PRO-GRACE
PROMOTING A PLANT GENETIC RESOURCE COMMUNITY FOR EUROPE

Funded by the European Union

Pillar 1
Services to support the *ex situ* PGR community

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PRO-GRACE Results and Legacy Workshop

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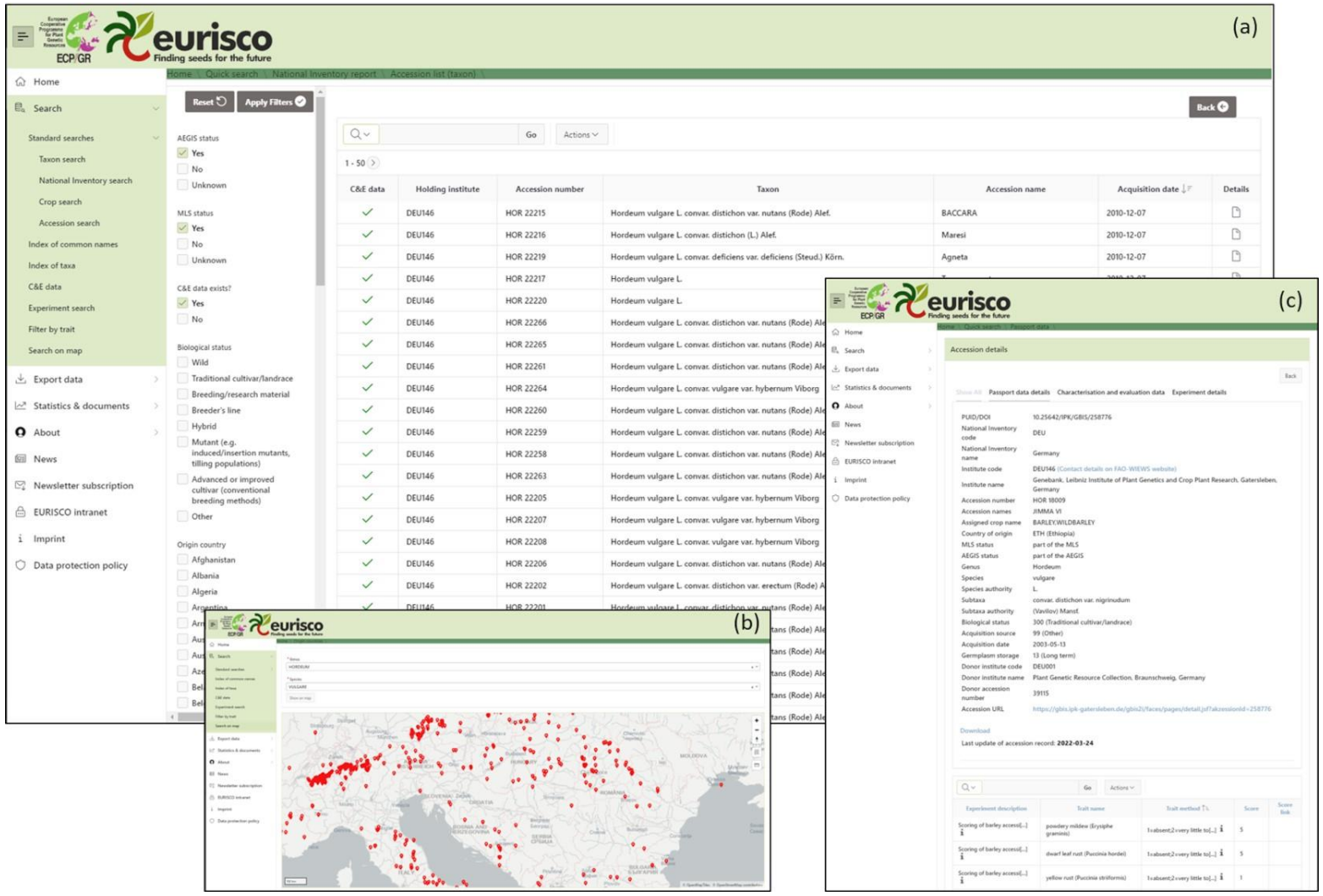
Introduction

EURISCO database:

- >2·10^6 accessions
- >400 Institutes
- 43 member countries



From Kotni et al. (2023)

Introduction

EURISCO database:

- >2·10^6 accessions
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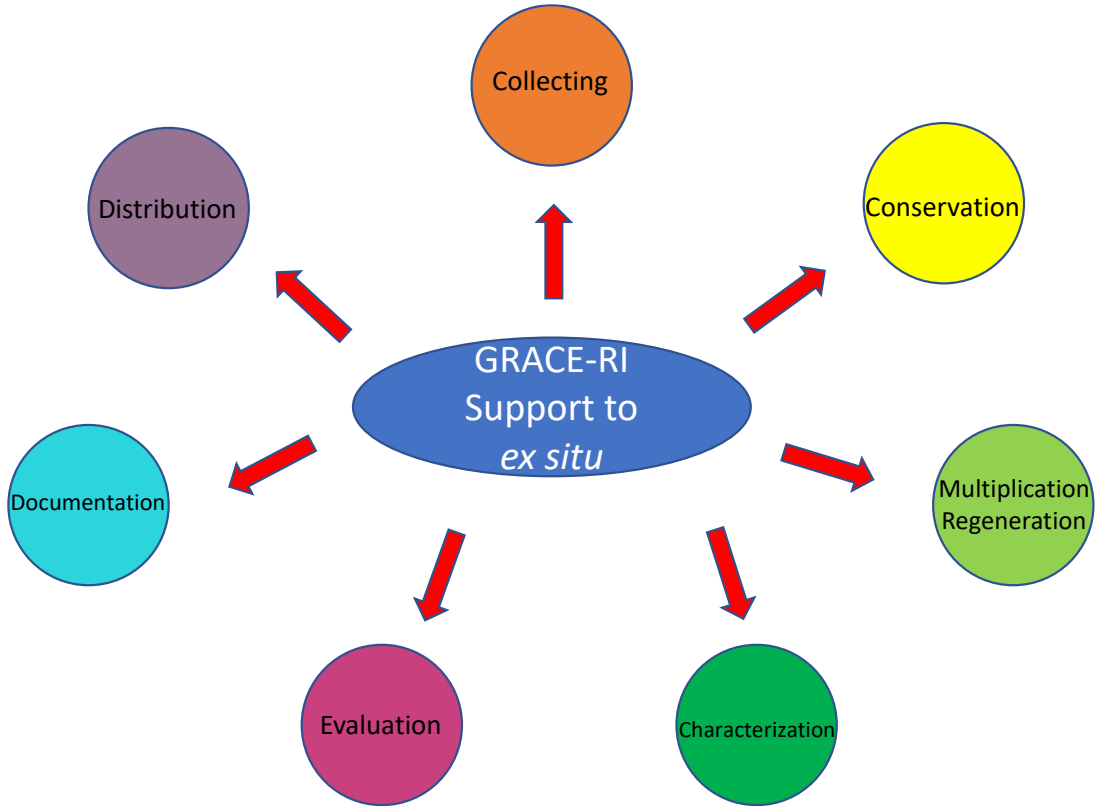
***Ex situ* community:**

- Seed banks
- Field collections
- *In vitro* collections
- *Cryo* facilities
- Botanic gardens

Introduction

Challenges:

- Fragmentation
- Unequal quality
- Limited resources
- Gaps in data and services



Pillar I aims to address these challenges thorugh (D2.5):

- A QMS system
- Improved conservation protocols
- Integration of omics
- Core collections
- Safety duplication

GRACE-RI and the *ex situ* conservation cycle

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Collecting germplasm

Actors:

- Genebanks
- Botanic gardens
- Field expeditions

Needs:

- Gap analysis
- Legal clarity (ABS, Nagoya)
- National permits

Pillar V

GRACE-RI Support:

- Gap analysis to prioritize taxa/sites (**D3.5**)
- Central service for permits & compliance
- Shared protocols for ethical & scientific collecting

Pillar V

Conservation

Actors:

- Seed banks
- In vitro collections
- Cryopreserved collections
- Field collections

Needs:

- Reliability of conservation
- Increased viability of germplasm
- Fast & non-destructive viability evaluation
- Cost efficiency

GRACE-RI Support:

- Quality management systems (QMS), certification and SOP repository (**D2.1., D2.2, D5.2** & **D5.5**)
- Shared *in vitro* & cryo hubs for recalcitrant & vegetatively propagated species
- Services for non-destructive viability testing
- Specialized crop genebanks to concentrate expertise

Multiplication & regeneration

Actors:

- Seed genebanks
- *In vitro* & cryo collections
- Field collections

Needs:

- Maintain viability & integrity
- Reduce risks
- Avoid genetic drift & genetic contamination
- Produce high quality propagation material

GRACE-RI Support:

- Standards and protocols to ensure genetic fidelity (**D3.2**) and phytosanitary safety
- Coordination of multiplication and regeneration through specialized genebanks
- Seed cleaning and quality services
- Backup services (cryo & *in vitro* conservation)

Characterization

Actors:

- Seed genebanks
- Field & *in vitro* collections

Needs:

- Reliable identification
- Standardized descriptors (minor species)
- High-throughput characterization tools
- Tools to manage and analyse large volume of data

Pillar III

GRACE-RI Support:

- Network of taxonomy experts
- Genotyping and cytogenomics services
- Development of core collections (CC)
- Image storage and analysis (**D1.1**)
- Analysis tools of characterization data

Pillar III

Evaluation

Actors:

- Seed genebanks
- Field & *in vitro* collections
- Research institutes
- ECPGR's EVA network

Needs:

- Trait screening for stresses & quality
- Multi-environment testing
- Standardized protocols & data
- Predictive tools for trait discovery

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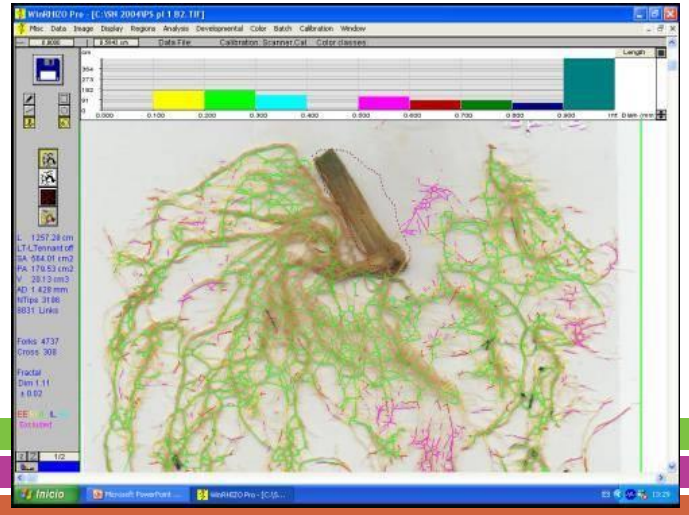
GRACE-RI Support:

- CC high-thoughput phenotyping (EMPHASIS)
- CC multi-site trials (EVA/ECPGR)
- Unified standards and protocols (**D4.1** & **D4.3**)
- Advanced tools for integrative data analysis

Pillar III



Documentation

Actors:

- Genebanks & other *ex situ* collections
- EURISCO
- ECPGR National Focal Points
- Research institutes

Needs:

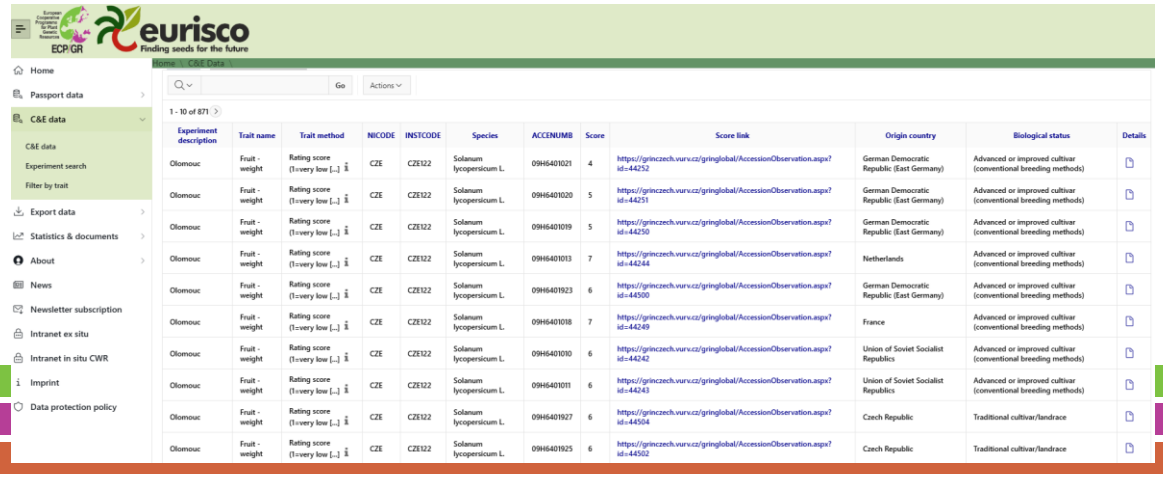
- Integration of diverse databases
- Standardized descriptors & metadata (D1.1)
- Detection of duplicates & gaps
- Storage of large amounts of data

Pillar III

GRACE-RI Support:

- EURISCO 2.0: integrate passport, omics & phenomics data
- FAIR-compliant data curation & stewardship
- AI tools for duplicate/gap detection
- Long-term repositories for large-scale datasets, linked to EURISCO

Pillar III



Distribution

Actors:

- Genebanks
- Phytosanitary authorities
- Researchers, breeders, farmers
- Seed exchange networks

Needs:

- Safe movement of material
- Compliance with ABS, SMTA, and seed & germplasm legislation
- Efficient use/access
- Traceability of distributed material

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GRACE-RI Support:

- Phytosanitary hubs for testing, sanitation, certification
- Legal helpdesk on ABS, SMTA, and seed laws
- Integrated ordering platform connected to EURISCO
- Digital traceability tools for monitoring exchanges

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Expanding the concept of *ex situ*

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Field Collections & Botanic Gardens

Actors:

- Field collections (clonal crops)
- Botanic gardens
- Tree collections & arboreta

Needs:

- Long-term security for unique living collections
- Back up strategies to reduce vulnerability
- Phytosanitary management of vegetative material
- Integration of data into European catalogues

Pillar V

Pillar III

GRACE-RI Support:

- Specialized genebanks for clonal crops
- Safety duplication in secure facilities
- Phytosanitary services for vegetative materials
- Linkage with EURISCO for data visibility and access

Pillar V

Pillar III

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In vitro & Cryo Collections

Actors:

- *In vitro* collections
- Cryo facilities
- Research labs developing new preservation protocols

Needs:

- Reliable long-term conservaton methods
- Protection from contamination and loss
- Harmonized protocols
- Sharing of specialized expertise and facilities

GRACE-RI Support:

- Standardized protocols & certification for *in vitro* and cryo practices
- Shared cryo hubs for storage
- Capacity building and training
- R&D platform to develop new technologies for difficult species

Herbaria & Digital Vouchers

Actors:

- Herbaria linked to genebanks
- Botanic gardens with vouchers
- DiSSCo and natural history collections

Needs:

- Secure storage of vouchers
- Integration of herbarium data with accession records
- Tools for digital imaging and analysis
- Use of specimens for DNA, trait and reference studies

GRACE-RI Support:

- Linked voucher system connecting herbaria to genebank accessions
- Integration with DiSSCo for biodiversity data standards (**D5.1**)
- AI-assisted image & spectral analysis for traits without cultivation
- Digital repositories for specimen data and images

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Duplication & Specialized Genebanks

Actors:

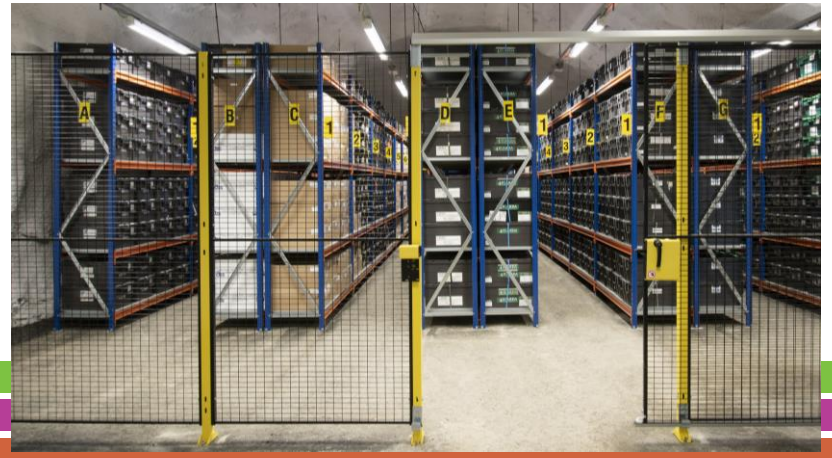
- National and regional genebanks
- International back-up facilities
- ECPRG networks
- Specialized genebanks

Needs:

- Ensure safety back-up of unique accessions
- Minimize unnecessary duplications
- Rationalize conservation by crop or species groups
- Strengthen coordination between institutions

GRACE-RI Support:

- Strategy for coordinated duplication
- Safety back-up mechanisms including Svalbard and regional vaults
- Promotion of specialized genebanks
- Integration with ECPGR & AEGIS to align responsabilities



Cross-cutting Services

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Bioinformatics Services

Actors:

- Genebanks & other GRCs
- Research institutes analyzing omics
- ELIXIR & bioinformatics structures
- Breeders using integrated datasets

Needs:

- Tools to process large-scale omics and phenomics data
- Integration of heterogeneous datasets (passport, phenotypic, omics, environment)
- User-friendly pipelines for non-experts
- Standards to ensure interoperability across Europe

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GRACE-RI Support:

- Shared analysis pipelines for genomics, phenomics, metabolomics
- Virtual research environments for integrative analyses
- Training and support in bioinformatics tools
- Coordination with ELIXIR for standards and interoperability

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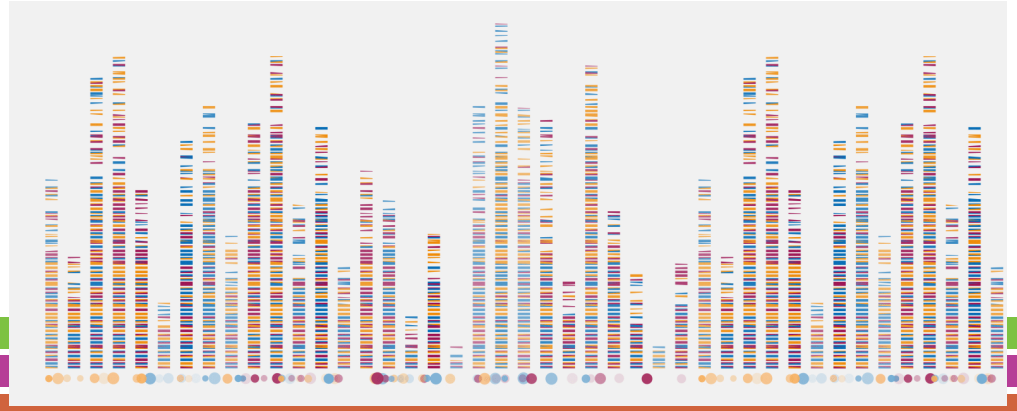


Training & Capacity Building

Actors:

- Genebank and other GRC staff
- ECPGR training and networking initiatives
- Universities and research institutes

Needs:

- Professional training in QMS, conservation, and phytosanitary practices
- Skills in omics, phenotyping, and bioinformatics
- Staff exchanges and mentoring
- Building capacity in smaller or underfunded collections

GRACE-RI Support:

- Structured training programmes across key technical areas
- E-learning modules & workshops accessible to all institutions
- Staff exchanges & mobility schemes within the RI network
- Peer-review audits as a learning and mentoring tool

Coordination in the European Landscape

Key roles:

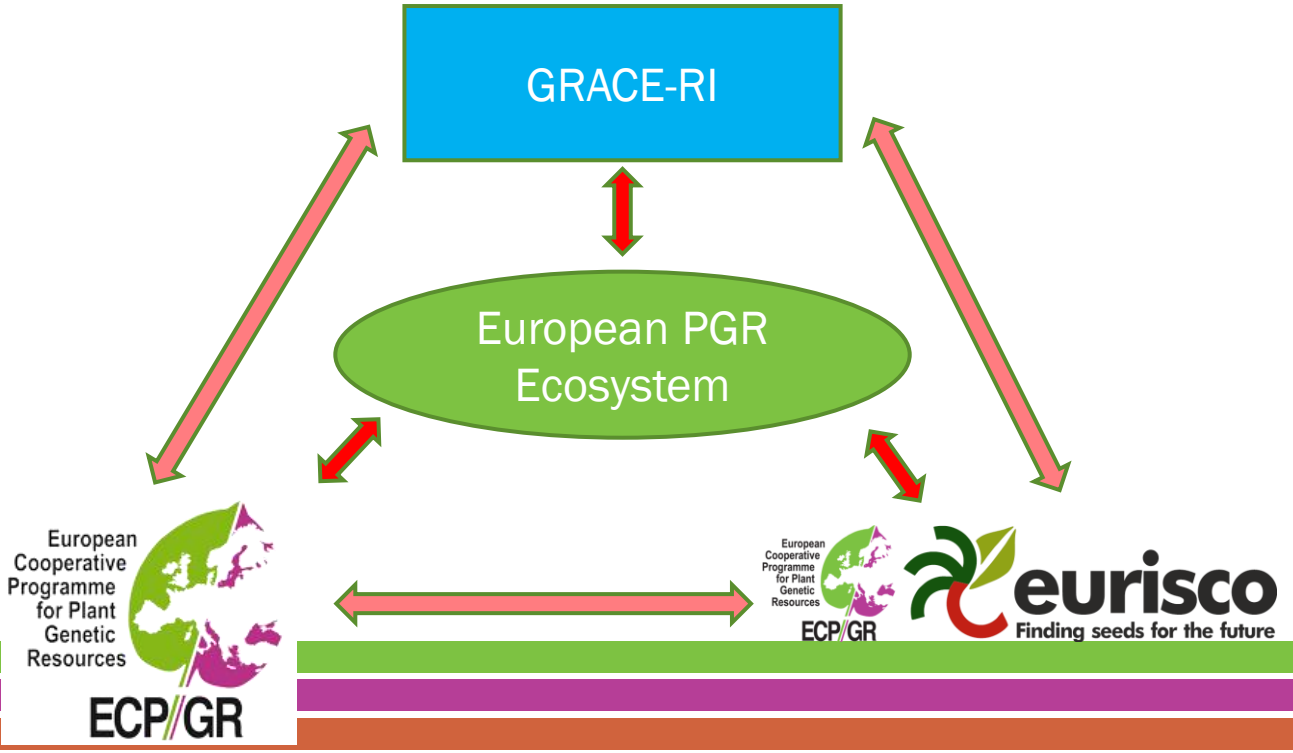
- EURISCO → European catalogue of accessions (accession data backbone).
- ECPGR → Policy & coordination network (countries, crop groups, AEGIS, EVA).
- GRACE-RI → Service provider (advanced scientific, technical, legal, training support).

Integration:

- EURISCO remains the data hub
- ECPGR remains the governance & coordination platform
- GRACE-RI provides infrastructure services to strengthen both

GRACE-RI Support:

- Complementarity
- Robust European system for *ex situ* conservation and use of PGR



Synergies with other ESFRIs & Conclusion

Potential synergies:

- EMPHASIS ⟶ Plant phenotyping
- ELIXIR ⟶ Life Science data and bioinformatics
- LifeWatch ERIC ⟶ Biodiversity and ecosystem data integration
- DiSSCo ⟶ Distributed system of scientific collections
- In-Sylva ERIC ⟶ Forest and tree genetic resources, linking *in situ* and *ex situ* networks
- BBMRI – ERIC ⟶ Biobanking and biomolecular resources
- METROFOOD ⟶ Metrology for Food & Nutrition

Conclusion:

GRACE-RI will support the *ex situ* conservation community with services that secure, connect, and enable use of PGR

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THANK YOU

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