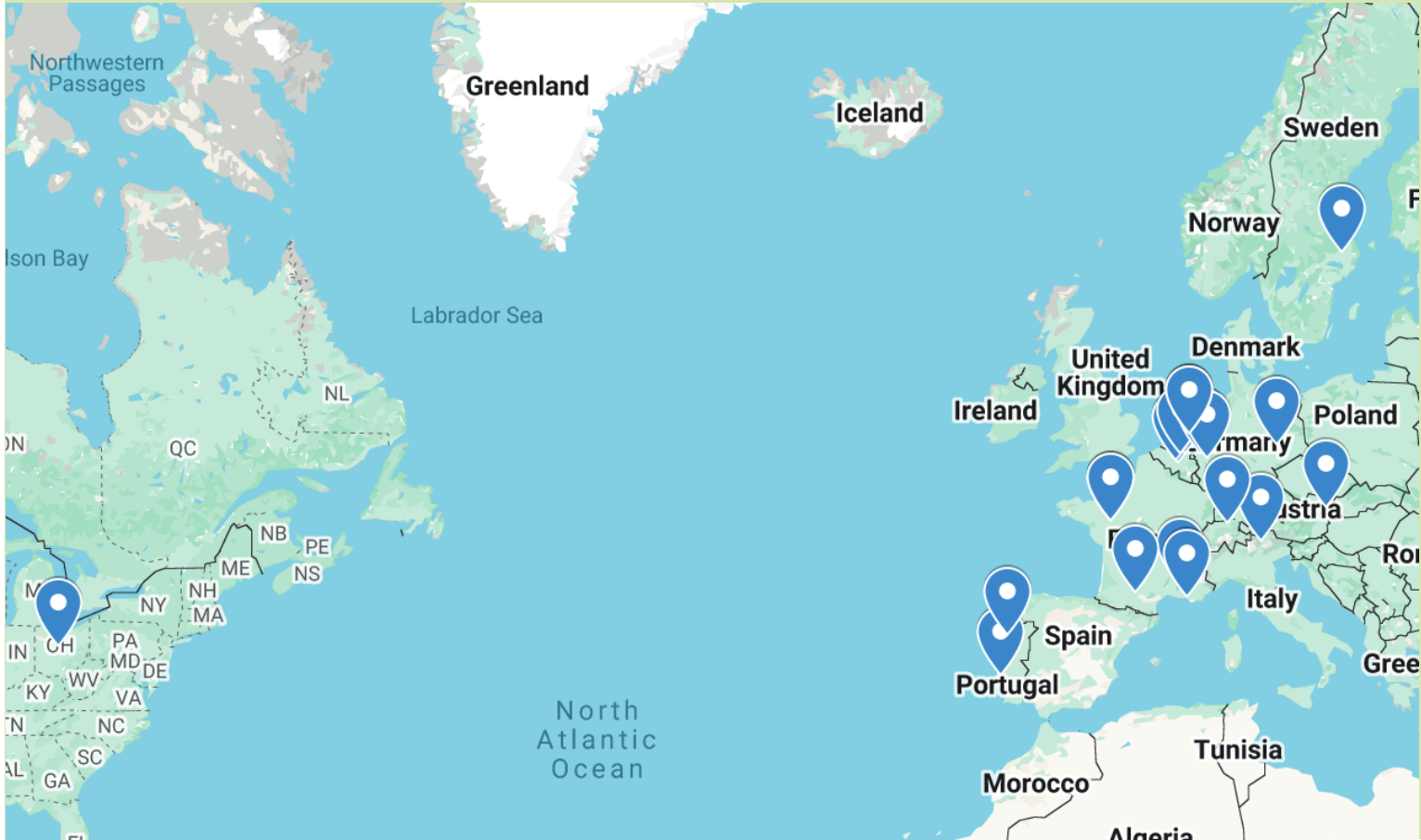
### ELIXIR –

Data infrastructure and bioinformatic resources for life science.

# Participants and Partner Organisations Across Work Packages



# PHENET Across Europe and Beyond



# Participants and Partners

- UC Louvain
- FZJ (Forschungszentrum Jülich)
- Wageningen University
- Universität für Bodenkultur Wien
- Hiphen
- Universite d'Angers
- UFZ (Helmholtz-Zentrum für Umweltforschung )
- INRAE Transfert Sas
- Rheinische Friedrich-Wilhelms-Universität Bonn
- CRA-W (Centre Wallon de Recherches Agronomiques)
- Universiteit Hasselt
- EarthDaily
- Soil Capital Belgium
- Uppsala Universitet
- Universite d'Aix Marseille
- Centro di Sperimentazione Laimburg
- GEVES (Groupe d'Etudes et de contrôle des Variétés et des Semences)
- Universidade Nova De Lisboa
- CIRAD (Centre de Coopération Internationale en Recherche Agronomique pour le Développement)
- INRAE (Institut National de la Recherche pour l'Agriculture, l'Alimentation et l'Environnement)
- Universidade Do Porto
- Stichting Wageningen Research
- Stichting EGI
- Better3fruit Nv
- RTA (Institut de Recerca i Tecnologia Agroalimentaries)
- CNRS (Centre National de la Recherche Scientifique)
- Protisvalor Mediterranee Sas
- ETH (Eidgenössische Technische Hochschule) Zürich
- AGROSCOPE (Eidgenössisches Departement für Wirtschaft, Bildung und Forschung)
- S4 Mobile Laboratories



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