Breeding birds on organic and conventional arable farms

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Summary

As a result of agricultural intensification, populations of farmland birds have been in steep decline since the 1960s. Once common species such as grey partridge (*Perdix perdix*), skylark (*Alauda arvensis*) and corn bunting (*Emberiza calandra*) have shown declines of over 90%. Many species are present on Red Lists in most western European countries. Several studies showed that densities of breeding birds are higher on organically managed farms. This is often addressed to be caused by higher crop diversity, more non-crop habitats (e.g. grassy field margins) and the no-use of pesticides and artificial fertilizers on these farms. However, the causal mechanisms behind higher bird densities on organic farms are still not well understood. Besides that, no good data are available on the breeding success of birds on organic and conventional farms. This study focussed on comparing and explaining differences in breeding bird densities and breeding success between organic and conventional arable farms in the Netherlands. Additionally, effects of volunteer nest protection on nest success were analysed on both farm types. Finally, differences in invertebrate prey abundance were investigated between the two farm systems. This was done from a perspective of three different bird species, all with different feeding habits. These species were lapwing (*Vanellus vanellus*), feeding mainly on earthworms; skylark, feeding mainly on surface active invertebrates and barn swallow (*Hirundo rustica*) feeding on aerial invertebrates.

The study was carried out on 20 organic and 20 conventional arable farms in Oostelijk Flevoland and Noordoostpolder in the Netherlands. Both areas are characterised by open landscapes dominated with arable land use. Dominating crops are cereals (mainly winter wheat), potatoes, sugar beet and onions. A pairwise approach for farm selection was adopted in which surrounding landscape factors were kept equal for both farms. All organic farms

have been managed organically for at least 5 years and were all certified with the SKAL certificate.

Breeding bird densities

Territory densities of field-breeding species were compared during two years. In both years, densities of most species did not differ between organic and conventional farms. Only skylark and lapwing were more abundant on organic farms, but only skylarks showed a consistent pattern over both years. Differences in territory densities between the two farm types were explained examining the effects of three factors on territory densities: (1) non-crop habitats, (2) crop types and (3) within-crop factors. Organic farms had a more diverse cropping pattern, but there was no difference in the presence of non-crop habitats. Larger areas of spring cereals grown on conventional farms were the only explaining factor for differences in densities of skylark. For lapwing, the difference was only partly due to differences in crop type (more winter cereals on conventional farms), but differences in within-crop factors (probably as a result of crop management) were likely to have had an effect as well. Abundance of non-crop habitats did not differ between the two farming systems and could therefore not be responsible for found differences in breeding bird densities.

Besides comparing densities of field-breeding species, also the abundance of breeding barn swallows, a species of farmyards, was compared. This study also compared farmers' attitude towards presence of barn swallows. 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.

Breeding success

Although organically managed have higher densities of lapwings and skylarks than conventionally managed holdings, differences in crop management may lead to lower levels of breeding success. With the use of agrochemicals prohibited on organic farms, weeds are controlled using mechanical methods that may pose a threat to ground-nesting birds. Therefore, nest success of lapwings was compared between organic and conventional arable farms during two years. Besides that, skylark breeding success was studied in one year (2006). Differences in breeding success were explained by analysing nest failure rates due to agricultural operations, predation and nest desertion.

For lapwing, nest success was lower on organic compared to conventional farms in one year. This was caused by higher nest loss resulting from farming activities on organic farms. There were no differences in predation rates. The results of this study show that breeding lapwings do face specific threats on organic farms. To sustain or enhance lapwing populations on these farms, additional conservation measures should be implemented.

Skylark nest density was seven times higher on organic farms than on conventional farms. Skylarks showed a strong preference for spring cereals, lucerne and grass leys, all of which were mainly or exclusively grown on organic farms. On organic farms nests were initiated during the entire breeding season, but on conventional farms no nesting activity was found during the peak of the season (early May to early June). On organic farms 27% of all nests were successful. During the peak of the breeding season availability of suitable breeding habitat was limited on conventionally managed farms. Increasing the availability of suitable breeding habitat during the peak of the breeding season on conventional farms might provide one means of enhancing breeding skylark populations. On organic farms, crop management should focus on reducing nest loss due to farming operations.

Clutches of ground-nesting farmland birds are often destroyed by farming operations, especially on organic farms. This results in insufficient reproductive success and subsequently declining populations. Volunteer nest protection might enhance nest success of ground-nesting birds. Nest success of protected and unprotected Lapwing nests were therefore compared over two years. Although nest protection significantly reduced nest loss due to farming operations, there were no significant differences in total clutch survival of protected and unprotected nests. However, sample sizes of unprotected nests, and protected nests on organic farms, were relatively small, which may have reduced statistical power. There were indications that protected nests were predated or deserted more often. It should be recommend exploring different ways to improve the effectiveness of volunteer nest protection through a further reduction of nest loss due to farming operations and predation.

Food abundance

Reduction of food abundance has been mentioned to be one factor behind the declines of farmland bird populations. Extensive farm management, such as organic, is expected to provide more food for birds. In this study, we compared invertebrate prey abundance for birds between organic and conventional arable farms during the breeding season. Comparisons were made for three different groups of birds: (1) birds feeding on soil living invertebrates (earthworms), (2) birds feeding on ground-dwelling invertebrates and (3) birds feeding on aerial invertebrates. Invertebrate abundance was compared between organic and conventional farms and between crops and non-crop habitats. On organic farms earthworm abundance was 2-4 times higher compared to conventional sites, but no differences were found between crop types. Total abundance of ground-dwelling invertebrates did not differ significantly between organic and conventional farms, but positive effects were found for several individual

taxonomic groups, such as carabid beetles and spiders. On organic farms invertebrate abundance was higher in carrots, cereals and onions compared to other crops. On conventional farms this was true for onions. Compared with most crops, ground dwelling invertebrate abundance was low in uncropped field margins and on ditch banks. On organic farms aerial invertebrate abundance was approximately 70% higher compared to conventional farms. Especially on cereal fields aerial invertebrates were abundant.

This study showed that organic farming will probably not enhance breeding bird populations of most species of farmland birds. However, differences in population trends of farmland birds between organically and conventionally managed farms are still unknown. Therefore, other options should be explored. These options should focus on enhancing availability of suitable breeding habitat, food availability during the breeding season and at improving the winter situation. Development of effective agri-environment schemes and reintroduction of set-aside should therefore be stimulated by policy makers. Currently, financial possibilities are too limited to ensure effective management of farmland bird populations. The future European Common Agricultural Policy (CAP) should therefore be reformed and focusing more on delivering social values, such as biodiversity and environmental quality.