



The soil microbial community: a key player in nutrient management in agroecosystems



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Background

- **The high loss of nitrogen (N)** to the environment in agroecosystems is an important issue in nutrient management.
- **The challenge** is to increase soil N retention capacity, while maintaining profitable crop production rates.
- **Mixing mineral fertilizer with organic amendments** has the advantage of stimulating both crop production and N retention capacity.
- **Soil microbial community structure** plays a key role in decomposition processes and regulation of the N cycle.
- **Quality of the organic amendment** has a high impact on the soil microbial community structure, and determines to a large extent the success of the nutrient management strategy.

Objective: Assess how properties (C/N ratio; digestibility) of organic amendments affect microbial community structure and hence soil N cycling.

Experimental setup

Brussel sprouts were grown in a pot experiment. Soil was mixed with mineral and organic fertilizer (1:1). Shown results are 6 months after start of the experiment.



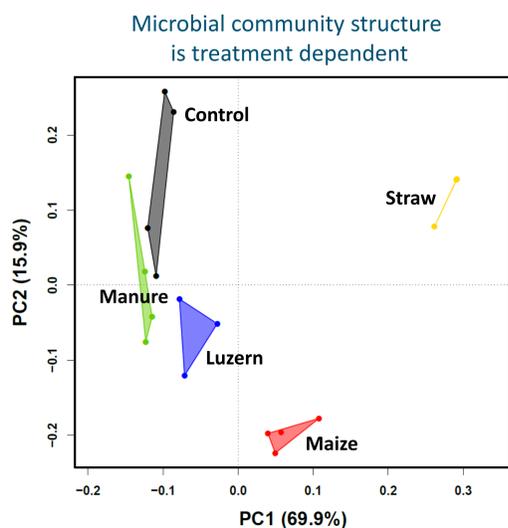
Soil microbial community analysis:
Phospholipid Fatty Acid (PLFA) analysis

5 treatments: 4 qualities of organic amendments + control

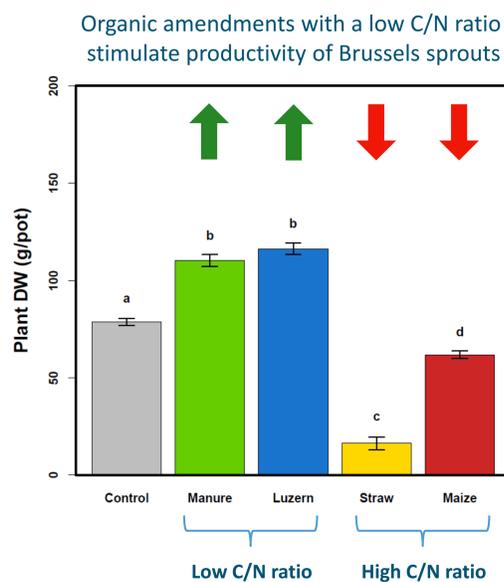
	Low C/N ratio	High C/N ratio	
Low digestibility	Manure	Straw	Control (only mineral fertilizer)
High digestibility	Lucerne silage	Maize silage	

Results

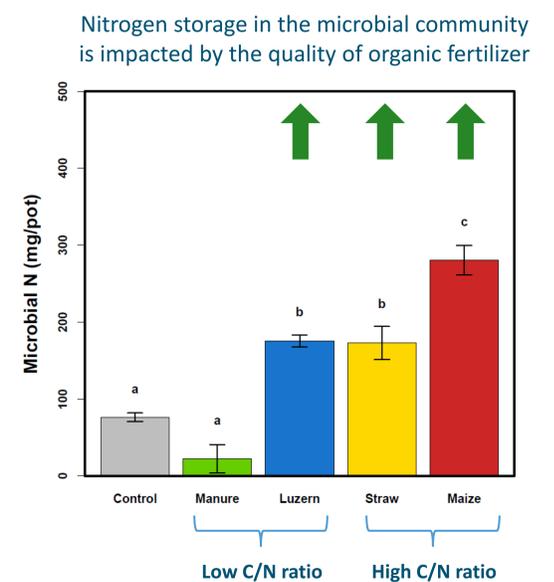
Soil Microbial Community



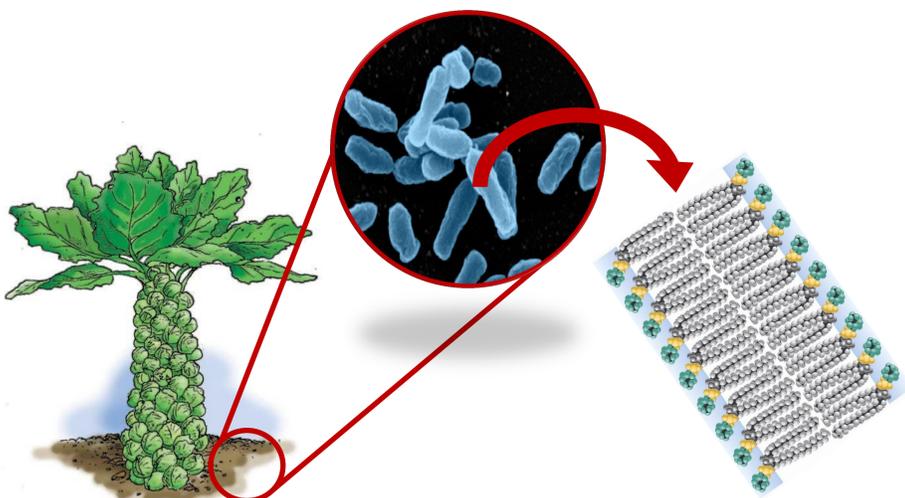
Crop production (yield)



Microbial N retention



Phospholipid Fatty Acids (PLFA)



References: Brussels Sprout www.grit.com; Soil bacteria - Courtesy the Research Center for Auditory and Vestibular Studies; PLFAs www.uic.edu

Conclusions

- The quality of organic amendments, added to the soil in combination with mineral fertilizer, affects soil community structure.
- Combining mineral fertilizers with low C/N ratio organic amendments **increases plant productivity** of Brussels sprout, compared to applying only mineral fertilizer.
- Combining mineral fertilizers with high C/N ratio and/or a high digestible organic amendments **increases the amount of nitrogen stored in the soil microbial community**.

This experiment shows that applying mineral fertilizer in combination with organic amendments changes soil microbial community structure. Those changes are translated into effects on plant productivity and nitrogen retention capacity, showing the important role of soil microbes in nutrient management.

