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No favorable effect of reduced tillage on microbial communities in a silty loam soil (Belgium)

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Context

Microbial Richness

Microbial Community composition

Response?

Tillage System  **CT/RT**

Crop residue fate  **R+/R-**

Depth  **0-5/15-20 cm**

Objectives were to (1) determine **richness levels** and (2) changes in microbial **community composition** under different combinations of tillage system (conventional vs. reduced) and crop residue fate (residue removal vs. residues left), at two depths. Indicators taxa, i.e. the taxa most representative of a given set of soil conditions, were also identified (IndVal).

The experimental field is located in central **Belgium**, whose **loess-derived soils** are among the most fertile in the world and have long been used for intensive agriculture.

Method

(1) Soil **sampling** (*Winter wheat)*

(2) **DNA** extraction

(3) Massive sequencing using **454** technology

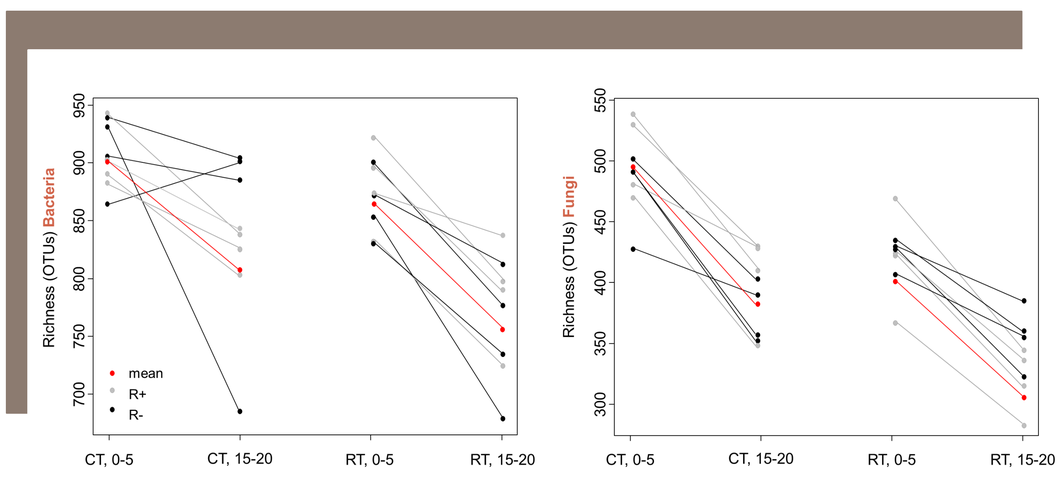
(4) Reads processing using the **mothur** pipeline

(5) Microbial **richness** (OTUs), **community compositon** (CAP, Bray-Curtis), and **indicator taxa** (IndVal) analysis

Results

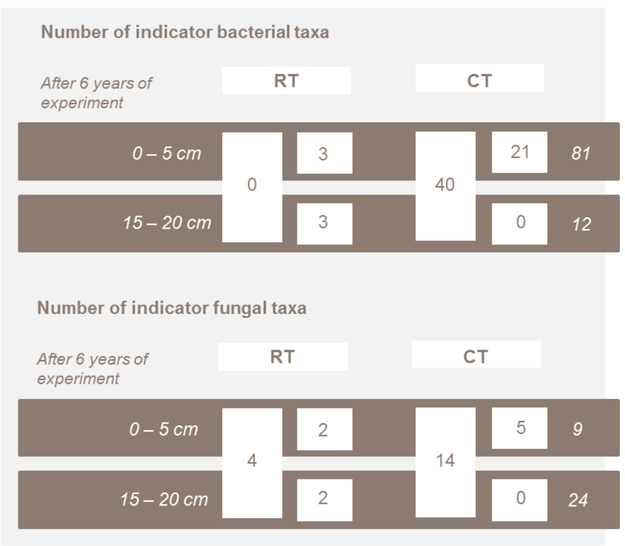
Microbial richness (OTUs)

Fig. 1



Indicator taxa (IndVal)

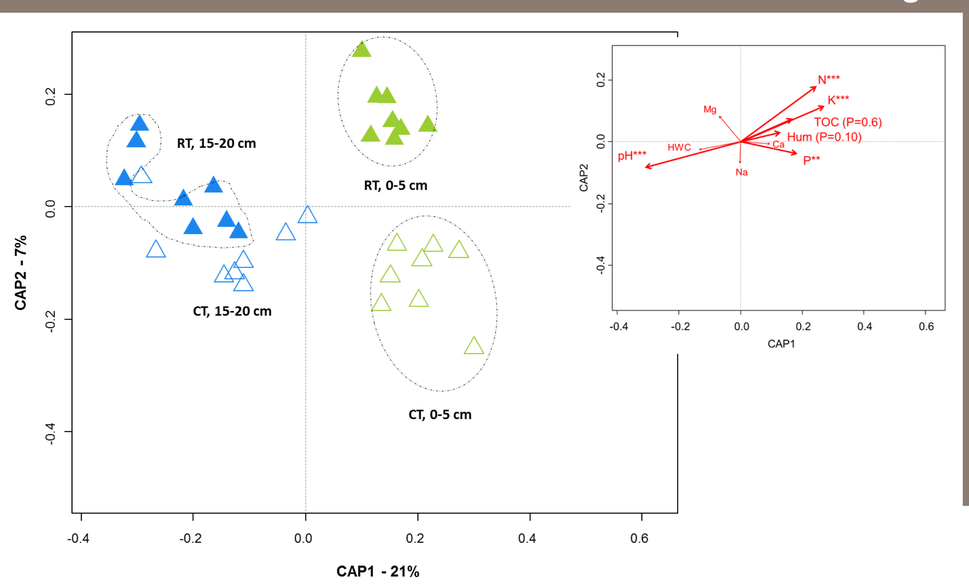
Fig. 4



Microbial community composition

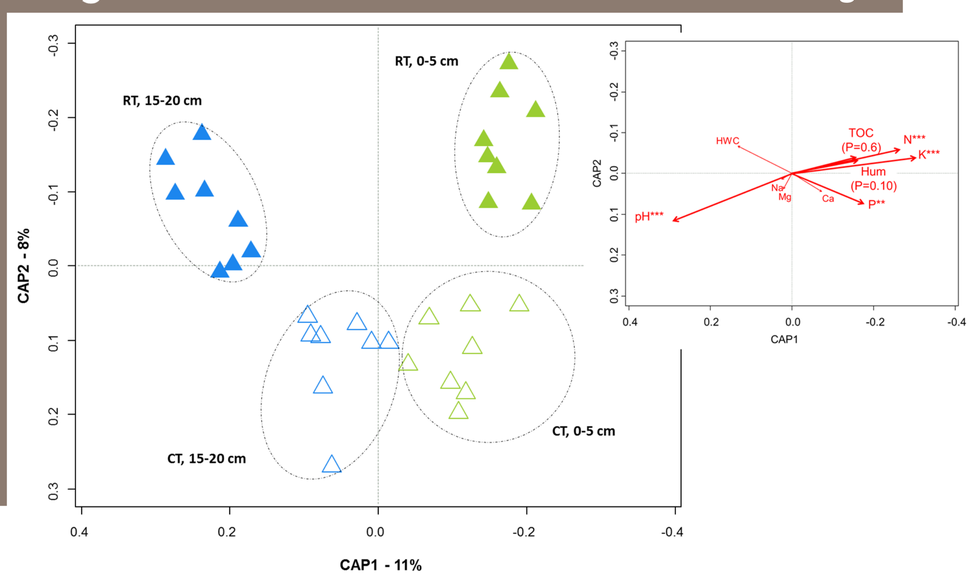
Bacteria

Fig. 2



Fungi

Fig. 3



Conclusion

After 6 years of conversion from Conventional to Reduced Tillage:

- For both bacteria and fungi, the richness appeared higher at 0 to 5 cm than at 15 to 20 cm, and surprisingly, higher under CT than under RT (**Fig. 1**). Crop residue fate had no influence on microbial richness.
- ***Depth*** emerged as the main factor responsible for variation in microbial diversity, ***tillage system*** ranked second, and finally, ***crop residue fate*** had no influence on microbial community composition (**Fig.2 and 3**).
- These differences are explained by changes in community composition due to **taxon loss rather than taxon replacement** (**Fig. 4**). The specific local set of environmental conditions (a loess-derived soil and an oceanic temperate climate) may explain these results. These observations raise the question: **does impoverishment in indicator taxa influence soil processes, and thus crop production?**

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