

Potential MSc topics, NIBIO, Særheim Research Centre.

Under our supervision, there are possibilities to develop small research projects on specific aspects of basic and applied plant ecology topics as listed below. Related topics are also welcome. The student will be involved in the whole process from planning, through execution, data handling and statistical analysis to a draft manuscript. In addition to knowledge of the biological processes, the student will develop skills in experimental design, data management, statistical analyses and good standards for research. To benefit from this opportunity a high motivation is required. Housing is available on location. 1-3 positions available.

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Location: Nibio Særheim research centre, Klepp, Jæren.

Period: from autumn 2018

Restoration ecology – establishment from seeds

Plant recruitment from seeds is central in population dynamics, but is often constrained by low soil moisture. Plants strategies to cope with this and especially fluctuating conditions are not well understood, but have implications for a range of applied aspects as vegetation establishment in restoration projects. There are possibilities to develop a research project on specific aspects of plant strategies for germination and seedling growth under variable soil moisture. Approaches are experimental, and depending on the motivation of the student, they can include comparative approaches based on phylogenetic relationships, ecophysiological responses, root growth dynamics and the impact of multiple covarying factors.

Abiotic constraints on the initiation and growth of the secondary root system in grasses

Grass seedlings first develop a primary root system that provide water in this early phase. This root system is later replaced by a secondary root system with higher water transport capacity that develops from the tiller bases that enable the shoots to grow larger. We have found that the initiation of the secondary root system is strongly constrained by drought, and studies on the impact of abiotic conditions on this transition are few. These simple systems open for short experiments, a wide range of environmental conditions and inclusion of phylogenetic approaches in the design to get a solid documentation.

Does leaf venation scale with root system characteristics?

Leaf vein network structure is an important aspect of the physiology, ecology and evolution of land plants, distributing water to different parts of the leaf. Venation is a plastic trait and responds to environmental conditions. Root traits are also highly plastic to provide water to the shoot under contrasting soil conditions. Thus, there is probably a relationship between

the ability to acquire water through roots and the capacity of the distribution system. This aspect has hardly been investigated and raises many questions related to the importance of plant development within individual, plastic between environments within species and fixed differences between species. These topics can be addressed in experiments under greenhouse conditions where growing conditions are manipulated and patterns of venation and root growth are quantified using image analysis. See the Cleared Leaf Image Database (<http://clearedleavesdb.org>) for examples of leaf venation patterns.

Recovery of non-succulent green roof vegetation after drought episodes

Green roofs are harsh environments, where the effects of drought, temperature extremes, radiation, air pollution and wind are amplified by the thin and porous substrates used. This impose a high risk of mortality for non-succulent vegetation on thin extensive roofs. However, to diversify green roof vegetation and provide more ecological functions and multiple ecosystem services we also need to include drought tolerant non-succulent vegetation. The problem with non-succulents is that they have a very limited ability to recover from desiccation, approaching a point of no return as drought intensifies. The project will establish ecophysiological methods to test and compare the desiccation tolerance and recovery of species and populations with a potential for use on green roofs.