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Developing a framework to assess the sustainability of farming systems

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Abstract

A growing number of economic, ecological, and social challenges are placing more pressure on the resilience of European agricultural systems. Farm systems must be aware of the local environment and agricultural functions of their operations in order to address these challenges, since farms, farmers' organizations, service providers, and actors in the supply chain all have roots in their local communities. In an era of increasing complexity and accumulating stress, farming systems are characterized by robustness, adaptability, and transformability. In our paper you describe your efforts to develop a framework that will be used to measure the resilience of various agricultural systems in Europe, along with your efforts to develop an operationalization method for the framework. In order to evaluate farmers' ability to handle challenges that are specific (specialized resilience) as well as handling uncertain conditions and unexpected surprises (general resilience), this tool was developed.

Keywords: agriculture, farming, economy, farmers, farmer organizations

1. Introduction

Farming systems today face a variety of issues involving the environment, economics, and social issues. As a result of liberalized markets, prices have become more volatile, access to markets has changed, Political boycotts resulted from trade wars, or Brexit, policy environments have become less stable, and the debates over agricultural practices such as animal welfare are becoming more heated. The absence of successors to provide generational renewal on farms and nonavailability of seasonal, permanent, and skilled labor are all

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demographic concerns related to these uncertainties. In spite of the fact that such challenges impact food systems on a large scale, regional contexts often mitigate or exacerbate their effects [1].

Local conditions also affect which responses are appropriate. It is possible for drought to have an economic impact depending on a number of factors, including farm conditions, agricultural practices, and the ability of lenders and insurance companies to recover produce. 'Farming systems' is a name given to the local interaction between agriculturists and other actors in an agro-ecological context.

2. Agriculture the Adaptive Cycles

Adaptive cycles refer to the different stages (Growing, conserving, collapsing, and reorganizing) that a system may go through when its environment and internal dynamics change with time. A farming system is different from an ecological system in that its purpose is production, and it makes a deliberate effort to escape disruption caused by environmental factors. Rather than being a model that guides the process of system change in agriculture systems [2][4], an adaptive cycle is a concept acts more as a heuristic. This is illustrated in Figure 1. Risk management, for example, ensures safety that farming systems remain in or swiftly return maintaining status quo when faced with potentially disruptive challenges (conservation). In addition to causing new practices (reorganizations), shocks and stresses can also cause ruptures and collapses of agricultural systems. Often, these changes are not restricted to a single field plot, but may affect farms and regions as a whole [5].

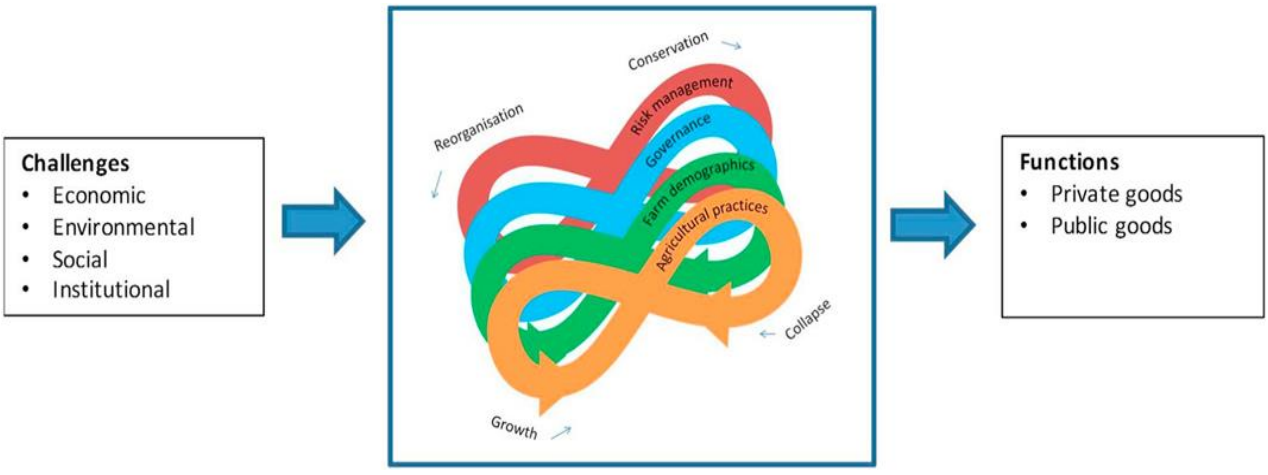

Figure 1 Agriculture - The Adaptive Cycles [5]

In order to attract workers from non-EU countries such as Ukraine, Russia, Belarus, Moldova, and Uzbekistan, new members adjusted hiring standards and raised wages [6][9]. Intergenerational transfers or shareholder turnovers are frequently responsible for significant changes among families and corporate farms [7]. Traditionally, farming is considered a an occupation with low income, constrained by working long hours, living in remote areas, little social life, and mounting financial challenges. An organization's structure will change as a farm's needs change, especially during generational shifts and ownership transfers. It depends on many factors such as alternative employment opportunities and whether another farm operation or function takes over whether a farm closes and the impacts are felt by the farmers, farmers' system, and farming operations [10].

3. Resilience in Farming - A Framework

As a result of the adaptive cycle concept, resilience is defined beyond the narrow definition involving maintaining equilibrium (conservation) [11][13]. Three capacities of systems play a crucial role in explaining agriculture systems' resilience, adaptability, and transformation. Previous distinctions among these capacities have been made in terms of their relevance to social-ecological systems that provide ecosystem services. The framework further distinguishes between a farming system's ability to address specific challenges (specific resilience) and its ability to manage the unknown, uncertainty, or surprise (general resilience) [5]. Our survey of resilience functions concludes that these benefits tend to be in the interests of wider society, even if their distribution is critical, not least for resilience itself.

4. Framework Optimization Methodology

To guide case inquiry and to facilitate comparative analysis across cases, we developed a comprehensive framework of methodological steps based on the framework. As a result of the framework, we established comprehensive steps for guiding inquiry and enabling comparison across case studies. SURE-Farm (surefarmproject.eu) methodological steps are illustrated in Figure 1. The project included multiple farming systems to illustrate different types of challenges and public goods that have an impact (Step 1a) [7][9]. What resilience is, what it does, what it can do, and what it does not do are analyzed in step two through five, and findings of earlier steps inform assessments in step six and seven. The methodology often combines quantitative and qualitative methods: quantitative methods, such as statistics, econometrics, and modeling, provide insights into patterns, explain causality, and identify contributors; while

qualitative methods, such as stakeholder workshops, provide understanding of human behavior. By utilizing the findings of multiple cases, step 5 is designed to develop theory and teach practical skills, including the identification of implementation roadmaps (step 5d) [8].

5. Discussion

The authors developed assessment of the resilience of farming systems based on a conceptual and methodological framework. With farming systems serving multiple objectives, challenges, players, and time frames, the framework enables the identification and assessment of the competences that foster and constrain resilience [12]. Applying the framework holistically has proved beneficial. As an example, when resilience is deemed to be linked to sustainability, it cannot be regarded as positive for unsustainable configurations. Implementing the framework empirically also poses a number of challenges. However, gathering data on system-level indicators can be a challenge since the farming system does not necessarily coincide with the administrative area, such as migration or visits to medical practitioners related to mental health. As an example, we have three provinces involved in our farming system. In addition to taking into account governance at multiple levels and including public and private sectors, policy decisions at the system level may also affect stakeholders in ways that go regardless of the particular farming system considered. In addition, the application shows how agricultural systems are more likely to be resilient if they are considered holistically rather than focusing on one or two challenges, as they are in risk management studies.

6. Conclusion

There are way too many factors involved in farming systems to measure a single indicator of resilience. We envision, therefore, that our framework allows and demands an assessment of farming systems' resilience that takes into account their changing functions, their interdependencies, and the range of stressors and shocks they may encounter. As a result, resilience can be assessed a bit differently, for example, the analysis may indicate that a particular environmental factor limits resilience to social or economic challenges, while a certain ecological force enhances it.

In order to assess resilience strategies and explore synergies and trade-offs among them, resilience can be differentiated into three capacities (robustness, adaptability, and transformability).

In a framework, strategies and attributes can be evaluated and defined in order to enhance farm resilience post-challenge, and strategies and attributes can be assessed and defined for building a resilient farming system ex-ante. Furthermore, there was a desire to create a framework which would complement current agricultural policy trends through its focus on agriculture systems. The emergence of these plans has demonstrated that they can provide a greater level of flexibility for dealing with context-specific challenges at the subnational level.

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