Agricultural systems by design

Designing Climate Smart Agricultural Systems for a Sustainable Transformation of the Agri-food Systems of the Dry Areas

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Landscape Agronomy: background concepts and emerging challenges to address agri-food system design beyond the farm level

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Extended abstract

The development of agri-food systems is expected to fight hunger (Sustainable Development Goal 2), but it is constrained by the need to protect drinking water (SDG 6), and aquatic life (SDG 14), as well as by the urgency of reversing land degradation and biodiversity loss (SDG 15). Indeed, the intensification of agricultural productivity conflicts with the sustainability of agricultural systems and the use of natural resources. Disruptions in rainfall distribution and other effects of climate change further compromise the balance between food production pressures and sustainability, while socio-economic instabilities and volatile food prices further increase uncertainties. Research should therefore address how global agri-food systems are evolving through the transition of local farming systems. This requires taking into account the different uses and expectations of the many stakeholders operating at different levels, including farmers, resource managers, local administrators, and all actors involved in socio-technical systems. Multiple spatial levels can be considered to reconcile divergent objectives and enhance synergies. In this sense, the landscape is probably the most operational level from the point of view of sustainability science, as it allows the integration of the priorities of individual actors in the co-design of the multiple spatial objects and temporalities generated and managed by the farming activities.

The aim of this communication is to present the landscape agronomy framework and how it addresses spatially explicit natural resource management in agriculture. Based on a summary of the scientific background and state of the art on how agriculture is addressed at the landscape level, the result is a conceptual model that provides a framework for observing, understanding, and supporting the actions of actors involved in the dynamics of agricultural landscapes and the design of agri-food systems. The landscape agronomy conceptual model was developed to integrate assessment and monitoring beyond the farm level and across multiple temporal and spatial scales. It was introduced in a seminal paper by Benoît and colleagues (Landscape Ecology, 27(10):2012), which highlighted the importance of an integrated approach to describing and understanding farming practices, natural resources, and landscape patterns. The landscape agronomy conceptual framework is intended to help understand what may be missing to achieve landscape agroecological transitions and to guide the design of research, education and training by raising awareness about the components and relationships of a system approach to agriculture.

This communication is structured in three parts. First, an overview of the background concepts of the framework and how they can enhance the inter- and transdisciplinary interface of agronomy with spatially-explicit disciplines such as landscape ecology, geography, and landscape planning. Second, a bibliometric analysis that used the CorTexT platform to explore research keywords, (inter)disciplinary bridges, and emerging issues related to these concepts. Finally, five recommendations for potential improvements of this conceptual model. The results highlighted the emergence of climate change, ecosystem services and management practices in the literature in relation to agronomic terms, especially when landscape is explicitly mentioned in titles, abstracts or keywords of publications.

The main target audience of this communication includes researchers, policy- and decision-makers who need or want to describe, understand, and manage agriculture beyond the farm level by involving farmers and other actors operating at the landscape level. The communication summarises a recently published book about landscape agronomy, which was partly inspired by "Pays, Paysans, Paysages" (INRA-ENSSAA 1977) about the crucial role of agriculture in the management of the local economy, resources, and culture by linking the territory (as an administrative entity), the farmers and the landscape. The authors of the book intended 'landscape' to represent an holistic agricultural outcome including the economy, the environment and the local socio-cultural identity. More than 40 years later, its title could be rephrased and expanded to "Participation, Prospective and Public Policies" to address agriculture within the broader commitment to the sustainability of human activities, of which the United Nations Sustainable Development Goals are the most prominent targets. Nevertheless, the research fronts in relation to these global issues of sustainability are largely concerned also with "scaling up" i.e., how to move research methods and results out of the original contexts. For example, questions remain about how to i) take into account changes in context over time, including the (invisible) patterns emerging from agricultural digitalisation, ii) address different geographical locations than the initial study context, iii) integrate local and regional and higher geographical scales.

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