



Response of farmland birds to oilseed rape areas

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► To cite this version:

Christophe Sausse, Aude Barbottin, Philippe Martin. Response of farmland birds to oilseed rape areas. 11. Congress of The International Association for Ecology, The International Association for Ecology (INTERCOL)., Aug 2013, Londres, United Kingdom. hal-01019167

HAL Id: hal-01019167

<https://hal.science/hal-01019167>

Submitted on 6 Jun 2020

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Susan Jepsen

Introduction

Oilseed rape (OSR) is one of the major crops used in Europe for biofuel production. It has several characteristics (dense crop structure, production of various food resources for birds, including insects) that could impact the farmland birds positively or negatively depending on the species. The consequences of the increase of OSR areas on bird populations and communities, however, are poorly understood. Indeed, studies focusing on the impact of OSR remain essentially monospecific and regional.

Our work aims to answer two questions: Is there a response of farmland bird populations to OSR at the landscape scale (4km²)? Is this response uniform or does it depend on the agricultural and landscape features?

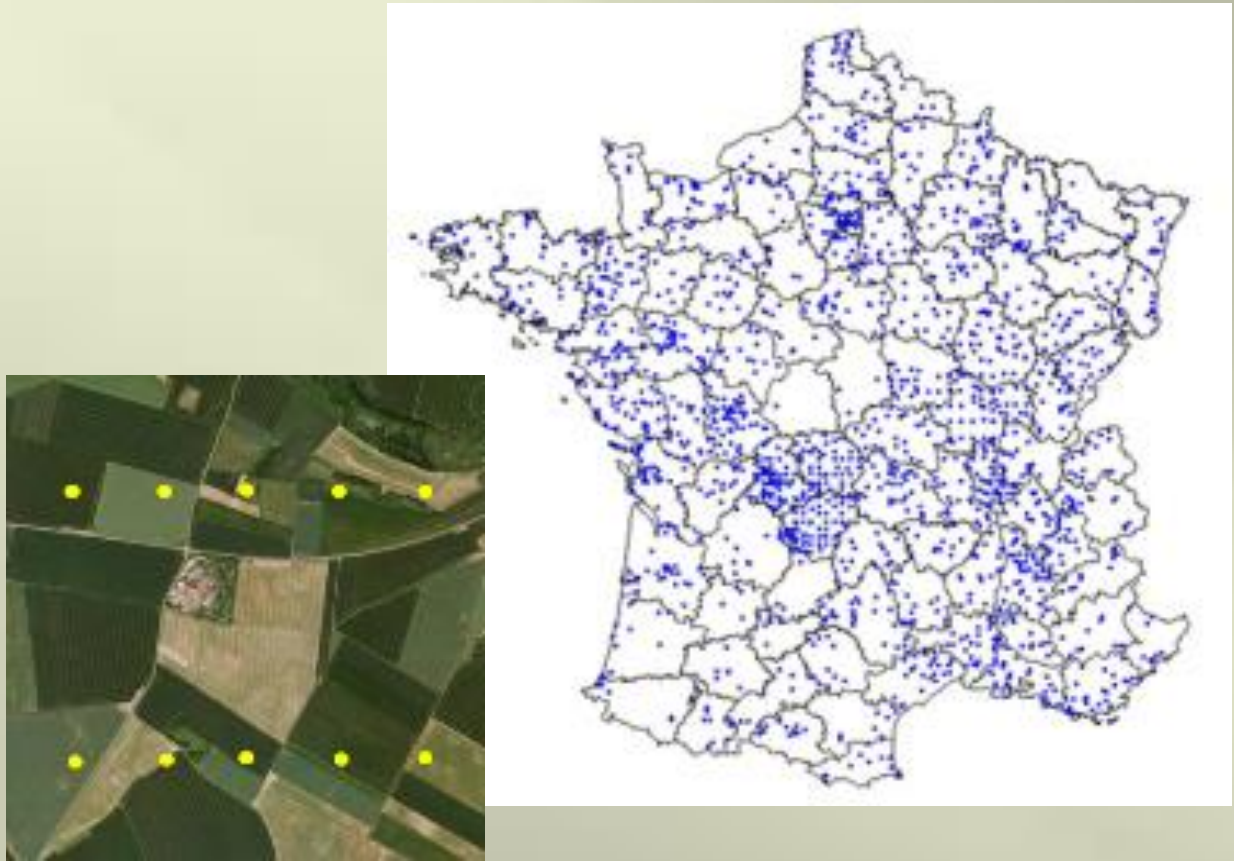
Material and methods

We used data from the French Breeding Bird Survey from 2007 to 2010, and sought to characterize the response of farmland bird abundance to OSR on 4 km² agricultural landscapes spread over France.

1. Databases

Biodiversity

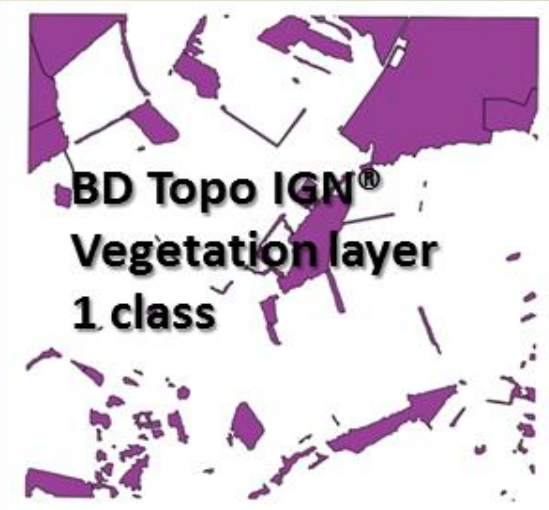
- Data extraction from the French Breeding Bird Survey
 - About 1000 plots/ year
 - 1 plot = 10 point counts on 4 km²
 - Plots usually followed over years



- Calculation of farmland bird abundance, 18 species were considered : Skylark, Red-legged partridge, Meadow pipit, Common buzzard, Eurasian linnet, Common quail, Corn bunting, Cirl bunting, Yellowhammer, Eurasian kestrel, Red back shrike, Wood lark, Yellow wagtail, Grey partridge, Winchat, European stonechat, Common whitethroat, Common hoopoe.

Landscape : on each plot,

- Data extraction from national high resolution databases



- Data integration (PostGis) and calculations :
 - *Landscape composition* (ha) :
 - Fixed elements : various elements including hedge, grass, crop and uncropped areas, roads, forests...
 - *Crops* (ha) : OSR, winter cereals, spring crops, maize and sunflower
 - *Landscape configuration* : number of distinct hedges and number of physical blocks of crops.

2. Statistical treatments

- One « observation » = one plot X one year
- Selection of observations on the period 2007-2010, with OSR and more than 50% of agricultural area;
- Distribution of observations in four groups according to two variables possibly interacting with OSR : grassland and trees in agricultural areas (hereafter « hedge »). The threshold values for grassland and hedge areas were defined in order to obtain balanced groups.
- Comparison of nested generalized linear mixed models to assess the impact of OSR.

Synchronic analysis : Impact of OSR variations between observations

Table 1 : number of observations by groups

	Hedge < 25 ha	Hedge > 25 ha
Grass < 56 ha	425	193
Grass > 56 ha	194	425

The effect of OSR area was assessed starting from a parsimonious model including the fixed elements of the landscape :

Farmland birds abundance = crop area + uncropped area + hedge area + hedge number + random effect / plot + random effect / year (link : Poisson)

Diachronic analysis : impact of OSR variations on plots followed two consecutive years

Table 2 : number of couple of observations by groups

	Hedge < 25 ha	Hedge > 25 ha
Grass < 56 ha	266	118
Grass> 56 ha	111	284

The effect of OSR area variation between year n and n+1 was assessed starting from the following model :

Variation of farmland birds abundance between year n and n+1 = random effect / year (link : Gaussian)

Stability of results : both synchronic and diachronic analysis were repeated 25 times on similar groups (variation of threshold values from 23 to 27 ha for hedges and 53 to 58 ha for grassland)

Results and discussion

Synchronic and diachronic analysis were consistent, and the repetitions on similar groups gave almost the same results (table 3). The relationship between OSR area and farmland birds at the landscape level depended on the landscape context. The farmland bird abundance was negatively influenced by OSR area in landscapes with many hedges and few grass. However, the underlying ecological processes are not known and further investigations are needed to understand this effect. One hypothesis is that an increase in OSR area would modify the landscape structure, possibly reinforcing the closure of the landscape, which is known to be unfavorable to farmland birds. These results do not yet have a practical significance. The magnitude of the relation is too low to allow a substantial improvement of farmland bird populations thanks to the management of crop allocation.



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Table 3 : results of model comparison

Group	Synchronic analysis			Diachronic analysis		
	OSR coefficient	test (P anova)	magnitude (% of abundance / 10 ha)	OSR coefficient	test (P anova)	magnitude (% of abundance / 10 ha)
Grass > 56 ha & hedge < 25 ha	+0.0007	0.500		+0.011	0.856	
Grass > 56 ha & hedge > 25 ha	+0.0002	0.878		-0.041	0.350	
Grass < 56 ha & hedge > 25 ha	-0.0029	0.021	1%	-0.131	0.005	3%
Grass < 56 ha & hedge < 25 ha	+0.0004	0.368		+0.035	0.273	

Perspectives

Analyses by species will allow further investigations on ecological processes. The overall methodology is usable to analyse the impact of other crops or crop diversity on bird abundances.

We thank the Muséum National d'Histoire Naturelle for the provision of the French Breeding Bird Survey, and Célia Pontet from CETIOM for her contribution to programming in R.