FOODLEVERS

Statement

This project focuses on how **organic and sustainable food systems** with long and short distribution chains contribute to reconnecting producers and consumers, more **efficient resource use from farm to fork** and the economic, environmental, social and governance dimensions of the system's sustainability.

At all levels in the food system insights are created in sustainability, i.e. the actors' role and potential barriers and drivers specific to the studied systems. Farmers learn about their **farm's overall sustainability** and the role of **distribution channels**. Analysis of different value chains and scenario building leads to recommendations for farmers and chain actors to **organise innovations that minimise trade-offs** between stages from production to waste recycling and identify new value chains. Involvement of and communication to consumers **raises awareness about sustainable food choices**. Food chain actors and policy makers are informed about impacts of scaling up sustainable food systems at various scales.

BACKGROUND AND STATE OF THE ART

Despite the recent uptake of innovative production systems, food systems continue to move on unsustainable trajectories through a focus on "highly tangible, but essentially weak, leverage points" (Abson et al. 2017). Thus, interventions fail to address key problems. Abson et al. (2017) therefore highlight the "need to focus on three realms of "deep leverage" in affecting change towards sustainability:

"Re-connect": reconnecting people to nature to encourage sustainable behaviours whilst shortening feed-backs and improving wellbeing;

"**Re-structure"**: re-organising institutions and considering how institutional dynamics can create an enabling environment for sustainability

and;

"Re-think": considering how knowledge is created and used, shared and validated.

Research that addresses relationships between the above areas can build an understanding of effective practices and how these interact with the design of and intent behind food systems (Fischer and Riechers, 2019). Better understanding of how ecology and productivity interact with social processes is also required to influence innovation in ways that address all dimensions of sustainability (FAO, 2012).

Innovative organic food systems may provide models for this holistic framing but none excel in all aspects (Van Wagenberg, 2017). More formal research and assessment is therefore required to better understand these systems, their benefits and the potential for individual socio-technical

practices and organisations to facilitate sustainability transitions (Geels et al. 2016). Through such an innovative scientific enquiry it is possible to identify "configurations that work" in specific socio-ecological and socio-economic contexts (Lamprinopoulou et al. 2014).

Within such an innovative approach, combining new models and metrics for an integrated biophysical and socio-economic evaluation is essential to highlight the trade-offs and synergies between diverse aspects of sustainability and identify the efficacy of individual practices. For example combining Life Cycle Assessment (LCA) and Emergy evaluation approaches can provide a more complete picture of the food system performance that results from specific interventions, allowing LCA to account for ecosystem services and environmental inputs that are usually treated as 'free' (e.g. ecosystem services, Smith et al. 2015). Extending LCA beyond the farm-gate (i.e. including the consumer and waste phases) can also allow for the identification of trade-offs / synergies between production, distribution and use stages (Lu & Halog, 2020). Including human nutrition, biodiversity and social wellbeing aspects within food systems can also help to identify trade-offs and enable improved policymaking, in the context of the Sustainable Development Goals and the EU's international commitments (e.g. Paris Agreement, Biodiversity Convention, Notarnicola et al. 2017).

At the same time exploring how innovative value chains can encourage all actors in food systems towards more sustainable pathways can determine (i) how food chains could be transformed following changes in production, consumption and trade levels, from both a governance and structural perspective (i.e. number and size of actors and power relationships between them); and help to (ii) evaluate the potential impacts of such reconfiguration on environmental, economic and social dimensions (including number of jobs and competitiveness of European food industries, Swisher et al. 2018).

FOODLEVERS will address knowledge gaps in the above areas through a comprehensive assessment approach that unites different disciplines and stakeholder groups to identify trade-offs and synergies within case-study food systems and Critical Success Factors for embedding a timely and effective transition to sustainability and circularity in food systems

Objective

To close the gap between production, processing and consumption it will be necessary to understand the role of all parts of a food system (FS). This project aims to analyse different forms of organic and sustainable FSs (e.g. organic, biodynamic, permaculture, agroforestry) in different geographical (rural, urban) and institutional (e.g. community supported agriculture) contexts to understand how different layers of efficiency (e.g. actors, processes, technologies and forms of organisation) can contribute to improved natural and human resource use efficiency. These results will be compared with the currently dominant FS.

We will apply a multi-disciplinary approach that enables us to understand material, organisational and behavioral dimensions of FSs. We will analyse the characteristics of case study systems in terms of agro-ecological factors, FS value chains (food cultivation, various stages of processing/distribution, consumption) in terms of input-output relations and the interaction processes between actors and the decisionmaking processes in consumption. In particular, we will consider whether the way that innovative organic and sustainable FSs are pushing the boundaries of what is known, what is expected and what is thought to be do-able, contribute to social theory about re-organisation and restructuring FSs (Fischer & Riechers 2019). In doing so we will identify the

leverage potential of different FSs (and sub parts of systems) to increase the performance of systems and to accelerate sustainability transitions.

Key to this will be to understand how food production and consumption are linked and influencing each other. In particular we will consider how knowledge production and use ('re-think') and increased human/nature connections (between supply chain actors including consumers, retailers, producers, processors) may be a lever for reorientation in FSs (Abson et al. 2017) to increase resource efficiency. We will specifically address the role that socio-technological innovation can play in the reorientation of FSs and consider whether institutional change in FSs ('re-structure') can provide leverage for change in Europe as we shape policy on agriculture and the environment. The disintegration of one set of frameworks and policies may provide fertile ground for re-orientation within value chains.

We build on theoretical approaches that stress that sustainability transitions are socio-technical transitions that imply a co-evolution of physical, technological, social, cultural, and organisational aspects at the same time. Innovative socio-technical niches within FS regimes provide the "seeds for change" (Geels 2002, Geels et al. 2016) for sustainability transitions. Thereby, technologies are composed of many different components (e.g. materials, skills) that form a "configuration system that works" in a specific social context (Rip & Kemp 1998; Hekkert et al. 2007; Lamprinopoulou et al. 2014).

Regarding sustainability transitions of FSs, the proposed framework is especially helpful, because it can connect material and organisational aspects of efficient and circular FSs. A key characteristic of the incumbent food regime is that production, processing and consumption are separated, resulting in a growing disconnection between stakeholders. There is a high temporal, geographical, social and cultural distance between production and consumption (commodity fetishism). In fact, we are dealing with a double commodity fetishism (Cook & Crang 1996), because not only is the information about the original production context extracted, but also new attributes are added. In consequence, the absolute and relational distance between production and consumption increases, resulting in unsustainable pathdependent patterns of production, processing and consumption. However, alternatives exist in innovative organic and sustainable systems, which often include new forms of organising food chains (direct marketing, box schemes, CSA) and an innovative use of resources('reconnect').

Relevance

This proposal is grounded on the premise that attaining sustainable food production and consumption will require transition from the current linear FSs, to more circular systems that also re-connect producers and consumers. Our multidisciplinary research team takes a system and multi-actor approach to study the leverage potential of FSs based on agro ecological principles, i.e. FSs in which eco-functional intensification of farming is combined with close cooperation with value chain actors and consumers.

In the FOODLEVERS project we analyse long and short chain organic FSs. This is specifically relevant for call topic 1 as it:

Takes a systems approach considering all links in the food chain and all the actors therein, from farmers over potential intermediaries, to consumers. FOODLEVERS studies the interconnections, synergies and trade-offs between different aspects of the links and actors in innovative FSs.

Studies food systems organisation and management, while particularly considering alternative systems. It compares organic FSs with conventional non-organic FSs. Next to the mainstream long chain organic FSs, both alternative production systems (e.g. biodynamic, silvopastoral, permaculture) and innovative short chain marketing systems (e.g. basket systems, community supported agriculture (CSA), food hubs) are considered.

Analyses innovative FSs to identify critical points (pressures, barriers and levers) by measuring their environmental impacts, resource efficiency and other sustainability aspects from farm to fork, e.g. by holistic sustainability assessment making sustainability tangible for farmers and other actors and “cradle-to-grave” LCA (considering all steps from mining raw materials to waste-disposal).

Provides insight on the extent to which FSs are resource-efficient, i.e. their reliance on renewable or non-renewable inputs, by-product and waste stream generation, energy efficiency, and into the environmental pressure they exert, e.g. regarding climate change, soil degradation, water use.

Considers the role of all actors in the FSs, in value chain analysis and assessment of causal relations in consumer behaviour and food choices. It uses the Theory of Planned Behaviour to study consumer behaviour and gain insight into their knowledge of the FSs, attitudes, subjective norms and perceptions.

The project will hereby identify critical points in the systems studied, i.e. barriers and levers, and points for intervention, throughout the FSs and with the actors.

Based on the identified critical points, FOODLEVERS will build scenarios and models. Stakeholder decision modelling and agent-based modelling provide a holistic view of the complex interplay between the different socio-economic and behavioural aspects in the FSs. They allow us to understand the potential of micro-level changes to achieve system-level change and transition towards sustainability and increased resilience. This helps to redesign processes at various scales with attention to advanced approaches to shorten and create more efficient FSs.

Lastly the project provides support for win-win transition to sustainable and organic food production.