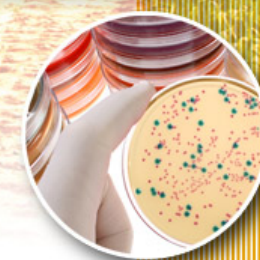




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Response of transplanted Chernozems towards C addition after 21 years of identical climatic, topographic and management practices



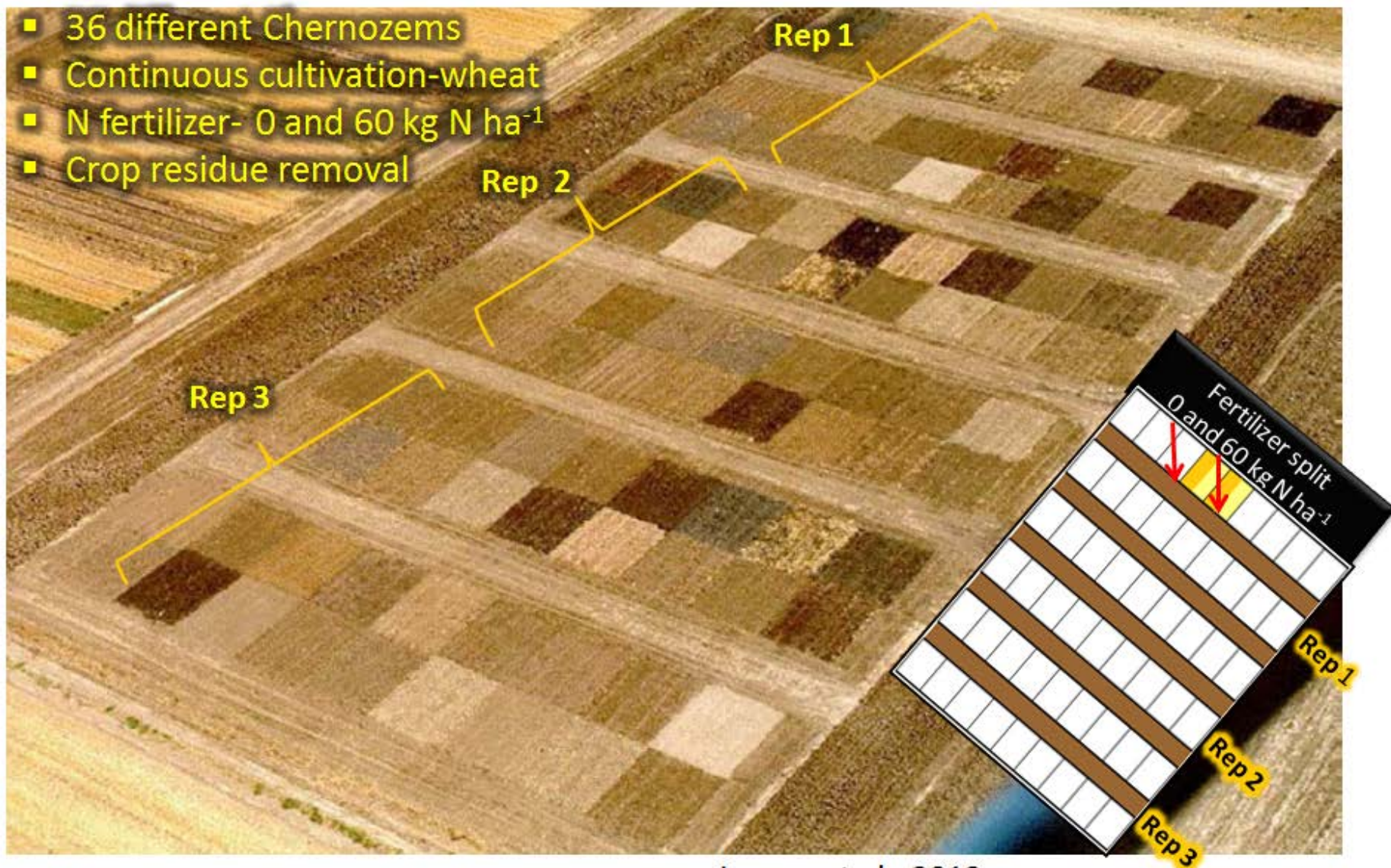
Soils and Crops- March 2016

Panchali Katulanda

Dr. Fran Walley and Dr. Bobbi Helgason

Long-term Transplanted Soils

- 36 different Chernozems
- Continuous cultivation-wheat
- N fertilizer- 0 and 60 kg N ha⁻¹
- Crop residue removal



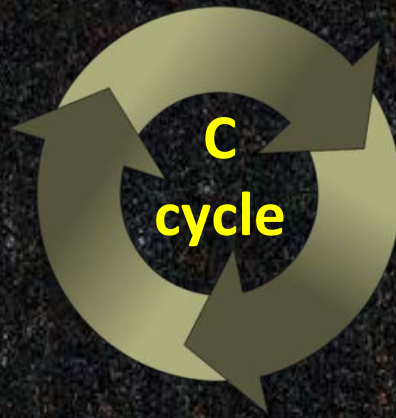
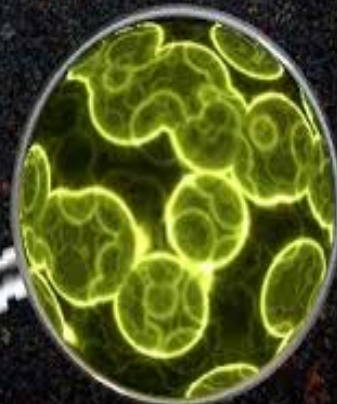
Continuous removal of
crop residues for 21 years

Climate



Management
Practices

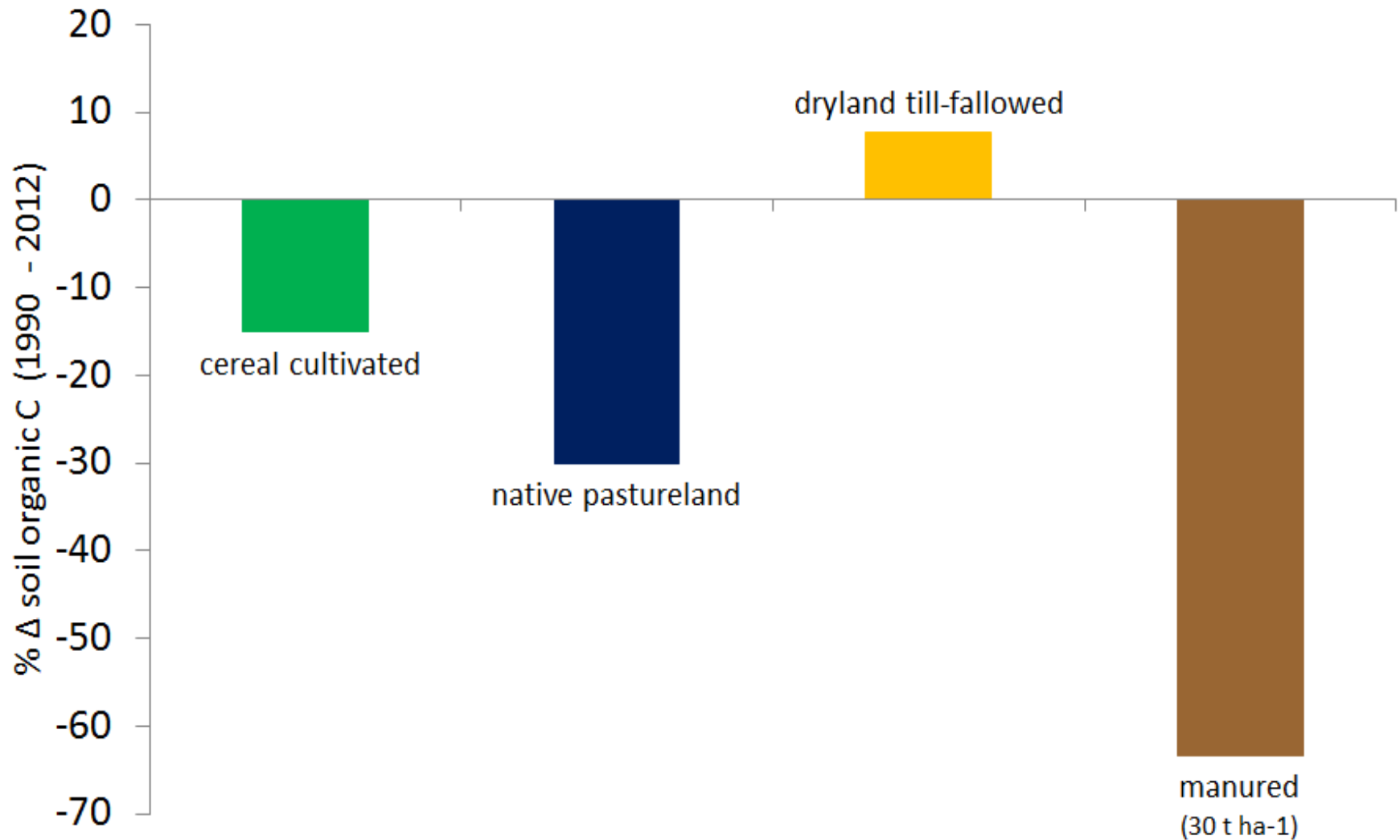
Topography



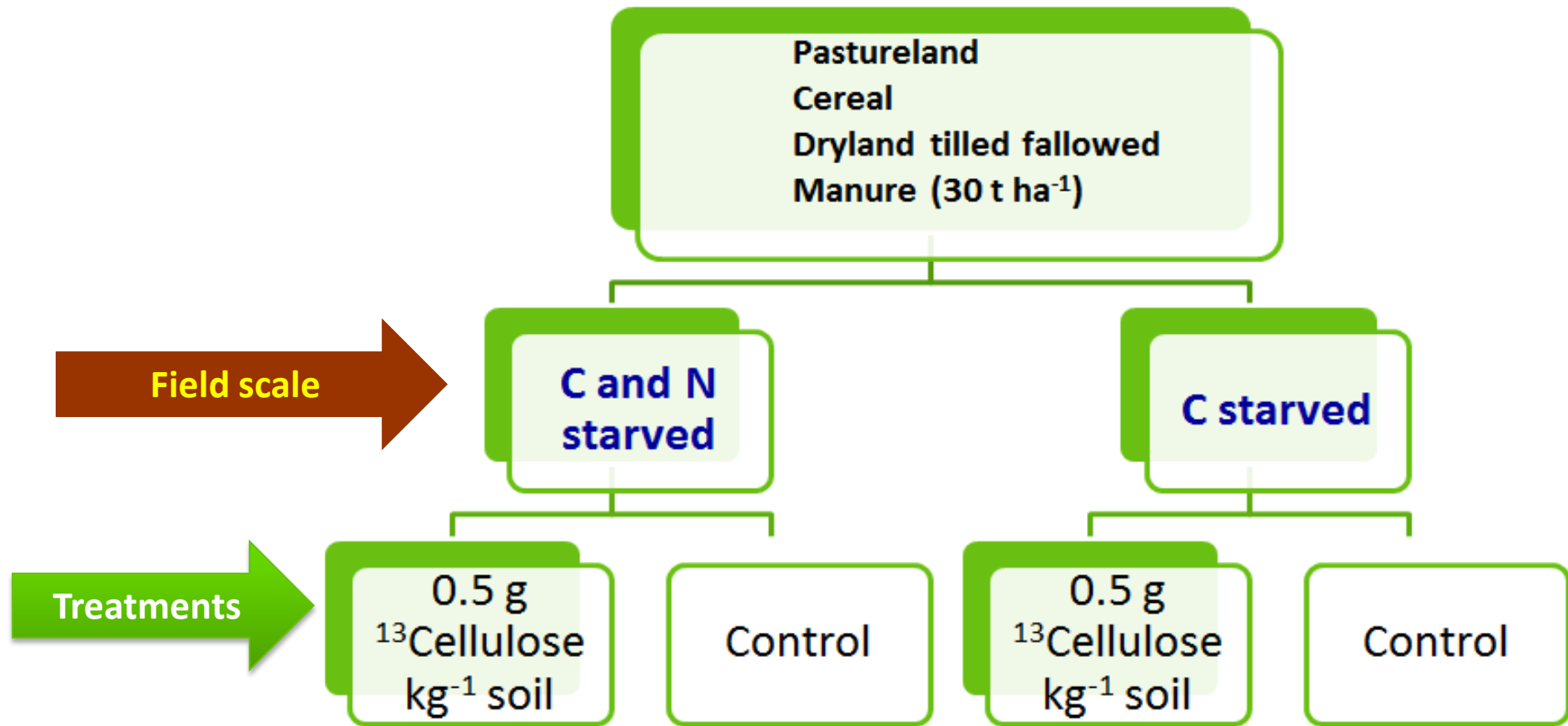
Objectives

- ❖ To observe the microbial assimilation of soil incorporated C (cellulose) in different soils.
- ❖ To observe the influence of long term N fertilizer application on ^{13}C labelled cellulose decomposition in different soils.

Effect of Residue Removal on Soil Total Organic C After 21 Years



Incubation conditions



- Soil moisture level: **70 % of field capacity**
- Temperature: **20°C**
- Incubation period: **72 days**

Gas sampling and microbial analysis



Determination of ^{13}C labelled decomposition



Gas sampling



$^{12}\text{CO}_2$ soil + $^{13}\text{CO}_2$ cellulose

Determination of active microbial population

Destructive sampling of soil microcosms



Phospholipid fatty acid analysis



^{13}C enriched PLFAs
(Mass spectrophotometer)

Results

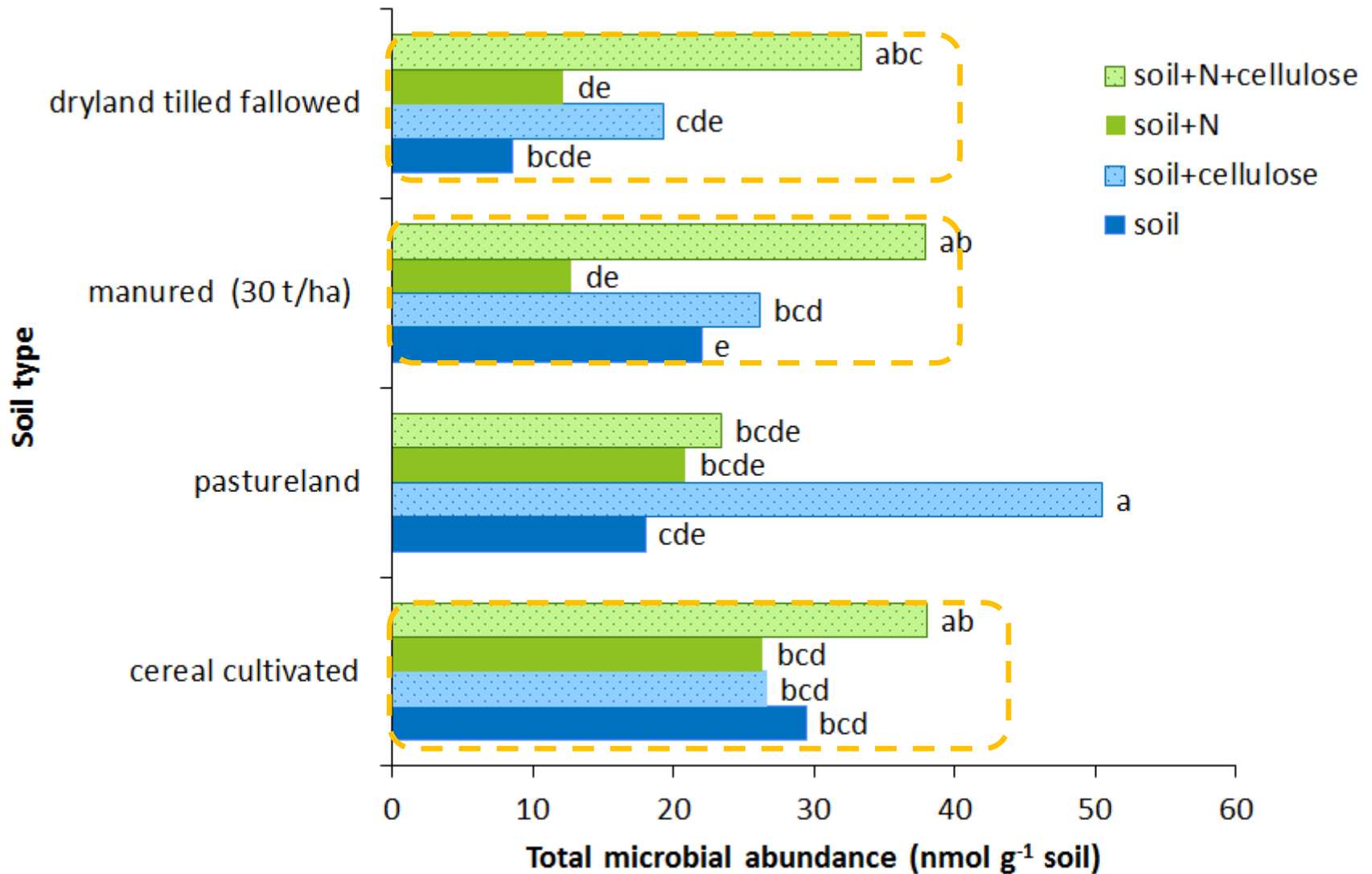
History of N addition increased C decomposition

Transplanted soil type	N History (kg ha ⁻¹)	Cumulative C-CO ₂ (mg kg ⁻¹ soil)	Effect of N addition
cereal soil	0	965.80	5%
	60	1013.89	
pastureland soil	0	983.61	22.5%
	60	1205.43	
dryland till-fallowed	0	761.89	31%
	60	998.96	
manured 30 t ha ⁻¹ yr ⁻¹	0	969.61	16.5%
	60	1128.90	

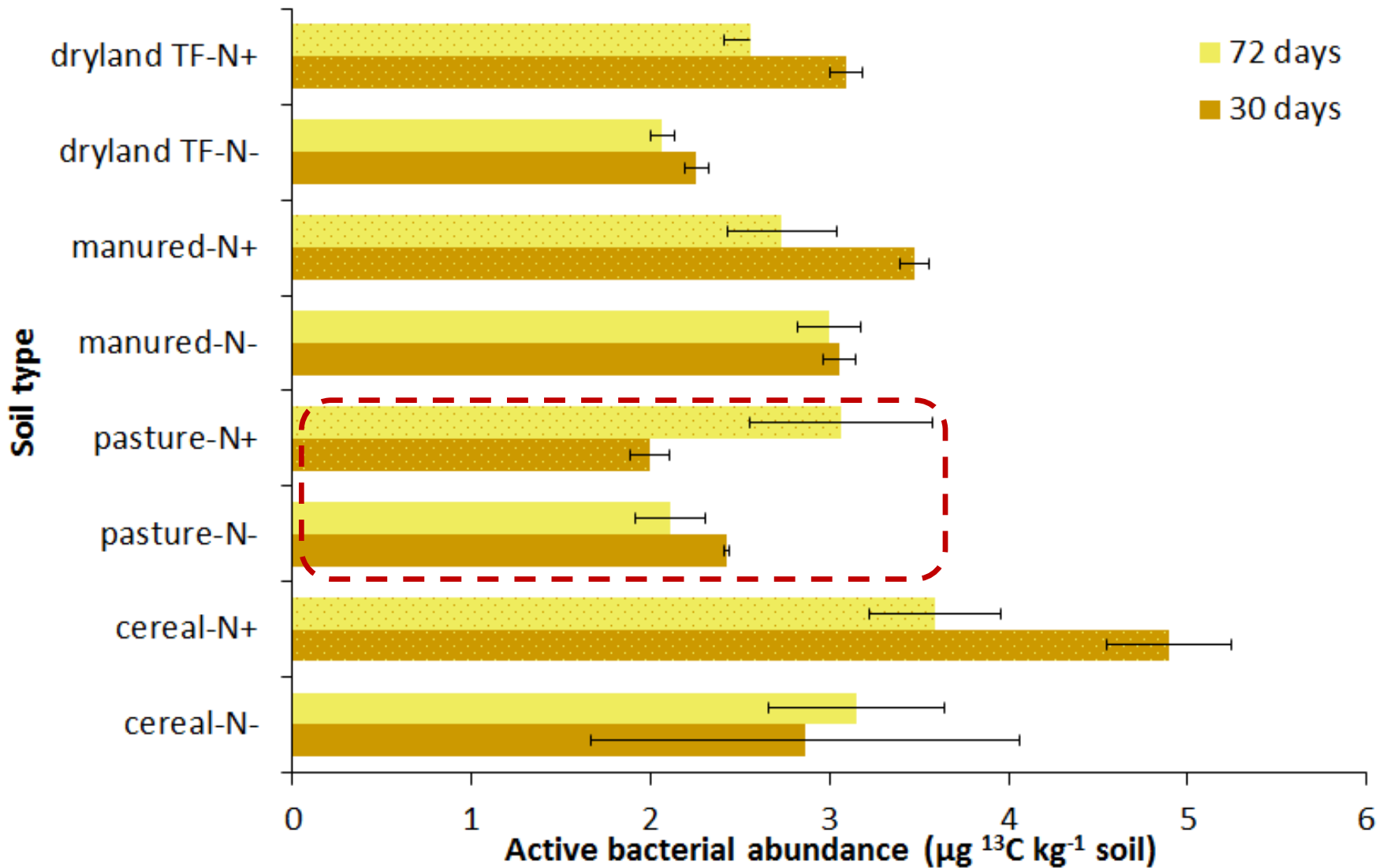
Original soil fertility influenced the effect of N fertilizer application on soil C decomposition

Total microbial abundance

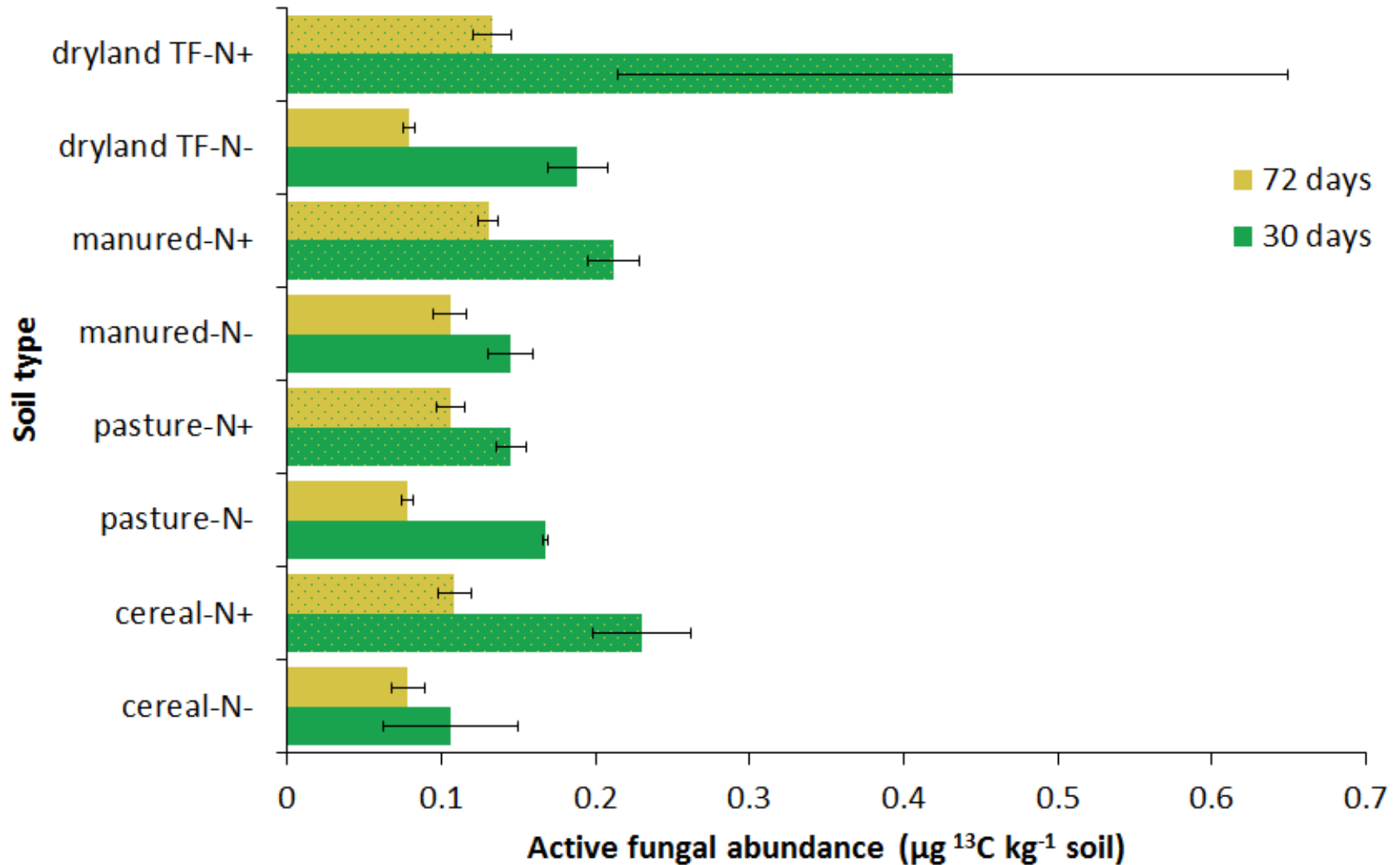
N fertilization enhanced C utilization



Active bacterial abundance

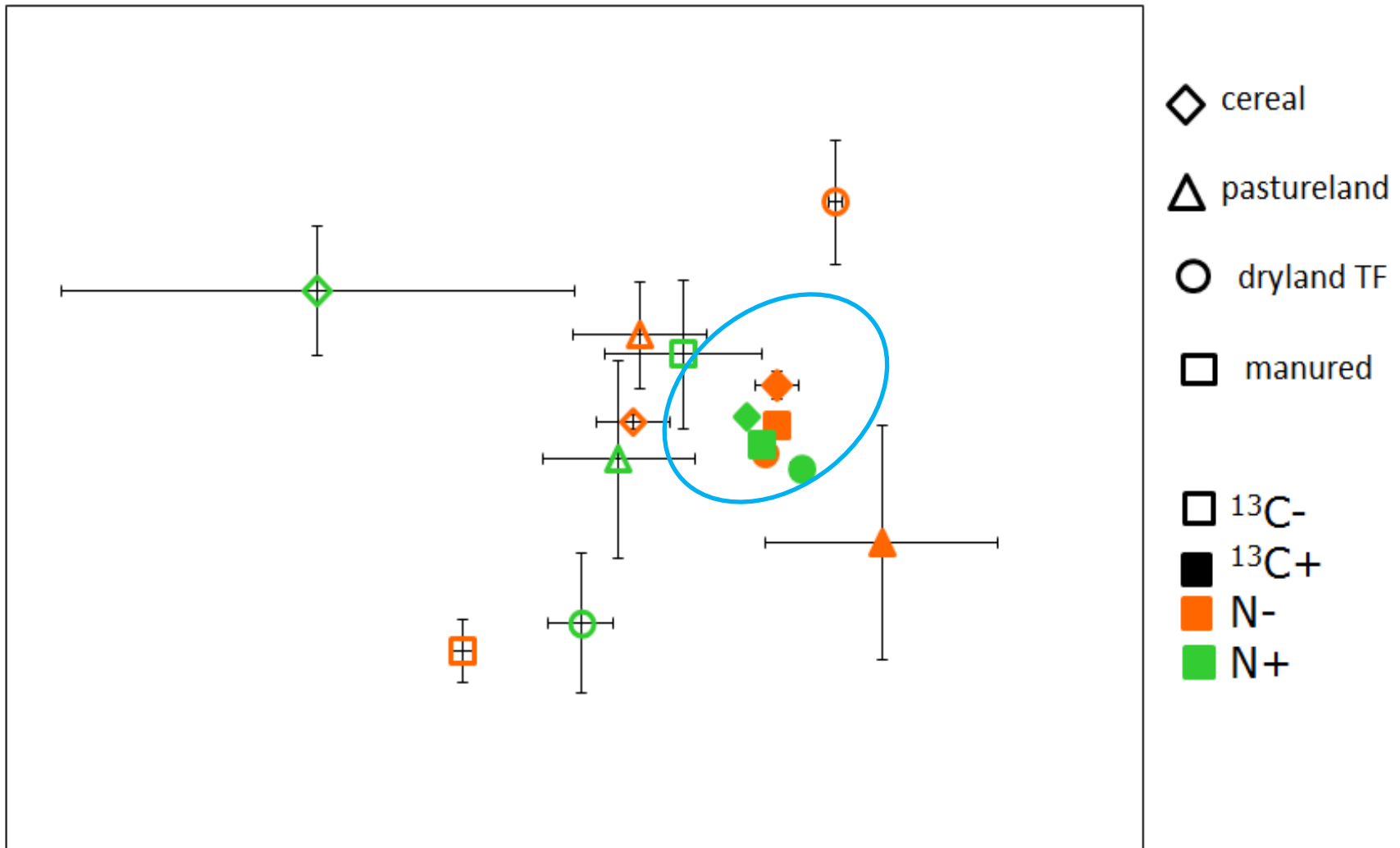


Active fungal abundance



Microbial community structure

C application reduced the difference between microbial communities

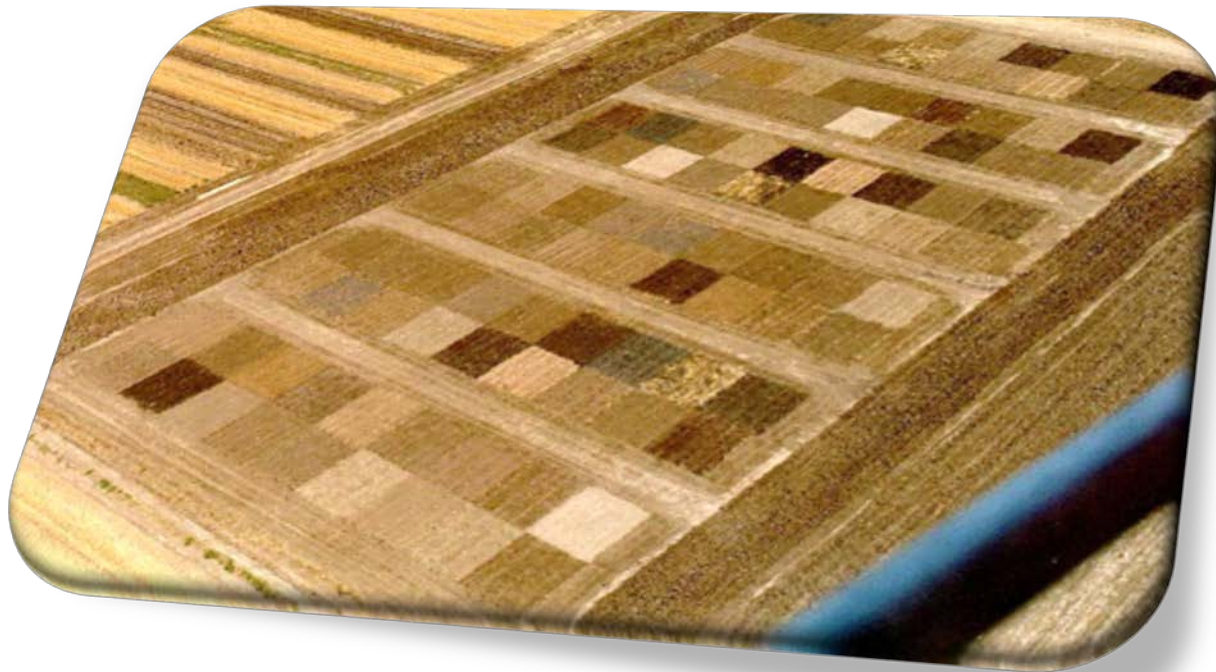


Conclusion

- ❖ Even after 21 years of identical conditions (limited C and N supply), C cycling of the transplanted soils is mainly governed by soil origin.
- ❖ Impact of long term N fertilization on microbial C utilization varied depending on the soil origin.
- ❖ Carbon application resulted similar microbial community structures among different soils under similar management conditions.

Implications

Land use and management have lasting effects on how soils function





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