FARMING SYSTEM DESIGN FOR SUSTAINABLE AGRIFOOD SYSTEMS: THEORIES AND PRACTICES

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Structuring transdisciplinary research on agroecology: comparing 10+ years of co-innovation in Uruguay and the EU

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Introduction

Coined to describe the way of complexity-aware working in the EU FP6 project EULACIAS (European -- Latin American Co-innovation of Agro-ecosystems; 2007-2010), the notion 'co-innovation' has evolved over multiple projects in Uruguay and has been used in EU projects since 2011 (Rossing et al., 2021). In all these projects, scientists worked in a transdisciplinary fashion, i.e. with other societal actors, including farmers, to effectuate systemic change towards agroecology. The co-innovation notion emerged around a time of increasing disgruntlement in the scientific and donor communities about achieving 'impact', which persists until today (e.g. Cronin et al., 2022). In EULACIAS, the 'hard', natural-science-based systems perspective on on-farm agroecological processes became connected to evolutionary learning approaches, soft systems thinking, and monitoring and evaluation originating from the social sciences.

Different from other types of participatory research, co-innovation takes a *complex adaptive systems* (CAS) perspective on both the societal structures that are the object of transdisciplinary investigation and on the project and its role in the evolution of the societal networks the project engages with. This (social-ecological) systems perspective recognizes systems at different levels, with components that interact through feedbacks and feed forwards, resulting in inherently unpredictable behaviour. Interactions may be quantified or characterized qualitatively. Targeting interventions in such systems becomes meaningful by adopting a *social learning* perspective supported by formative *monitoring and evaluation*. The CAS perspective instigates the need to iteratively consider different system boundaries to support reflection, connect different types of knowledge, and instil a preparedness to adapt courses of action based on novel insights. This perspective is missing from participatory research, conceptualized merely as researchers working with non-scientific actors.

The application in the Uruguayan projects of co-innovation as a way of working has resulted in a range of highly successful on-farm outcomes, as witnessed by scientific publications (Dogliotti et al., 2014; Ruggia el al., 2020; Colnago et al., 2022) and farmer testimonies. In EU projects, outcomes have been more variable, with the project participants usually being more appreciative of the reflexive way of working than of the material changes (Klerkx et al., 2017; Rossing et al., 2021; Iocola et al., 2020). Comparative analysis may aid the many science-society initiatives that have become funded (e.g. Living Labs, Multi-Actor Approaches) by enhancing learning about factors stimulating and hindering meaningful knowledge production for sustainability transitions.

In this contribution, we draw on the authors' experiences with co-innovation projects to compare contextual and organizational factors and discern differences in tangible sustainability outcomes between Uruguay and the European Union.

Methods

We comparatively analyzed the context and the organization of the various projects that used co-innovation in the EU (two projects covering 9 years) and in Uruguay (four projects covering 13 years) to develop hypotheses on why material results were so different. Guiding questions were based on why, what, who, where and how. Data come from scientific publications on the various projects, unpublished material, deliverables, and personal experiences. Thus, the results are based on self-assessment and critical reflective dialogue among the author team members.

Results

The results are summarized in Table 1.

Discussion and perspectives

All projects report positive effects of the way of working instilled by the co-innovation governance approach, providing safe spaces for developing novel insights, discussing tensions and reaching agreement on ways ahead. We found clear differences in the way of organizing researcher involvement. In the Uruguayan projects, a team of researchers and farm advisors developed characterization, diagnosis, and redesign activities on farms, and they accompanied farmers during the implementation and evaluation of the farm plans. In the EU projects, both the geographical and the epistemological distance between the project and the farmers (and other actors) was mediated through network facilitators that enabled access by researchers. As a result, the role of research-based knowledge in the networks remained more in the academic realm. Co-innovation in the European projects involved reflexivity around the institutional change needed to support the aspired ecologically intensive technological change, which was less pronounced in the Uruguayan projects. In addition, the tools and learning cycle procedures in the EU projects appeared more thorough than those in the Latin American projects.

Obtaining EU funding requires (explicitly/implicitly) geographic spread and a high diversity of networks in projects. As research organizations are not necessarily equipped to engage in complexity-sensitive on-farm research and are geographically distant, concrete changes on farms are hindered. In the Uruguayan projects, the regionalized approach and the centralized research and advisor team enabled a more focused and integrated approach. These factors appear to be key to project interventions' effects on sustainability outcomes. However, insufficient reflexivity on institutional change hinders scaling out of project learning in Uruguayan projects.

The lessons from this comparison inform the need to forge more intense connections between the LL and RI structures in the European research area than is currently the case. In addition, the tendency to 'supersize' proposals regarding the number of innovation networks to win over reviewers requires curbing. For future Uruguayan projects, reflexivity on the institutional adjustments as part of transformative change may benefit from the learning procedures developed in the EU projects.

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