# Soil microbial activity in deep soil profiles

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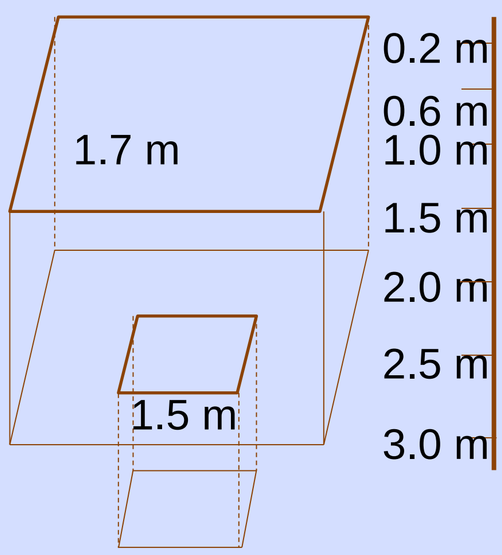
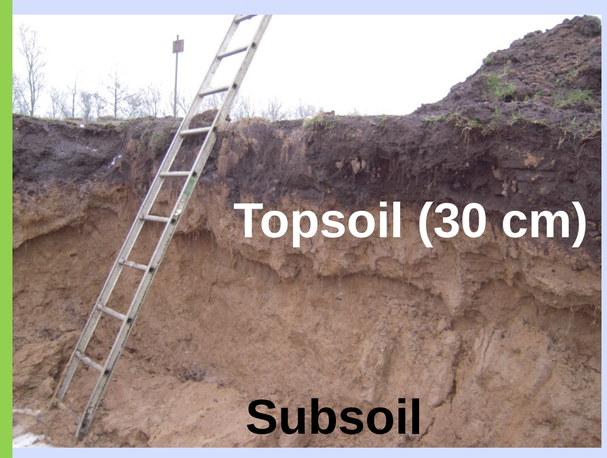
## INTRODUCTION

- Deep mineral subsoils (>100 cm) generally have a low concentration of soil organic carbon (SOC), but due to their immense volume, subsoils hold the majority of the global SOC pool. Hence, subsoils play an important role in C sequestration, which may counteract atmospheric $CO_2$ increase.
- Microbial activity is the main cause of turn-over of C compounds in soil ecosystems. However, the quality of SOC in subsoils is usually poor and is limiting microbial activity. Input of fresh C material from deep root growth may stimulate microbial activity in subsoils and thereby also increase the decomposition of the low-quality subsoil SOC eventually leading to increased $CO_2$ emission.
- In the present study we test how root-derived C compounds are  turned over by microbial activity and to what extent there is a feedback on the subsoil SOC (enhanced decomposition). The first part presented here is a characterization of native microbial biomass and activity in a 3.2 m deep soil profile developed on a cultivated grassland.

## SOIL PROFILE SAMPLING



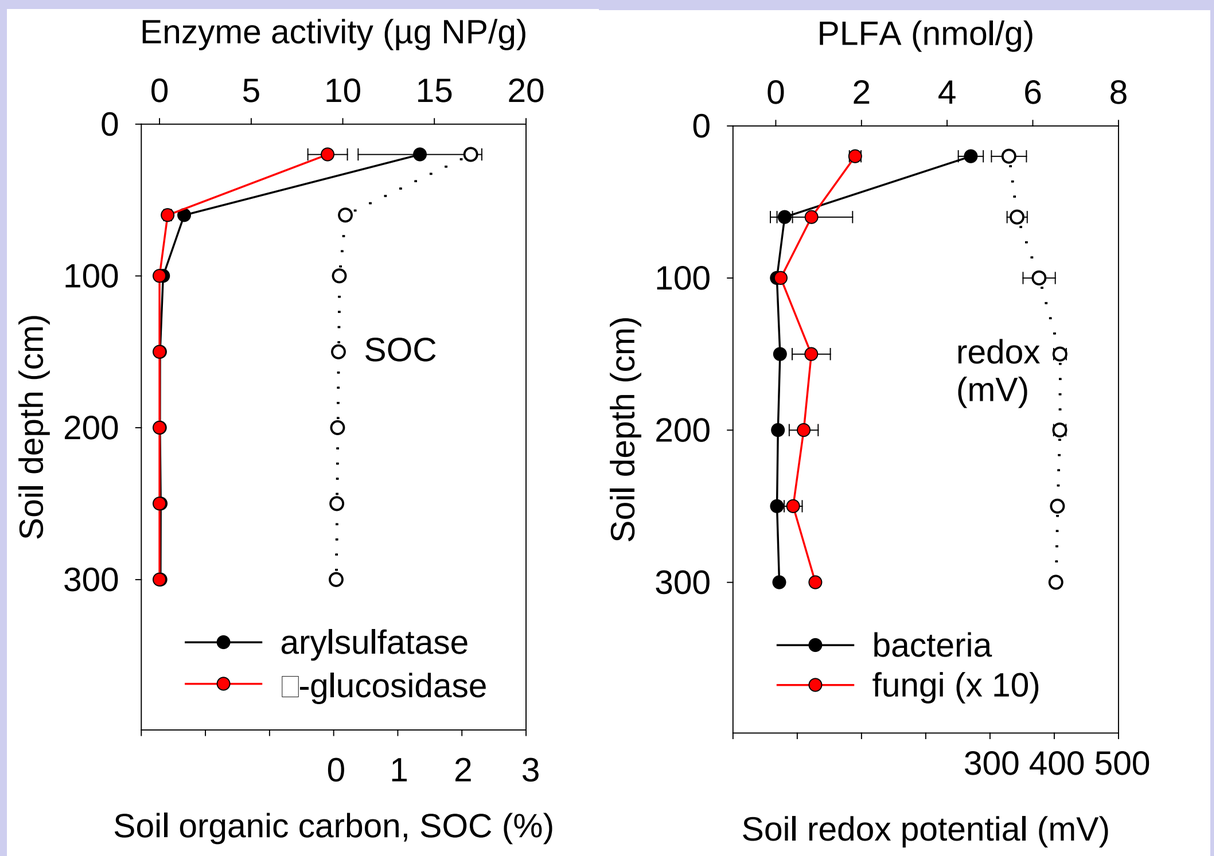




Soil was sampled at 7 depths from a 3.2 m deep soil profile at AU Foulum. SOC ranged from 2.1% in topsoil to 0.04% in subsoil.

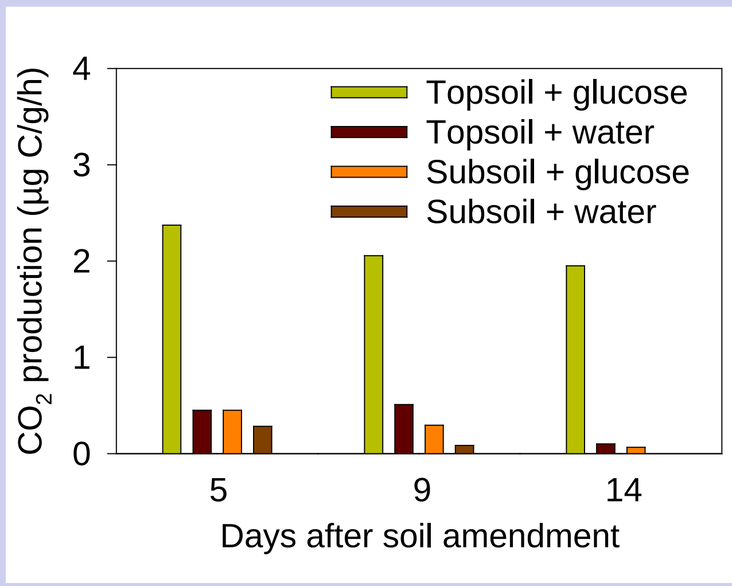
## MEASUREMENTS INCLUDE

- Soil texture, redox potential, pH, total C and total N
- Extracellular enzyme activity
- Microbial signature fatty acids (PLFA)
- Basal and substrate-induced respiration ($CO_2$)
- Molecular biomarkers

## RESULTS




Left: Enzymatic activities and SOC.
Right: PLFA biomarkers of bacteria and fungi, and soil redox potential. Fungal PLFA is multiplied by 10.




Microbial activity ($CO_2$ production) in topsoil and subsoil with or without added glucose (water as control). Respiration rates were measured 5, 9 and 14 days after the amendments.

Results show that microbial activity and indicators in the native subsoil are much lower than in topsoils. Incubation studies on stimulation of subsoil microbial activity by adding different root materials are ongoing.

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