

**ABSTRACT:** Arthropod biodiversity declines challenge agricultural production as many ecosystem services and crop yields are biodiversity-mediated. Agri-environmental schemes (AES), like sown flowering fields, are established in order to provide safe spaces for biodiversity conservation and to ensure ecosystem service provision.

However, little is known about the benefits of different AES for functional biodiversity and how these habitats affect ecosystem services in adjacent crop fields. In a large scale field study, we compared the effects of sown flowering fields with different temporal continuity, area and perennial semi-natural source habitats in the surrounding landscape on local biodiversity across 12 taxonomic groups as well as their effects on natural pest control in adjacent crop fields over crop rotation and compared them to semi-natural calcareous grasslands. Multi-taxa diversity increased with temporal continuity while species assemblages of most groups shifted with increasing temporal continuity. We identified distance functions of ground dwelling predators, pest control and crop yields that changed with crop rotation and were partly influenced by the presence of an adjacent flowering field. Our results indicate that flowering fields and semi-natural grasslands function synergistically. Their effects on pest control are intricate and demand further investigation. We recommend a network of smaller, temporally continuous AES flowering fields of different ages, combined with permanent seminatural grasslands, to maximize benefits for biodiversity conservation and ecosystem service delivery in agricultural landscapes