

CONTENTS

Contributors

ix

Preface

xiii

1. Networking Agroecology: Integrating the Diversity of Agroecosystem Interactions	1
David A. Bohan, Alan Raybould, Christian Mulder, Guy Woodward, Alireza Tamaddon-Nezhad, Nico Bluthgen, Michael J.O. Pocock, Stephen Muggleton, Darren M. Evans, Julia Astegiano, François Massol, Nicolas Loeuille, Sandrine Petit, and Sarina Macfadyen	
1. Introduction	2
2. What is a Network?	10
3. The Agricultural Landscape as a Network of Agricultural, Semi-natural and Natural Habitats	20
4. Linking Structure, Functioning and Services	26
5. Evaluating and Predicting Ecosystem Change	33
6. Conclusion	41
Appendix A. Migration and Interactions Among Populations	44
Appendix B. References for Fig. 1.3	45
Glossary	46
References	50
 2. Connecting the Green and Brown Worlds: Allometric and Stoichiometric Predictability of Above- and Below-Ground Networks	 69
Christian Mulder, Farshid S. Ahrestani, Michael Bahn, David A. Bohan, Michael Bonkowski, Bryan S. Griffiths, Rannveig Anna Guicharnaud, Jens Kattge, Paul Henning Krogh, Sandra Lavorel, Owen T. Lewis, Giorgio Mancinelli, Shahid Naeem, Josep Peñuelas, Hendrik Poorter, Peter B. Reich, Loreto Rossi, Graciela M. Rusch, Jordi Sardans, and Ian J. Wright	
1. Introduction	71
2. Aims and Rationale	74
3. Can a Stoichiometrically Explicit First Trophic Level Be Parameterised?	84
4. The Advantages of Stoichiometric Plasticity	88
5. Constrained Resources, Isotopic Signatures and Networks	102
6. Antagonism Above, Mutualism Below: Nature or Agriculture?	119

7. Scaling Stoichiometry Provides a Bridge to Ecosystem Processes	125
8. Be Explicit: Can We Reach a Consensus?	135
Acknowledgements	141
Appendix	142
References	151
3. Empirically Characterising Trophic Networks: What Emerging DNA-Based Methods, Stable Isotope and Fatty Acid Analyses Can Offer	177
Michael Traugott, Stefaniya Kamenova, Liliane Ruess, Julia Seeber, and Manuel Plantegenest	
1. Introduction	178
2. Molecular Approaches to Analyse Trophic Interactions	180
3. Stable Isotope Analysis	191
4. Fatty Acid Analysis	197
5. Which Approach to Choose, How to Start and How to Interpret the Data?	203
Acknowledgements	209
Glossary	209
References	211
4. Construction and Validation of Food Webs Using Logic-Based Machine Learning and Text Mining	225
Alireza Tamaddon-Nezhad, Ghazal Afroozi Milani, Alan Raybould, Stephen Muggleton, and David A. Bohan	
1. Introduction	226
2. Methods	239
3. Results	254
4. Discussion and Conclusions	267
Acknowledgements	272
Appendix A. References used for Manual Corroboration	272
Appendix B	273
References	282
5. Interaction Networks in Agricultural Landscape Mosaics	291
François Massol and Sandrine Petit	
1. Introduction	292
2. Ecological Patterns and Processes in Spatially Structured Ecosystems	295
3. The Goals of Agricultural Landscape Mosaics Studies: Management for Crop Production and Other Ecosystem Services	303
4. Specific Properties of Agricultural Landscape Mosaics: Temporal and Spatial Heterogeneity	307

5. Metaecosystems and Agricultural Landscape Mosaics	311
6. Conclusion	324
Acknowledgements	325
References	325
6. Eco-Evolutionary Dynamics of Agricultural Networks: Implications for Sustainable Management	339
Nicolas Loeuille, Sébastien Barot, Ewen Georgelin, Grigorios Kylafis, and Claire Lavigne	
1. Introduction	340
2. Within Field, Applying Evolutionary Perspectives to the Selection of Agricultural Species	344
3. Disturbances Due to Agriculture: Implications for Eco-Evolutionary Dynamics Within Surrounding Ecosystems	360
4. Accounting for Spatial Heterogeneities: Dispersal, Fragmentation, and Evolution in Agricultural Landscapes	376
5. Perspectives and Challenges	395
Acknowledgements	398
Appendix A. Evolution of the Investment into Nutrient Uptake, Effects on Emergent Functioning	398
Appendix B. Mixing Group Selection and Individual Selection in Co-evolutionary Models	401
Appendix C. Effects of Enrichment on the Control of Biomass Within a Tri-trophic Food Chain when the Herbivore Evolves	402
Appendix D. Eco-evolutionary Dynamics in a Plant-Herbivore-Predator Confronted to Insecticides	407
Appendix E. Evolution of Specialization Rate of the Pest and its Ecological Consequences	413
Glossary	416
References	417
7. Modelling Interaction Networks for Enhanced Ecosystem Services in Agroecosystems	437
Philippe Tixier, Nathalie Peyrard, Jean-Noël Aubertot, Sabrina Gaba, Julia Radoszycki, Geoffrey Caron-Lormier, Fabrice Vinatier, Grégory Mollot, and Régis Sabbadin	
1. Introduction	438
2. Which Network Model for Which Ecosystem Service Question?	440
3. Toward a Comprehensive Approach That Links Networks and Services	469

4. Conclusions and Future Directions	470
Acknowledgements	472
References	473
<i>Index</i>	<i>481</i>
<i>Cumulative List of Titles</i>	<i>495</i>