



Effect of farmland heterogeneity on multiple ES spatial variability and trade-offs

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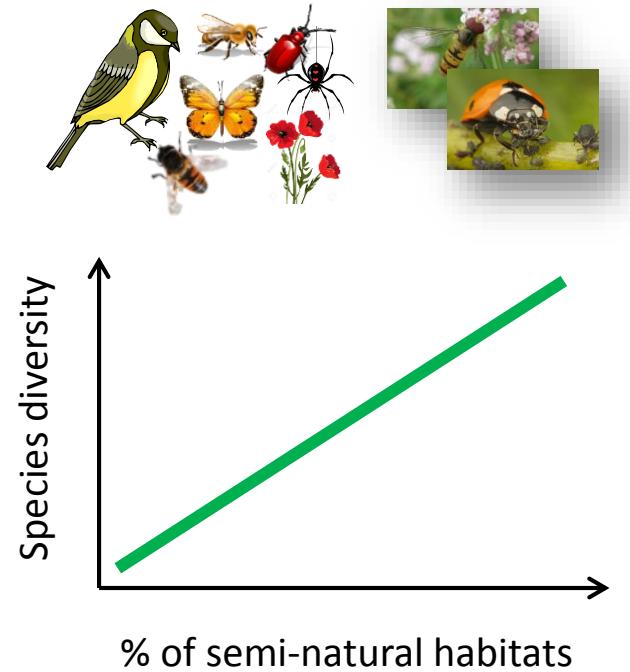


EcoSummit 2016 29 August – 1 September 2016 Montpellier, France



The role of agricultural landscape heterogeneity

Proportion of semi-natural habitats



Role studied/known

Implementation not always feasible

The role of agricultural landscape heterogeneity: a paradox

**Proportion of
few semi-natural habitats**



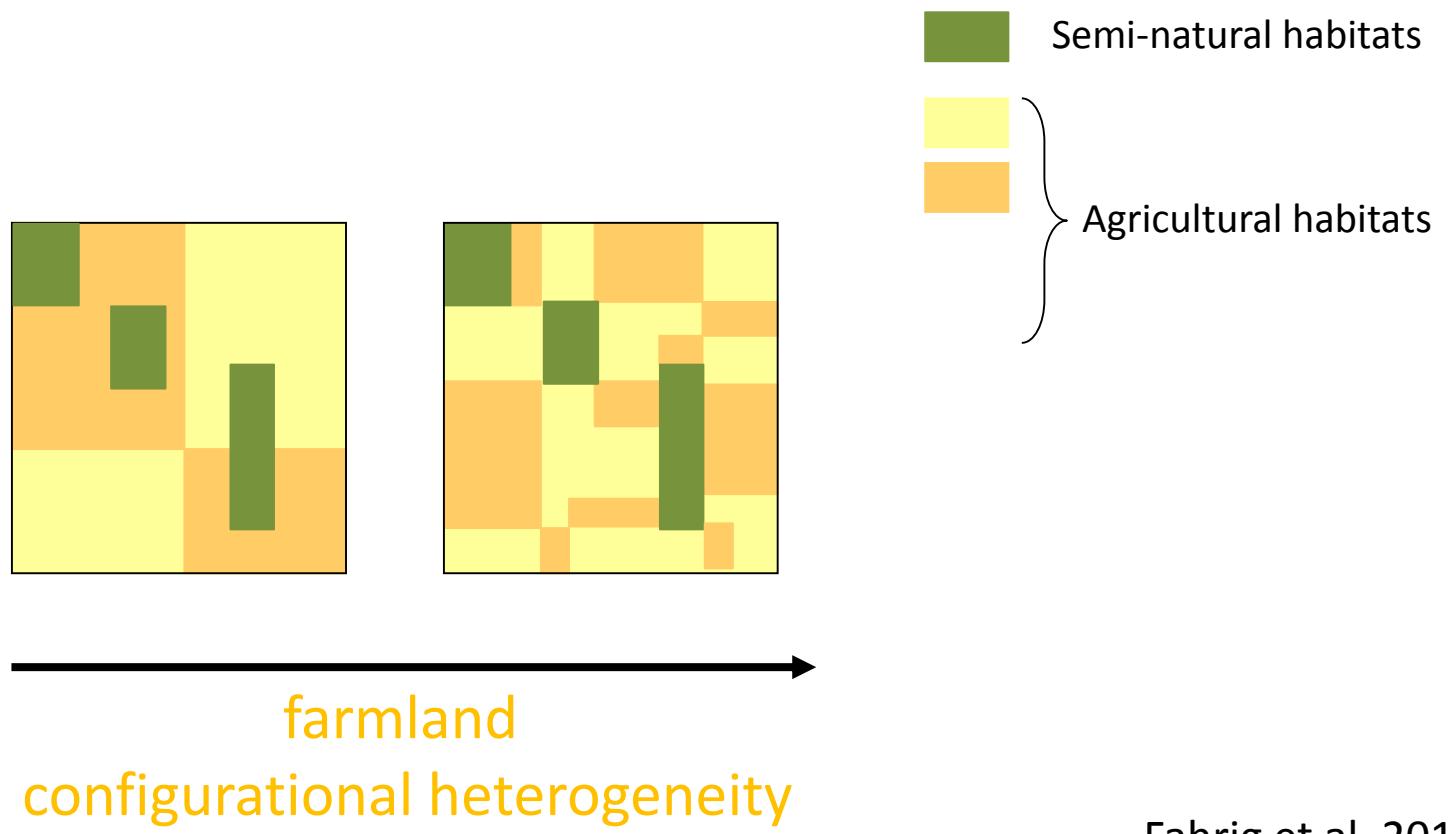
**Heterogeneity of the
large « farmland matrix »**



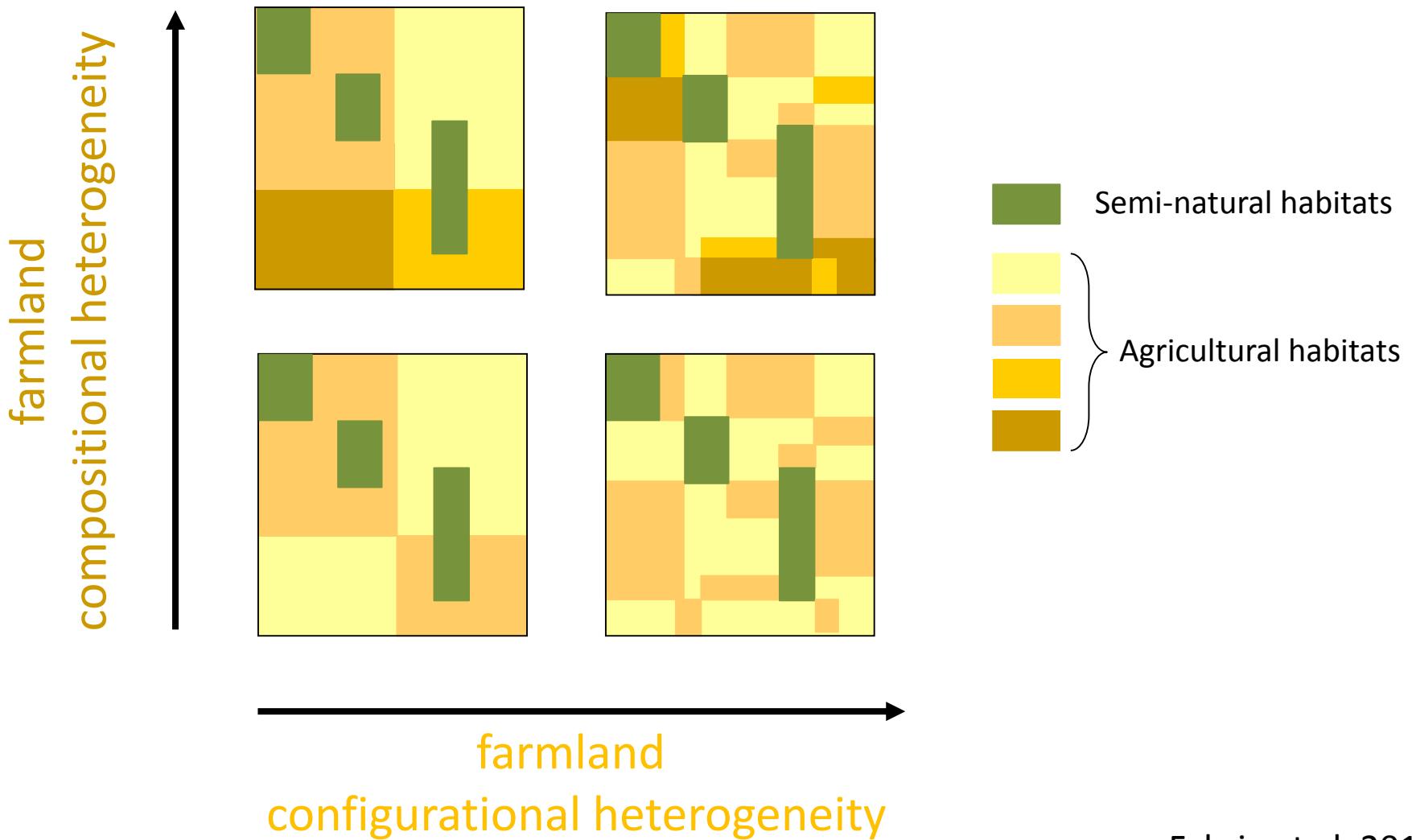
**Role studied/known
Implementation not always feasible**

**Role ?
Implementation ?**

Farmland heterogeneity

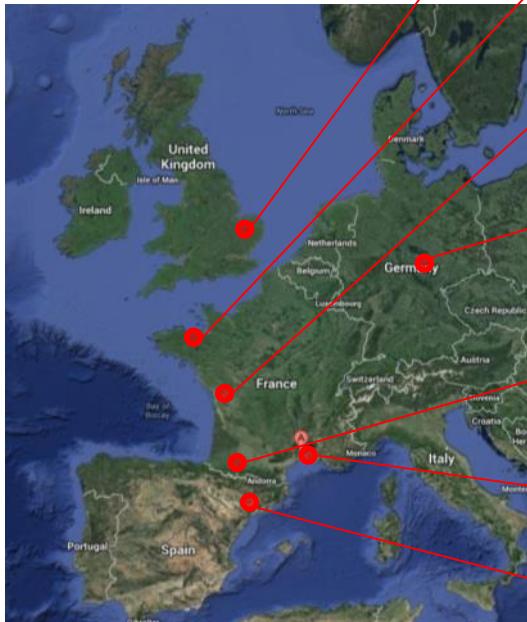
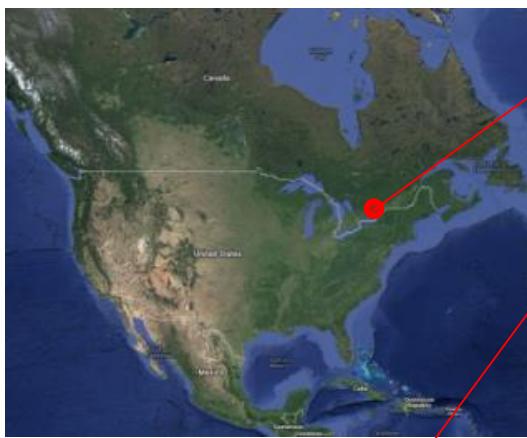


Farmland heterogeneity

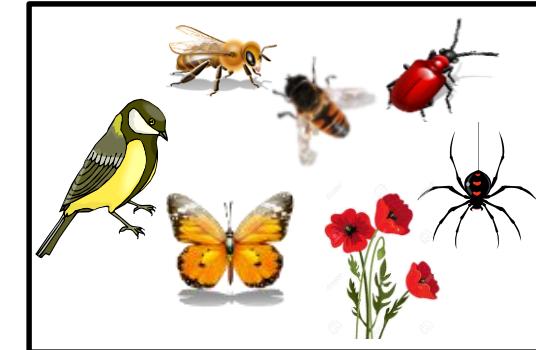




A multi-region, multi-taxa, multi-ES project



Biodiversity (7 taxa)



Biological control



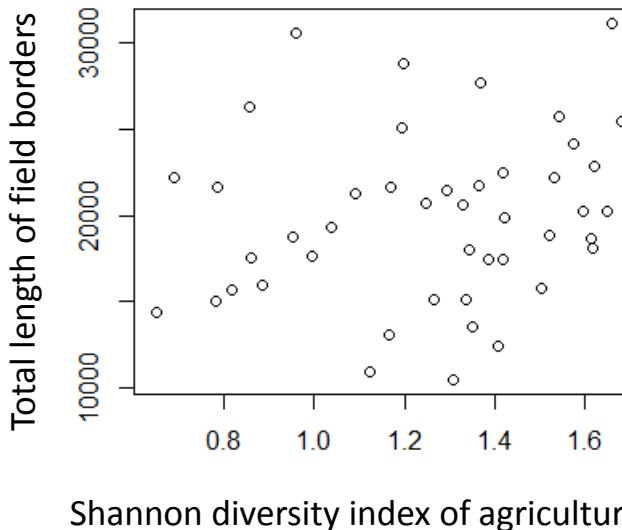
Pollination



Production



Common protocols across regions

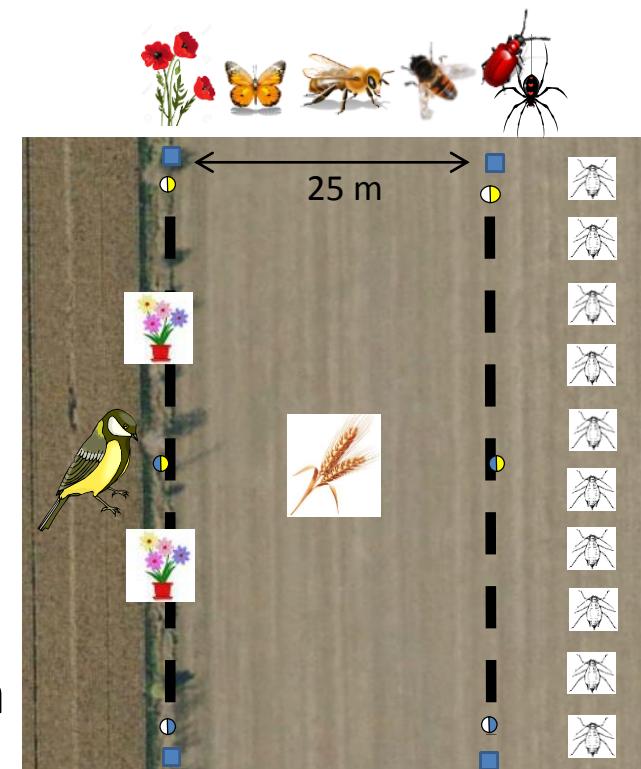


1. Landscape selection

- ⇒ 1 x 1 km
 - ⇒ 2 independent gradients
 - ⇒ 60-90% semi-natural habitat
 - ⇒ 30-90 landscapes/region
- Total: 435 landscapes

2. Sampling site selection

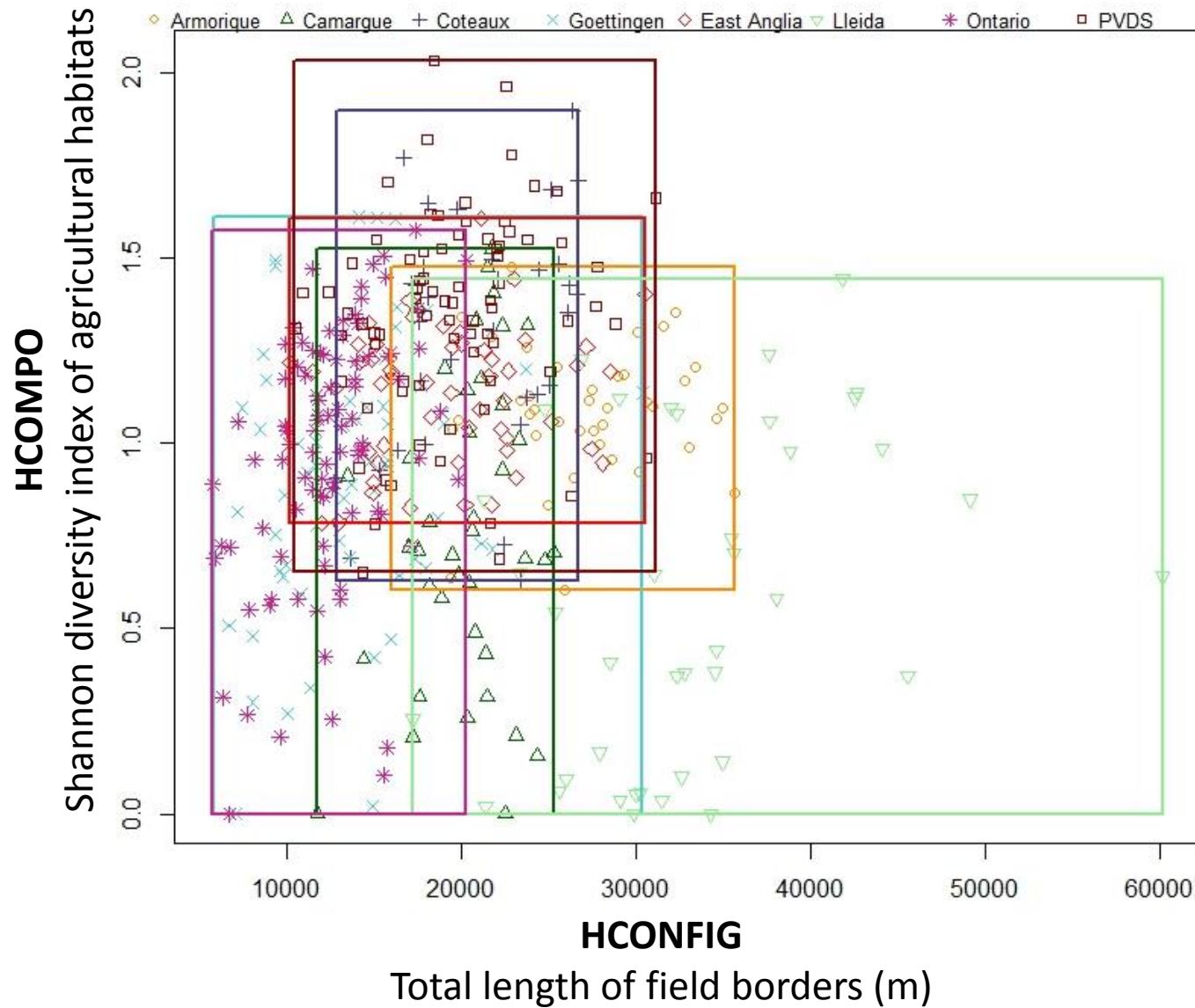
- ⇒ 3 representative fields
(cereal, corn, grassland)
- Total: 1305 fields



3. ES measures

Total: 2795 species,
78000 aphids glued,...

Farmland heterogeneity gradients



Testing the effect of farmland heterogeneity

Landscape selection:

435 landscapes

2 uncorrelated gradients across/among regions

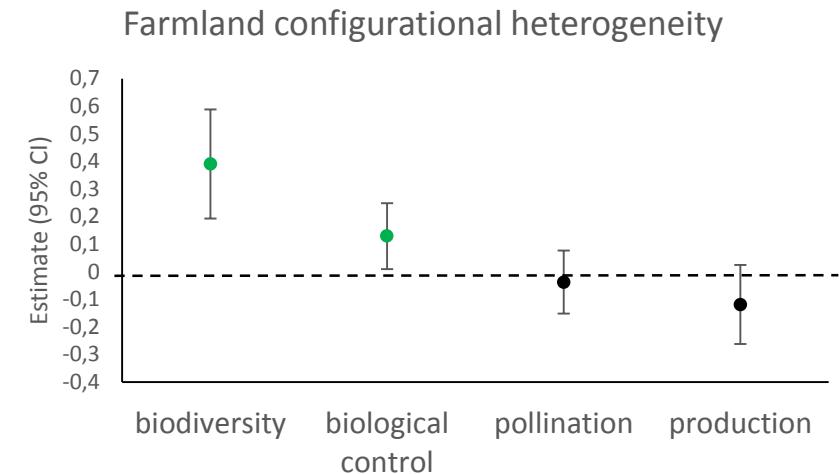
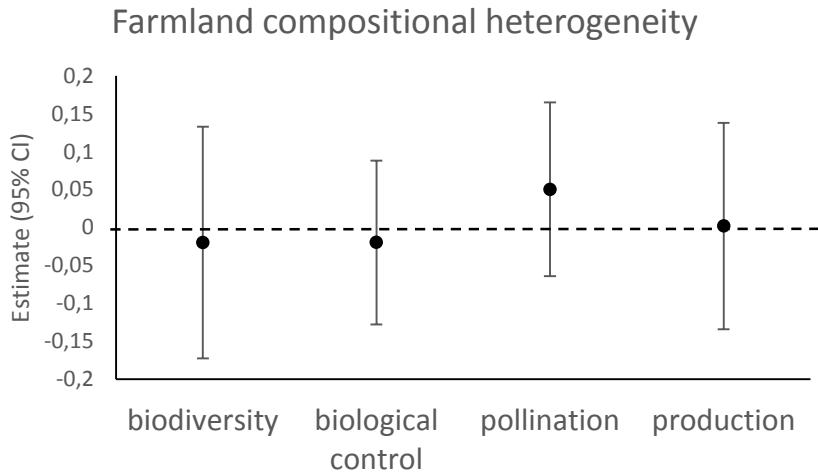
limited variations in % semi-natural habitat within each region

Mixed model:

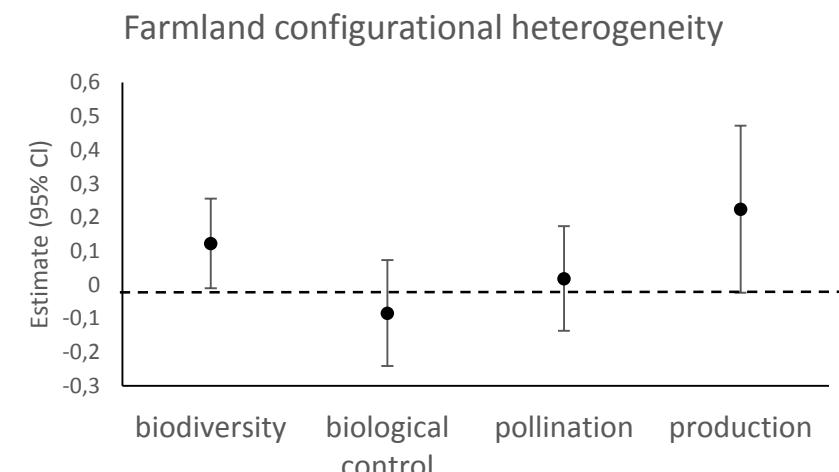
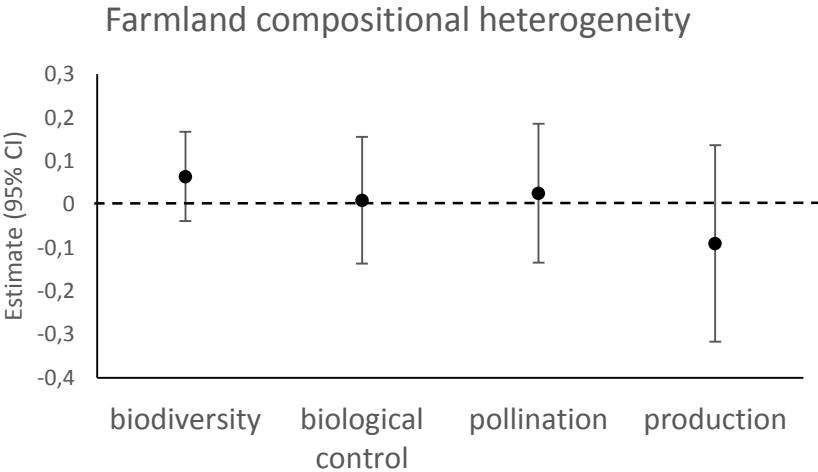
$ES \sim HCOMPO + HCONFIG + \% \text{ semi-natural} + (1 | \text{Region})$

Farmland heterogeneity effects

ES average



ES spatial variability



True effect of configurational heterogeneity?



Coteaux de Gascogne



↔ 1 km

↔ 1 km

HCONFIG

Effect
?

Linear SN habitats

Testing the true effect of farmland heterogeneity

Landscape selection:

selection of a subset of 274 landscapes

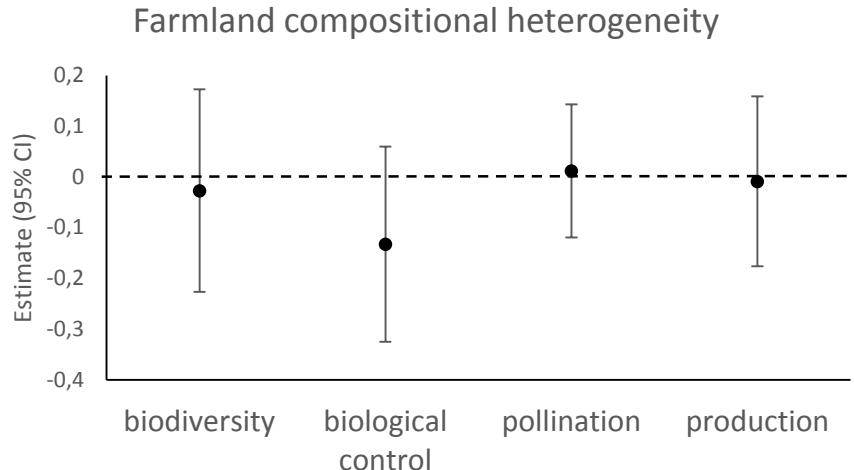
correlations between explanatory var. across/among regions <0.4

Model 2:

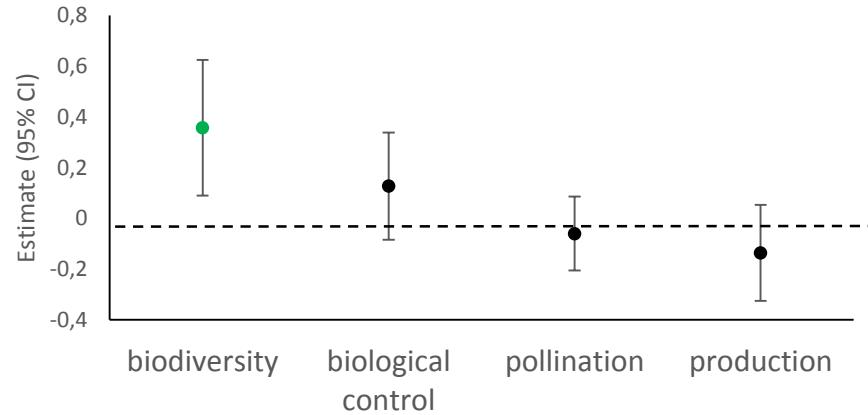
$ES \sim HCOMPO + HCONFIG + \% SN + \text{length linearSN} + (1 | \text{Region})$

Farmland true heterogeneity effects

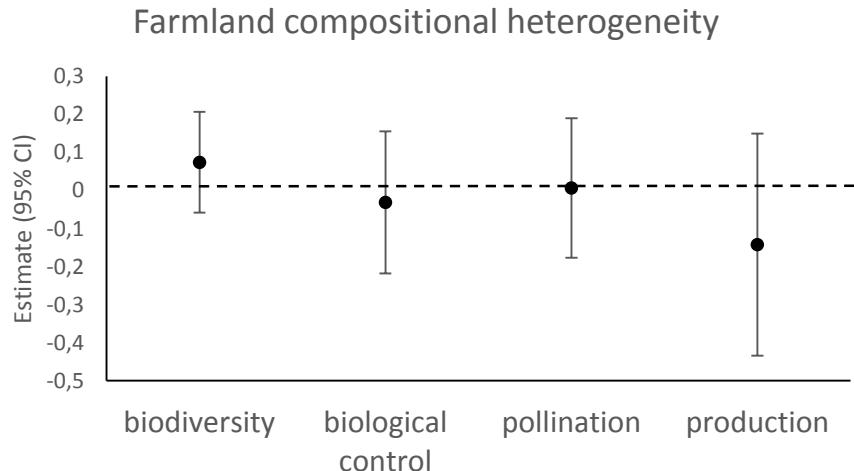
ES average



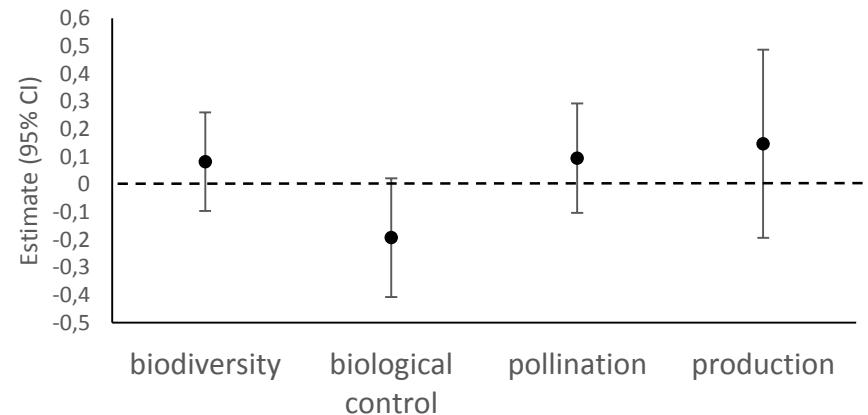
Farmland configurational heterogeneity



ES spatial variability



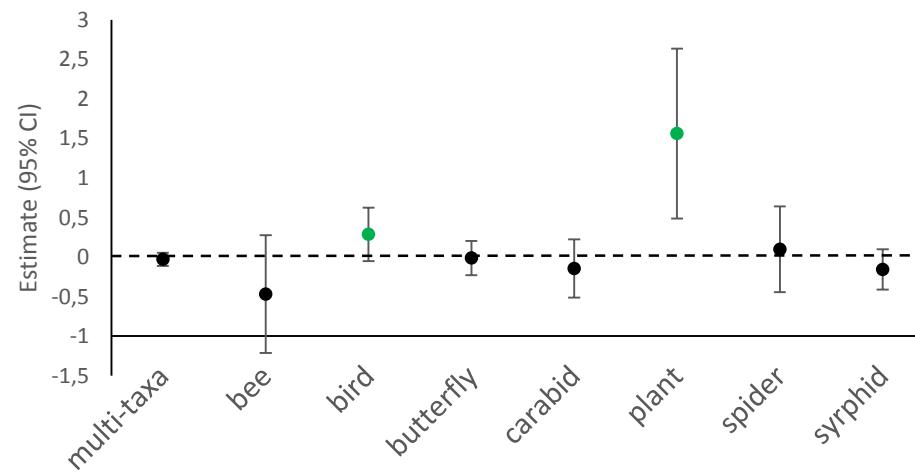
Farmland configurational heterogeneity



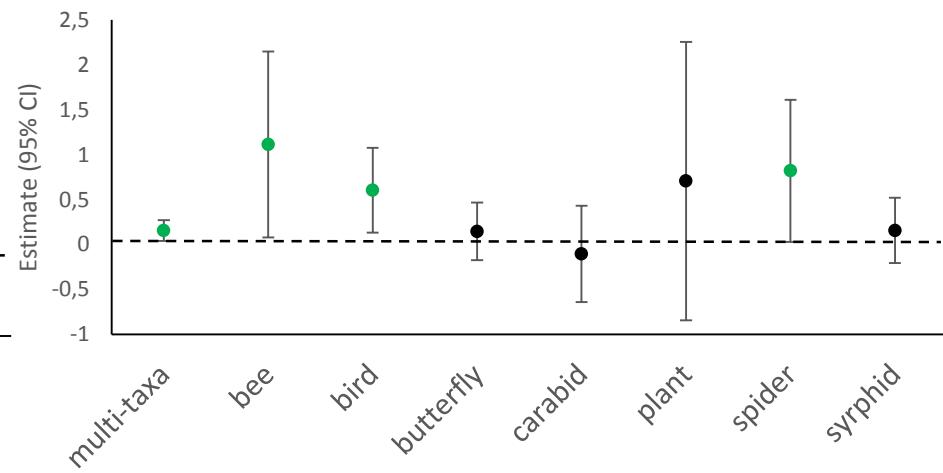
Farmland true heterogeneity effects

Response variations between taxa

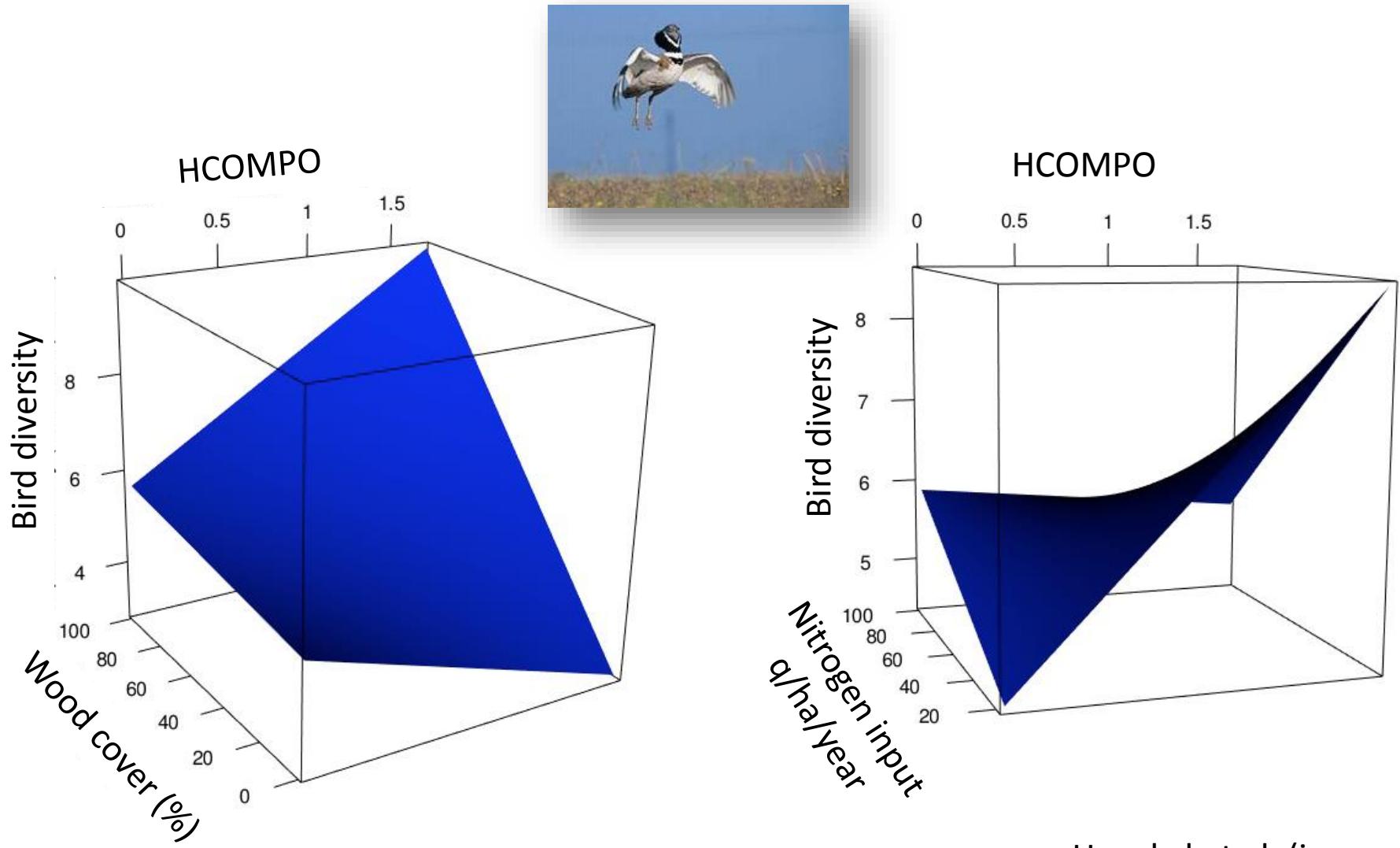
Farmland compositional heterogeneity



Farmland configurational heterogeneity



Multiple interactions



Take-home messages

- ✓ Farmland heterogeneity has a true positive effect on biodiversity - in particular bee, bird, plant, spider
- ✓ Positive effect on biological control - due to linear semi-natural elements. No effect on pollination and production.
- ✓ Complex interactions :
Farmland heterogeneity \leftrightarrow Semi-natural % \leftrightarrow Practices
- **Agricultural policies should start considering field configuration while maintaining semi-natural habitats and agrochemical reduction**

Acknowledgments

