

Ecosystemic (dis)services of field margin vegetation in French agroecosystems

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Introduction

Field margin vegetation : biodiversity and services

- **Important role for biodiversity**

→ Food and shelter for biodiversity



→ Connectivity between habitat patches

- **Ecosystem services delivered**

→ Buffer zone for pesticides

→ Erosion fighting

→ Biologic regulations



Field margin vegetation : services and disservices

- Risk of disservices



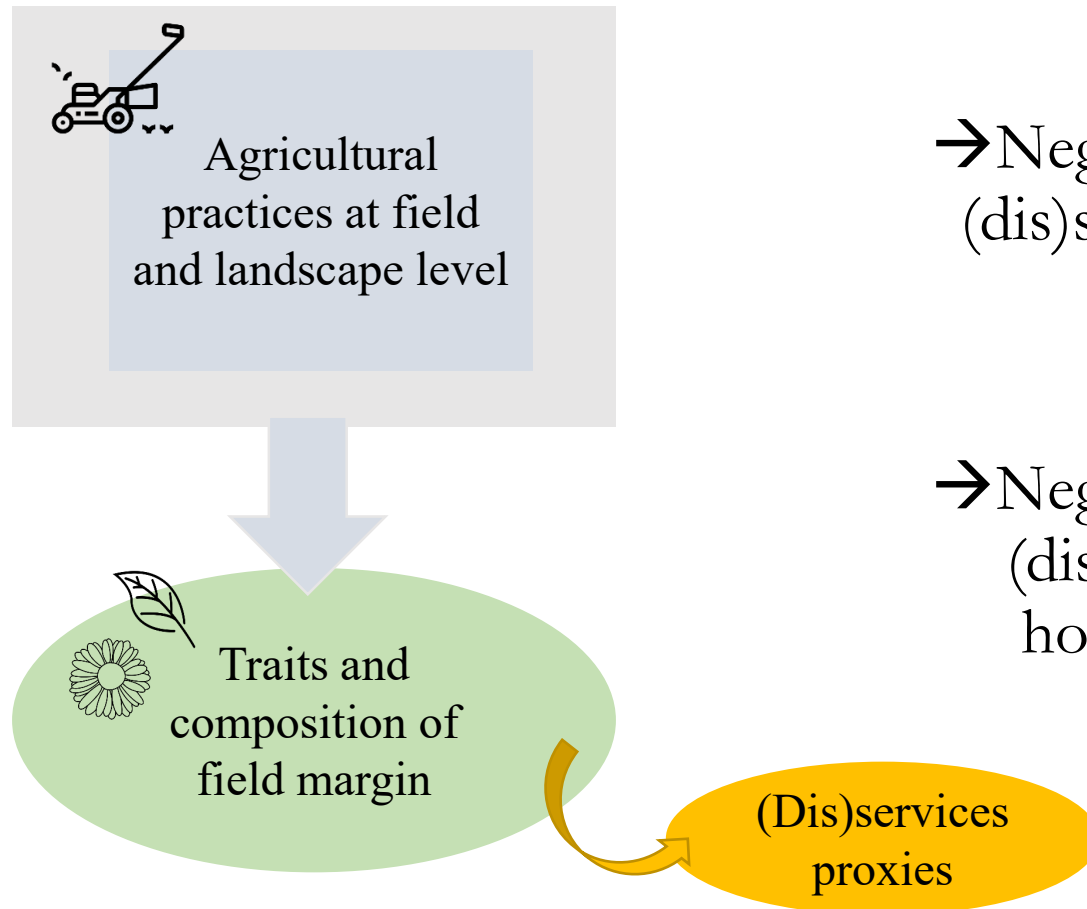
→ Host problematic weeds around the field

- Services & disservices can actually be linked



Research question

What are the effects of agricultural practices on the (dis)services provided by field margin vegetation ?

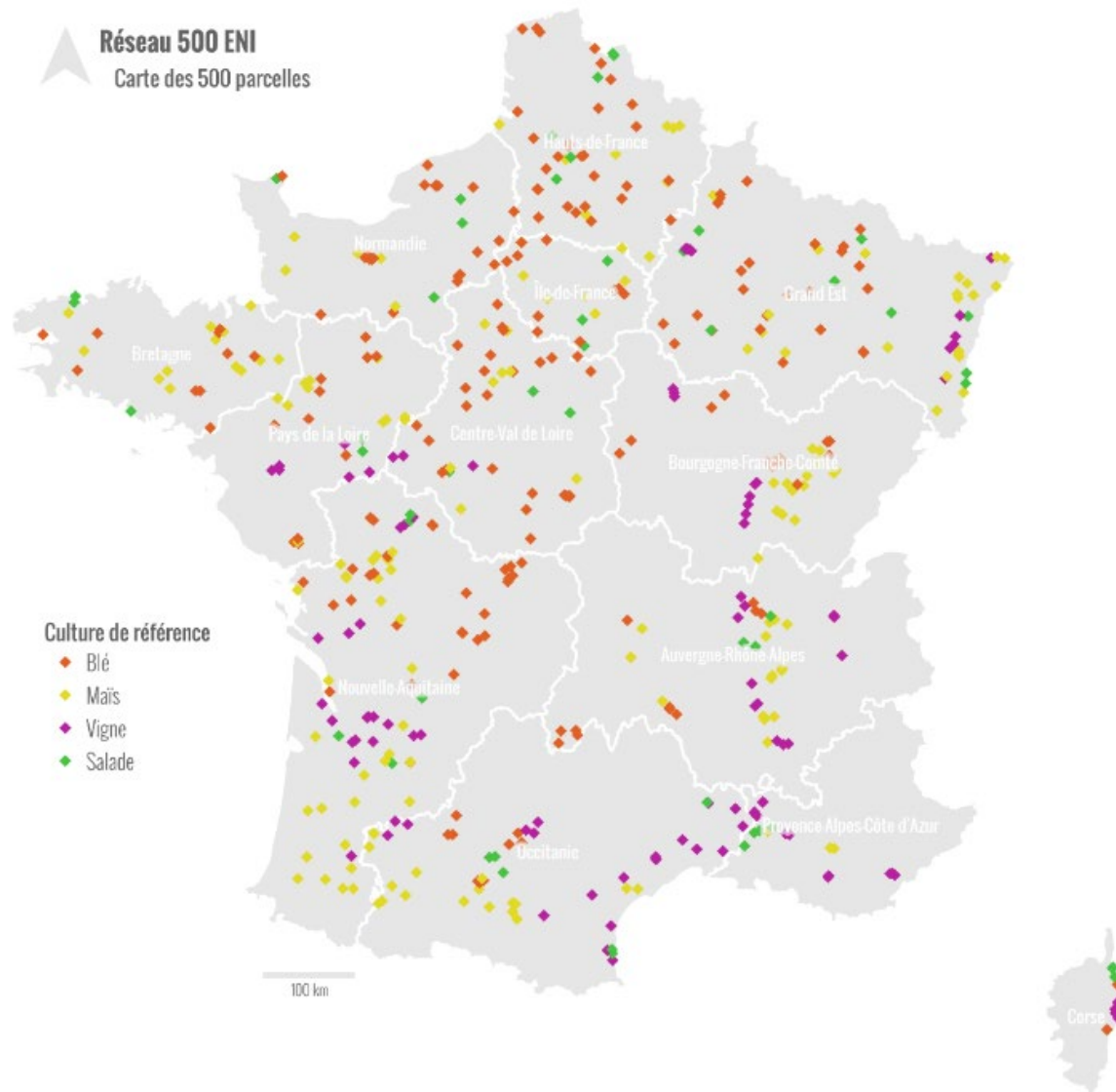


→ Negative impacts of intensification on (dis)services at the field level by favoring ruderal species in the field

→ Negative impacts of intensification on (dis)services at the landscape level by homogenizing regional species pool

Material and methods

The 500 ENI network to assess field margin vegetation

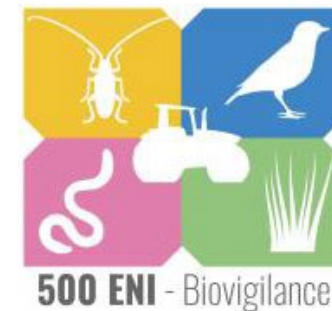


Large scale :

- Temporal : since 2013
- Spatial : all over France
- Agronomic : 458 fields of 4 different crops

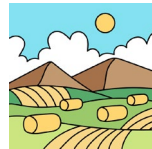
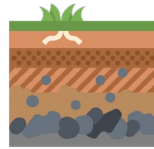
High levels of precision with annual monitoring :

- Agricultural practices
 - Biodiversity



Environmental variables

- T° and rainfalls
- Soil characteristics
- Landscape elements at 1km radius
- Adjacent elements



Classify all the fields in
few similar groups
using *ascending*
hierarchical classification

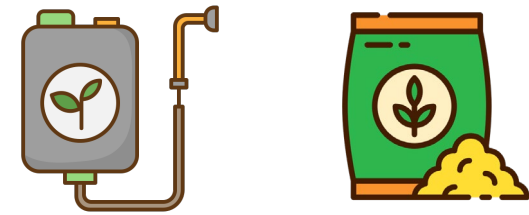
Agronomic predictors

- Pesticides at the landscape (commune) scale



- TFIs in the landscape
- % of organic fields

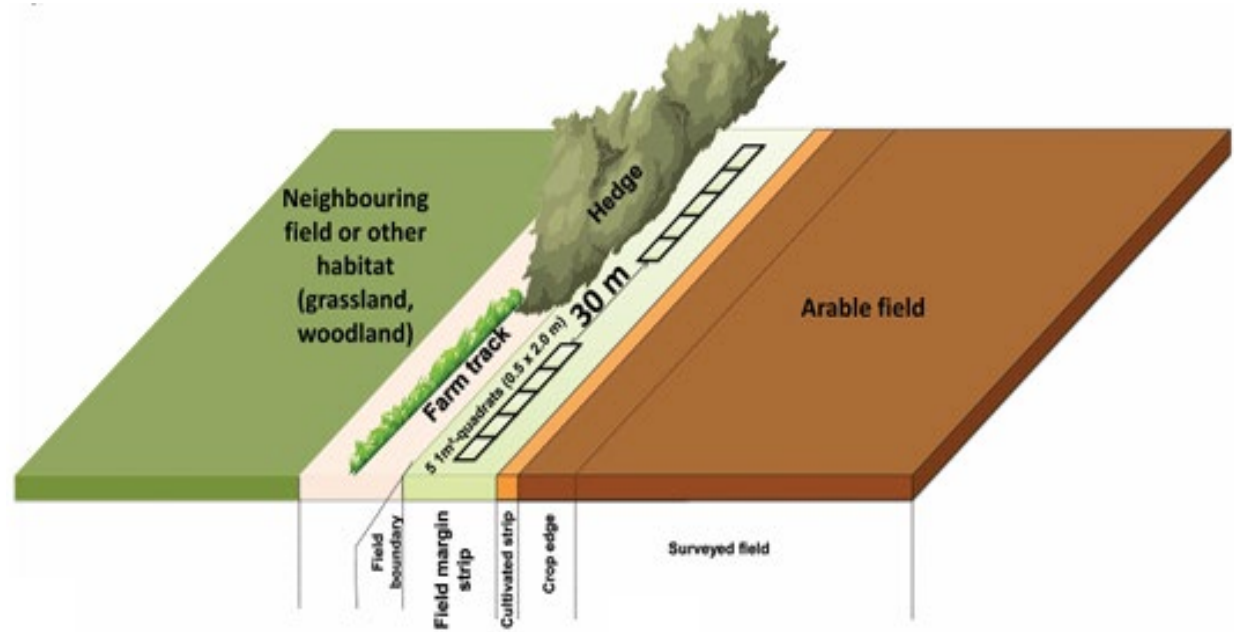
- In-field management



- TFIs
- Fertilization
- Crop rotation
- Copper use

Botanical sampling

- 10 quadrats of 1 m²
- Presence/absence of the species
- Once a year at the vegetation peak



(dis)Services indicators

- Providing floral resources for flower-visiting insects



→ % entomogamous sp

- Erosion and lixiviation fighting

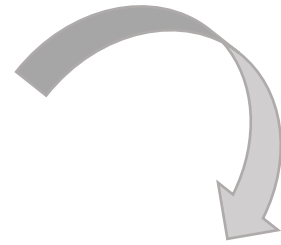


→ % perennial sp

- Plant conservation



→ % nature-value species



GLMMs

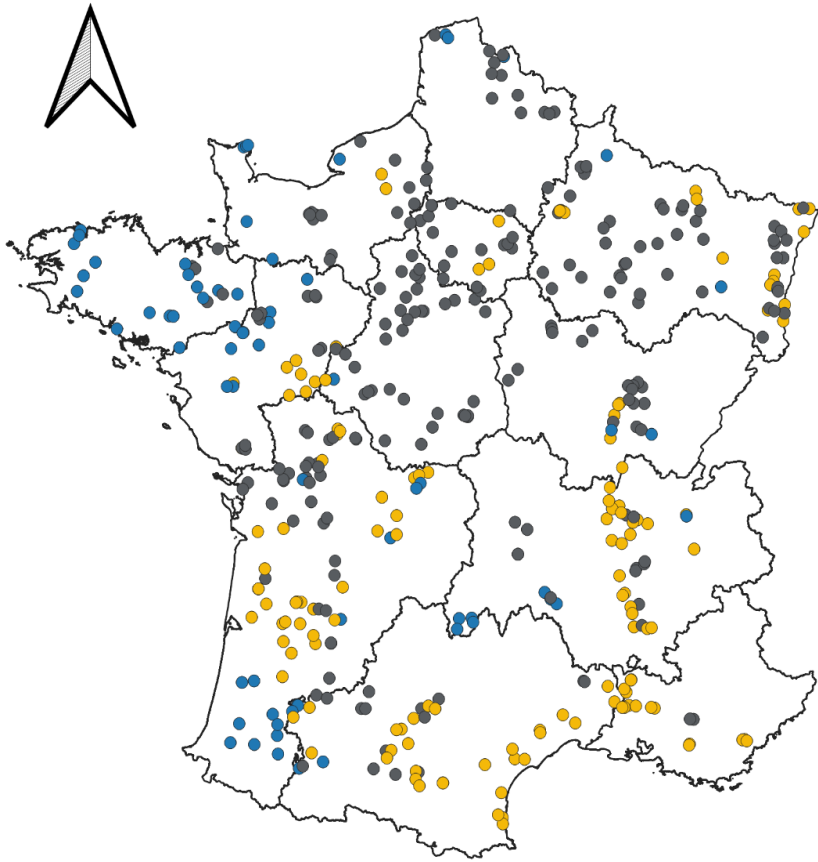
- Competition



→ % problematic weeds

Results & Discussion

Classifying fields



cluster 1

n = 75

+ rainfalls
Fertile soils
Grasslands



Oceanic and
« bocage »

cluster 2

n = 147

+ T° moy
Low fertile soils
Few cereal crops
in the landscape



Mediterranean
and vineyards

cluster 3

n = 236

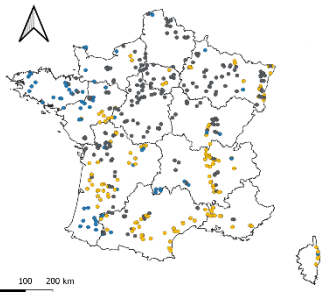
- T° moy
- rainfalls
Low fertile soils
Cereal crops in
the landscape



Temperate and
mostly cereals

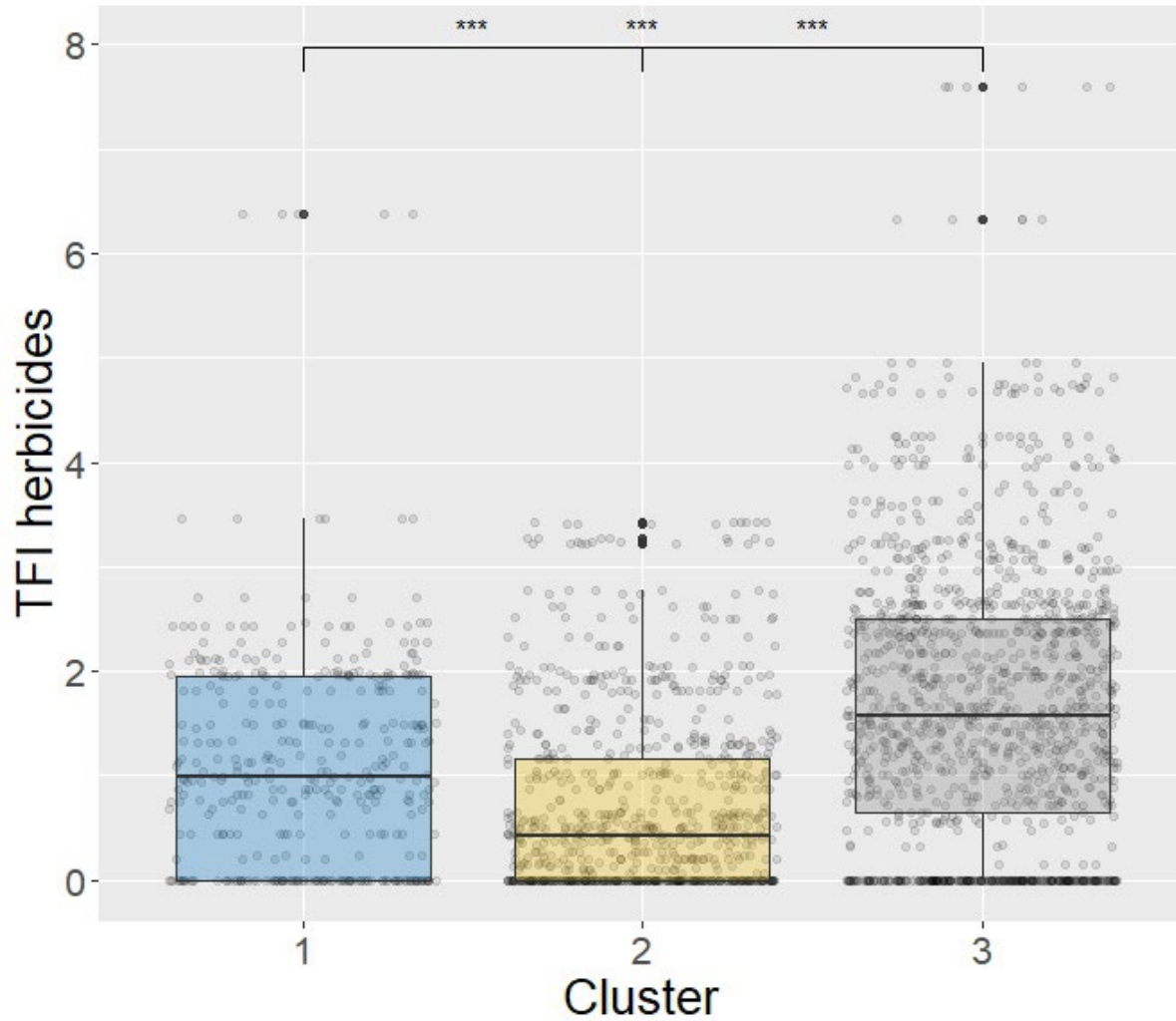


0 100 200 km

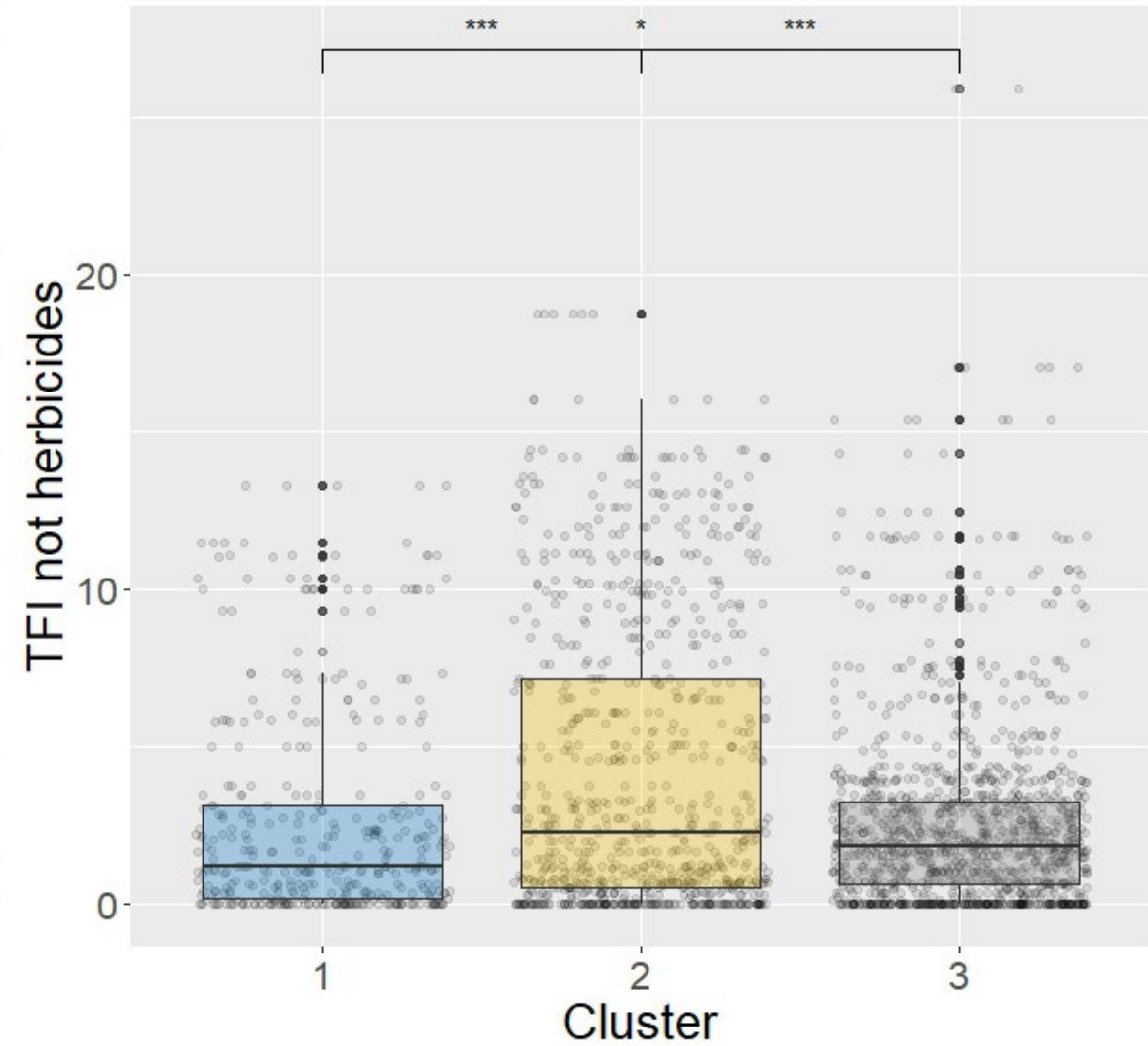


Clusters reflect different pesticides use

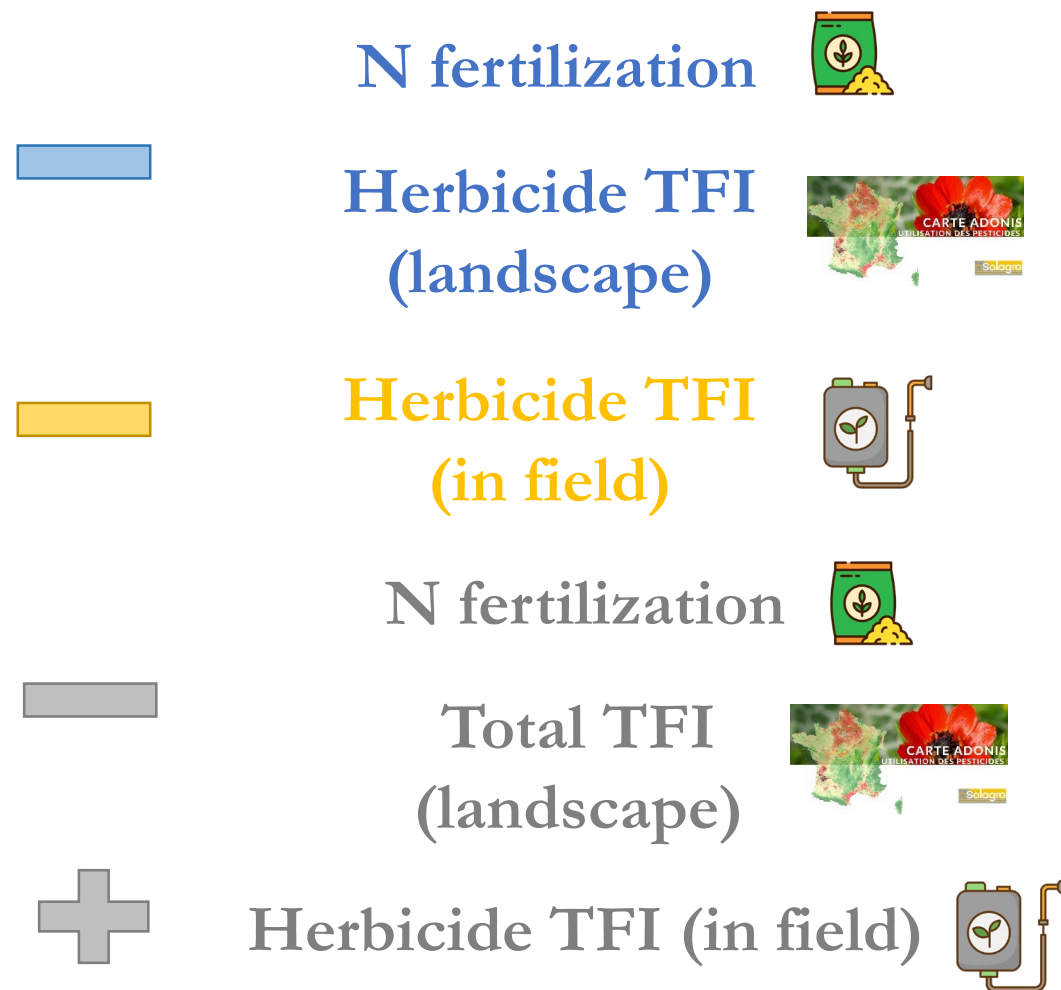
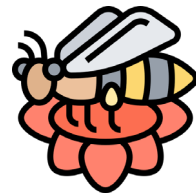
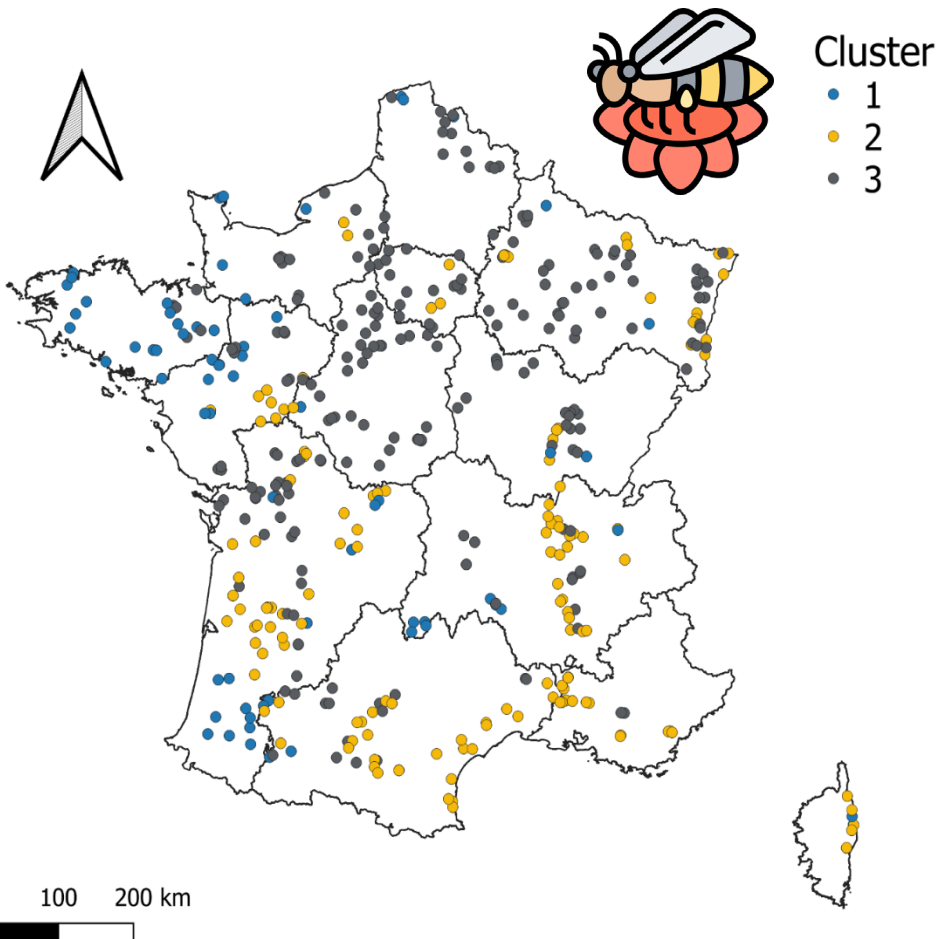
In-field TFI
herbicide



In-field TFI fongicide
and insecticide



Floral resources: % entomogamous sp

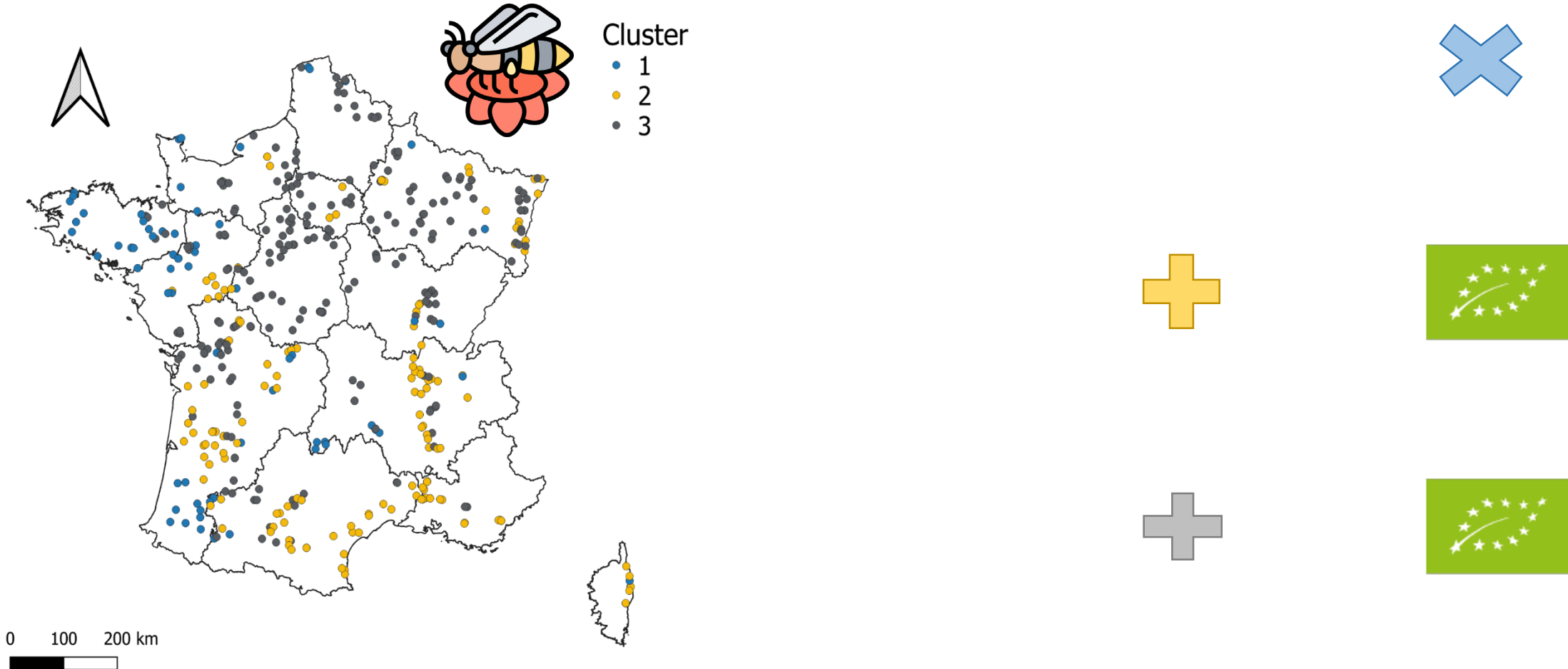


→ TFIs favoring ruderal species with autogamous strategies

Fanfarillo et al., 2019

Fried et al., 2023

Floral resources: effect of organic production on % entomogamous sp



→ Positive effect of organic management, as already shown for weeds

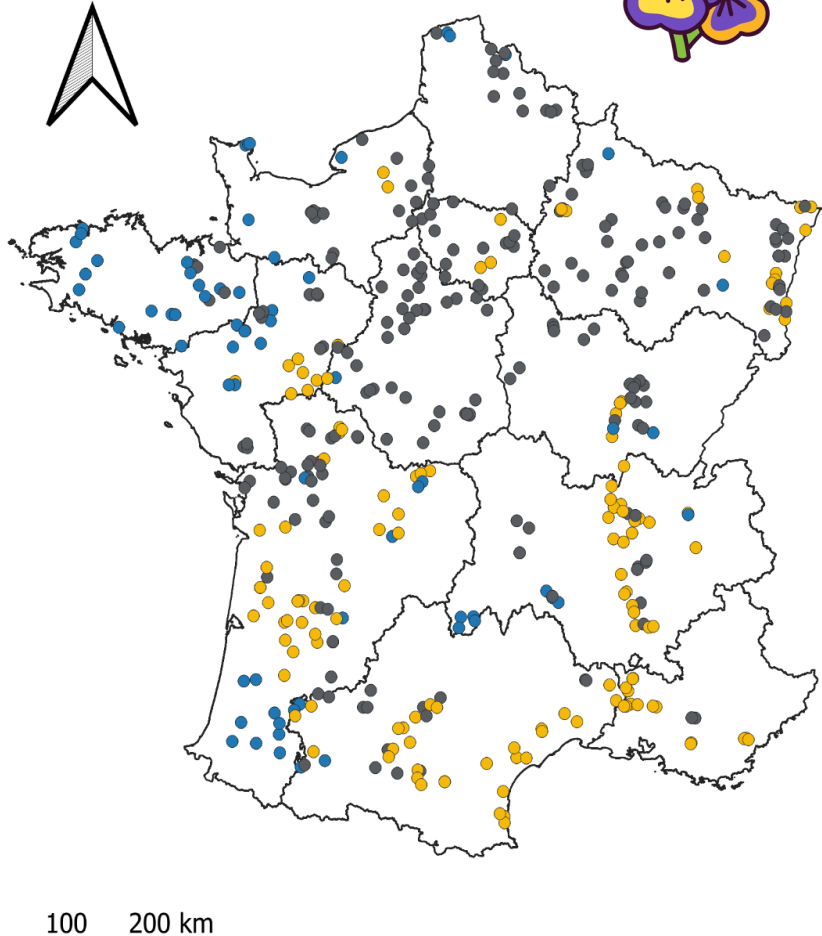
Tarifa et al., 2021
Rotchés-Ribalta et al., 2023

Plant conservation : % nature-value sp



Cluster

- 1
- 2
- 3



0 100 200 km



Herbicide TFI
(in field)

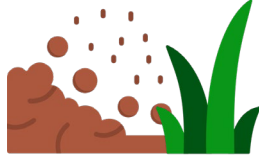


Herbicide TFI (in field)
Herb. And Tot. TFIs
(landscape)
% organic (landscape)



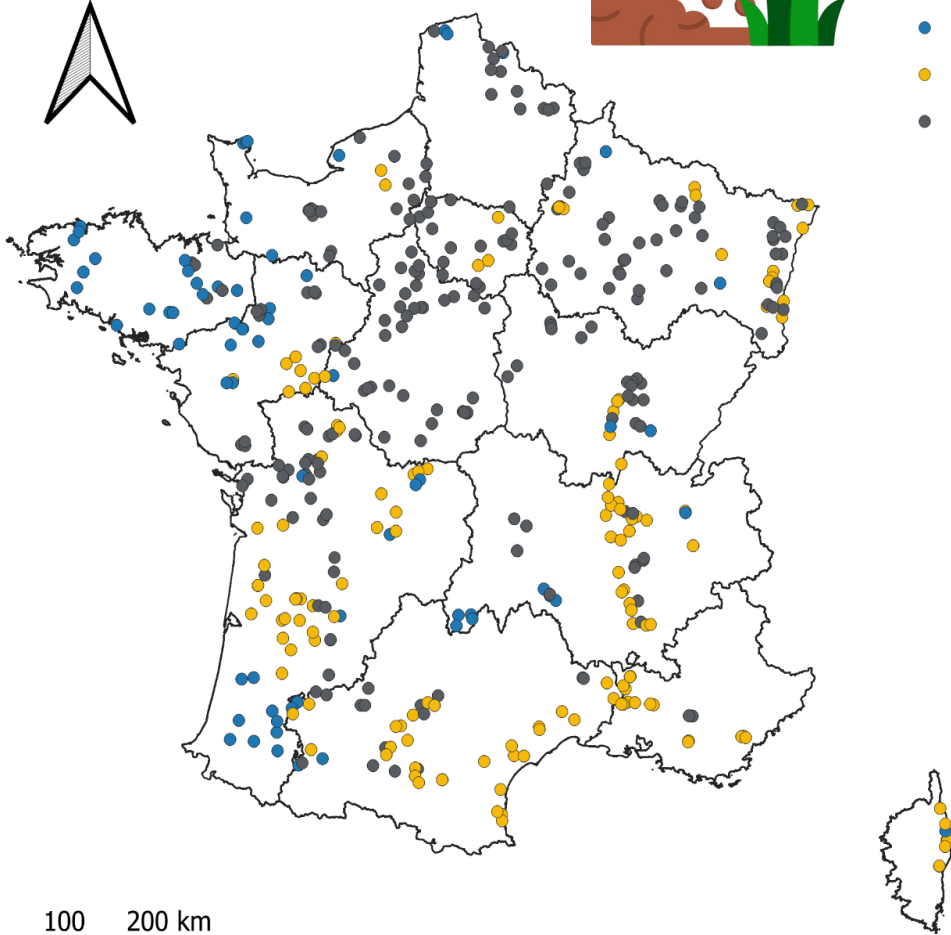
→ Not seen in more diversified landscapes / richer communities ?

Erosion fighting : % perennial sp



Cluster

- 1
- 2
- 3



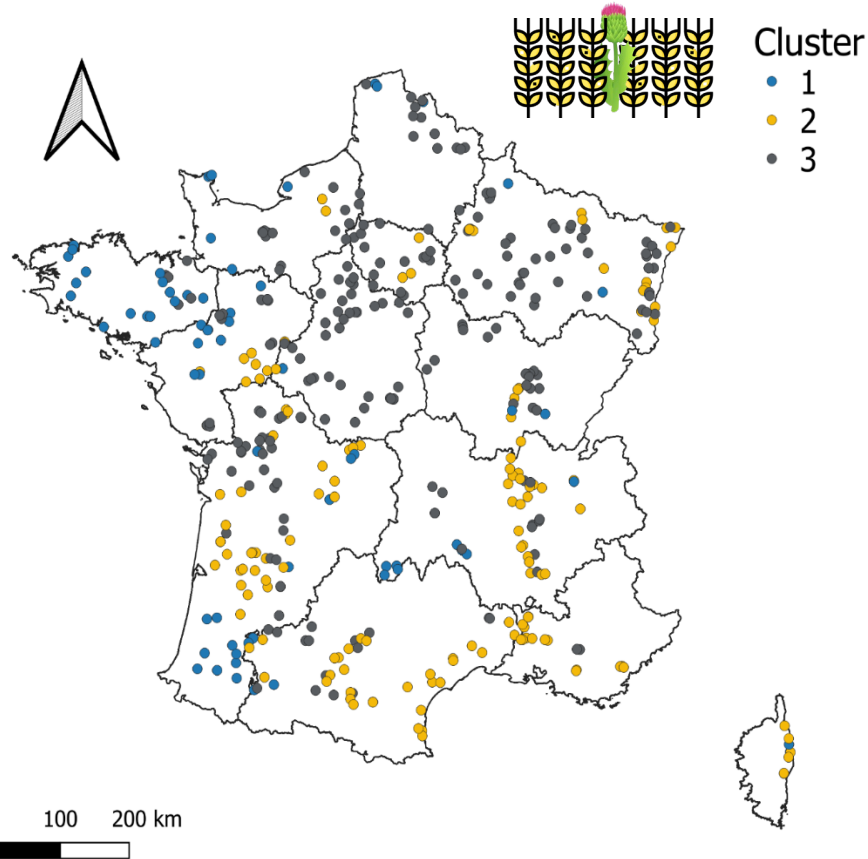
Total TFI
(landscape)



0 100 200 km

→ Poorly affected by agricultural practices

Competition : % problematic weeds



Total TFI
(landscape)



Herbicide TFI (in field)
% of organic



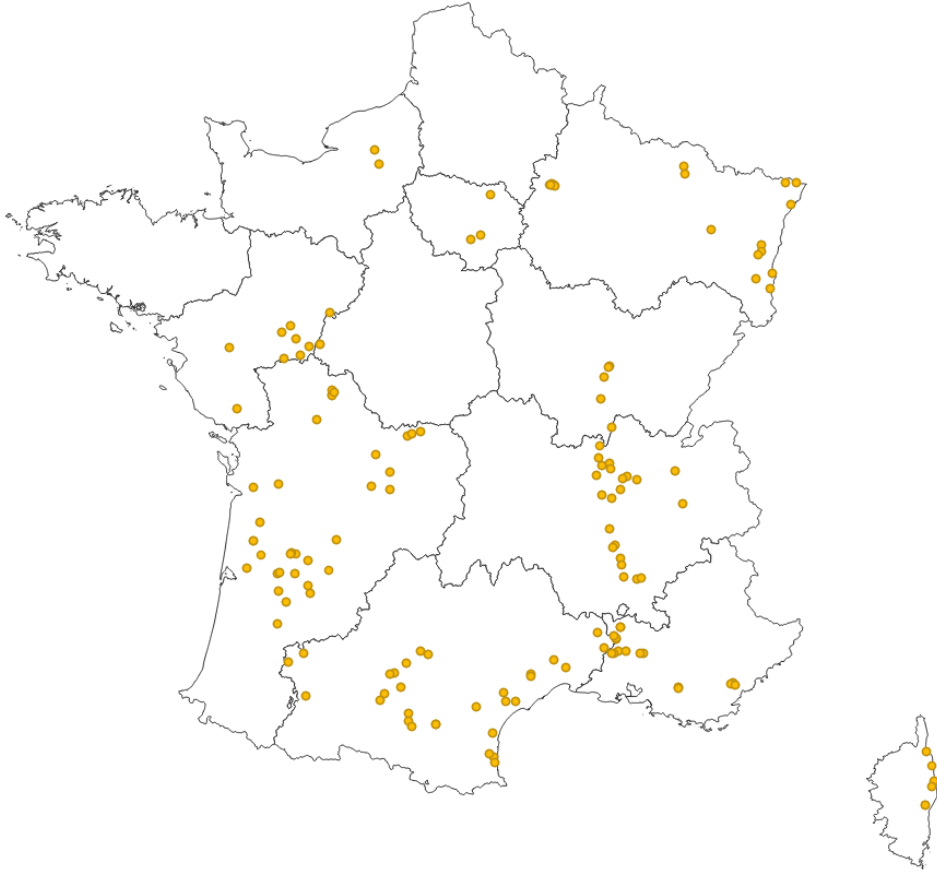
Herbicide TFI
(landscape)



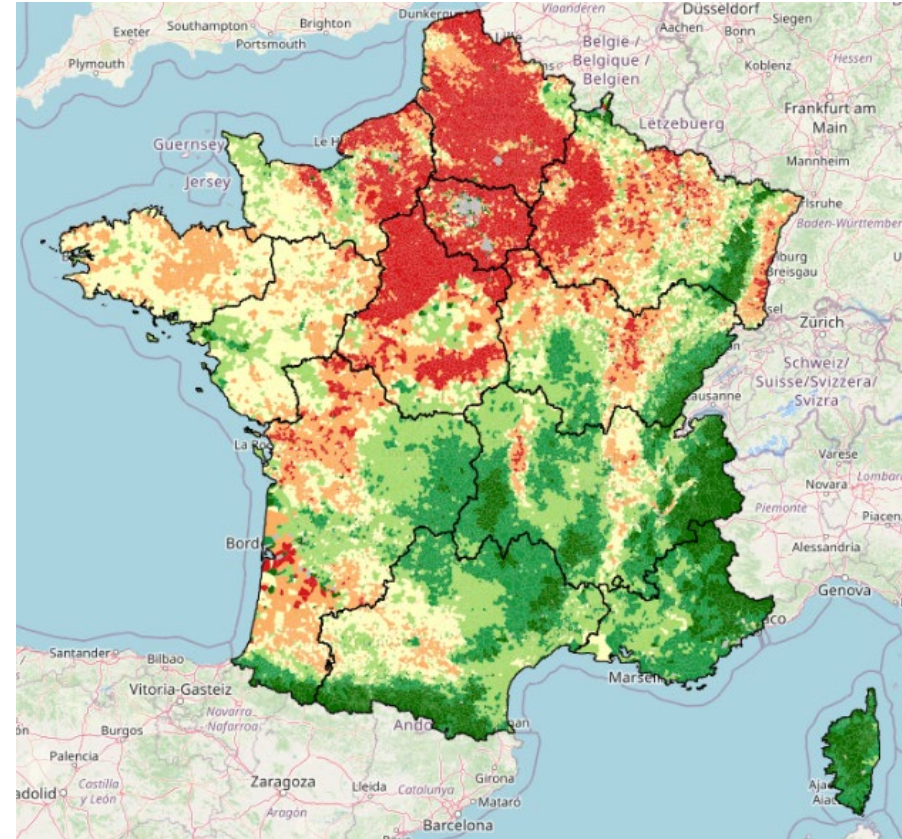
→ Practices increasing disservice also decrease services,
not the case for all (dis)services

General discussion : services at low level of herbicide use

Cluster 2



Herbicide TFI at the landscape scale, Solagro©

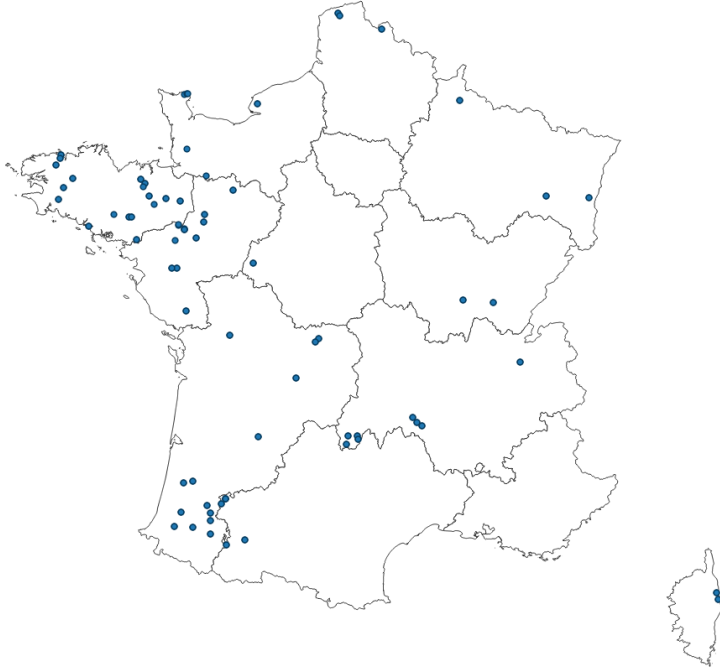


→ Cluster 2 : lowest herbicide use, in-field effect

→ Low levels of herbicides use + indirect application

General discussion : services in landscapes with higher herbicide use

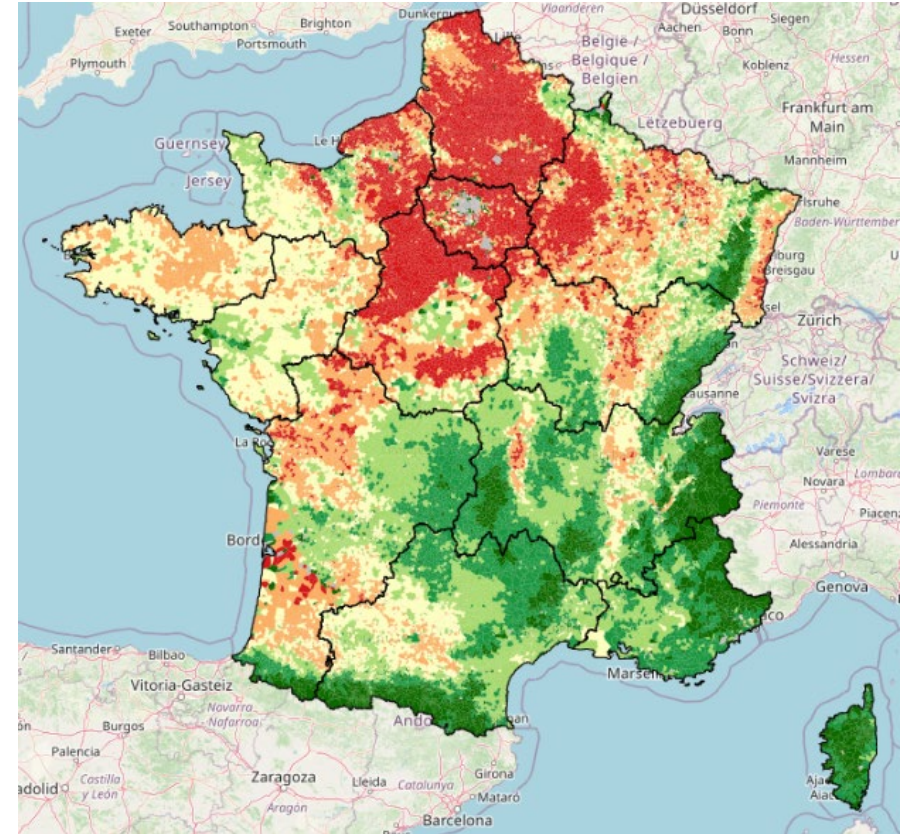
Cluster 1



Cluster 3



Herbicide TFI at the landscape scale, Solagro©



→ When higher herbicide use, mostly landscape scale,
not in line with previous study

Conclusion



- Pesticides damage service provisions, but the scale vary according to the region
- Floral resources delivery is the most threatened service studied
- Pesticides reduction solutions have to be implemented both at the farm and landscape scales

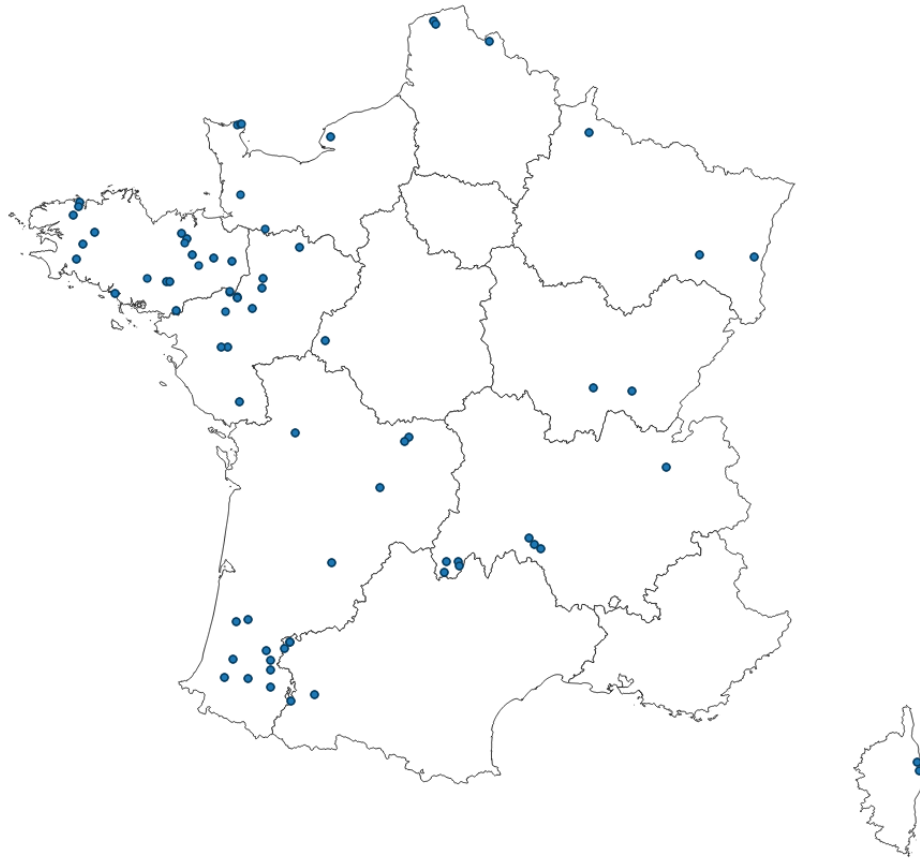


Thank you !

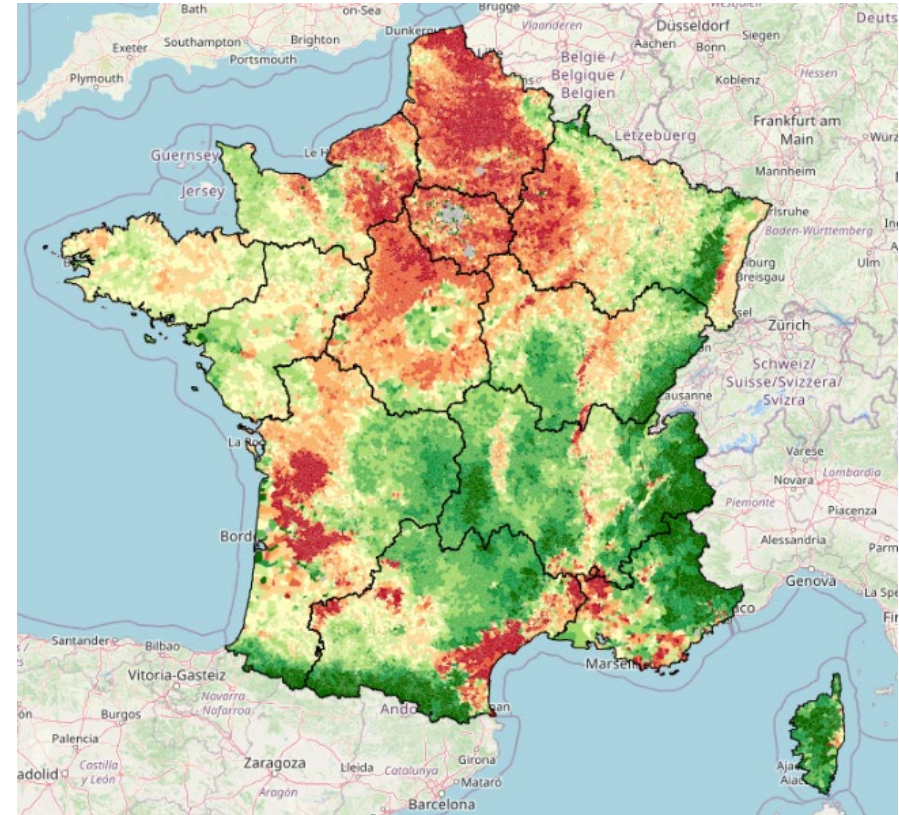
Any questions ?

General discussion : services in diversified landscapes with low pesticides use

Cluster 1



Total TFI at the landscape scale, Solagro©



- Cluster 2 : lowest herbicide use but in-field TFI always decreases services
- Even at low levels of herbicides use and when not directly applied on plants negative effects on services are captured

Cluster 1, oceanic and bocage



→ % sp entomogames



N fertilization

**Herbicide TFI
(commune)**



→ % nature-value species



→ % sp pérennes



→ % adventices problématiques



**Total TFI
(commune)**

Cluster 2, Mediterranean and vineyards



→ % sp entomogames



**Herbicide TFI
(in field)**

→ % nature-value species



**Herbicide TFI
(in field)**



→ % sp pérennes



→ % adventices problématiques



**Herbicide TFI (in field)
% of organic**

Cluster 3, temperate and mostly cereals



→ % sp entomogames



N fertilization

Total TFI
(commune)



→ % sp pérennes



Total TFI
(commune)



→ % nature-value species

Herbicide TFI (in field)
All TFIs (commune)
% organic (commune)



→ % adventices problématiques



Herbicide TFI
(commune)