



Soil chemical and biological properties under conventional systems and direct seeding mulch-based cropping systems



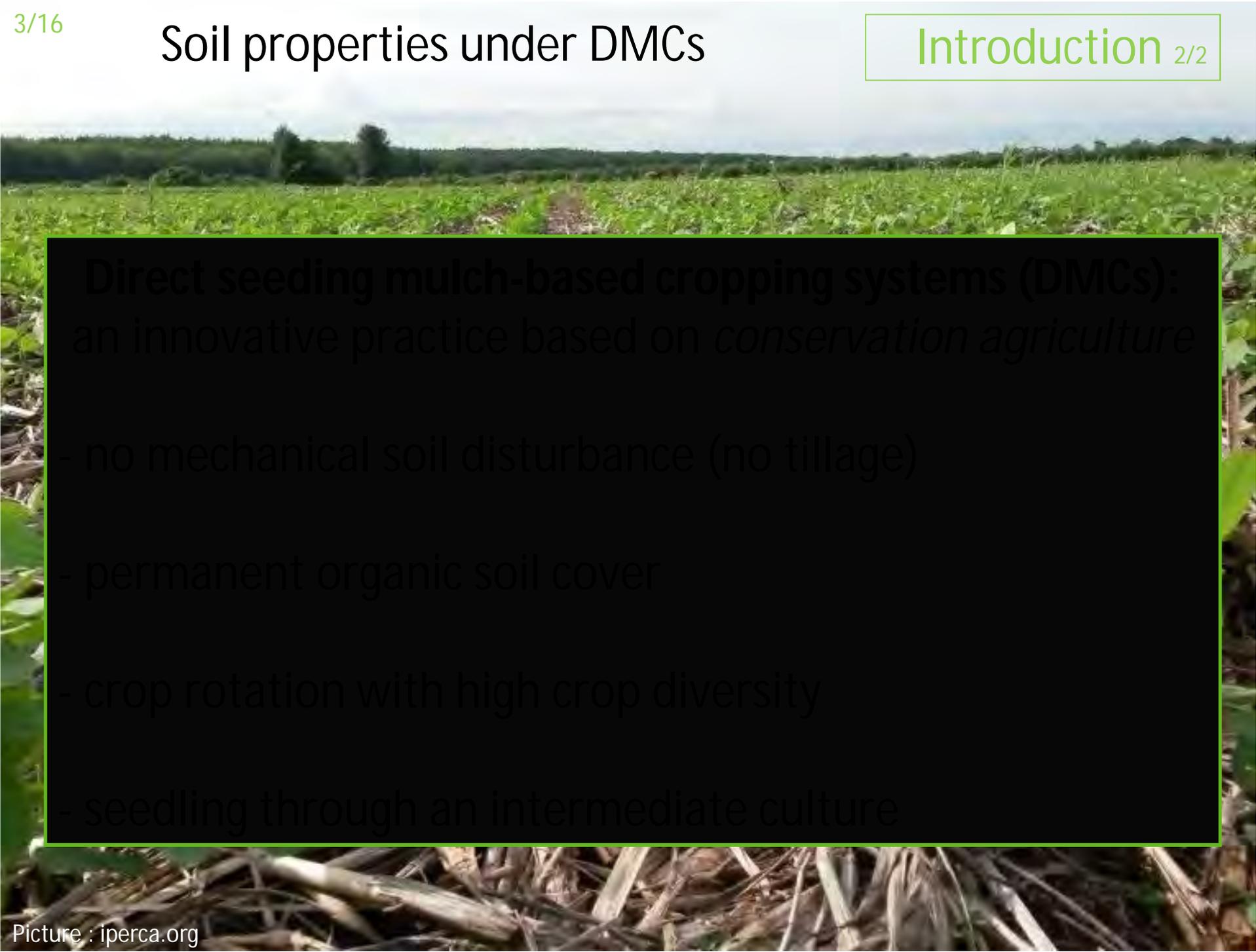
Picture : C. Gueule / APAD

A necessary evolution of agriculture:

- Saving time and fuel
- ↘ soil erosion and water pollution
- ↗ nutrient cycles efficiency
- ↗ soil fertility and biomass production



Innovative agricultural practices



Direct seeding mulch-based cropping systems (DMCs):
an innovative practice based on *conservation agriculture*

- no mechanical soil disturbance (no tillage)

- permanent organic soil cover

- crop rotation with high crop diversity

- seedling through an intermediate culture

BUT:

- Lack of scientific data on this practice
- Lack of knowledge on its effect on soil properties
- Lack of studies at the farm scale using a systemic approach

**How DMCs impact
soil biological and chemical properties
compared to conventional practices
at the farm scale ?**

Soil properties under DMCs

Hypotheses

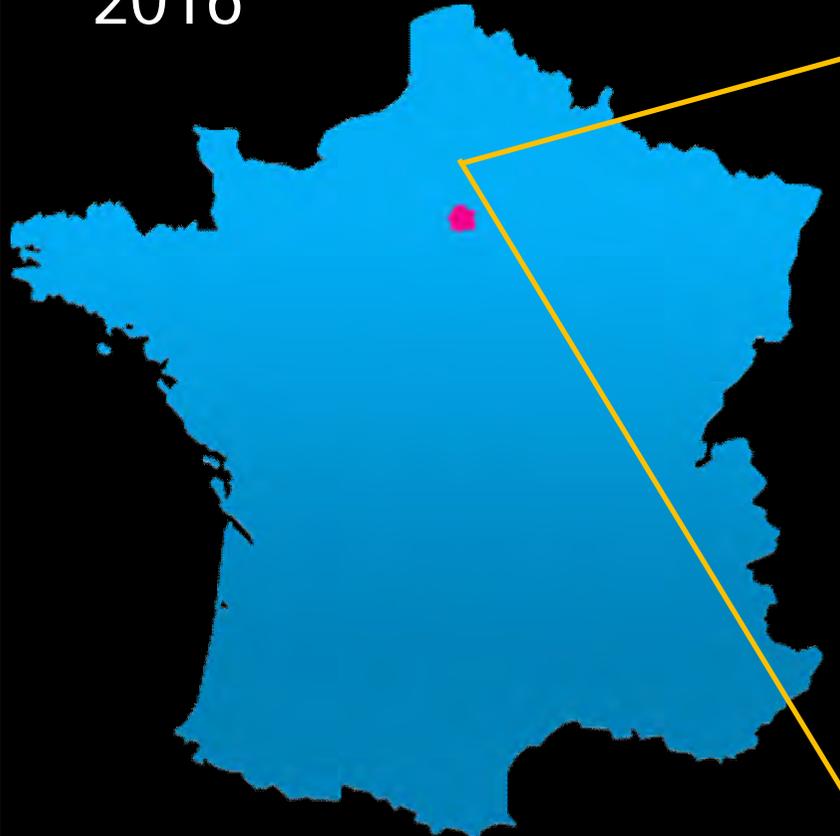
1) Soil communities are + abundant and + diverse under DMCs



2) Organic matter decomposition is faster under DMCs



2016



Monoculture landscape (wheat / barley / rapeseed)
22 fields / 4 plots per field

Soil properties under DMCs



Fields defined by pairs:

- topography
 - spring crop
 - soil type
- } similar
- + geographically neighboring



1 field in
conventional



<http://3.bp.blogspot.com>



1 field in
DMCs



<http://nsa25.casimages.com>

- Earthworms communities (ISO 23611-1)



- Collembola functional traits (ISO 23611-2)

- Tea bag index (<http://www.teatime4science.org/>)

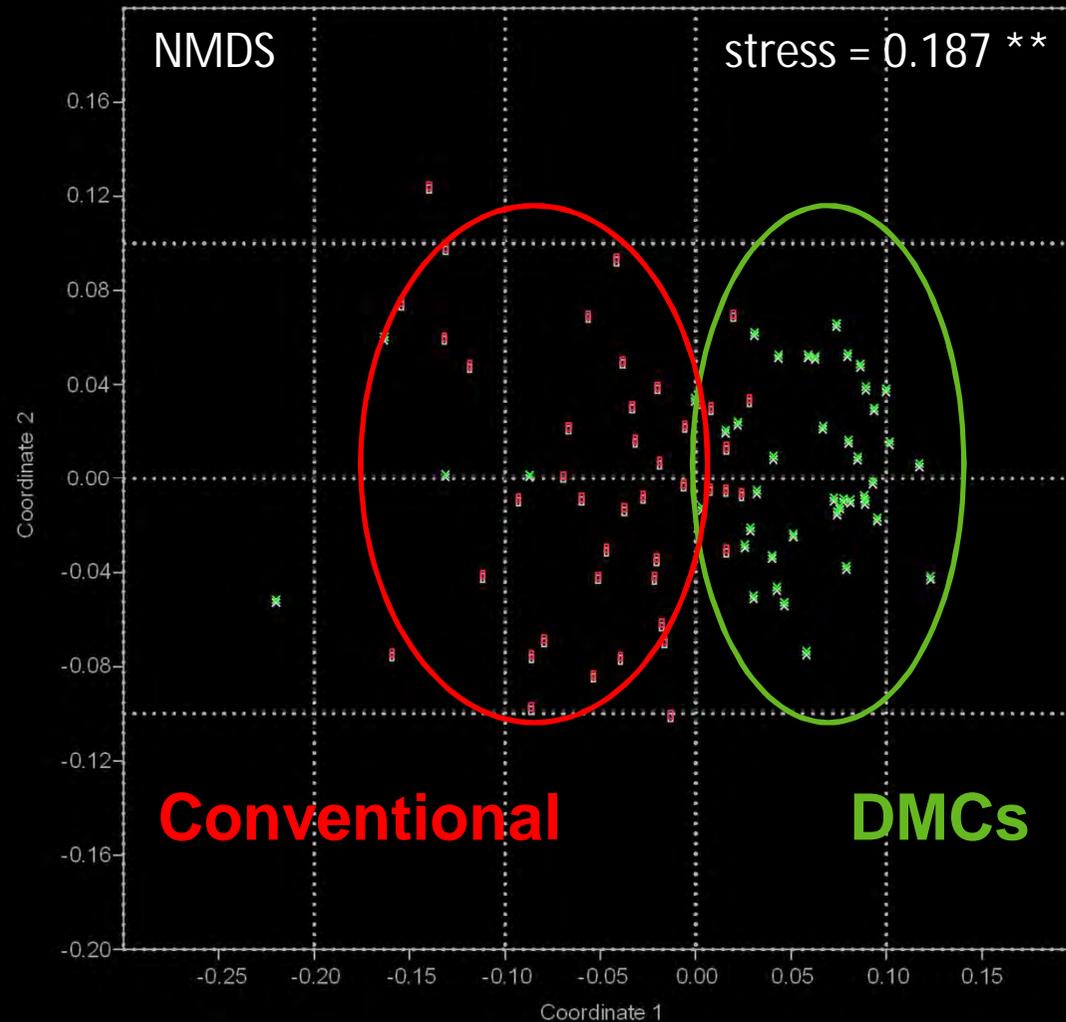


Earthworms communities



10 species :

- 2 anecic
- 2 epigeic
- 6 endogeic

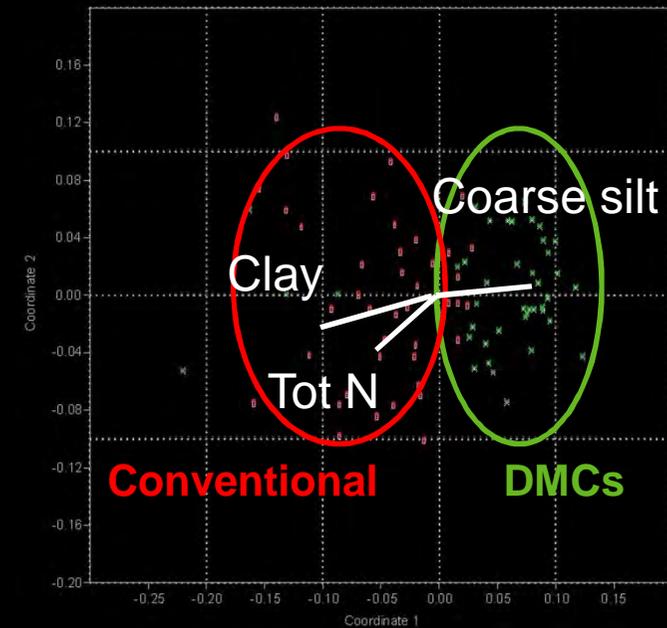


2 communities are clearly distinguished by agricultural practice

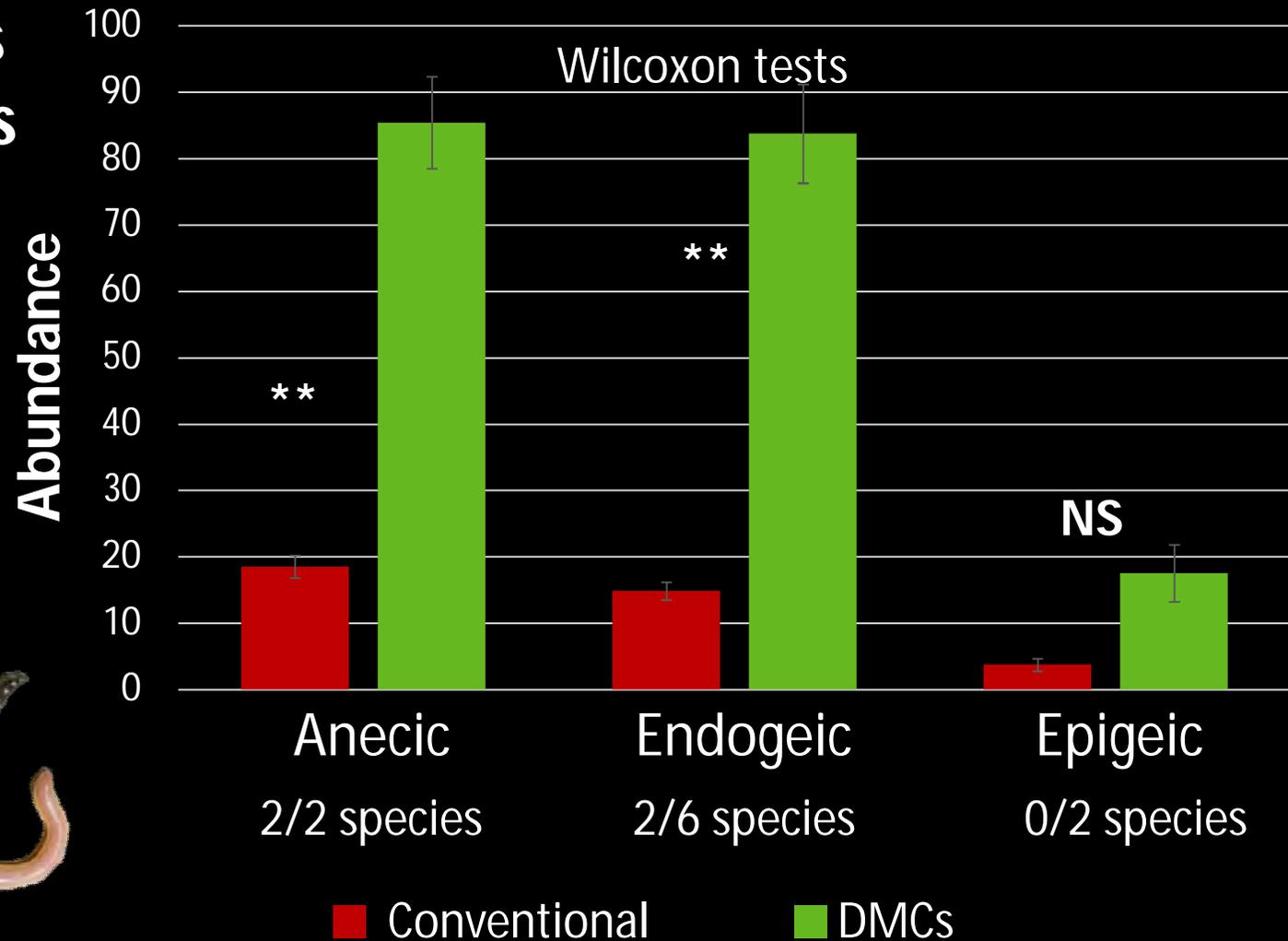
Soil properties under DMCs

Results ^{2/5}Earthworms
communities

| Explanatory variable | P-value |
|-----------------------|--------------|
| P | 0.107 |
| K | 0.488 |
| Mg | 0.325 |
| Ca | 0.051 |
| pH | 0.665 |
| Organic C | 0.132 |
| Humus | 0.132 |
| Total Nitrogen | 0.034 |
| C/N ratio | 0.062 |
| CEC | 0.047 |
| Clay | 0.007 |
| Fine silt | 0.397 |
| Coarse silt | 0.024 |
| Fine sand | 0.204 |
| Coarse sand | 0.312 |



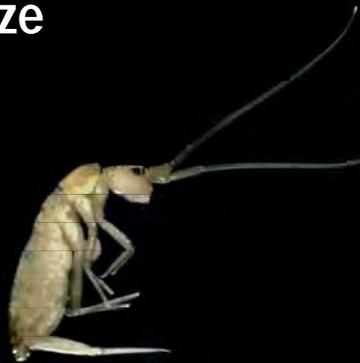
Communities covariate with soil chemical composition (Total N, clay, silt)

Earthworms
communities

Communities are more abundant under DMCs
but species composition are overall the same in *proportion*

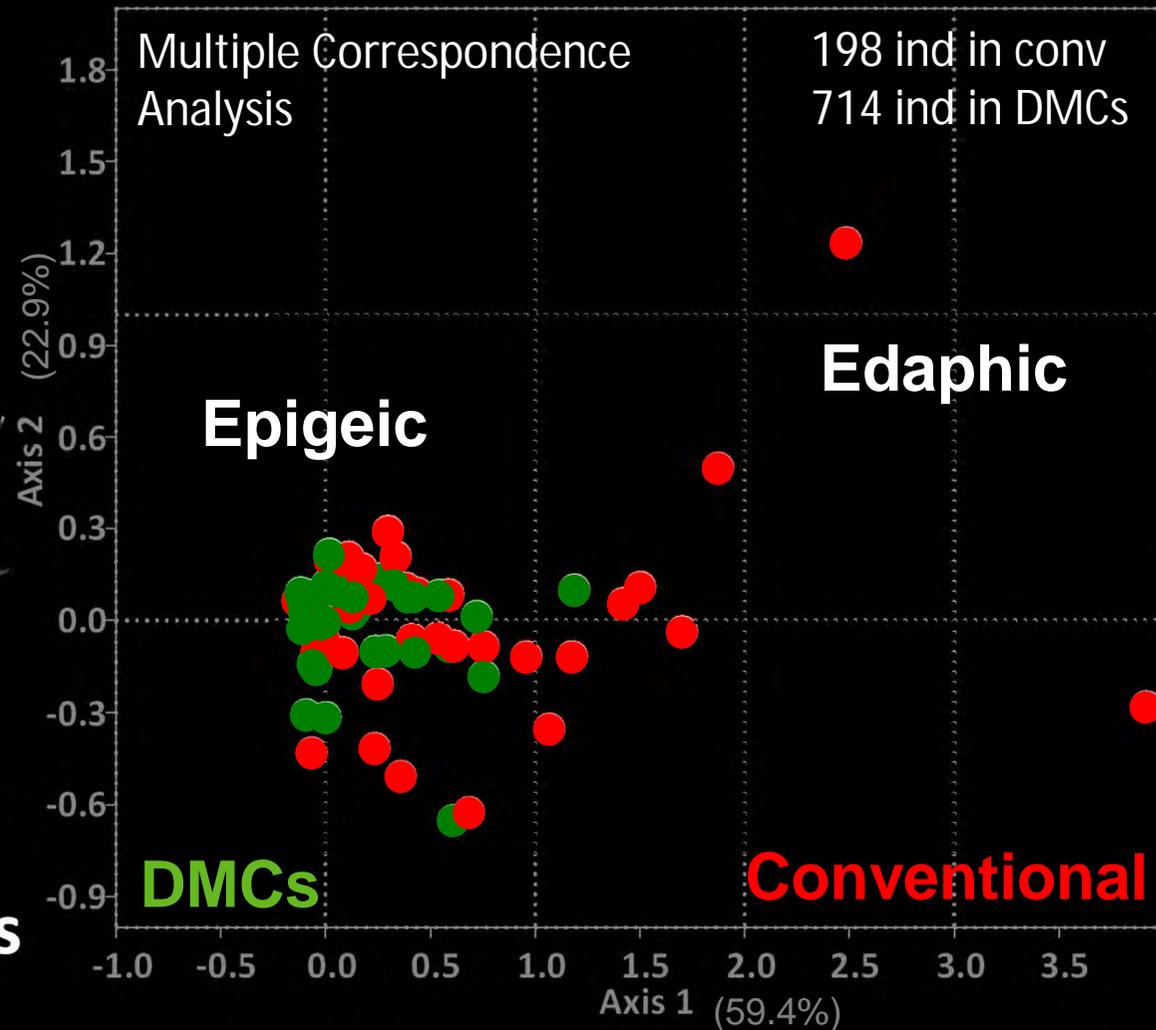
Collembola functional traits

- body pigmentation
- antennae size
- furca size



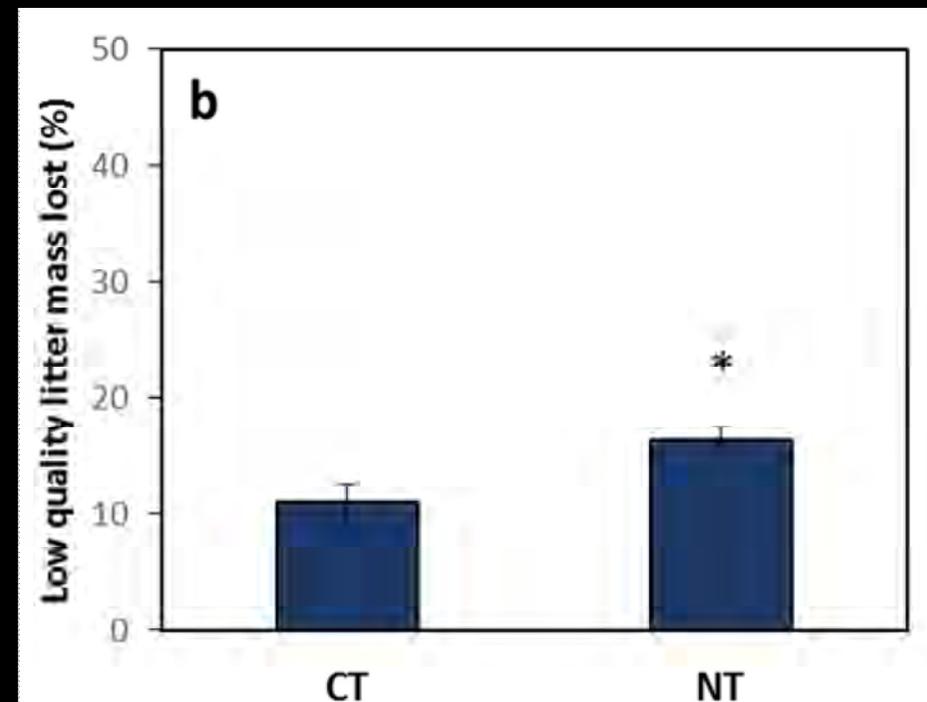
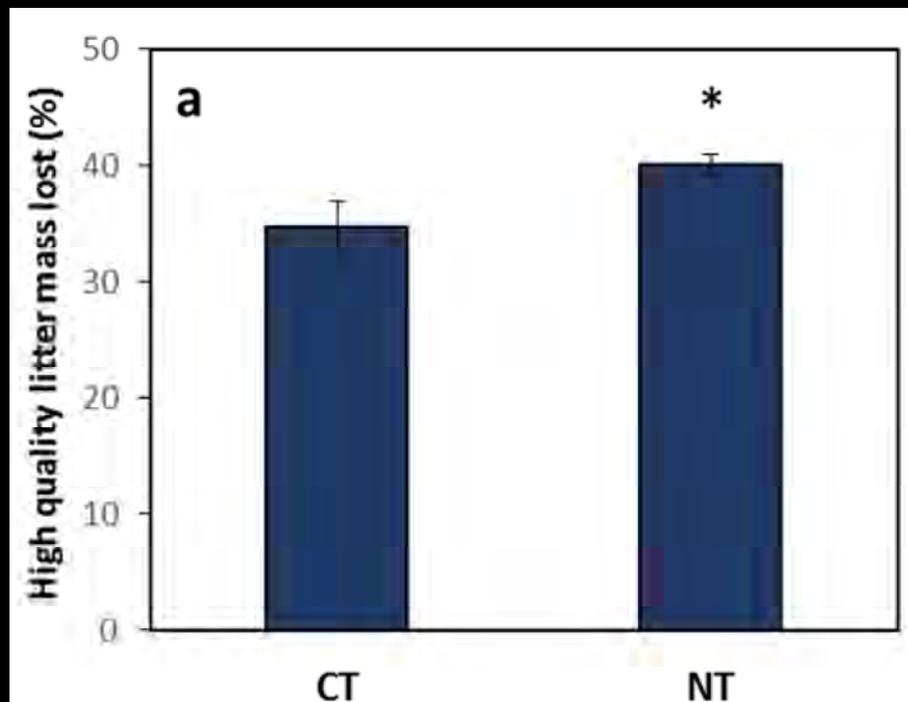
Collembola life forms

- Epigeic vs. edaphic



Collembola functional traits are distinguished by agricultural practices

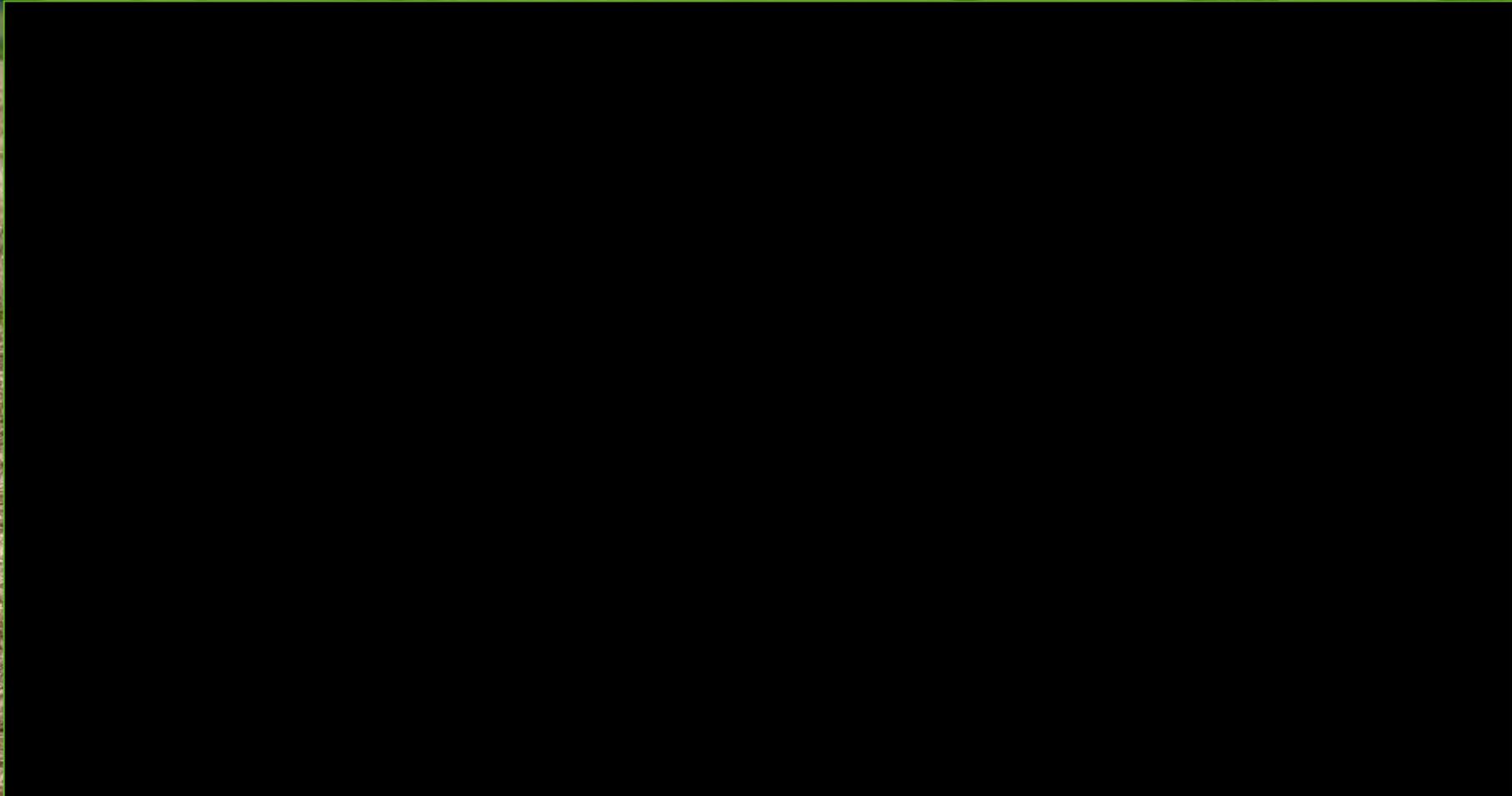
Litter decomposition

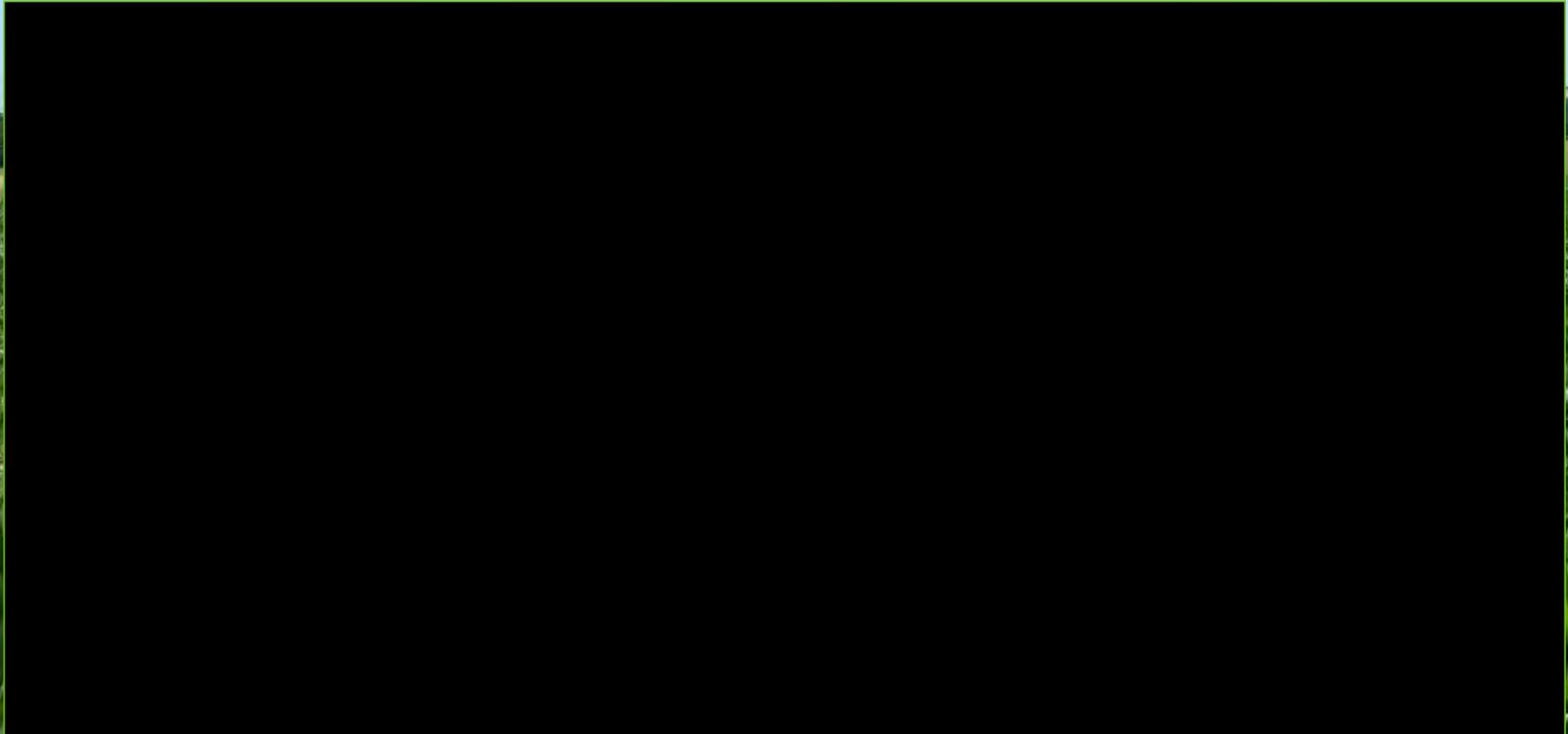


Irrespective of the litter quality, the average amount of litter decomposed over the incubation period was higher under DMCs

Soil properties under DMCs

Conclusion ^{1/2}





Picture : C. Gueule / APAD



Picture : P. Robert / APAD