

THE IMPACT OF AGRICULTURAL MANAGEMENT PRACTICES ON THE SPECIES COMPOSITION OF BIRDS IN SOUTH BULGARIA

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Abstract

Agriculture is one of the most important areas of human activity and therefore has a crucial impact on the environment and the landscape. Its main objective is primarily produce high-quality raw materials for the food industry and animal husbandry. At the same time, agriculture is one of the main contributors to the loss of biodiversity worldwide. In recent decades, agricultural intensification has led to a serious decline in biodiversity including Farmland Birds. In order to analyze the impact of agricultural practices on the species composition of birds a study of two types of agricultural farming systems- organic farming and conventional was conducted. Birds were studied in four types of crops - rose, lavender, apple and pea on the territory of nine different villages in South Bulgaria. 48 bird species from nine orders have been identified. Direct impact of agricultural practices on the species composition of birds was not established.

Key words: agriculture, conventional, farmland birds, organic farming.

INTRODUCTION

Conservation of biodiversity and ecosystems is interconnected to the agricultural practices applied to the different types of crops. In the recent years in Bulgaria there has been an increasing interest in the cultivation of medicinal and essential oils plants, legumes and fruit crops. Areas with lavender and oilseed rose. Apple is one of the most profitable for Bulgarian agriculture. To maintain the ecological functions of agro-ecosystems it is essential to implement agricultural practices that provide greater sustainability to both agro-ecosystems themselves and their adjacent natural and semi-natural ecosystems. Birds play a key role in the economy of nature. They are very important for agriculture, forestry, green spaces etc. The various bird species - insectivorous and predatory feed on invertebrates, insects and rodents and thus destroy a number of pests on crops, fruit trees, forest and ornamental plants. Their contribution is highlighted in a number of references worldwide. Beneficial birds in agriculture are found everywhere in Bulgaria, but unfortunately their number in many places is relatively small.

Intensification of agriculture poses the greatest threat to biodiversity beyond climate change and the spread of invasive species (Pullin, 2002).

In recent decades, agricultural intensification has led to a serious decline in biodiversity, including Farmland Birds (Chamberlain et al., 2000; Donald et al., 2001). This decline is still ongoing (Gregory et al., 2005; Donald et al., 2006; Flade et al., 2008), although agri-environment schemes have been implemented as an important policy tool (Kleijn & Sutherland, 2003).

The main objectives of these schemes are the reduced use of pesticides to protect biodiversity. Several studies have shown the positive effects of agri-environment schemes on birds (Bengtsson et al., 2005), but a Pan-European study can't prove an overall positive effect (Kleijn et al., 2006).

MATERIALS AND METHODS

In order to study the impact of agricultural practices on priority crop systems and evaluate their impact on biodiversity and ecosystems, as well as the services they provide, the following field sites have been identified (Table 1).

Table 1. Study areas, crops and farming practices for study the species composition of birds

| Region | Area | Crop | Type of farming |
|--------------|-------------------|----------|-----------------|
| Stara Zagora | Skobelevo village | Rose | Conventional |
| Stara Zagora | Asen village | Rose | Organic |
| Stara Zagora | Koprinka Dam | Lavender | Conventional |
| Stara Zagora | Asen village | Lavender | Organic |
| Plovdiv | Brestnik village | Apple | Conventional |
| Plovdiv | Yagodovo village | Apple | Organic |
| Plovdiv | Sadovo town | Pea | Conventional |
| Plovdiv | Sadovo town | Pea | Organic |
| Stara Zagora | Chirpan town | Pea | Conventional |
| Stara Zagora | Chirpan town | Pea | Organic |
| Burgas | Karnobat town | Pea | Conventional |
| Burgas | Karnobat town | Pea | Organic |

The survey was conducted between May and August 2019, this period covering the breeding season and autumn migration of the birds.

A specialized field form for suspected occurring bird species has been developed based on literary data before field work. It helps for faster and accurate monitoring of the birds in the study areas.

Personal geographic information from the study areas was imported used Google Earth Pro for easier viewing, such as:

- Geographic relief;
- Access roads;
- Surrounding landscape;
- Habitat types;
- Protected areas.

Adjacent protected areas have also been imported with specialized KML files available on the Natura 2000 Network Viewer online platform of the European Environment Agency. For determination the species composition of birds in different study areas and sites, field surveys were carried out using the methods of monitoring birds from stationary points, using predetermined linear car tours and determining by birds sounds. An innovative field research technique, which is an advantage of remote sensing with high efficiency and productivity, reliability of information and the ability to use in difficult conditions, has also been used:

- Binoculars Nikon MONARCH 5 8x42
- Field scope tube SWAROWSKI 80HD
- Camera Nikon D 71000
- Camera Lens Nikon AF-S Nikkor 200-500mm
- GPS Garmin Montana 610
- Drone 4K camera DJI Mavic Pro FLY MORE COMBO

RESULTS AND DISCUSSIONS

As a result of preliminary studies, two types of agricultural practices have been identified - conventional and organic. They were studied in four types of crops - rose, lavender, apple and pea on the territory of nine villages.

As a result of studies have been identified 48 bird species from 9 orders - order Galliformes, order Ciconiiformes, order Accipiterformes, order Falconiformes, order Columbiformes, order Strigiformes, order Coraciiformes, order Piciformes and order Passeriformes.

Results from field sites:

I.

Region: Stara Zagora;

Area: Skobelevo village;

Crop: Rose;

Type of farming: Conventional

24 bird species have been identified in 5 orders:
Order Accipiterformes: *Circus pygargus*, *Buteo buteo*, *Accipiter nisus*.

Order Falconiformes: *Falco tinnunculus*.

Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.

Order Piciformes: *Dendrocopos major*

Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Hirundo rustica*, *Delichon urbicum*, *Motacilla alba*, *Luscinia megarhynchos*, *Saxicola torquatus*, *Turdus philomelos*, *Turdus merula*, *Parus major*, *Pica pica*, *Garrulus glandarius*, *Sturnus vulgaris*, *Fringilla coelebs*, *Carduelis carduelis*, *Emberiza calandra*.

II.

Region: Stara Zagora

Area: Asen village

Crop: Rose

Type of farming: Organic

36 bird species have been identified in 8 orders:
Order Galliformes: *Perdix perdix*.

Order Ciconiiformes: *Ciconia ciconia*, *Ciconia nigra*.

Order Accipiterformes: *Aquila pomarine*, *Circaetus gallicus*, *Aquila pennata*, *Circus cyaneus*, *Circus pygargus*, *Buteo rufinus*, *Buteo buteo*, *Accipiter gentilis*.

Order Falconiformes: *Falco tinnunculus*.

Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.

Order Coraciiformes: *Upupa epops*, *Merops apiaster*, *Coracias garrulous*.

Order Piciformes: *Dendrocopos major*, *Dendrocopos syriacus*.

Order Passeriformes.

III.

Region: Stara Zagora

Area: Koprinka Dam

Crop: Lavender

Type of farming: Conventional

7 bird species have been identified in 2 orders:

Order Ciconiiformes: *Ciconia nigra*.

Order Passeriformes: *Alauda arvensis*, *Hirundo rustica*, *Delichon urbicum*, *Pica pica*, *Sturnus vulgaris*, *Emberiza calandra*.

IV.

Region: Stara Zagora

Area: Asen village

Crop: Lavender

Type of farming: Organic

36 bird species have been identified in 8 orders:

Order Galliformes: *Perdix perdix*.

Order Ciconiiformes: *Ciconia ciconia*, *Ciconia nigra*.

Order Accipiteriformes: *Aquila pomarine*, *Circaetus gallicus*, *Aquila pennata*, *Circus cyaneus*, *Circus pygargus*, *Buteo rufinus*, *Buteo buteo*, *Accipiter gentilis*.

Order Falconiformes: *Falco tinnunculus*.

Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.

Order Coraciiformes: *Upupa epops*, *Merops apiaster*, *Coracias garrulous*.

Order Piciformes: *Dendrocopos major*, *Dendrocopos syriacus*.

Order Passeriformes.

V.

Region: Plovdiv

Area: Brestnik village

Crop: Apple

Type of farming: Conventional

15 bird species have been identified in 5 orders:

Order Galliformes: *Perdix perdix*.

Order Accipiteriformes: *Buteo buteo*.

Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.

Order Coraciiformes: *Upupa epops*.

Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Luscinia megarhynchos*,

Turdus philomelos, *Turdus merula*, *Parus major*, *Lanius excubitor*, *Sturnus vulgaris*, *Emberiza melanocephala*.

VI.

Region: Plovdiv

Area: Yagodovo village

Crop: Apple

Type of farming: Organic

8 bird species have been identified in 2 orders:

Order Piciformes: *Dendrocopos major*, *Dendrocopos syriacus*.

Order Passeriformes: *Galerida cristata*, *Hirundo rustica*, *Delichon urbicum*, *Luscinia megarhynchos*, *Turdus merula*, *Parus major*.

VII.

Region: Plovdiv

Area: Sadovo town

Crop: Pea

Type of farming: Conventional

11 bird species have been identified in 6 orders:

Order Ciconiiformes: *Ciconia ciconia*.

Order Columbiformes: *Cuculus canorus*.

Order Strigiformes: *Tyto alba*, *Athene noctua*.

Order Coraciiformes: *Upupa epops*, *Merops apiaster*.

Order Piciformes: *Dendrocopos major*.

Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Hirundo rustica*, *Delichon urbicum*.

VIII.

Region: Plovdiv

Area: Sadovo town

Crop: Pea

Type of farming: Organic

11 bird species have been identified in 6 orders:

Order Ciconiiformes: *Ciconia ciconia*.

Order Columbiformes: *Cuculus canorus*.

Order Strigiformes: *Tyto alba*, *Athene noctua*.

Order Coraciiformes: *Upupa epops*, *Merops apiaster*.

Order Piciformes: *Dendrocopos major*.

Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Hirundo rustica*, *Delichon urbicum*.

IX.

Region: Stara Zagora

Area: Chirpan town

Crop: Pea

Type of farming: Conventional
11 bird species have been identified in 5 orders:
Order Ciconiiformes: *Ciconia ciconia*.
Order Accipiterformes: *Circus pygargus*, *Buteo buteo*.
Order Falconiformes: *Falco tinnunculus*.
Order Coraciiformes: *Upupa epops*, *Merops apiaster*.
Order Passeriformes: *Galerida cristata*, *Hirundo rustica*, *Delichon urbicum*, *Motacilla alba*, *Fringilla coelebs*.

X.

Region: Stara Zagora
Area: Chirpan town
Crop: Pea
Type of farming: Organic
19 bird species have been identified in 8 orders:
Order Galliformes: *Perdix perdix*.
Order Ciconiiformes: *Ciconia Ciconia*, *Ciconia nigra*.
Order Accipiterformes: *Aquila pomarine*, *Circus pygargus*, *Buteo buteo*, *Accipiter gentilis*.
Order Falconiformes: *Falco tinnunculus*.
Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.
Order Coraciiformes: *Upupa epops*, *Merops apiaster*.
Order Piciformes: *Dendrocopos major*.
Order Passeriformes: *Motacilla alba*, *Parus major*, *Oriolus oriolus*, *Fringilla coelebs*, *Emberiza calandra*.

XI.

Region: Burgas
Area: Karnobat town
Crop: Pea
Type of farming: Conventional
15 bird species have been identified in 5 orders:
Order Ciconiiformes: *Ciconia Ciconia*.
Order Accipiterformes: *Aquila pennata*, *Circus pygargus*, *Buteo rufinus*, *Buteo buteo*.
Order Falconiformes: *Falco tinnunculus*.
Order Coraciiformes: *Merops apiaster*.
Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Motacilla alba*, *Parus major*, *Cyanistes caeruleus*, *Lanius excubitor*, *Lanius collurio*, *Pica pica*, *Emberiza calandra*.

XII.

Region: Burgas
Area: Karnobat town

Crop: Pea
Type of farming: Organic
20 bird species have been identified in 7 orders:
Order Ciconiiformes: *Ciconia Ciconia*.
Order Accipiterformes: *Buteo rufinus*, *Buteo buteo*, *Accipiter nisus*.
Order Falconiformes: *Falco tinnunculus*.
Order Columbiformes: *Columba palumbus*, *Streptopelia turtur*, *Cuculus canorus*.
Order Coraciiformes: *Merops apiaster*.
Order Piciformes: *Dendrocopos major*.
Order Passeriformes: *Alauda arvensis*, *Galerida cristata*, *Motacilla alba*, *Luscinia megarhynchos*, *Parus major*, *Cyanistes caeruleus*, *Lanius senator*, *Pica pica*, *Sturnus vulgaris*, *Emberiza calandra*.

CONCLUSIONS

Due to the fact that the birds inhabit vast territories and cover large areas, and the fields studied are relatively small in size, no direct dependence on agricultural practices and crops on the species composition of the birds were established. In this case, the number of birds in the area is determined by the type of habitats in the surrounding area - the presence of arable and arable land, forest areas and anthropogenic conditions. Equally important is the presence of Natura 2000 Ecological Network Protected Areas, Protected Areas, National and Natural Parks and Reserves. The species composition of the studied fields is largely influenced by the composition in the Protected Areas and Territories located nearby.

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