EMPHASIS

EMPHASIS: European Infrastructure for Multi-Scale Plant Phenotyping And Simulation for Food Security in a Chancing Climate

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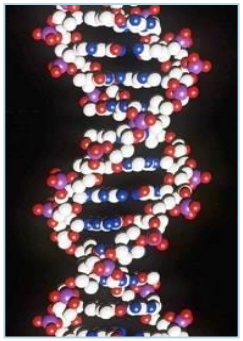
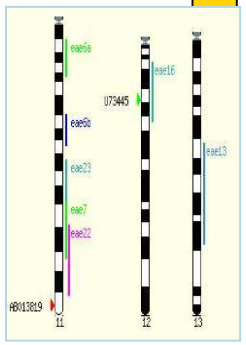
IBG2: Plant Sciences

Plant Phenotyping contribute to solving these challenges

Environment

Genes



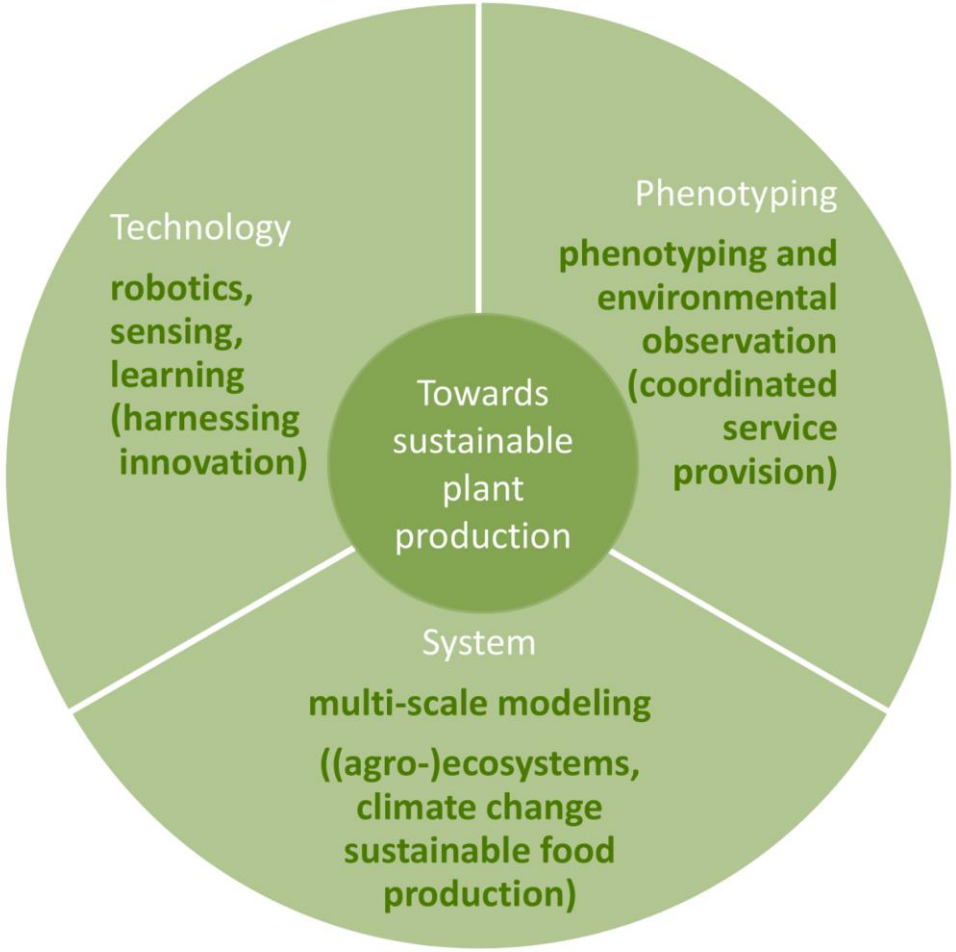


Plant performance and plant production

- Higher quantity and quality of plant biomass production
- Novel characteristics and products
- Yielding in stressful environments
- Sustainable production / intensification

Demand for plant phenotyping as a tool – towards sustainable agriculture

- Addressing diverse crops and conditions
- Specialized infrastructure
  - plant characterization
  - environmental simulation
- Expertise is required, e.g. analysis pipelines, modelling, data re-usability
- Integrated (multi-disciplinary) approaches
- Europe is the global leader, but competition is growing



Plant phenotyping initiatives to address the demand

Deutsches Pflanzen Phänotypisierungs-Netzwerk DPPN

APPN Austrian Plant Phenotyping Network

PHENOME EMPHASIS French Plant Phenomic Infrastructure

PPN-Ireland

PhenomUK

Belgian Plant Phenotyping Network

CZPPN CZECH PLANT PHENOTYPING NETWORK

Phen-Italy

NPEC

EUROPEAN NATIONAL INFRASTRUCTURE

MICROBES 4CLIMATE

PHENET PHENOTYPING & ENVIROTYPING SOLUTIONS FOR AGROECOLOGY

European Plant Phenotyping Network EPPN

European Plant Phenotyping Network EPPN 2020

More projects in development

EUROPEAN REGIONAL PROJECTS / NETWORKS

AgroServ Integrated SERvices supporting a sustainable AGROecological transition

cost

DROPS

EURoot

EMPHASIS

ESFRI

Long-term and stable organization

- integrating and operating a pan-European infrastructure
- listed on ESFRI roadmap since 2016

The road to Operation

Preparatory Phase (2017-2020)

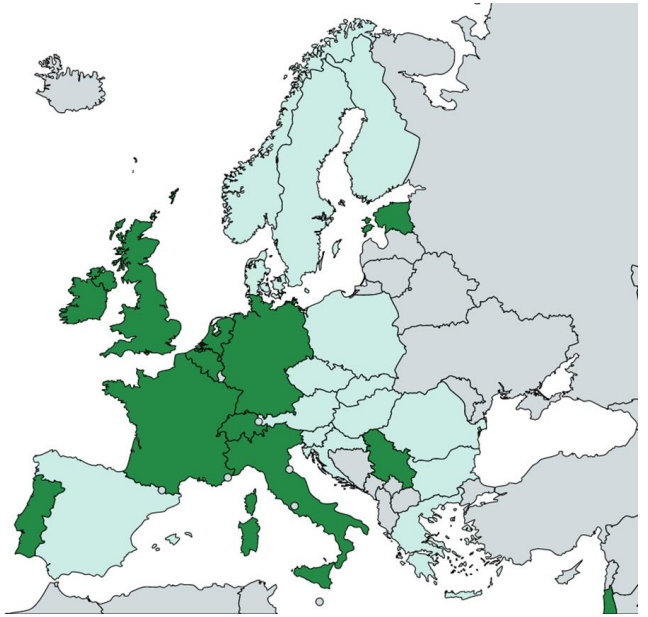
- H2020 (€4m)
- Work undertaken as per the EC proposal
- Evaluate the phenotyping landscape Development of business plan

Implementation Phase (2021-2025)

- HE (€1.5m)
- Aligned to the long-term operations
- Governed via interim agreement
- Official representation of ministries
- Set up of EMPHASIS pan-European Services
- Widen membership
- Set up of National Nodes

Operational Phase (2025 onwards)

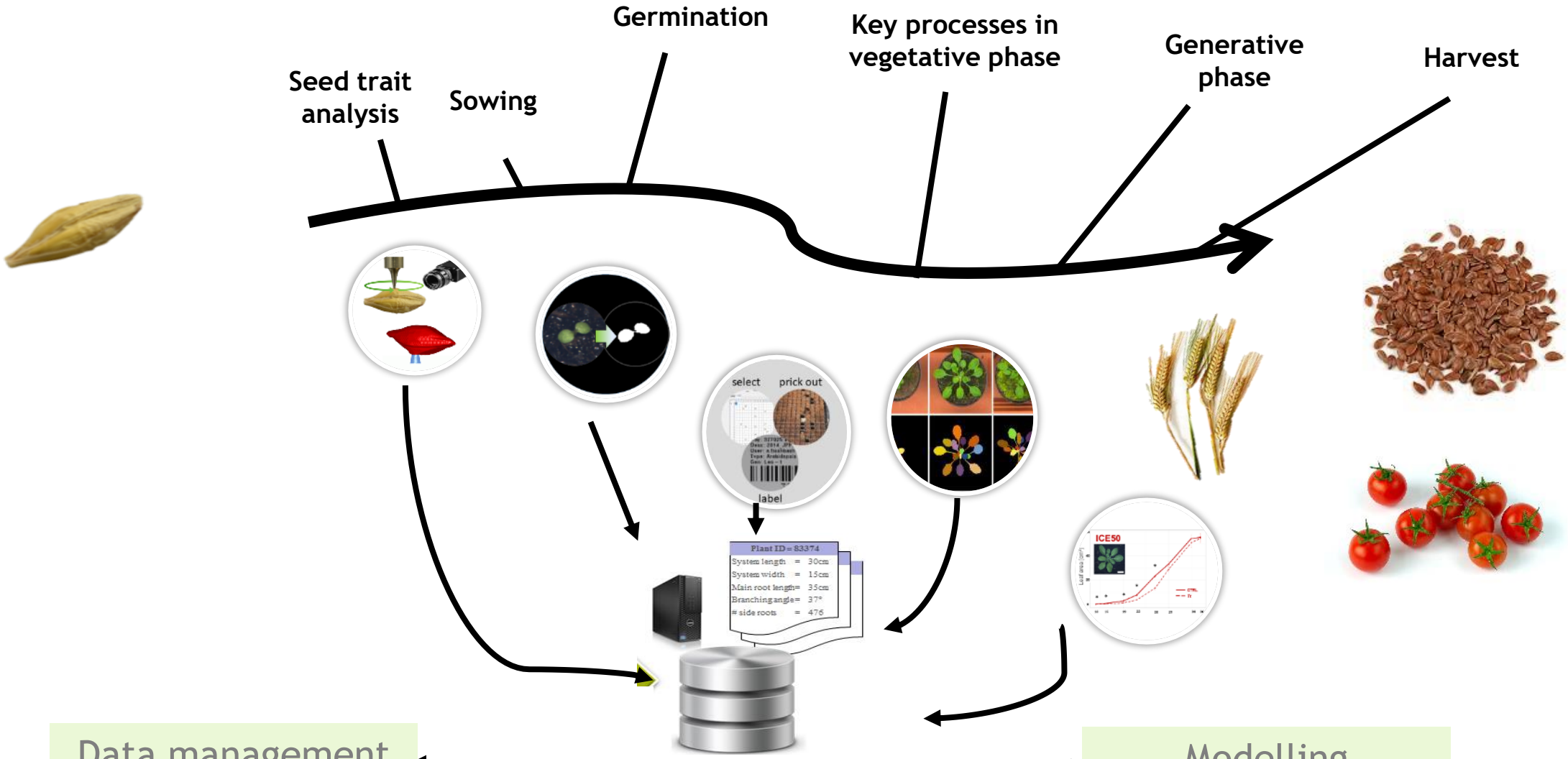
- Long-term legal framework in place
- Fully function governance bodies
- Annual membership contributions
- Full access for members to facilities and services



Objectives

DEVELOPING INFRASTRUCTURE AND PROVIDING ACCESS

Phenotyping modalities and pipelines from seed to plant tracking

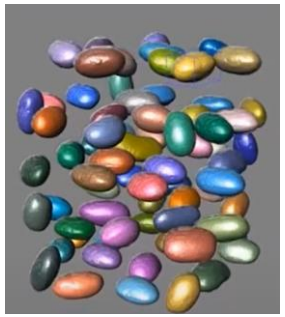


Seed phenotyping

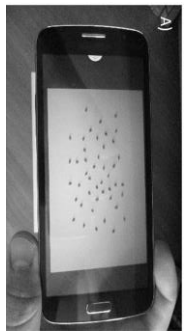
- Optimizing the phenotyping pipeline
- Seed physiology
- Characterising germplasm
- Seed testing for seed industry

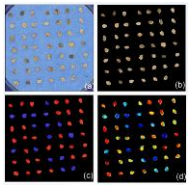
Bulk seed properties & individual seeds

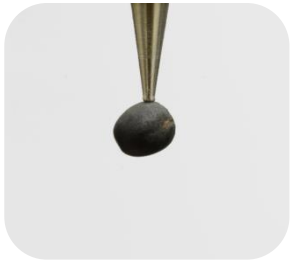
extrem Detail



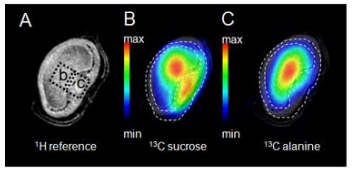
CNR







Fraunhofer CT



IPK High Resolution MRI

Information

Throughput

Individual seeds:High throughput (PhenoSeeder)

2D and 3D traits

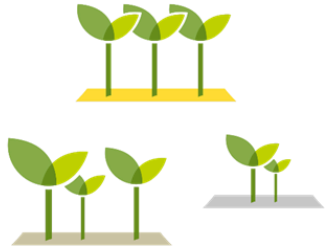
- Projected area
- Volume
- Mass
- Density
- Colour
- (3D) shape

Infrastructure categories in EMPHASIS

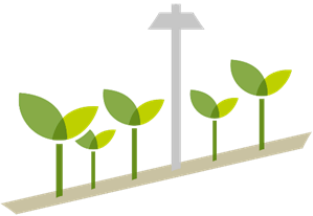
PLANT PHENOTYPING REQUIRES INTEGRATED CONCEPTS TO FULLY

EXPLORE ITS POTENTIAL

CONTROLLED CONDITIONS



LEAN FIELD



INTENSIVE FIELD

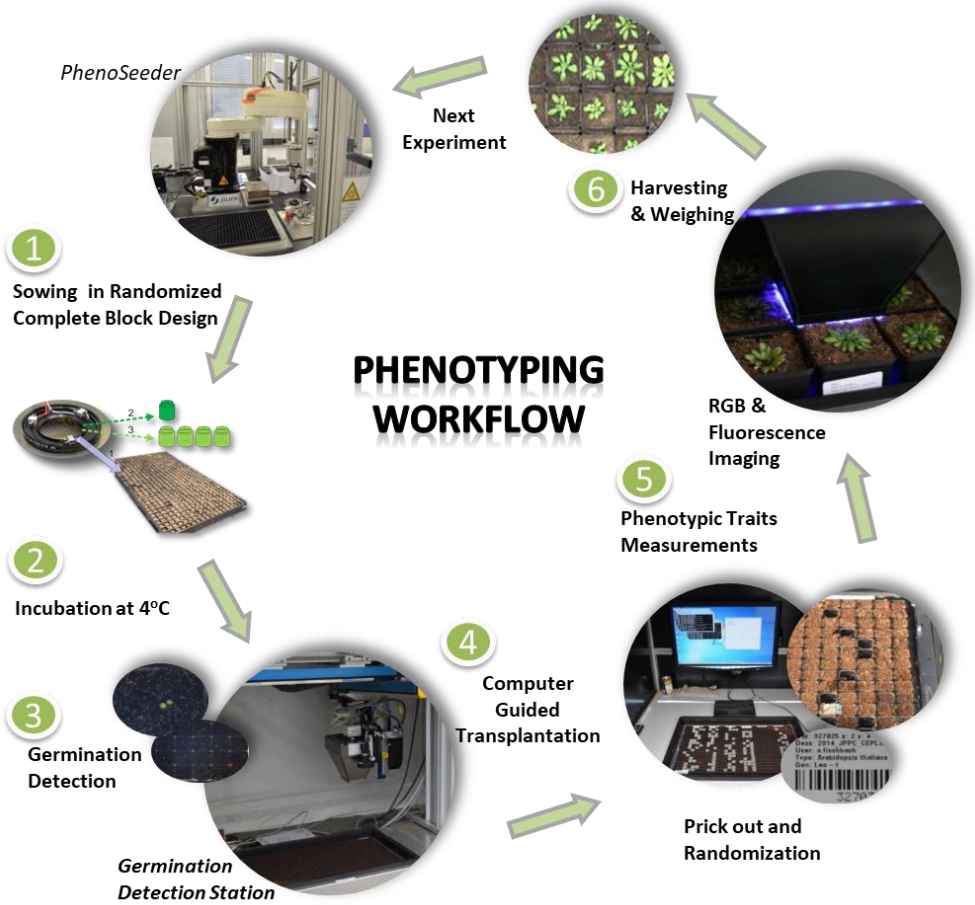
MODELLING

DATA & COMPUTATIONAL SERVICES

Source: EMPHASIS homepage (https://emphasis.plant-phenotyping.eu/emphasis_infrastructure_map)

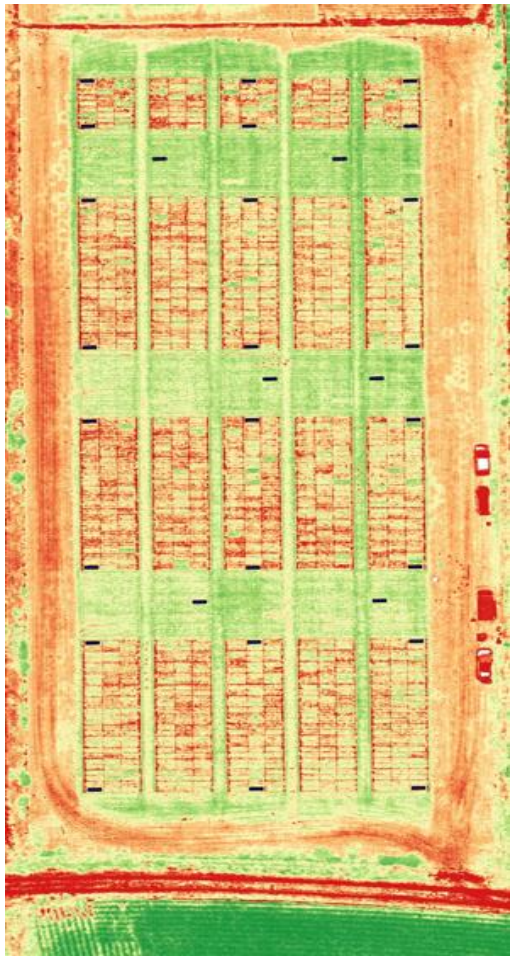
Infrastructure: controlled environment

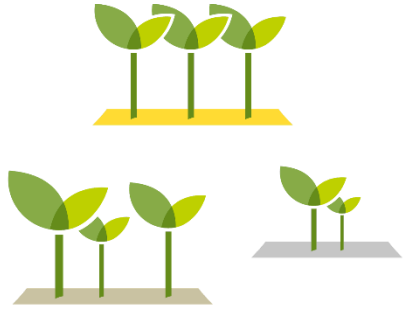
- ✓ Greenhouses and growth chambers
- ✓ Simulation and monitoring of the environment
- ✓ High level of automation
- ✓ Deep phenotyping
- ✓ Throughput typically between 100-1000s plants



Infrastructure: intense field and lean field

- ✓ Detailed environmental monitoring
- ✓ High quality, details measurements
- ✓ Field sites enabling environmental simulation

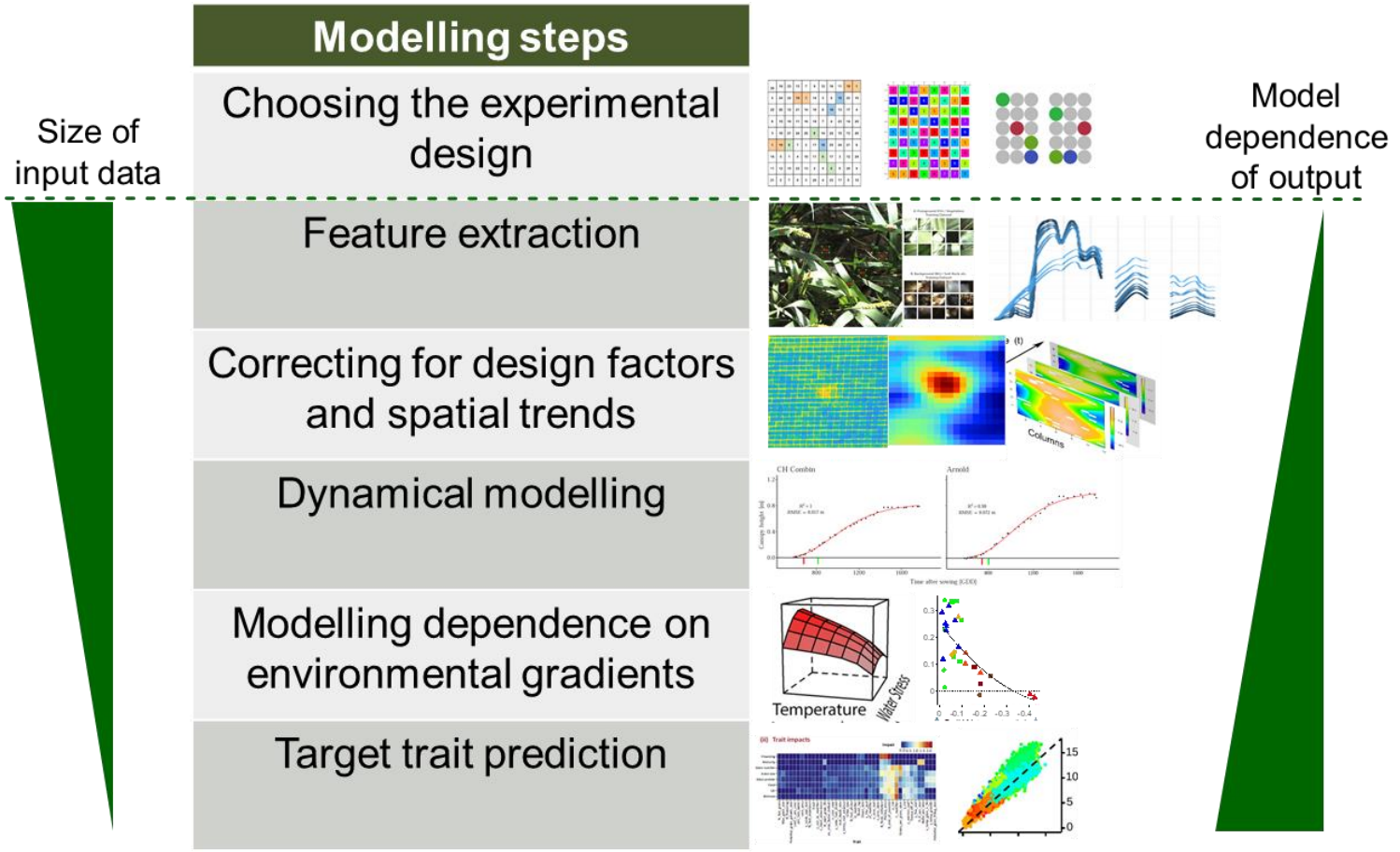




- ✓ Field sites with environmental monitoring
- ✓ Phenotyping equipment for basic traits
- ✓ Potentially ground based or airborne sensing systems
- ✓ Networks of fields

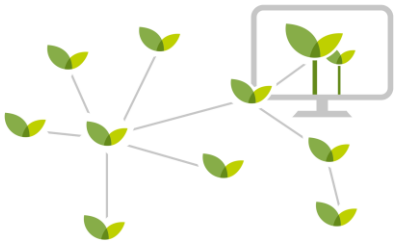
Infrastructure: modelling

- ✓ Virtual platforms
- ✓ Different types of models
- ✓ Integrated or interfacing with phenotyping installations

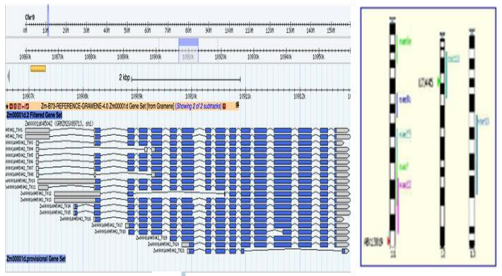


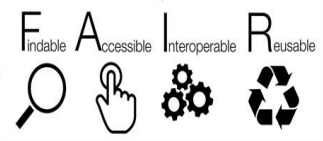
Millet and Hund - Adapted from Van Eeuwijk et al. (2018)

Infrastructure: information system



- ✓ FAIR Information systems plant phenotyping data
- ✓ Access to data
- ✓ Local installation data-management
- ✓ EMPHASIS installations should have integrated information systems





More details: Thematic session 4 (Wednsday, 9:30 -10:30)

C Pommier, R. Pieruschka: *Plant phenotyping data management from phenomics to integration for analysis and PGR characterizations: challenges and solutions from ELIXIR and EMPHASIS*

Building on experience in service development and provision

EMPHASIS

since 2016: EMPHASIS-PREP / EMPHASIS-GO
ESFRI infrastructure, currently 12 countries will establish an ERIC
In total 26 national communities are interested to join

2012-2015: EU FP7 Transnational Access 14 partners (5 ME)

2017-2021: EU H2020 Transnational Access 22 partners (10 ME)

2019-2023: Digital life sciences ~70 partners (26 ME)

2022-2027: EU HE Agroecology (15 ME) Transnational Access ~70 partners

2023-2027: EU HE Agroecology (10 ME) novel tools, methods ~20 partners

2024-2028: EU HE Transnational Access, ~30 partners (15 ME)

2022-2025: EU HE AI4Life, AI (5ME) image analysis ~10 partners

National infrastructures as a backbone for EMPHASIS

2012 – ongoing:
Development of multiple national RIs providing services

NaPPI, PhenomUK, Belgian Plant Phenotyping Network, PPN-Ireland

AgroServ: CALL for access to services addressing agroecological transition

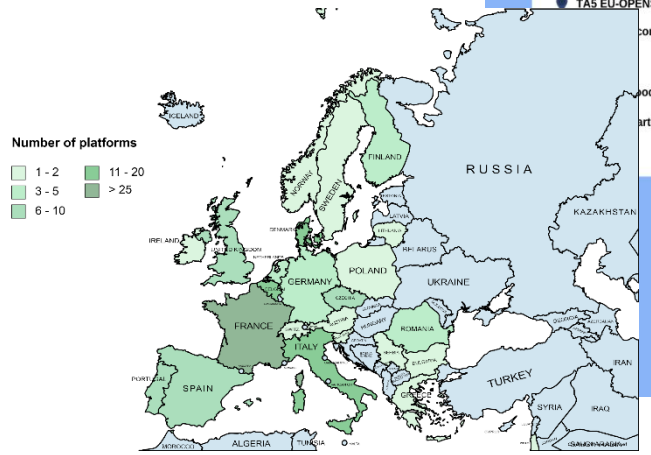
https://agroserv.eu/

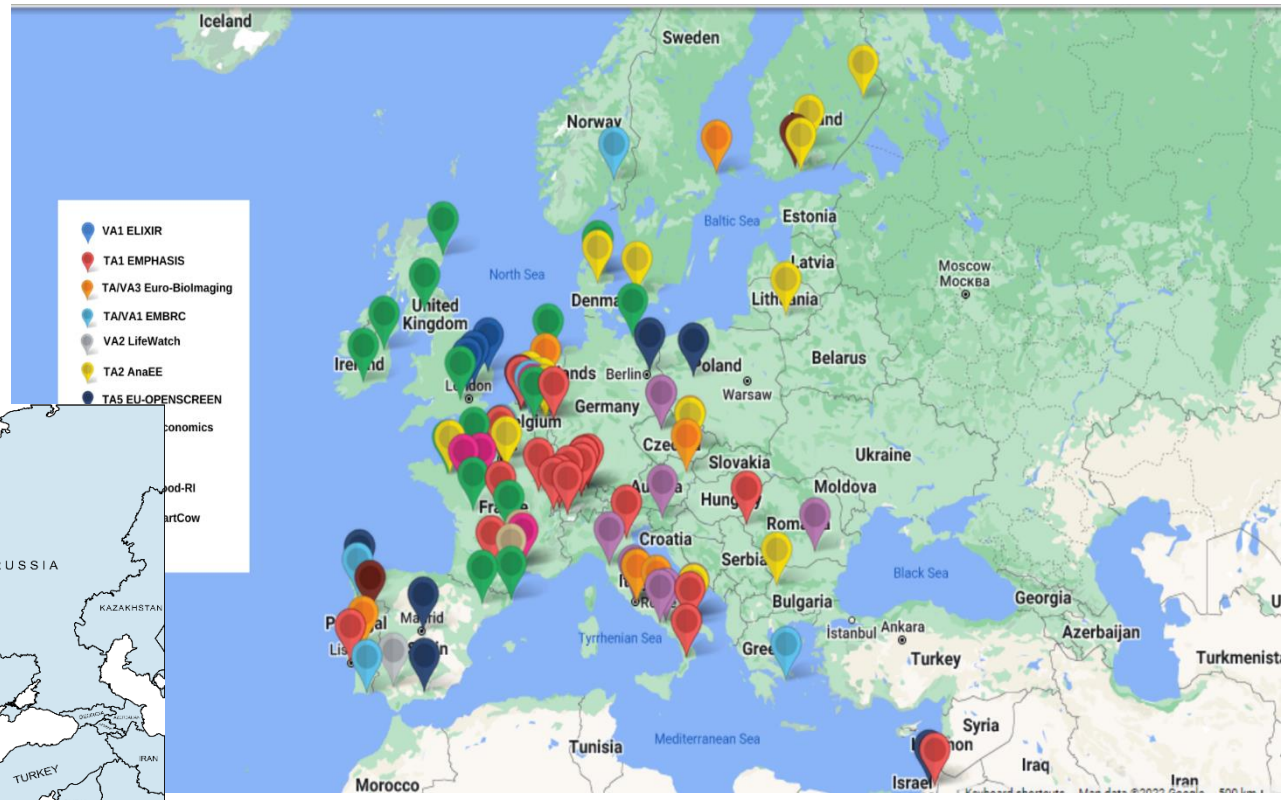
An unprecedented offer within the TNA scheme

deadline 23th of October

Combination of

- Climate zones and ecosystem types
- Agricultural practices
- Type of services
- Living labs in progress
- Socio-economic studies





Get In Touch

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Emphasis on Plant Phenomics