FARMING SYSTEM DESIGN FOR SUSTAINABLE AGRIFOOD SYSTEMS: THEORIES AND PRACTICES

Proceedings of the 8th International Farming System Design Conference

Temporary version

Marion CASAGRANDE, Marie-Hélène JEUFFROY, Gentiane MAILLET

25 - 29 August 2025
Palaiseau (France)
Campus Agro Paris-Saclay

AgroParisTech INRAE ideas

Challenges for rural extension to promote a sustainability transition in family livestock farming: lessons from a sequence of projects in Uruguay

AGUERRE Verónica[1], BIANCO Mariela[2]

[1] Instituto Nacional de Investigación Agropecuaria (INIA), Uruguay, [2] Universidad de la República (UdelaR), Facultad de Agronomía, Uruguay

Keywords: co-innovation, farm technical assistance, livestock farming on natural grassland

Introduction

The transformation of the current agri-food system towards a more sustainable one requires socio-technical strategies that can drive radical changes. An ecological intensification strategy could play a fundamental role in the transition towards more sustainable Uruguayan family livestock farming. These are based on natural grasslands and face difficulties due to overgrazing degradation, which is detrimental to the production of forage and meat, while reducing family income and provision of ecosystem services. Research institutions have generated process technologies that can support ecological intensification trajectories, which are not necessarily contained in a physical format and require contextualized knowledge to be leveraged. Therefore, vertical technology transfer logics are inefficient, requiring horizontal logic where knowledge is built on a shared basis. In this sense, participatory research approaches have been implemented, working directly on farms and involving farmers in the identification of problems and the design of solutions, on the basis of a sequence of projects that used co-innovation to promote and evaluate ecological intensification strategies between 2004-2019.

The continuity of those projects over 15 years was fundamental to achieve the development of a socio-technical niche, as a seed of transition process (Aguerre and Bianco, 2023). On the basis of ecological intensification practices farm sustainability was improved and participants considered that a very special bond between extensionists and families was a key factor with co-innovation as a modality of intervention for farm technical assistance (Aguerre and Bianco, 2024).

Different from diffusionist approaches with limited achievements in terms of technology use, co-innovation proves as a convenient intervention model for Uruguayan family livestock farming. A Sustainability Transition (ST) could be fostered through a disruptive extension policy based on co-innovation to promote ecological intensification, with the coordinated efforts of relevant institutions linked to family livestock farming.

In this text we offer a vision to enhance the scaling of the existing niche and contribute to the ST of livestock family farming through an extension policy and discuss the challenges that this implies for rural extension in Uruguay.

Methods

A case study design was followed, focusing on the sequence of 6 research projects, that involved 52 livestock family farms, researchers, extensionists and other relevant actors, at national level. Analysis was based on documents and semi-structured interviews, combining inductive and deductive methods to identify scaling strategies.

Results

Following the coinnovation approach, on-farm work based on monthly interactions between families and extensionists allowed the integration of technical knowledge with farmers' knowledge and experience in an horizontal dialogue to elaborate on the implementation of fundamental changes in farm management in line with ecological intensification. The orientation is to improve the sustainability of the productive system and help the family achieve its goals and implies systemic approach and medium/long term planning.

The extension method has work stages (Table 1), in a process that takes 3 to 4 years.

Table 1. Work stages and their objectives.

Characterization and diagnosis
Understanding the family objectives.
Knowing the structure, operation and results of the production system.
Identifying and agreeing on strengths and weaknesses.
Building trust between the family and the extensionist.
Redesign proposals
Agreeing on a future goal (3 years) involving farm structure, operation and results.
Agreeing on an implementation plan to achieve this goal.
Implementation, monitoring and adjustment
Accompanying the implementation of the redesign agreed upon according to an activity schedule.
Monitoring system evolution.
Implementing adjustments and changes as necessary.
Implementation of changes begin with the first visits.

Whitin the niche, the implementation of farm technical assistance had difficulties due to several factors: training of extensionists, lack of experience on co-innovation and ecological intensification, where relational skills, systemic vision and technical knowledge are needed. The strategy developed to deal with weaknesses was the conformation of an interdisciplinary team to support the work of extensionists, with a low presence in the field, but indirectly nourishing farm interventions.

An extension policy is needed to scale co-innovation and trigger a ST in family livestock farming in Uruguay. Some key aspects emerge from the study for policy design and implementation:

- Promotion of ecological intensification principles and the achievement of family objectives.
- Systemic approach / medium/long term planning.
- Horizontal communication combining technical knowledge and farmers' experience.
- On-farm work based on monthly extensionist visits for periods over 3-4 years.
- Work stages: characterization and diagnosis, redesign proposal and implementation, monitoring and adjustment.
- Form a broad, interdisciplinary and interinstitutional work team:
    - extensionists working directly on farms.

    - support team including specialists in the economic-productive, environmental and social sciences.
- Define an operating structure linking on farm and support levels, whit institutional articulation combining national and regional levels, involving different actors: policy makers, research and extension, farmer organizations and meat processing industry.
- Initial time for the assembly and bonding of the team, aligning with the technical strategy and working style.
- Selection of extension workers:
    - Motivated to overcome and learn from difficulties.
    - Interested in dialogic approaches.
    - Relational skills / systemic vision / technical knowledge for ecological intensification.
- Comprehensive initial training of extensionists.
- Continuous training, monitoring and support system for extensionists' work, through interaction with the interdisciplinary and interinstitutional support team.

Discussion and Perspectives

A key element for promoting more sustainable family livestock systems is providing farm technical assistance with a co-innovation approach, contrasting with traditional services mainly based on farm investments and input technologies. Co-innovation aligns with alternative extension approaches given its interactive and dialogical approach (Méndez Sastoque, 2020). Despite some institutional efforts towards a more participative practice. in Uruguay (and also in Latin America) the diffusionist approach is predominant. Shifting towards an alternative model based on an extension policy poses very significant challenges since interventions cannot be scaled up without trained human resources and institutional commitment to design a supporting structure for extensionists' work.

In this regard, a livestock promotion program recently announced by the Ministry of Agriculture to provide farm technical assistance is considered a window of opportunity. The program aims to reach 1,000 family and medium-sized farmers starting in 2025. However, alignment with co-innovation and ecological intensification will be necessary. Opportunities also open up in the international landscape, where llivestock farming is being strongly questioned due to its environmental impact;,the productive base of Uruguayan livestock farming in the natural grassland, which uses the capacity of ruminants to produce animal protein from fibrous fodder using extensive areas of pastures that are not suitable for agriculture or feeding monogastric animals, while generating ecosystem services (Tittonell, 2021).

References

Aguerre, V., & Bianco, M. (2023). *Journal of Rural Studies.* https://doi.org/10.1016/j.jrurstud.2022.12.003

Aguerre, V., & Bianco Bozzo, M. (2024). *Revista de Economia e Sociologia Rural.* https://doi.org/10.1590/1806-9479.2023.279500en

Méndez Sastoque, M. J. (2020). *Redes.* http://doi.org/10.17058/redes.v25i1.14684

Tittonell, P. (2021). *Frontiers in Sustainable Food Systems.* https://doi.org/10.3389/fsufs.2021.664103