

# Project *brief*

Thünen Institute of Biodiversity

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## Regulating ecosystem services in conventional crop rotations with field bean (*Vicia faba* L.)

 Katharina Schulz-Kesting<sup>1</sup>, Jens Dauber<sup>1</sup>

- **Quantification of effects of conventionally managed field bean (*Vicia faba* L.) on predatory arthropod diversity, abundance and biomass and natural biocontrol**
- **Overall fewer effects than expected and no effect on natural biocontrol**
- **Higher density of predatory arthropods in winter wheat fields adjacent to field bean than to winter wheat**

### Background

One goal of the protein crop strategy is to improve resource protection and to promote biological diversity and ecosystem services through the cultivation of native legumes.

### Research questions

**1)** What is the significance of conventional field bean cultivation for predatory arthropods, whose diet include common agricultural pests, in crop rotation and on a landscape scale?

Are **2)** neighborhood and **3)** pre-crop effects of conventional field bean cultivation on the densities of vegetation-dwelling natural biocontrol agents, pests and natural pest control measurable, and if so, which ones?

### Methods

**1)** Survey of the biomass and frequency of epigeal arthropods (ground beetles, spiders, rove beetles) and ground beetle diversity in 15 paired landscapes, one with and one without field bean cultivation

**2 und 3)** Four repeated specific ratings (1-flag leaf, 2-flowering, 3-milk maturity, 4-dead maturity) in 22 winter wheat plots adjacent to a field bean (11) or winter wheat plot (11), as well as in 22 winter wheat plots whose previous crop was field bean (11) or winter wheat (11).

### Key findings

- 1)** Contrary to expectations, no effects were measured.
- 2)** Neighbourhood-effect: The overall density of natural biocontrol agents was higher in winter wheat plots next to field bean than next to winter wheat, both at the beginning and at the end of the data collection (Fig. 1). When tested individually, only the spiders' densities were higher in winter wheat next to bean, in contrast to hoverflies, lacewings and parasitic wasps. The effect

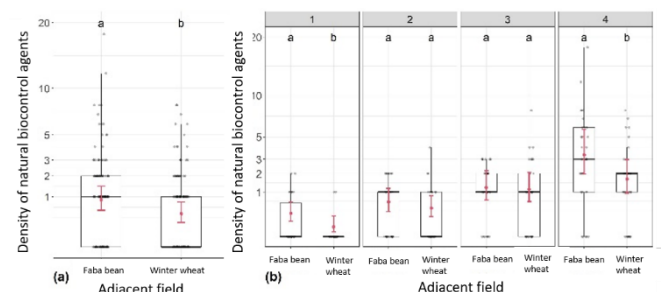
on overall density was not reflected in parasitism rate and predator-prey ratio.

**3)** Pre-crop effect: Contrary to expectations, no pre-crop effects of field bean cultivation were measured.

### Advice for policy makers

The extension of conventional crop rotations with field beans does not *per se* promote biodiversity. The measured effects indicate that the field bean is not a habitat and food resource for predatory arthropods because of its nectar and pollen supply, but rather because of its plant structure and the presence of pests.

**Fig. 1:** Density of natural biocontrol agents in winter wheat in total (a) and per inspection (b) (boxplots with median, upper and lower percentile (black), data points (grey), mean and 95% confidence intervals (red)). Groups with the same letter do not differ significantly.



Source: RELEVANT Abschlussbericht

### Further Information

#### Contact

<sup>1</sup> Thünen Institute of Biodiversity  
 Jens.dauber@thuenen.de  
[www.thuenen.de/bd](http://www.thuenen.de/bd)

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1820

#### Publications

Schulz-Kesting K, Thiele J, Everwand G, Dauber J (2021) Neighbourhood effect of faba bean (*Vicia faba* L.) on density of vegetation-dwelling natural biocontrol agents in winter wheat. *Biological Control* 160, 104673.