

### Reference 22

Wilcox, JC; Barbottin, A; Durant, D; Tichit, M; Makowski, D. 2013 Farmland Birds and Arable Farming, a Meta-Analysis. Sustainable Agriculture Reviews 13: 35-63. 10.1007/978-3-319-00915-5\_3

### Background and objective

Declines in bird populations associated with farmland habitat have been recorded during recent decades and have been principally attributed to changes in farming practices and homogenization of agricultural landscapes. Agri-environmental schemes and organic farming have been implemented with the goal of improving the ability of farmland to support wildlife species. A more recent meta-analysis reviewing literature published after 2002 that examines birds' response to organic farming is not available. In light of these conflicting conclusions, it is proposed to perform an updated examination of the published data using a meta-analysis approach. 1) focusing on a large set of farmland bird species, it was tested whether organic agriculture is more favorable to birds compared to conventional agriculture, considering species and site-year effects. 2) focusing on the most studied species in the literature (skylark), it was examined if skylark territory abundance differs among crop types.

### Search strategy and selection criteria

A series of queries were searched in the literature. The first of these queries contained six simple keywords related to birds as well as the names of 56 bird species and 20 bird families considered as farmland birds in Europe. The next two queries contained 20 cropland-related keywords and 30 habitat-related keywords. Articles needed to contain one keyword from the first bird-related queries, plus a keyword from each of the cropland- and habitat-related queries. In addition, selected articles could not contain one of the 89 exclusion terms that made up the remaining queries. Finally, a total of 17 additional exclusion words were used to remove articles from non-target countries. 1) A measure of bird abundance, productivity or species richness was given (not a percentage or results of a model prediction); 2) The quantitative bird metric was directly related to an arable farming practice, system, or crop type.

### Data and analysis

Differences of log response ratios between bird species within an experiment were determined using a chi square test. A mean effect size was computed by averaging all the log response ratios of the different species and calculated the confidence interval of the mean effect size for each one of the 16 experiments. The mean effect size was computed for 36 species for which standard errors were available in the 16 experiments. Mean effect size and the confidence interval of the mean effect size were performed by averaging all the log response ratios for each species. The relationship between crop types and bird territory abundance was limited to the skylark. We tested generalized linear models and mixed models with Poisson distributions with/without a term for crop type and with/without a random site-year effect. Model fit was assessed using the Akaike Information Criterion (AIC).

| Number of papers | Population  | Intervention    | Comparator           | Outcome   | Quality score |
|------------------|---|-----------------|----------------------|---|---------------|
| 12               | Studies conducted in arable crops in Europe and North America assessing the performance of organic systems in comparison to conventional systems. | Organic systems | Conventional systems | Metric: Farmland bird abundance; Effect size: Logarithm of ratio of the considered metrics in the intervention to the considered metrics in the control | 81.25         |

### Results

- From six articles that included data on farmland bird abundance and standard errors, a total of 16 experiments was identified. The average log ratios ranged from -0.03 to 1.01, which correspond to a mean difference between organic and conventional farming from one to three birds.
- The mean effect sizes, or the average log ratios over species, were higher than zero in all experiments except experiment 4.
- For 30 species out of the 36 tested, the log ratio values were higher than zero, showing a positive effect of organic agriculture on species abundance. However, this effect was significant for only ten species. For those species, the abundance was 1.5–18 times higher in organic systems in comparison to conventional systems.
- The mean number of skylark territories varied from 0.4 (sugar beet) to 8.7 (set-aside).
- The box plots of the relationship between skylark territory abundance and crop types show that more skylark territories were found in legumes (including bean, pea and alfalfa crops) and set-aside (fallow land) than other crop types, and these differences were significant. However, there were no significant differences among all the other crop type.

### Factors influencing effect sizes

- No factors influencing effect sizes to report

### Conclusion

Organic farming systems supported on average higher bird numbers (1 to 3 more birds) than conventional systems. However, this positive effect was significant in less than half of the experiments, showing that the uncertainty about the estimated effects is high. Skylarks nesting territories were two-times higher in legume and set-aside fields than in other crops during the breeding season.