

SOFIA: Importance of agricultural practices on functional diversity of soil microbiota: first tracks of response with a diachronic study of biogeochemical cycles



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Highlights

- SOFIA project offers new insights into the dynamics of soil processes and soil communities in response to changes in agricultural practices.
- Enzymatic activities are associated to microbial activities and important indicators for soil functioning.

1) After two years, significant differences appeared in the top soil layer (0-5 cm).

2) Some enzymes were earlier indicators of differentiation among treatments.

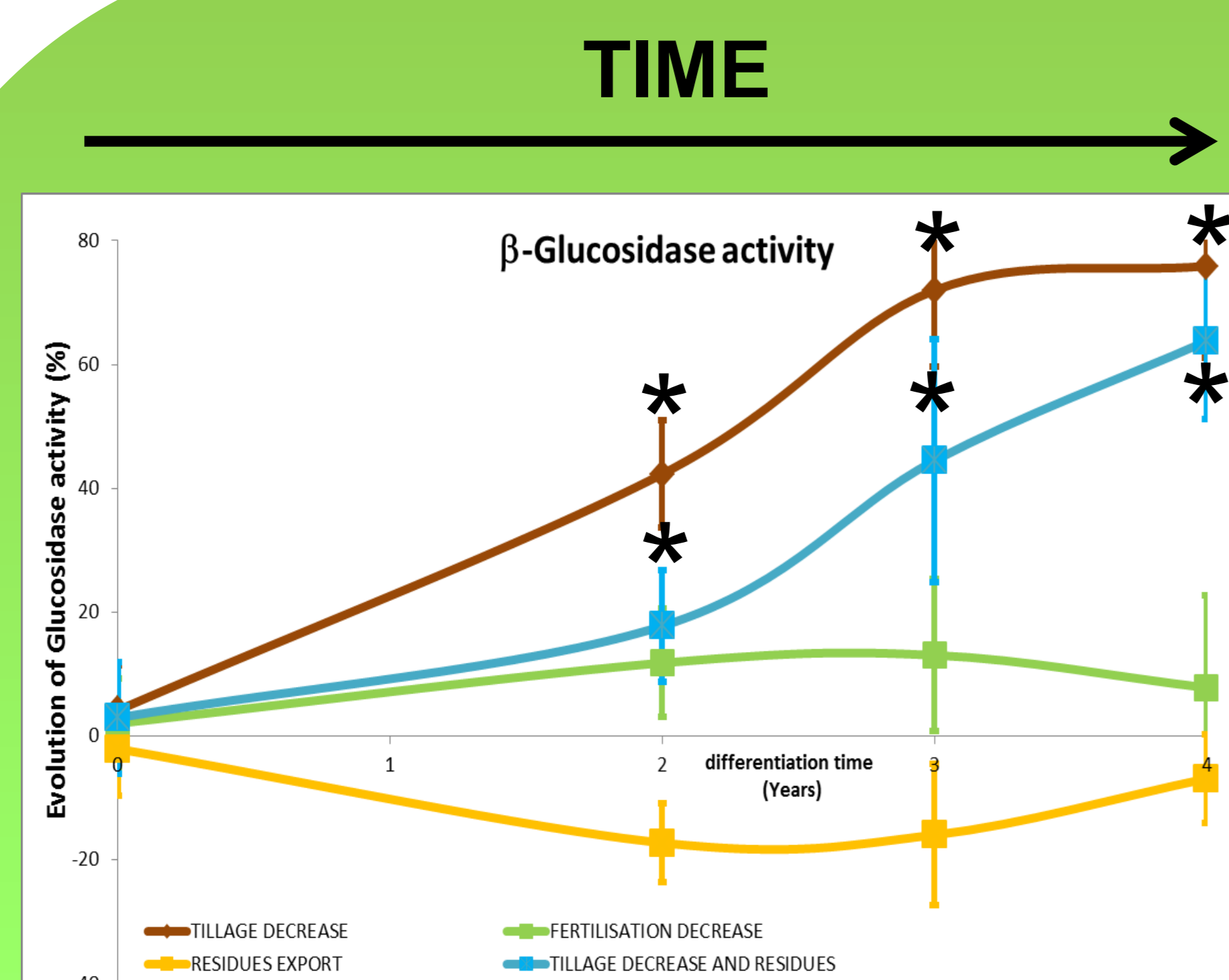
3) Importance of practices for enzymatic activities :

SOIL TILLAGE >> **CROP RESIDUES** > **RATE OF N FERTILISATION**

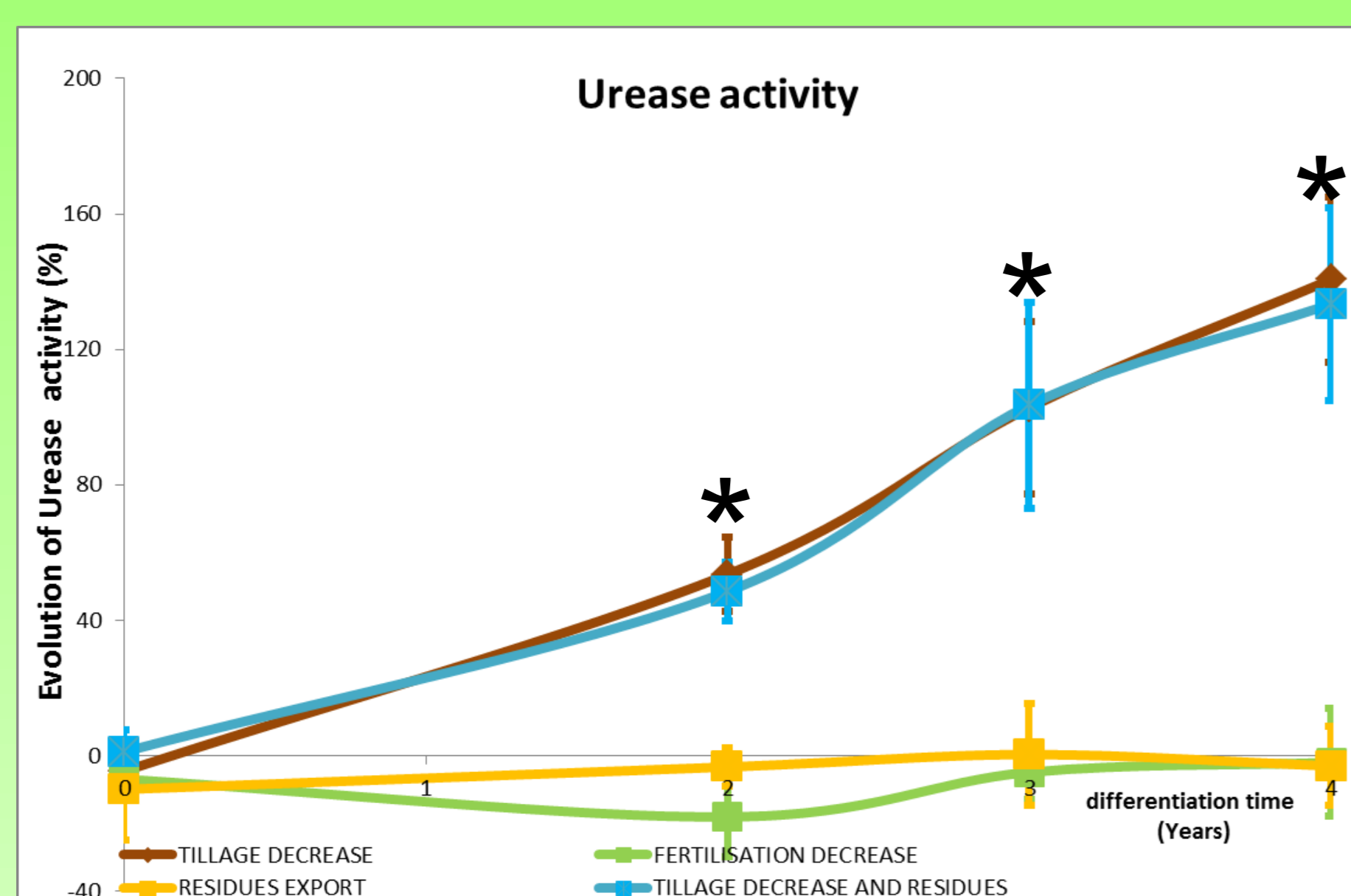
Treatments	Rotation	Tillage	Management of residues and fertilization
T1	Pea/ winter wheat/ winter rape/ spring barley	Deep tillage (25cm)	Residues incorporated Optimal fertilization
T2	Pea/ winter wheat/ winter rape/ spring barley	Superficial tillage (7-10 cm)	Residues incorporated Optimal fertilization
T3	Pea/ winter wheat/ winter rape/ spring barley	Superficial tillage (7-10 cm)	Residues removed Optimal fertilization
T4	Pea/ winter wheat/ winter rape/ spring barley	Deep tillage (25cm)	Residues incorporated, reduced fertilization
T6	Switchgrass (continuous)	No till	Residues removed



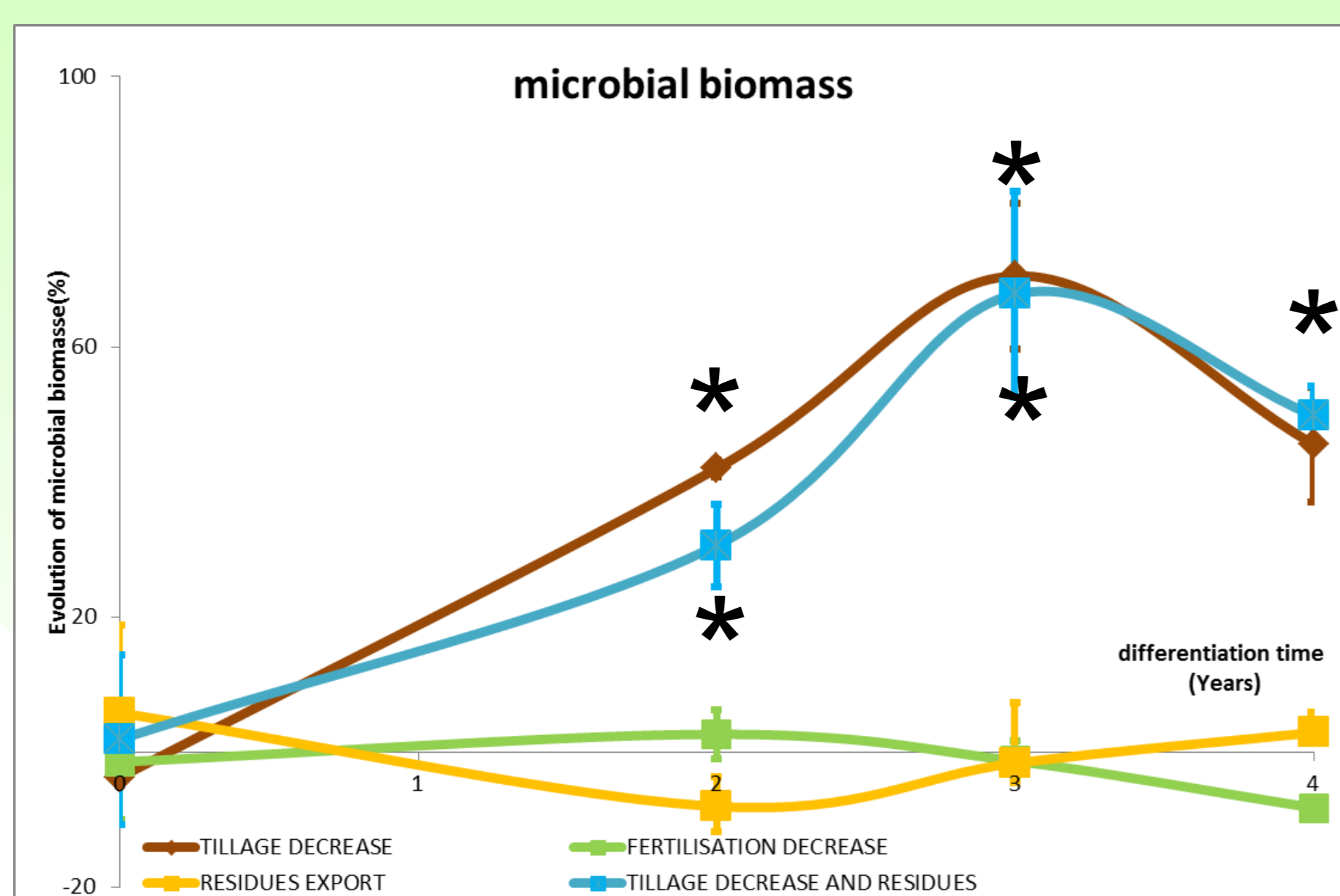
Experimental design of the SOERE ACBB experiment



ACTIVITY OF CARBON CYCLE

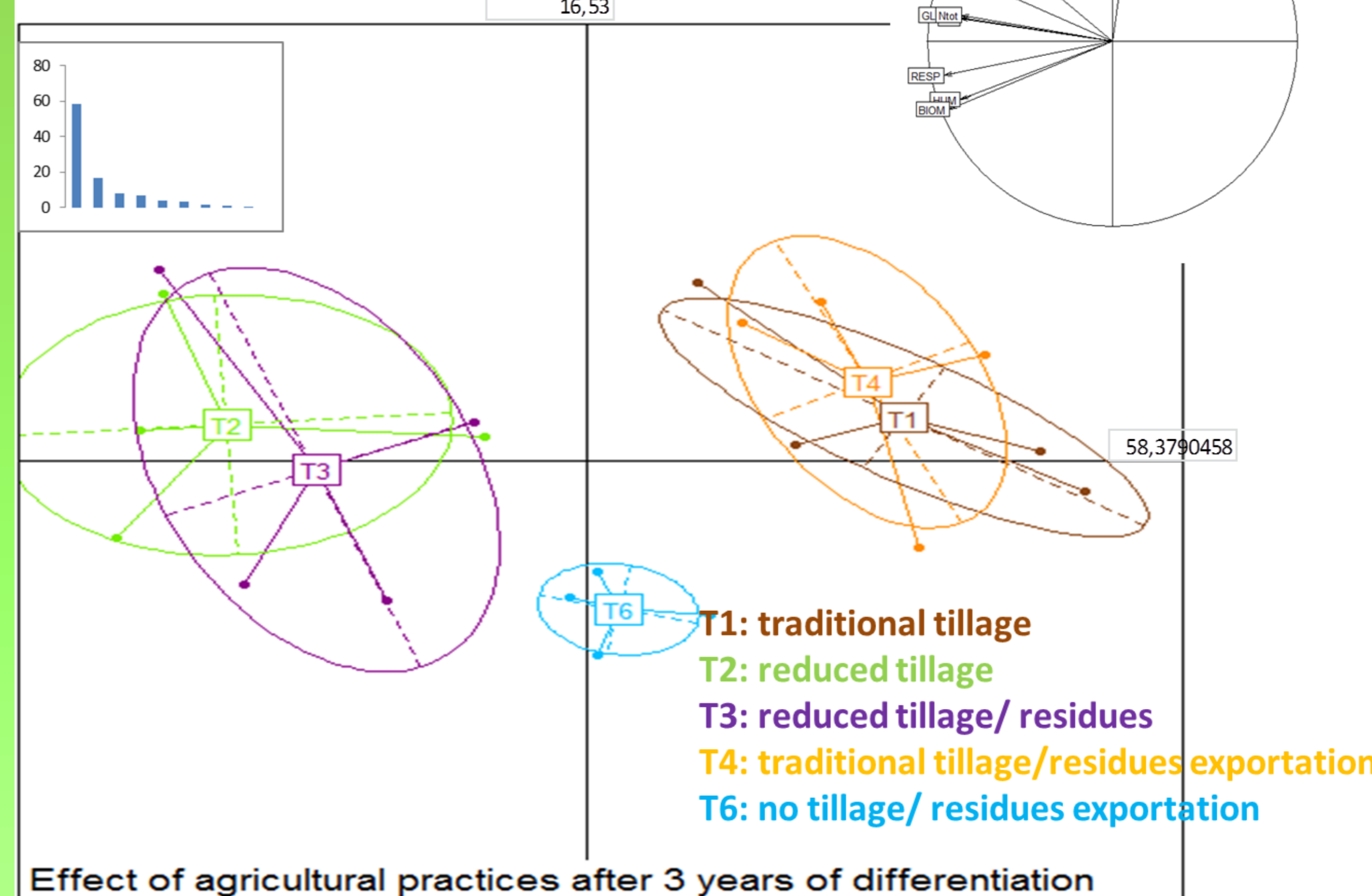


ACTIVITY OF NITROGEN CYCLE



MICROBIAL BIOMASS - C

DIFFERENTIATION AFTER 3 YEARS



Effect of agricultural practices after 3 years of differentiation

Significant differentiation in enzymatic activities and microbial C-biomass between agricultural systems

Enzymatic activities clearly discriminated among tillage systems.
→ Reduced tillage systems displayed higher enzymatic activities and microbial C-biomass.

Enzymatic activities responded weakly to residue management and fertilization reduction.

PCA Factors : 4 enzymatic activities, microbial C biomass, microbial respiration, TOC, Total N

CONCLUSIONS

Tillage reduction

↑ Microbial biomass, Enzymatic activity of N and C cycle

Crop residue export:

↑ Enzymatic activity of C cycle

Fertilisation N reduction:

→ no significant effect

PERSPECTIVES

Modifications of microbial community structure reflecting changes in enzymatic activity and C biomass?

Dynamic of response for other biogeochemical cycles?

Persisting differentiation on the long term?

Experimental design

The field : LTER site "Agroecosystèmes, Cycles Biogéochimiques et Biodiversité" located at Estrées-Mons, Picardie, France (24 plots) with series of experimental treatments (crop rotation, fertilisation, residue management or soil tillage). Enzymatic activities were obtained according to de Santiago et al (2012), microbial C biomass by fumigation-extraction (Vance et al. 1987).

