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Contribution of organic farming to conserving and improving biodiversity in Germany – the example avi-fauna

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Summary

Although it is the aim of organic farming to increase biodiversity, there is little knowledge about the impact of organic farming on birds. From 2001 to 2003, the number of breeding birds was recorded annually on the organic experimental farm of the Institute of Organic Farming (600 ha), and on adjacent conventional and organic farms (60 ha and 40 ha) in Northern Germany.

The number of skylark (*Alauda arvensis*) territories increased considerably after the conversion from conventional to organic farming on the premises of the Institute. Their number remained unvaried on the conventional farm. The highest density of skylark territories was found on the farm which has been under organic management for many years. The number of yellowhammer (*Emberiza citronella*) territories fluctuated largely in relation to the availability of field margin strips, both on conventional and organic land. During the breeding season aerial hunters (swallows and swifts) and raptors significantly preferred organic fields. Outside the breeding season, densities of raptors (in autumn and in winter), seed-eating birds (in autumn) and insect-eating birds (in autumn) were significantly higher on organic than on conventional fields.

Key words: skylark, swallow, swift, yellowhammer, farm management system

Introduction

Organic farming enhances the biodiversity of cultivated plants, domestic animals and natural flora and fauna. Several scientific studies proved the positive effect of organic farming on biodiversity (Soil Association, 2000; Rahmann, 2004). So far, however, investigations about the significance of organic farms as habitats for birds are rare, although they are an excellent indicator for the impact of agriculture on biodiversity. Birds occupy nearly every habitat and are the richest vertebrate species in Germany. Additionally, they respond quickly to changes in the management system by (re-)settling fast.

Agriculture-related birds show the most diminished number of species in Western Europe and have been facing enormous losses during the last decades (Bauer *et al*., 2002; Tucker &

Heath, 1994; Witt *et al*., 1996), because of an intensification of agriculture (Donald *et al.*, 2001). Under the same agro-environmental conditions, organic farming is usually less intensive than conventional farming (Rahmann, 2004). Consequently organic farming proved to have a positive effect on the abundance of agriculture-related birds (Christensen *et al.,* 1996; Chamberlain *et al*., 1999; Flade *et al*., 2003; Laussmann & Plachter, 1998; Hötker *et al*., 2004). The presented study shows how the conversion from conventional to organic farming in 2001 changed the preferences of agriculture-related birds. The abundance of all nesting birds was assessed in 2001. In 2002 and 2003 the ground nesting and foraging sky lark (*Alauda arvensis*) and the hedge nesting and farm land foraging yellowhammer (*Emberiza citronella*) were chosen as sensitive indicator species to follow up any shifts caused by conversion and farm management practices, respectively.

Material and methods

The organic experimental station, with 600 ha (500 ha pastures and crop land; 80 ha forest; 20 ha miscellaneous) was converted to organic farming in 2001. The production potential of the soils is high and the farm land was used very intensively over the last centuries. The single fields are 10 to 20 hectares in size and divided by hedges (Fig. 1). Natural water ponds and streams are scattered over the farm area.

Fig. 1. The landscape of the 600 ha large organic experimental station of the Institute of Organic Farming in Northern Germany (595800-5961500 N; 599000-602000 E)

The total bird population (territory assessment) was documented in 2001. 60 hectares of an adjacent conventional farm was used as a control. Further on, a 40 ha private organic farm adjacent to the experimental farm was part of the investigation to evaluate the long-term

effects of organic farming. In 2002 and 2003, populations of skylark and yellowhammer were registered. The assessment of the bird territories followed the methodology of Bibby *et al*. (1995) and was carried out in May continuously from sunrise to sunset with a break at midday. The procedure was repeated four times in the forests and five times on the open land.

Results

Bird habitat changes due to conversion towards organic

The biodiversity of cultivated crops increased significantly after conversion to organic farming. Additionally, about one third of the farmland was converted to grass/clover cultivation (green fertilizing). Mean yield of crops decreased significantly (Table 1).

Table 1. *Agricultural production before (conventional) and after conversion to organic farming (mean yield of all harvested crops in t/ha)*

	Conv.	**Conv.**	**Conv.**	**Organic**	**Organic**	**Organic**
Year of cultivation	97/98	98/99	99/00	00/01	01/02	02/03
Cultivated crop	t ha^{-1}	t ha^{-1}	t ha^{-1}	t ha^{-1}	t ha^{-1}	t ha^{-1}
Winter barley (*Hordeum vulgare*)	7.9	8.9	9.1	2.4	2.2	
Winter wheat (*Triticum aestivum*)	7.9	10.0	11.0	4.0	8.8	6.8
Winter rape (*Brassica napus*)	4.1	4.5	4.6	2.3	2.7	1.7
Oats (*Avena sativa*)	7.1					5.2
Fodder peas (*Pisum sativum*)				3.1	1.6	5.5
Summer wheat (*T. aestivum*)					0.5	2.7
Summer barley (*Hordeum vulgare*)					2.3	
Triticale (*S. cereale x T. aestivum*)					3.2	2.7
Rye (*Secale cereale*)					2.9	
Spelt (*T. aestivum spelta*)					0.9	4.2
Flax (*Linum spp*.)					0.8	0.8
Horse beans (*Vicia faba*)						3.7

Bird territories

About 63 different bird species with 1,256 territories could be detected in 2001 (without water fowl and building-related birds). Nine of them are on the "red list" for endangered birds in Schleswig-Holstein (Hötker *et al*., 2004). Only 5.4% of the bird species were related to open farm land, but 94.2% to forest and tall trees.

Influence of conversion to organic farming on farmland- related birds

For yellowhammer (*Emberiza citronella*) 1.06 territories per 10 hectare (T $10ha^{-1}$) and for sky lark (*Alauda arvensis*) 0.5 T $10ha^{-1}$ were counted. Most of the sky lark territories where found on winter barley (1.44 T $10ha^{-1}$) and winter wheat fields (0.9 T $10ha^{-1}$). Grassland (0.8 T $10ha^{-1}$), fallow land and oilseed rape (0 T $10ha^{-1}$) were less important as habitats. Though the acreage of winter barley and winter wheat decreased with the conversion to organic farming, the number of both birds increased in 2002 and 2003 (Table 2). Birds from the conventional farm probably moved to the organic fields.

Table 2. *Density of bird territories of yellowhammer (Emberiza citronella) and sky lark (Alauda arvensis) 2001 – 2003 (territories per 10 hectares)*

	Year	Private Conventional Farm	Organic Experimental Farm	Private Organic Farm
Alauda arvensis	2001	1.9	1.3	no data
	2002	1.8	3.4	9.2
	2003	1.1	2.0	7.3
Emberiza citronella	2001	0.8	1.0	no data
	2002	1.2	1.7	1.8
	2003	0.6	0.6	2.7

Discussion

The conversion of a conventional to an organic farm management system will attract birds such as yellowhammer and sky lark and increase their territories. Increased biodiversity of cultivated crops, weeds and ultimately sources for food are a principal advantage for birds. Agri-environmental payments for converting to organic farming should be financially sponsored with a view to habitat conservation.

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