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## **Les territoires d'exploitations agricoles qui pratiquent des systèmes de production différents présentent-ils une biodiversité différente? L'exemple des oiseaux nicheurs**

Sébastien Bonthoux, Jean-Philippe Choisis, Annick A. Gibon, Sylvie Ladet, Gerard Balent

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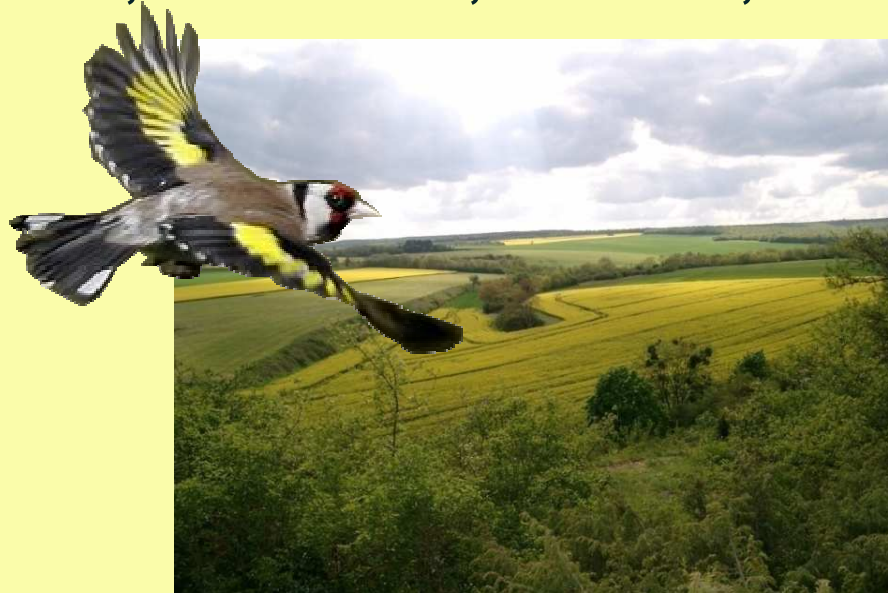
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**Les territoires d'exploitations agricoles qui pratiquent des systèmes de production différents présentent-ils une biodiversité différente ?  
L'exemple des oiseaux nicheurs**

**BONTHOUX S., CHOISIS JP., GIBON A., LADET S., BALENT G.**



Ce travail est financé par une bourse ANR, BIODIVAGRIM (ANR-07-BDIV-002) "La conservation de la biodiversité dans les agro-écosystèmes : une approche de modélisation des paysages spatialement explicite".

# Aim of the study

Agri-environmental policies are most often applied at the individual farm level. An improved effectiveness of these policies could result from an it is then necessary to study the ecological patterns by considering the level of agricultural organisation.

However, many studies are currently lead at the field scale or the landscape scale without considering the whole farm territory.

Our study focus on the relationships between bird diversity in farmland and spatial patterns of farming-system types regarded as a level of agricultural organisation.

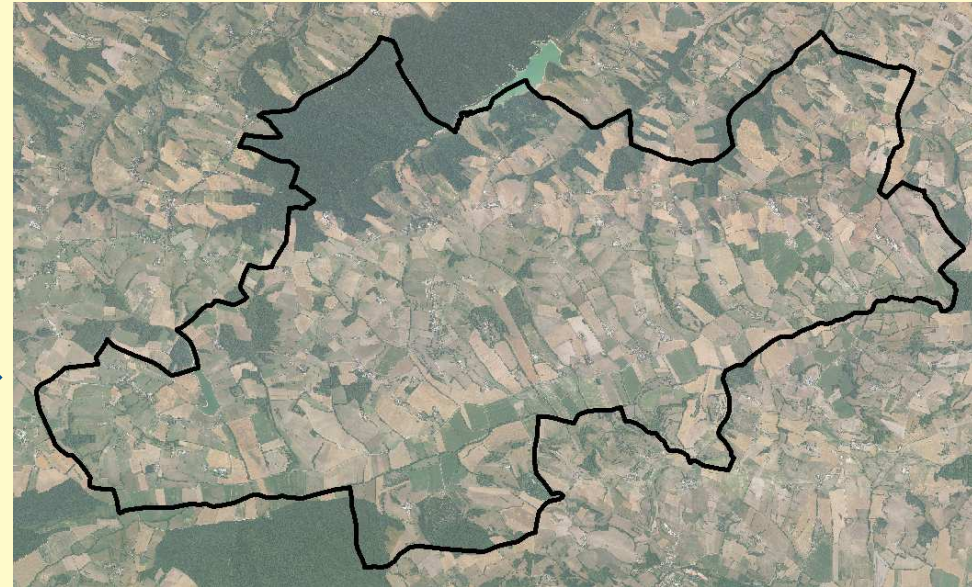
We test **2 hypotheses**:

- The farming systems can discriminate bird diversity.
- Landscape areas with extensive farming systems have an higher bird diversity than the ones with intensive farming systems because they include more semi-natural elements.

# Our study area



11 km



**'Vallées et Coteaux de Gascogne'**  
Long Term Ecological Research site

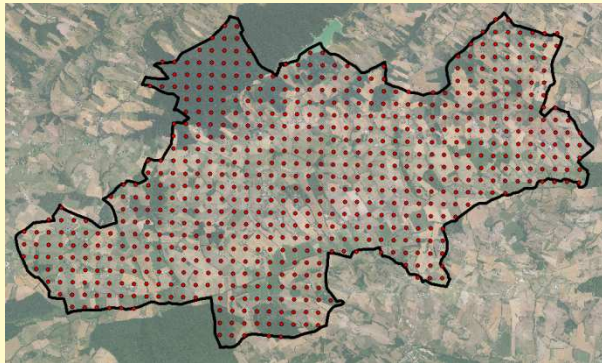


- A hilly region
- A combination of arable crops, (maize, oilseed rape, sorghum, sunflower, forage), meadows, grazed pastures, and small woodlands

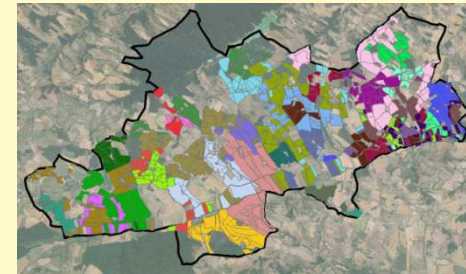
# Method **Global approach**

## **Ecological data**

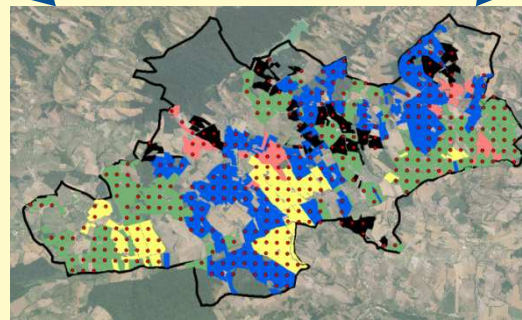
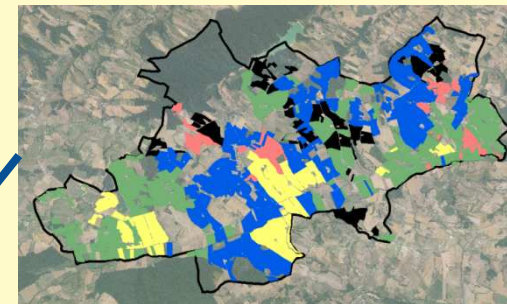
A grid of point counts to record birds



## **Agronomical data** 34 interviewed farms



A typology of farming systems  
in 5 modalities



**Results**

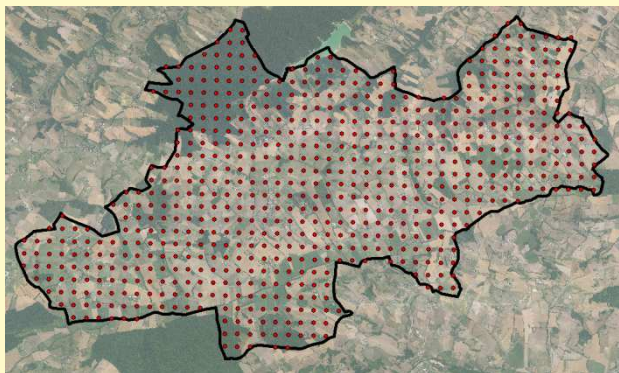
Bonthoux S. et al.

# Method Global approach

## Ecological data

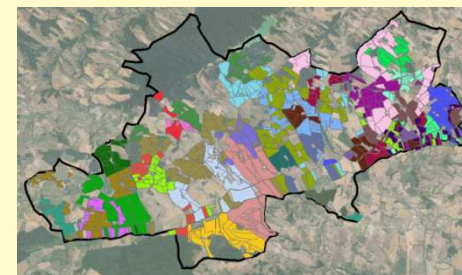
A grid of point counts to record birds

1

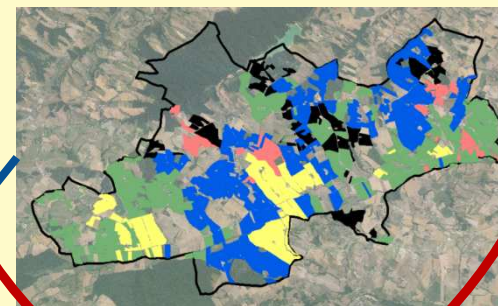


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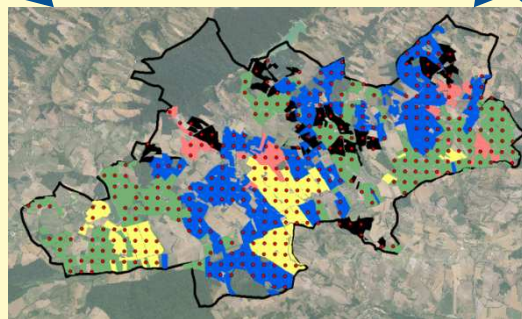
Agronomical data  
34 interviewed farms



A typology of farming systems  
in 5 modalities



3



Results

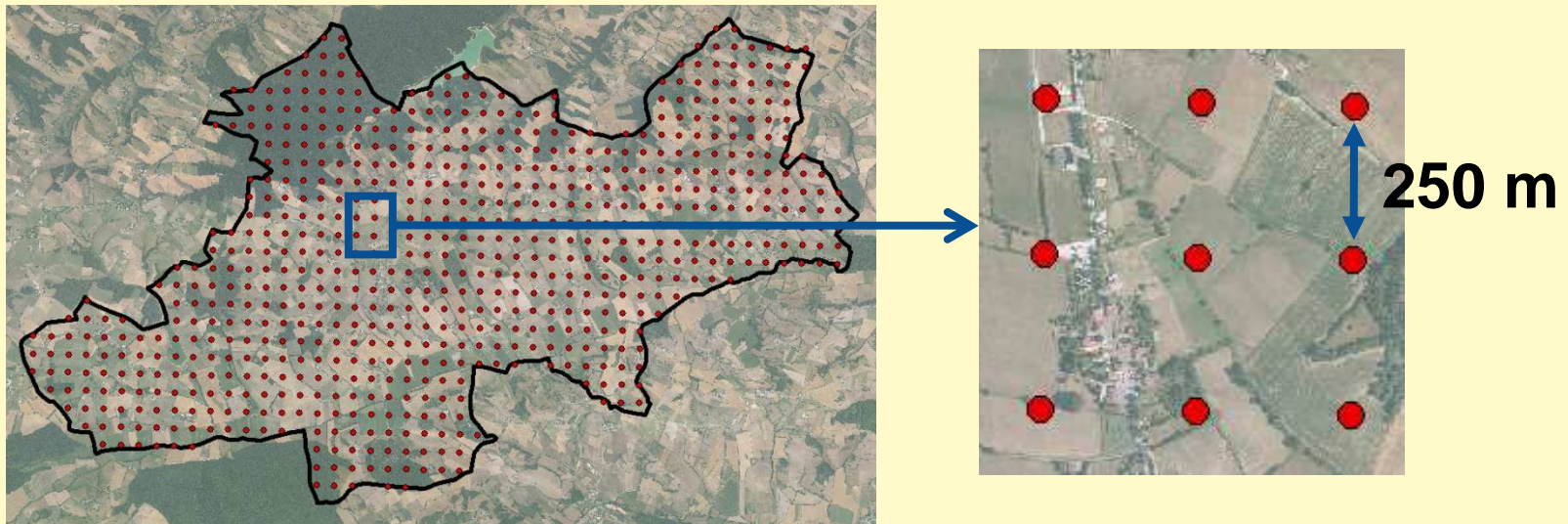
## Ecological data

### A grid of point counts on the whole study area:

A systematic sample

One point count = 20 minutes

All birds seen or heard are recorded

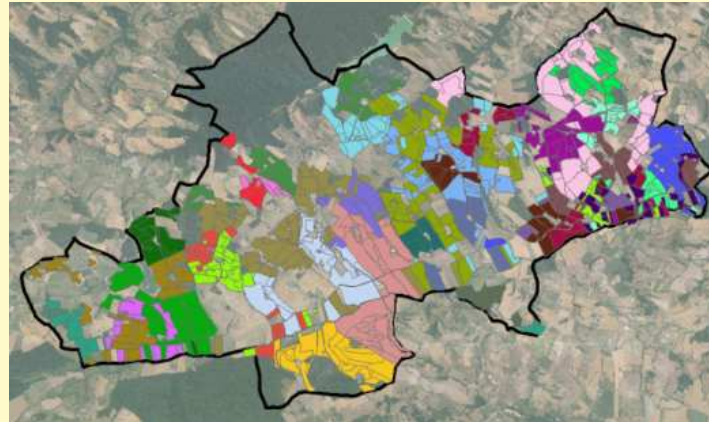


# Agronomical data

34 interviewed farms

## Farming system data

- history of farm
- farm productions
- technical operations
- economical data



## Spatial arrangement of farm territory (computed by GIS)

- field size, field shape, field slope
- farm territory fragmentation

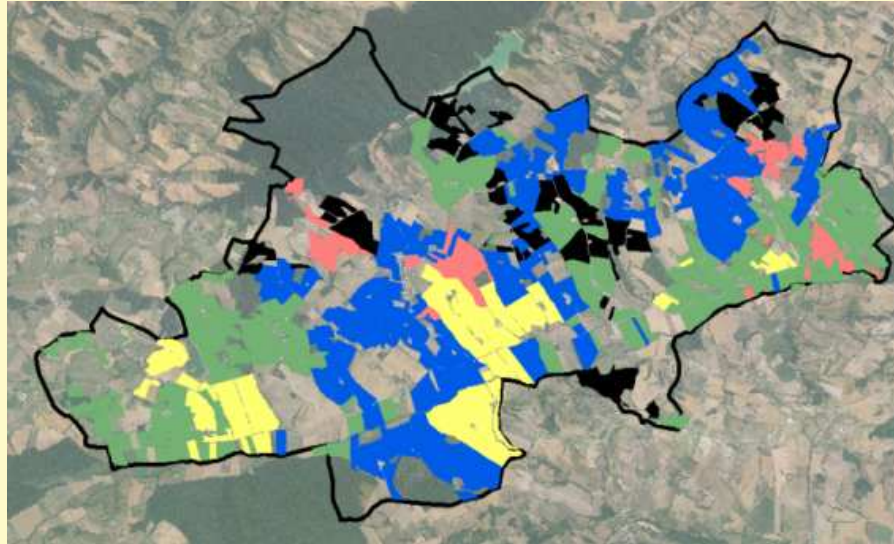
Co-inertia analysis

A typology in 5 types of farming system

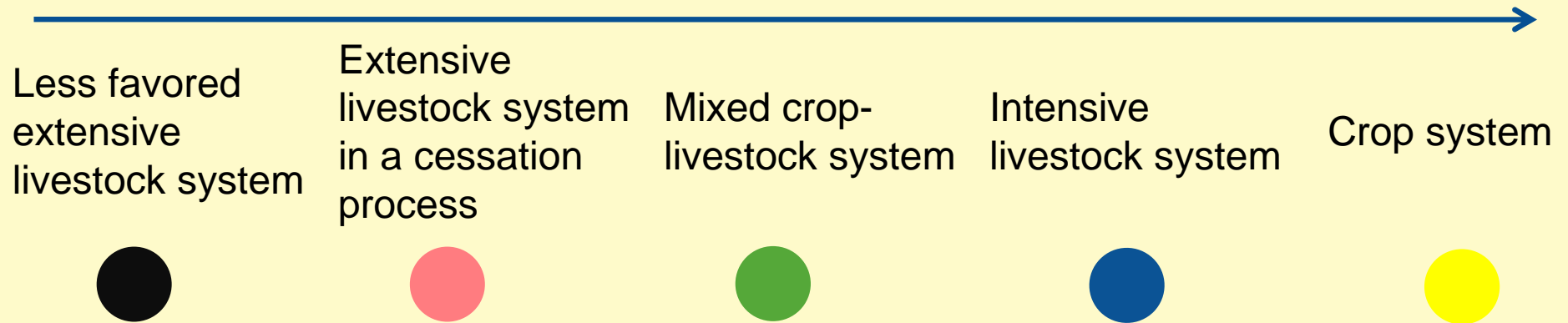
Adapted from Choisis et al. 2010

Bonthoux S. et al.

# A typology in 5 types of farming system



Production intensity

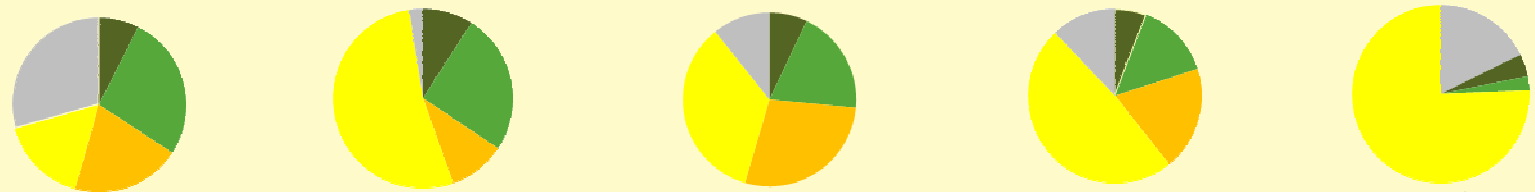


# Some characteristics of the farm types:

## Production intensity

	Less favored extensive livestock	Extensive livestock system in a cessation process	Mixed crop-livestock system	Intensive livestock system	Crop system
Farm number	4	5	15	6	4
Averaged Agricultural area (ha)	82	23	61	155	69
Averaged Field size (ha)	1.8	1.8	2.5	3.9	4.8
% of sloping fields (>15%)	58	26	20	25	6

### Land uses



■ Crop

■ Seeded grassland

■ No data

■ Semi-natural grassland

■ Woodland

↘ semi-natural elements

## Some pictures of the farming systems



An open landscape with arable crops

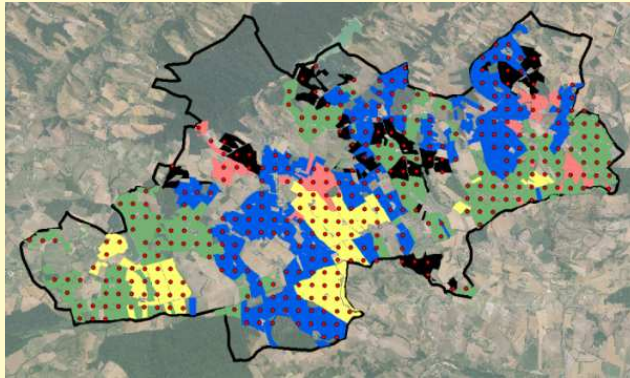


A landscape with sloping fields and permanent pastures



An intermediate landscape with a combination of crops and pastures

# Linking farmland bird diversity to farming system



→ Each point count is related to one farming system

- 5 GLMs to link the bird species richness to the types of farming system

Statistical unit = point count, n=363

## 5 Response variables

Species Richness

of

All bird species  
Nesting on ground species  
Nesting in trees species  
Omnivorous species  
Insectivorous species

## Explanatory variable

Type of farming system (5 modalities)

43 farmland species (passerines) were recorded in the 363 point counts.

### Occurrence of the 10 most frequent species

<b>English name</b>	<b>Latin name</b>	<b>Occurrence</b>
Eurasian Blackcap	<i>Saxicola atricapilla</i>	234
Common Blackbird	<i>Turdus merula</i>	209
Common Nightingale	<i>Luscinia megarhynchos</i>	176
Corn Bunting	<i>Emberiza calendra</i>	156
Common Whitthroat	<i>Sylvia communis</i>	132
Great Tit	<i>Parus major</i>	128
Blue Tit	<i>Parus caeruleus</i>	119
Common Chiffchaff	<i>Phylloscopus collybita</i>	110
Skylark	<i>Alauda arvensis</i>	101
Red Robin	<i>Erithacus rubecula</i>	87

## Two species of open habitat



Skylark



Corn Bunting

## Three species of intermediate habitat



Eurasian Blackcap




Common Nightingale

Common Blackbird



# Linking farmland bird diversity to farming system

## Farming systems

Production intensity 

		Less favored extensive livestock	Extensive livestock system	Mixed crop-livestock system	Intensive livestock system	Crop system
Species richness	<b>Total</b>	ns	ns	ns	ns	-
	Avged SR / point	7.6	7.0	7.3	7.5	6.3
	<b>Nesting ground</b>	+	ns	ns	ns	-
	<b>Nesting in tree</b>	ns	ns	ns	ns	ns
	<b>Omnivorous</b>	+	ns	ns	ns	-
	<b>Insectivorous</b>	ns	ns	ns	ns	ns

**+** = positive effect    **-** = negative effect    **ns** = non significant

# Discussion

Our results show that bird diversity differs among farming systems which are extremely opposed along a gradient of production intensity.

The crop system which has few semi-natural elements on its territory, has the less bird diversity. In contrast, the less favored extensive livestock system has the higher diversity.

However, the difference of bird diversity is very weak between these farming systems. This is probably because the studied landscape is globally heterogeneous. The different farming systems are spatially mixed. Then, birds which are very mobile move between the different farming systems.

Results would be probably more contrasted if we would consider these farming systems in different homogeneous landscapes.

# Perspectives

Mettre en lien la **dynamique** du territoire des exploitations agricoles avec la dynamique des communautés d'oiseaux



**1992**



**2006**

Remembrement sur la  
commune d'Eoux



Merci pour votre attention !