The effect of crop diversification and season on microbial carbon use efficiency across a European gradient

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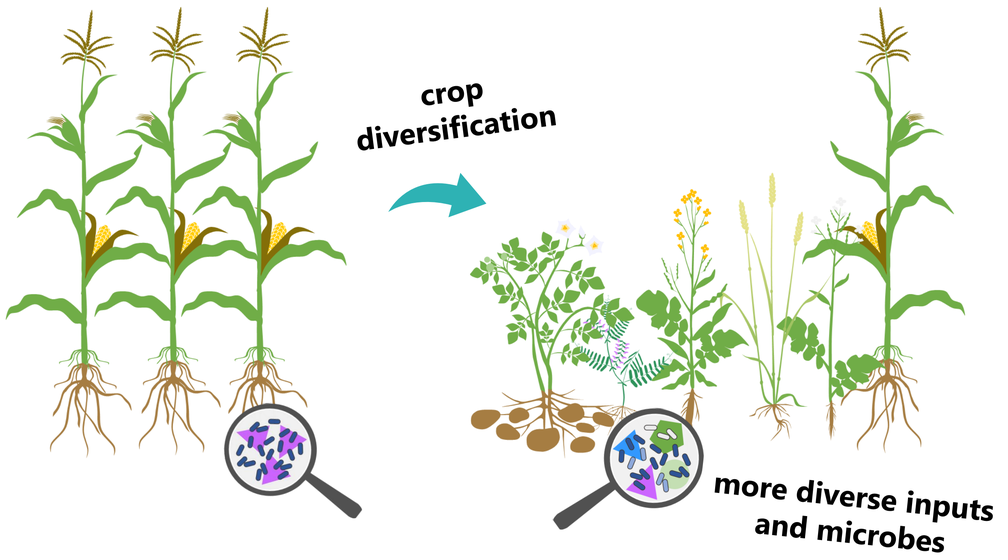
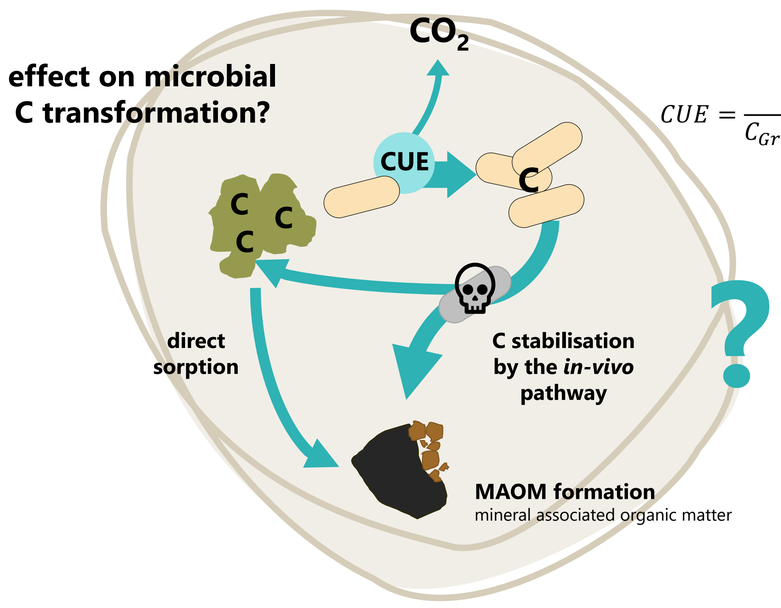
background





$$CUE = \frac{C_{Growth}}{C_{Growth} + C_{Respiration}}$$

how does crop diversification alter CUE

set-up

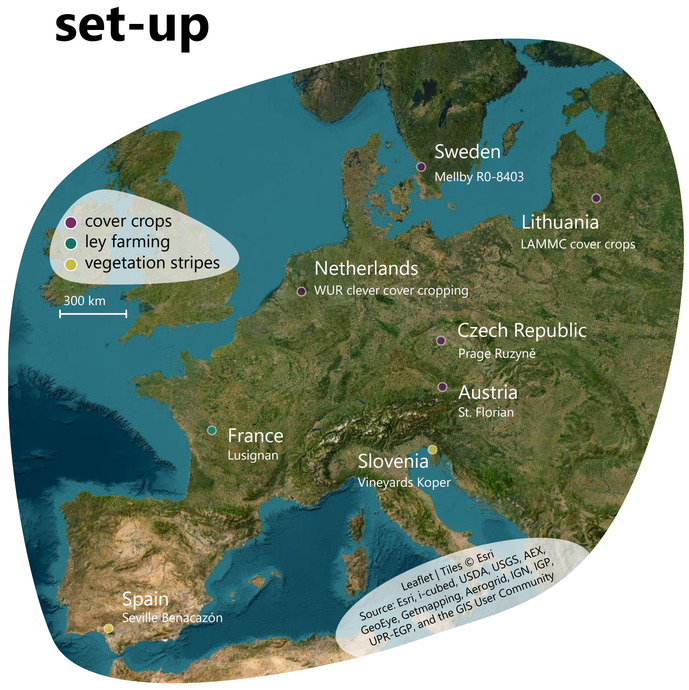


Figure 1 Sampling sites. The selected long-term field experiments along the pan-European pedo-climatic gradient cover different measures, i.e. cover crops, ley farming, and vegetation stripes representative for crop diversification across Europe.

topsoil 0-20 cm | **2 samplings (where feasible)**

^{18}O-CUE method

control vs. most diverse

all samples

ANOVA site-wise

season

meta-analysis (*meta* package)

effect size ln(RR)
weighing $\frac{1}{\sigma^2+\tau^2}$

crop diversification

season

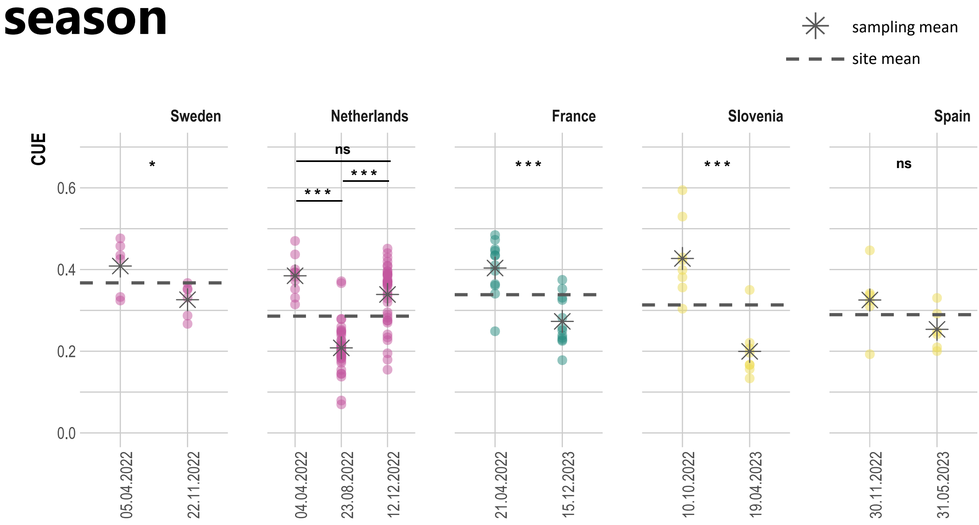


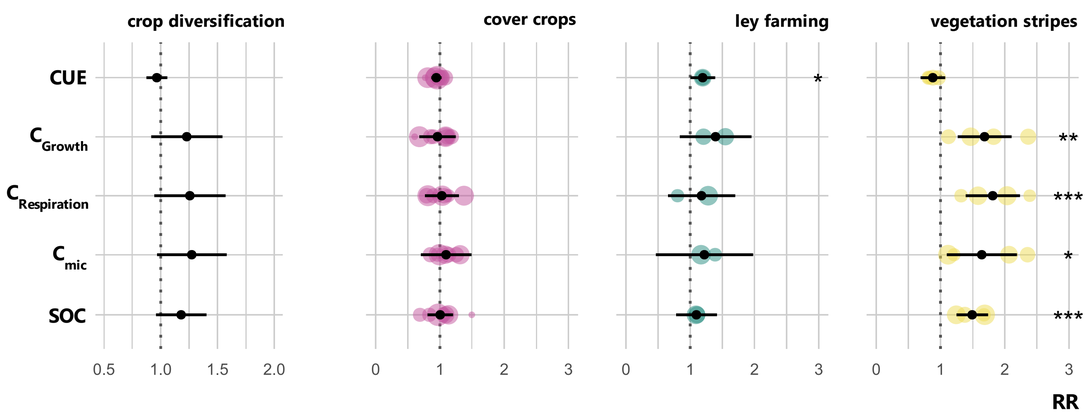
Figure 3 Effect of season on microbial carbon use efficiency (CUE). ANOVA revealed CUE differed significantly between samplings (except Spain). Differences between samplings exceeded differences between sites.

! CUE varies with sampling

which samplings to compare?

? seasonality effect

crop diversification



! no general effect on microbial CUE

Figure 2 Results of the meta-analysis. Overall and measure-specific effect sizes of crop diversification on microbial carbon use efficiency (CUE), respiration ($C_{Respiration}$), growth (C_{Growth}), biomass C (C_{mic}) as well as soil organic carbon (SOC). There was no significant general effect of crop diversification on microbial C transformation.

Table 1 Test statistics of meta-analysis. Overall high heterogeneity between observations. Only for CUE the effect sizes across studies are homogenous (i.e. no effect). Overall heterogeneity is partly explained by different effect sizes between diversification measures.

overall variability in the effect sizes

p-value for subgroup differences

	τ^2	I^2	p_Q	$p_{subgroup}$
CUE	0.009	34 %	0.114	0.036
$C_{Respiration}$	0.152	90 %	< 0.001	0.008
C_{Growth}	0.155	89 %	< 0.001	0.015
C_{mic}	0.154	88 %	< 0.001	0.276
SOC	0.07	83 %	< 0.001	0.008

variance between observations

p-value for heterogeneity test

outlook

season in numbers

assigning calendaric seasons not meaningful across climatic gradient

weather data collection

NASA POWER project

3 months prior sampling

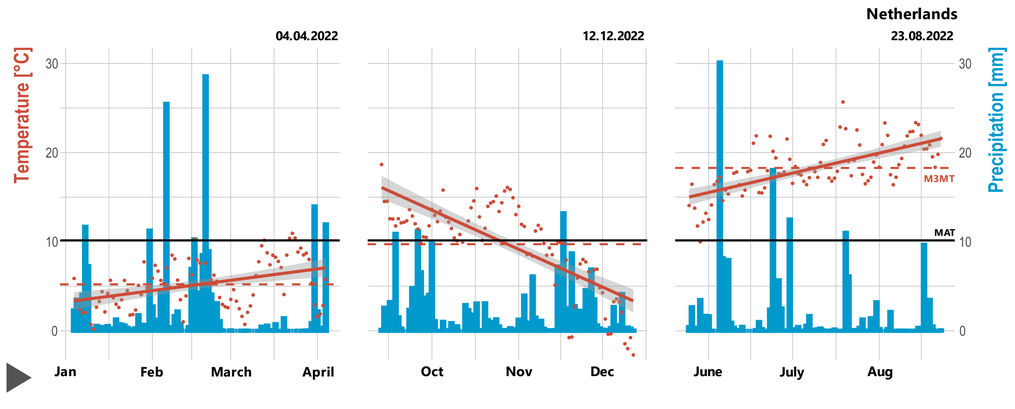


Figure 4 Season in numbers (example Netherlands). Mean daily temperature was plotted over 3-months prior sampling. The fitted slope and the distance of the 3-months mean temperature (M3MT) to the mean annual temperature (MAT) were retrieved to serve as seasonal predictors of CUE. Water availability was expressed as cumulative precipitation over 3-months.

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