

# Soil fungal community structure is shaped by agricultural systems revealing little temporal variation

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## Introduction

Soil fungi are vital to a multitude of processes in agricultural systems. Such system undergo both numerous management events and changing weather conditions throughout the growing season which may influence soil fungal community structure.

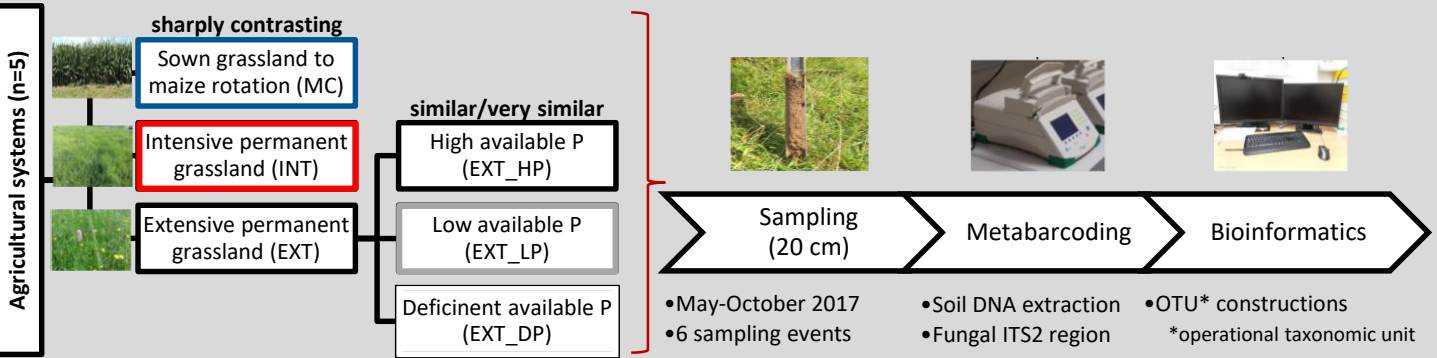


## Question

How do seasonal plant growth conditions affect the temporal stability in soil fungal community structure between differently managed systems?

- (i) Sharply contrasting systems
- (ii) Similar/ very similar systems

## Methods

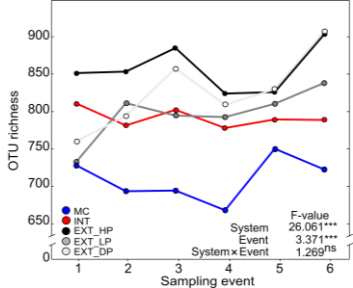


### PERMANOVA

Factor	df	MS	Pseudo-F	$\sqrt{VCV}$
System	4	2.647	3.878***	0.256
Event	5	0.178	2.456***	0.065
System $\times$ Event	20	0.088	1.214***	0.056
Residual	100	0.072		0.269

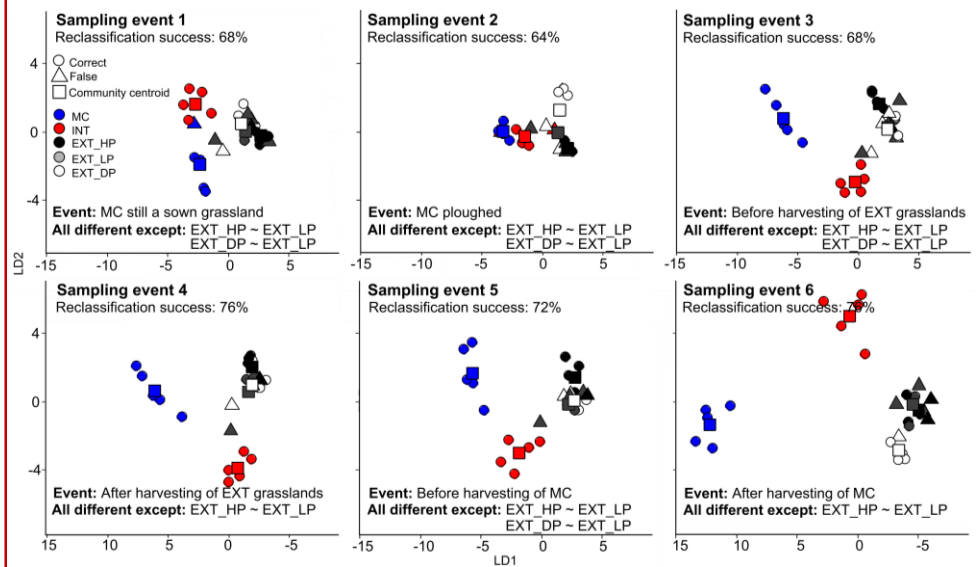
**Table 1:** Summary of PERMANOVA model for fungal community structure. df= degrees of freedom, MS= mean sum of squares,  $\sqrt{VCV}$  = square-root of components of variation. \*\*\* $P \leq 0.001$

### Soil Fungal OTU richness



**Fig. 1:** Mean fungal OTU richness across all sampling events. Insert: Repeated measures ANOVA, \*\*\* $P \leq 0.001$  'ns'  $P > 0.05$ .

### Soil Fungal Community Structure



**Fig. 2:** Canonical analysis of principal coordinates (CAP) showing patterns of fungal community structure in the five agricultural systems across all sampling events. Displayed in each panel are the pairwise differences between systems ( $P \leq 0.05$ ).

## Results

- Agricultural system ( $\sqrt{VCV} = 0.256$ ) was a much stronger determinant than sampling event ( $\sqrt{VCV} = 0.065$ , **Table 1**)
  - ➔ Clear differences in fungal community structure *persist over time*.
- Differences in fungal OTU richness between the systems are temporally stable over the sampling events (**Fig. 1**).
  - ➔ Clear differences in fungal community richness *persist over time*.
- Differences in fungal community structure were large (**Fig. 2**); MC  $\sim$  INT (average centroid distance (CD): 0.394), MC  $\sim$  EXT systems (CD = 0.542), INT  $\sim$  EXT systems (CD = 0.463).
  - ➔ This agrees with Fox et al. 2021 (*FEMS Microbiol Ecol*, fiab1481), which found that management drives fungal community structure as much as *continental-wide differences in pedoclimatic conditions*.

## Take-home

The pairwise differences in soil microbiome structures between established agricultural systems are large and temporally stable over changing plant growth conditions, even between systems with a comparable management regime.