WORKSHOP

The Italian plant phenotyping landscape and the other international initiatives

5 - 6 September 2018, Metaponto - Matera

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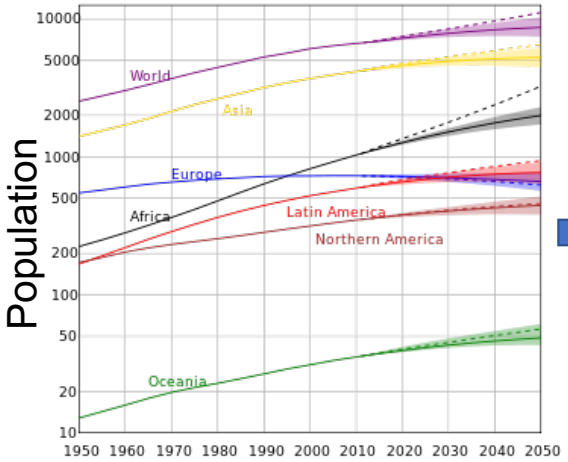
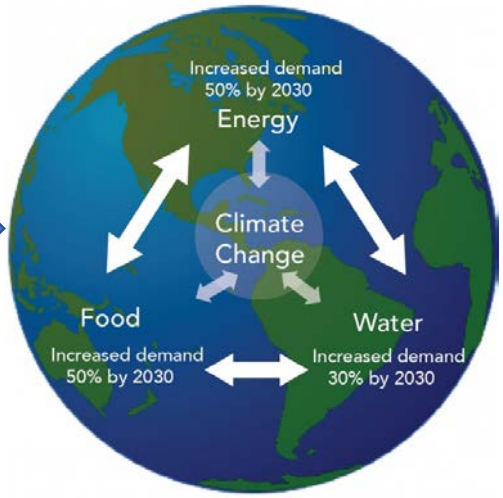
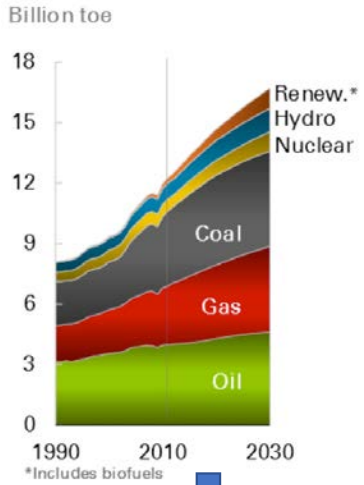
6 September 2018	
INTERNATIONAL SESSION - Palazzo Viceconte, Matera ***Plant phenotyping in the Mediterranean climate***	
9:00	*Introduction,* **Francesco Loreto, CNR**
9.15	*The plant phenotyping initiatives: IPPN and EMPHASIS* **Ulrich Schurr, FZJ**
9:40	*Multi site prediction of yield based on phenomics, genomic prediction and environmental information* **Francois Tardieu, INRA**
10:00	*State-of-the-art phenotyping for root morphology and physiology* **Fabio Fiorani, FZJ**
10:20	*Perspectives and challenges for VOC phenotyping in plants* **Jörg-Peter Schnitzler, HZM**
10:40	*Field Phenotyping: affordable solutions* **José Louis Araus Ortega, Universidad de Barcelona**
11:00	*Coffee Break*
INDUSTRY SESSION - Palazzo Viceconte, Matera ***Industry and plant phenotyping: innovative interactions***	

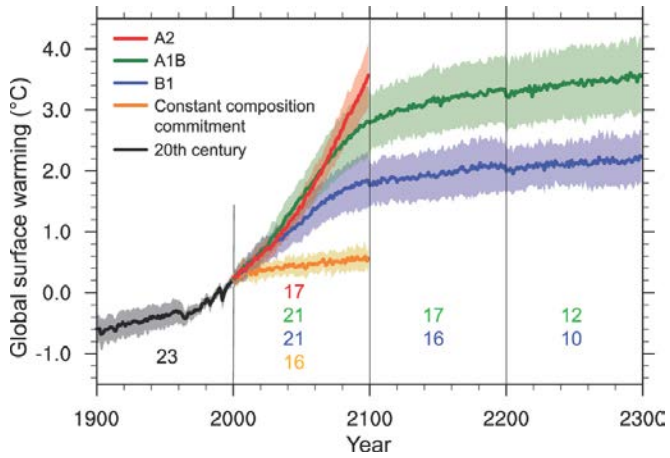
The problem – the drivers – the nexus

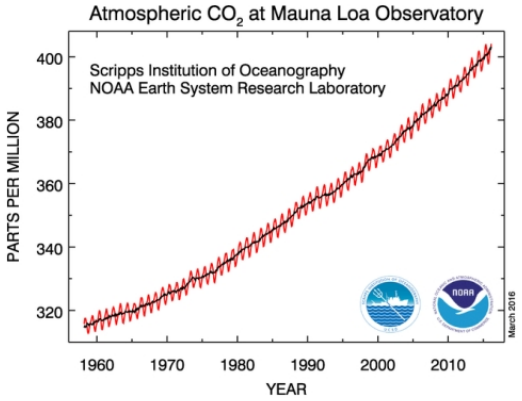






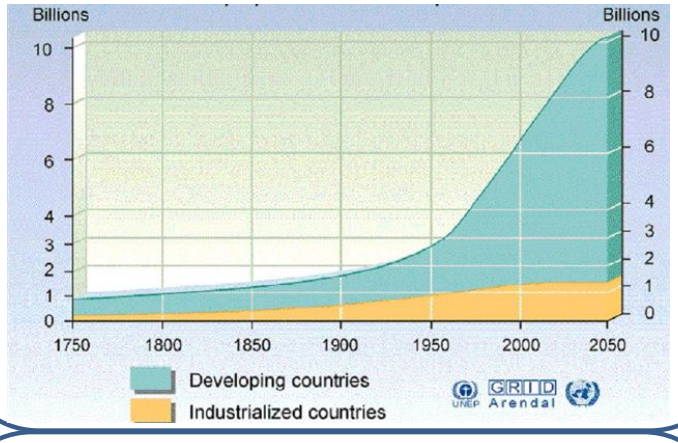
Energy Outlook 2030
© BP 2013



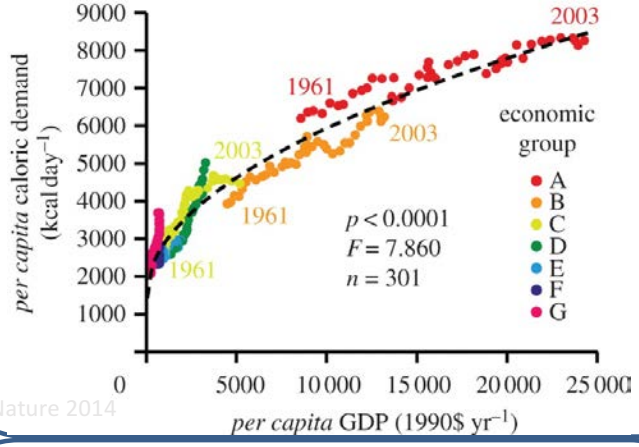


Plant research – the challenges

Population growth

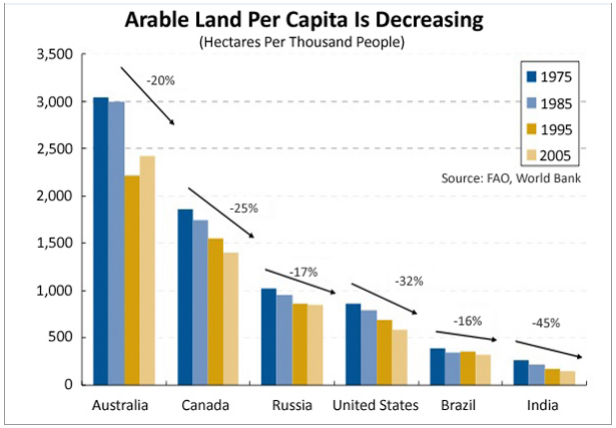


Increasing per-capita consumption

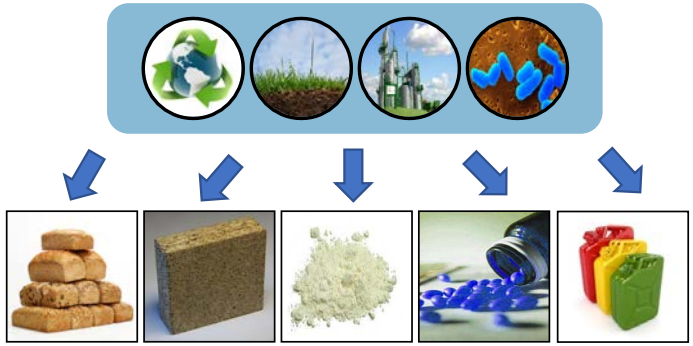


Nature 2014

Limits of land



Novel demands in quality and scale



Need for diversification

Plant research – the challenges

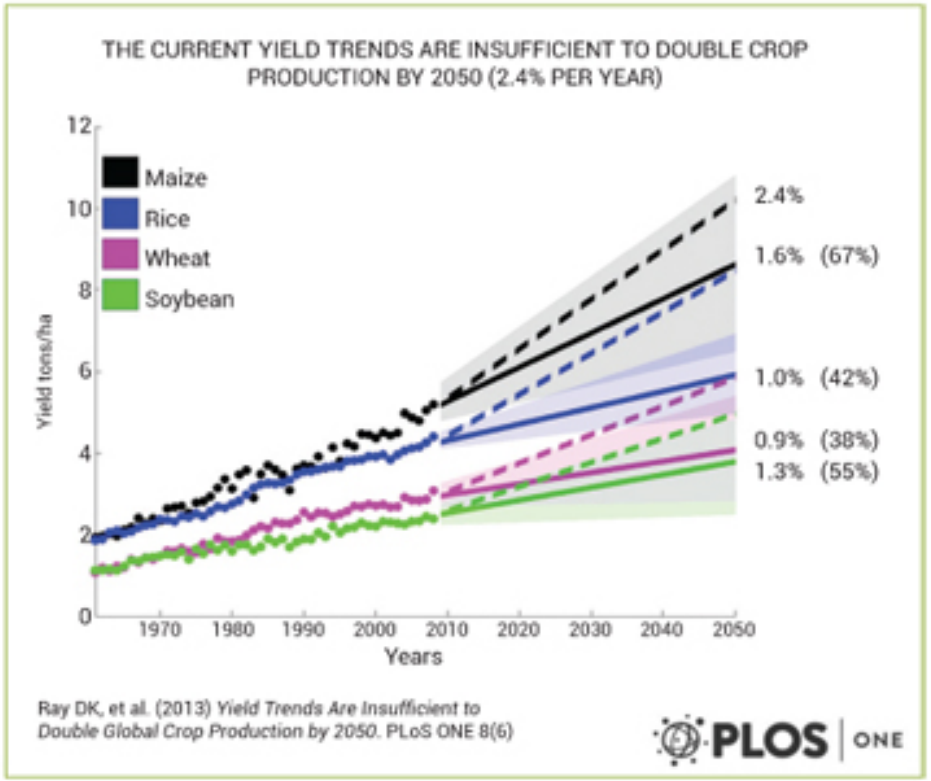
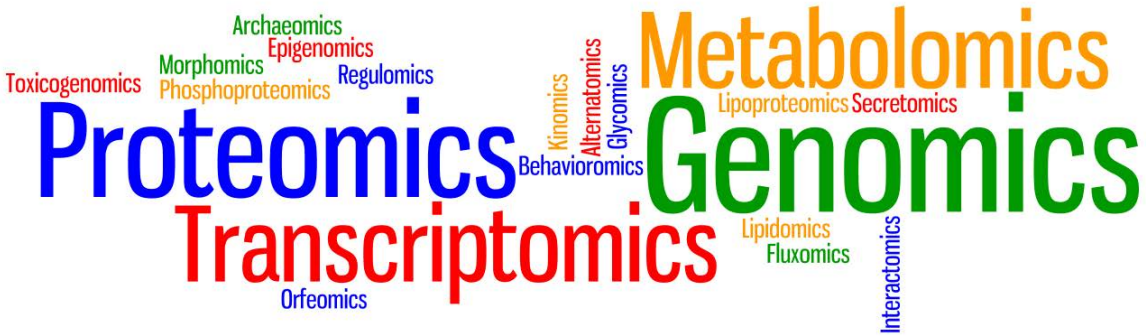
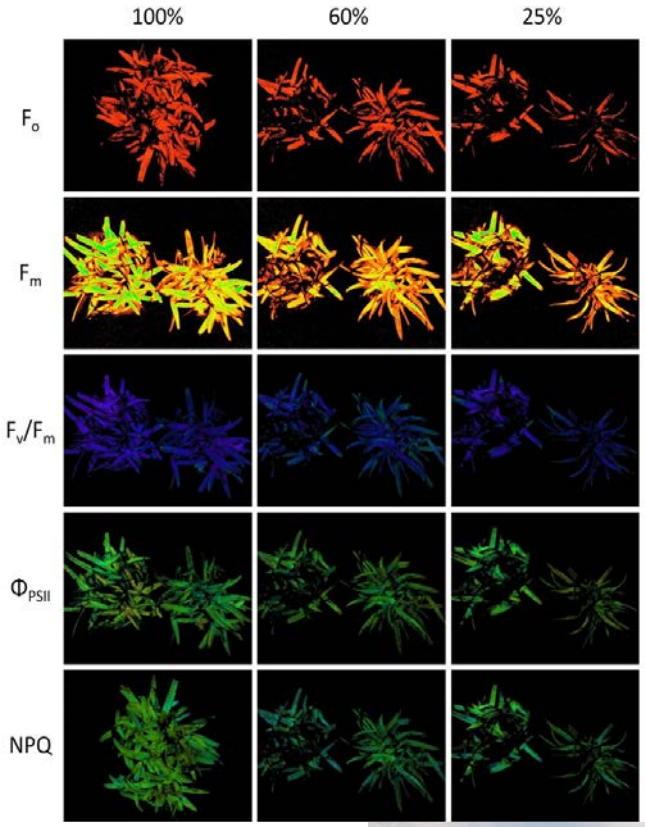


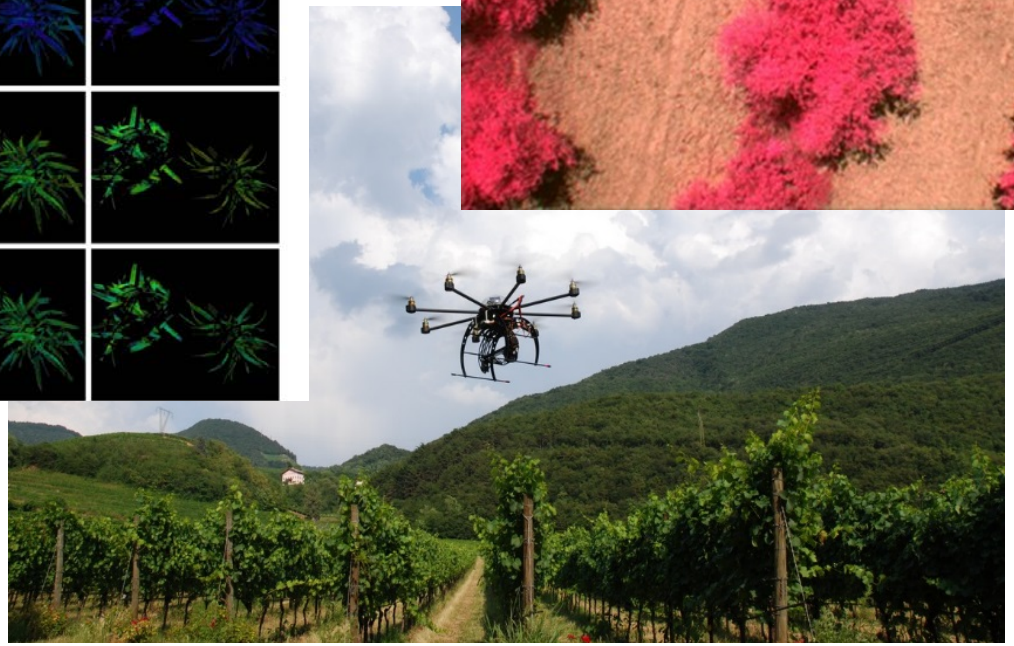
Figure 12. Actual trends for the rate of increases of crop yields for maize, rice, wheat, and soybean compared to the 2.4% rate increase required to feed nine billion people by 2050 (Ray et al. 2013).



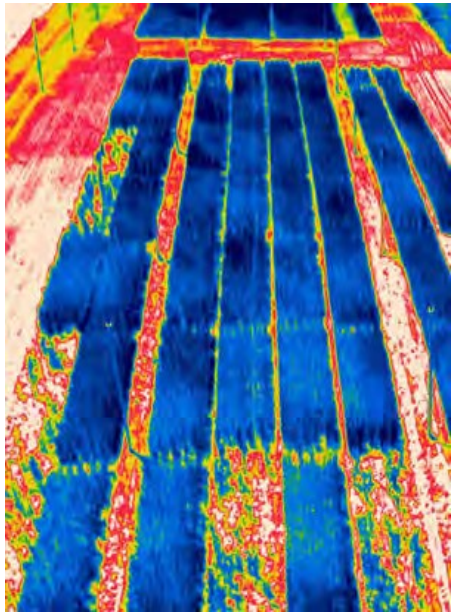
Phenotyping

The Genome x Environment x Management interaction

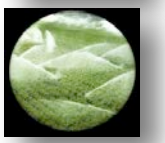




Phenotyping@ CNR-DISBA



Sustainable intensification of agricultural and forestry productions

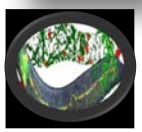


Optimization of the use of natural resources

Multifunctional use of productions

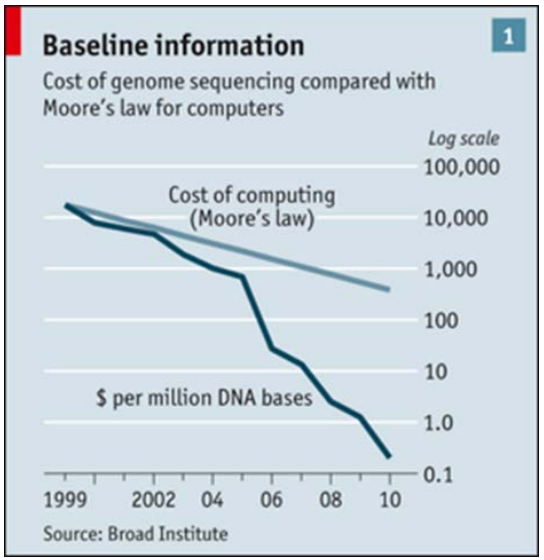
Protection of productions and food/feed safety

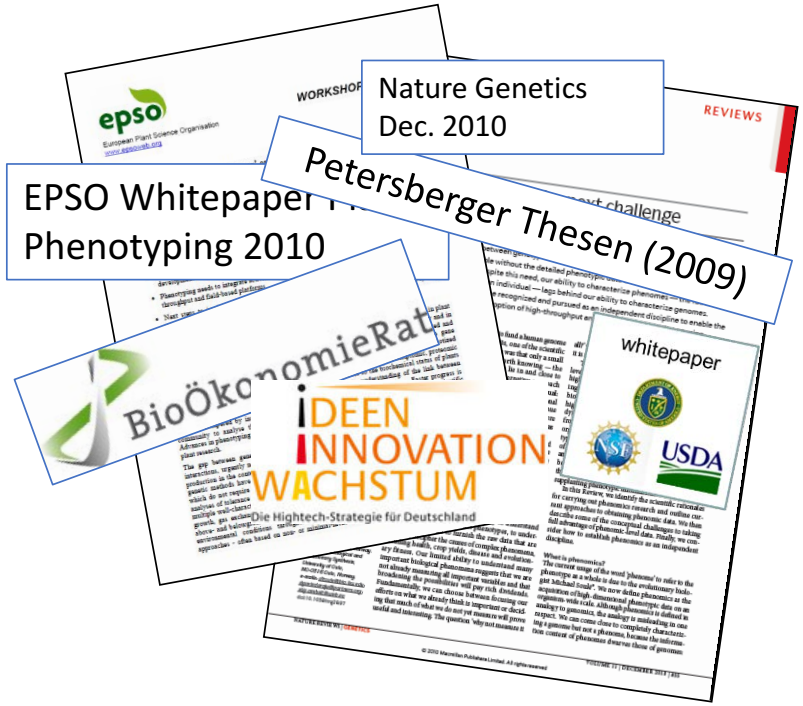
New frontiers of food and nutrition



Molecular and cellular bases of life of organisms

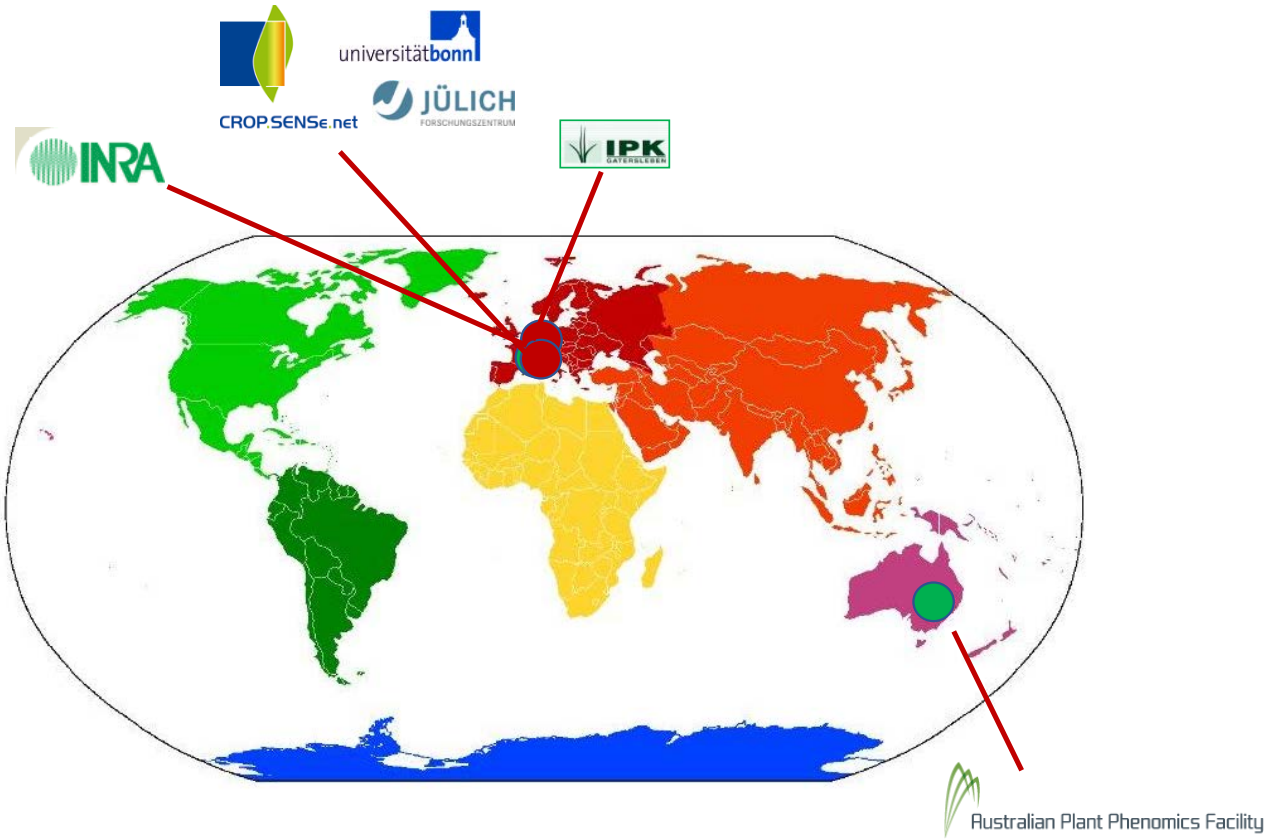
Phenotyping is a bottleneck





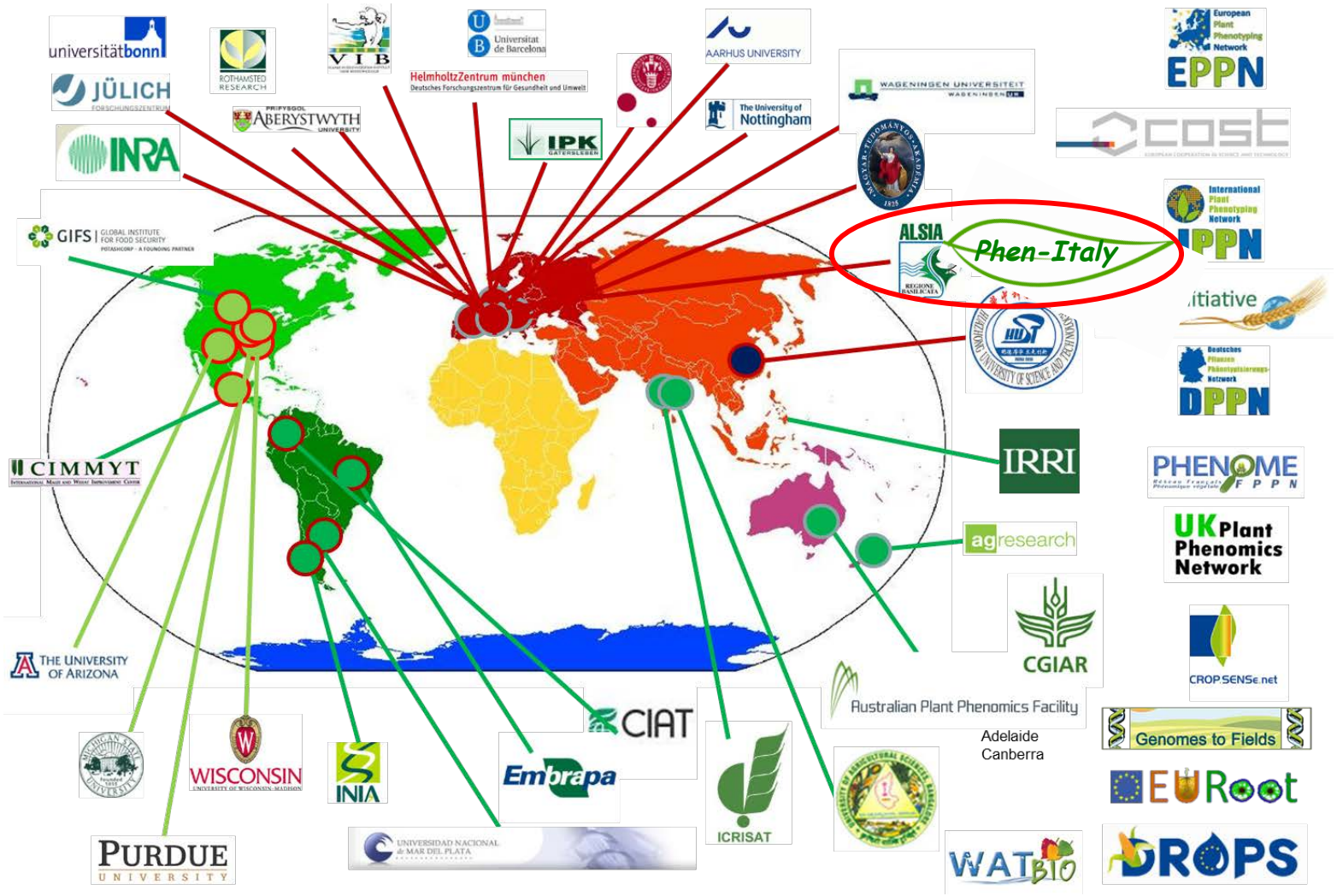
- **Bottleneck in basic plant science and plant breeding**
- **Novel opportunities** develop from **interdisciplinary approaches**
- **mechanistic, high-throughput and field-based platforms**

Plant phenotyping super-rapid development 2008

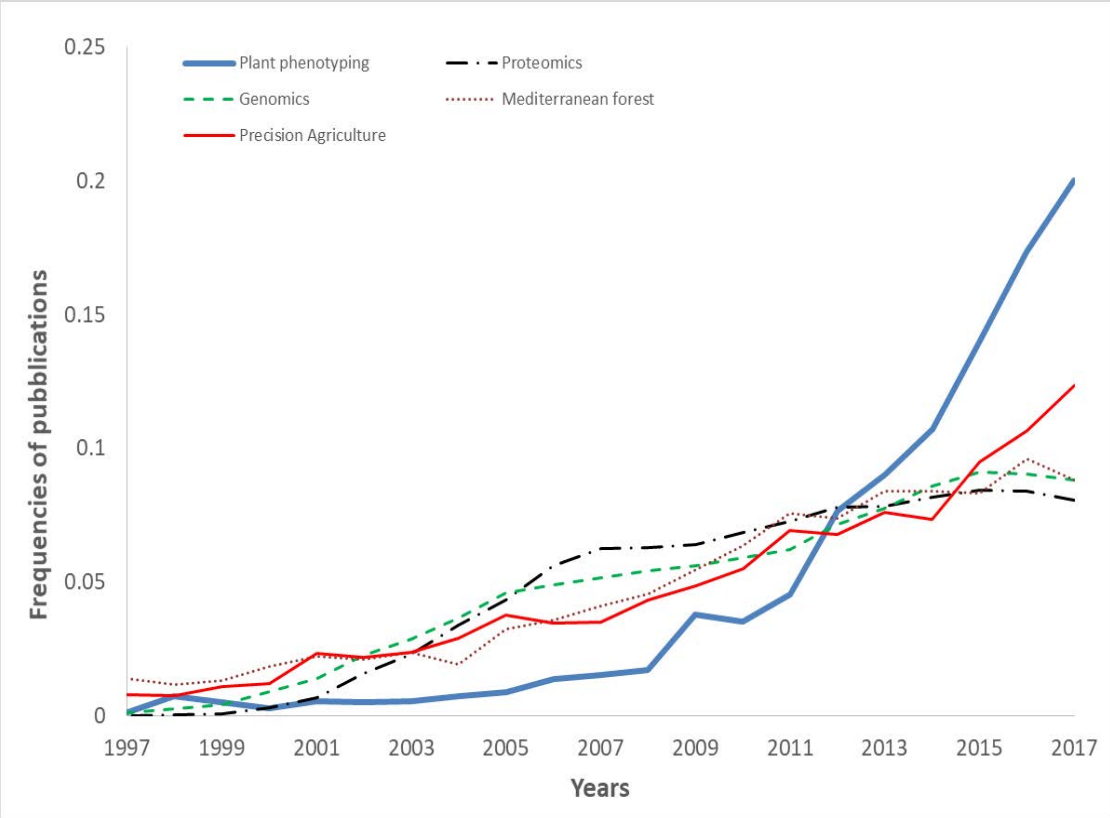


Plant phenotyping super-rapid development

2015



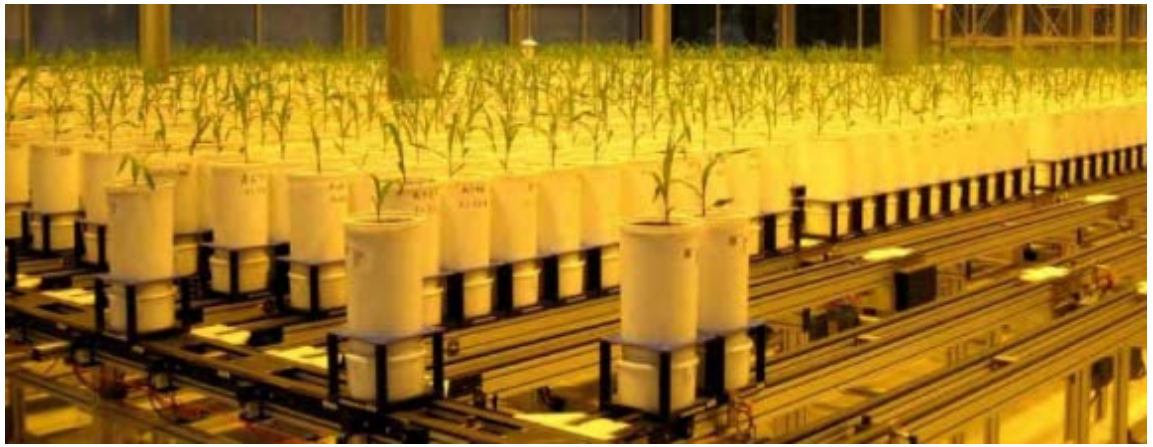
Plant phenotyping super-rapid development



Costa et al. To be submitted

Phenotyping - Challenges

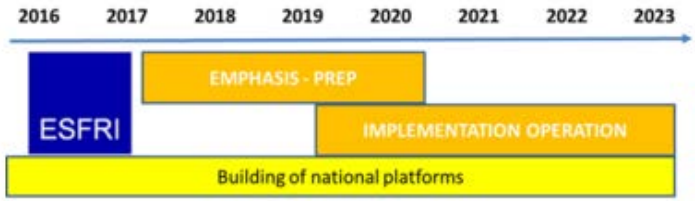
- Development is very fast
- Large facilities for intensive measurements needed
- Demand is
  - increasing and diverse
  - often linked to special expertise for development
  - often requires specialised infrastructures
- Competition is growing globally



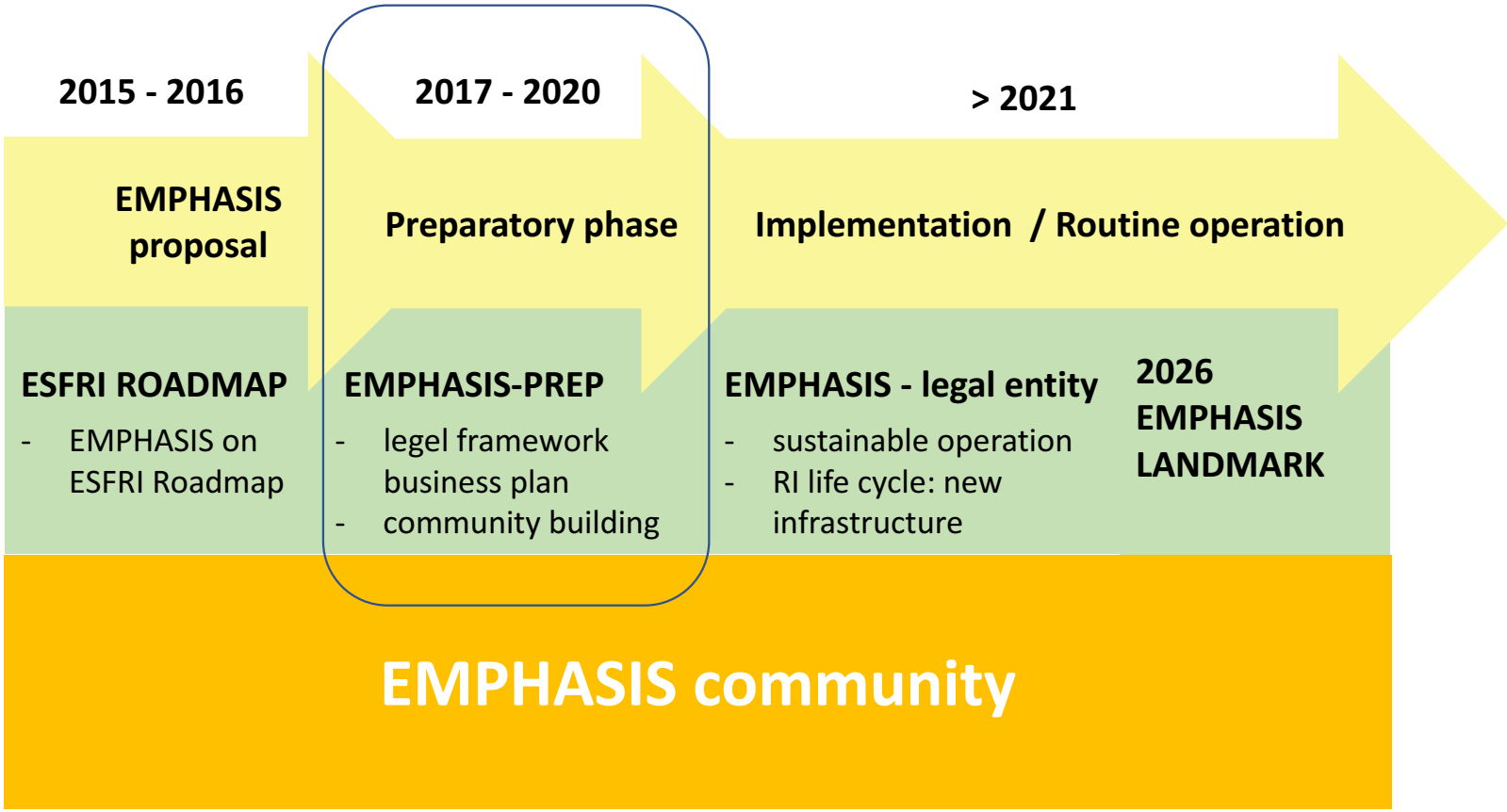
EMPHASIS in the ESFRI Roadmap

The European Strategic Forum for Research Infrastructure (ESFRI) has identified “Plant Phenotyping” as a priority for the European research area.**EMPHASIS** has been listed on the ESFRI Roadmap (2016) as a project to develop and implement a pan-European plant phenotyping infrastructure.

The strategy of the **EMPHASIS** project is the development and implementation of **plant phenotyping infrastructure** to make it **available** and **accessible** to a **wide user community** in Europe.



EMPHASIS - timeline



What is EMPHASIS-PREP?

Horizon 2020

Call: H2020-INFRADEV-2016-2017

(Development and long-term sustainability of new pan-European research infrastructures)

Topic: INFRADEV-02-2016

Type of action: CSA

(Coordination and support action)

Preparation for EMPHASIS**:**
European Infrastructure for multi-scale Plant Phenomics and Simulation for food security in a changing climate (EMPHASIS-PREP)

Objectives:

EMPHASIS-PREP´s targets **are not predominantly scientific results**, but facilitating EMPHASIS as a European infrastructure

The project EMPHASIS-PREP will provide the basis for the establishment of the **legal framework**, the **business plan** and preparation of an **information system** for a **sustainable and innovative pan-European infrastructure** for plant phenotyping within the framework of EMPHASIS.

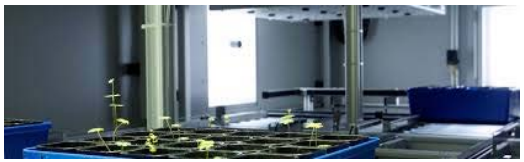
Four major steps

Mapping (infrastructure, funders, access procedure and models, stakeholder community, e-infrastructure, imaging approaches,

gap analysis based on the mapping activities;

developing strategies to address the gaps;

plan for future operation of EMPHASIS within a corresponding **legal framework**



The Italian Plant Phenotyping Landscape

Phen-Italy

ACCORDO PER COSTITUZIONE E FUNZIONAMENTO DI UNA RETE NAZIONALE DI PLANT PHENOTYPING TRAMITE UNA JOINT RESEARCH UNIT (JRU) DENOMINATA ITALIAN PLANT PHENOTYPING NETWORK – PHEN- ITALY

PARTNERS

Research institutions

ALSIA

CREA

FONDAZIONE EDMUND MACH

Universities

International Organizations

CIHEAM
IAM BARI

The Italian Plant Phenotyping Landscape

Scanalyzer 3D-System (LemnaTec GmbH)

-Hardware: greenhouse, conveyor belts and image chambers;

-Plant randomization in 0,3 Km conveyor (500 cars);

- Observations from various angles

-Optionals filter/sensor in non-visible spectrum (NIR and Fluorescence);

- Plant weight + accurate water dosage

ESFRI RI landscape

for the sustainability of development, conservation of biodiversity and ecosystems, and climate change, by using virtual research environments.

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

for experimental manipulation of managed and unmanaged terrestrial and aquatic ecosystems

for Multi-Site Plant Phenotyping And Simulation for Food Security in a Chancing Climate by improving plants

for biological information, supporting life science research and its translation to medicine, agriculture, bioindustries and society

Continental to regional

Regional to field (agroecosystem)

Phenotypes
Field – Plant – Tissue

Data
Plant - Tissue - Molecular

Phenotyping – Networking for joint infrastructures

Deutsches Pflanzen Phänotypisierungs-Netzwerk
DPPN

PHENOME
Réseau Français Phénomique végétale
F P P N

UK Plant Phenomics Network

VIB

Phen-Italy

National platforms

European Plant Phenotyping Network
EPPN

cost

European projects/ networks

EMPHASIS

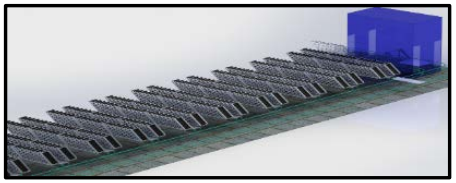
ESFRI

European Infrastructure

European Infrastructure for Multi-Site Plant Phenotyping And Simulation for Food Security in a Chancing Climate

EMPHASIS infrastructures

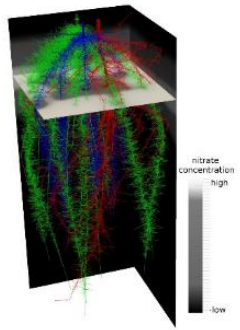
*Phenotyping **platforms** for high resolution, **high throughput phenomics***



*Semi-controlled **field** systems for **high throughput phenomics***

*Network of practical field experiments for **lean-phenotyping***

***Modelling** for improving phenotypic processes and for testing existing or virtual combinations of alleles in a variety of climatic scenarios and management practices*

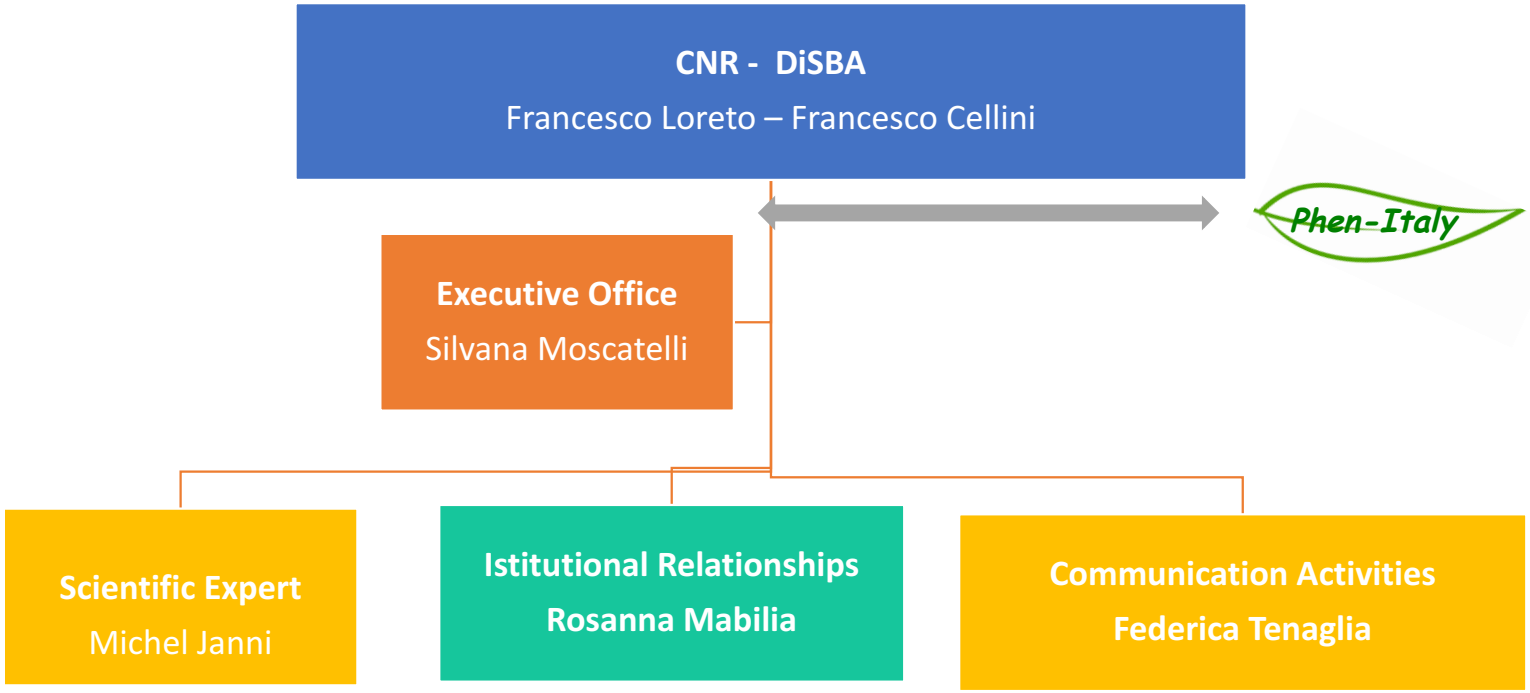


*Joint data management and **e-infrastructure***

The Italian Plant Phenotyping Landscape

EMPHASIS – PREP

WP3 – User demand, orientation and communication



Thanks !