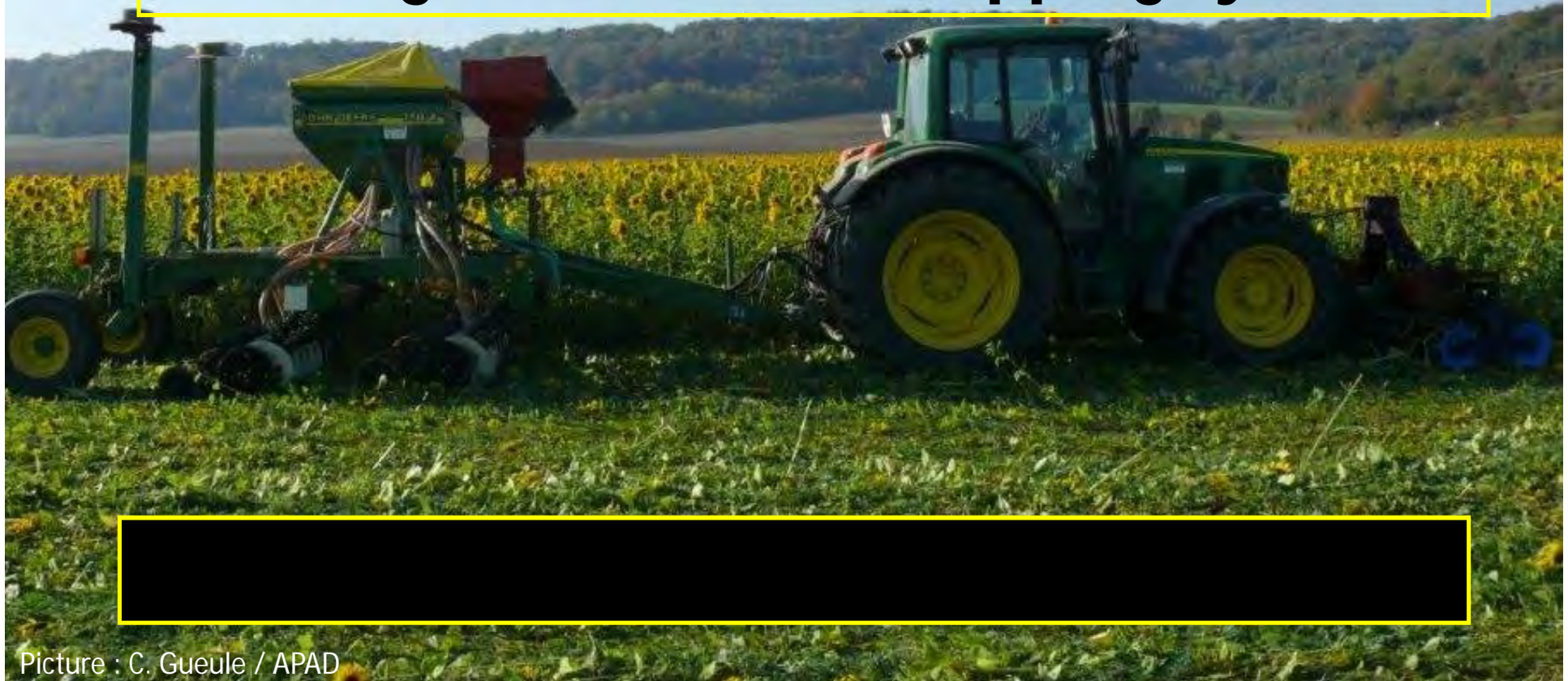




# Soil chemical and biological properties under conventional systems and direct seeding mulch-based cropping systems



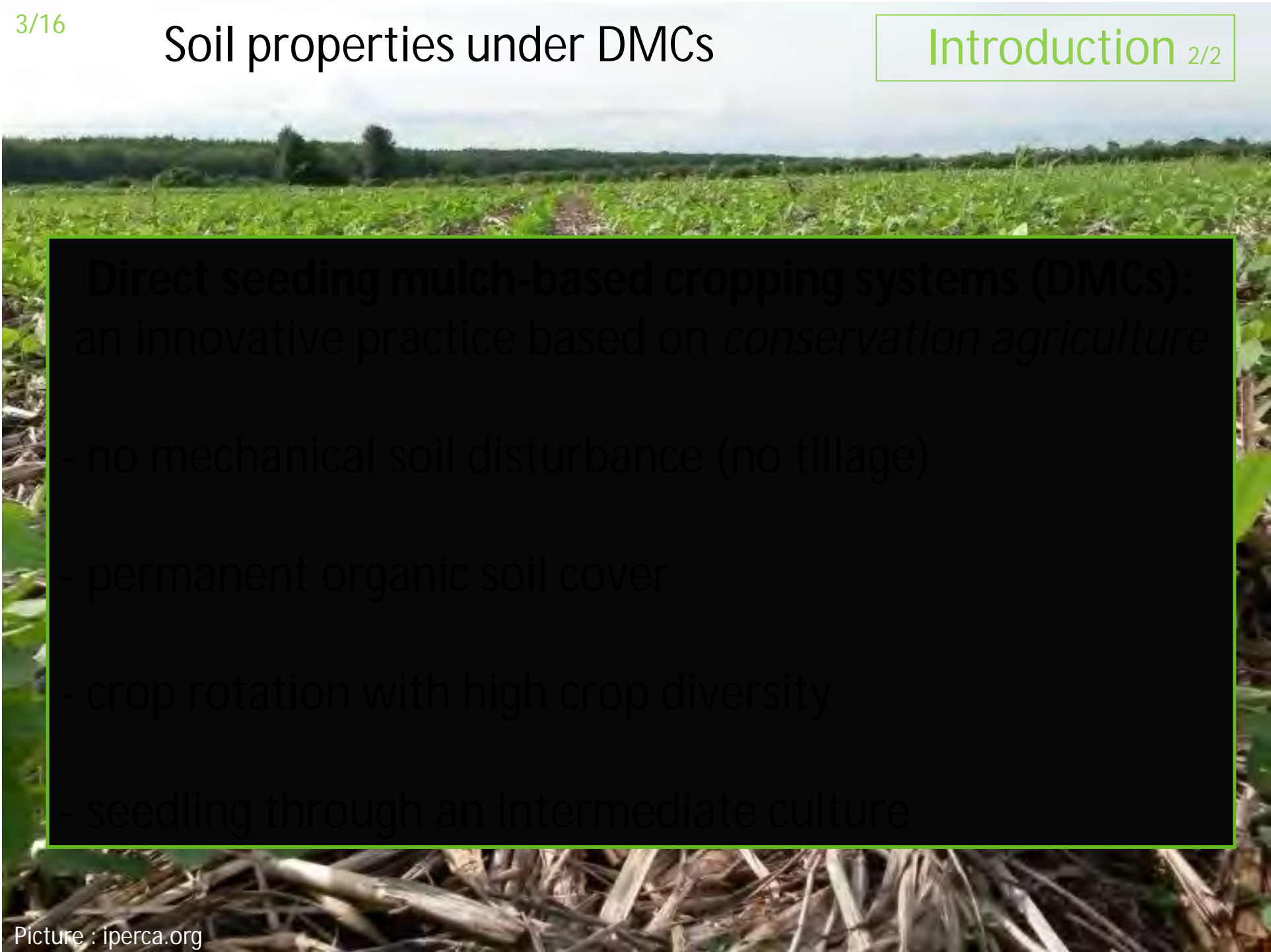
Picture : C. Gueule / APAD

## 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

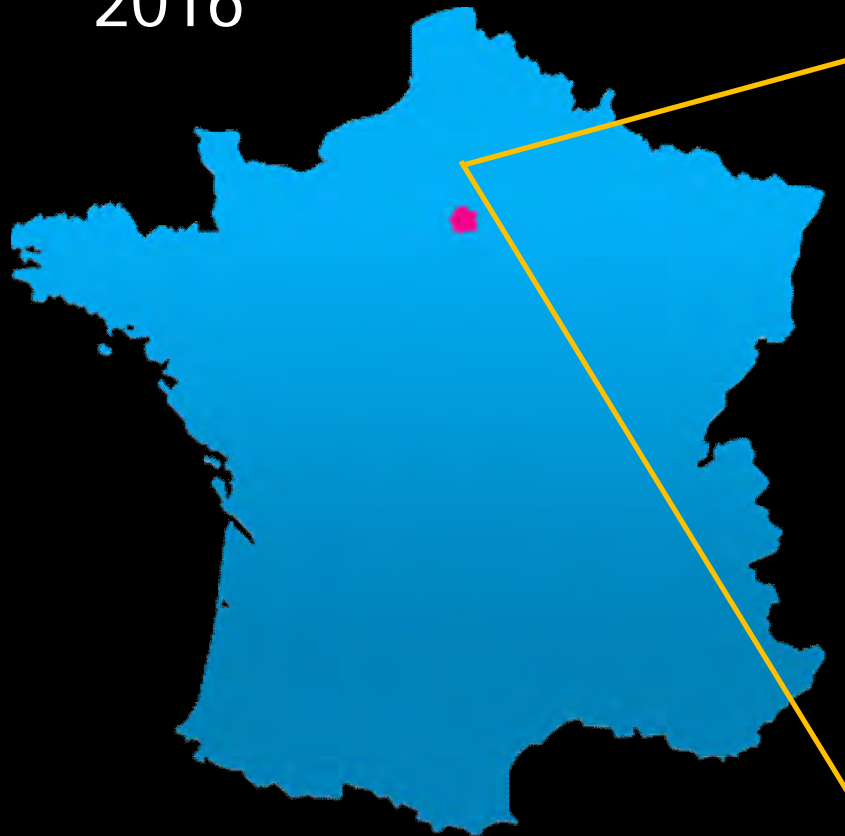
**1) Soil communities are + abundant and + diverse under DMCs**



**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



- Earthworms communities (ISO 23611-1)



- Collembola functional traits (ISO 23611-2)

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

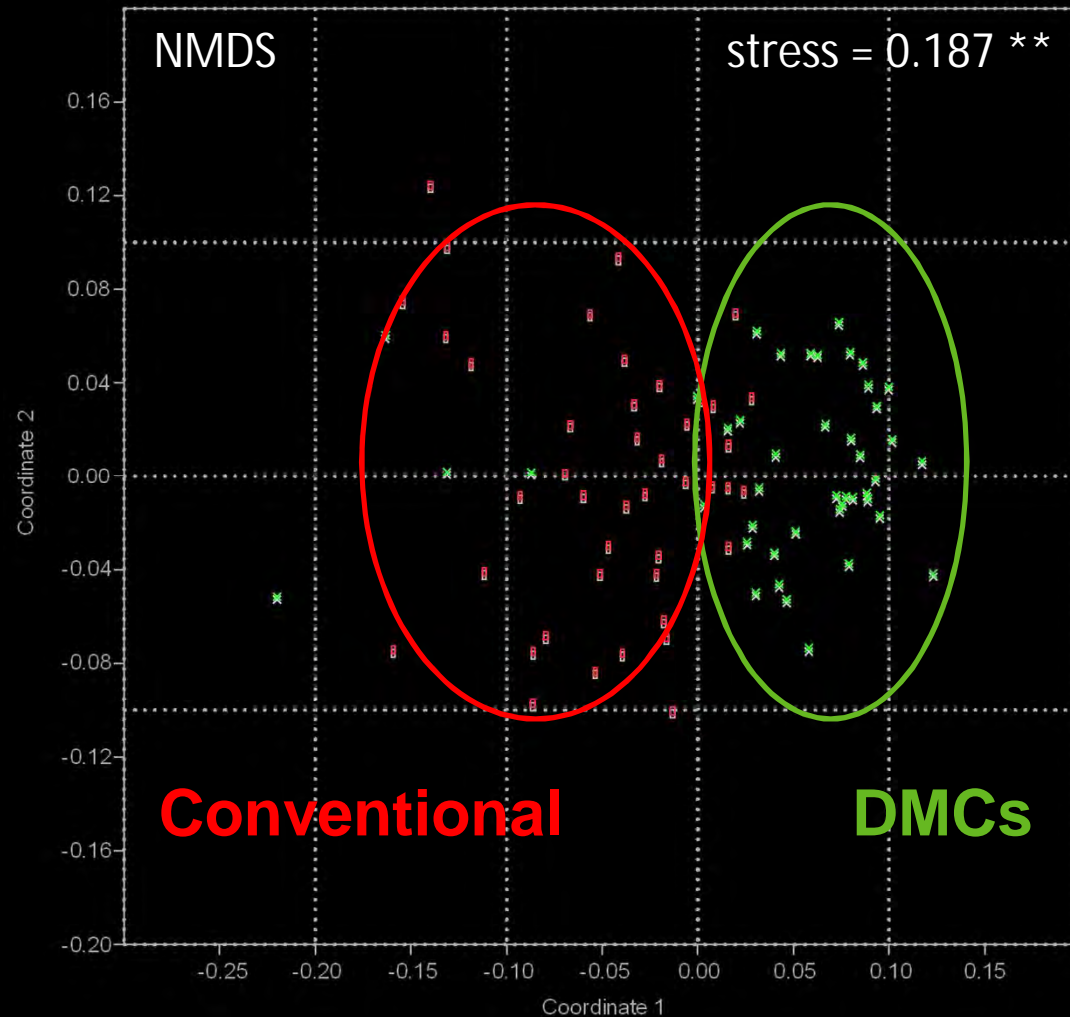


## Earthworms communities



10 species :

- 2 anecic
- 2 epigeic
- 6 endogeic



2 communities are clearly distinguished by agricultural practice

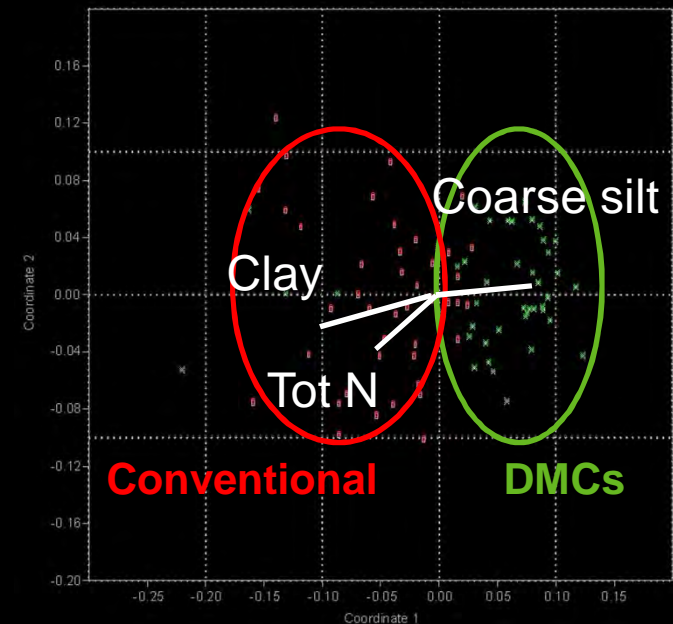
# Soil properties under DMCs

## Earthworms communities



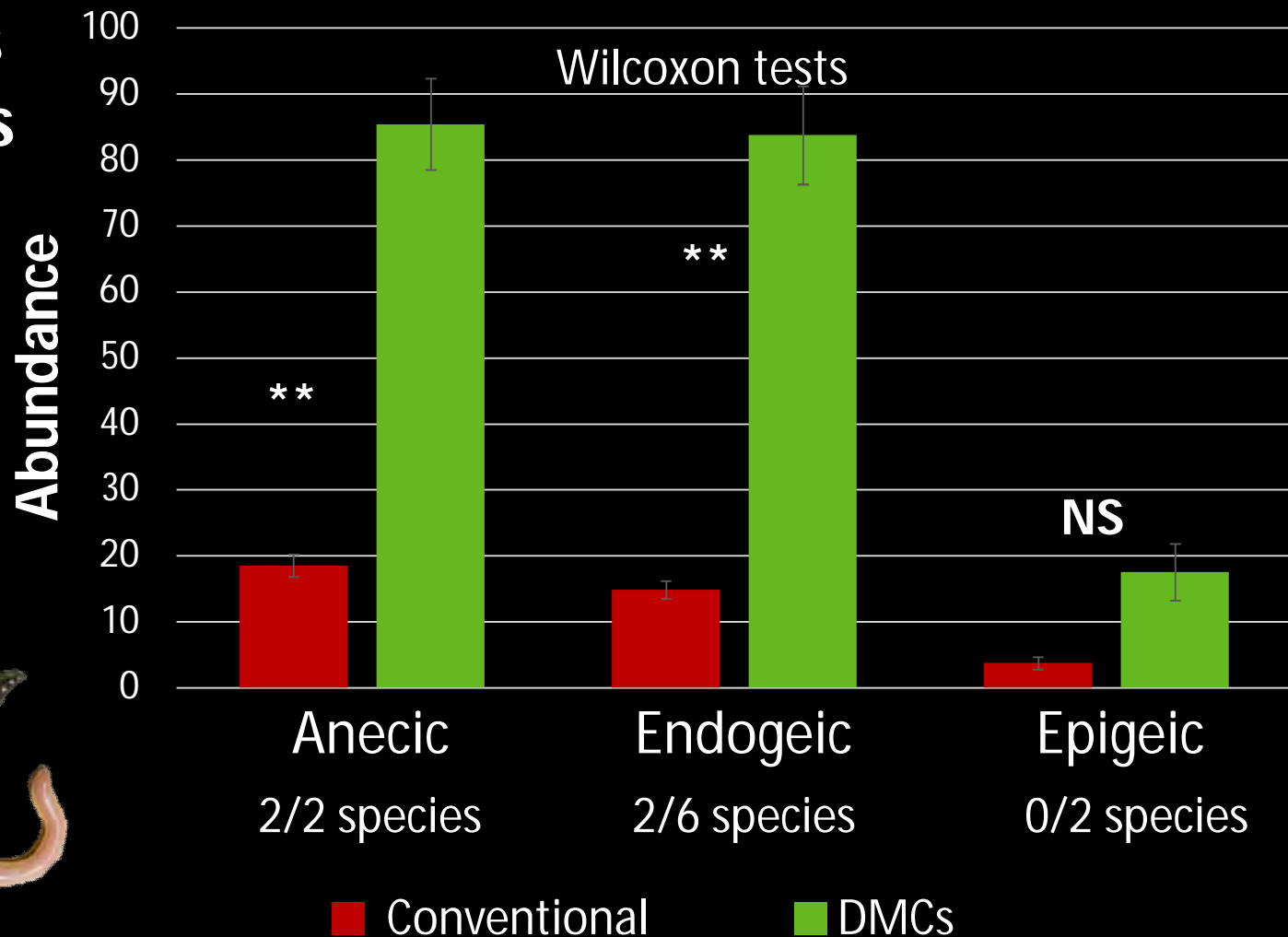
Explanatory variable	P-value
P	0.107
K	0.488
Mg	0.325
Ca	0.051
pH	0.665
Organic C	0.132
Humus	0.132
<b>Total Nitrogen</b>	<b>0.034</b>
C/N ratio	0.062
CEC	0.047
<b>Clay</b>	<b>0.007</b>
Fine silt	0.397
<b>Coarse silt</b>	<b>0.024</b>
Fine sand	0.204
Coarse sand	0.312

## Results <sup>2/5</sup>



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*

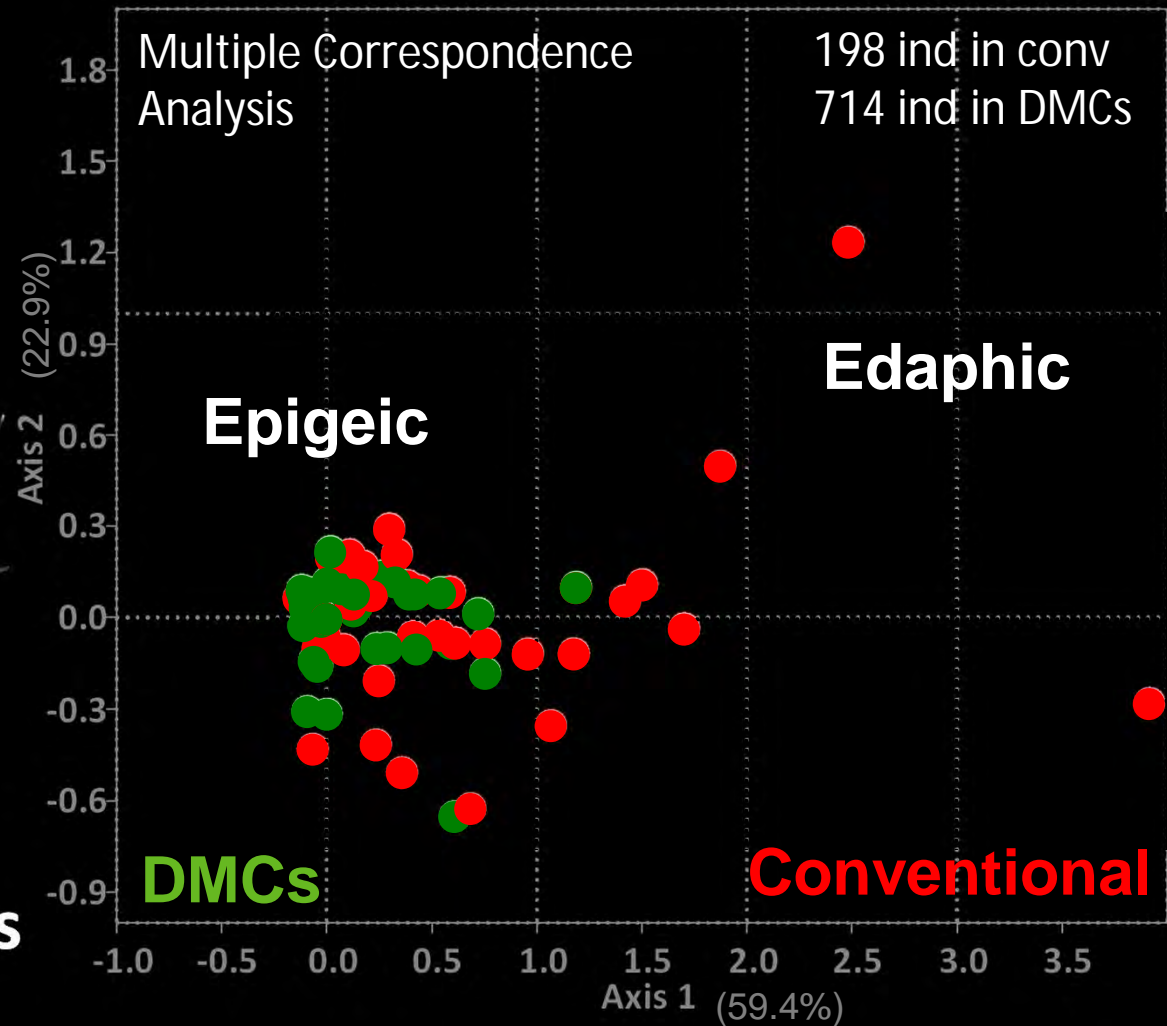
## Collembola functional traits

- body pigmentation
- antennae size
- furca size



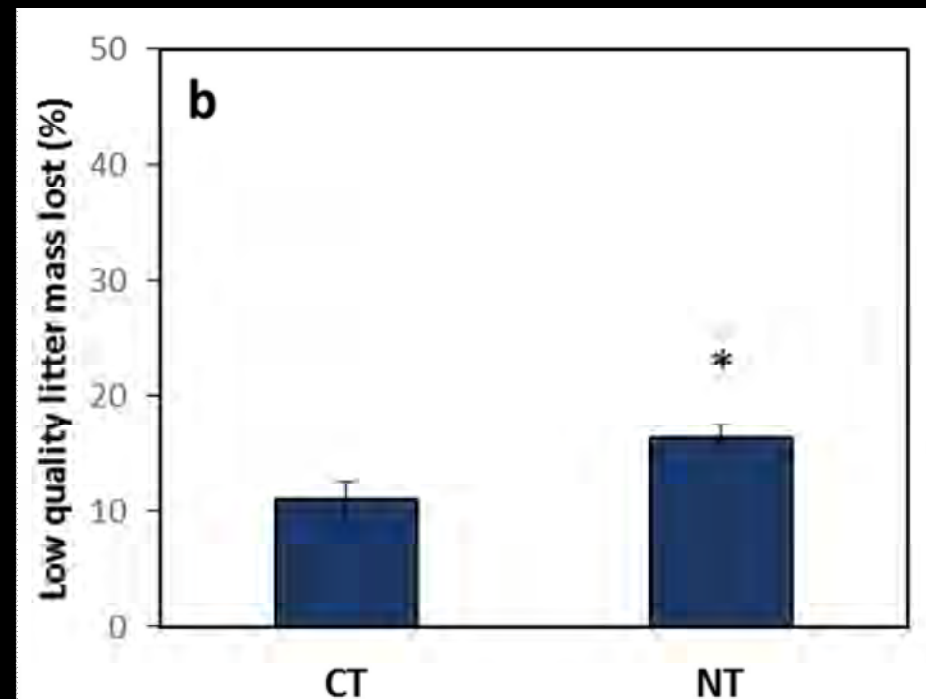
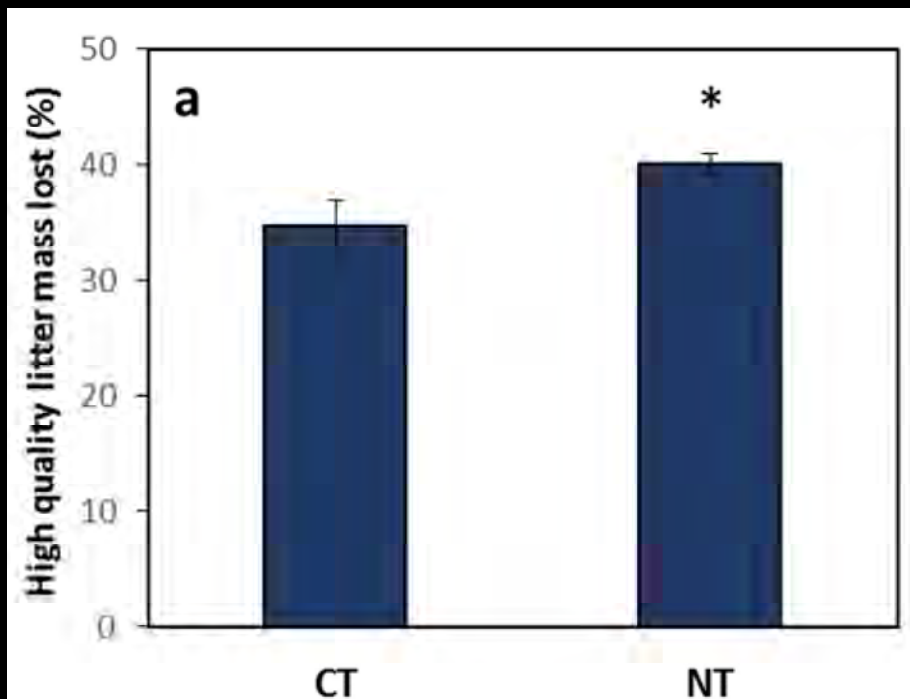
## Collembola life forms

- Epigeic vs. edaphic



Collembola functional traits are distinguished by agricultural practices

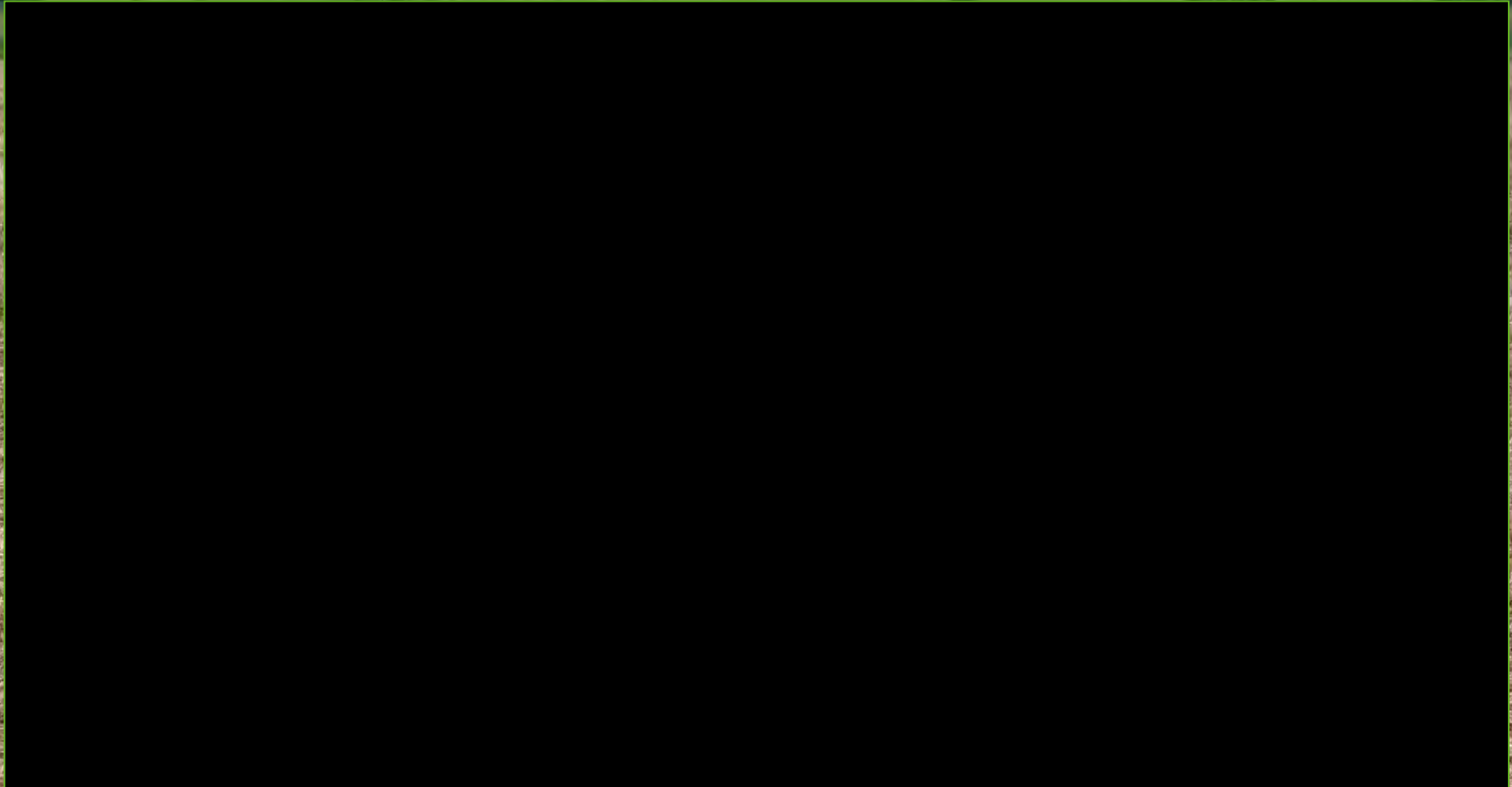
## Litter decomposition

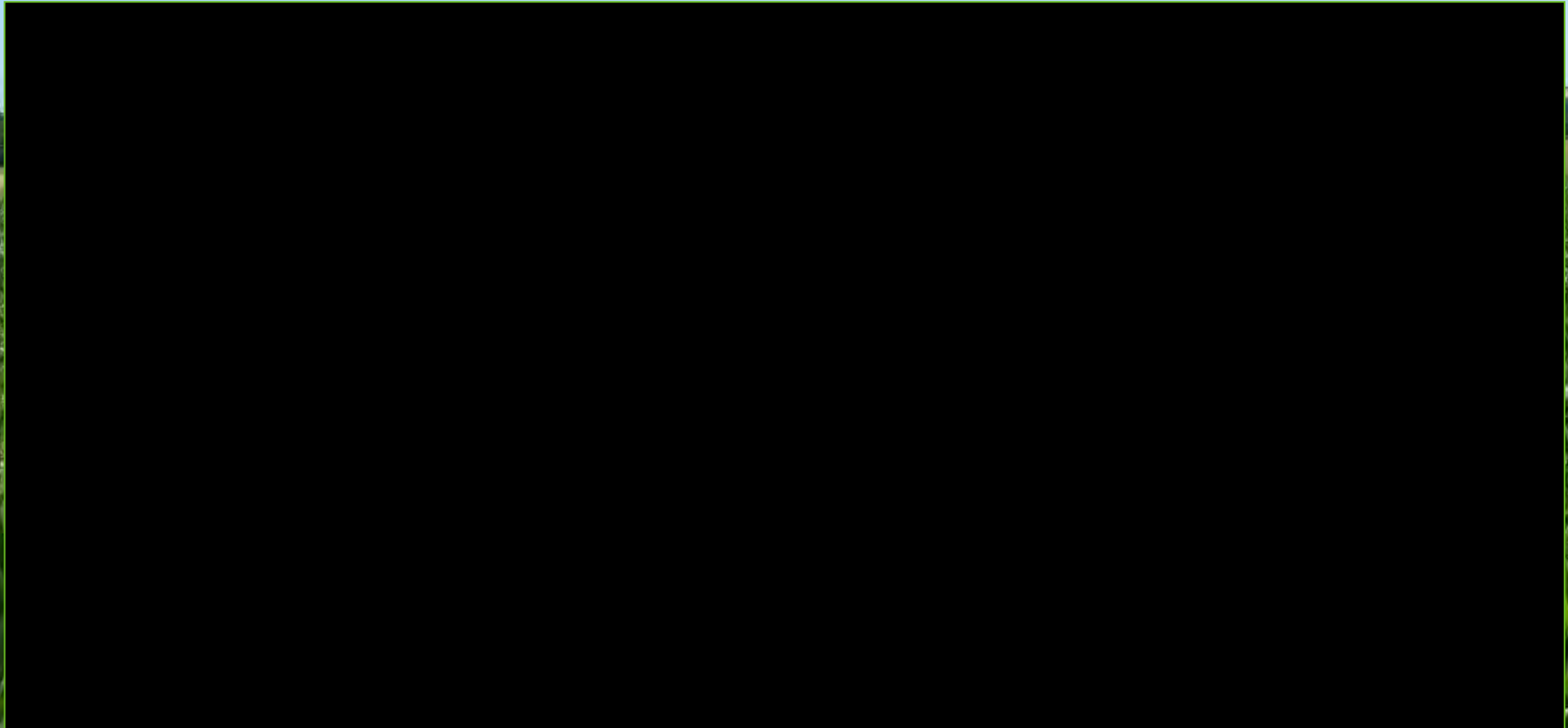


Irrespective of the litter quality, the average amount of litter decomposed over the incubation period was higher under DMCs

# Soil properties under DMCs

Conclusion <sup>1/2</sup>







Picture : P. Robert / APAD