

# Improving adaptability and resilience of perennial ryegrass for safe and sustainable food systems through CRISPR-Cas9 technology - EditGrass4Food

Project consortium meeting, 30.-31. March 2023

**“EditGrass4Food”, ID No EEA-RESEARCH-64, Contract No EEZ/BPP/VIAA/2021/4  
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# Project goals and current progress



## EEA-RESEARCH-64

**Aim of the project is to utilize transcriptomics and functional genomics to increase sustainability in agriculture through improvement of perennial ryegrass with better adaptation to frost and drought for current and future climates.**

1. Establish a diverse perennial ryegrass core association panel by utilization of data from ongoing projects (WP1),
2. Screen the association panel in order to detect haplotype-resolved single-nucleotide variants and structural variation in the targeted genes/alleles for freezing and drought genes (WP1),
3. Identify novel genes and characterize drought and freezing tolerance genes by comparing their expression for pathway related genes in non-edited and mutant plants (WP2),
4. Develop CRISPR-Cas9 constructs and generate CRISPR-edited perennial ryegrass mutants for freezing and mild drought tolerance (WP3),
5. Validate and characterize the role of the genes and their sequence variations in the freezing and drought mechanisms (WP4).

# WPs



- WP1. Establishment and screening of perennial ryegrass association panel for freezing and drought related traits. Coordinator: NMBU; Involved partners: NMBU, LAMMC
- WP2. Transcriptome regulation of freezing and drought tolerance in perennial ryegrass. Coordinator: NMBU; Involved partners: NMBU, LAMMC
- WP3. Functional characterization of frost and drought candidate genes in perennial ryegrass by CRISPR-Cas9. Coordinator: TalTech; Involved partners: LU, NMBU
- WP4. Validation of improved freezing and water shortage tolerance. Coordinator: LAMMC; Involved partners: TalTech, NMBU, LU
- WP5. Management and coordination of research activities and dissemination of results. Coordinator: LU; Involved partners: TalTech, NMBU, LAMMC

# Deliverables



- Publications
  - 4 papers and 1 book chapter (open access)
- Project meetings:
  - kick-off meeting (2021, Latvia), annual meeting (2022 in Estonia), **workshop (2023, Latvia)**, workshop (2023, Lithuania), final conference (2024, Latvia)
- Scientific achievements
  - association mapping panel, transcriptome sequences, 10 gene edited plants assessed for drought or freezing tolerance, 4 PhD students
- Joint application for Horizon Europe funding
- Project semi-/annual reports

# Gantt chart (updated November 2022)

# Project updates

- Request for additional funding 30,000 EUR approved in February, 2023
- Serguei Kouchnir's employment May 1 – December 31 (8 month)
- Latvian Council of Science call 2023 (deadline May 15)
- EUCARPIA Fodder Crops and Amenity Grasses Section, September 10 – 14, Brno, Czech Republic. Early bird registration deadline – March 31, abstract deadline – April 30
- Horizon Europe (or similar) project call

## Current progress of project activities – WP3

- To be provided by Anete



# Current progress of project activities – WP4



## EEA-RESEARCH-64

Validation of improved freezing and water shortage tolerance (Coordinator: LAMMC; Involved partners: TalTech, NMBU, LU)

- WP4 is scheduled to start in 2023, when genome edited plant are obtained



# Current progress of project activities – WP5



## EEA-RESEARCH-64

Management and coordination of research activities and dissemination of results (Coordinator: LU; Involved partners: TalTech, NMBU, LAMMC)

- Implementation of WP5 continues throughout the project duration
- Project kick-off meeting in Riga (public event, October 2021), steering committee meeting, regular scientific meeting between partners, next project meeting – end of October 27 – 28 2022 in Tallinn
- Project website <https://www.editgrass4food.lu.lv/en/>, Twitter - @foodedit, ResearchGate
- Interview for the Norwegian TV (Odd Arne Rognli)
- Publications – book chapter in 34th Meeting of the EUCARPIA Fodder Crops and Amenity Grasses (LAMMC only)
- Publications – review article in progress for IJMS (to be submitted late 2022)
- Conferences:
  - 2<sup>nd</sup> PlantEd Conference (COST Action CA18111) in Lecce, Italy, 20-22 September 2021 (Cecilia Sarmiento)
  - Mendel Early career symposium in Viena, Austria May 2022 (Ferez Sustek)
  - 100th Anniversary of Plant Breeding in Lithuania conference in Akademija, Lithuania, 8 – 9 June (Nils Rostoks)
  - FEBS3+ conference in Tallinn, Estonia 15 – 17 June 2022 (Nils Rostoks)
  - 3<sup>rd</sup> PlantEd Conference (COST Action CA18111) in Dusseldorf, Germany, 5 – 7 September 2022 (Cecilia Sarmiento)

# Acknowledgements

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