



The LifeWatch ERIC Biodiversity
& Ecosystem eScience Conference
PLOVDIV, BULGARIA 7-10 JULY 2026

Fertilisation type alters soil microbiome structure of sweet maize

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Introduction & Objectives

- Soil microbial communities drive fertility, nutrient cycling and agroecosystem resilience
- Sweet corn (*Zea mays* var. *saccharata*) yield and quality depend on a healthy rhizosphere microbiome
- Fertilization strategy – mineral, organic, combined or microbial – reshapes microbiome structure and activity
- **Objective:** evaluate how 5 agroecological practices affect the diversity, structure and functional potential of the sweet corn rhizosphere microbiome using 16S rRNA metagenomics

5

agroecological treatments

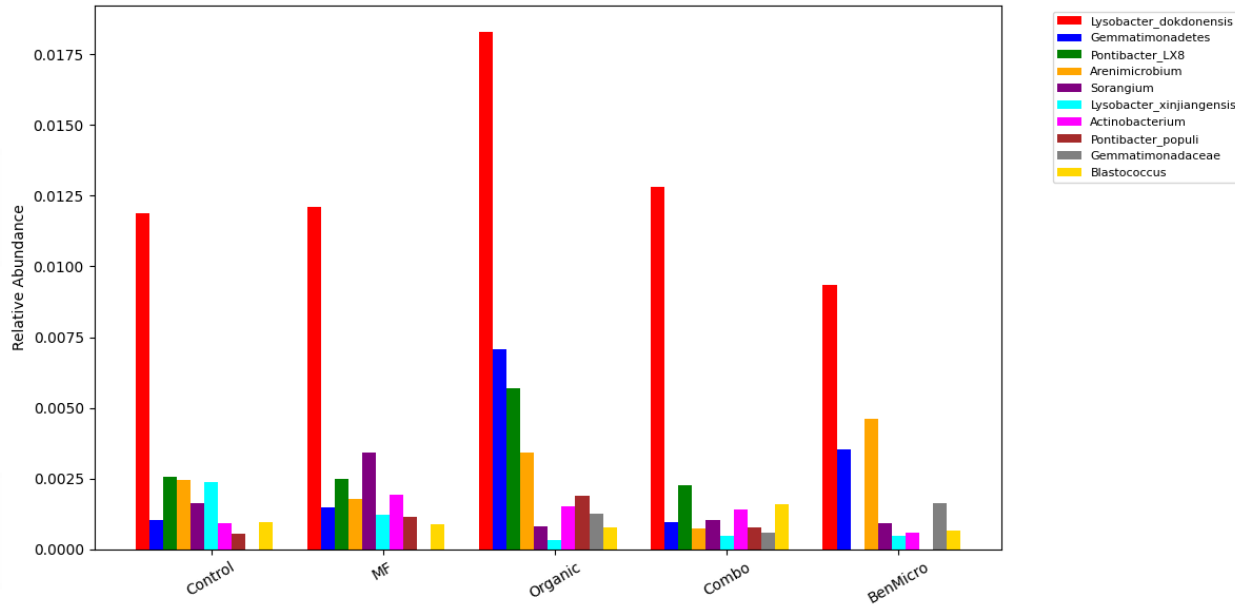
compared via 16S rRNA amplicon metagenomics

Five experimental treatments (rhizosphere soil, sweet corn)

Code	Treatment
Control.P	Untreated control
MF.P	Mineral fertilization
Organic.P	Organic fertilization
Combo.P	Combined mineral + organic
BenMicro.P	Beneficial microorganisms (biopreparation)

16S rRNA amplicon metagenomics

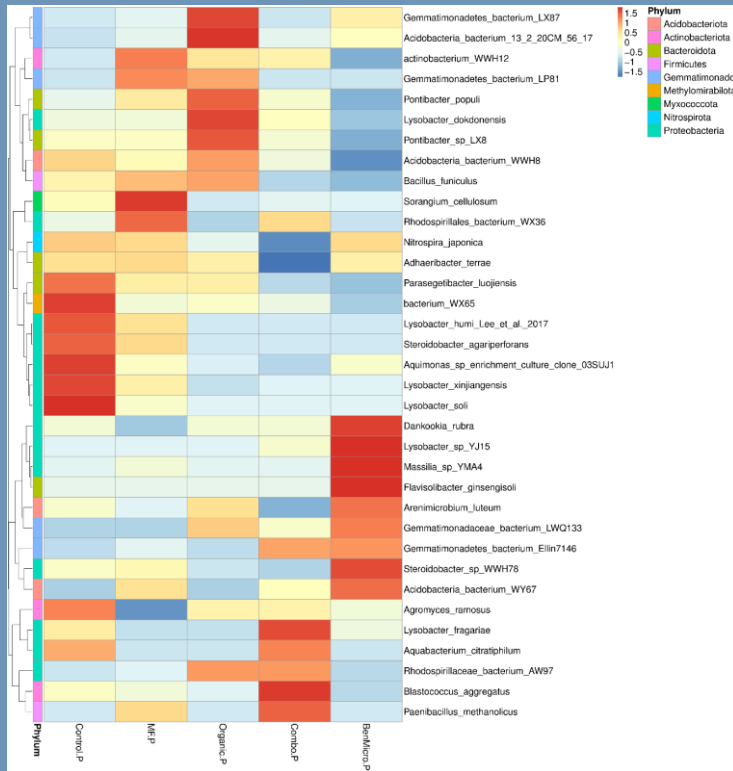
- High-throughput sequencing, quality filtering & chimera removal
- 62,459–79,121 raw reads/sample → 34,242–50,294 effective reads
- Q20 > 98.7%, Q30 > 95.5%, GC ~56% – uniform quality across samples
- α -/ β -diversity, taxonomic & functional profiling, PCA/PCoA (QIIME2; Bolyen et al., 2019)



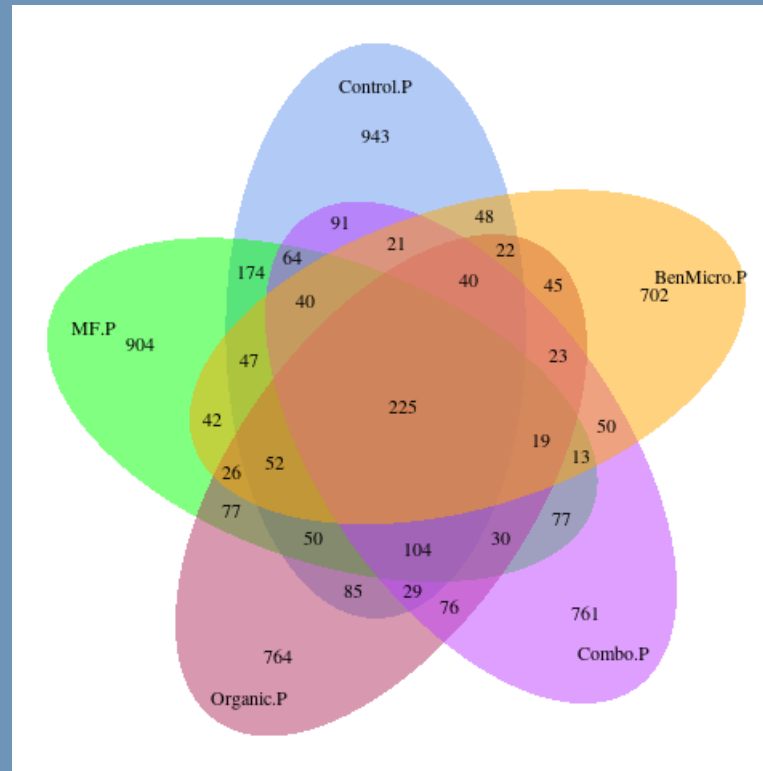
Relative abundance of bacterial communities across the five agroecological treatments

- **Proteobacteria, Actinobacteriota & Acidobacteriota** dominate every treatment
- Differences between variants are driven mainly by shifts in relative abundance, not by presence/absence
- *Lysobacter dokdonensis* – most abundant taxon overall, peaking under organic fertilization
- **Organic:** enriched in *Gemmatimonadetes bacterium*, *Pontibacter* sp.
- **BenMicro:** selective increase in *Arenimicrobium luteum* & Gemmatimonadaceae

Community Structure: Clustering & Shared Taxa



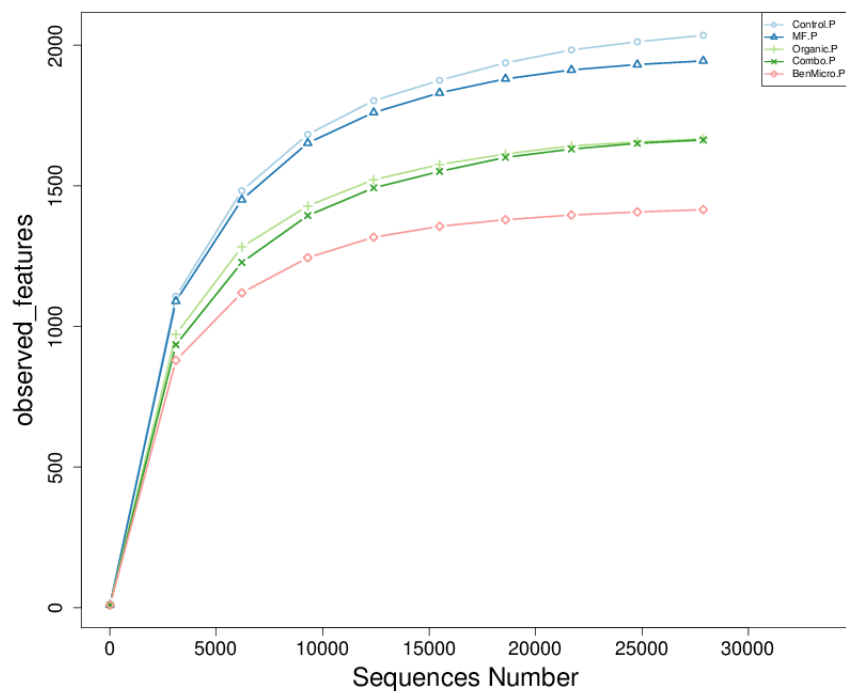
Heatmap of dominant taxa



Shared & unique taxa (Venn)

- **225 taxa** form a shared core microbiome across all treatments
- Control & MF hold the most unique taxa
- BenMicro has the fewest – the most selective shift
- Organic shows the broadest taxonomic enrichment in the heatmap

α -Diversity: Richness & Evenness

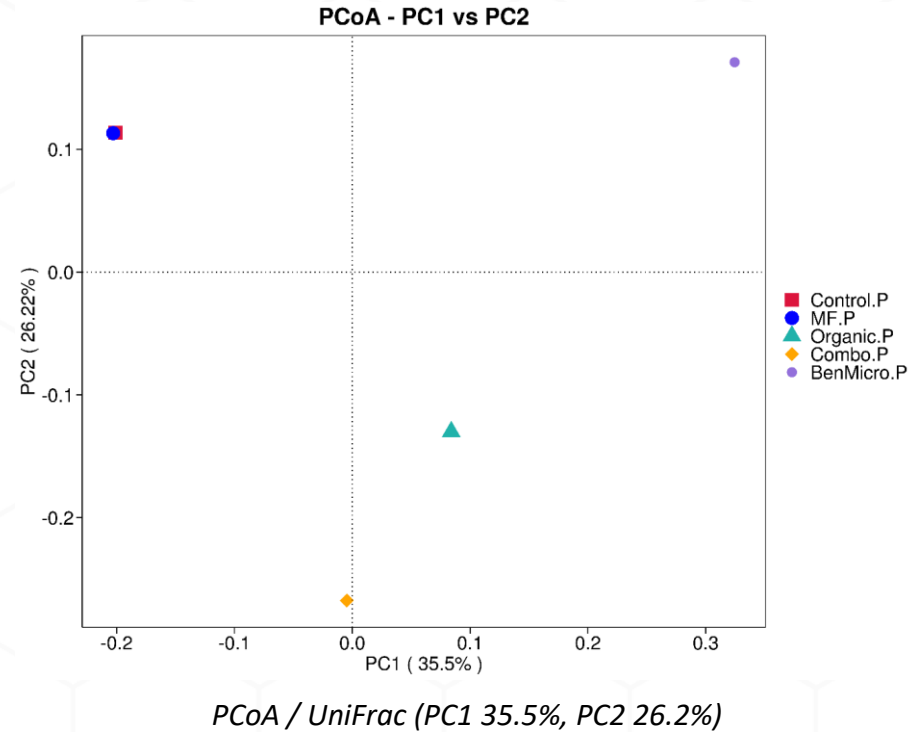
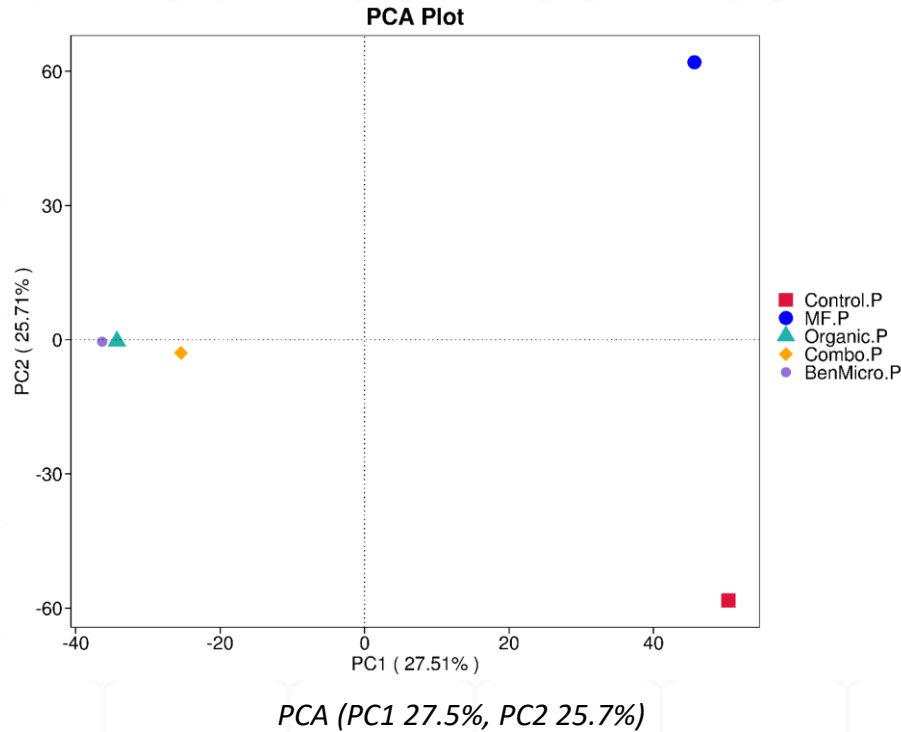


Key diversity indices

Treatment	Chao1	Shannon
Control.P	2145.9	9.734
MF.P	1967.1	9.739
Organic.P	1683.2	9.425
Combo.P	1689.6	9.368
BenMicro.P	1428.6	9.062

- Richness & diversity highest in Control & MF (Chao1, Shannon, observed features)
- BenMicro lowest – stronger dominance by fewer taxa; Organic & Combo intermediate

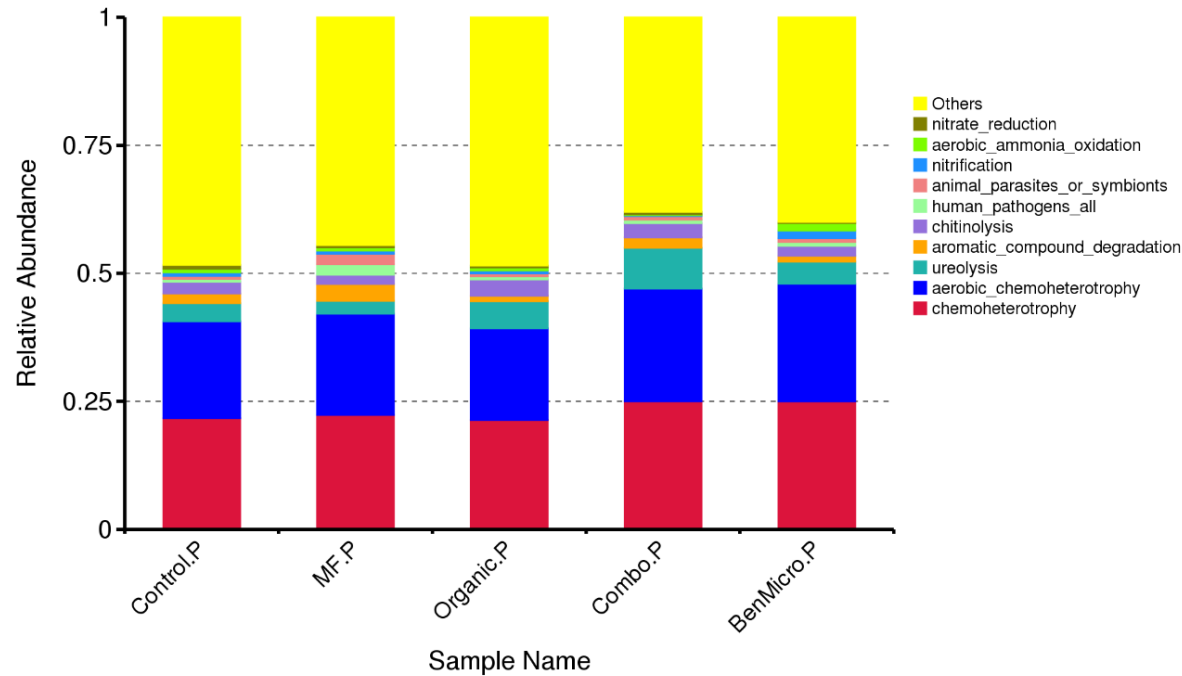
β -Diversity & Multivariate Ordination



Unweighted UniFrac
Control-MF: 0.078 (most similar)
Combo-BenMicro: 0.238 (most distant)

- Both ordinations agree: Control & MF cluster tightly; BenMicro forms the most distinct, separate cluster

Functional Profile of the Microbiome



Predicted functional groups across the five treatments

- **Chemoheterotrophy & aerobic chemoheterotrophy** dominate every treatment – organic matter decomposition & C-cycling
- N-cycle functions present at lower levels: nitrification, aerobic ammonia oxidation, ureolysis
- Control & MF: stable, balanced functional profile – mirrors their high α -diversity
- Combo: highest chemoheterotrophy & ureolysis – most intensive metabolic activity
- BenMicro: narrow profile dominated by aerobic chemoheterotrophy – mirrors its lowest α -diversity

Conclusions

- Agroecological practice is a major driver of rhizosphere microbiome composition and function in sweet corn
- Control & mineral fertilization sustain the richest, most diverse microbiome
- Organic & combined fertilization stimulate specific microbial groups and functional processes (decomposition, N-cycling)
- Beneficial-microorganism treatment triggers the most selective, distinct community shift – lower diversity, stronger taxon dominance
- **Practical implication:** fertilization strategy can be used as a lever to steer microbiome function for sustainable soil fertility management

Control
Diverse

MF
Diverse

Organic
Enriched

Combo
Balanced

BenMicro
Selective



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THANK YOU!

Questions?

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