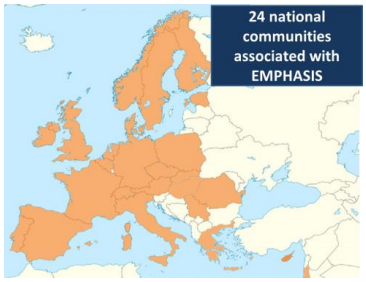
EUROPEAN UNION

Interreg Austria-Czech Republic
European Regional Development Fund

EMPHASIS - European Infrastructure for Multi-scale Plant Phenomics and Simulation for Food Security in a Chancing Climate

- challenges, objectives, developments -



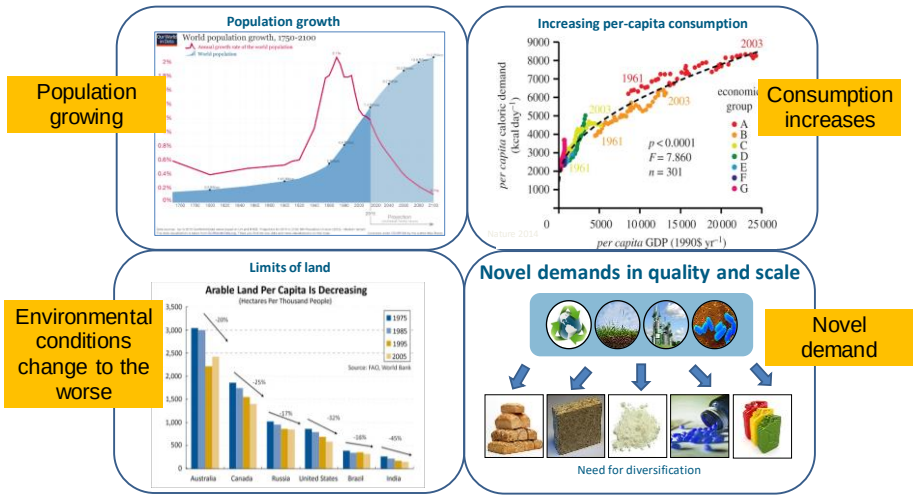

EXECUTIVE MASTERS IN MANAGEMENT OF RESEARCH INFRASTRUCTURES

Certificate of Excellence in Research Infrastructure Leadership

www.plant-phenotyping.eu emphasis-on-plant-phenomics @EMPHASIS_EU

1

The "perfect storm"



2

A sustainable agriculture supports many of the Sustainable Development Goals

THE GLOBAL GOALS For Sustainable Development

3

Horizon Europe: R&I policy priorities to shape the future

- The vision:
  " a Europe that protects, a Europe that empowers, a Europe that defends"
  Jean-Claude Juncker
- Tackling **climate change** (35 % budgetary target)
- Helping to achieve **Sustainable Development Goals**
- Boosting the Union's **competitiveness and growth**

European Commission

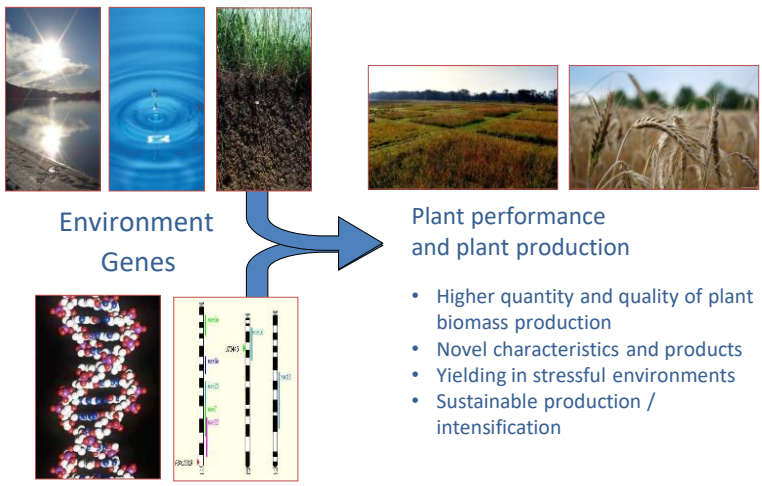
Agnès Robin and Roberta Zobbi, European Commission – DG RTD, Brussels, Envriplus Dissemination event, 4 June 2019.

4

How does plant phenotyping contribute to solving these challenges?

5

Plant Phenotyping is the bottleneck



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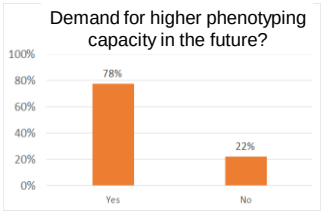
Growing demand for phenotyping as a tool



EMPHASIS survey

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

7

Five pillars of plant phenotyping infrastructure

Plant phenotyping in (semi-)controlled conditions.

Field sites with minimal equipment, which could be combined in a network of fields with different environmental conditions

Modelling platforms to support plant phenotyping data analysis

Intensive field experiments in highly equipped field sites or semi-controlled field sites

Information systems for plant phenotyping data management supporting open science

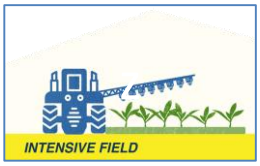
8

Infrastructure: CONTROLLED ENVIRONMENT

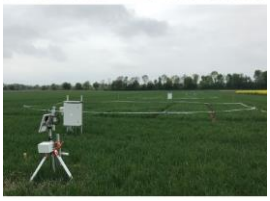
- ✓ Greenhouses and growth chambers
- ✓ Monitoring of controlled environmental conditions
- ✓ Automated
- ✓ Throughput typically between 100-1000s plants

9

Infrastructure: INTENSIVE FIELD



- ✓ Fully equipped
- ✓ Detailed environmental monitoring
- ✓ High quality/throughput phenotyping measurements
- ✓ Semi-controlled intensive field sites: alter specific key environmental conditions



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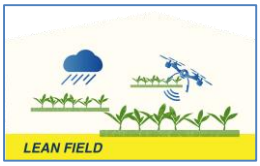
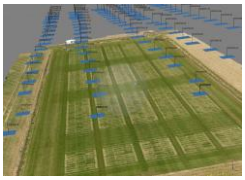
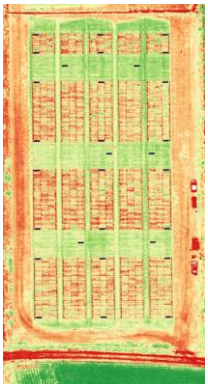
Infrastructure: LEAN FIELD



- ✓ Field trials with environmental monitoring
- ✓ Phenotyping equipment for basic traits
- ✓ Potentially ground based or airborne sensing systems
- ✓ Usually in networks of fields

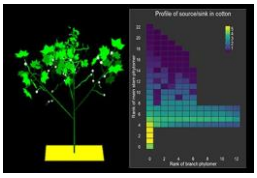


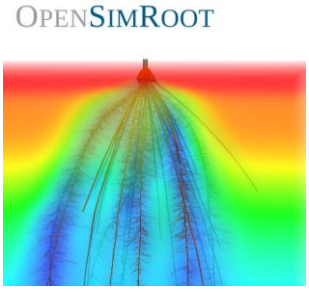


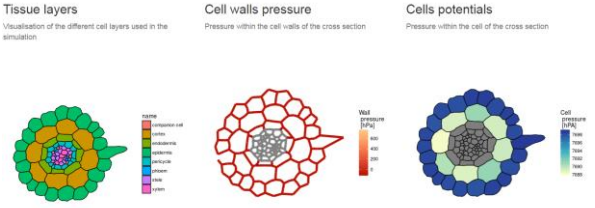
11

Infrastructure: MODELLING

- ✓ Virtual platforms
- ✓ Support plant phenotyping
- ✓ Different types of models: Crop Models, FSPM
- ✓ integrated or interfacing with phenotyping installations



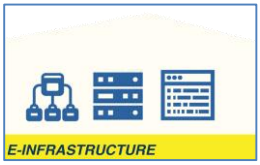




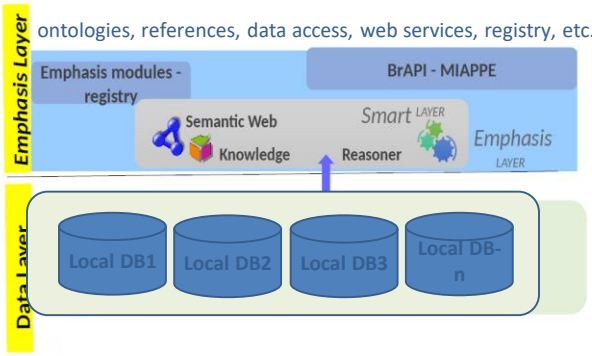
12

Infrastructure: E-INFRASTRUCTURE

ESFRI EMPHASIS



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



Web based entry to query all databases at local infrastructures

EOSC-Life

EUROPEAN OPEN SCIENCE CLOUD

Linked to European Open Science Cloud via EOSC-Life

13

Plant phenotyping initiatives

DPPN · APPN · PHENOME EMPHASIS · Phen-Italy · PPN-Ireland · CPPN · NaPPI · PhenomUK · Belgian Plant Phenotyping Network · Australian Plant Phenomics Facility · CZPPN

National infrastructure

EMPHASIS · COST · EPPN · EPPN 2020 · NAPPN · EUROOT · DROPS

Regional Projects / Networks

Crop specific aspects

WHEAT INITIATIVE

General development

IPPN

International networks

14

Plant phenotyping initiatives

European Infrastructure

European Infrastructure for Multi-Scale Plant Phenotyping And Simulation for Food Security in a Changing Climate

15

ESFRI EMPHASIS

Aims, impact and benefits from EMPHASIS

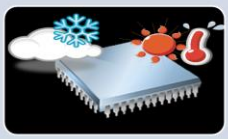
16

Vision and objectives

EMPHASIS Vision: Empowering plant science to enable sustainable plant production, food security, and agricultural business.

EMPHASIS objectives:

Develop an integrated pan-European infrastructure of instrumented facilities available to the user community



Link data acquisition to a European-level data information system and modelling

Develop, evaluate and disseminate knowledge and novel technologies providing innovative opportunities for academia & industry

17

Supporting the development and integration of national communities

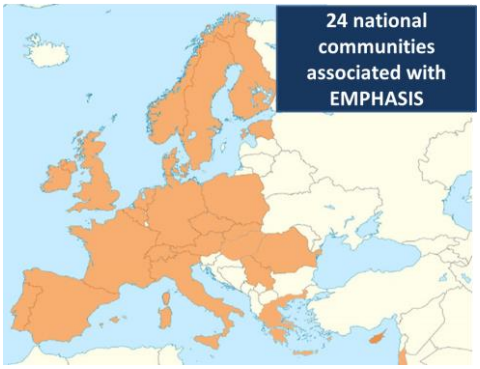
Europe

National infrastructures applying for ESFRI Roadmap:
Germany, France, UK, Belgium

Funded national infrastructures:
Finland, Netherlands

Proposals for national roadmaps:
Estonia, Poland

National initiatives were initiated:
Ireland, Italy, Austria, Czech Republic, Cyprus

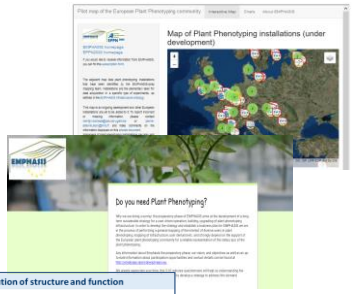


Building of national plant phenotyping initiatives:
Bulgaria, Denmark, Greece, Israel, Norway, Portugal, Romania, Serbia, Slovakia, Spain, Sweden, Switzerland

Representatives of all these countries are involved in the EMPHASIS Support Group

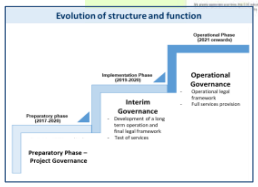
19

EMPHASIS-Preparatory Phase - first project phase



Mapping and evaluation of:

- phenotyping infrastructure landscape incl. e-infrastructure
- user demand: access to facilities, training, services etc.
- legal framework for the intermediary and long term operation of EMPHASIS



Based on the mapping development of:

- first draft of a business plan
- communication strategy
- community engagement
  - development of national initiative
  - addressing different scientific disciplines (engineering, image analysis, pathology, ecology…)
- criteria for infrastructure qualification

20

ESFRI RI landscape

ICOS – INTEGRATED CARBON OBSERVATION SYSTEM

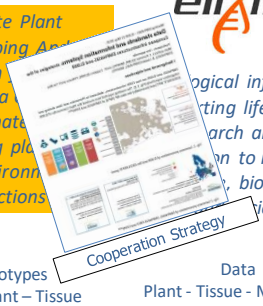
for harmonized and high precision scientific data on carbon cycle and greenhouse gas budget and perturbations

AnaEE – Analysis and Experimentation on Ecosystems

for experimental manipulation of managed and unmanaged terrestrial and aquatic ecosystems

EMPHASIS

Multi-Site Plant Phenotyping A… Simulation … curity in a … Climat… …roving pl… …t-environ… interactions



elixir

…ogical information, …ting life science …arch and its …n to medicine, …, bioindustries …iety

Continental to regional | Regional to field (agroecosystem) | Phenotypes Field – Plant – Tissue | Data Plant - Tissue - Molecular

21

Cooperation with other ESFRI infrastructures in cluster projects

Interdisciplinary cooperation in ESFRI cluster projects:

- **Life sciences**: 13 research infrastructure develop synergies and access to cutting-edge biomedical research
- **Environmental sciences**: 26 environmental and earth system research infrastructures develop integrated solutions
- **Data sciences** (EOSC-Life – started in March 2019):
  13 biomedical research infrastructures create an open collaborative space for digital biology (68 partners)
- **Internationalization** (RI-VIS – started in February 2019):
  13 RI aiming at improving visibility of RIs to broader scientific communities, infrastructure operators and industry in third countries

www.corbel-project.eu

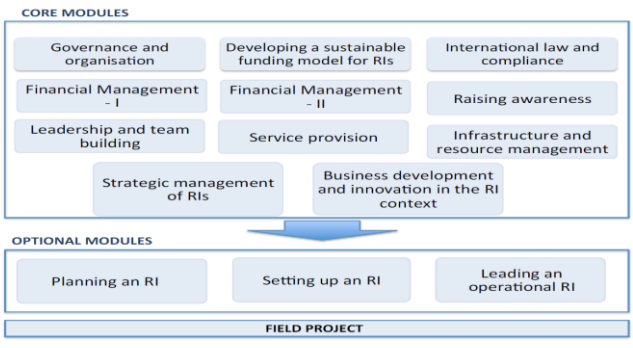
www.envriplus.eu

www.ri-vis.eu

22

Supporting the EMPHASIS development with high-level management competences

EMPHASIS-Prep Coordination and Support Office has acquired "Certificate of Excellence in Research Infrastructure Leadership"



http://www.emmri.unimib.it/en/

23

Development of a service portfolio

24

Next step: Development of Service portfolio

Operational Platforms	Specific services
I. User Access	a) User access to infrastructure under controlled environment b) User access field installations incl.: intense field and network of field sites c) User access to modelling services d) Facilitating R&D user projects utilizing plant phenotyping infrastructure
II. Infrastructure Quality	a) Development of plant phenotyping standards b) Technological capacity development c) Staff exchange programs
III. Data management	a) Coordination of data management in EMPHASIS b) Innovate data management c) User access to Data d) Staff exchange programs
IV. EMPHASIS innovation	a) Validation of technology in realistic scenarios at EMPHASIS infrastructure b) Consulting on innovation within the plant phenotyping landscape c) Legal support for innovation d) Private public partnership for technology development e) Technology dissemination
V. Communication and community integration	a) User engagement b) Interaction with other ESFRI projects c) Virtual user environment
VI. Training and education	a) Training of users b) Training of local infrastructure managers c) Modular training material for different groups d Raising funding for training and education e) Mentoring programme
VII. Expert advice	a) Reports on different aspects related to plant phenotyping b) Analysis of the phenotyping landscape and user demand

28

Pilot services

Aims

- Illustrate the potential to generate benefits for all stakeholders;
- Illustrate the potential to increase the Return on Investment;
- Test and optimize processes involved; test feasibility;
- Integrate stakeholders of the community outside EMPHASIS-Prep into the pilots.

Selected Pilot Services

- Interoperability/Harmonisation;
- Enabling access to lean field phenotyping equipment, competences, sites;
- Enabling **access to plant phenotyping models**;
- **Fostering innovation** at plant phenotyping infrastructures;
- Development of a pan-European **Information Sysstem**
- Enabling **access to controlled conditions** plant phenotyping infrastructures (-> EPPN 2020);
- **Enabling access to data** according to FAIR principles (-> EOSC-Life).

29

European Plant Phenotyping Projects – test case for EMPHASIS

2012-2015

Access to 21 installations in Europe

5.5 M€, 14 partners

Transnational access :

- 66 accesses > 50 peer revied publications
- interaction within the community
- 200 users directly involved in the experiments

2017-2021

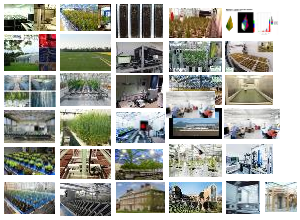
Access to 31 installations in Europe

10 M€, 21 partners

4th Call for Transnational Access is open now!
Application deadline: 8th of July 2019, at 17:00 (German time)

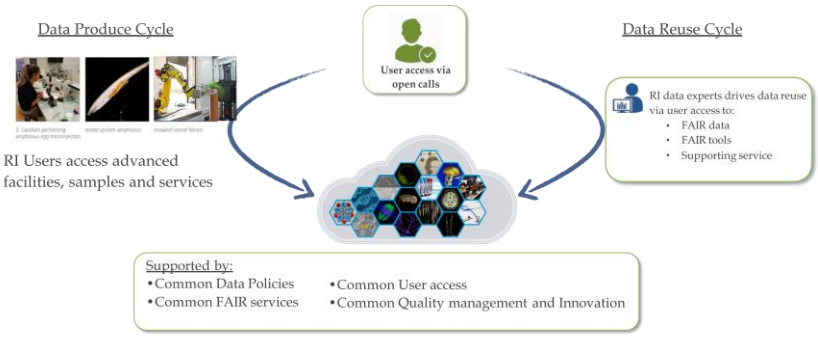
https://eppn2020.plant-phenotyping.eu/

- Capacity for ~200 experiments



30

EOSC-Life: Enable ground-breaking data driven research in Europe by connecting life scientists to EOSC



- 13 ESFRI Health and Food Research Infrastructures
  - 46 Partners and 17 linked 3rd parties
  - Sourcing e-Infrastructure services from EOSC (Cloud, AAI,…)
- 4 year Project, 24M€

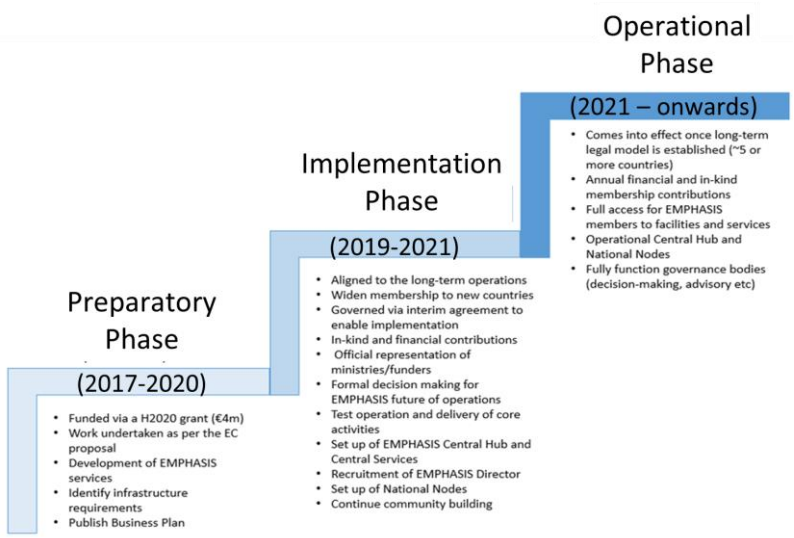
EOSC-*Life*

31

Towards implementation and operation

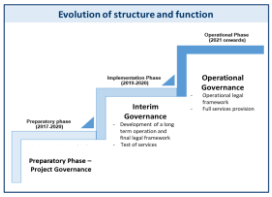
32

From Preparatory to Implementation



33

From Preparatory to Implementation



Pre-Implementation (2019)

1. Test service portfolio (pilot services)
2. Engage ministries to enable a decision making for the development of the Operational Phase

   1st Ministry Meeting 11th of June 2019

   Preparation of implementation agreement

Open to all countries across Europe to join EMPHASIS

34

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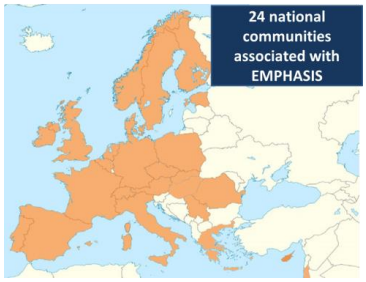

www.plant-phenotyping.eu emphasis-on-plant-phenomics @EMPHASIS_EU

35