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## OWC 2020 Paper Submission - Science Forum

*Topic 1 - Ecological approaches to systems' health*

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### ORGANIC FARMING AND BIODIVERSITY: STATUS QUO AND ACCEPTANCE FOR IMPROVING OPTIONS

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**Abstract:** *Intensive discussions are ongoing with regard to the negative impacts of intensive farming practices on wild flora and fauna and their habitats. Our systematic literature review compiled from 75 sources from 1990 to 2017 showed that organic farming has clear positive effects on the species richness and abundance of selected flora and fauna groups. The results underline the high potential of organic farming for the preservation and promotion of biodiversity in agricultural landscapes. At the same time, however, there is a need to develop and improve organic management systems to better meet biodiversity goals for certain species. A survey of organic farmers in north-eastern Germany showed that besides the costs, other factors, such as overcoming bureaucratic constraints, are very important for the acceptance of conservation measures.*

**Introduction:** Agriculture has a significant impact on biodiversity. Many species such as field birds or amphibians live partly on land used for the production of foodstuffs and animal feed. Most arable plants would disappear without regular soil tillage. The alarming loss of biodiversity is – to a large extent – attributed to intensive land use (Schmidt-Traub et al. 2019). Although there have been many efforts to halt this loss of biodiversity, it has been accelerated according to a new study by 145 scientists from 50 countries (IPBES 2019). They predict that over the next few decades one million species will be endangered, if fundamental changes in agricultural systems, environment and climate protection are not made. As organic farming is subject to the same economic pressure for intensification and specialisation as is conventional farming, the impact of organic farming on biodiversity is discussed controversially and there is a lack of updated quantitative and statistically verified data comparing the two farming systems. In this context, the pertinent questions are: To what extent does organic farming actually contribute to biodiversity? How can the implementation of targeted biodiversity-friendly conservation measures become more widely accepted by farmers?

Firstly, we present the results of a current comprehensive literature review based on a comparative assessment of conventional and organic farming. Secondly, we explain the results of a survey among farmers on the acceptance of the implementation of nature conservation measures.

**Material and methods:** Comparative studies in temperate regions published in English and German from 1990 to 7/2017 were identified using the online databases scopus and web of science (core collection) along with an additional search in

the database organic eprints, conference proceedings or reference lists of reviews and meta-analyses. The study was part of the review on the 'Benefits of organic farming for the environment and society' (Sanders & Heß 2019, eds.). The design had to meet at least one organic vs conventional pair with at least three independent replications. For conventional farming we included studies defined as conventional or integrated farming, organic farming was defined in accordance with national and international regulations. Studies investigating the effects of conversion to organic farming were excluded. We concentrated on measured results and evaluated the species richness and abundance of flora groups (arable flora, seedbank and field margin flora), birds and flower-visiting insects. From a total of 801 identified studies, 75 studies with 312 comparison pairs were selected according to the project specific and thematic selection criteria. The results of the comparisons were statistically evaluated. If no significances are given, the results were classified based on a 20 % deviation of the individual pairs of the organic from the conventional variant (org+, org=, org-).

To analyse which factors are mainly influencing the acceptance of the implementation of nature conservation measures, a survey was conducted in north-eastern Germany among 31 farmers that are involved in the 'Farming for biodiversity' project (Gottwald and Stein-Bachinger 2018).

**Results:** The selected flora and fauna species groups definitely benefit from organic management through increase in richness and abundance (Table 1). In total, organic farming showed clear positive effects in 86 % of the flora and in 49 % of the fauna species groups. Negative effects through organic management based on the classification were found in only 2 studies.

Table 1: Number of studies, percentage and number of pairwise comparisons according to the classification of organic and conventional farming for mean richness and abundance of flora and fauna species groups

Species groups	Indicator	Number of studies	Number of pc*	Percentage and number of pc* with:		
				org +	org =	org -
Flora	Richness	39	105	85 % (89/70*) )	14 % (15 )	1 % (1/0*)
	Abundance	8	15	100 % (15/11*) )	0	0
Birds	Richness	10	16	69 % (11/11*) )	31 % (5)	0
	Abundance	11	20	50 % (10/10*) )	50 % (10 )	0
Flower-visiting insects	Richness	18	37	41 % (15/11*) )	59 %	0

				)	(22)	
	Abundance	16	64	42 % (27/13*)	41 % (26)	17 % (11/0*)

Richness or abundance in organic farming is higher: org +, lower: org - or comparable: org =; \*number of pairwise comparisons (pc) with significant values from the studies

However, the habitat requirements of many species can be even improved in common organic farming by means of targeted nature conservation measures (Gottwald and Stein-Bachinger 2018). The survey of 31 farmers shows the most important factors influencing decision-making with respect to the implementation of measures. In addition to better rewards through agri-environmental schemes, which 71 % of the farmers would consider very important, even 90 % judged the reduction of bureaucratic constraints as the most important factor. 77 % voted for a higher flexibility for modifications and 71 % for a simplification of the controlling system to overcome the rejection of implementation.

**Discussion:** In comparison with previous studies (e.g. Tuck et al. 2014), the positive effects of organic farming on birds and arable flora in our study were even more pronounced. The mobility of birds and insects and the influence of landscape elements are probably the main reasons that a higher number of the pairwise comparisons showed no differences in species richness and abundance between the farming systems in comparison to the flora species groups. One of the main reasons for the higher achievements for biodiversity in organic farming is probably the organic farming's system approach. The restrictions on the use of pesticides and fertilizers, as well as the limitation of livestock units per hectare, require an intelligent linkage of individual system components and management options as well as the use of synergies. Simultaneously, there is the need to consider system boundaries, as the production intensity is limited, resulting in lower yields compared to conventional farming systems. The review reveals that more research is needed to examine the effects of different yield levels on flora and fauna in order to exploit the potential to increase yield and crop quality in line with biodiversity goals. Moreover, long-term studies on the benefits of farming systems for biodiversity should include crop rotation in order to better take into account the whole farming systems as well as the effects of landscape elements.

The implementation of targeted biodiversity-friendly measures is highly dependent on the risks and benefits from the point of view of the individual farmer (Busse and Siebert 2018). As money is not the only obstacle to implementing conservation measures, e.g. the reduction of bureaucratic constraints along with a simplification of the controlling system would help to broaden the acceptance of more biodiversity-friendly management systems.

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**Disclosure of Interest:** None Declared

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