

InterRest

Interactive effects of local and landscape scale restoration of semi-natural grasslands and agricultural fields on species interactions and ecosystem functions in different social-ecological systems

DURATION
1/05/2022 – 30/06/2025

BUDGET
146 321 €

PROJECT DESCRIPTION

Biodiversity in Europe is closely linked to cultural landscapes and agriculture has traditionally led to a high biodiversity by establishing a small-scale mosaic of different extensively managed land use types. However, agricultural intensification has led to landscape simplification and biotic homogenization. To recover extensively used species-rich habitats, tailored and collaborative restoration efforts are needed. One particularly important habitat are calcareous grasslands, which resulted from extensive grazing and mowing regimes and are present in many European countries. They are characterized by plant and animal communities specially adapted to dry and nutrient poor soil conditions. Calcareous grasslands are one of the most species-rich habitats in Europe and offer many niches for endangered species, including plants, insects and birds. Nowadays, calcareous grasslands mostly occur as fragmented remnants left within intensively used agricultural landscapes and these fragments are further degraded through ongoing land use intensification or abandonment. In particular, the loss of traditional agropastoral practices is leading to shrub and tree encroachment resulting in the homogenization of microhabitat-microorganism-plant-animal interactions and a loss of ecosystem functions.

The major aim of InterRest is to investigate species interactions across trophic levels, including plant-soil, plant-pollinator and bird-food resource interactions, in restored and degraded calcareous grasslands that are embedded in different socio-ecological and landscape contexts in three countries (Germany, Spain and Estonia). More specifically, InterRest will address the following questions:

1. Do local restoration measures of calcareous grasslands enhance the functional diversity, complexity and stability of biotic interactions and ecosystem functions across multiple trophic levels?
 2. Can AES increase habitat connectivity between fragmented grasslands and thus create synergistic or additive effects of local and landscape restoration resulting in higher functional diversity, complexity and stability of biotic interactions and stable ecosystem functions across multiple trophic levels?
 3. How is the resource use of species altered by local and landscape restoration and which crops and crop pests are collected/consumed by species on calcareous grasslands indicating ecosystem service/disservice provision?
 4. What are the interlinkages between functional diversity, network stability and complexity and ecosystem functions? Do additive or synergistic effects of local and landscape restoration lead to enhanced ecosystem multifunctionality or are there trade-offs between different functions (soil- and plant-related functions, pollination functions and predation functions)?
 5. Which are the central nodes in metanetworks across different trophic levels, do they differ between restored and degraded calcareous grasslands and which sites/interactions should be prioritized for restoration measures?
- How do social-ecological contexts differ across study regions and which are the main characteristics of social-ecological networks that determine the ecological and social outcomes of local and landscape-scale restoration?



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To investigate species interactions across different trophic levels in restored and degraded grasslands, biodiversity and species interactions have been sampled by vegetation surveys, metabarcoding of soils, bird surveys, arthropod sampling by pitfall traps and sweep netting, bird faeces sampling, transect walks for bees and pollen collection. It is hypothesised that local restoration measures will lead to more complex and stable interactions and improved ecosystem functions compared to degraded sites. Moreover, the project will investigate whether landscape-scale restoration with agri-environment schemes can improve local restoration through additive or synergistic effects. Finally, investigations of a range of social factors that enhance or suppress stakeholders' willingness and capacities to accomplish local and landscape restoration will be conducted. Several stakeholders, such as farmers, nature conservation organisations, land managers and local conservation authorities, are responsible for the restoration of the calcareous grasslands. Based on stakeholder interviews and ecological data, InterRest will develop social-ecological networks to better understand human-nature interdependencies. To synthesize the results of this project, we will use metanetwork and multifunctional approaches to identify conservation priorities and possible trade-offs.

Regarding EU policy goals, our project will inform the EU Biodiversity Strategy for 2030 and the Habitat Directive on the success of restoration measures not only on species richness, but also on species interactions, their stability and functions provided. We will identify possible trade-offs and priority sites/interactions (metanetworks) to efficiently implement future restoration measures. In addition, the project partners have close contacts to many stakeholders, including farmers, local nature conservation authorities, NGOs, local businesses, and regional, national and international policy makers. Working with these stakeholders will be used for dissemination, outreach, and to identify key challenges of conservation and restoration as well as to analyse social structures and interdependencies and their linkages to the ecological outcomes of restoration activities.

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LINKS

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