

"GLOBAL PERSPECTIVES ON YOUTH ENGAGEMENT IN AGRIFOOD SYSTEMS: THE CENTRAL ROLE OF DATA AND INNOVATION"

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ABSTRACT

Despite a declining trend in youth employment within agrifood systems, these sectors remain the largest employer of young people in the global South. To address this paradox, 30 youth leaders, including farmers, journalists, researchers, and activists, from diverse global regions collaborated in a workshop using fuzzy cognitive mapping (FCM). The workshop identified key drivers of youth disinterest in agriculture, proposed actionable solutions, and analyzed the systemic consequences of this disengagement.

Given the diverse realities of agrifood systems around the world, a wide range of factors were identified, which were later condensed into 11 global categories for the assessment of interconnections and their systemic influence. Among the findings, the lack of access to reliable data emerged as the most central barrier, highlighting the need for evidence-based interventions. Scenario analyses also revealed that data availability and innovation are pivotal leverage points for reshaping agricultural opportunities and addressing systemic barriers for young people.

This preliminary study consolidates global perspectives on the declining interest of young people in the agrifood sector and provides actionable pathways for stakeholders to redefine agriculture as a compelling career opportunity, ensuring the sector's future sustainability and resilience.

Keywords: youth engagement, fuzzy cognitive mapping, innovation, data access, agrifood systems

1. Introduction

Agriculture faces a growing challenge in engaging the next generation of farmers and food system professionals. Many young people perceive farming as a difficult, low-status occupation and are migrating from rural areas to cities in search of better opportunities (Girdžiūtė et al., 2022). This exodus has led to an aging farmer population worldwide, in Europe, only around 5.6% of farms are managed by people under 35 and over 30% are managed by those above 65 (Girdžiūtė et al., 2022). Negative stereotypes about agricultural work – portraying it as labor-intensive with little reward – further limit youth from entering the sector (Girdžiūtė et al., 2022). At the same time, global organizations warn that making agri-food systems more appealing to young people is urgent for the future of food security (HLPE, 2021). Studies have identified numerous barriers that young aspiring farmers face, including insufficient access to knowledge and education, limited access to land and finance, poor rural infrastructure, and a lack of involvement in policymaking (FAO, 2014).

The EU has implemented various measures under the Common Agricultural Policy (CAP) 2023-2027 to support young farmers (EC, 2025). Besides, the European Commission's Vision for Agriculture and Food, unveiled in February 2025, emphasizes the importance of attracting younger generations to the agricultural sector to ensure its long-term sustainability and competitiveness. To address this, the EC plans to introduce a Generational Renewal Strategy within the same year. This initiative aims to remove structural barriers for young and new farmers and to create more viable, appealing career pathways within agriculture.

It is crucial to ensure that youth can seize opportunities in agriculture and drive innovation in food systems. In this context, a participatory workshop with young agricultural leaders titled "**How can we make agriculture more attractive to young people?**" was conducted to systematically explore the factors influencing youth engagement in agriculture and to identify leverage points for making the sector more appealing.

2. Methodology

The workshop brought together 30 young leaders in food systems participating in a program of the NextGen Ag Impact Network (NGI) with diverse backgrounds – including young farmers, agricultural journalists, researchers, and food system activists – to collaboratively address the question of how to attract more youth to agriculture. Fuzzy Cognitive Mapping (FCM) was chosen as the participatory modeling method. FCM is a semi-quantitative approach that represents key factors as nodes in a cognitive map and uses weighted directed links to denote causal influences between factors. This method enables stakeholders to make their

mental models explicit and to integrate different types of knowledge in a formal system model. We used the *Mental Modeler* software tool to facilitate group model-building and analysis. Mental Modeler allowed participants to add and connect concepts easily and then run computational analyses and scenario simulations on the resulting map.

The focal question guiding the mapping was exactly the workshop title: “*How can we make agriculture more attractive to young people?*” Participants first worked individually to brainstorm factors they believed were important in answering this question. These individual inputs were then shared and discussed in groups. Through an iterative, collaborative process, overlapping or similar factors were merged, refined, and given a common name. Participants also discussed the meaning of each factor to ensure a shared understanding. After finalizing the list of factors, participants identified cause-and-effect relationships between them. For each pair of factors where a direct influence was believed to exist, the group assigned a *weight* on a scale from -4 to $+4$. A positive weight indicated that increasing one factor would cause an increase in the affected factor (a reinforcing influence), whereas a negative weight meant an inverse relationship (a inhibiting influence). The magnitude of the weight (1 through 4) defines the perceived strength of that influence. All weights were determined by group consensus, with discussion to resolve any differing opinions on the direction or strength of relationships. To maximize interaction and consensus-building, participants were shuffled into different small groups in successive rounds of discussion, so that each group was composed of new mixes of people.

Once the fuzzy cognitive map was built, key metrics computed included each factor’s *outdegree* (the sum of absolute weights of links emanating from that factor), *indegree* (sum of weights of links coming into that factor), and *centrality* (sum of outdegree and indegree) which indicates a factor’s overall importance or connectedness in the system. Factors with high outdegree were interpreted as dominant drivers that significantly influence other parts of the system, whereas factors with high indegree were seen as dependent variables or outcomes influenced by many others. Finally, we conducted **scenario analysis** by adjusting the state of certain factors and simulating the model to observe potential outcomes (“what-if” scenarios). In these simulations, a factor’s state can be increased or decreased (e.g. simulating an intervention that improves data availability, or a policy change that reduces barriers to youth) and the resulting equilibrium shifts in all other factors are calculated.

3. Results

The final FCM contained a total of 11 factors and dozens of weighted connections representing these insights:

1. **Lack of transformation willingness in the food system** – resistance among current actors to change or modernize practices, leading to a slow transformation of agriculture.
2. **Environmental impacts** – negative environmental externalities of agriculture (e.g. pollution, climate change) and the sector’s vulnerability to environmental changes.
3. **Lack of data** – insufficient data availability and information-sharing in the agricultural sector (e.g. best practices, opportunities), leading to poor decision-making and visibility.
4. **General level of society’s education** – the overall education and awareness level in society about agriculture and food systems.
5. **Barriers to youth engagement in food systems** – societal and economic hurdles for young people (such as lack of access to land, funding, or credit, and limited job opportunities).
6. **Rural services and infrastructure** – the quality of rural amenities (e.g. internet connectivity, transportation, schools, healthcare) that affect the attractiveness of rural life.
7. **Bad reputation of agriculture** – the low public image of agriculture as a profession, often seen as low-tech and unrewarding by the general public.
8. **Innovative approaches and techniques** – the presence of new technologies, sustainable practices, and creative business models in agriculture.
9. **High effort / low profit** – the perception or reality that farming involves hard work for low financial returns, reducing its appeal to young entrepreneurs.

10. **Partnerships (value chain, generation, geography)** – collaboration and networks across value chains, between generations (e.g. mentorships between older and younger farmers), and among regions, which can support youth entry and success in agriculture.
11. **Policies to incentivize youth engagement** – government and institutional policies that encourage youth in farming (for example, land grant programs, start-up funding, training schemes, or involving youth in governance).

These factors represent a mix of societal, economic, environmental, and perceptual elements that collectively influence whether young people find agriculture to be an attractive career or livelihood. **Figure 1** provides a schematic illustration of the cognitive map structure with all the factors and their interrelations.

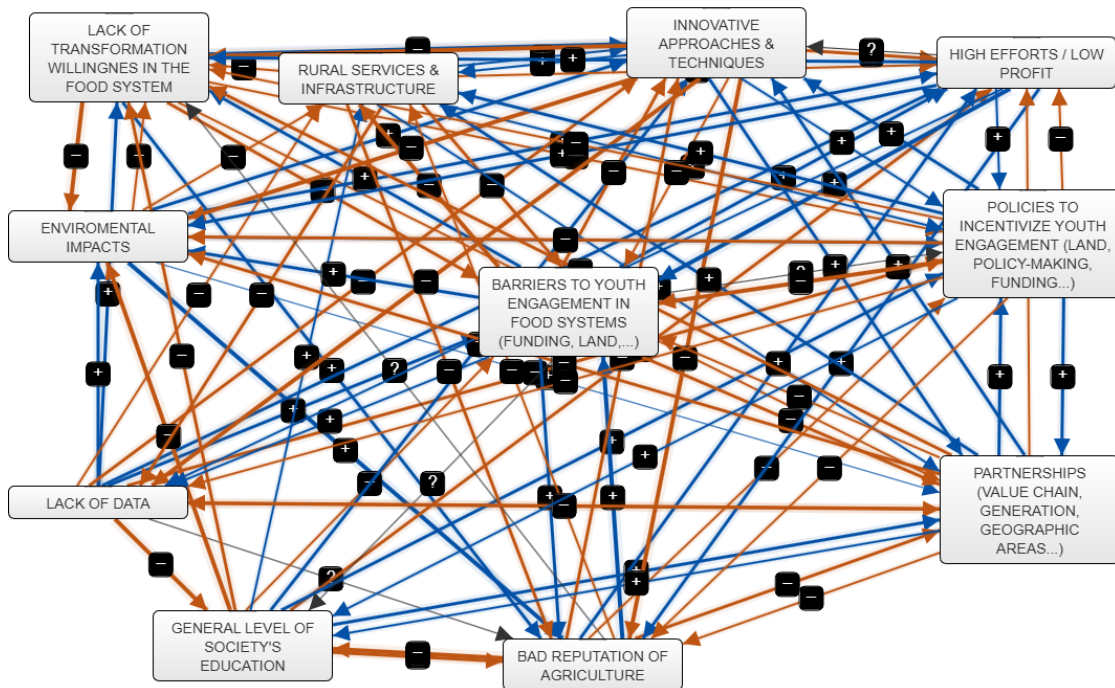


Figure 1 - FCM of the factors influencing the attractiveness of agriculture to young people

Many interrelations were identified, for instance, *Barriers to youth engagement* (factor 5) could be alleviated by strong *policies to incentivize youth* (factor 11) and supportive *partnerships* (factor 10). Also, many factors were interlinked in feedback loops. For instance, workshop participants described how a *lack of transformation willingness in the food system* (factor 1) can reduce the adoption of *innovative approaches* (factor 8), thereby perpetuating the sector's traditional image and contributing to a *bad reputation of agriculture* (factor 7). This poor reputation in turn discourages youth, reinforcing resistance to change as fewer young innovators enter the field – a reinforcing cycle that traps the system in its status quo.

Analysis of the map revealed that not all factors were equally influential. In particular, *Lack of data* emerged as the most central element in the cognitive map being a leverage point within the system. In discussions, it became clear that better data (e.g., training opportunities or new farming techniques) is considered crucial for empowering young farmers and informing supportive policies. This aligns with prior findings that ensuring youth have access to right information is crucial for their engagement in agriculture (FAO, 2014).

In terms of **outdegree and indegree**, *lack of transformation willingness in the food system* (factor 1) had a high outdegree – it was a source of influence on many other factors. In line with past research, this suggests it is a fundamental driver: for example, a persistent unwillingness to transform can negatively affect innovation uptake, contribute to environmental degradation, and worsen agriculture's reputation (since older generations may cling to unsustainable or inefficient practices) (Girdžiūtė et al., 2022). On the other hand, *Bad reputation of agriculture* (factor 7) had one of the highest indegree values, meaning it was largely an outcome shaped by other factors such as low profitability, environmental impacts, or lack of innovation. In essence, the model indicates that agriculture's poor image is not an isolated issue but rather the cumulative result of other systemic problems.

Among the scenarios tested, a scenario in which *Lack of data* was significantly reduced (simulating a major improvement in data availability and knowledge sharing) along with a boost to *Innovative approaches and techniques* (simulating increased adoption of new farming methods by young people) was the most promising. When the model was run with these changes (and all other factors held constant), it produced the most positive systemic shifts compared to other scenarios. Better data empowered policymakers and institutions to design more effective support programs (factor 11), thereby indirectly reducing barriers to youth (factor 5). It also directly improved the general level of knowledge in society about agriculture (factor 4), since information was more accessible. Meanwhile, the boost in innovation (factor 8) helped to break the cycle of low profitability – novel techniques improved efficiency or opened new income streams, thus mitigating the *high effort/low profit* problem (factor 9). Together, these changes led to a noticeable improvement in agriculture’s reputation (factor 7) in the model output, since farming was hypothetically becoming more data-driven, modern, and rewarding. This positive feedback loop indicates that interventions in information availability and innovation approaches can have compounding benefits for the attractiveness of the sector.

Even so, the scenario analyses suggested that no single measure is a silver bullet; rather, a combination of improvements yielded the best results. For example, a separate scenario that focused only on policy incentives without addressing data and innovation showed more limited impact – this is because, in the model, policies alone could not fully compensate for the lack of practical information and new techniques. The group’s discussion around these scenarios emphasized the value of integrated approaches.

4. Conclusion

Attracting young people to agriculture is a complex challenge that requires addressing interrelated economic, social, environmental, and informational factors. The FCM workshop allowed a diverse group of youth to collectively map out this complexity. The resulting cognitive model highlighted that making agriculture more appealing to youth is about simultaneously improving the realities of farming and the perceptions of farming. The insights from this workshop underscore that change must happen concurrently on several fronts: improving the economic prospects of farming, updating the narrative and image of agriculture, and actively supporting youth through education, partnerships, and policy incentives.

In this context, the upcoming Generational Renewal Strategy announced in the European Commission’s Vision for Agriculture and Food should take into account this systemic complexity and foster integrated approaches. Addressing youth engagement in agriculture effectively requires coordinated actions across multiple areas, ensuring that efforts in one domain reinforce progress in others.

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