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Title:

Ecological network analysis used to assess the agroecological properties of farming systems

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1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

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Farming systems are expected to address the new challenge of having to be more efficient by producing more while using less resources and being more resilient with respect to external disturbances. Agroecology appears relevant to address these challenges, including the application of ecological concepts and principles to the design and management of sustainable agrosystems. Agroecology and the increasing importance of ecological processes in the management of sustainable agrosystems have shed new light on ecology methods for analysing agrosystem properties. Ecological network analysis (ENA) seems to be a relevant approach to assess potential agroecological properties of future agrosystems. ENA can be used to systemically and holistically analyse the structural and functional properties of interrelated species in an ecosystem. Although some studies have applied ENA to agrosystems, but issues concerning the agronomic interpretation of provided indicators are partly addressed. Our aims are: i) to propose an agroecological framework, adapted from ENA, to systemically and holistically analyse agrosystems, and ii) to test the capacity of this framework for assessing the agroecological properties of agrosystems and their relation with efficiency and resilience. The framework was built using a farming system approach to characterize three closely interconnected criteria: the structure, functioning and performance of agrosystems. It was applied to theoretical case studies from simplified non-integrated farming systems to complex integrated farming systems. The results showed that ENA indicators are appropriate to characterize some criteria in a same dimension (ex. diversification and complexity) and to discriminate agrosystems. Some indicators are less relevant, like resilience assessment because the gap between concept definition in ecology and agronomy is still too important and no consensus is find for the moment. Growing concern in applying ENA to study agricultural systems is observed, the next step is to analyse relationships between the different criteria in a wide range of world agroecosystems.