



**EVA**  
European Evaluation Network



# MAIZE GENETIC RESOURCES IN MRIZP

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# About the Institute

The Maize Research Institute Zemun Polje (**MRIZP**) is the leading public institution in the Republic of Serbia, dedicated to research, innovation, and the development of high-yielding and high-quality maize hybrids, soybean cultivars, and small grain varieties tailored to diverse agro-ecological environments and user demands. The main objectives are:

- to create programs for plant breeding, seed production, cultivation, use, and market placement of cultivars, varieties, and hybrids
- to develop technological methods and processing procedures for the production of food and feed as well as for industrial purposes, both at the national and international levels.

With expertise in agronomy, genetics, food technology, biology, phytopathology, and chemistry, the MRIZP employs 48 PhD researchers across two sectors: Research and Development and Seed Production. This expertise intensively supports the primary MRIZP activity—cereal breeding in the development of climate-smart crops and high-quality grain varieties.



# Ongoing EU projects within the MRIZP



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- **CREDIT Vibes - Horizont 2020-TWINNING GREEN-EDITING VIBES FOR FØØD** (Developing a **scientific roadmap** for nutribreeding, innovative agro-technologies and high-quality nutriproducts; Developing a **technology roadmap** focusing on translating scientific excellence production into new approaches, services and consulting; To significantly **boost productivity** by enhancing workflow efficiency).
- **AGrOecOlogy for weeDs - GOOD - Horizont 2020** (The reduction of herbicide use and risk has become major policy targets of Farm to Fork strategy, aiming to promote agroecology and the transition to sustainable and resilient farming systems. The main ambition is to foster the agroecological transition for weed management across Europe. Living-Labs (LL) will be established in 6 EU pedoclimatic conditions in both annual and perennial crops to promote practices in conventional, organic and mixed farming systems).
- **MYMATCH - Mycotoxin management (AI) platform to face CC impact on food safety and human health - Horizont 2020**. The aims: Predict and mitigate risks associated with fungi and mycotoxin occurrence; Assess mycotoxin exposure in humans (considering different diets) and animals; Implement effective risk management measures.
- **PHENO\_MaizE - High-throughput field phenotyping in temperate maize hybrid breeding: how can phenomics improve speed and accuracy of selection? National project**. PHENO\_MaizE goal is to investigate the use of drone-based HTFP in temperate hybrid maize breeding programs. The project will enable us to evaluate digital traits for their use instead of manual measurements, develop prediction models for the traits of interest using image-derived variables and field images *per se*, and, finally, select the most informative variables and flights during the season.





# Identification of new sources in gene bank



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- **Identification of drought tolerant sources in maize gene bank** (TR 20014), Ministry of Education, Science and Technological development, Republic of Serbia, 2008–2011
- **Exploitation of maize diversity to improve grain quality and drought tolerance** (TR 31028), Ministry of Education, Science and Technological development, Republic of Serbia, 2011–2019
- **Centre of Excellence for Biodiversity and Molecular Plant Breeding** (CoE CroP-BioDiv), (KK.01.1.1.01.0005), Republic of Croatia, 2018–2023
- **Harmonization of methods for phenotyping, genotyping and management of genetic resources in maize** (337-00-205/2019-09/30), Bilateral Project with Republic of Croatia, 2019–2020
- **Evaluation network**, ECPGR – European Cooperative Programme for Plant Genetic resources (2019–2024)
- **MAize LAndraces traits phenomic prediction using Near InfraRed Spectra (MALANIRS)** (2024–2028)



# MRIZP's maize collection



## The largest maize collections

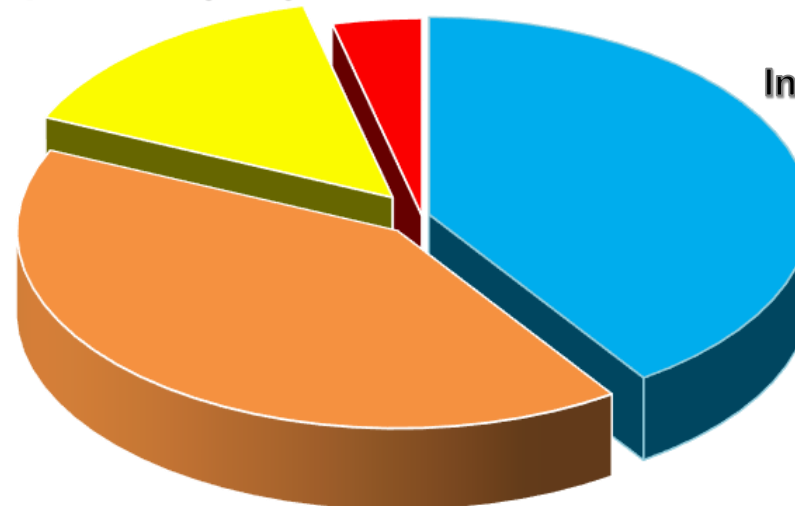
▪ Ukraine	9050
▪ Romania	6813
▪ Portugal	5942
▪ <b>Serbia-MRIZP</b>	<b>5806</b>
▪ Italy	5640
▪ Bulgaria	4824
▪ Spain	3035
▪ Hungary	2907
▪ Germany	1408
▪ Poland	1102

1 335 heterozygous accessions

Introduced populations (24%)

Composites, synthetics (9%)

Introduced inbred lines (67%)  
2 254 homozygous  
accessions



Local landraces (2 217 genotypes)

# Expectations from EVA Maize/Malanirs



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MALANIRS – the exciting opportunity for advancing the understanding and utilization of maize landraces

## Expectations to address:

### ➤ Genetic Material

Genetic diversity – expectation that the maize landraces will exhibit a wide range of genetic diversity necessary for their studies on abiotic stress tolerance traits, grain quality traits, and adaptation to local agricultural practices

Availability of accessions – The MRIZP will provide 150 new landraces (66 from SRB; 70 from BIH; 6 from MKD and 8 from SVN) to enhance genetic material needed for phenotyping and genomic studies

### ➤ Traits

Abiotic and Biotic Stress Tolerance – expectation that many landraces will harbour alleles associated with increased tolerance to stresses such as drought, heat, and nitrogen deficiency

Kernel Composition – expectation to utilize the landraces to investigate traits linked to kernel composition such as starch, oil, and protein content, which are essential for both human and animal consumption

Agronomic Performance – expectation that selected landraces will highlight traits that can be advantageous for improving future breeding programs, although initially they may not outperform elite germplasm

### ➤ Conditions of Operation

The MRIZP will perform field evaluation under different irrigation regimes to assess landraces' performance and adaptability



ECP/GR

# Constraints from EVA Maize/Malanirs

## Possible constraints to address:

### ➤ Genetic Material

High genetic heterogeneity – challenge to consistently identify beneficial traits for breeding  
Limited availability of characterized accessions at the molecular level

### ➤ Traits

Limited agronomic performance compared to modern elite varieties – deterring immediate utilization for commercial breeding

Variability in trait expression under different conditions may complicate the establishment of reliable phenomic and genomic prediction models

## Conditions of Operation:

Technical and Methodological Challenges: The success of high-throughput technologies for phenotyping (e.g., NIR) hinges on proper calibration and technological infrastructure availability, which might not be consistent across all collaborating institutions.

- The MRIZP has Infraneo NIR Grain Analyser (Chopin Technologies, France), but the performance of the device is such that it cannot analyze maize seeds with red and blue pericarp
- As public scientific and breeding institution, MRIZP expresses great interest in intensifying collaboration in exchange and characterization of genetic material with the other public and private institutions