

Advances in Ecological Research Volume 61

Biodiversity–ecosystem functioning (BEF) research is currently one of the most vibrant research areas in Ecology, as ecosystem functioning is critical for human well-being, and the time available to make decisions for preserving global biodiversity is short. Since the first experiments in the early 1990s, BEF research has evolved, as the knowledge gained has inspired new questions, ideas and approaches. By combining case studies, data syntheses, reviews and perspectives papers, this special issue on *Mechanisms underlying the relationship between biodiversity and ecosystem functioning* provides an overview of the key achievements, current research frontiers and future perspectives in BEF research, with a strong focus on terrestrial, mostly grassland, ecosystems. Moreover, this special issue is mostly based on research in the framework of the Jena Experiment, a large-scale and long-term grassland experiment on the role of biodiversity for multiple ecosystem functions. Since its establishment in 2002, the Jena Experiment has focused on grassland biodiversity effects on multitrophic interactions and element cycling, and has utilized trait-based approaches to understand the mechanisms underlying BEF relationships. At the same time, researchers of the Jena Experiment have contributed to synthesizing data and information from other experiments and natural ecosystems – this plethora of approaches is reflected by the diversity of chapters of this special issue. The first chapter provides a short history of the key advances and future challenges of BEF research. The subsequent chapters fall into two broad categories: Chapters 2 to 6 cover case studies, reviews and syntheses that explore different mechanisms underlying BEF relationships; and Chapters 7 to 10 review current BEF knowledge to provide recommendations for future research. Together, this special issue represents a synthesis of the *status quo* in terrestrial BEF research as well as stimulating perspectives of the most pressing challenges and important future research directions in this field.



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ISBN 978-0-08-102912-1



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