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Setting the scene and expected outcomes of the workshop

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PRO-GRACE - EMPHASIS Workshop on evaluation and valorisation of PGRs

28 June 2024, Brussels, Belgium

SETTING THE SCENE

why improve the management of PGR's phenotypic data?

- ~40% plant species are at **risk of extinction**, causing loss of biodiversity, while plants are essential for life on Earth.
- **Climate change** is already threatening plant diversity and production.
- **Better-adapted and more robust crop varieties** with lower impacts on ecosystems have to be provided to farmers.
- European genebanks conserve ~2 million accessions, which can be **exploited in research to speed up breeding**.
- **To combat climate change, we need to share phenotypic data of PGRs, along with their passport and genomic data.**
- However, **heterogenous practices and guidelines for phenotyping PGRs** across genebanks hinder easy data exchange.

FROM SEEDS TO SOLUTIONS



Sustainable and science-based coordination of phenotypic data management will foster new innovations, ensuring food security and facilitating the agroecological transition.

PRO-GRACE is developing a proof of concept for a novel European RI dedicated to cataloguing, describing, preserving and enhancing PGRFA

WP1 - Inventory of PGRs and information system

WP2 - Quality standards for the management PGR collections

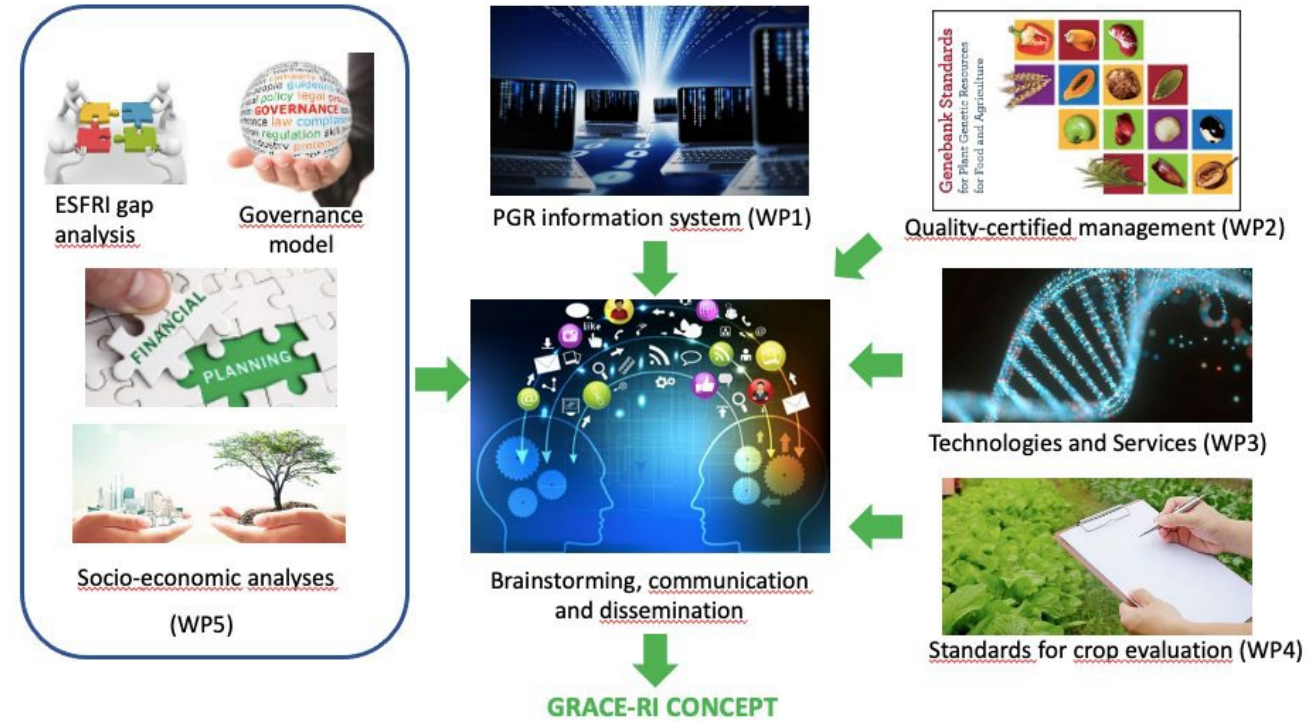
WP3 - Technologies and scientific services facilitating the use

WP4 - Standards and protocols for evaluating and valorising PGRs

↳ a systematic approach to assess potential of PGRs

WP5 - Governance model, regulatory aspects, financial plan

WP6 - Communication and training to the scientific community, stakeholders, policy makers and the civil society



→ **WP4** should help to translate genetic diversity into practical solutions for agriculture

WP4 aims to develop and disseminate crop-specific methods for evaluation, based on existing standards and protocols

→ 4 deliverables - to make the PGRs and their knowledge available for use in order to achieve the green deal



D4.1 - Unified, crop-specific standards and protocols for the evaluation of the phenotypes and agronomic characteristics of PGRs (**version 1**, January 2024)

available on www.grace-ri.eu

D4.2 - Workshop on the evaluation of *in situ* and *ex situ* PGR collections organized in collaboration with EMPHASIS (Brussels, 28 June 2024)

D4.3 - Improved and completed D4.1 (**version 2**, December 2024)

D4.4 - Interconnection of the different phenotype databases with the central EURISCO Information System (April 2025)

EMPHASIS aims to develop an IS dedicated to PGR's phenotypic data

A European Infrastructure for Plant Phenotyping



Develop an integrated pan-European infrastructure of instrumented facilities

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

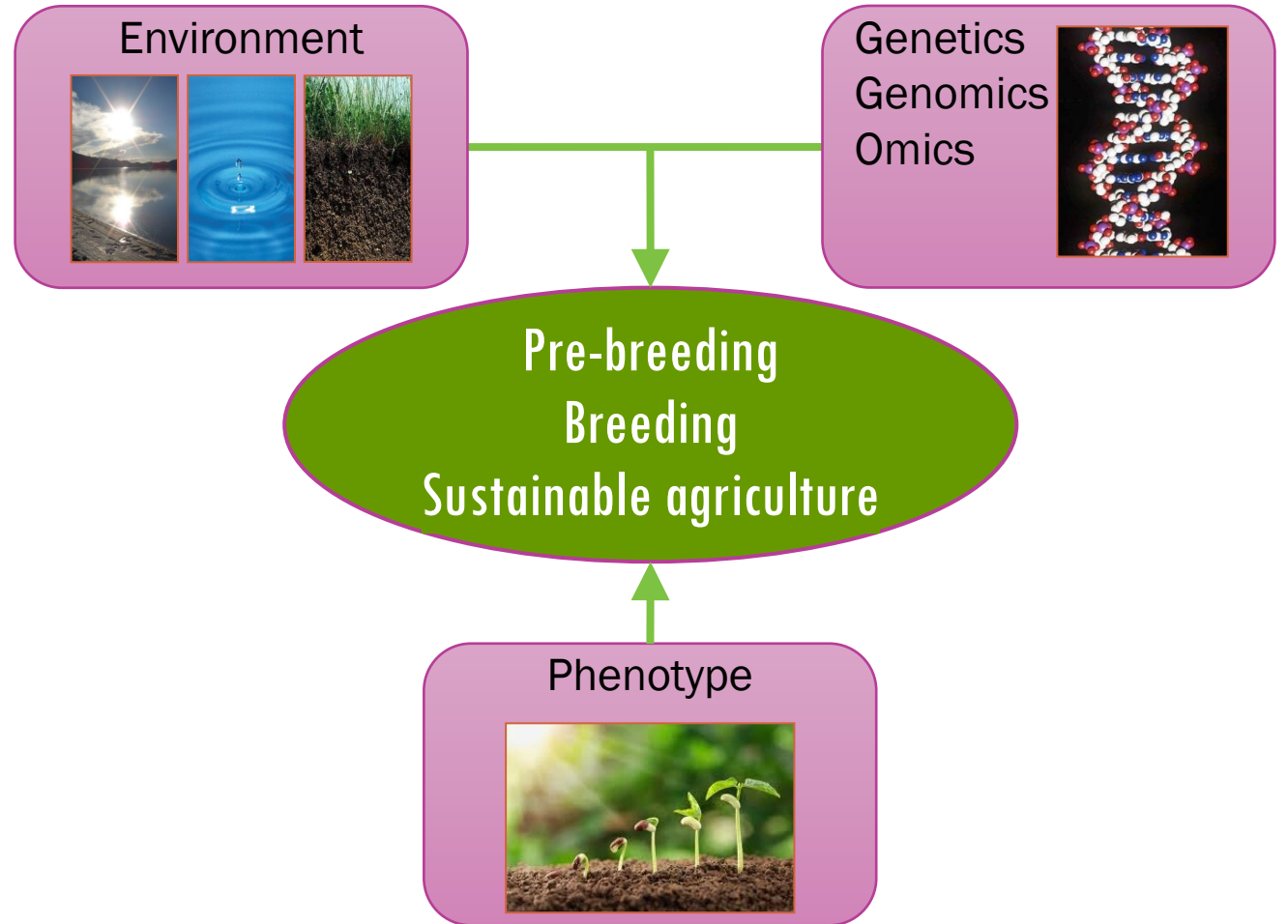
Develop, evaluate and share knowledge and novel technologies

GRACE-RI & EMPHASIS' common objectives

→ Exploit PGRs for sustainable agriculture

Key elements addressing synergies between GRACE-RI and EMPHASIS

- *1st session:* Seed phenotyping
- *2nd session:* Cost-effective phenotyping
- *3rd session:* Data management



EURISCO, a web-based catalogue that informs on ~2 million preserved plant accessions in Europe



<http://eurisco.ecpgr.org>
Weise et al, 2017, NAR

- EURISCO contains both **passport and phenotypic data** of ~6,700 genera and ~45,000 species sourced from ~400 genebanks in 43 European countries
- >10 EU-funded projects have **provided genetic resources and associated knowledge** on important crop families (Cereals, Solanaceae, Legumes)



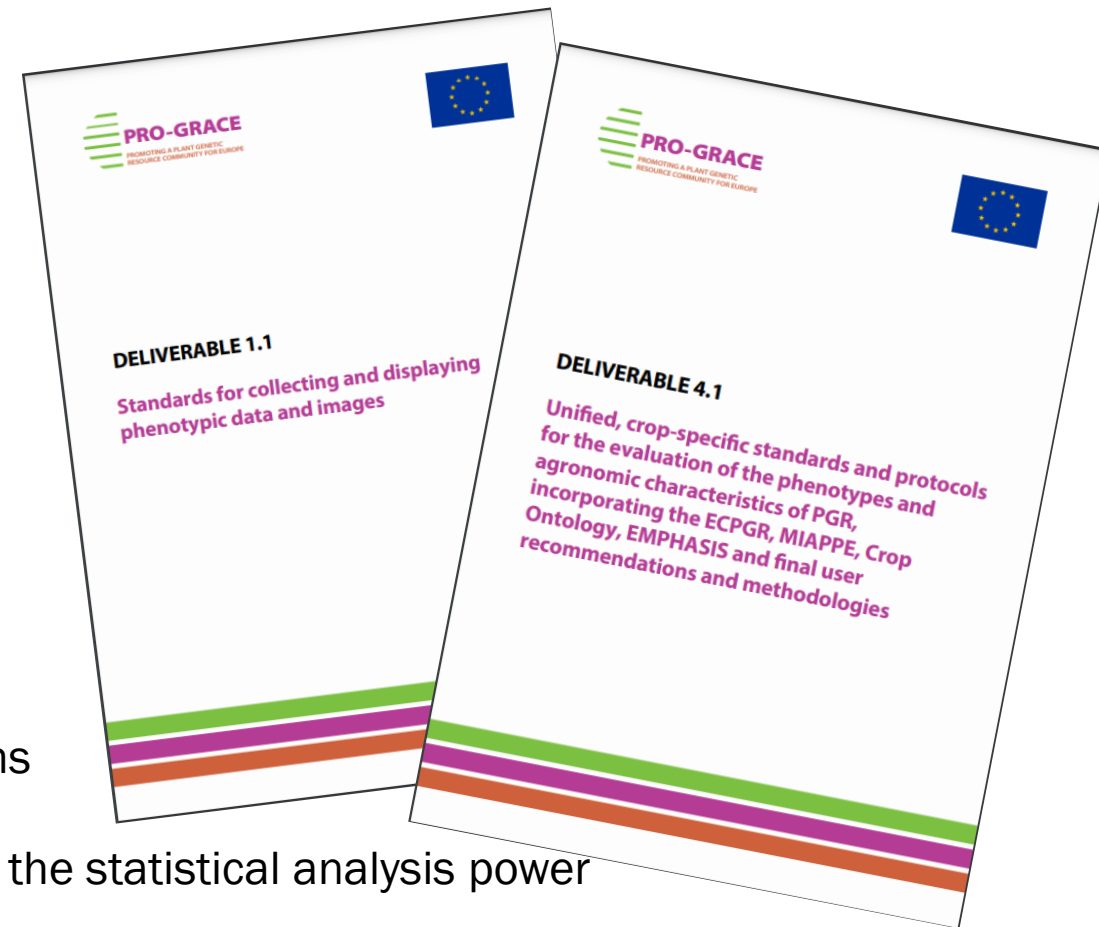
CHALLENGE: upload the vast amount of new phenotypic data into EURISCO ensuring it remains a valuable resource for plant research and breeding.

MAIN CHALLENGES

of data standardization

- ensuring **reproducibility** of phenotypic data
- making phenotypic data **FAIR**
- enabling phenotypic data to be **reused by machines**
- ensuring **semantic interoperability** between information systems
- merging data from **different phenotyping platforms** to increase the statistical analysis power
- comparing data to understand how **GxE interactions** produce phenotypes
- speeding up interconnection to **integrate various phenotypic databases with EURISCO**

Findable
Accessible
Interoperable
Reusable



→ to improve the usability and impact of phenotypic data for research and breeding

MEASURES TO BE TAKEN to standardize phenotypic data

Plant diversity



→ Germplasm accession G_i

→ **Assign a unique identifier** for each accession

×
Phenotype P_{ij}



→ Trait name

→ Ontology-based name

→ Method+Scale

→ Clearly defined methodology, Scale unit, Growth stage...

→ Environment E_j



→ Standardized metadata for envirotyping the environment

**Producing FAIR
plant phenotyping data**

to establish EURISCO as a **trusted
open-access repository**

to **generate knowledge**

→ **While describing experimental metadata is relatively easy to standardize,**
standardizing phenotyping methods and environmental conditions is more challenging.

EXPECTED OUTCOMES of the joint PRO-GRACE / EMPHASIS workshop

- How can breeders, farmers, citizens **gain easy access to PGRs and use them** to speed up the green transition?
- What **standards should be improved** in genebank inventories?
- What is the potential of **novel phenomics technologies** and their inclusion in phenotypic databases?
- How can we **integrate PRO-GRACE, EMPHASIS and EURISCO initiatives**?
- How can **breeders, farmers, citizens contribute** to conservation and phenotyping?
- What is needed to **merge experiments from pre-existing databases to assess GxE**?

→ Define priorities to leveraging PGRs for sustainable agriculture

PROGRAM of the day

09:00 - Setting the scene – **V. Lefebvre**, *INRAE*, France

09:15 - Introduction to EMPHASIS – **R. Pieruschka**, *FZJ*, Germany

09:30 - Genebank materials attractive for users? – **J. Prohens**, *UPV*, Spain

09:50 - Improved genebank inventories, AGENT and EVA – **S. Goritschnig**, *ECPGR*, Italy

10:10 - Phenotyping by citizens – **R. Papa**, *INIVPM*, Italy

11:00 - **1st theme: Seed phenotyping**

13:00 - **2nd theme: Cost-effective phenotyping**

14:00 - **3rd theme: Data management**

15:00 - **Wrap-up & conclusions**

Each theme:

- 4 invited speakers
- a common Q&A session

Future



THANK YOU

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