

Europe-wide negative effects of agricultural intensification on biodiversity and biological pest control on farmland

Frank Berendse¹, Flavia Geiger¹, Janne Bengtsson², Pablo Inchausti³, Wolfgang W. Weisser⁴, Mark Emmerson⁵, Manuel B. Morales⁶, Piotr Ceryngier⁷, Pavel Kindlmann⁸, Jaan Liira⁹, Teja Tschardt¹⁰, Camilla Winqvist², Sönke Eggers³, Riccardo Bommarco³, Tomas Pärt³, Benjamin Boisteau³, Lars W. Clement⁴, Christopher Dennis⁵, Catherine Palmer⁵, Irene Guerrero⁶, Violetta Hawro⁷, Olga Ameixa⁸, Tsipe Aavik⁹, Carsten Thies¹⁰, Andreas Flohre¹⁰, Sebastian Hänke¹⁰, Christina Fischer¹⁰

¹ Nature Conservation and Plant Ecology Group, Wageningen University, The Netherlands; ² Department of Ecology, Swedish University of Agricultural Sciences, Sweden; ³ Chizé Centre for Biological Studies, France; ⁴ Institute of Ecology, Friedrich-Schiller-University Jena, Germany; ⁵ Department of Zoology, Ecology and Plant Sciences, University College Cork, Eire; ⁶ Departamento de Ecología, Facultad de Ciencias, Autonomous University of Madrid, Spain; ⁷ Centre for Ecological Research, Polish Academy of Sciences, Poland; ⁸ Institute of Systems Biology and Ecology AS CR, Ceske Budejovice, Czech Republic; ⁹ Institute of Botany and Ecology, University of Tartu, Estonia; ¹⁰ Dept. of Agroecology, Georg-August-University Goettingen, Germany

The intensification of agriculture associated with increased production during the last 50 years has resulted in the decline of diversity in many taxa and the loss of ecosystem services. The increased use of fertilizers and pesticides, higher inputs of energy, larger farms and fields and landscapes simplification are all components of agricultural intensification. However, the relative contribution of the different components to the decline of biodiversity is hardly understood. In a large-scale study, including nine different European countries, we investigated the effects of agricultural intensification on vascular plant, carabid and bird species. In addition, we tested experimentally the biological control potential, by putting living aphids, glued on plastic labels, into arable fields and measuring their survival time.

After correcting for differences in regional landscape structures, we found consistent negative effects of agricultural intensification on the species diversity at three trophic levels (plants, carabids and birds) and on the biological control potential. Furthermore, we were able to disentangle the relative effects of 14 different intensification components on the different species groups. We conclude that Europe-wide negative effects of agricultural intensification still continue and that current policy is apparently not sufficient to reverse these losses.