DEEP FRONTIER

Challenging one last frontier: Understanding and improving deep rooting

Increased and sustainable resource exploitation by deep rooting

Background

As frequently emphasized, the increasing global population and wealth leave us with a huge challenge for producing enough food during the century ahead, with a projected increase in demand of about 70% by 2050. Any attempt to increase agricultural land into areas currently left to nature occur at severe environmental costs, and many developed countries, including Denmark, strive to increase the proportion of land in nature.

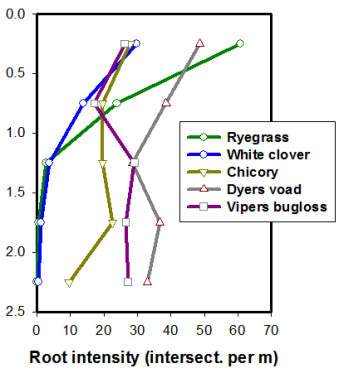
As we cannot increase the agricultural area, production has to increase through increased efficiency and intensification of production. The intensification needed to handle this situation will require high resource input, and will cause further environmental problems and increase the use of limited resources.

Increased exploitation of subsoil resources by crops is one of the ways whereby we can increase food production in a sustainable way.

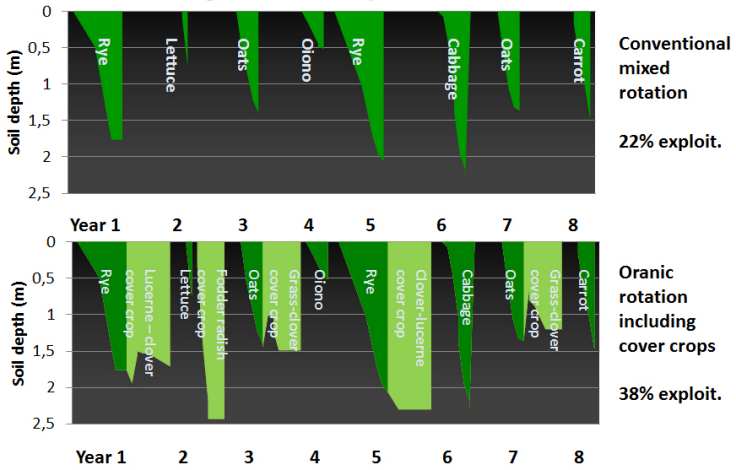
Purpose

The overall aim in Deep Frontier is to increase the exploitation of the subsoil resources by deep roots in order to enhance food production in a sustainable way. The results will also contribute to climate change mitigation and improved soil iodiversity through the increased organic matter input to the soil, especially to deep soil layers.

Exploiting biodiversity:
- new species as cover crops



Root exploitation dynamics of organic crop rotation



New

The expectation is that the project will be able to develop results, methods and ideas for the development of sustainable agricultural systems for the future, through increased exploitation of resources from deep soil layers, and to contribute to further research and development in this direction.
Deep rooting will contribute to development of systems which need less resource input in terms of plant nutrients and irrigation water, loose less plant nutrients to the environ ment, give higher productivity and higher production stability, as resource availability from deeper soil layers is less affected by short term variability e.g. in water supply, give stronger climate change mitigation through increased storage of carbon in the subsoil.

Project period:
01-09-2014 til 31-08-2019

Projekt partners:

- University of Copenhagen
- University of Aarhus
- ICROFS

Objectives

- Increase our understanding of how deep rooting can be achieved, and to identify deep rooted species and cropping systems with significant root activity between 2 and 4m.
- Develop unique facilities for deep root research for this project, for inspiration and for attracting cooperation with other scientists, - also after the project period.
- Develop and test new methods for studying root growth and resource uptake (water and different plant nutrients) from deep soil layers (1 to 5m depth).
- Quantify potential use of resources from the deep soil layers by different species and cropping systems and assess the potential environmental improvements in terms of nutrient cycling.
- Study the effect of deeper and more permanent rooting on soil C storage, and develop DNA based methods for understanding root interaction with soil biology in deep soil during growth and subsequent decomposition.
- Create and communicate a compelling and accessible narrative on the biological and environmental value of deep root growth.

The project group January 2015

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ICROFS
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