

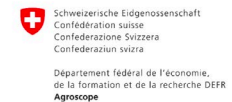


# Network of farmers committed to the non-use of phytosanitary seed treatments

Josep Massana-Codina, Natacha Bodenhausen, Amandine Fasel, Susanne Vogelgsang, Irene Bänziger, Fabio Mascher, Raphaël Charles, Charlotte Savoyat



Partenaires du projet ayant participé à l'élaboration de la demande :



## Réseau d'exploitants engagés pour le non recours aux traitements phytosanitaires des semences

Projet selon l'art. 77a et b LAgr «Utilisation durable des ressources naturelles» de l'Office fédéral de l'agriculture »

4 crops:

**wheat,**

barley,

pea,

lupin

Canton Vaud et

Canton Valais

**73 farmers**

**30 wheat,**

16 barley,

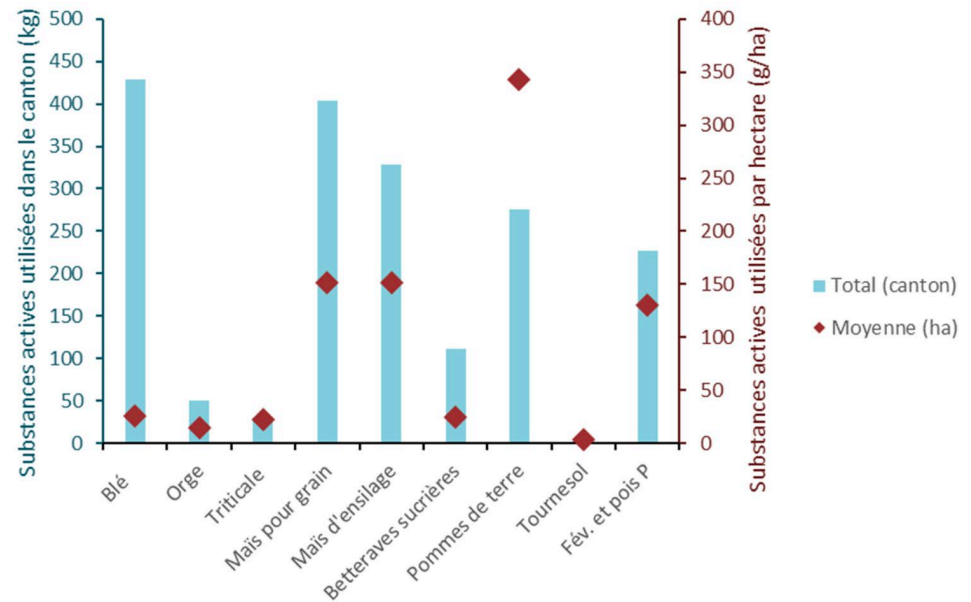
15 pea,

12 lupin

# Seeds are usually coated with fungicides



Utilisation des traitements de semences dans le canton de Vaud



## Alternatives studied:

### Thermoseed

seed treatment based on steam pasteurization

<https://www.lantmannenbioagri.com/thermoseed/>

### Evonta

seed treatment with electrical power

<https://www.evonta.de/Application/46511/>

### Others

### Tillecur

Yellow mustard

<https://www.biofa-profi.de/de/t/tillecur.html>

### Cerall

*Pseudomonas chlororaphis*

<https://www.koppert.com/cerall/>

# Seedborne diseases

- Wheat:
  - **snow mold** (*Microdochium nivale*, *Microdochium majus*)
  - **leaf spot** (*Septoria nodorum*)
  - **common bunt** (*Tilletia caries*)
  - **smut disease** (*Tilletia controversa*)
- Barley: **Loose smut** *Ustilago spp*
- White lupin and pea: **anthracnose** (*Colletotrichum spp*)



Semences infectés avec *Tilletia caries* ou *Tilletia controversa*.



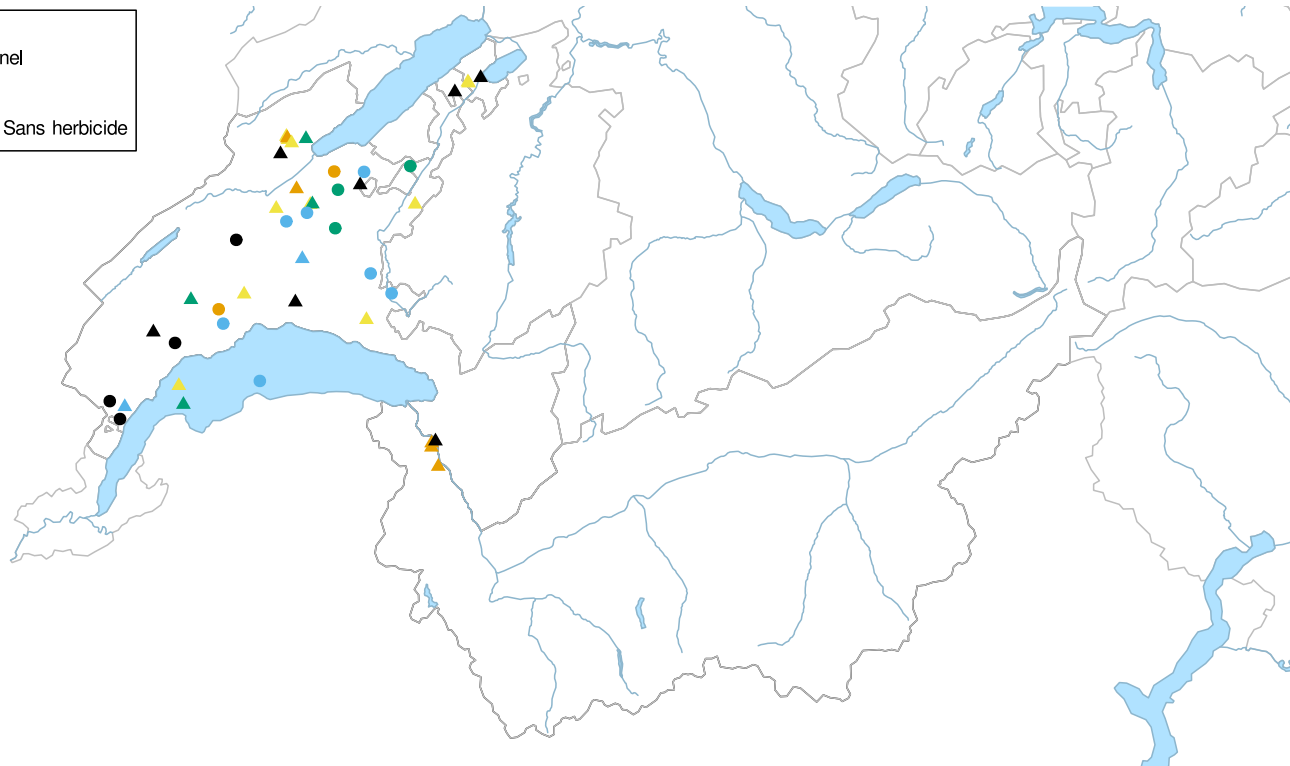
Semences infectés avec *Microdochium majus*



common bunt

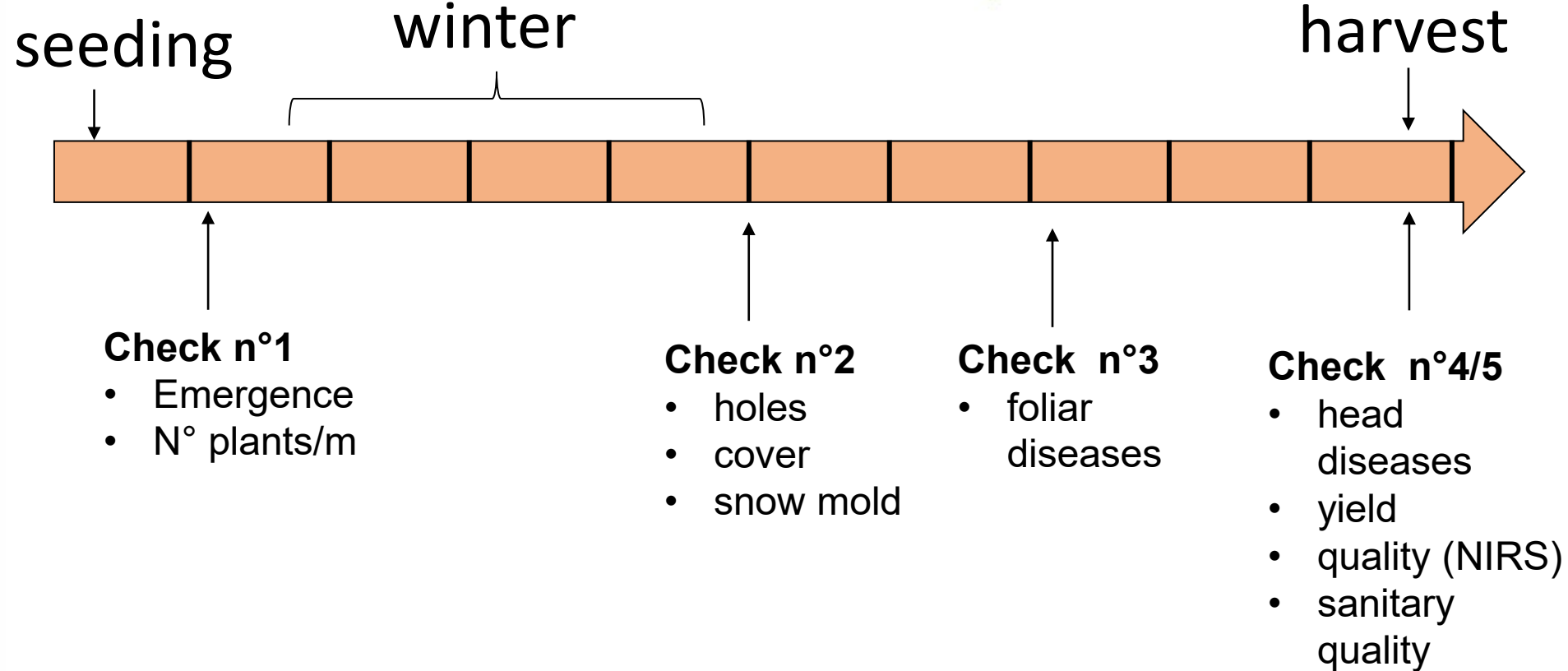
# On-farm trials

- BIO
- Conventionnel
- Extenso
- IP-Suisse
- IP-Suisse / Sans herbicide

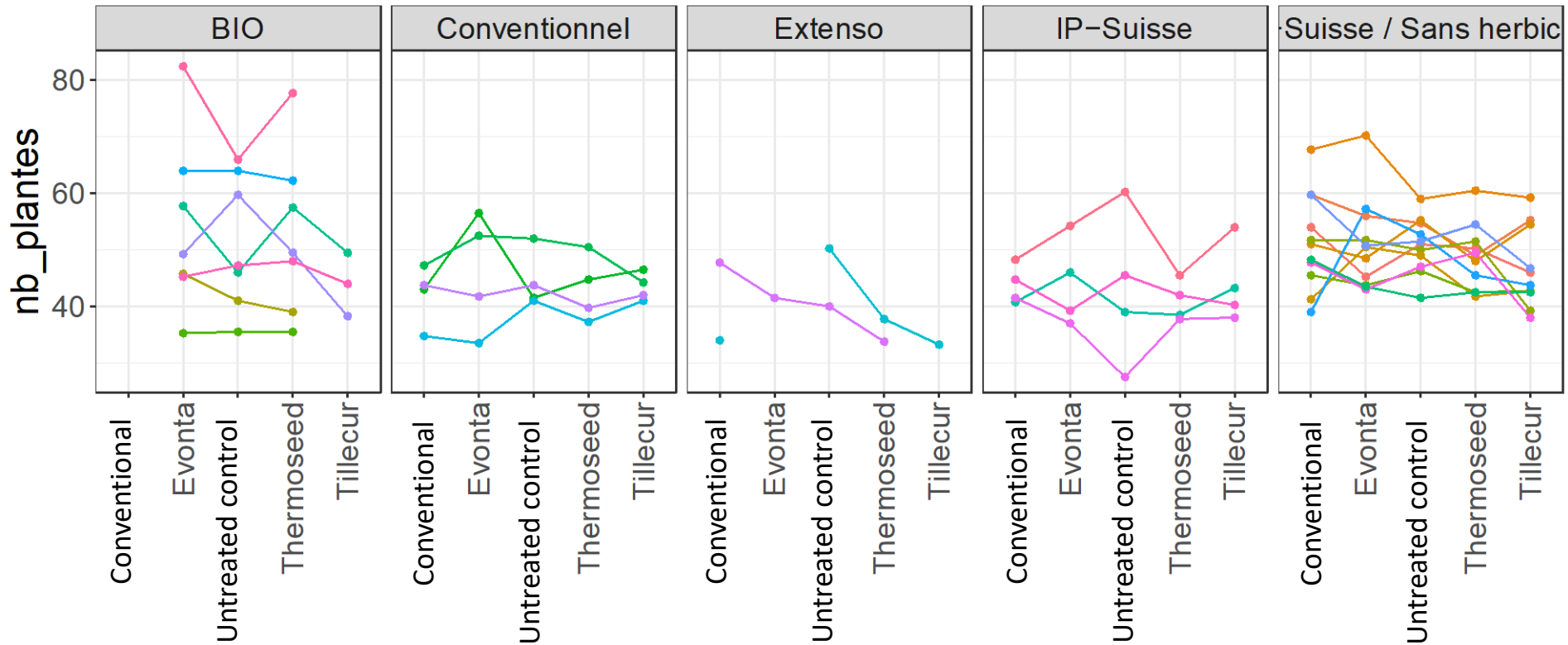


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# Monitoring in cereals

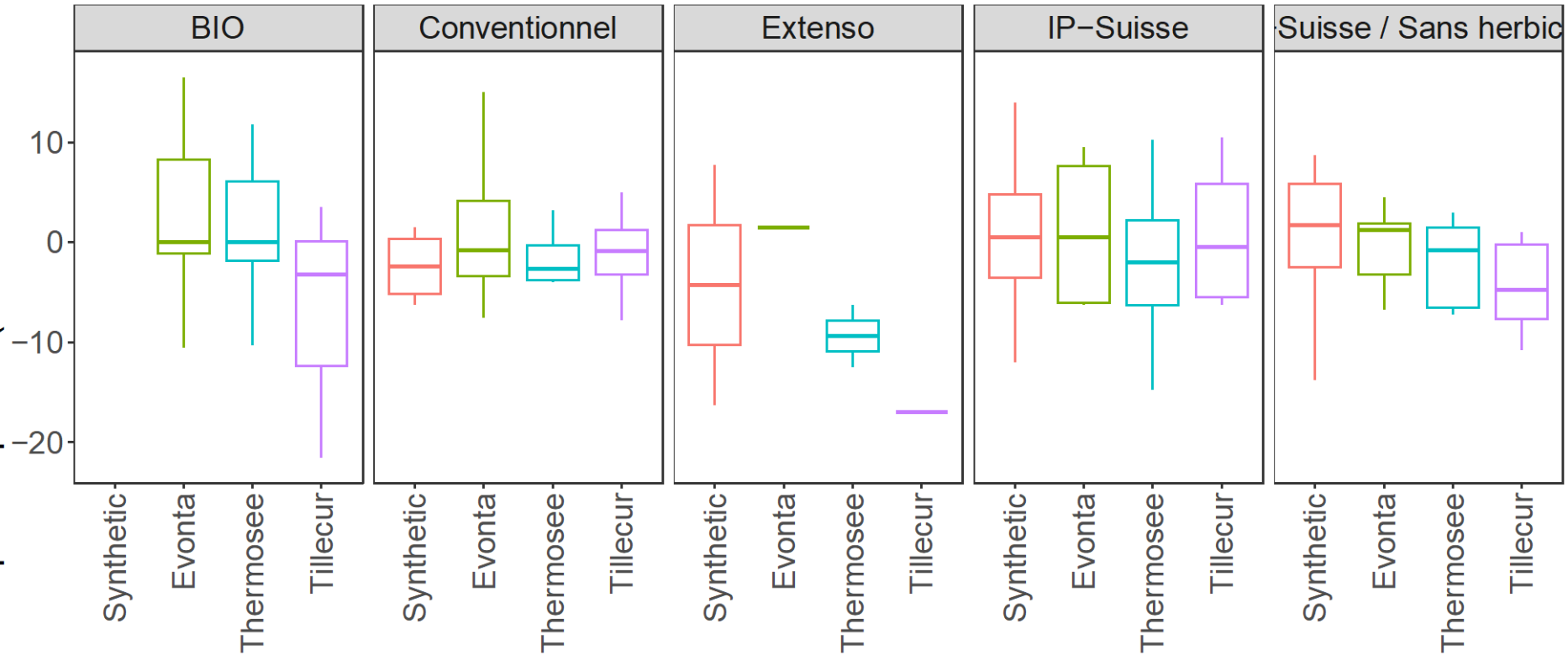


# Effect of treatment on emergence



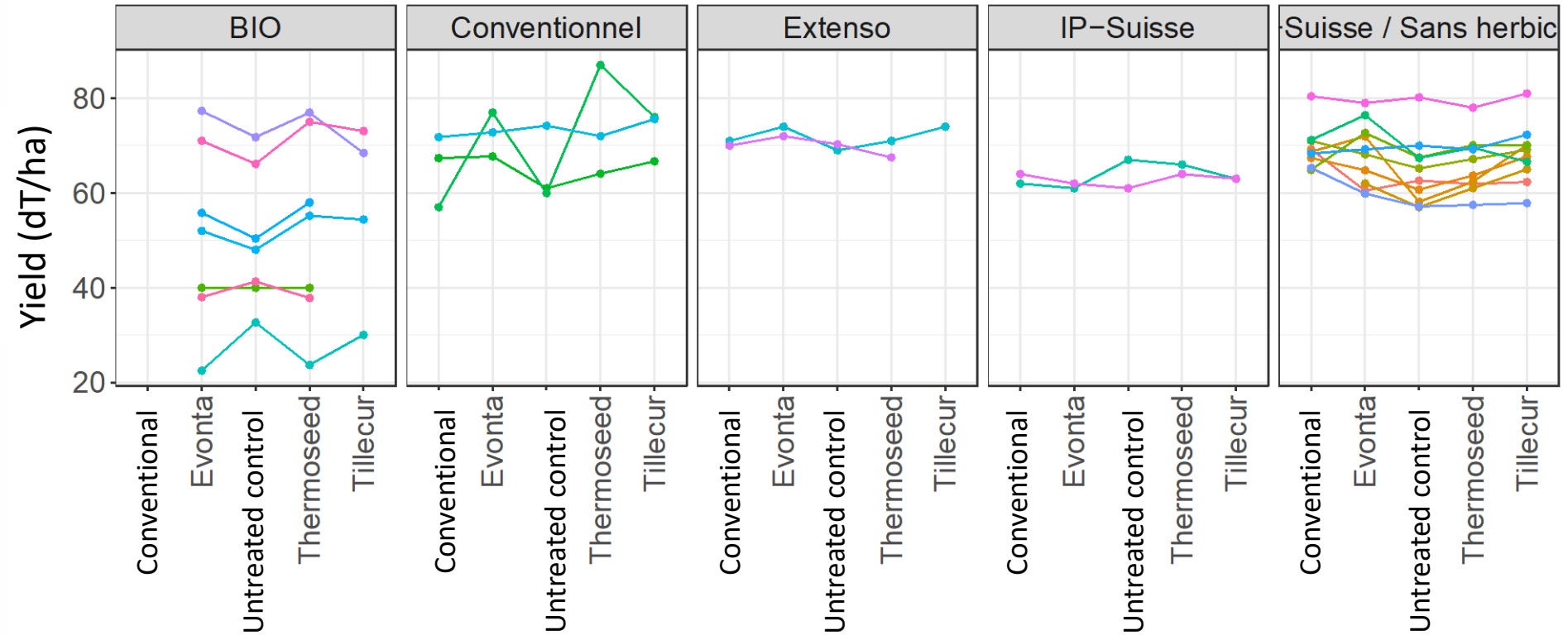
# Effect of treatment on emergence

plants per m (difference to contr





# Effect of treatment on yield



# Soil microbiome analysis

## Number of samples

20 farms

roots	conventional	organic
control	13	7
synthetic	13	
Thermoseed	13	7
Tillecur		4
Trichoderma		1
vinegar		1



Raphaël Charles



Robin Sonnard

FiBL Romandie



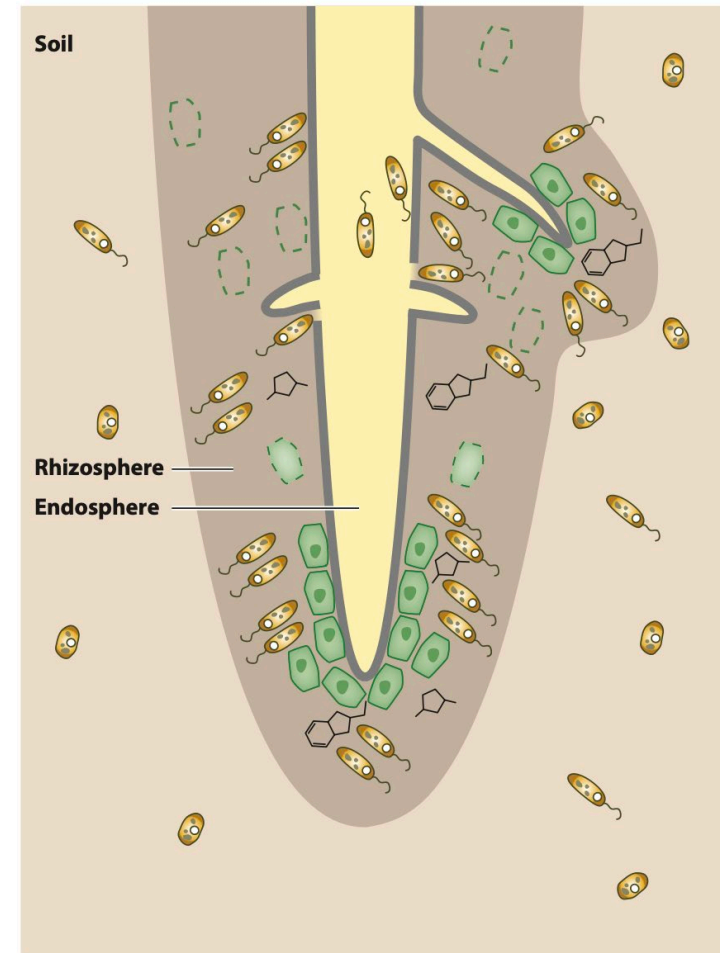
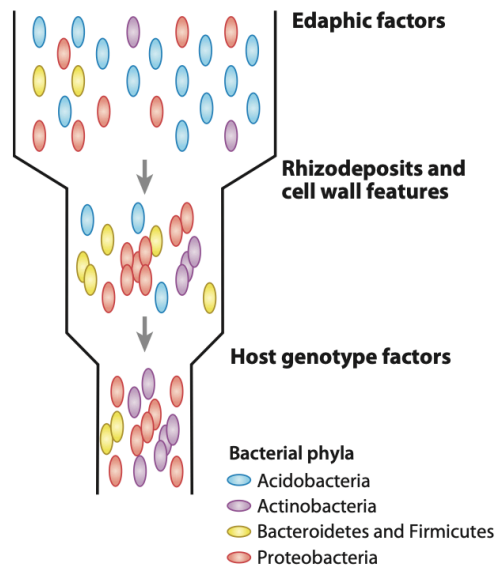
alternatives

soil	conventionel	organic
soil	13	7

altogether: 79 samples

# The rizhosphere

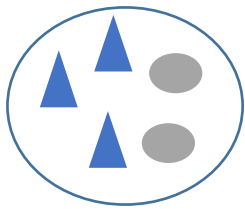
**Définition:** zone under the influence of the root



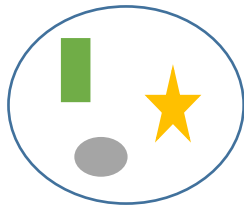
Bulgarelli et al 2013

# Microbial diversity is higher in the soil than in the rhizosphere

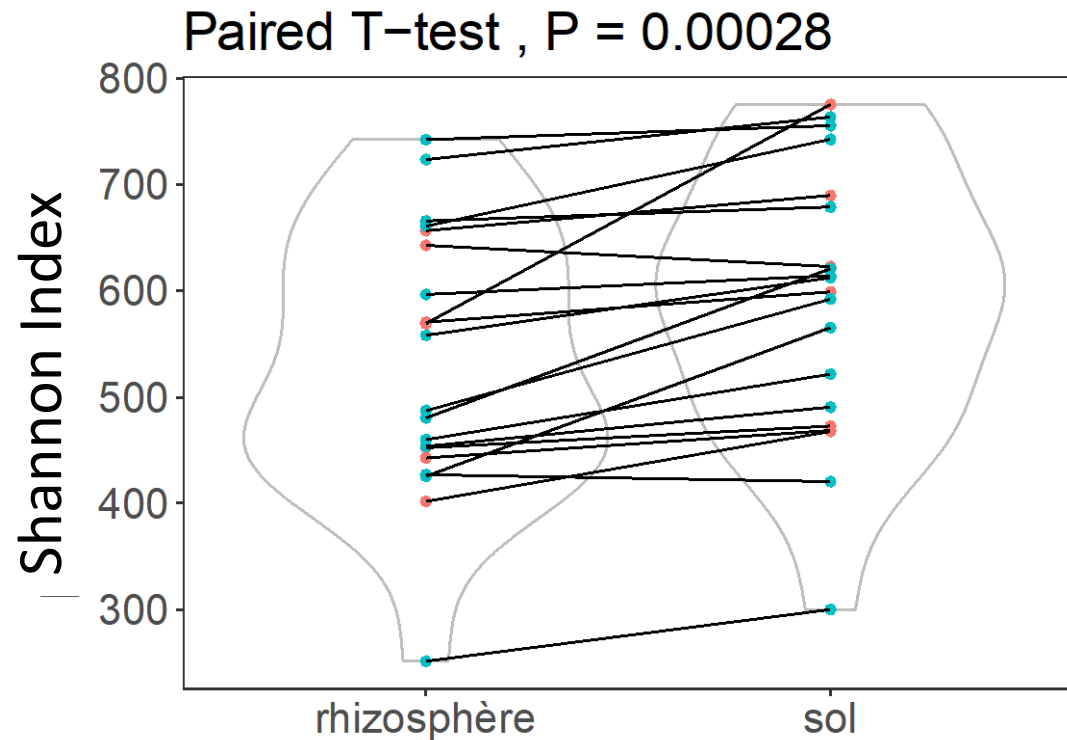
**Definition:** number of species present in a habitat



richness  $n = 2$



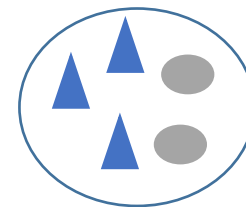
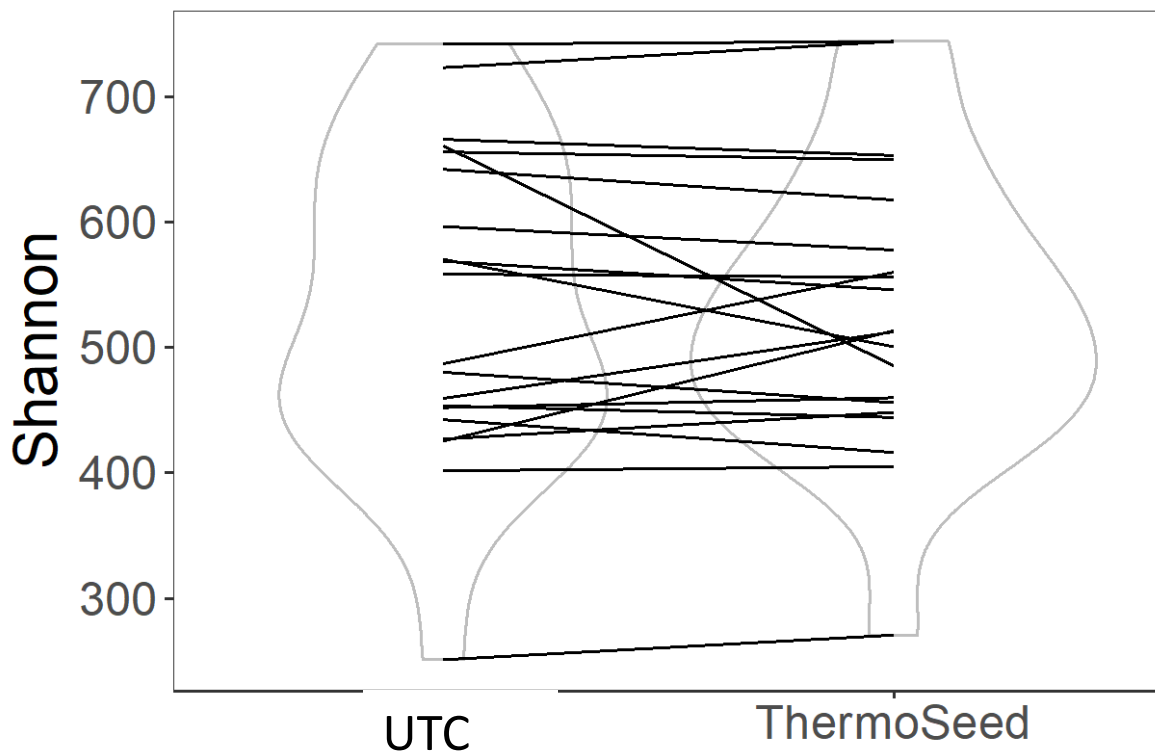
$n = 3$



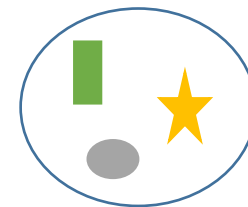
# Effect of seed treatment on diversity

- Thermosteed vs UTC

Paired T-test ,  $P = 0.6748$



$n = 2$

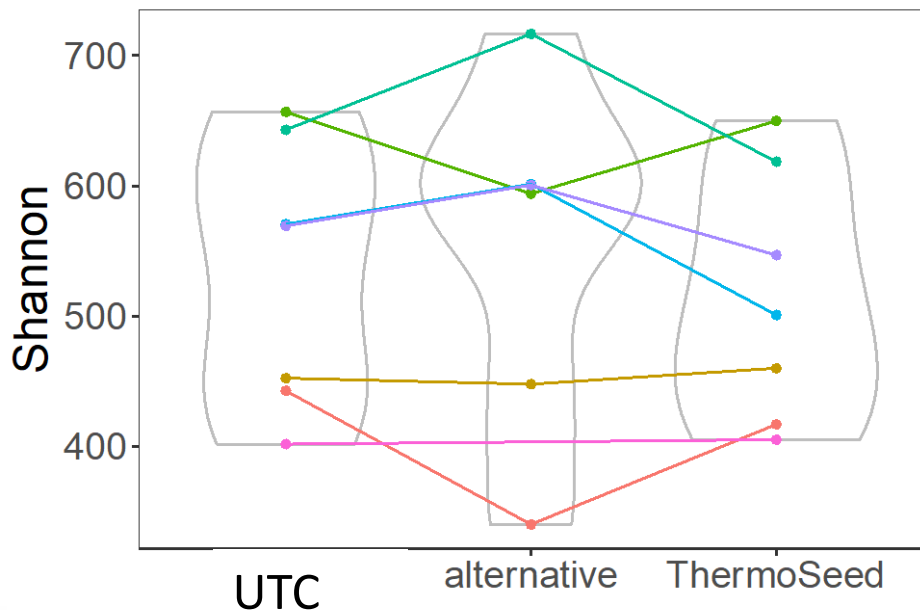


$n = 3$

# Effect of seed treatment on diversity

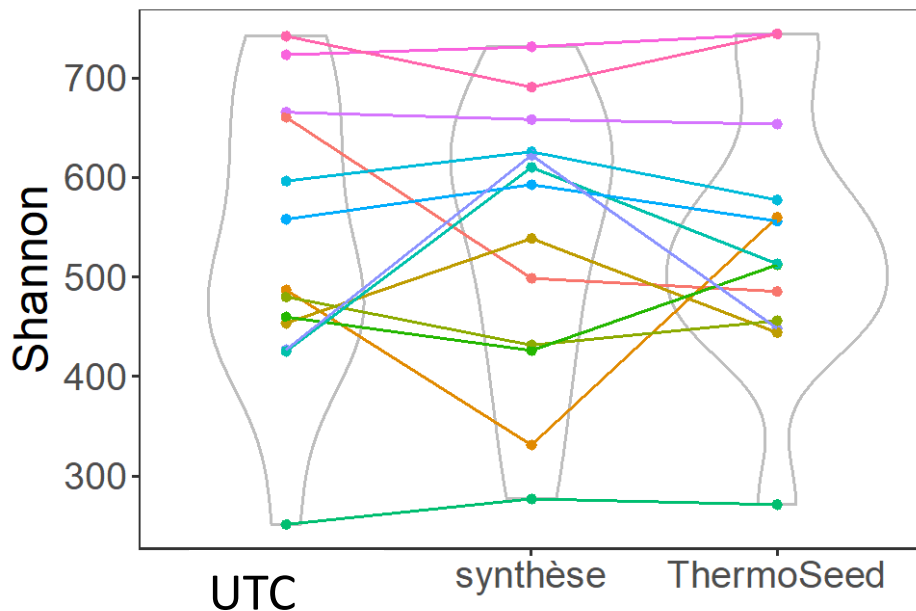
## Organic

$F = 0.44765$  ,  $P = 0.65027$



## Conventional

$F = 0.051993$  ,  $P = 0.94944$



# Conclusions and perspectives

- no difference between treatments for the agronomical parameters
- no difference between treatments at the microbiome level
- Absence of seedborne diseases → the use of seeds with low pathogen contamination decreases the risk of seedborne disease development(it is not necessary to treat clean seeds!)

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# Rés sem

## Thank you for your attention



Une filiale de Prométerre



# FiBL



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Département fédéral de l'économie,  
de la formation et de la recherche DEFR  
Agroscope



Haute école  
spécialisée bernoise



# Rés sem

## Extra slides



Une filiale de Prométerre



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Agroscope

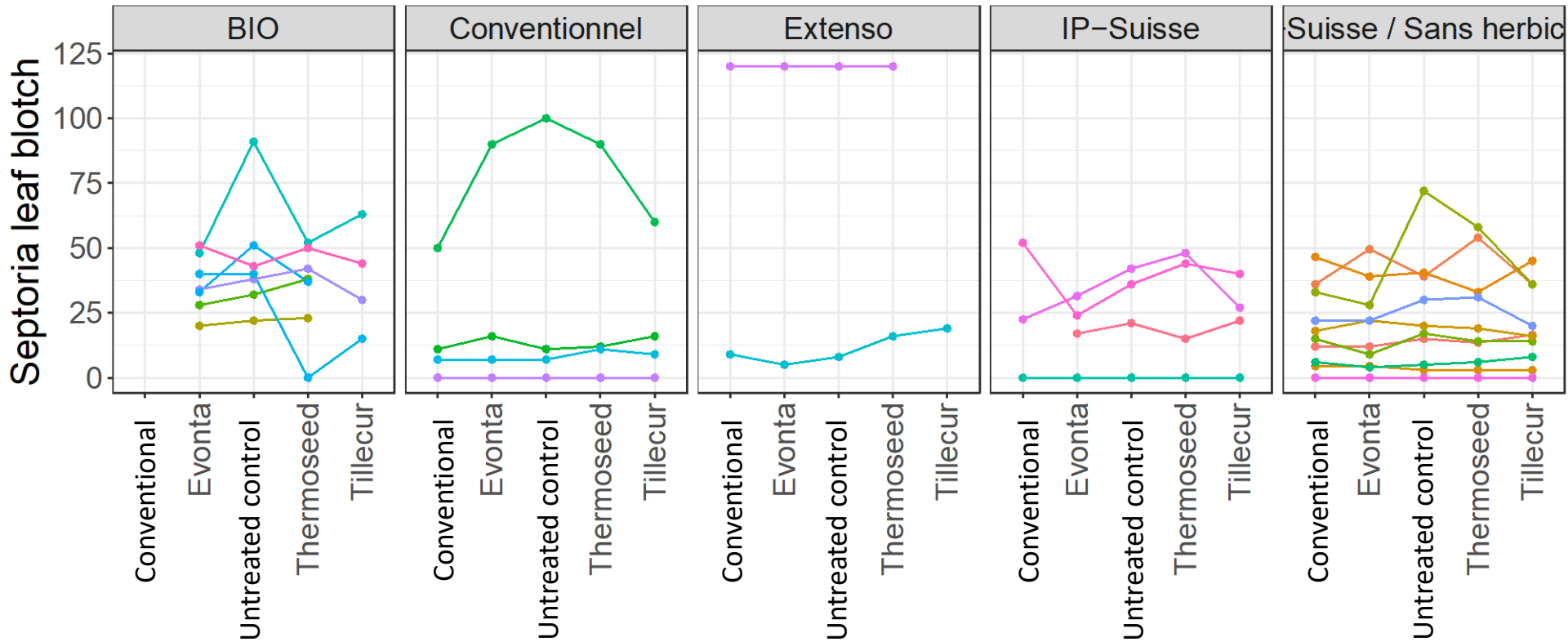


Haute école  
spécialisée bernoise

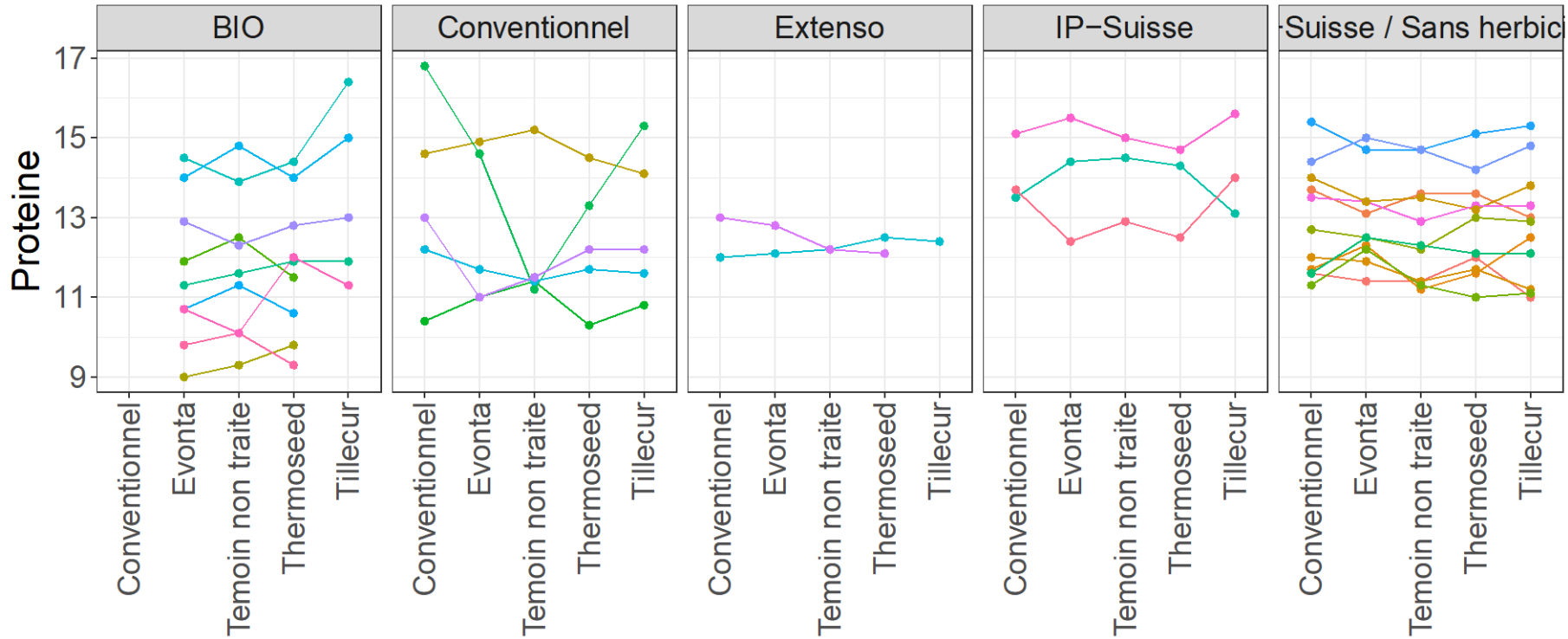
# Work organization

- Recruitment of farms and coordination of project by Proconseil
- Seed provided by “Société cooperative des sélectionneurs”, ASS
- **Monitoring cereals by Agroscope**
- Monitoring protein crops by FiBL Romandie
- Economic and social factors for decision making by FiBL Romandie
- **Monitoring soil life by FiBL**
- Workshops with farmers organized each year

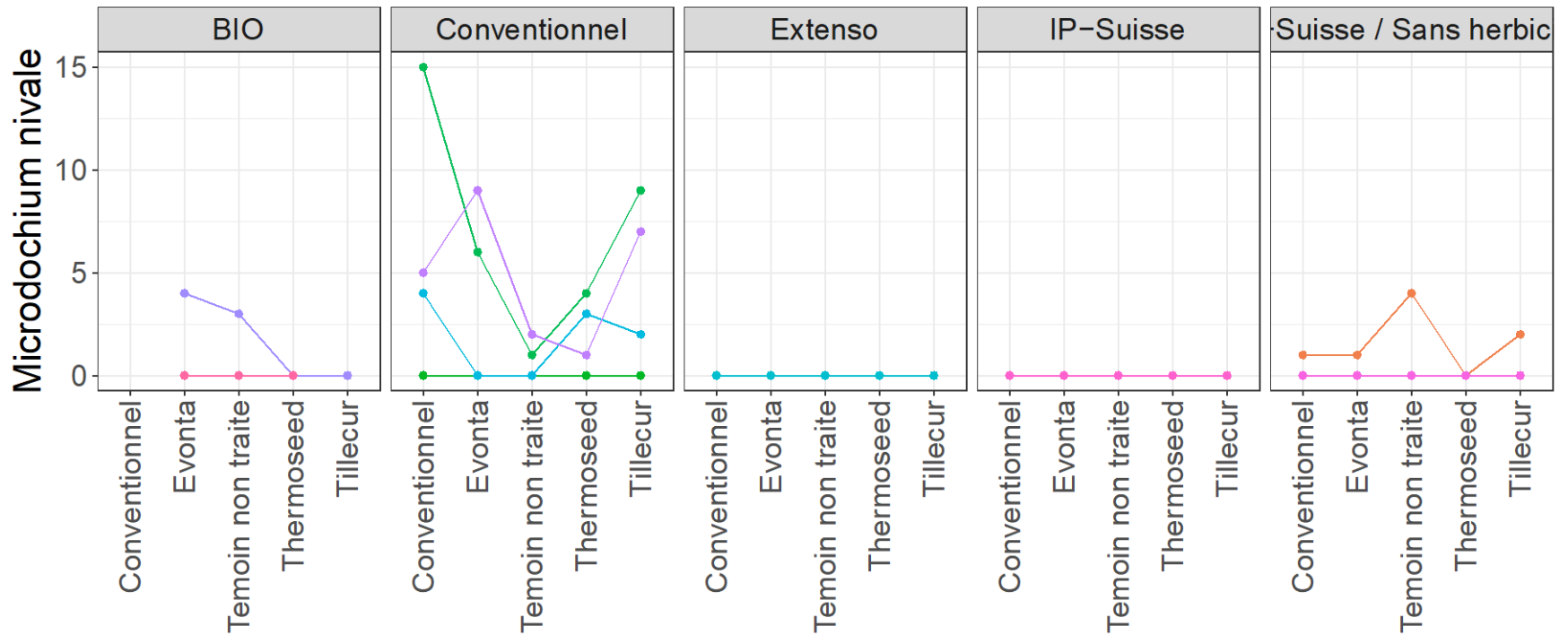
# Effect of treatment on foliar diseases



# Quality (protein)



# Sanitary quality



# In the molecular biology lab



Sonja  
Reinhard

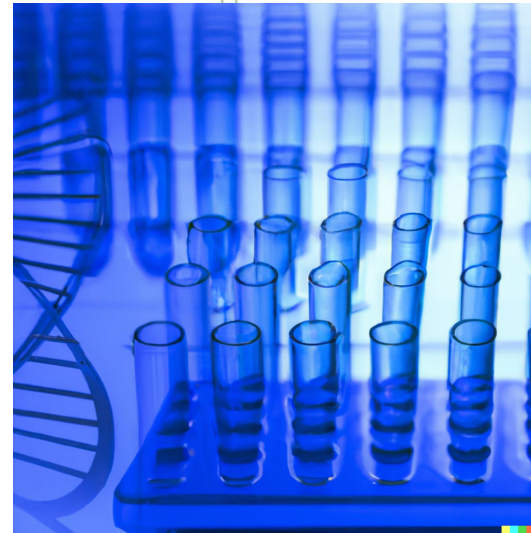
images: DALL-E



80 samples



DNA  
extraction



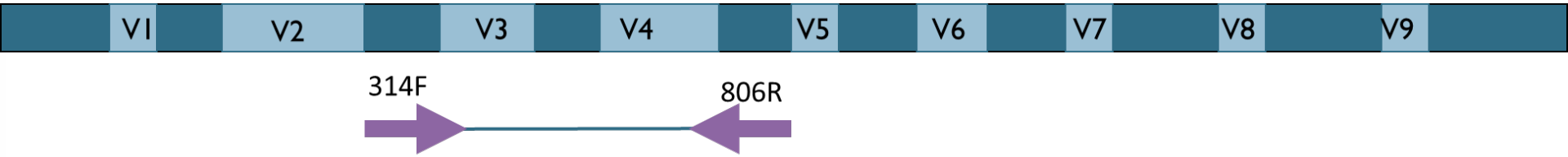
Genomic DNA



PCR and  
sequencing

# Analysis of the microbiome by sequencing of the 16S rRNA gene

9 hypervariable regions



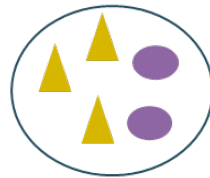
- amplification by PCR of a fragment of the 16S rRNA gene
- each sample is barcoded with a nucleotide sequence



Genome Quebec Innovation Center (Montreal, Canada).

# Monitoring of soil life: bacterial and fungal communities

- What is the effect of the treatment on the microbial diversity?

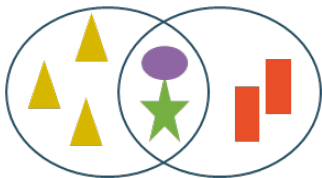


richesse  $n = 2$

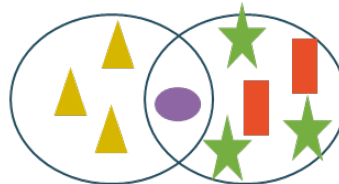


$n = 3$

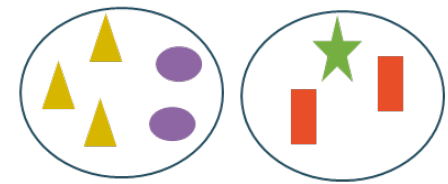
- What is the effect of the treatment on community composition?



Bray-Curtis: 0.55



Bray-Curtis: 0.8



Bray-Curtis: 1