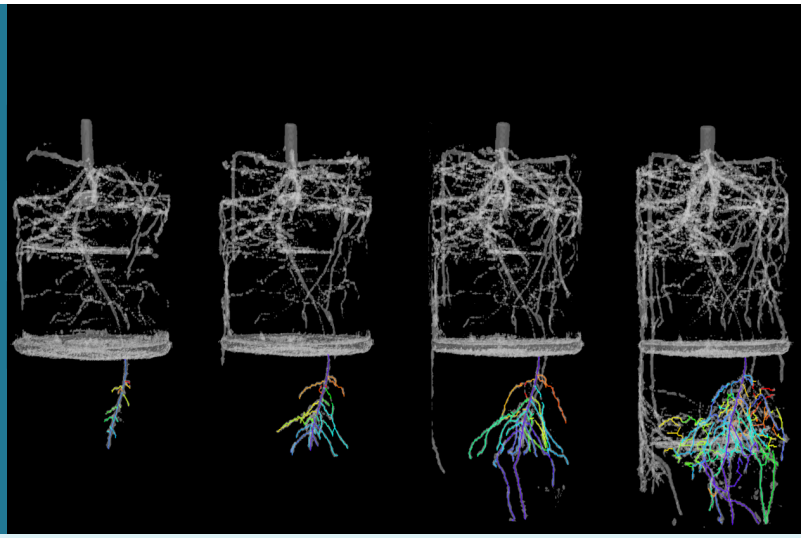
FICHE PROJET

www.list.lu/fr/recherche/projet/forfus-rt11/?no_cache=1&cHash=44d7852a094ba0115a7fd02218c6d705

FORFUS-RT1.1

Postdoc project on root-soil interactions, part of the "Forest function under stress" doctoral training unit (FORFUS)



Inspiration

Soil compaction in forests can have severe consequences for the functioning of ecosystems, in terms of seedling establishment, root growth and overall plant development. Compaction also reduces soil porosity, affecting oxygen, water and nutrient availability to plants and microorganisms. There is limited understanding of carbon investment into the root system with different levels of soil compaction and the associated benefits in terms of root access to water and nutrients. These cost-benefit trade-offs are fundamental for plant performance and the soil carbon balance.

Innovation

The objectives of FORFUS-RT1.1 are to determine how soil compaction (1) alters below-ground carbon allocation and the uptake of water and nutrients, (2) affects utilization of nutrient pools in the litter and the regolith layers in forest soils, and (3) impacts symbiosis with arbuscular mycorrhiza, an important contributor to nutrient uptake in trees.

We will set up a series of controlled experiments with young trees of different species that have been adapted to different climates and grown in soil columns divided into layers equipped with openings for water injections and extractions. Sensor foils are available to observe the CO2, O2 and pH dynamics deriving from root and mycorrhiza activity and from root exudation. Shoot gas exchange and soil respiration rates can be monitored continuously in 15 growth chambers. Isotope tracer techniques are available to track sources of nutrients (e.g. litter vs. regolith). Imaging techniques are available to record root growth dynamics and 2D fields of CO2, O2 and pH along an inclined transparent surface.

Impact

The scientific knowledge generated in this project will help us to better understand how much carbon plants need to invest below-ground under different environmental conditions in order to extract the water and nutrients they need for their growth and survival. This knowledge will help build more powerful and robust vegetation models and better understand the environmental costs of soil degradation (e.g. by compaction).

Partenaires

Administration de la nature et des forêts (LU) , BOKU (AT) , Center for International Climate Research , Groupement des Sylviculteurs a.s.b.l (LU) , INRAE (FR) , Luxembourg Institute of Socio-Economic Research (LU) , Musée national d'histoire naturelle Luxembourg , National Institute of Statistics and Economic Studies (LU) , Sapienza University Rome (IT) , Swedish University of Agricultural Sciences (SWE) , Delft University of Technology (NL) , Ville de Luxembourg , The National Institute for Public Health and the Environment (NL) , Université Catholique de Louvain (BE) , University of Naples (IT) , University of Agriculture Krakow (PL) , University Göttingen (DE) , University of Tartu (EE) , University of Trier (DE) , University of Edinburgh (UK)

Support financier

Fonds National de la Recherche Luxembourg , Luxembourg Institute of Science and Technology

Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
tél : +352 275 888 - 1 | LIST.lu

Christophe HISSLER (christophe.hissler@list.lu)
Stanislaus SCHYMANSKI
(stanislaus.schymanski@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST