

Drivers of Change in the Austrian Beef and Dairy from Farm to Fork: A system analysis

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Abstract – This article discusses the drivers of change in Austrian beef/dairy from farm to fork. As part of the transdisciplinary project COWLEARNING, we conducted an iterative and transdisciplinary research approach, including a literature review and participatory workshops with relevant scientists and practitioners. Based on a grading system categorizing drivers of change according to their transformative power and directability, we identified 16 most effective drivers of change that could affect sustainability transitions. The paper provides a transdisciplinary approach to identify and assess drivers of change that can be used as a basis for decision-making to tackle societal problems.

INTRODUCTION

Modern beef and dairy from farm to fork in high-income countries is heavily challenged by environmental, economic, social, and animal welfare related sustainability problems (Bojovic and McGregor 2022). To achieve the goal of transforming food systems into ones that are fair, healthy, and eco-friendly by 2030, as described in the Farm to Fork Strategy of the European Union (European Commission 2020), the beef and dairy system must undergo changes. While there are several studies that examined the sustainability of individual beef and dairy farming cases or focused on specific segments of the supply chain, there is a lack of comprehensive research examining the key drivers of change in the entire beef and dairy system from farm to fork. To understand what enables a transition towards more sustainability in the Austrian beef and dairy system, we developed a list of drivers of change (DoC) in an inter- and transdisciplinary approach.

ITERATIVE TRANSDISCIPLINARY APPROACH

A DoC influences the time-dependent development of beef and dairy from the breeding and rearing of animals, the processing and commerce of beef and dairy products up to its consumption in private and public settings (Frangenheim et al. *unpublished*).

To study the DoC for beef and dairy from farm to fork since 1950, we combine an interdisciplinary analysis of problem-oriented causal and historical relationships with a transdisciplinary, more normative and solution-oriented approach to understand the current design and intent of the beef and dairy system (figure 1; cf. Riechers et al., 2022).

We co-developed the context-sensitive problem framing in two participative workshops (November 2020 and Mai 2022). This has been the basis for a scoping

literature review from three complementary disciplinary perspectives, i.e. social science and agro-food studies, animal welfare science and sustainability assessment studies (June – September 2022). The aim of the literature review was to thoroughly investigate what drives past developments in Austrian beef and dairy from farm to fork. For each discipline we developed an search string using the PICO Methodology (Kuhn 2014) and following the PRISMA 2020 statement (Page et al. 2021). The search was then complemented with grey literature from federal and research institutes (for more details see Frangenheim et al. *unpublished*). Based on this review, we identified 23 DoC from 1950 until 2020.

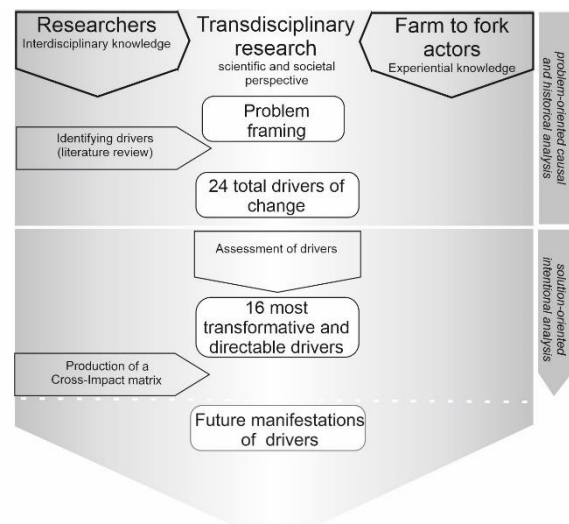


Fig. 1 Iterative and transdisciplinary research approach

In a workshop in September 2022 that involved 30 stakeholders from farm to fork and six researchers from the mentioned disciplines we completed and assessed this list. The stakeholders were selected based on their experience. We also were interested in balancing incumbents and niche actors. In the workshop we compiled and integrated interdisciplinary and experiential knowledge to grade DoC according to 1) their transformative power, that is the extent to which a driver has the potential to create an impact on individuals, organizations, or the agri-food system as a whole, and 2) their directability, that is the extent to which involved actors can influence the direction and pace of a DoC.

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Grading shallow and deep leverage points, i.e. places to intervene in a system, helps understanding the extent to which DoC can alter a system's trajectory and transform it (Meadows, 1999; Riechers et al., 2022). As a result, we jointly identified 16 most effective drivers of change that may be approached to direct sustainability transitions.

The researchers subsequently conducted a cross-impact analysis with the selected drivers, taking into account the causality between the individual DoC based on experts' judgements (Hayashi, 2006). Each DoC was valued based on the relation of active and passive sums and the joint cross-impact matrix was discussed with the cooperation partners with regard to their future manifestations. The respective interpretations are based on considerations by Penker (2005).

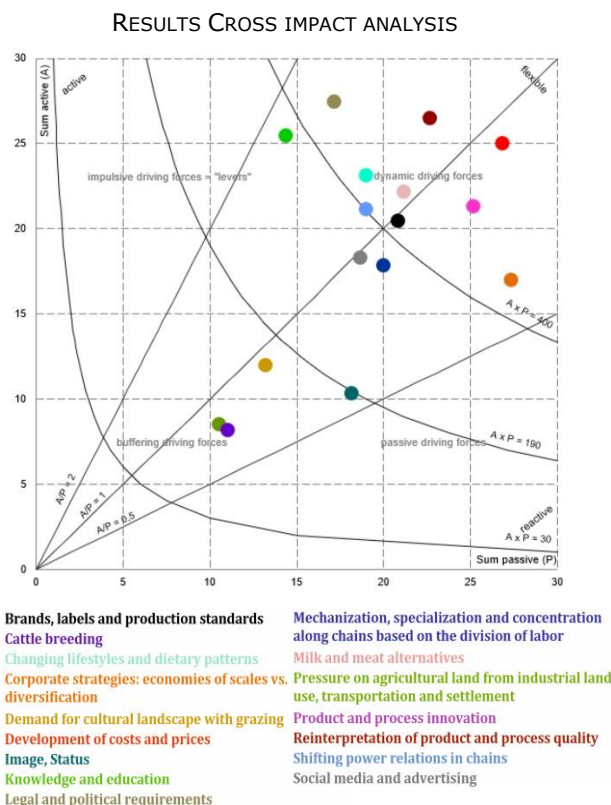


Fig.2: Cross-Impact-Matrix of the 16 drivers of future change

An active or impulsive DoC with a high active and low passive sum is 'knowledge and education', explained by its high impact on other DoC but little suggestibility.

Reactive or passive DoC with a high passive sum and a low active sum are more influenced by other DoC and have less impact on other DoC e.g. 'Demand for cultural landscape with grazing'. Reactive DoC are good indicators to observe the system.

Critical or dynamic DoC have a high active and high passive sum. Most of our identified DoC belong to this group (cf. figure 2, right upper quadrant). Since they are said to be strongly influenced by other DoC and at the same time have a high impact on other DoC, the high portion of drivers belonging to this group proves the validity of the selection and weighting of drivers according to their transformative power during the participative workshop. Due to their strong

linkage to other DoC (and each other), they have to be kept in focus.

Finally, a buffering, slow, inactive or sluggish DoC with a low active and low passive sum is 'image and status of work in agri-food industries'. Only marginally influencing other DoC and experiencing only a low impact by other DoC, this DoC is hardly linked with other DoC and can thus be considered rather isolated.

OUTLOOK

Our analysis of the DoC in Austrian beef and dairy from farm to fork has the aim to understand the present system and develop an information frame-work for decision makers by understanding possibilities for action despite of partial uncertainty (Penker 2005). Combining a problem-oriented causal and historical analysis with a solution-oriented intentional analysis, we present an overview of the factors that have a significant impact on the system's future development, which also makes it a profound basis for further methodological approaches to identify future manifestations of drivers, such as participatory scenario planning.

With our study, we focused on the DoC in one country and one system. The iterative transdisciplinary research approach, arguably, may be transferred to other agri-food or non-food sectors.

ACKNOWLEDGEMENT AND FURTHER INFORMATION

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<https://cowlearning.boku.ac.at/>

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