

# **Pillar 1**

## **Services to support the *ex situ* PGR community**

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# Introduction

## EURISCO database:

- $>2 \cdot 10^6$  accessions
- $>400$  Institutes
- 43 member countries

(a) Main search results table:

C&E data	Holding institute	Accession number	Taxon	Accession name	Acquisition date	Details
✓	DEU146	HOR 22215	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.	BACCARA	2010-12-07	
✓	DEU146	HOR 22216	Hordeum vulgare L. conv. distichon (L.) Alef.	Maresii	2010-12-07	
✓	DEU146	HOR 22219	Hordeum vulgare L. conv. deficiens var. deficiens (Steud.) Körn.	Agneta	2010-12-07	
✓	DEU146	HOR 22217	Hordeum vulgare L.			
✓	DEU146	HOR 22220	Hordeum vulgare L.			
✓	DEU146	HOR 22266	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22265	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22261	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22264	Hordeum vulgare L. conv. vulgare var. hybernum Viborg			
✓	DEU146	HOR 22260	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22259	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22258	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22263	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22205	Hordeum vulgare L. conv. vulgare var. hybernum Viborg			
✓	DEU146	HOR 22207	Hordeum vulgare L. conv. vulgare var. hybernum Viborg			
✓	DEU146	HOR 22208	Hordeum vulgare L. conv. vulgare var. hybernum Viborg			
✓	DEU146	HOR 22206	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			
✓	DEU146	HOR 22202	Hordeum vulgare L. conv. distichon var. erectum (Rode) Alef.			
✓	DEU146	HOR 22201	Hordeum vulgare L. conv. distichon var. nutans (Rode) Alef.			

(b) Map of Europe showing member institute locations (red dots).

(c) Accession details for HOR 18009:

Field	Value
PUR/DOR	10.25642/IFC/GBIS/258776
National inventory code	DEU
National inventory name	Germany
Institute code	DEU146 (Contact details on EAD, WGRIS website)
Institute name	Genbank, Leibniz Institute of Plant Genetics and Crop Plant Research, Gatersleben, Germany
Accession number	HOR 18009
Accession name	JARMA 91
Assigned crop name	BARLEY WILDBARLEY
Country of origin	ETH (Ethiopia)
MLS status	part of the MLS
AEGIS status	part of the AEGIS
Genus	Hordeum
Species	vulgare
Species authority	L.
Subtaxa	conv. distichon var. nigrescens
Subtaxa authority	(Vavilov) Mansf.
Biological status	300 (Traditional cultivar/landrace)
Acquisition source	99 (Other)
Acquisition date	2003-05-13
Germplasm storage	13 (Long term)
Donor institute code	DEU001
Donor institute name	Plant Genetic Resource Collection, Braunschweig, Germany
Donor accession number	39115
Accession URL	<a href="https://ghis.lpk-gatersleben.de/ghis2/faces/page/detail.jspx?_afAccessionId=258776">https://ghis.lpk-gatersleben.de/ghis2/faces/page/detail.jspx?_afAccessionId=258776</a>

Download  
Last update of accession record: 2022-03-24

Experiment description	Trait name	Trait method	Score	Score
Scoring of barley accessions	powdery mildew (Erysiphe graminis)	1 to absent, 2 = very little to 1	1	5
Scoring of barley accessions	dwarf leaf rust (Puccinia horidis)	1 to absent, 2 = very little to 1	1	5
Scoring of barley accessions	yellow rust (Puccinia striiformis)	1 to absent, 2 = very little to 1	1	1

From Kotni et al. (2023)



# Introduction

## EURISCO database:

- $>2 \cdot 10^6$  accessions
- $>400$  Institutes
- 43 member countries

## *Ex situ* community:

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



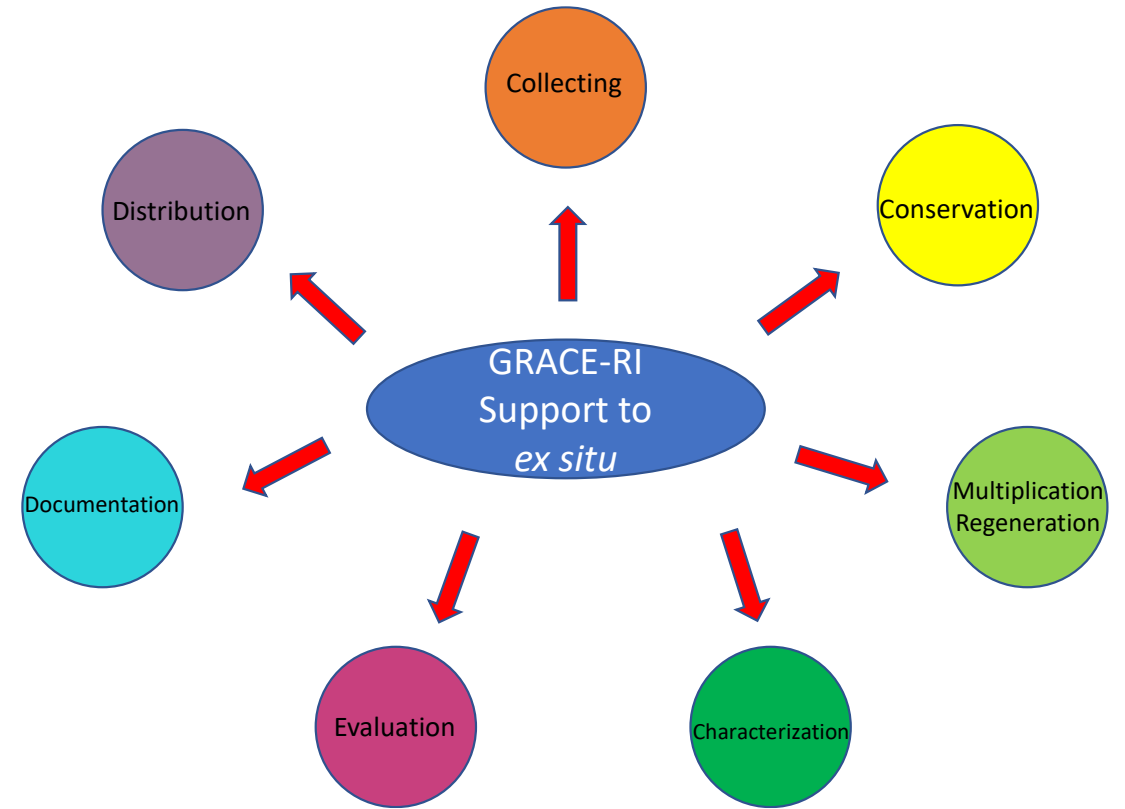
# Introduction

## Challenges:

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

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

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







# GRACE-RI and the *ex situ* conservation cycle



# Collecting germplasm

## Actors:

- Genebanks
- Botanic gardens
- Field expeditions

## Needs:

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

## GRACE-RI Support:

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

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# 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

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## 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

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# Evaluation

## Actors:

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

## Needs:

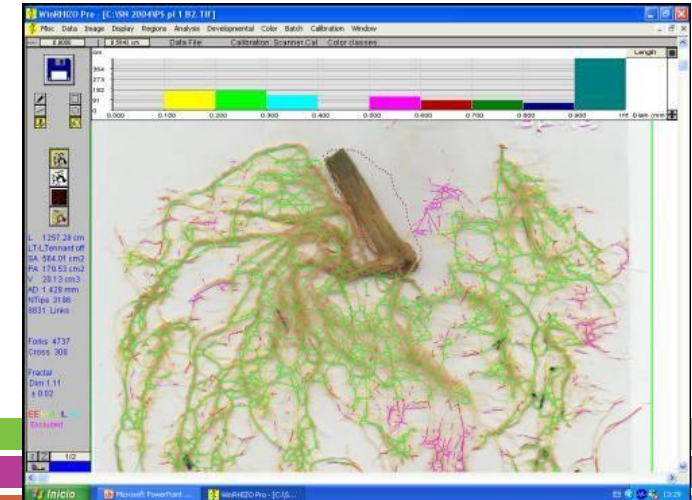
- Trait screening for stresses & quality
- Multi-environment testing
- Standardized protocols & data
- Predictive tools for trait discovery

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## GRACE-RI Support:

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

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# Documentation

## Actors:

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

## Needs:

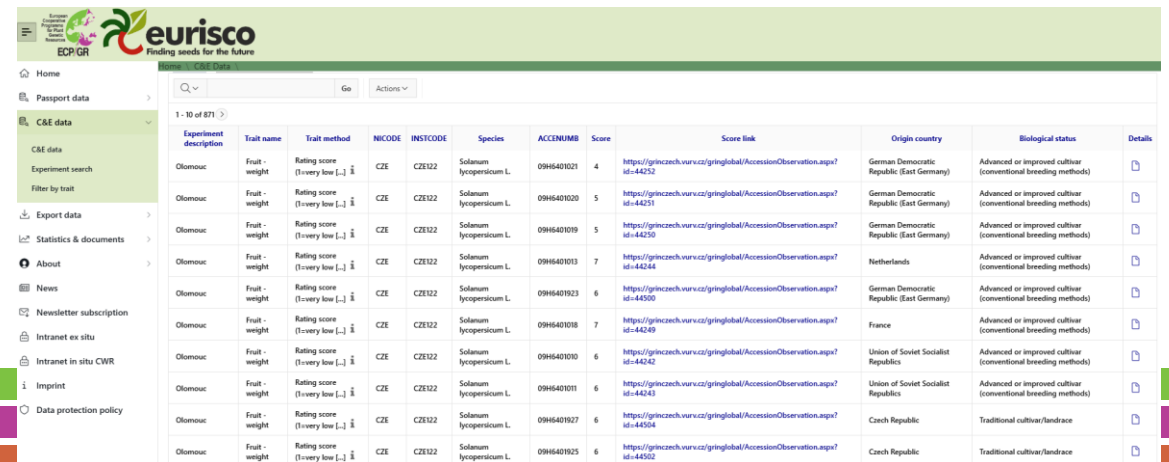
- Integration of diverse databases
- Standardized descriptors & metadata (D11)
- Detection of duplicates & gaps
- Storage of large amounts of data

## 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

Pillar III



The screenshot displays the EURISCO web interface. At the top, there is a header with the EURISCO logo and the tagline 'Finding seeds for the future'. Below the header, a navigation menu on the left includes links for Home, Passport data, C&E data, Experiment search, Export data, Statistics & documents, About, News, Newsletter subscription, Intranet ex situ, Intranet in situ CWR, Imprint, and Data protection policy. The main content area shows a table of plant accessions. The table has columns for Experiment description, Trait name, Trait method, NICODE, INSTCODE, Species, ACCNUMB, Score, Score link, Origin country, Biological status, and Details. The table lists 10 accessions, all of which are 'Olomouc' and 'Fruit - weight' traits, with various scores and origin countries.

Experiment description	Trait name	Trait method	NICODE	INSTCODE	Species	ACCNUMB	Score	Score link	Origin country	Biological status	Details
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401021	4	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44252">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44252</a>	German Democratic Republic (East Germany)	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401020	5	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44251">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44251</a>	German Democratic Republic (East Germany)	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401019	5	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44250">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44250</a>	German Democratic Republic (East Germany)	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401013	7	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44244">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44244</a>	Netherlands	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401923	6	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44500">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44500</a>	German Democratic Republic (East Germany)	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401018	7	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44249">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44249</a>	France	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401010	6	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44242">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44242</a>	Union of Soviet Socialist Republics	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401011	6	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44243">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44243</a>	Union of Soviet Socialist Republics	Advanced or improved cultivar (conventional breeding methods)	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401927	6	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44504">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44504</a>	Czech Republic	Traditional cultivar/landrace	<a href="#">Details</a>
Olomouc	Fruit - weight	Rating score (1=very low [–] 5)	CZE	CZE122	Solanum lycopersicum L.	09H6401925	6	<a href="https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44502">https://grin.czech.vur.cz/gringlobal/AccessionObservation.aspx?id=44502</a>	Czech Republic	Traditional cultivar/landrace	<a href="#">Details</a>

# 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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**CERTIFICADO FITOSANITARIO**  
PHYTOSANITARY CERTIFICATE  
Nº CE / ES / **0392716 2B**





# Expanding the concept of *ex situ*



# 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

## 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

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# *In vitro* & Cryo Collections

## Actors:

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

## Needs:

- Reliable long-term conservation 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 responsibilities





A top-down view of several burlap sacks filled with different types of grains, including yellow lentils, black lentils, white rice, and yellow soybeans, arranged on a wooden surface.

# Cross-cutting Services



# Bioinformatics Services

## Actors:

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

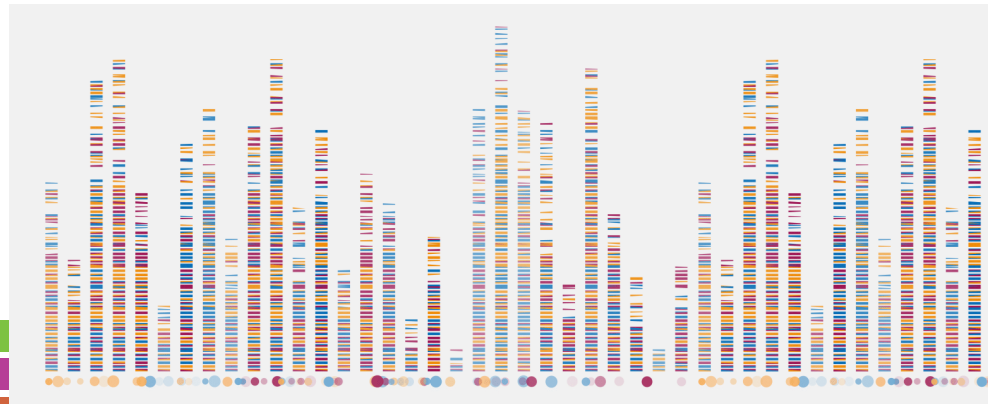
## Needs:

- 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

## 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:

- Genbank 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:

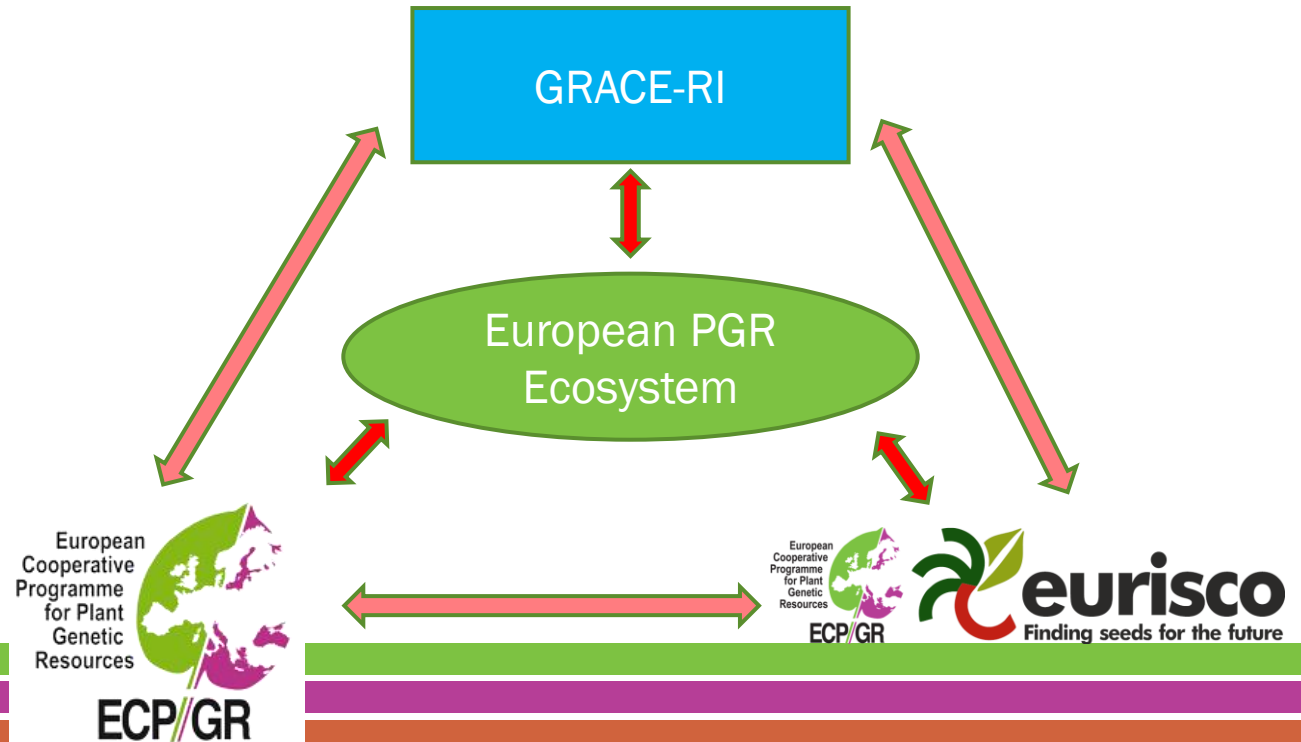
- EURISCO → European catalogue of accessions (accession data backbone).
- ECPGR → Policy & coordination network (countries, crop groups, AEGIS, EVA).
- GRACE-RI → Service provider (advanced scientific, technical, legal, training support).

## 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



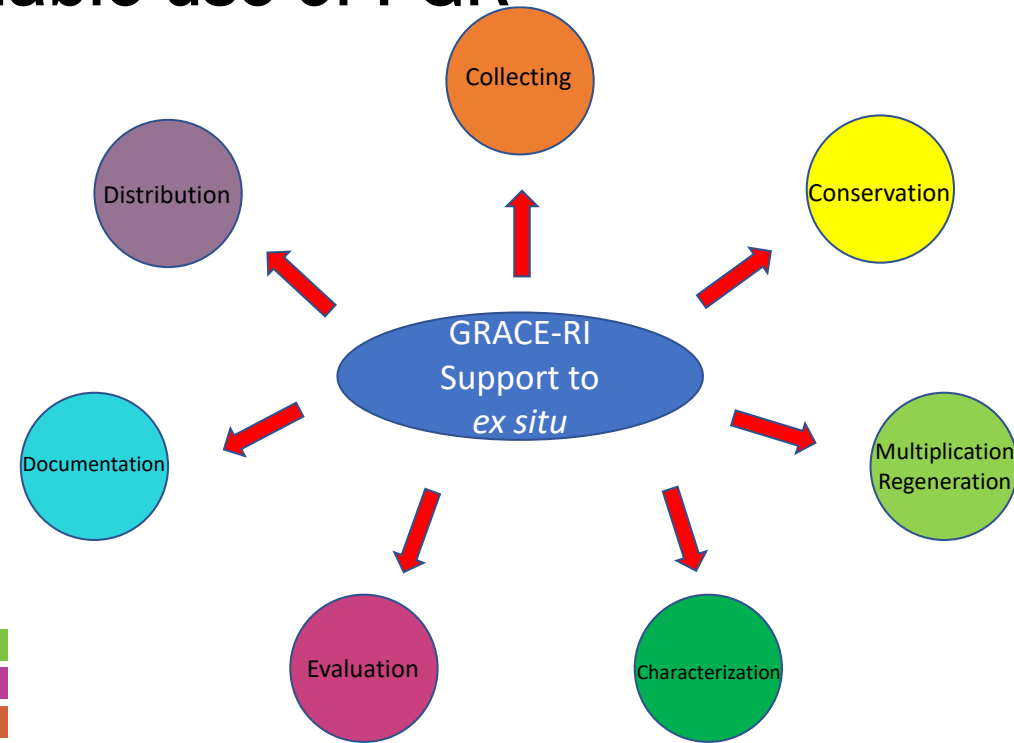
# Synergies with other ESFRIs & Conclusion

## 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**



# THANK YOU

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