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FARMING SYSTEM DESIGN FOR SUSTAINABLE AGRIFOOD SYSTEMS: THEORIES AND PRACTICES

Proceedings of the 8th International Farming System Design Conference

Temporary version

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

The correct citation of this book of abstracts is:

Farming System design for sustainable agrifood systems: theories and practices, proceedings of the 8th International Farming System Design Conference, Marion Casagrande, Marie-Hélène Jeuffroy, Gentiane Maillet, 2025. DOI: 10.17180/j9xc-fs91

The correct citation of articles in this book of abstracts is:

Authors, year, *title*. on: Farming System design for sustainable agrifood systems: theories and practices, proceedings of the 8th International Farming System Design Conference, Marion Casagrande, Marie-Hélène Jeuffroy, Gentiane Maillet, 2025. DOI: 10.17180/j9xc-fs91

Co-designing regional scenarios for the transition of agrifood systems and diets by 2050: a methodological contribution

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Introduction

There is a consensus that a holistic transformation of agrifood systems including more grain legumes (GL) is needed due to their contribution to climate change mitigation, healthy diets and proteins self-sufficiency. However, their integration in European cropping systems (4% of the arable land) remains limited, as well as in diets (4 kg/capita/year), whereas the general recommendation is at least 11 kg/capita/year (Poux & Aubert, 2018).

Foresight is a valuable approach to explore and support the transition of agrifood systems (de Lattre-Gasquet et al., 2025). While numerous foresight studies such as TYFA (Poux & Aubert, 2018) have explored alternative scenarios at large scales, regional downscaling is a complementary step to take into account local specificities, integrate the visions and knowledge of local stakeholders, and trigger changes. However, co-designing scenarios with stakeholders raises methodological challenges related to knowledge integration, time constraints and the choice of boundary objects to facilitate discussions.

To overcome these challenges, we propose a scenario-building process, linking quantitative and qualitative methods and involving both stakeholders and project scientists. We then present its application in a case study, the development of GL in a French region by 2050.

Method

The scenario-building process integrates methods commonly used in foresight and system thinking studies and involves six stages: stages 1, 2, and 6 were carried out by experts/scientists, while stages 3, 4 and 5 were articulated in a one-day participatory workshop involving 12 stakeholders representing different stages of the value chain.

The first step aims to build a causal diagram that delineates the system under study and that allows to identify the key influencing variables. In step 2, a map of stakeholder interests and impact was drawn up, in order to identify the stakeholders who most influence the variables identified in step 1 and those who should be involved in the participatory process. In step 3, scenarios were built using the morphological analysis, an approach that combine a set of hypotheses about how the variables of the system may evolve in the future to create a range of scenarios (Lamblin, 2020). While comprehensive, this approach can be time consuming, when the number of variables is high, which can be an obstacle in a participatory process. Therefore, before the workshop, projects scientists constructed future hypotheses for each influencing variable, based on literature and experts' interviews, and group them into micro-scenarios that took the form of narratives. During the workshop, stakeholders used pre-existing microscenarios and proposed new ones to build a trend and preferable scenarios. To facilitate the appropriation of the micro-scenarios and the discussion between stakeholders, participants were divided into two small groups of 6 and several artefacts were created (Figure 1). In step 4, we relied on the Story and Simulation Approach (Alcamo, 2008). Using the narratives from step 3, stakeholders mapped the changes in GL acreage that would be required to meet their preferable scenario and a supply-demand balance model was run to assess the associated level of self-sufficiency. In step 5, the backcasting approach, which works backward in order

to identify the most strategic steps and sequence actions leading to the desirable future, was used (Robinson, 1982). To help stakeholders project in 2050, we broke down the future into 2 steps, with a first milestone set in 2035. The last step synthesized the main results of the workshop into a leaflet.

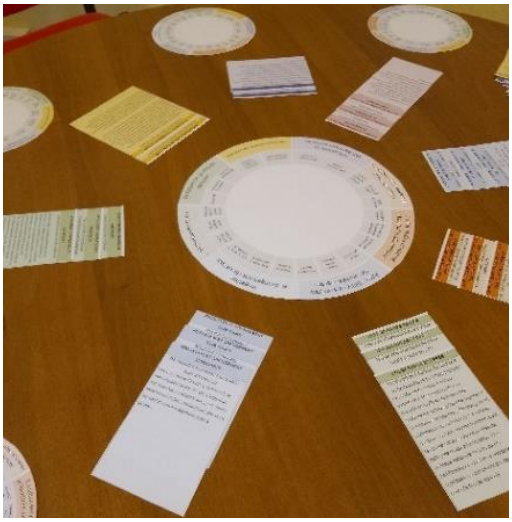

Figure 1: Overview of the artefacts. At the center, the wheel presents the micro-scenarios without imposing an order in the discussion. Around the wheel, the cards describe the micro-scenarios.

Results

The application of this method led to the co-design of 3 scenarios: one trend scenario, in which participants' visions converge towards a maximum yearly GL consumption of around 6 kg/capita without profound changes within the system, and two preferable scenarios in which participants' visions diverge on several points. Stakeholders agree on a number of desirable changes for the future (increasing GL consumption to 11 kg/capita/year, implementing European public policies in favor of protein self-sufficiency and local policy against the loss of arable land, strengthening research and development activities for a diversity of GL). However, their visions diverged on the future accessibility to inputs (one group envision a drastic reduction of synthetic nitrogen fertilizers and irrigation water compared to the other), the development of agroecology (up to 70% in one group), and the role of catering in changing diets (for one group the transition towards more plant-based protein diets will mainly take place in the catering sector while the other group envisions a profound change in the household consumption behaviors).

Thanks to the use of mapping and model simulation, stakeholders found that by increasing the GL acreage by ~50% and reducing livestock farming, it would be feasible to reach regional proteins self-sufficiency. This result helped them appreciate the feasibility of their scenarios. Finally, the backcasting approach allowed stakeholders to identify 35 actions to be implemented at different levels of the value chain.

Discussion and perspectives

The scenario-building process proposed here is a generic and operational approach that provide a guide for developing scenarios for agrifood system transition. This approach can be transferred to other contexts or other agricultural products. If the methods we have mobilized are not new, the way we have articulated them to build future scenarios in a participatory approach is original and can help stakeholders bring out contrasted visions of preferable futures and orient their current actions to trigger changes (Inayatullah, 2013). Even if for some

participants, projecting themselves in 2050 and stagger actions over time was challenging, they learned from the exercise and the artefacts facilitated their engagement.

To conclude, this work has enabled scenarios to emerge for a given territory, but it would be interesting to carry out a comparative analysis with other French or European regions to increase genericity and identify commonalities and differences to foster GL development in Europe.

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