# Improving perennial ryegrass adaptability and resilience

## Summary

*The aim of the project is to improve adaptability and resilience of perennial ryegrass for safe and sustainable food systems through CRISPR-Cas9 technology. Genes involved in the mechanisms of freezing tolerance and biomass growth under water deficit will be investigated and targeted via gene editing.*

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| Research field: | Chemistry and biotechnology |
| Supervisors: | Dr. Maria Cecilia Sarmiento Guerin |
| | Merike Sõmera |
| Availability: | This position is available. |
| Offered by: | School of Science |
| | Department of Chemistry and Biotechnology |
| Application deadline: | Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich) |

## Description

"EditGrass4Food" is a EEZ-NOR project that will start in May 2021 and lasts three years. It is coordinated by the University of Latvia and the partners are: Norwegian University of Life Sciences, Lithuanian Research Centre for Agriculture and Forestry and Tallinn University of Technology.

Perennial ryegrass (Lolium perenne) is the dominant forage grass species in Europe due to its high regrowth capacity, rapid establishment, tolerance to frequent cutting and grazing, and high nutritive value for ruminant livestock. However, perennial ryegrass exhibits poor performance under unfavourable environmental conditions, thus the changing climate poses a substantial challenge to ryegrass cultivation in the Baltic/Nordic region. In this project, we intend to utilize unique pre-breeding material, developed by the members of our consortium and CRISPR-based editing to validate candidate genes involved in northern adaptation of perennial ryegrass. We will investigate changes during abiotic stress periods at the transcriptome level to reveal gene regulatory pathways. Improving perennial ryegrass for winter hardiness, persistence and biomass formation under water limited conditions will help breeders in the Nordic/Baltic region to prepare for meeting new demands due to climate change.

The goal of this PhD project is to contribute to the "EditGrass4Food" consortium specifically targeting candidate genes for freezing and drought related traits using CRISPR/Cas9 technology. Protocols for selecting edited embryogenic callus cultures without marker genes will be developed. Regeneration protocols from embryogenic calli will be optimized for selected perennial ryegrass genotypes. Finally, freezing and water shortage experiments for validation of improved adaptability to unfavourable conditions will be conducted.

**Applicants should fulfil the following requirements:**

The applicant must have a masters in science degree (MSc) in a field related to molecular biology. At least some experience in plant sciences is required. Previous knowledge in CRISPR/Cas9 and plant tissue culture techniques will be favoured. The applicant must be a highly motivated and proactive individual, who speaks English fluently and has good writing skills. The future PhD student should be willing to cooperate in a team and be ready to spend some time in another country on scientific missions.

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