Breeding birds on organic and conventional arable farms

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Chapter 3

Breeding barn swallows *Hirundo rustica* on organic and conventional arable farms in the Netherlands

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Abstract

Populations of farmland birds are under pressure as a result of agricultural intensification. Less intensive farming methods, such as organic are believed to be a possibility to halt these population declines. Besides that, organic farmers have possibly a more positive attitude towards nature and environment which can have positive effects on breeding birds as well. This study compared farmers' attitude towards presence of barn swallows *Hirundo rustica* and abundance of breeding barn swallows between organic and conventional arable farms in the Netherlands. Abundance of breeding barn swallows did not differ between organic and conventional arable farms. Both organic and conventional farmers were positive towards the presence of barn swallows on their farms. This study showed that organic farming does not attract more barn swallows. However, agricultural intensification could have resulted in lower breeding success and consequently population declines, although other factors are possibly playing a role as well.

Keywords: Barn swallow; Organic farming; Arable farming; Agricultural intensification; Farmers' attitude

Introduction

Populations of farmland birds have been in steep decline since a few decades now (e.g. Siriwardena *et al.*, 1998; Donald *et al.*, 2006). As a result of these declines species like skylark *Alauda arvensis*, corn bunting *Miliaria calandra* and grey partridge *Perdix perdix* have been put on Red Lists in several European countries (e.g. van Beusekom *et al.*, 2004; Gärdenfors, 2005). New developments on the world market, such as increased demands for cereals and biofuels, are likely to further intensify agriculture and possibly further decrease farmland bird populations.

Barn swallows *Hirundo rustica* are characteristic birds of agricultural areas, including grassland areas and arable areas. Just like other farmland birds, barn swallow populations declined during the last decades in large parts of Europe (BirdLife International, 2004). Causes of barn swallow population declines are related to conditions in breeding grounds, migration and conditions at wintering quarters. Agricultural intensification has contributed to reduced populations in several ways. First, increased pesticide use and reduced grazing livestock is associated with a reduction of invertebrates (e.g. Vickery *et al.*, 2001; Benton *et al.*, 2002). Reduction of food availability during the breeding season can reduce the breeding success (e.g. Hart *et al.*, 2006). Secondly, especially in arable areas, farm specialisation might have resulted in barn swallow population declines (Evans and Robinson, 2004). In wintering habitats and during migration environmental conditions are shown to have great impact on barn swallow populations (Baillie and Peach, 1992).

As agricultural intensification is mentioned to be one factor causing barn swallow population declines, less intensive farming such as organic should be beneficial for barn swallows. In order to see whether this could be true, the abundance of breeding barn swallows was compared between organic and conventional arable farms. Besides this, farmers' attitude towards presence of

barn swallows was assessed as well. As respect for and conservation of the environment, nature and landscape have a central place in the philosophy of organic farming (IFOAM, 2005) it is hypothesized that organic farmers are more positive towards the presence of barn swallows. As a result, this could result in better habitat conditions for barn swallows on organic farms and consequently in higher numbers of breeding barn swallows.

Materials and methods

The study was carried out on 40 arable farms in the province of Flevoland in the Netherlands (approximate location 52°32'N, 05°46'E) in the spring of 2005. Conventional farms were somewhat larger than organic farms, but the difference was not significant (Conventional: 40 ha; Organic: 36 ha; Paired-samples *t*-test, $t = 1.062$, df 19, NS). Farms of one pair were at least 600 meters apart from each other. Conventional farms were never adjacent to an organically managed farm, including organic farms that were not included in this study. Dominant crops grown in the area are winter cereals, potatoes, sugar beet and onions. Farms were selected according to a pairwise set-up, each pair consisting of one organic and one conventional farm. All organic farms have been managed organically for at least 5 years. Conventional farms applied pesticides and artificial fertilizers. On organic farms weeds were removed mechanically and occasionally biological pesticides or natural enemies were used to fight insect pests. Instead of artificial fertilizers, only manure was used on organically managed farms. The pairing procedure was based on surrounding landscape, which was similar for both farms in a pair. On farm differences, such as crop rotation scheme and abundance of non-crop habitats (e.g. field margins, hedgerows), were not included in the pairing procedure as these are direct effects of differences in farm management. Organic farms grew more spring cereals compared to conventional farms and grew more crop types. On

conventional farms, more potatoes, sugar beet and winter cereals were grown (see also Kragten and de Snoo, 2008). Organic farms had somewhat more non-crop habitat compared to conventional farms (4.4% of farm area vs. 3.6%), but this difference was not significant (Wilcoxon, $Z = 1.717$, NS). Woody elements (e.g. trees, hedgerows), which are of importance for foraging barn swallows during bad weather circumstances were on all farms present as tree lines around the farmyards. Some organic farms had some small solitary trees between fields.

In June 2005 each farm was visited once to count "occupied" nests. This was done by checking all buildings on the inside and on the outside. Both farms of a pair were visited during the same day. Difference in the number of occupied nests between organic and conventional farms was analysed using Wilcoxon matched pair test. In order to get a picture of farmers' attitude towards barn swallows a small questionnaire was carried out. Farmers were asked to react on the following statements:

1) Barn swallows are part of my farmyard
2) Presence of nesting barn swallows is a risk for food hygiene
3) Presence of barn swallows is hindering due to their droppings on windows, terrace, cars etc…
4) I always notice when barn swallows have returned

For each statement a score of 1 to 5 could be given, with 5 being the most positive for the swallows. Difference in farmers' attitude between organic and conventional farmers was analysed using Mann-Whitney test.

Results

On 60% of the farms at least one barn swallow nest was found. Of the organic farm 65% had swallow nests, while on 55% of conventional farms swallow

nests were found. Occupancy rates of farm did not differ (logisitic regression, χ^2 = 0.328, df 1, NS) In total 99 nests were found, with the highest number found on one farm being 17. Mean number of nests (± SD) found did not differ significantly between organic and conventional farms (Organic: 2.40 ± 3.38, Conventional: 2.55 ± 4.50, Wilcoxon, Z = -0.380, NS).

The answers of 38 questionnaires were received and analysed. One organic and one conventional farmer did not fill out the questionnaire. Attitude towards presence of barn swallows did not differ between organic and conventional farmers (Table 4). Both organic and conventional farmers are generally positive towards the presence of barn swallows. Presence of barn swallows was not viewed as a risk for food hygiene.

Table 4 Attitude (mean ± SD) of organic and conventional farmers towards presence of barn swallows Answers could be given on a scale from 1-5, with 5 being the most positive towards barn swallows.

Statement	Organic	Conventional	*P*
Barn swallows are part of my farmyard	4.6 ± 0.5	4.5 ± 0.8	NS
Presence of nesting barn swallows is a risk for food hygiene	4.5 ± 0.7	4.0 ± 1.4	NS
Presence of barn swallows is hindering due to their droppings on windows, terrace, cars etc…	3.7 ± 1.2	3.7 ± 1.2	NS
I always notice when barn swallows have returned	4.9 ± 0.2	4.9 ± 0.5	NS

Discussion

This study indicates that organic and conventional arable farms are both equally qualified as nesting sites for barn swallows. Mean number of barn swallow nests per farm did not differ between the two farm types and also occupancy rates of farms did not differ significantly. Also farmers' "swallow-friendliness" is equal for organic and conventional farmers.

Similar results were found in a study comparing breeding barn swallow abundance between organic and conventional dairy farms in the Netherlands (Lubbe and de Snoo, 2007). However, Christensen *et al.* (1996) found higher numbers of barn swallow above organically managed fields compared to conventionally managed fields. Barn swallows feed on aerial invertebrates and several studies found that invertebrate abundance is generally higher on organically managed fields (Hole *et al.*, 2005). In 2004, on the same farms as where this barn swallow study was carried out aerial invertebrate abundance was found to be higher on organic farms (Kragten *et al.*, in prep.). Barn swallows forage above fields with highest food abundance (Evans *et al.*, 2007). It could be possible that lower food abundance on conventional farms will result in lower breeding success and chick body condition. So, in this way intensification of arable farming (e.g. use of pesticides and artificial fertilizers) could have resulted in barn swallow population declines. Future studies should therefore focus on the effects of arable farming intensification on barn swallow reproduction.

As a result of higher food abundance, it could be possible that barn swallow pairs breeding on organic farms are in better condition compared to birds breeding on conventional farms. This might lead to earlier starting dates of nests on these farms. As a consequence, some of these nests could have been missed during the counts in June. This could especially be the case on farms that were investigated at the end of the field period. This might have led to some

bias, although this is probably limited because second nests are likely to have been initiated as well.

The number of breeding swallows on a farm might be positively influenced when the farm is located next to a food rich habitat, such as an organic farm. Barn swallows generally forage within 400 metres of their nest site (Ambrosini *et al.*, 2002). As paired farms in this study were at least 600 meters apart from each it is unlikely that breeding barn swallow abundance on conventional farms was influenced by possibly better foraging sites on organic farms.

The Pan-European Common Birds Monitoring program shows that barn swallow numbers have been in decline during the 1980s (-9%) and 1990s (-7%) (EBCC 2008). However, these declines are much smaller compared to other typical farmland birds such as skylark (1980s: -49%; 1990s: -28%) corn bunting (1980s: -64%; 1990s: -14%) and grey partridge (1980s: -79%; 1990s: -56%). A British study showed that barn swallow population levels were not correlated with agricultural intensification, but with climatic conditions during migration instead (Robinson *et al.*, 2003). Therefore, in the future more focus should be on wintering grounds and migration. At the breeding grounds, more effort is needed to study breeding success of barn swallows in extensively and intensively managed farmland and preferred foraging habitats. These studies can provide tools to design effective conservation plans for barn swallows.

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