Flanders
State of the Art

Sustainable Farming BASF – site Brussels

Results breeding bird monitoring 2016 - 2018

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Way of quoting:
Verstraete H., van de Walle M., Pollet M.(2021). Sustainable Farming BASF – site Brussels. Results breeding bird monitoring 2016 - 2018. Reports of the Research Institute for Nature and Forest 2021 (31). Research Institute for Nature and Forest , Brussels.
DOI: doi.org/10.21436/inbor.39514554

D/2021/3241/246
Reports of the Research Institute for Nature and Forest 2021 (31)
ISSN: 1782-9054

Responsible publisher:
Maurice Hoffmann

Cover photograph:
The study site in Sint-Martens-Bodegem.

SUSTAINABLE FARMING BASF – SITE BRUSSELS
RESULTS BREEDING BIRD MONITORING
2016 - 2018

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doi.org/10.21436/inbor.39514554

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Introduction

With the Sustainable Farms project in three countries in Europe the multinational BASF aimed to demonstrate that intensive agriculture can go hand in hand with a high biodiversity as a result of appropriate local agro-environmental measures (AEMs). In Belgium, the company intended to accomplish the development of a bird- and bee-friendly farming model by applying specific AEMs in an agricultural area near Dilbeek (province of Vlaams Brabant, Belgium). Two sites were selected by BASF to develop these specific AEMs: a farm at Sint-Martens-Bodegem (SMB), with the surrounding arable fields, and arable lands at a nearby site in Sint-Katherina-Lombeek (SKL). These sites have a combined size of approximately 150 ha. INBO was asked by BASF to give advice about how to install specific AEMs, and to conduct breeding bird monitoring at these two sites. Researchers of the University of Mons explored the impact of AEMs on wild bees. The project was widely referred to as “Sustainable Farms – Brussels”.

doi.org/10.21436/inbor.39514554

Abstract

Upon request by BASF, INBO conducted bird monitoring in two farmland study areas around Dilbeek from 2016 to 2018. It was the aim of BASF to demonstrate that intensive agriculture can go hand in hand with a high biodiversity as a result of appropriate agro-environmental measures (AEM). The study area at Sint-Martens-Bodegem serves as a site where specific measures are taken for the creation of suitable breeding habitat for Birds of Small Landscape elements (BSL birds), while the study area at Sint-Katherina-Lombeek is a site where specific measures for Birds of Open Landscape (BOL birds) are more relevant and promising. This report presents the results of the 2018 bird monitoring and gives an overview of the results over the past 3 years, with a focus on farmland birds.

In 2018, the total number of bird species and territories proved to be much higher in Sint-Martens-Bodegem than in Sint-Katherina-Lombeek, due to the high share of non-farmland birds breeding in the urbanized areas of the study site. The percentage and absolute number of territories and species indicative for farmland, in contrast, are much higher in Sint-Katherina-Lombeek, with 4 species indicative for farmland breeding in 2018: Grey Partridge (5 territories), Northern Lapwing (11 territories), Skylark (5 territories) and Yellow Wagtail (6 territories). In the study area of Sint-Martens-Bodegem only 1 indicative species for farmland was observed breeding in 2018: Northern Lapwing (2 territories). The percentage of species and territories listed on the Flemish Red of List is also higher at the Sint-Katherina-Lombeek site.

Over the past 3 years the study area of Sint-Katherina-Lombeek saw an increase of Grey Partridge, Northern Lapwing and Yellow Wagtail, while the number of territories of Skylark remained the same. In contrast, numbers of territories of Grey Partridge and Northern Lapwing decreased in the Sint-Martens-Bodegem study site, with no territories of Grey partridge in 2018.

Over the past 3 years INBO recommended BASF to aim for a coverage rate of at least 7% AEMs, which is necessary to obtain an increase in territories of farmland birds in farmland characterized by intensive agriculture. Unfortunately the total covered area by AEMs remained very limited.

Recommendations for management and/or policy

1. A better selection of the study area, both geographically and in terms of land use is necessary. The study area should be located within a large agricultural area. The study area itself should only contain farmland areas.

2. Regarding the AEMs the effort should be higher both in time and space. The coverage rate should extend 7% and the period of the taken measures should be much longer.

3. To evaluate the results of AEMs on farmland birds, the study should use only farmland birds as response variable.

doi.org/10.21436/inbor.39514554

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1 METHODS AND DATA COLLECTION

1.1 STUDY AREA

1.1.1 AEM study site for BSL - Sint-Martens-Bodegem (SMB)

The SMB study site (Figure 1) is characterized by fragmentation due to roads, power lines, buildings, and urbanized areas. For that reason it is not suitable for open farmland birds, nor to install most of the AEMs to support them. The extant arable land is mainly used for crop farming, with pastures mainly present in the northern part. Because of its low potential for farmland birds, INBO tried to recommend some AEMs focussing on birds that benefit from a more fragmented landscape with some small landscape elements: Birds of Small Landscape elements (BSL birds). Since 2017 this whole area serves as a study site where specific measures could be taken for the creation of suitable breeding habitats for BSL birds. The total area is approximately 91 ha.

In the SMB study site, the first AEMs were planned and installed in 2016 (Figure 1), even before INBO was involved. They consisted of the creation of Skylark windows in a field of winter wheat and the creation of an area sown with different flower mixtures (this area is known as the 'demo field'). In 2017, the demo field was extended with a mixed grass strip and a flower mixture was provided at the edge of a field. In 2018 the demo field remained the same as in 2017 as well as the mixed grass strip.

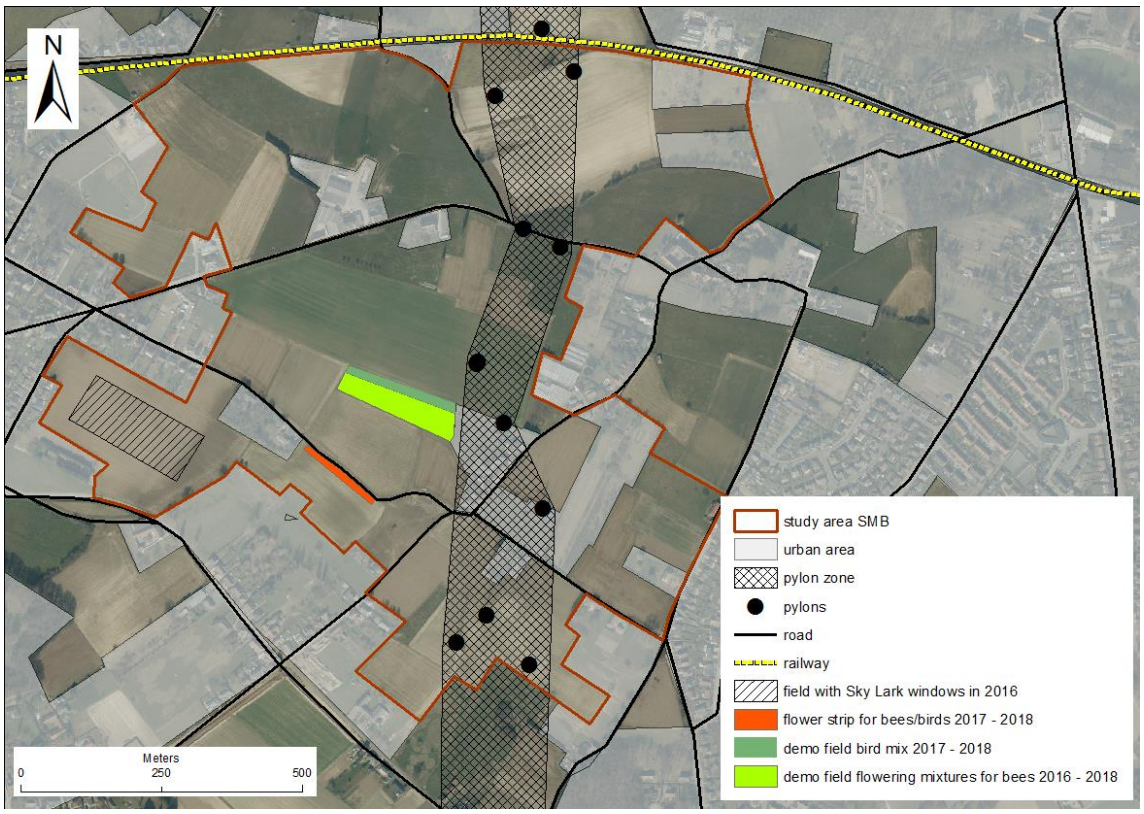

Figure 1 The study area of SMB with indication of areas where AEMs were installed from 2016 to 2018.

doi.org/10.21436/inbor.39514554

Photo 1 The study area in SMB: the ‘demo field’ (at the top), a flower strip (in the middele) and a high-voltage line, one of the confounding elements in the area for farmland birds (at the bottom). Photos Hilbran Verstraete.

1.1.2 AEM study site for BOL - Sint-Katherina-Lombeek (SKL)

This area is featured by large, contiguous plots, with little fragmentation and low disruption (Figure 2). The study area is dominated by crop farming as well. It serves well as a study site where specific measures can be taken for the creation of suitable breeding habitat for Birds of Open Landscape (BOL birds). The total area is approximately 71 ha.

In the study area of SKL the first (and only) AEM was employed in 2017: a strip of a flower seed blend (Figure 2). This strip remained unchanged in 2018. The construction of Skylark windows in a field of winter wheat failed in 2017.

Figure 2 Study area of SKL with indication of areas where AEMs were installed from 2017 to 2018.

doi.org/10.21436/inbor.39514554

Photo 2 The study area in SKL: a mixed grass strip along a dirt road in early spring (at the top) and in the summer (in the middel) and some 'waste land' of great value for farmland birds (at the bottom). Photos Hilbran Verstraete.

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1.2 DATA COLLECTION AND PROCESSING

Birds are monitored, using the Breeding bird Monitoring Program (BMP) of SOVON as described in Hustings *et al*. (1985), and adapted by van Dijk (2011) as included in T'Jollyn *et al* (2016). The ultimate aim of this methodology is to determine bird territories, i.e. this method does not cope with breeding success nor survival. An automatic clustering method within Avimap (http://www.Avimap.be) is used to aggregate multiple sightings of birds over the successive bird counts. The output is the total number of territories, and the point location of the centre of these territories of all bird species in the two study areas. The advantage of automatic clustering versus manual clustering (the traditional approach) is the data standardization. The automatic clustering takes into account various parameters such as period, time of day, bird behaviour (singing, calling, copulating, single, pair…), number of surveys and number of valid observations within a certain time period. All of these parameters are species-related.

Six field visits from April until July 2018 were conducted at the two study areas on the dates listed in Table 1. At least five field visits spread over a period from the 1st of April until the end of June are necessary based on the time windows of all the bird species of both study areas in which certain observations are needed to validate a territorium. On the above mentioned dates both study areas were visited. Each survey event (both sites combined) took about 7 to 8 hours. The study areas were screened by crossing them as much as possible by using public roads, field roads, and field boundaries. Visual and auditory observations of territorial birds were entered directly into the Avimap data system via a dedicated Avimap app on a smartphone. Binoculars were used to determine all birds and determine their exact location within the study area. During the two previous years the monitoring was conducted in the same way with five field visits per year.

Based on their ecological characteristics, birds can be divided into different groups. In this report we recognize two major groups: farmland birds and non-farmland birds. Farmland birds are birds that are fully depending on farmland to survive. Most of the observed birds listed as non-farmland birds are birds that breed in a wide variety of urbanized areas. The classification of the breeding birds into these two groups is important, because only the farmland birds can be used as an indicator to evaluate the different AEMs. A bird list of indicative bird species for farmland in Flanders is given in Appendix 1. In the study area (especially the SMB study site), the non-farmland birds are fully depending on gardens for breeding and foraging and are therefore inappropriate response variables to evaluate the AEMs. The nomenclature used in this report is based on the AERC list (Crochet & Joynt, 2015).

Table 1 Overview of the dates of field visits during the field season 2018.

field visit	date
1	April 11th
2	April 26th
3	May 15th
4	May 30th
5	June 12th
6	July 17th

doi.org/10.21436/inbor.39514554

2 INBO ADVISE ABOUT AEMS IN THE TWO STUDY AREAS

When INBO was asked by BASF to conduct bird monitoring and to give advise to implement AEMs, two study areas were already determined by BASF: the SMB study site and the SKL study site. Initially it was the intension of BASF to consider the study area in SMB as an experimental site to test specific AEMs for birds. The study site in SKL would serve as a control site. However, as a result of the considerable difference between the two study areas, both with their own specific bird communities, early on in the project the site at SKL proved unsuitable as a control site. Despite the fact that the SMB study area has a very low potential for farmland birds and the SKL site a much bigger potential to implement succesfull AEMs, it was very important for BASF to retain this site as a study area. Finally, upon request by INBO, the two study areas were considered to be separate experimental sites. The SMB study area had no potential for BOL species, but it would serve as a experimental site for BSE species. The SKL site would serve as a study site for BOL species. Over the past tree years INBO recommended a lot of possible AEM's for the two study areas (Appendix 4), all well thought over according to optimal locations and according to the specific needs of the bird communities in both study areas. Also, in order to be succesfull, INBO suggested to BASF to reach an AEM coverage rate of at least 7% in each of the two study areas. In 2018, the SMB study site had a total AEM coverage rate of 0,5%. It consisted out of bird mix (0,32 ha) bordering the demo field and a flower strip (0,17 ha) for bees and birds. The flowering mixture for bees (0,88 ha) in the demo field has not been taken into account, because it's a specific measure for bees. In 2018 the SKL site had a total AEM coverage rate of 0,6%, consisting out of a mixed grass strip.

Photo 3 The mixed grass strip along a dirt track in the study area of SKL. Photo Hilbran Verstraete.

3 RESULTS

3.1 THE SMB STUDY SITE

Due to its fragmented, rather closed nature with some small landscape elements (willows and some bushes), this whole area serves as an experimental site to implement agro-environmental measures for BSE species. In general, the extant arable land is used for crop farming, with pastures mainly present in the northern part. The inventory of the different crops was not included as an INBO task. Urban gardens mainly situated along the outer edges were considered as an integral part of the study area.

A total of 129 territories of 27 different bird species were found in the SMB study in 2018 (Table 2). Only one indicator species for farmland did occur in this study area in 2018: Northern Lapwing (2 territories). Common Pheasant is an introduced game bird originating from Asia and can therefore not be regarded as an indicator of ecological importance. Consequently, it is not treated here as an indicator species for arable land. The percentage of *territories* of birds indicative for farmland is 1,5%, the percentage of bird *species* indicative for farmland is 3,7% (Figure 3). Most of the other birds are common (sub)urban species that occur in the gardens surrounding the farmland (Appendix 2).

Two species are listed on the Flemish Red List (Devos *et al*. 2016): Northern Lapwing (2 territories) and House Sparrow (23 territories). The percentage of species at SMB listed on the Flemish Red List is 7,4%, the percentage of territories of these species listed on the Flemish Red List is 15,5% (Figure 4).

It is obvious that the bird community is strongly dominated by a high number of urban bird species in the gardens. Appendix 3 gives an overview of all territories in the SMB study site. It is clear that most of the territories are not on the farmland itself but rather in the surrounding gardens. Actually, 79% of all territories are located in the (sub)urban zone within the SMB study site.

Photo 4 A male Northern Lapwing. This species was the only farmland bird with territories in the SMB study site during 2018. Photo Hilbran Verstraete.

doi.org/10.21436/inbor.39514554

Table 2 Birds found in the SMB study site in 2018, with information on individual observations, the number of territories, and their classification on the Red List of Flanders (Devos *et al*. 2016). Indicator species for agriculture are listed in bold. RL Flanders: EN = endangered, VU = vulnerable.

Common name	Scientific name	11.04.2018	26.04.2018	15.05.2018	30.05.2018	12.06.2018	17.07.2018	**Number of territories**	RL -Flanders
Common Kestrel	Falco tinnunculus		1	1			1	**1**	
Common Pheasant	Phasianus colchicus	10	6	7	5	5	3	**9**	
Northern Lapwing	**Vanellus vanellus**	3	2	1	1			**2**	EN
Stock Pigeon	Columba oenas	2	1	5		1		**5**	
Common Wood Pigeon	Columba palumbus	1	4	10	7	5	6	**12**	
Eurasian Collared Dove	Streptopelia decaocto		1	2	1	2	2	**3**	
Barn Owl	Tyto alba			1				**1**	
Little Owl	Athene noctua			1				**1**	
Green Woodpecker	Picus viridis				1			**1**	
Pied Wagtail	Motacilla alba	1	1			1		**1**	
Winter Wren	Troglodytes troglodytes	2	4	8	4	5		**8**	
Hedge Accentor	Prunella modularis	3	1	7	1	3		**9**	
European Robin	Erithacus rubecula		2		1	2	1	**3**	
Black Redstart	Phoenicurus ochruros			1		1	1	**1**	
Common Blackbird	Turdus merula	3	3	7	2	6	4	**10**	
Common Whitethroat	Sylvia communis			1	1			**2**	
Blackcap	Sylvia atricapilla	1	2	6	5	1		**7**	
Common Chiffchaff	Phylloscopus collybita	1	1	3	2	2	3	**3**	
Goldcrest	Regulus regulus	1		1	1			**2**	
Blue Tit	Parus caeruleus	3		2	2	1		**5**	
Great Tit	Parus major	4	2	8	2			**9**	
Black-billed Magpie	Pica pica	1	1	2	1			**3**	
Carrion Crow	Corvus corone	1	3					**2**	
Common Starling	Sturnus vulgaris	1		1				**1**	
House Sparrow	Passer domesticus	3	18	23	16	13	11	**23**	VU
Chaffinch	Fringilla coelebs	1	1	2	1		1	**4**	
European Greenfinch	Chloris chloris		1					**1**	
Total		42	55	100	54	48	33	**129**	

3.2 THE SKL STUDY SITE

Due to its open nature without small landscape elements, this whole area serves as an experimental site to implement and evaluate measures for BOL species. The extant arable land is mainly used for crop farming. As mentioned before, the inventory of the different crops falls beyond the INBO tasks. In general and in contrast with the other study area, no gardens nor any other urbanized areas occurred inside the study area (Figure 2).

In 2018, 48 territories of 20 different bird species were found in the study area at SKL (Table 3). Four indicator species for farmland occurred in the study area: Grey Partridge (5 territories), Northern Lapwing (11 territories), Skylark (5 territories) and Yellow Wagtail (6 territories). The percentage of *territories* of birds indicative for farmland is 56%, the percentage of *species* indicative for farmland is 20% (Figure 3). The other (non-farmland) bird species occurred in the scattered bushes in the outer margins of the study area (Appendix 3).

Three species are listed on the Flemish Red List: Grey Partridge, Northern Lapwing and Eurasian Skylark. The percentage of species on the Flemish Red List is 17%, the percentage of territories of these species in SKL is 41% (Figure 4).

Finally, for 4 bird species that were encountered in the study area no evidence of breeding nor territories were found. These species included Common Linnet and Corn Bunting (Table 3).

Photo 5 Grey Partridges. According to the results over the years 2016 – 2018, Grey Partridges (vulnerable species in Flanders) are doing well in the study area of SKL. Photo Hilbran Verstraete.

doi.org/10.21436/inbor.39514554

Table 3 Birds found in the study area of SKL in 2018, with information on individual observations, the number of territories, and the classification on the Red list of Flanders (Devos *et al*. 2016). Indicator species for agriculture are listed in bold. RL Flanders: CR = critical endangered, EN = endangered, VU = vulnerable.

Common name	Scientific name	11.04.2018	26.04.2018	15.05.2018	30.05.2018	12.06.2018	17.07.2018	**Number of territories**	RL -Flanders
Grey Partridge	**Perdix perdix**	4	3	5	1	2	2	**5**	VU
Common Pheasant	Phasianus colchicus	1	1	1				**1**	-
Northern Lapwing	**Vanellus vanellus**	13	12	14	8	6		**11**	EN
Stock Pigeon	Columba oenas			1	1			**1**	
Common Wood Pigeon	Columba palumbus	1					1	**2**	
Eurasian Collared Dove	Streptopelia decaocto				1			**1**	
Sky Lark	**Alauda arvensis**	5	3	4	2	2	1	**5**	VU
Yellow Wagtail	**Motacilla flava**	2	3	5	5	4	2	**6**	
Pied Wagtail	Motacilla alba	1						**0**	
Winter Wren	Troglodytes troglodytes	2		2	2	1		**3**	
European Robin	Erithacus rubecula	3		1	1	1		**1**	
Black Redstart	Phoenicurus ochruros	1						**0**	
Common Blackbird	Turdus merula			1				**1**	
Song Thrush	Turdus philomelos			1				**1**	
Common Whitethroat	Sylvia communis				1			**1**	
Blackcap	Sylvia atricapilla	2		1	2	1		**3**	
Common Chiffchaff	Phylloscopus collybita	1	1	1	1	1	1	**1**	
Goldcrest	Regulus regulus					1		**1**	
Great Tit	Parus major	1			1		1	**1**	
Short-toed treecreeper	Certhia brachydactyla	1						**1**	
Black-billed Magpie	Pica pica				1			**1**	
Chaffinch	Fringilla coelebs				1			**1**	
Common Linnet	**Carduelis cannabina**	2						**0**	
Corn Bunting	**Miliaria calandra**	1						**0**	CR
Total		41	23	37	28	19	8	**48**	

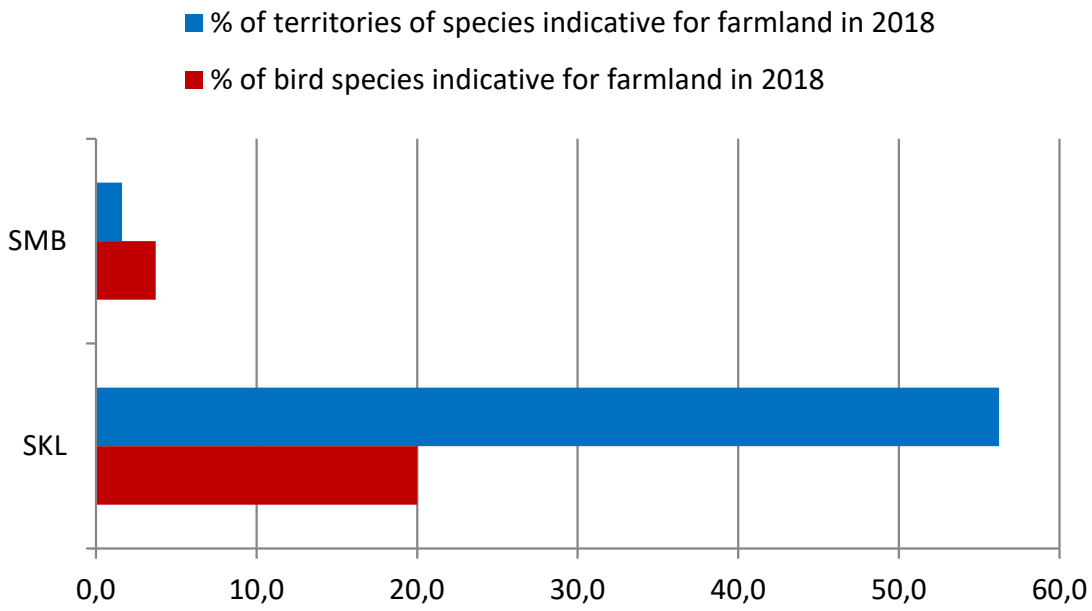

Figure 3 Percentage of territories and species of farmland birds (BSL + BOL) in the two study areas in 2018. SMB = Sint-Martens-Lombeek, SKL = Sint-Katherina-Lombeek.

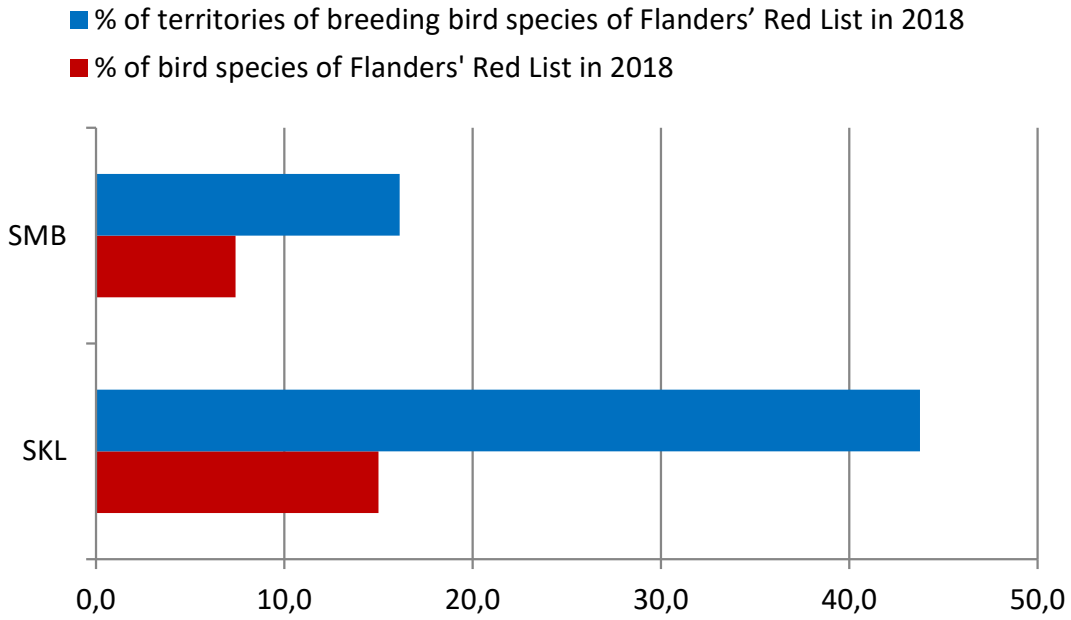

Figure 4 Percentage of territories and species on the Red List of Flanders in 2018. SMB = Sint-Martens-Lombeek, SKL = Sint-Katherina-Lombeek.

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3.3 RESULTS 2016 – 2018

Table 4 gives an overview of the number of territories of farmland birds for the two study areas in 2016, 2017 and 2018. In the SMB study site two farmland bird species were present in 2016 and 2017 (Grey Partridge and Northern Lapwing) but only one farmland bird species remained in 2018 (Northern Lapwing). In SKL four species of farmland birds (Grey Partridge, Northern Lapwing, Sky Lark and Yellow Wagtail) were present in all years.

The two farmland bird species that were observed at the SMB study site (Grey Partridge and Northern Lapwing) decreased in numbers from 2016 to 2018 (Figure 5), with Grey Partridge disappearing in 2018. The populations of the four farmland birds that occurred in SKL is positive (Grey Partridge, Northern Lapwing and Yellow Wagtail), while the trend for Skylark is stable Figure 5.

Despite the differences in the number of breeding pairs over the three years, it is actually too early to draw reliable conclusions about the state of the farmland birds at both sites. A longer term monitoring effort should provide the crucial basic data for long term trend assessments.

Table 4 Number of territories of farmland birds found in the two study areas (SMB = Sint-Martens-Bodegem, SKL = Sint-Katherina-Lombeek) during the years 2016, 2017 en 2018. 0* = there was at least one sighting, but it didn't contribute to a territory.

		2016	2017	2018
Grey Partridge	SMB	2	2	0
	SKL	3	3	5
Northern Lapwing	SMB	4	2	2
	SKL	9	14	11
Sky Lark	SMB	0	0	0
	SKL	5	3	5
Yellow Wagtail	SMB	0	0	0
	SKL	3	5	6
Common Linnet	SMB	0	0*	0
	SKL	0	0	0*
Corn Bunting	SMB	0	0	0
	SKL	0	0	0*

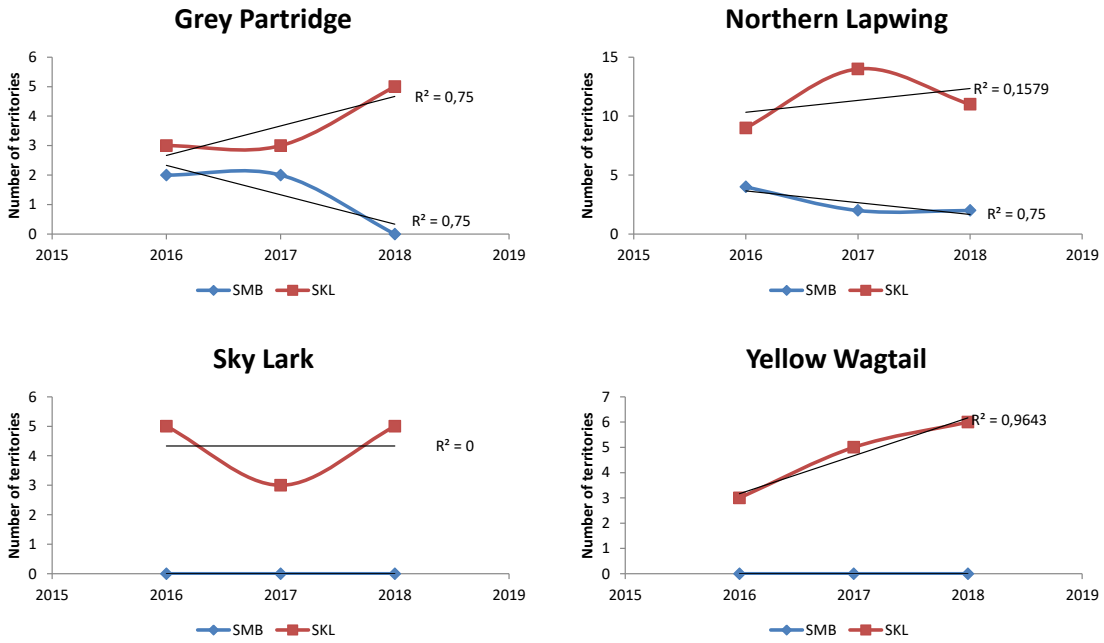

Figure 5 Number of territories of farmland birds found in the two study areas (SMB = Sint-Martens-Bodegem, SKL = Sint-Katherina-Lombeek) during the years 2016, 2017 en 2018.

Photo 6 The four species of farmland birds present in the study area at SKL: Grey Partridge (photo Hilbran Verstraete), Northern Lapwing (photo Hilbran Verstraete), Skylark (photo Herman Blockx) and Yellow Wagtail (photo Willy Ceulemans).

doi.org/10.21436/inbor.39514554

4 CONCLUSION

It was the aim of BASF to demonstrate that intensive agriculture can go hand in hand with a high biodiversity as a result of appropriate agro-environmental measures (AEM). Despite the INBO recommendations to implement a coverage rate of at least 7% of specific AEMs at the most promising locations in both study areas, the total effort remained poor. The coverage rate in 2018 for the study areas at SMB and SKL was 0,5 and 0,6% respectively. Only with a coverage rate of at least 7% can an increase of farmland bird communities be expected. Moreover an effort of 3 years is not sufficient. The impact of these measures on the number of territories remains therefore limited.

In this three years project we have to come to the conclusion that no hard evidence was gathered to support the above BASF statement, i.e. that intensive agriculture can be accompanied by a high biodiversity of farmland birds.

Photo 7 A nest of Northern Lapwing, camouflaged on the arable land in the study area at SKL. Photo Hilbran Verstraete.

5 DISCUSSION

The birds found in the two study areas can roughly be divided into two ecological groups based on habitat preferences: farmland birds and non-farmland birds. According to Dochy & Hens (2005) farmland birds can further be divided into two groups based on habitat preferences: farmland birds of open landscape (BOL) and farmland birds of small landscape elements (BSL).

The two study areas were chosen by BASF and are, in fact, very different farmland areas. The study area at SMB represents an area with a high level of fragmentation and elements that are not suitable to support farmland birds (Figure 1), resulting in very low numbers of these species. This makes it incredibly hard to implement favourable AEMs, unless more measures are taken on a larger scale. In contrast, the study area at SKL represents a more favourable open arable landscape providing much higher densities of different species of farmland birds. INBO recommended a list of AEMs (Appendix 4) for the two study areas. SMB was considered as a study area with the highest potential to install AEM for BSE species, and SKL as a study area with high AEM potential to support BOL species. Locations to install AEMs are best chosen in areas with high densities of farmland birds. AEMs can support established populations of farmland birds, but will be less effective at locations were these birds are (almost) absent.

Farmland birds are totally depending on farmland, which nowadays makes them a very vulnerable group in a world of agricultural intensification. As a result of the dramatic decline of most farmland birds (BirdLife International 2015, EBCC/BirdLife/RSPB/CSO, 2017), more and more AEMs are applied in Europe to support them. However, it is decisive to evaluate these measures with appropriate indicators. Measures to support and increase the number of farmland species can – evidently - only be tested with the farmland birds themselves as response variables (indicators). Non-farmland birds, on the contrary, use a wide spectrum of habitats ranging from natural environment over (sub)urban to industrial environment. For that reason, INBO did not use any diversity indexes including these species. Indeed, a diversity index takes all species into consideration and therefore does not focus on the target species (the farmland birds) which is essential to evaluate the effects of AEMs.

In highly urbanized regions like Flanders, urbanized areas and the associated non-farmland birds should be excluded from monitoring, which would facilitate the focus on the impact of EAMs on farmland birds. Unfortunately, urbanized areas were considered an integral part of the study area in SMB. Repeated recommendations from INBO to adapt the current area to a strictly agricultural area (thus without the lawns and gardens), were not approved for by BASF. Excluding gardens and their bird faunas from the study area in SMB, nevertheless, would have allowed us to concentrate on the focal habitat (farmland) and the effect of AEMs on farmland birds.

With respect to Figure 4 and more specifically to the percentage of territories of Flemish Red List species in SMB (15%), it should be noted that the majority of this percentage is obtained by House Sparrow, a non-farmland bird. In contrast, all Red List species in SKL are true farmland birds.

Regarding measures to support farmland birds, research in the past has already shown the importance of a high coverage rate of measures (Boller *et al.* 2004; Flade *et al.* 2006; Phillips *et al.* 2009). With a AEM coverage rate of less than 5% of the area, a further decline of farmland birds is very likely. A coverage rate of 5% of the area will stop the decline and with a coverage

 doi.org/10.21436/inbor.39514554

rate of 8 – 10%, the population is likely to recover. So, if it is the intention to make a positive difference for farmland birds, a AEM coverage rate of 8 – 10% is strongly recommended and might speed up the increase of farmland birds recovery in the study sites.

The difference in quality and potential between the two study areas for farmland birds is striking. The density of farmland birds in SKL is surprisingly high for an area of that size in the current Flemish context. Apparently the conditions seem sufficient to support high numbers of these breeding birds. A number of conditions makes SKL a more favourable place for farmland birds compared to SMB: 100% of farmland surface, a low rate of fragmentation, lower urban and traffic disturbance and the absence of pylons wich provide opportunities for predatory birds. However, the promising numbers of farmland birds in SKL are expected to decline, like most other parts of Flanders and Europe. For example, the numbers of Northern Lapwing remained rather high and stable during the years of the survey. However, Northern Lapwing is a long-lived species, with a low reproduction rate in Flanders and a high mortality of the offspring. If the breeding success does not improve, the species is very likely to disappear, also in sites like SKL. To keep up with the current situation, it is preferable that appropriate long term AEMs are taken.

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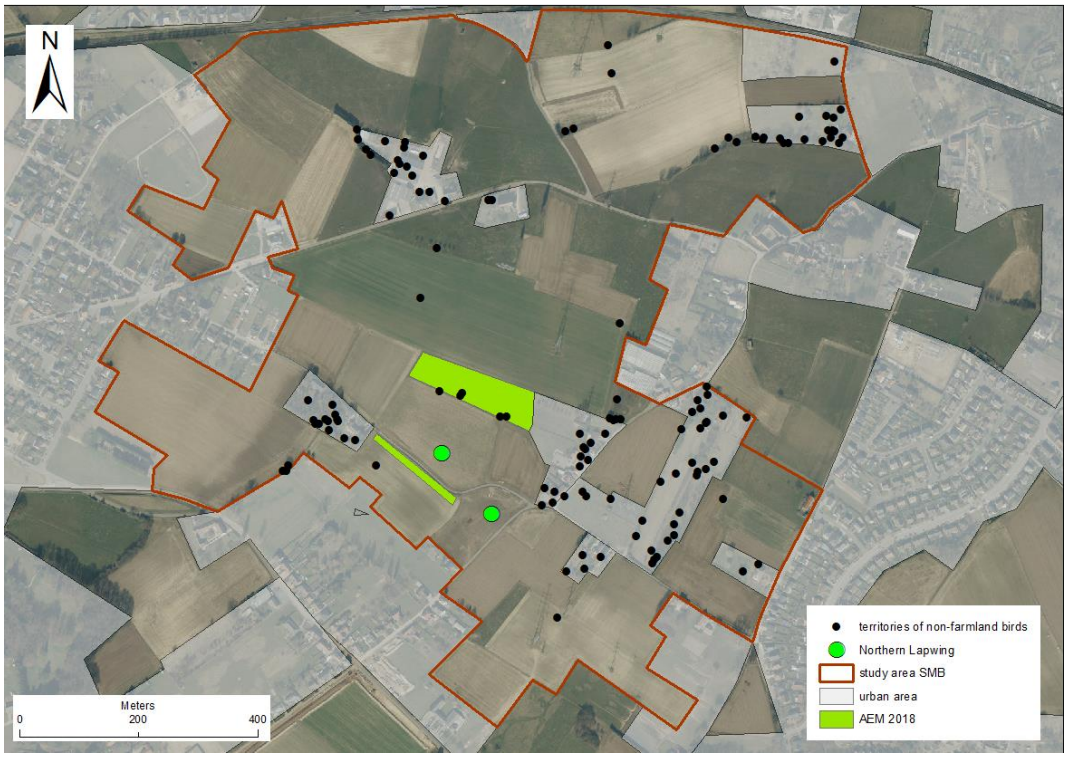
Appendix

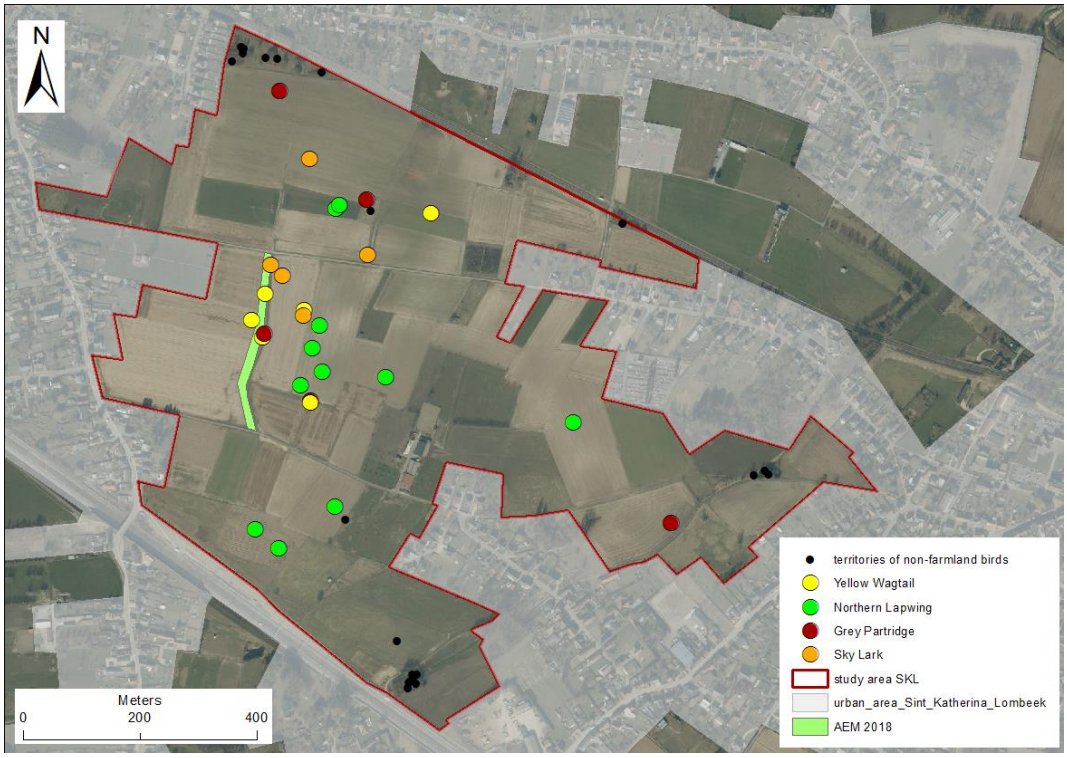
Appendix 1. List of birds considered to by 'farmland birds' in this study.

species	
Grey Partridge	*Perdix perdix*
Northern Lapwing	*Vanellus vanellus*
Sky Lark	*Alauda arvensis*
Yellow Wagtail	*Motacilla flava*
Eurasian Tree Sparrow	*Passer montanus*
Common Linnet	*Carduelis cannabina*
Yellowhammer	*Emberiza citrinella*
Corn Bunting	*Miliaria calandra*

Appendix 2. Location of the territories of breeding birds within the study area of SMB (2018). Black dots = territories of non-farmland birds, the coloured dots indicate the territories of farmland birds. Red dots = territories of Grey Partridge. Green dots = territories of Northern Lapwing. Areas filled with green = urban(ized) areas, consisting of gardens and buildings.



Appendix 3. Location of the territories of breeding birds within the study area of SKL (2018). Black dots = territories of non-farmland birds, the coloured dots indicate the territories of farmland birds. Coloured dots = territories of farmland birds (see Legend in Figure). Areas filled with green = urban(ized) areas, consisting of gardens and buildings.



doi.org/10.21436/inbor.39514554

Appendix 4. Overview of possible AEMs for farmland birds. BSE = Birds of Small landscape Elements, BOL = Birds of Open Landscape.

	BSL	BOL
AEM to support farmland birds	Small landscape elements unsprayed mixed grass strips Bird seed crops Extensive pasture Retaining cereal edges Unsprayed cereal edges Rough field margins	Skylark windows unsprayed mixed grass strips unsprayed stubble fields Rough field margins
present species in 2018		Grey Partridge Northern Lapwing Eurasian Skylark Yellow Wagtail
target	Grey Partridge Tree Sparrow Common Linnet	increase of the above mentioned species
location	Sint-Martens-Bodegem	Sint-Katherina-Lombeek