

The learning value chain:
An action research perspective on innovation
in local agri-food systems

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*All that you touch,
You Change.*

*All that you Change,
Changes you.*

*The only lasting truth
Is Change.*

*God
Is Change.*

(Octavia E. Butler, Parable of the Sower)

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Abstract

In light of ecological crises and vulnerable supply chains, there has been an increasing interest in local agri-food systems in socio-political debates and academia. The sustainable transformation of such systems requires not only new knowledge about possible solutions but also concrete social and organizational changes in practice, co-designed and supported by the practitioners and companies involved—through collaborative innovation. This dissertation explores co-innovation using the example of emerging value chains for organic vegetables in a multi-actor network in the Berlin-Brandenburg region. Based on an action research approach, the network created a learning space that, over a six-year period, facilitated change in local value chains while also generating new knowledge, for academia and practice.

Starting with an analysis of the initial situation, data was continuously collected through qualitative interviews and participant observation as the action research progressed. The analysis employed an iterative-abductive process following the grounded theory approach. The core of this dissertation comprises four peer-reviewed research papers. Paper 1 examines the practices of actors along the value chain for organic vegetables in Berlin school meals. Using structuration theory, factors were identified that influence and inhibit local value creation, e.g., gaps in production and food processing as well as a lack of incentives for local sourcing. Paper 2 frames change processes in regional value chains through concepts of organizational learning and provides lessons for the design of learning spaces, process facilitation, and action research. Paper 3 represents the development of value chains in different phases that oscillate between intra- and inter-organizational and exploratory and exploitative learning. Paper 4 focuses on interventions and activities at boundaries between actors (boundary work), expressed in shared understanding and improved know-how (knowledge practices), and in new ways of working together (collaborative practices).

Based on these findings, the dissertation discusses four elements of learning value chains: (1) the creation of local spaces for learning and change, (2) the facilitation of iterative problem-solving processes, (3) the reconfiguration of value chain practices, and (4) the outcomes of co-innovation that result from the application of the other three elements. For the practice of value chain development, these findings demonstrate an approach to transformative learning processes that enable actors to challenge existing practices, develop new strategies for local value creation, and implement them. For academia, the findings provide directions for

conducting action research to support co-innovation in practice while maintaining scientific rigor. Further research should address the question of how learning value chains can be sustained in the long term, and transfer the findings presented here to other value chains and regions to extend and refine the present results.

Zusammenfassung

Vor dem Hintergrund von ökologischen Krisen und vulnerablen Lieferketten rücken zunehmend regionale Agrar- und Ernährungssysteme in den Fokus, sowohl gesellschaftspolitisch als auch in der Wissenschaft. Eine nachhaltige Transformation solcher Systeme erfordert nicht nur neues Wissen über mögliche Lösungen, sondern konkrete soziale und organisationale Veränderungen vor Ort, die von den beteiligten Praktiker:innen und Unternehmen mitgestaltet und getragen werden – durch Ko-Innovation. Diese Dissertation untersucht Ko-Innovationsprozesse am Beispiel der Entwicklung von Wertschöpfungsketten für Bio-Gemüse in einem Multi-Akteurs-Netzwerks in der Region Berlin-Brandenburg. Mittels Aktionsforschung wurde dort ein Lernraum geschaffen, der über sechs Jahre Veränderungen in regionalen Wertschöpfungsketten begleitete und gleichzeitig neues Wissen generierte, für Wissenschaft und Praxis.

Ausgehend von der Analyse der Ausgangssituation wurden im Verlauf der Aktionsforschung kontinuierlich Daten durch qualitative Interviews und teilnehmende Beobachtung erhoben. Die Auswertung erfolgte mittels eines Grounded-Theory-Ansatzes in einem iterativ-abduktiven Verfahren. Den Kern der Dissertation bilden vier wissenschaftlich begutachtete Veröffentlichungen: Artikel 1 untersucht Praktiken von Akteuren entlang der Wertschöpfungsstufen beim Einsatz von Bio-Gemüse in der Berliner Schulverpflegung. Anhand der Strukturierungstheorie wurden Faktoren aufgezeigt, welche die Entwicklung der Wertschöpfung in der Region beeinflussen und hemmen, z.B. Lücken in der Produktion und Weiterverarbeitung sowie fehlende Anreize für lokale Beschaffung. Artikel 2 rahmt Veränderungsprozesse in regionalen Wertschöpfungsketten durch Konzepte des organisationalen Lernens und leitet Erkenntnisse ab über die Gestaltung von Lernräumen, Prozessbegleitung und Aktionsforschung. Artikel 3 bildet die Entwicklung von Wertschöpfungsketten in verschiedenen Phasen ab, die zwischen intra- und interorganisationalem sowie explorativem und exploitativem Lernen pendeln. Artikel 4 betrachtet Interventionen und Aktivitäten an organisationalen Grenzen (Boundary Work), die sich in einem gemeinsamen Verständnis und verbessertem Know-how ausdrücken (Wissenspraktiken) sowie in neuen Wegen der Zusammenarbeit (kollaborative Praktiken).

Basierend auf diesen Ergebnissen diskutiert die Dissertation vier Elemente lernender Wertschöpfungsketten: (1) Die Schaffung von regionalen Räumen für Lernen und Veränderung, (2) die Begleitung und Unterstützung von iterativen Lösungsprozessen, (3) die Rekonfiguration der Praktiken in Wertschöpfungsketten, (4) die Resultate der Ko-Innovation, die sich im Prozess aus den anderen drei Elementen ergeben. Für die Praxis der

Wertschöpfungskettenentwicklung zeigen diese Erkenntnisse Ansatzpunkte auf für die Gestaltung transformativer Lernprozesse, die Akteure dazu befähigen, bestehende Praktiken zu hinterfragen, neue Strategien für regionale Wertschöpfung zu entwickeln, und diese umzusetzen. Für die Wissenschaft bieten die hier präsentierten Ergebnisse Hinweise für die Durchführung von Aktionsforschung, um sowohl Ko-Innovation in der Praxis zu unterstützen als auch wissenschaftlich relevante Erkenntnisse zu generieren. Weiterer Forschungsbedarf ergibt sich aus der Frage, wie dauerhaft lernende Wertschöpfungsketten gestaltet und verstetigt werden können, sowie aus der Erweiterung und Konkretisierung der hier präsentierten Erkenntnisse in anderen Wertschöpfungsketten und Regionen.

List of publications

Main parts of the cumulative dissertation

- Braun, Charis Linda, Vera Bitsch, Anna Maria Häring. (2023). Creating spaces for change: Boundary work in emerging agri-food value chains. *Journal of Cleaner Production*, 424. // doi: [10.1016/j.jclepro.2023.138821](https://doi.org/10.1016/j.jclepro.2023.138821)
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- Braun, Charis Linda, Vera Bitsch, Anna Maria Häring. (2022). Behind the scenes of a learning agri-food value chain: Lessons from action research. *Agriculture and Human Values*, 39(1). // doi: [10.1007/s10460-021-10229-7](https://doi.org/10.1007/s10460-021-10229-7)
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1 Introduction

When embarking on this dissertation in 2017, it was hard to imagine the learning journey that would unfold along the way, with all the different encounters, detours, and insights inherent in an action research study. The research was embedded in a multi-actor network in which farms and other food enterprises worked together to develop local value chains for organic vegetables in the Berlin-Brandenburg region in eastern Germany. As an action researcher, the author of this dissertation was involved with the network and could experience firsthand how these actors engaged around real-world problems and explored new ways of sustainable value creation—for their enterprises and the region. In 2023, at the end of the research, this dissertation details the entire journey, reflects on the shared learning process, and places the results of four research papers into an overall context. The first chapter outlines the current discourse on local food systems and co-innovation, introduces the present research context, and provides an overview of the dissertation project.

1.1 Toward local agri-food systems

In recent years, the localization of agri-food systems has gained increasing attention in agricultural policy and public debate. Even before failing supply chains became a prominent issue due to the Covid-19 pandemic, local food production has been discussed as a vital component of a more sustainable food system. Given the challenges posed by climate change and other ecological crises, it has become evident that a paradigm shift toward sustainable practices in food production, processing, and distribution is imperative—requiring both global action and local-level innovations (Caron et al., 2018). In the European Union, the pathway for this transformation is laid out by the “Farm-to-Fork” strategy, a guideline for the European Union’s agricultural policy which aims to limit the environmental impact of the agri-food sector, ensure food security, and foster the social and economic well-being of food producers (European Commission, 2020). Measures include, among others, a significant increase in organic agriculture, the strengthening of local agri-food systems, and a reduction in long-haul transportation. Similar guidelines exist at national and regional levels. In Germany, for instance, the federal government’s “Organic Farming—Looking Forwards” strategy (BMEL, 2017) commits to increasing organic farming until 2030 to a 30 percent share of Germany’s total agricultural area, which also entails the development of value chains for organic products to promote sustainable practices across the food sector.

Against this background, a range of recent initiatives and projects around Europe aim for closer relationships among value chain actors, with a focus on sustainable agriculture and food practices. Localizing food production and building partnerships in local food systems is expected to foster innovation in products and processes, promote new business models, and contribute to rural development (European Commission, 2015). Examples of such initiatives include regional development programs such as “organic regions” (e.g., Mennig & Sauer, 2022; Stotten et al., 2018) and other innovation projects to build more sustainable agri-food chains (e.g., Gutiérrez & Macken-Walsh, 2022). These projects bring together people and organizations to address specific problems of food production, processing, and distribution within a region.

Efforts in local food production and sourcing are commonly discussed under the umbrella term “short food supply chains” (e.g., Aubry & Kebir, 2013; Kneafsey et al., 2013; Marsden et al., 2000). The term is often associated with various forms of direct marketing and alternative food networks, but the basic definition refers to agri-food chains with a limited number of intermediaries between producers and consumers and some level of spatial and social proximity (Doernberg et al., 2022). A similar concept is that of “mid-scale value chains”, which represent strategic partnerships among small and medium sized farms and other agri-food enterprises operating on a regional level, aimed at scaling-up sustainable agri-food production (Lev & Stevenson, 2011; H. H. Peterson et al., 2022; Stevenson & Pirog, 2008). While literature on short food supply chains puts an emphasis on the distance between food producers and consumers, socially and geographically, the focus of the mid-scale value chain concept is on values—related to the business relationships among the partnering enterprises and the quality of the food products. The present research was conducted in an initiative that can be categorized as an effort to build mid-scale value chains, working in a multi-actor setting toward more local value creation in eastern Germany.

1.2 Value chain development through co-innovation

The transformation toward sustainability requires innovation, not only in terms of technological advances but also deep organizational and social changes through collaborative learning processes (Boström et al., 2018). In local food systems, the need for innovation is often reflected in the challenge of creating efficient supply chains and scaling local production to handle substantial volumes and thus serve more people with sustainable food, e.g., in retail or public catering services (H. C. Peterson, 2009; Lev & Stevenson, 2011). Especially small and

medium-sized farms and food enterprises are faced with the question of how to expand production capacities and build new distribution channels while maintaining and further developing their sustainable principles and values (e.g., J. K. Clark & Inwood, 2016; Milestad et al., 2023; Mount, 2012). One way to address such challenges is to form strategic partnerships on regional level, horizontally among producers and vertically along the agri-food chain. These kinds of value chain partnerships can enable local enterprises to access larger markets, e.g., by bundling their output or organizing joint logistics, and at the same time achieve premiums from the values associated with their products through quality standards or environmental stewardship (Fleury et al., 2016; Milestad et al., 2023; H. H. Peterson et al., 2022).

Developing local value chains is not a linear process but an evolving effort embedded in a specific local context. It requires negotiating shared visions and business strategies, establishing information sharing and collaborative decision making, and creating agreements for fair distribution of profits among the partner enterprises (Stevenson et al., 2011). This kind of sustainable innovation is a complex and ambiguous social process in which the different actors build inter-organizational collaboration based on their individual business interests and capabilities (Gray, 1989; Huxham & Vangen, 2005). The negotiations are commonly intertwined with questions of sustainable practices and other “wicked problems” which are ill-defined, without clear pathways to resolution, and entail conflicting agendas of the participating actors (e.g., Batie, 2008; Conner et al., 2010; H. C. Peterson, 2009). This includes questions relating to, e.g., climate change, scarce resources, or the deprivation of rural areas, manifested in various situational challenges of regions. To address such problems and enable sustainable value creation, there is a need for environments in which multiple actors can engage around local issues, build a shared understanding, and experiment with new practices in co-innovation processes (Berthet et al., 2018; Dentoni et al., 2012).

In recent years, co-innovation approaches have gained significant interest in research projects and regional development initiatives focusing on various problems of the agri-food system (e.g., Berthet et al., 2018; Botha et al., 2017; Dogliotti et al., 2014; Ingram et al., 2020). A co-innovation perspective recognizes the involved actors’ capacity to develop their own solutions to the problems they face in practice. It considers practitioners not mere end-users but co-creators of innovation, often in collaboration with consultants or academic researchers (Berthet et al., 2018; Botha et al., 2017; Ingram et al., 2020). In this way, co-innovation resonates with research approaches that foster engaged scholarship, practical change, and collaborative

knowledge creation, as in, e.g., action research or forms of transdisciplinary research (Botha et al., 2017; H. C. Peterson, 2011). While a growing body of research addresses co-innovation in agri-food systems, details of what happens at the interface where practical change and research overlap remain largely abstract, and concrete examples are rare (Ingram et al., 2020). This dissertation research contributes to the debate on co-innovation processes and presents an example of how multiple actors addressed sustainable value-creation issues in a local learning network.

1.3 Case description: The learning network

The present dissertation is based on action research conducted in a learning network that supported the organic vegetable sector of Germany’s Berlin-Brandenburg region over five years (2018-2022), with an additional year of preparation and preliminary research (2017-2018). In the network, practitioners from about 20 agri-food enterprises worked with a team of facilitators, researchers, agricultural consultants, and other domain experts in a multi-actor setting (Figure 1). Through this approach, the members of the learning network engaged in activities that created practical change and knowledge relevant to the participating value chain actors, the facilitators, and the researchers.

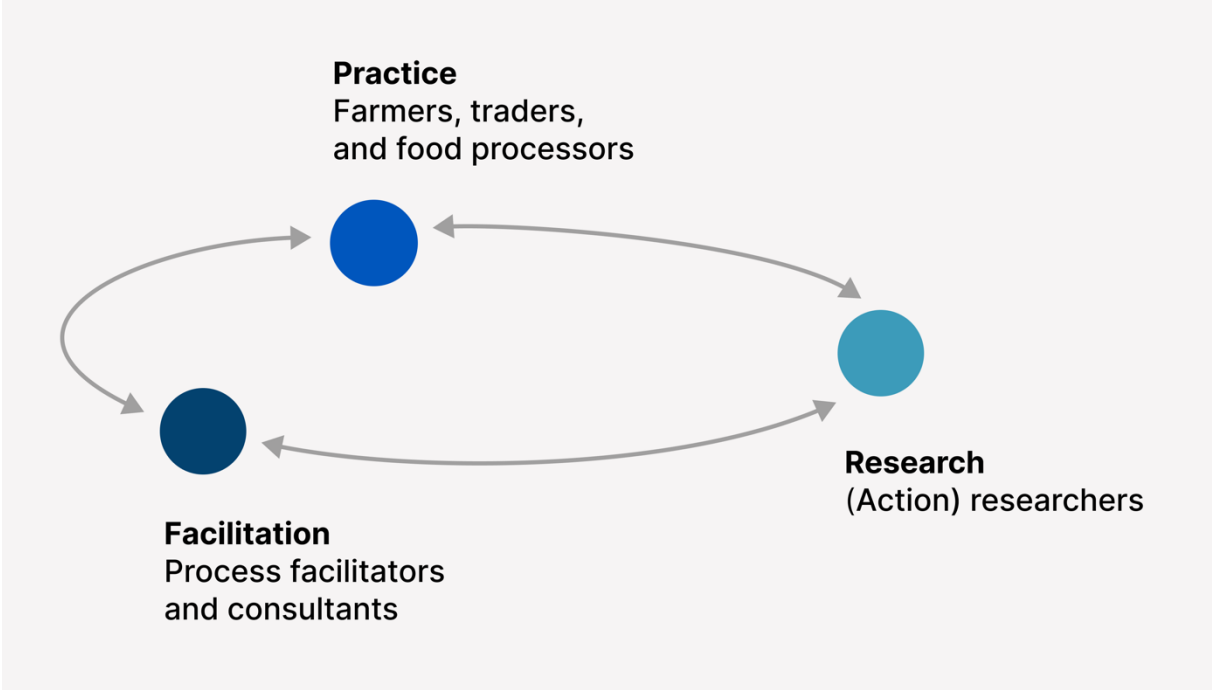


Figure 1: Composition of the multi-actor setting.

The network included owners and managers of farms, as well as of trading and food processing enterprises, that had joined the network based on an open call for participation. The participating enterprises were a diverse group of both established organizations and start-ups with very different capabilities in terms of expertise and resources. Some of the enterprises were certified organic; others were considering certification. Some farms had produced organic vegetables for many years; others were planning or preparing to diversify into vegetable production. All core members of the network were located within a radius of about 100 km around the City of Berlin. Most of them did not know each other personally or had business relationships before they engaged with the network. In addition to the core network members, other local stakeholders regularly participated in network activities, including, e.g., industry experts, policymakers, and nonprofit organizations active in the sector.

The practitioners were supported by an interdisciplinary facilitation team consisting of process facilitators and researchers. At different stages of the process, this team included four to six people with professional backgrounds in practical agriculture, agri-food business, and communication sciences. Some team members had additional qualifications in group dynamics, coaching, and process facilitation methods. Their tasks included network building, organizing learning activities, and providing resources like project infrastructure and access to agricultural consultants and other domain experts. In the co-innovation process, the role of the facilitation team was that of an innovation intermediary (e.g., Berthet & Hickey, 2018; Kivimaa et al., 2019) that supports a group of actors in exploring their issues and generating the knowledge needed to overcome them. The role of the facilitation team was less that of expert consultants who apply their specialized domain knowledge to solve a problem for participants and more that of “helpers” who provide support by organizing learning activities (Schein, 1988).

The learning network operated in a region consisting of the densely populated metropolitan area of Berlin and the surrounding federal state of Brandenburg. Berlin is Germany’s most populous city, with 3.8 million inhabitants, and one of Europe’s largest markets for organic food. In 2021, organic products accounted for 13% of Berlin consumer spending on fresh food, which is four percentage points more than the German average (MLUK, 2023). The city has a well-established system of organic supermarkets and local wholesale that has grown over the last three decades and a wide variety of direct marketing channels such as farmers’ markets, organic box schemes, and community-supported agriculture (Doernberg et al., 2016). More recently, market developments have challenged these established structures due to increased attention to issues of sustainable production and consumption, which have led to the

placement of organic food in conventional retail channels and public catering services (MLUK, 2023). For example, the City of Berlin incentivizes the use of organic food in school meals through sustainable public procurement practices that mandate certain shares of organic products (e.g., Haack et al., 2016; Schäfer & Haack, 2023). Due to the market developments in the organic food sector, there is a shift toward sourcing larger quantities and consistent qualities, raising the question of how local agri-food enterprises can generate added value based on these developments by extending or diversifying their production and marketing channels.

When looking at local food production in the region, it is primarily situated in Brandenburg, the predominantly rural federal state around the City of Berlin. Due to the history of the region with the collectivization of the agricultural sector in East Germany and the subsequent privatization and restructuring after the German reunification, the situation of the agricultural sector is different than in other parts of the country, as reflected in a concentration of larger farms and the parallel erosion or lack of structures, e.g., for cooperatively organized market access, processing, or transport (Hagedorn, 2014). In this environment, a niche for organic agriculture has developed over the past thirty years, with many farms of different sizes and modes of operation but leaning toward smaller farms than in the conventional sector, often employing direct marketing channels (Doernberg et al., 2016). The share of land that is organically farmed has grown continuously and is now at 217,410 hectares, which is about 16 percent of the total agricultural area in Brandenburg, creating opportunities for new marketing channels and local processing (AMI, 2022; MLUK, 2023). The local organic food sector focuses primarily on cereals, milk, and meat production. In Brandenburg, vegetables are conspicuously underrepresented compared to other regions and well below the national average (MLUK, 2023). According to official statistics, organic vegetables are grown on about 580 hectares, with an additional 300 hectares of organic potatoes—barely three percent of the total German cultivated area used for organic vegetables and potatoes (AfS, 2022; MLUK, 2023).

The learning network formed in a situation where various local actors sought to strengthen and expand organic vegetable production in the region to capitalize on the potential of the growing market for organic food in Berlin. At that time, the region's limited output of organic vegetables was primarily distributed through small-scale direct marketing channels or sold as fresh produce in local organic retail. There were no mid-scale value chains that could process significant volumes of organic vegetables in the region or market them through public catering services or larger retailers. At the same time, individual farms faced barriers to market entry,

high investment costs and risks, as well as a lack of know-how, which hindered the development of new value chains in the region. Funded through a grant from the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI), the learning network addressed these issues in practice (European Commission, 2017). The EIP-AGRI program aims to foster co-innovation in the European agricultural sector by enabling multi-actor settings that bring together actors from agriculture and related sectors with researchers to work on real problems of sustainability (e.g., Fieldsend et al., 2022). The present learning network, named “Local and organic vegetables from Brandenburg” (Regionales Bio-Gemüse aus Brandenburg), was a joint project of the participating value chain actors, the Organic Agriculture Association in Berlin-Brandenburg (Förderungsgemeinschaft Ökologischer Landbau Berlin-Brandenburg, FÖL), and Eberswalde University for Sustainable Development (Hochschule für nachhaltige Entwicklung Eberswalde, HNEE). The facilitation team was composed of employees from both HNEE and FÖL.

1.4 Overview of the dissertation project

This dissertation was based on an action research approach embedded in the learning network. Through this approach, it was possible to tackle practical problems and, at the same time, generate new knowledge for practice and academia. As a researcher on the learning network’s facilitation team, the author of this dissertation gained in-depth insights into the learning activities and practical change process. The research was divided into three phases and resulted in four peer-reviewed research papers presented and discussed in this dissertation (Figure 2). When the publications are referenced in this dissertation, they are referred to as Papers 1-4.

The **first phase** of the dissertation research (Paper 1) explored the practices and perspectives of actors in the local agri-food system, using the example of a value chain for organic vegetables in school catering services. In this phase, the research adopted a structuration theory perspective (Giddens, 1984; Stones, 2005) which assumes a recursive relationship between value chain structures and the professional practices of the actors involved. The primary objectives were to uncover structural factors that either hinder or support the development of local value chains and to identify opportunities and challenges associated with such chains. The findings served as a basis for developing new value chains in the region. The **second phase** of the research (Papers 2 and 3) examined the progressively unfolding change processes in emerging value chains, utilizing concepts from organizational learning theory

(Argyris & Schön, 1996; March, 1991). This phase focused on co-creating knowledge in inter-organizational settings and facilitating such processes as they evolve over time. Paper 2 presents lessons learned from action research conducted within the learning network, offering recommendations for developing local agri-food value chains. Paper 3 delves deeper into the roles and practices of facilitators in such value chains, incorporating perspectives from facilitators involved in various value chain initiatives across Germany. The **third phase** of the research (Paper 4) employed the notion of boundaries and boundary work (Hernes, 2004; Langley et al., 2019) to conceptualize the co-innovation processes inherent in emerging value chains. This paper looked back on the entire action research study and, specifically, on the re-configuration of structures and practices in the local agri-food system over time.

Through these different theoretical perspectives on emerging value chains, the dissertation investigates co-innovation in this specific inter-organizational setting. Following a practice-based perspective, innovation is a collaborative effort embedded in the value chain actors' practical problem-solving process. The author of this dissertation was placed directly in situations where the participants engaged in learning and organizing, which allowed her to develop practice-oriented theory about the learning value chain. Based on the practical problems the learning network addressed, the research aimed to improve the understanding of (1) how co-innovation is implemented in sustainable value creation and (2) how learning value chains can be supported and studied through action research.

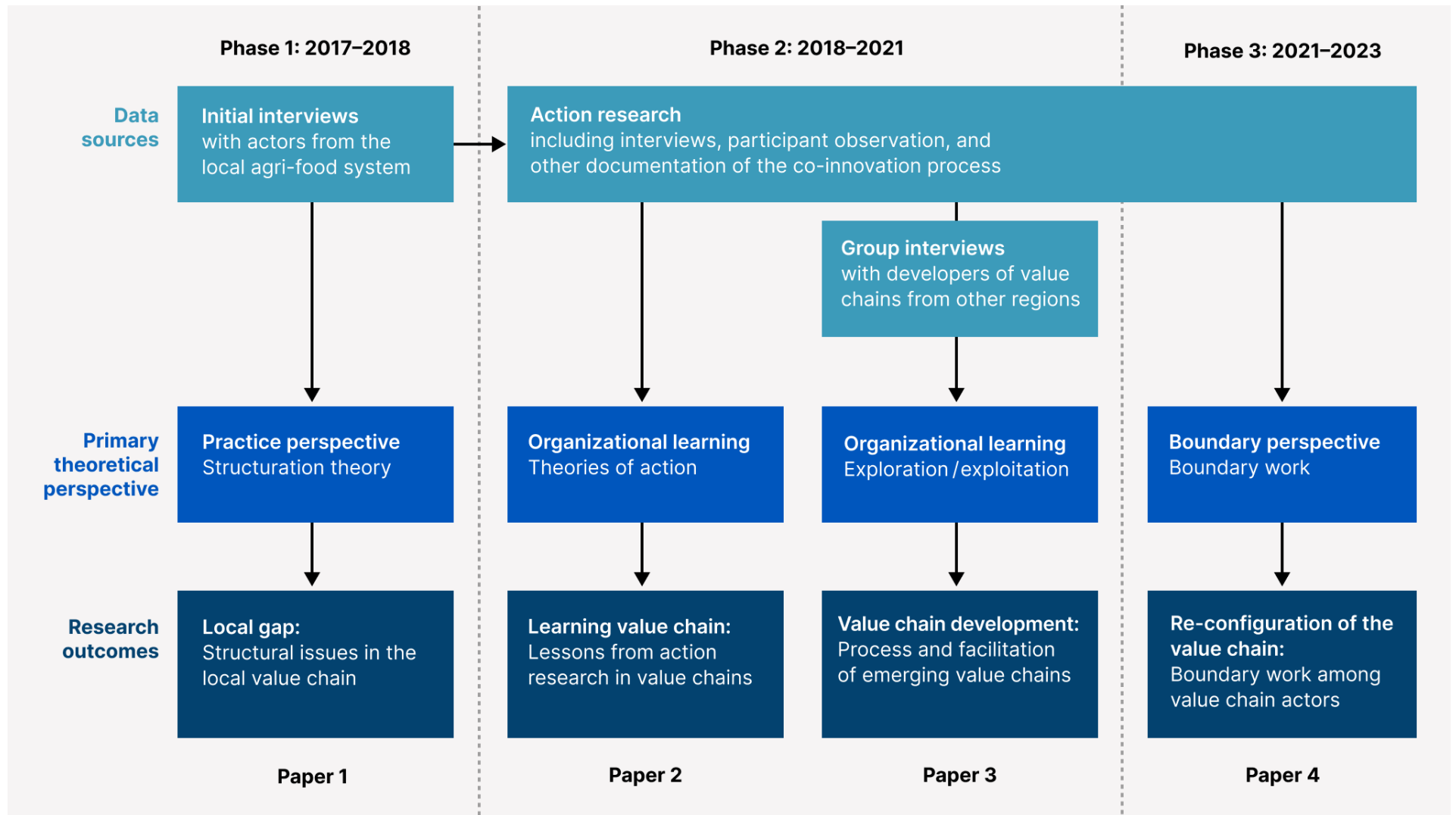


Figure 2: Elements of the dissertation project.

2 Theoretical background

The present research conceptualizes value chains as social systems, based on several related perspectives on learning and change in inter-organizational settings. This chapter provides an overview of the theoretical background in three parts. The first subchapter elaborates on the notion of learning and knowing as a situated practice, localized around the problems people face in a particular context. The second subchapter introduces organizational learning, including theories of action and the concepts of exploration and exploitation. The third subchapter details the concept of boundaries and their role in inter-organizational collaboration.

2.1 A practice perspective on organizing and learning

The present research adopts a practice-based view of innovation as located within activities such as organizing, working, and learning (Gherardi, 2009). This perspective aligns with the “practice turn” in social theories, driven by the work of, e.g., Giddens (1984), that has also made its way into research on organizations and management (Brown & Duguid, 2001; Nicolini, 2012; Schatzki et al., 2001). At the center is the notion of social life as produced through practices, i.e., people’s recurrent actions (Feldman & Orlikowski, 2011). In the context of organizations, practices have been defined as the regular activities of individuals or groups that perform “real work” in their professional settings (Cook & Brown, 1999). An example of such a setting is an agri-food value chain, in which multiple actors work together to produce and distribute a certain kind of product through coordinated practice.

At the start of the dissertation project, this perspective was used to examine the work practices of value chain actors and draw conclusions about issues in the local agri-food system (Paper 1). Following Giddens’ (1984) theory of structuration, the initial research phase established a view on value chain participants as “knowledgeable actors” who act purposively with an understanding of their specific contexts. The structuration theory proposes a recursive relationship between actors’ practices and their surrounding structures. Therefore, the practices of value chain actors shape the value chains’ structures, while the structures, in turn, enable and constrain these same practices. While structuration is a general theory of human action, it is commonly referenced in the study of organizational settings (e.g., Huxham & Vangen, 2000; Orlikowski, 2002; Zietsma & Lawrence, 2010). Examples from the study of value chain settings include Pullman and Dillard (2010) and Heiss et al. (2015), who used

structuration as a theoretical lens to investigate complex and dynamic relationships between practices and structures in agri-food systems.

Following this practice perspective, learning is a practical and social activity in which individuals become skilled practitioners through interaction with others in an organizational setting (Brown & Duguid, 1991; Lave & Wenger, 1991). Learning is localized around the problems practitioners face in a particular context and the responses they develop in addressing those problems (Lave & Wenger, 1991). This view on learning shifts the notion of knowledge from something individuals possess to an active process of knowing (Cook & Brown, 1999). Orlikowski (2002) describes it as an ongoing social process of “knowing in practice” that is continuously constituted and reconstituted as participants of an organizational setting interact and collectively construct meaning about their activities. In the present research, value chains are understood as settings in which actors work and learn together to address specific problems they face in their everyday practice. By engaging in an emerging value chain’s day-to-day activity, the actors build a shared understanding of their context while shaping and reshaping the structure and the practices that constitute the value chains.

2.2 Organizational learning

The second phase of the research (Papers 2 and 3) explored the emerging value chains from the distinct perspective of organizational learning. This kind of learning has been described as the process by which organizations improve their actions over time through better knowledge and understanding (Fiol & Lyles, 1985). The seminal literature on organizational learning is primarily concerned with changes in organizational behavior through experiential learning, i.e., the idea that organizations learn based on the experiences their members make (e.g., Argyris & Schön, 1996; Easterby-Smith et al., 2000; Fiol & Lyles, 1985; Levitt & March, 1988). According to organizational learning theory, the members of an organization learn by detecting discrepancies between the intended and the actual outcome of their actions and, consequently, adapt or fundamentally question their behavior. Organizational learning occurs when the individual lessons are applied to the organization in the form of improved collective behavior (Argyris & Schön, 1996).

This understanding of learning is based on the notion that deliberate action is governed by some form of cognitive structures or frames of reference—individually but also on an organizational level. Such cognitive structures have also been described as mental models—internal representations of reality that people use to create meaning about the world around

them (Senge, 1990). In their organizational theories of action, Argyris & Schön (1996) argue that there is a fundamental discrepancy between people's stated intentions and perception of how they act (espoused theory) and the cognitive structures that guide what they actually do (theory-in-use). Learning, consequently, is the process of aligning espoused theory with the outcomes of actual behavior. This process of revealing and aligning cognitive structures can be supported by individual or collaborative inquiry and reflection (Schön, 1983; Senge, 1990).

When discussing the quality and depth of organizational learning, Argyris & Schön (1996) introduce the concepts of single- and double-loop learning. Single-loop learning is where existing behaviors are improved, but the underlying cognitive structures remain unchanged. In contrast, double-loop learning takes place when not only behaviors evolve but also the cognitive structures that determine them. In this second mode of learning, a given problem is addressed by challenging the fundamental norms, policies, or objectives that caused the problem in the first place (Argyris & Schön, 1996). An environment that enables double-loop learning is associated with valid and reliable information, as it helps organizations to make informed decisions and monitor the outcomes (Argyris, 1995). The research presented in Paper 2 adopts this perspective on organizational learning. It explains how such an environment was created in the context of emerging value chains through reflection and other learning activities in an action research setting.

A separate organizational learning framework is that of exploration and exploitation, as defined by March (1991). Exploration involves activities that aim to create new knowledge or opportunities, while exploitation is about optimizing existing routines. Exploration is associated with high levels of uncertainty and is geared toward long-term change and innovation. By contrast, exploitation aims to improve established routines and is associated with efficiency and reliability. The two strategies of exploration and exploitation are not discreet options but form a continuum of activities in organizational learning (Lavie et al., 2010). Organizations that strive for a balance between the two strategies prioritize both efficiency and the capacity for adaption to changes in the organization's environment (March, 1991). The related concept of organizational ambidexterity, as defined by Tushman & O'Reilly (1996), refers to a company's ability to pursue activities of exploitation and exploration concurrently.

When multiple organizations engage in a collaborative learning setting, there is learning on different levels, inter-organizational and within organizations (Holmqvist, 2003; Knight & Pye, 2004; Lavie et al., 2010). In addition, there is tension between exploratory and exploitative learning activities at both levels. This dual interdependence oscillates between exploration and

exploitation activities, simultaneously occurring within and between the collaborating organizations (Holmqvist, 2003; Lavie et al., 2010). According to Coughlan et al. (2021), inter-organizational learning can provide an “away” setting where organizations engage in collaborative exploration to later exploit the results “at home” within the participating organizations. Holmqvist (2003) emphasizes that inter-organizational learning is often primarily explorative but also the product of the combined experiences of individual organizations. Conversely, inter-organizational exploration can create new knowledge and opportunities for exploitation within the respective organizations. Based on these concepts, Paper 3 applied a framework of inter-organizational exploration and exploitation to the specific environment of emerging agri-food value chains.

2.3 Boundary work

In inter-organizational settings, learning takes place at the boundaries that exist among collaborating organizations. Learning can be a specific objective of the collaboration between organizations, e.g., in a learning network, but it also occurs whenever organizations engage at their boundaries, e.g., through coordinated activities in a value chain or the negotiation of shared strategies (Hibbert & Huxham, 2005; Lavie & Rosenkopf, 2006). The boundary perspective on inter-organizational learning focuses on the interfaces between organizations as barriers that separate them from each other or as junctures where they can interact, share knowledge, and make new connections (Quick & Feldman, 2014). As a general concept used across the broader field of social sciences, boundaries are distinctions that people make when reasoning about their environment by categorizing objects, practices, people, or other entities (Lamont & Molnár, 2002). In organizational settings, boundaries manifest as demarcations among people or groups, i.e., as boundaries between organizations, boundaries between distinct professions and roles, or boundaries resulting from differences in the cognitive frames of individuals (Langley et al., 2019; Santos & Eisenhardt, 2005). Boundaries are a recurring theme in research on knowledge and learning in settings where people from different organizations or professional backgrounds work together, including agri-food systems (e.g., W. C. Clark et al., 2011; Hale et al., 2022; Tisenkopfs et al., 2015; Velter et al., 2020). By engaging at boundaries, organizations are expected to increase their capacity for exploration, knowledge integration, and innovation (e.g., Caccamo et al., 2022; Carlile, 2004; Holmqvist, 2003).

Boundaries are not byproducts of organizations, but organizational settings are, like any other social systems, established through drawing distinctions and persist or evolve through their reproduction (Hernes, 2004; Langley et al., 2019). From the structuration perspective introduced in Chapter 2.1, boundaries can be understood as structural elements that enable and constrain collaborative practices. In contrast, the practices produce and reproduce the boundaries in a recursive process. The organizational system does not evolve toward a final state but is in a continuous process of boundary drawing based on past experiences and environmental changes (Hernes, 2004). Following this emergent notion, boundaries can be shaped by actively managing the organizational practices that manifest them. Purposeful efforts to create, maintain, or disrupt boundaries are defined as boundary work (Gieryn, 1983; Langley et al., 2019; Zietsma & Lawrence, 2010). Boundary work includes all activities directed at opening up or closing down boundaries, e.g., between professions, groups, or organizations (Chreim et al., 2013).

Langley et al. (2019) described boundary work as competitive when it is aimed at enforcing distinctions and closing down boundaries. Conversely, boundary work is collaborative when it opens up boundaries and reduces distinctions. These two categories of boundary work are not exclusive opposites but complementary, as boundary work usually combines both collaborative and competitive aspects (Langley et al., 2019). A third type of boundary work is directed at changing the patterns of collaboration and competition in a system through outside interventions. In this configurational boundary work, a third party, e.g., a facilitator or consultant, works on the existing boundaries to bring about change in the system. In inter-organizational settings, this facilitating function is commonly performed by a dedicated boundary organization that brings together several actors in a social space to engage them around a specific issue (Guston, 1999; O'Mahony & Bechky, 2008). Paper 4 draws on the concept of boundary work to explore the mechanisms of co-innovation inherent in emerging value chains. The learning network is understood as a boundary organization aimed at practical change in the local food system by enabling collaboration between value chain actors.

3 Research design

The dissertation was designed as an action research study which addressed real-world problems through a series of interventions while developing practice-based theory using qualitative research methods. This chapter details the research design and outlines different aspects of the action research process, from facilitating practical change to data collection and conceptualization.

3.1 Action research as emergent process

Action research is a participative orientation toward knowledge creation that deals with problems of practice by actively engaging researchers with the very people affected by these problems (Bradbury, 2015). This understanding of research differs from a more positivist epistemology as it is focused on producing actionable knowledge in the specific context or situation where this knowledge is applied (Coghlan, 2011; Huxham, 2003). A central feature is that action researchers are embedded in the field of study rather than being external observers. The collaboration between researchers and practitioners results in some level of practical change as well as new knowledge for both academia and practitioners (Shani & Coghlan, 2021). This notion of research as an effort of knowledge co-creation in change processes is expressed in the axiom “you cannot understand a system until you try to change it”, which has been related to the work of Kurt Lewin (1946), a pioneer of action research in organizational settings (e.g., Schein, 1996).

Over the decades, action research has evolved into a diverse group of related approaches (e.g., Argyris & Schön, 1989; Cassell & Johnson, 2006; Rigg & Coghlan, 2016; Schein, 1995) that are utilized in different disciplines, including health care, education, social movements, and business (Shani & Coghlan, 2021). Depending on the use case and discipline, the various approaches have different emphases, e.g., concerning the researcher’s role in the practice setting, the way practitioners are involved in the research, and how new knowledge is created. Action research approaches range from a focus on the mere empowerment of participants or organizational development to more research-oriented approaches that prioritize academic knowledge and theory development (Dick et al., 2009; Huxham, 2003; Shani & Coghlan, 2021). The present learning network focused on facilitating learning and change in an inter-organizational setting while pursuing the development of theory in the process. This dissertation applies the approach to innovation in agri-food systems and therefore adds to a body of existing action research studies in this field (e.g., Conner et al., 2010; Guzmán et al.,

2012; Rigg et al., 2021), albeit with a particular emphasis on developing practice-based theory from process data collected in value chain development.

Like other qualitative methodologies, e.g., ethnography or longitudinal case study research, action research is appropriate for dynamic and evolving settings, such as those inherent in emerging value chains. In such environments, the researcher cannot know precisely how the process will unfold, what opportunities for intervention will arise, and what data will be generated (Huxham, 2003). Given this nature, the present action research was not completely pre-planned but developed along with the change process in practice. This approach, commonly called “emergent design” (e.g., Hammersley, 2022; Tom, 1996), is beneficial when research problems and objectives may shift due to changing conditions or new findings. In the present research, the emergent design was implemented as an iterative process of problem formulation and problem solving, combined with ongoing data collection and conceptualization (Figure 3), adapted from a model by Van de Ven (2007).

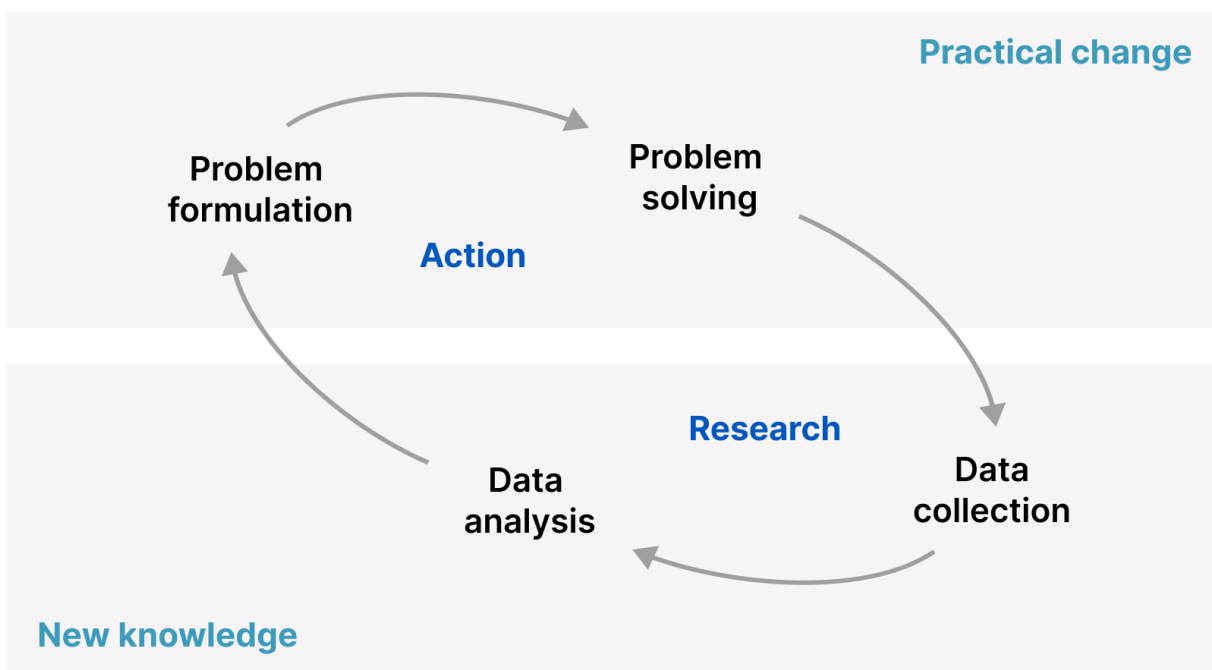


Figure 3: Emergent research design between action and research.

Strategies that bridge the gap between action and research have been described as “engaged scholarship” (Van de Ven & Johnson, 2006). This concept aims for practical relevance and scientific rigor when conducting research in organizational contexts, e.g., through action research (H. C. Peterson, 2013; Van de Ven & Johnson, 2006). The author of the dissertation was primarily responsible for the research design and the systematic data collection and analysis. Her role also included knowledge transfer across the boundaries of the network, i.e.,

transferring best practice examples from other regions and other research findings to the network and, conversely, disseminating results from the network to the public through publications and conference presentations. She also had an insider perspective on the facilitation team's work of organizing and supporting the change process. At the same time, the facilitation team itself held an outsider position to the participating enterprises. The facilitators maintained a neutral stance toward the outcome of the change process and the specific strategic decisions taken by the value chain actors.

3.2 Change in practice

Central to action research is the emphasis on a problem that has genuine relevance for practice. Rather than focusing solely on a research question that enhances academic knowledge, the research must formulate the "right problem" to address, which is the basis for establishing practical relevance (Ackoff, 1981; Eden & Ackermann, 2018). This problem formulation is the starting point for facilitating targeted change in practice through a series of interventions. In the present action research, the interventions were planned and conducted by the learning network's facilitation team (see Chapter 1.2). As systemic intermediaries (e.g., Agogu e et al., 2017; Kivimaa et al., 2019; Klerkx & Leeuwis, 2008), the facilitation team supported the value chain actors in exploring their issues (problem formulation) and in generating the capacity for learning and collaboration to overcome them (problem solving). The activities unfolded throughout the change process (Figure 4), starting from a preliminary status quo analysis in the first phase of the action research.

In this phase (2017-2018), initial problems were formulated based on an exploration of the local agri-food system through surveys, qualitative interviews, and workshops with practitioners and other stakeholders. To evaluate and refine these problems, existing literature and other materials were reviewed, including previous research and publicly available data. Additional perspectives were captured through informal conversations with agricultural consultants and other domain experts. This phase focused on revealing issues, or "gaps", to identify the potential for value chain development. Specific problems were identified within individual enterprises and on the value chain level, such as a lack of infrastructure for bundling and processing or a lack of production know-how (Paper 1).

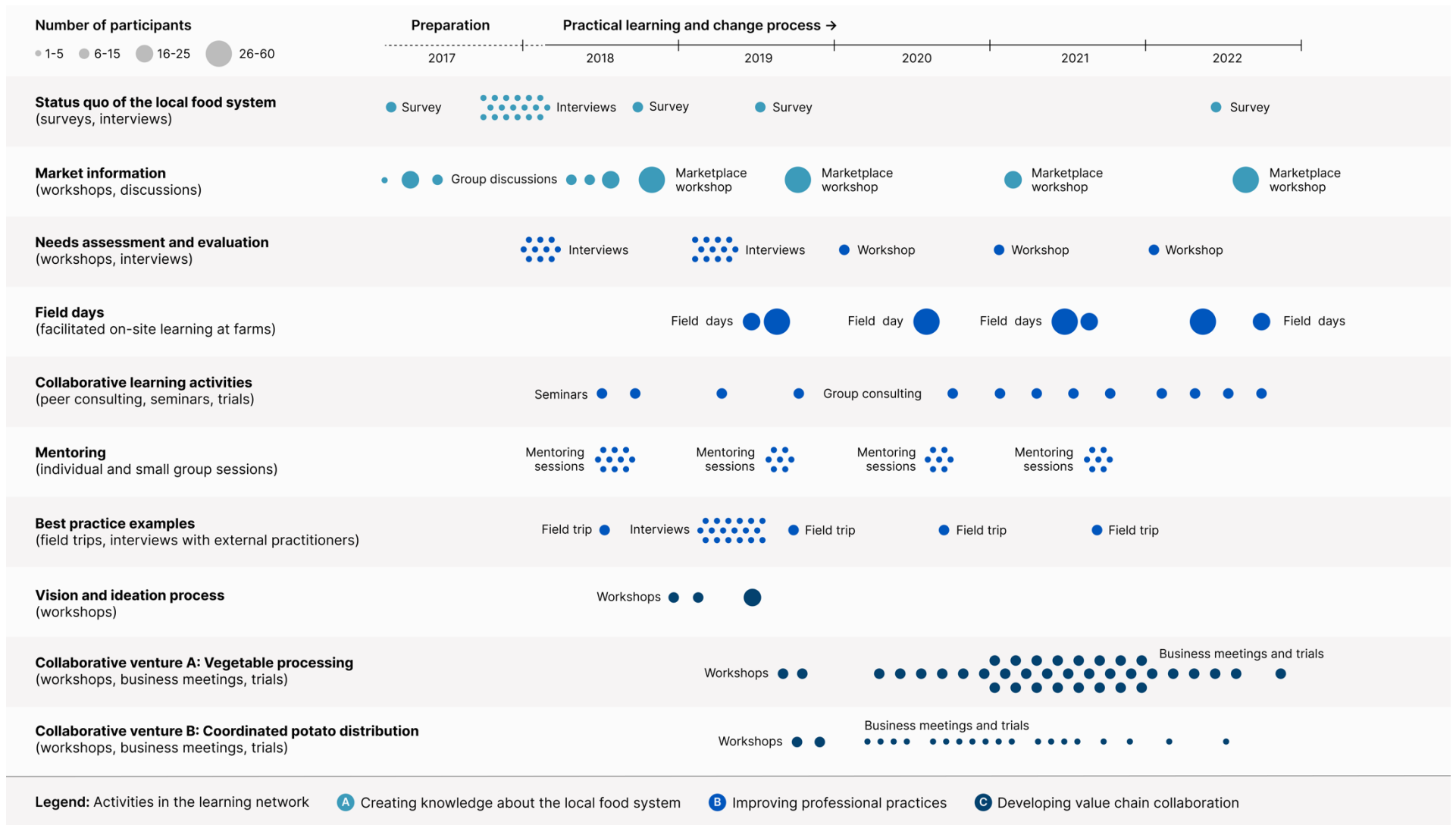


Figure 4: Overview of activities in the practical change process.

Based on the initial problem formulation, various learning activities and other interventions were planned and conducted throughout the action research process (2018-2022). The interventions addressed (A) creating a shared understanding of the local vegetable market situation, (B) extending and improving professional domain practices, and (C) exploring and developing shared strategies for value chain collaborations (Figure 4, based on categories developed in Paper 4). Event formats included seminars, workshops, peer consulting, field days, and practical trials with knowledge transfer and co-creation activities (Figure 5). To maintain relevance in the emerging process, interventions were developed iteratively based on the results of previous activities, new insights, and changing problems the participating value chain actors faced. The participants' needs were repeatedly assessed during interviews, workshops, and the evaluation of learning activities. In addition, the practical change process and its results were regularly reflected and discussed within the facilitation team. Planning for these processes included weighing and prioritizing various needs and ideas of practitioners to design appropriate interventions. It also involved balancing individual business interests and shared interests for developing value chain collaborations. The learning activities in the network were described in detail in Papers 2-4.



Figure 5: Examples of learning activities: marketplace workshop, variety and processing trials, and peer consulting.

3.3 Data collection

Through the insider position in the facilitation team, it was possible to collect data about the network's learning activities and practical decision-making in the emerging value chains. All participants in the action research agreed to data collection and use for scientific purposes and could object to this agreement at any time during the process, although none of the actors did. The action research generated rich, longitudinal data about people's behavior from a series of unfolding events in this specific setting, similar to other forms of process research (Langley, 1999; Van de Ven, 1992). Data collected in action research has the potential to reveal theory-in-use, as it is collected at the point of happening, based on the actual behavior of participants rather than on their description of past events or espoused theory (Argyris & Schön, 1989; Eden & Huxham, 1996). In other words, as data is collected when practitioners face a real need for action, this research approach bears the potential for deep conceptualization about why and how things happen in practice (Huxham, 2003). A theory developed in this way is not just grounded in data but "grounded in action" (Eden & Huxham, 1996).

For data collection, a mix of different methods and data sources was used (Table 1). As a member of the facilitation team, the author was involved in the planning and conducting of learning activities and gathered data through fieldwork and participant observation in the process (Pole & Hillyard, 2016). During the learning activities, she adopted the role of a "participant-as-observer" (Gold, 1958), acting transparently as an observer of the situation while also interacting with the participants, e.g., by asking questions. In these settings, field notes were prepared by the author or, in rare cases, by other members of the facilitation team. Critical events were recorded as audio or video files, which enabled subsequent reviews of situations and statements made by participants and transcription for further analysis. In addition, notes were taken of informal conversations, and other materials were collected during the learning network's activities, such as photos, meeting documentation, and project reports. Several surveys were conducted to assess needs and gather feedback from value chain actors, primarily used as a basis for planning and evaluating the interventions.

Table 1: Overview of the data collection.

Data collection	Source and materials
Data collection for the status quo analysis	<p>18 qualitative individual interviews with value chain actors and other stakeholders (audio transcripts, field notes / 2017-2018)</p> <p>Records of conversations during phone and video calls (meeting minutes, field notes)</p> <p>Surveys about the local market situation (unpublished, only used internally in the learning network)</p>
Data collection while working with value chain actors in the learning network	<p>16 qualitative individual and group interviews (audio transcripts, field notes, photos / 2018-2021)</p> <p>53 workshops and meetings (video and audio recordings, field notes, photos, and other materials / 2018-2022)</p> <p>Participant observation during interventions (field notes / 2018-2022)</p> <p>Records of conversations during interventions, phone, and video calls (meeting minutes, field notes)</p>
Data collection during the planning of and reflection on intervention in the facilitation team	<p>Weekly and quarterly meetings, 7 workshops (meeting minutes, field notes, photos, and other materials / 2017-2022)</p> <p>Records of conversations during phone and video calls (meeting minutes, field notes)</p>
Data collected from value chains in different regions	<p>5 qualitative group interviews with 17 value chain developers (audio transcripts / 2019)</p> <p>Individual and group interviews with managers of focal organizations in 8 value chain collaborations (unpublished, only used internally in the learning network / 2019)</p>

For answering specific questions and to gain access to deeper information from the individual perspectives of practitioners and domain experts, qualitative in-depth interviews (Johnson & Rowlands, 2012) were conducted at various points in the process, within and outside of the learning network. The interviews took place individually and in group settings. They were semi-structured based on interview guides that specified a particular set of questions for the given context while allowing the interviewees to talk about what they considered important (Weiss, 1995). Group interviews were explicitly aimed at co-creating meaning among multiple participants and exploring differences and similarities in their perspectives. In some interview settings, sketching activities were used to better capture the interviewees' organizational

contexts and encourage them to think deeper (Warren, 2011). All formal interviews were recorded and transcribed verbatim for later analysis.

3.4 Data analysis and conceptualization

The research integrated a continuous and recursive process of data collection, analysis, and conceptualization following a grounded theory approach (Corbin & Strauss, 2015). Grounded theory is widely used in research into social practices and processes in organization and management studies (e.g., Gehman et al., 2018; Langley, 1999) and has also found its way into agri-food business research (Bitsch, 2005). This strategy is appropriate for complex and dynamic social settings because it can integrate situationally emerging data and concepts over time, resulting in grounded, practice-oriented theory about a phenomenon or process specific to a field or context (Bitsch, 2005; Langley, 1999). This kind of theory is located between general theory in a positivistic sense and the mere practical knowledge people gain through everyday practice (H. C. Peterson, 2011). As grounded theory is moderately abstract and analytically transferrable to other settings, it is of value for both practice and academia (Huxham, 2003; H. C. Peterson, 2011). In the learning network, the process of conceptualization formed new academic knowledge about value chain development (Papers 2-4) and provided feedback for the iterative process of planning and facilitating interventions in practice.

From an epistemological perspective, the conceptualization followed abductive reasoning (Richardson & Kramer, 2006; Rinehart, 2021). The process of abduction starts by observing a puzzling phenomenon in practice and then developing a plausible explanation by reframing the observation using existing concepts or previous research findings (Coghlan & Shani, 2021; Richardson & Kramer, 2006). In this way, a possible explanation for the phenomenon can be formulated. Abduction creates preliminary theory (“may be”), which can then be checked and refined by further empirical data (Coghlan & Shani, 2021). For the present research, this process of inference was carried out in the grounded theory analysis, employing an iterative approach to reviewing and coding the collected material, constructing categories from the codes, interpreting the categories and codes based on previous research and existing theoretical concepts, and validating the emerging concepts with participants (Figure 6). Following the principle of constant comparison, this analytical procedure aims to uncover and explain patterns and variations as the researcher moves back and forth between coding, categorizing, and conceptualizing (Bitsch, 2005).

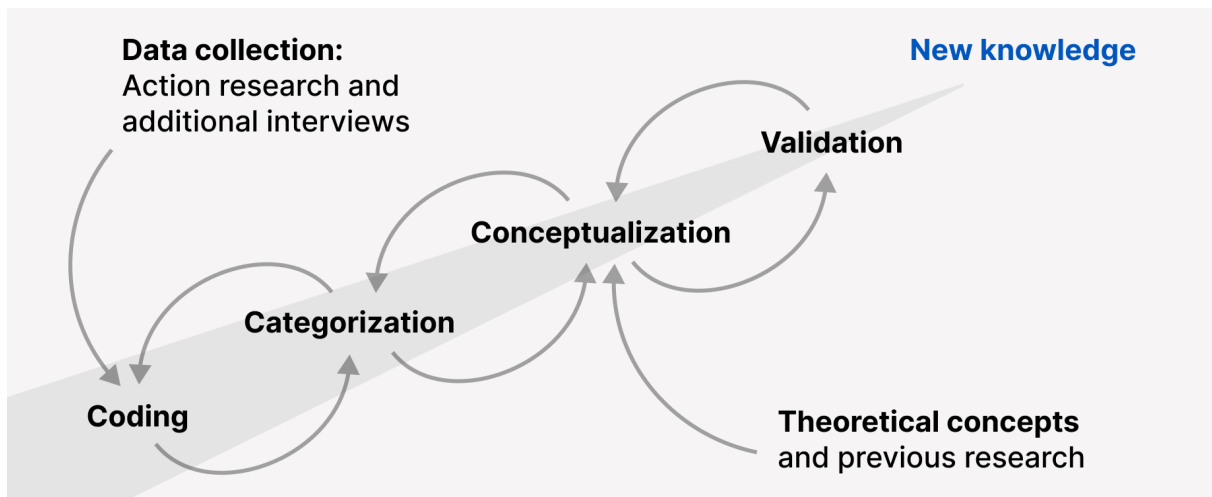


Figure 6: Conceptualization through grounded theory analysis.

Data collection and analysis was a continuous process that spanned the entire duration of the action research. After the preliminary phase, with a content analysis of several interviews to explore the initial situation (Paper 1), the data collection continued with additional interviews, fieldwork and observation in the learning network, forming the data basis for further research (Papers 2-4). The ongoing coding and category building was supported by ATLAS.ti, a software tool for qualitative data analysis, which was used for managing the material, breaking it down into fragments, labeling and annotating, and organizing the resulting codes and categories (Friese, 2019). The subsequent work of conceptualizing and presenting the results involved additional techniques and strategies. The research for Paper 3 employed visual mapping techniques with paper cards and pinboards to explore patterns and connections in the emerging categories. For Paper 4, a timeline of the entire change process was created, exemplary micro cases were identified, and a narrative strategy was used to present thick description of these cases.

For validating preliminary findings, emerging concepts were regularly discussed with facilitation team members. Also, the ongoing change process provided opportunities for the gradual checking, expanding, and refining of concepts in recurring activities of the learning network. To further enrich concepts and improve their robustness, additional data was collected, e.g., through interviews with value chain developers from outside the network (Paper 3). The process of expanding and narrowing the research focus was guided by two factors, the evolving problem formulation in practice and the emerging analysis and conceptualization. In this way, the ongoing analysis served as the basis for selecting new data that could validate findings or provide new insights about the interpretation of data collected earlier in the process.

4 Contributions

This section presents the peer-reviewed papers which form the main part of the dissertation. The following subchapters summarize each paper's findings, their position in the research process, and their main theoretical and practical contributions. In addition, the authors' individual contributions are listed.

4.1 Paper I: A local gap in sustainable food procurement

Braun, Charis Linda, Meike Rombach, Anna Maria Häring, Vera Bitsch. (2018). A local gap in sustainable food procurement: Organic vegetables in Berlin's school meals.

***Sustainability*, 10(11), 4245. // doi: [10.3390/su10114245](https://doi.org/10.3390/su10114245)**

Author contributions: *Charis Linda Braun was the first and corresponding author of the paper. She conceptualized the research design and developed the theoretical background of the article. She reviewed relevant literature, conducted the interviews, and analyzed the data. For conducting the interviews, she was assisted by a co-worker who helped with organizing the interview setting. Charis Linda Braun wrote the original draft of the manuscript and was responsible for the submission, review, and editing of the manuscript. // Meike Rombach provided substantial advice on the research design and relevant literature, as well as data collection and analysis. In addition, she contributed to the manuscript through detailed feedback and critical revision. // Anna Maria Häring contributed by commenting on the research design and the manuscript. // Vera Bitsch provided scientific guidance on the theoretical background and the research design, and reviewed and edited the manuscript.*

Submitted 21 October 2018 / accepted 15 November 2018 / published online 17 November 2018

This first paper presents results from the early phase of the research process (2017 to 2018) that explored the initial situation of the value chain for organic vegetable production in the Berlin-Brandenburg metropolitan region. The paper highlights challenges for local value creation in the region by focusing on sustainable food procurement for Berlin schools. The study used a qualitative research design to capture different value chain actors' perspectives and day-to-day practices. 14 in-depth interviews were conducted with farmers, wholesalers, and public caterers. The interview data were analyzed through qualitative content analysis, employing a hybrid approach of deductive and inductive coding.

The paper conceptualizes the value chain as a social system where actors from diverse organizations collaborate to provide school catering services with local organic food products.

Through the lens of structuration theory (Giddens, 1984; Stones, 2005), the paper examined the actors' lived experiences within their individual contexts and uncovered existing practices in the value chain. This approach revealed how established structures in the local agri-food system could facilitate or impede certain value chain practices and how the actors' practices, in turn, created and reinforced these same structures. Although the use of organic food in Berlin schools had risen, there remained a "local gap" in the school catering value chain. The existing sustainable procurement policy had not contributed significantly to local value creation in the organic vegetable industry. This was caused by various impeding factors in the agri-food chain, such as a lack of local processing facilities and production capacity, and a lack of incentives for sourcing local produce. The results suggest that the existing structures will likely persist in reproducing the local gap in the value chain without interventions that facilitate local value chain development.

Regarding knowledge transfer and practical contributions, the findings were presented at various events across the Berlin-Brandenburg region. The results served as a starting point for the practical learning and change process within the network. The facilitation team used the results for designing the learning environment and gained insights into which issues to address. Also, the practitioners in the learning network decided to broaden the focus beyond the school catering value chain and consider additional distribution channels. In August 2018, the research was discussed with policymakers and civil society actors to feed the findings back into policy action. Early results were also presented at the 2018 Igls-Forum on System Dynamics and Innovation in Food Networks and, in a revised version, at the 2019 edition of the German Scientific Conference on Organic Agriculture (Wissenschaftstagung ökologischer Landbau).

4.2 Paper II: Behind the scenes of a learning agri-food value chain

Braun, Charis Linda; Vera Bitsch, Anna Maria Häring. (2022). Behind the scenes of a learning agri-food value chain: Lessons from action research. *Agriculture and Human Values*, 39(1). // doi: [10.1007/s10460-021-10229-7](https://doi.org/10.1007/s10460-021-10229-7)

Author contributions: Charis Linda Braun was the first and corresponding author of the paper. As an action researcher, she was directly involved in planning and facilitating the learning and change process in practice. She conceptualized the action research design and developed the theoretical background for the study. She coordinated and conducted the data collection and analysis within the action research process. She also wrote the original draft and was responsible for submitting, reviewing, and editing the manuscript. // Vera Bitsch advised on the research

design, the methodology, and the theoretical background. She also contributed by reviewing and editing the manuscript. // Anna Maria Häring provided feedback on the research setting as well as reviewed and edited the manuscript.

Submitted 07 October 2020 / accepted 29 May 2021 / published online 11 June 2021 / issue date March 2022

Paper 2 presents a behind-the-scenes view of the learning activities in emerging value chains for organic vegetables. It reflects on the first years of conducting action research in the learning network (2017 to 2020). The data included material from a total of 32 qualitative interviews and from participant observation at learning activities, informal conversations with value chain actors, as well as planning and reflection sessions of the facilitation team. The analysis employed the grounded theory approach in which data were coded and categorized in a recursive process of constant comparison. Based on this analysis, the paper presents lessons learned from action research in the emerging value chain setting.

This paper contributes to the discussion of collaborative learning in inter-organizational environments by utilizing concepts from organizational learning literature (Argyris & Schön, 1996; Schön, 1983; Senge, 1990). Specifically, it emphasizes an individual cognitive perspective on knowledge building by adopting concepts such as mental models and double-loop learning. The paper outlines how facilitated processes of inquiry and reflection on professional practices created a setting where value chain actors could reveal and discuss the problems of the local agri-food sector and develop possible solutions (Schein, 1995). Further, the lessons presented in the paper show how a “learning value chain” was established to address complex problems in a local agri-food system by (1) creating a social space that supported regular interaction among value chain actors, (2) employing an iterative approach to the design of the learning process, (3) fostering shared knowledge and understanding among actors, and (4) by applying learning strategies that prioritize both the improvement or adaptation of existing value chain practices (single-loop learning) and the disruption of existing routines (double-loop learning). In a more general lesson (5), the paper reflects on the application of action research in emerging agri-food chains.

Concerning practical contributions, the paper analyzed change processes that unfolded through the iterative development of interventions addressing actual problems by value chain practitioners. The paper’s grounded theory analysis supported evaluating the learning activities that informed subsequent interventions. For academia, preliminary findings from this paper were presented at the 2020 Iglis-Forum on System Dynamics and Innovation in Food Networks.

A second conference contribution, accepted for the 2020 World Conference of the International Food and Agribusiness Management Association, was not presented due to the Covid-19 pandemic.

4.3 Paper III: Developing agri-food value chains

Braun, Charis Linda, Vera Bitsch, Anna Maria Häring. (2023). Developing agri-food value chains: Learning networks between exploration and exploitation. *The Journal of Agricultural Education and Extension*, 29(4), 417-438. // doi: [10.1080/1389224X.2022.2082499](https://doi.org/10.1080/1389224X.2022.2082499)

Author contributions: Charis Linda Braun was the first and corresponding author of the paper. As an action researcher, she was directly involved in planning and facilitating the learning and change process in practice. For conducting additional group interviews with value chain developers, she was assisted by a co-worker. Charis Linda Braun reviewed the existing literature, developed the theoretical background, and conducted the data collection and analysis. She prepared the original draft of the manuscript and was responsible for the submission, review, and editing of the manuscript. // Vera Bitsch provided advice on the research design, methodology, and theoretical background. She also reviewed and edited the manuscript. // Anna Maria Häring provided feedback on the research process as well as reviewed and commented on the manuscript.

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The third paper explores the development process of local value chains in the context of the German organic agri-food sector and specifically the role of “value chain developers”. Such intermediaries support emerging value chains, e.g., in regional development initiatives or agri-food innovation projects. Despite the increasing importance of this specific facilitator role, little research had been conducted to explore how they contribute to the development of local food systems. The paper draws on data from action research in the learning network and five in-depth group interviews involving 17 value chain developers operating in different regions of Germany. Through the grounded theory analysis, the study conceptualized development processes in emerging agri-food value chains and the facilitation practices supporting them.

The paper investigated emerging value chains from an organizational learning perspective, focusing on the concepts of exploration and exploitation (Holmqvist, 2003; March, 1991). Value chain development includes activities of ideation and experimentation (exploration) but also

activities that guide the process toward focus and stabilization (exploitation) at appropriate times. The results illustrate the development process in three phases, from exploring and understanding the problem, followed by a phase of experimenting and implementing, to perpetuating and optimizing the value chain practices. Learning occurred both within the participating companies (intra-organizational) and in the interaction of the companies along the value chain (inter-organizational). The value chain developers applied appropriate activities to guide their groups of value chain actors through the evolving change process. By doing so, they enabled these actors to gain a better understanding of their business contexts and professional practices as they prepared to make strategic decisions regarding value chain collaborations.

As with the previous paper, the results informed subsequent work of the learning network. Key findings were also disseminated to policymakers and the broader community of value chain developers in policy briefs, online learning materials, and trade journals. In addition, the group discussions with value chain developers evolved into a conference format with an event titled “Active in Value Chains” (Wirksam in Wertschöpfungsketten) in March 2022. At the event, around 30 value chain developers shared experiences among peers and explored new facilitation methods. For the scientific community, preliminary findings from the paper were presented at the 2021 conference of the German Society of Economics and Social Sciences in Agriculture (Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues).

4.4 Paper IV: Creating spaces for change

Braun, Charis Linda, Vera Bitsch, and Anna Maria Häring. (2023). Creating spaces for change: Boundary work in emerging agri-food value chains. *Journal of Cleaner Production*, 424. // doi: [10.1016/j.jclepro.2023.138821](https://doi.org/10.1016/j.jclepro.2023.138821)

Author contributions: Charis Linda Braun was the first and corresponding author of the paper and, as an action researcher, was involved in the planning and facilitating of the practical learning and change process. She conducted the literature review and developed the theoretical background, as well as analyzed and conceptualized the data. She wrote the original draft and was responsible for submitting, reviewing, and editing the manuscript. // Vera Bitsch provided feedback on the research design and methodology as well as suggestions for the theoretical background. In addition, she reviewed and edited the manuscript. // Anna Maria Häring reviewed the manuscript and provided feedback.

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The fourth and final publication looks back at the entire activities of the learning network between 2017 and 2022. This paper utilized longitudinal case data from action research to conceptualize the co-innovation process. The data was collected during the learning network's activities, including workshop documentation, photos, project reports, interview transcripts, and field notes. The analysis involved three steps. First, a timeline was developed from the data to map the learning network's activities over time. Second, a reflection workshop was conducted with the facilitation team to validate the timeline and develop narratives of significant events and situations. Third, an in-depth analysis was performed using the grounded theory approach, resulting in three categories that were further constructed into exemplary micro cases to present the findings.

This paper used the notion of boundaries and boundary work (Hernes, 2004; Langley et al., 2019) to conceptualize the development of value chains in local agri-food systems. It examined how agri-food system actors interact at organizational boundaries and how these boundaries are reshaped in the process. Based on three micro cases, the paper presents modes of boundary work in which value chain actors engaged at boundaries, including (1) uncovering knowledge to build a shared understanding of the local food sector, (2) creating and integrating domain knowledge to improve professional practices, and (3) negotiating and implementing shared strategies for value creation. Additionally, the paper highlights higher-level boundary work performed by facilitators that enabled value chain actors to learn and collaborate at their boundaries. This configurational boundary work involves purposeful intervention by creating a space for organizing and re-configuring structures and practices in local food systems.

Preliminary findings from this paper were presented at the 2023 edition of the German Scientific Conference on Organic Agriculture (Wissenschaftstagung ökologischer Landbau). For knowledge transfer into practice, results were also published as a non-fiction comic book in collaboration with an illustrator. This alternative format was chosen to disseminate the content in an easily accessible and novel way to people who learn about the practice of value chain development, e.g., in practical training and education.

5 Discussion and conclusions

The discussion integrates the findings of the four papers and relates them to existing literature. In addition, it presents contributions and implications for researchers, facilitators, and other stakeholders involved with developing agri-food value chains, as well as suggestions for future research. The first part discusses how co-innovation was implemented, resulting in a learning value chain. The second part reflects on the action research approach embedded in the process, providing lessons for similar research beyond the present value chain setting.

5.1 The learning value chain

The basic notion of the learning value chain is that of a social system produced through the interaction of multiple actors. While the technical concept of the value chain, according to Porter (1985), describes the linear sequence of steps necessary to produce and distribute a product, the additional focus of the learning value chain, as proposed in this dissertation, is on collaborative and dynamic processes of learning and change in local food systems aimed at creating sustainable value for people, enterprises, and regions. Following a practice perspective, this kind of innovation is embedded in the everyday activities of the participating actors.

The learning value chain is an example of an environment in which transformative learning toward sustainable development takes place at a local level. It is the type of learning that addresses practical problems by enabling transformational change within existing organizational contexts and social practices while also transcending them, as described by Boström et al. (2018). In what follows, the learning value chain is discussed in terms of four elements that synthesize findings from the present research, which include (1) the space that creates an environment for innovation, (2) the facilitation of the iterative problem solving process, (3) the concrete reconfiguration of the value chain practices through learning activities and interventions, and (4) the outcomes of the actors' engagement in the change process. Figure 7 illustrates these four elements with different colors representing different groups of actors in local food systems.

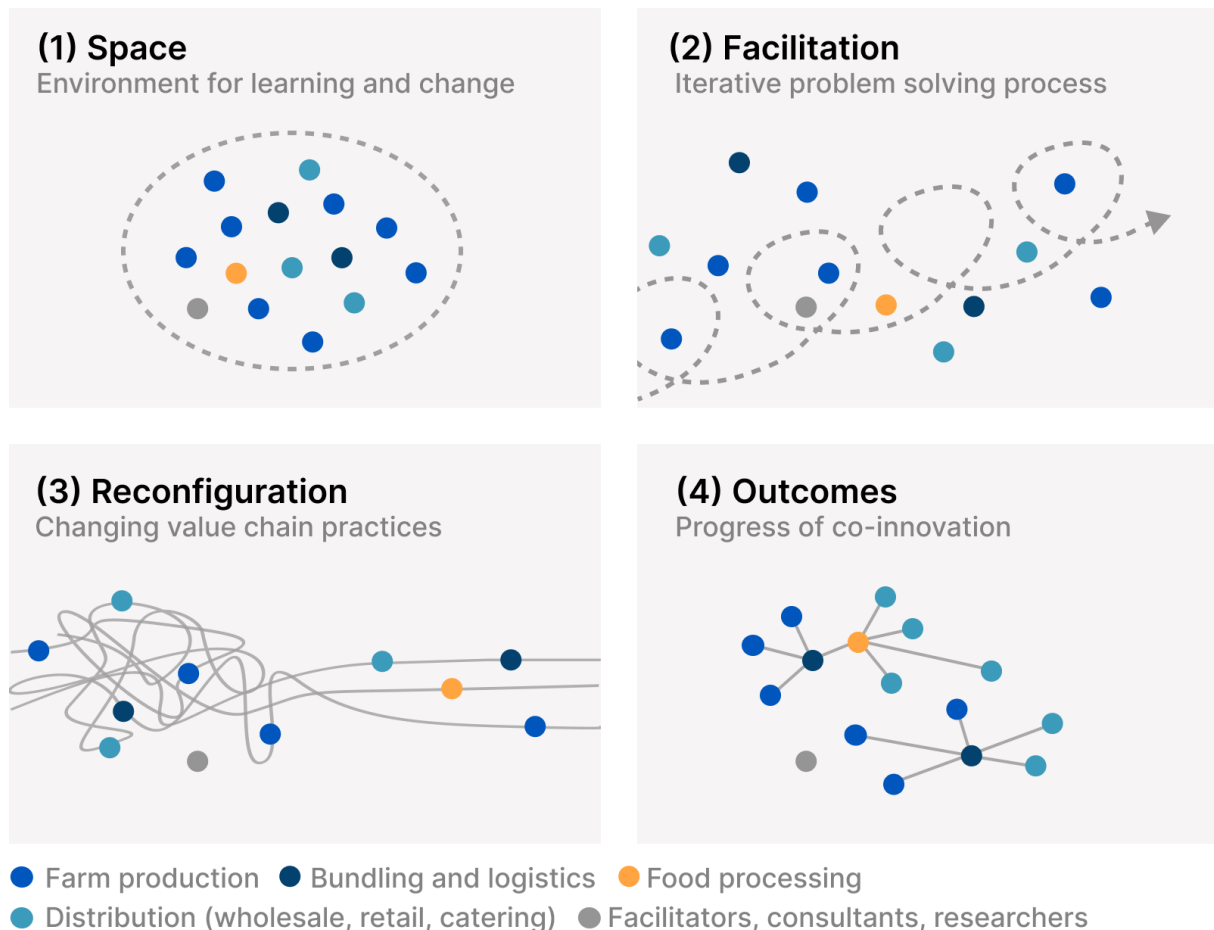


Figure 7: Elements of the learning value chain.

(1) Space: Creating an environment for learning and change

The first element of the learning value chain is the social space that brings local actors together and creates the capacity for change in the food system. This element addresses the problem that emerging inter-organizational collaborations typically lack the structures, responsibilities, and roles necessary to effectively organize and facilitate collaborative innovation processes (Gray & Purdy, 2018; Huxham & Vangen, 2005). In emerging value chain settings, where these formal structures are often not established yet, it is the element of space that can enable the actors to engage around the problems of the local food system, to work on the “local gaps” in their value chains, and to challenge problematic routines (Papers 1, 2).

The research outlines how the space forms a setting that is distinct from, but also connected to the day-to-day activities of practitioners, as it provides them with opportunities to reflect on existing practices, experiment, and negotiate strategies for collaboration. Similarly, Bucher and Langley (2016) describe bounded spaces as instrumental in changing recursively reproducing practices in organizational settings. They highlight the continuity and stability that such spaces

require for iteratively re-enacting them over time and make a distinction between spaces that are organized from within, i.e., by participants, and spaces that are organized from the outside, i.e., by intermediaries (Bucher & Langley, 2016). The present learning network is an example of the latter. Its results emphasize that such outsider-organized spaces are particularly valuable for small to mid-sized enterprises that would not otherwise have the capacity to organize this kind of setting and to efficiently work on issues of their local food systems.

Experience from the learning network also suggests that these spaces can act as catalysts for transformational change in local agri-food systems. The network can be understood as a boundary organization that forms an intermediate structure or a scaffold until the actors have established viable practices and structures for value chain collaboration (Paper 4). For creating these kinds of spaces, it is crucial to continuously align them with the real-world problems faced by the participating actors. Therefore, spaces must be flexible enough for iterative adaptation, and durations must be long enough to produce meaningful change in practice. Given that current programs for value chain development are often project-based and time-limited, the question remains of how to permanently establish local boundary organizations that can facilitate spaces for co-innovation with a long-term perspective and can continuously support value chains in adapting to the changing conditions in food systems.

(2) Facilitation: The role of value chain developers in the problem-solving process

The second element of a learning value chain is the role of facilitators, or value chain developers (Paper 3). This intermediary role performs various tasks inherent in emerging value chains, such as project management, networking, and the facilitation of learning activities. Results from Paper 3 emphasize that this role is usually separate from that of a supply chain manager. In contrast to such managers, value chain developers are not concerned with the day-to-day operation of the chain, e.g., in terms of production planning or logistics. They are usually outsiders to the participating enterprises and employed with third parties, such as organic farming associations or rural development programs. The role of value chain developers also differs from that of traditional agricultural advisors or business consultants. Although they need some background in agriculture or other food-related professions to understand the issues at hand, the focus of their work is not on applying expert knowledge to solve a particular problem for value chain actors but on helping them build the capabilities they need to create their own solutions (Paper 3). In that sense, the work of value chain developers is similar to that of process consultants (Schein, 1988) or innovation intermediaries (Kivimaa

et al., 2019) that support people and organizations in exploring their issues and lead them through a series of interventions for mobilizing capacity for learning and change. These intermediaries design and convene interventions, but ultimately, the act of innovating is carried out by the participating practitioners (Ingram et al., 2020; Kivimaa et al., 2019).

The present results indicate that in their role as conveners of collaborative transformation processes, the stance of value chain developers is often ambiguous between the supposed neutrality of facilitators and advocacy for socio-ecological change. The function of a facilitator is to organize the process but not to impose any objectives on the group (Schein, 1995; Schumann, 1996). However, since they work for sustainable innovation programs or organizations advocating for organic agriculture, value chain developers are also dedicated to specific values or interests. In this regard, Paper 4 emphasizes that value chain development should not be treated as an end-in-itself. Instead, the process should help participants make well-informed decisions that enable sustainable business practices, which may or may not culminate in the formation of new value chains. As implications for practice, value chain developers should be aware of potential conflicts of interest arising from their roles' ambiguity and be embedded in an environment that enables critical reflection. An open question is how to assess the quality of the facilitation given the specific needs and capabilities of local actors because the outcome cannot be expressed solely in terms of the number of value chain collaborations developed. In this regard, further research should refine the professional profile of value chain developers to provide better guidelines for organizations that facilitate and fund these types of innovation projects.

(3) Reconfiguration: Changing practices through interventions

The third component of the learning value chain refers to the reconfiguration of practices among local food system actors. The aim is to address the problems or gaps in value chains identified initially (Paper 1) and to achieve real-world changes for the actors. This emphasis on changes in practice aligns with the understanding of innovation as the outcome of collaborative engagement in problem solving, embedded within the actors' daily work and organization routines (Gherardi, 2009; Orlikowski, 2002). The present research provides two perspectives on the learning activities that constitute co-innovation processes. From an organizational learning perspective, the innovation process unfolds in cycles of explorative and exploitative activities based on joint inquiry, reflection, and experimentation, until the emerging value chain practices eventually stabilize and perpetuate (Paper 3). A second complementary

perspective focuses on the boundaries at which the actors interact in co-innovation processes. By engaging in boundary work, the actors build a shared understanding of their context, improve professional practices, and develop common business strategies (Paper 4). The reconfiguration is based on interventions that challenge existing value chain practices (boundary work), thereby forming new structures over time (boundaries), enabling or constraining these practices in a recursive relationship.

The research contributes to current literature on sustainability innovation in agri-food systems by applying this practice-based perspective to the context of local value chains. The main difference to existing research in similar learning settings (e.g., Rigg et al., 2021; Tisenkopfs et al., 2015) is that these studies are primarily concerned with the co-creation of knowledge rather than with the negotiation of practical collaboration among actors in the agri-food system. The dissertation research extends this existing body of literature by providing insights into learning activities and other interventions that are not only aimed at building know-how and improved understanding of local issues but also at challenging and eventually reconfiguring the practices of value creation. As an orientation for facilitators, Paper 3 presents a practical model of value chain development that depicts the reconfiguration process over time and indicates areas facilitators should address, intra- and inter-organizationally. Paper 4 details the learning activities and defines three modes of boundary work in which value chain actors engage. By providing a theoretical lens to the interaction at boundaries and through a detailed description of micro cases, this account of the learning network's activities provides transferability for further research in similar settings, e.g., in other regions or value chains, which could further substantiate the applicability of the conceptualized learning activities and interventions.

(4) Outcomes: The progress of the co-innovation process

The fourth element of the learning value chain refers to the outcomes of the change process resulting from the three elements described above. These processes involve addressing relevant problems, implementing appropriate interventions for the given setting, and establishing collaborative practices among actors. As described in the previous elements, the learning value chain is an iterative and emergent process rather than a directed effort toward a specific change outcome. The present research suggests that supply chain performance, as proposed by H. C. Peterson (2002, 2009), may not be appropriate as a primary indicator for evaluating the activities of a learning value chain. Performance indicators such as

responsiveness and efficiency may be helpful for evaluating activities of exploitation in more technical aspects of the process, e.g., in production and logistics, but not for the more explorative activities aimed at, e.g., creating shared understanding and new strategies (Paper 3). Instead of measuring performance, Knight & Pye (2004) propose a focus on the progress of change, which they base on describing and explaining the processes and their outcomes in terms of interpretations, practices, and structures. Applied to the context of emerging value chains, these categories can be related to the modes of boundary work developed in Paper 4 (Figure 8). Activities for creating a shared understanding of the local food system are primarily aimed at challenging interpretations and developing meaning, e.g., about the market or existing business strategies. The category of practices can be mapped to activities for improving professional domain practices, e.g., in terms of production techniques or value chain processes. Lastly, activities for developing value chain collaborations are primarily about changing structures, e.g., by negotiating collaborative strategies or establishing partnerships. In terms of outcomes, changes to interpretations were visible, e.g., in the actors' revised presumptions and better understanding of the market. Changes to practices became evident through new know-how and improved value chain practices. Changes to structures manifested in commitment for value chain collaborations.

Process	Interpretations	Practices	Structures
Creating shared understanding of the local food system	<ul style="list-style-type: none"> Collaborative inquiry into market knowledge and experiences Reflecting on participants' existing business strategies Discussing challenges and opportunities of the market 		
Improving professional domain practices		<ul style="list-style-type: none"> Reflecting on participants' existing value chain practices Sharing problems and experiences related to domain practices Experimenting with cultivation and production practices 	
Developing value chain collaboration			<ul style="list-style-type: none"> Developing shared visions and negotiating collaborative strategies Developing collaborative business and production processes Establishing partnerships and collaborative enterprises
Outcomes	Revised presumptions and shared understanding of the local food system	New know-how and improved value chain practices	New strategies and commitment for value chain collaboration

Figure 8: Processes and outcomes of the learning value chain.

According to the model proposed by Knight and Pye (2004), the progress of a practical change process becomes visible when the actors' interpretations, structures, and practices increasingly converge. In the context of the present research, this kind of transformative learning and change occurred in that participants were able to challenge pre-existing assumptions about their work and ultimately develop new strategies and new ways of working together based on activities of inquiry, experimentation, and reflection (Papers 2, 4). This resonates with the basic notion of Argyris and Schön's (1996) theories of action, which suggest that organizational learning occurs by aligning espoused theory with the outcomes of actual behavior. It also echoes the transformative nature of learning, which, as proposed by Boström et al. (2018), becomes evident as actors gain the ability to comprehend, interpret, and approach things differently, implying a process of change, on the levels of the participating individuals and organizations. As an implication for practice, value chain development requires appropriate tools for evaluating emergent change processes. In particular, there is a need for approaches that help describe the progress against the local problems addressed by the co-innovation activities and thus align them with practical relevance, values, and objectives of the participating actors. Further research could develop and test evaluation criteria and methods for examining progress in emerging value chain settings.

5.2 Action research in the learning value chain

This subchapter focuses on the research process in the learning value chain beyond the facilitation of learning and practical change. The following discussion of the action research approach and the integrated grounded theory analysis proposes four lessons for conducting further research in similar environments. These refine and extend lessons presented in Paper 2 by looking back at the entire action research process and placing additional focus on challenges of scientific rigor. The reflection integrates four criteria for evaluating qualitative research—credibility, dependability, transferability, and confirmability (Bitsch, 2005).

Establishing access to the field

The present action research was based on a longitudinal study conducted with a specific group of people in a local food system and included the collection of in-depth data. This type of prolonged engagement and persistent observation in a real-world setting is a crucial factor for the credibility of qualitative research (Bitsch, 2005). Long-term involvement with the research participants allowed for contextual immersion and for building an understanding of their lived

realities. The value chain actors were not selected purposefully but joined the learning network based on an open call for participation. They had an intrinsic motivation and a specific need to develop their businesses, which provided opportunities for research to be conducted in actual processes of practical change and to gain access to participants when they were engaged in negotiations and decision-making.

A common challenge in establishing action research settings is the quality of relationships—among participants and between participants and action researchers (Shani & Coghlan, 2021). In the learning network, these relationships were fostered by actively designing and maintaining an environment oriented toward the practitioners' needs and a culture of transparency in which all actors could participate in the network equally. The setting was based on regular interaction in joint activities, supported by appropriate methods for facilitating groups and change processes. The present action research approach can be understood as a type of “living lab” (e.g., Gamache et al., 2020) that provides new insights based on direct engagement in co-innovation processes. Importantly, it is in the nature of such settings that the practical change projects can fail or turn out differently than anticipated, e.g., if the actors pursue separate paths due to differing objectives or if conflicts among actors remain unresolved. In the context of the present research, the facilitators' competent handling and management of the process was a crucial factor for the success of the practical change projects in the learning network.

Lesson #1: Action research in emerging value chains builds on practitioners' engagement with an intrinsic motivation to address real-world problems. This kind of research needs regular and continuous interaction between researchers and participants in a flexible and well-facilitated environment that allows for longitudinal and in-depth data collection.

Balancing practical relevance and rigorous research

An essential question in action research is how to ensure practical relevance, i.e., the impact of the change process in practice, while at the same time fulfilling the requirement of rigorous research (Shani & Coghlan, 2021). The present research established this balance through a clear division of roles and tasks within the learning network—between the action researcher, responsible for data collection and analysis, and other members of the facilitation team that focused more on practical relevance. Despite the division of responsibilities in the team, there was overlap in actual implementation which proved positive in a review of the overall process. The action researcher was involved in planning and, to some extent, conducting activities,

which provided access to practitioners and first-hand insights into applied value chain development (Papers 3, 4). At the same time, the other members of the facilitation team were involved in the research, e.g., by documenting the activities they facilitated or by discussing the results of the data analysis, which also helped the facilitators to reflect on their work and gain new perspectives on their practice.

Action research has the potential to support co-innovation in emerging value chain settings, but these settings can also create dynamics that make it hard for action researchers to keep up with. Rigorous qualitative research requires systematic data collection based on activities of inquiry and reflection, for which participants and researchers have to take time during the process. Also, developing grounded theory from action research data is a challenging, laborious, and sometimes unpredictable creative endeavor (Huxham, 2003). In contrast, the work of agri-food professionals often requires fast decision-making, as it is determined by short-term changes in market and seasonal conditions. Using an emerging and iterative design, the present research was continuously adapted to changing issues and priorities of the real-world setting. The evolving research process was thoroughly documented to ensure the dependability of the findings. The action research approach, how it supported changes in practice, and how it evolved over time were also subjects of the research and discussed in Papers 2 and 4.

Lesson #2: Teamwork and division of responsibilities ensure rigor and relevance in action research. Using an emerging design allows for the research process to be adapted to the needs and priorities of practice. To ensure the dependability of the research, the process and how it evolves must be carefully documented.

Building theory from action research data

This dissertation presents findings from research that developed practice-oriented theory through an action research approach (Eden & Huxham, 1996). This kind of research design has the potential to generate highly applicable and situational knowledge, or, as Shani & Coghlan (2019) put it, “localized theory through localized action”. One of the challenges lies in developing theory about dynamic and complex real-world situations that is analytically transferable to other settings, thereby adding value for academia (H. C. Peterson, 2011). Grounded theory methodology offers a range of techniques and principles to ensure the credibility and transferability of qualitative research (Bitsch, 2005). In the present action research, particular emphasis was on incorporating different perspectives, through the

triangulation of data sources and methods as well as the validation of research results, at various points in the research. The data that emerged naturally from observing activities of the learning network were enriched by interviewing people in and outside the network. The analysis was guided by constant comparison to generate meaning about the practical change process as it progressed. Throughout the research, emerging concepts were repeatedly discussed within the facilitation team and refined in practice across recurring activities. Also, different concepts from existing literature on organizational learning and collaboration were employed as theoretical lenses to uncover and explain the patterns and phenomena inherent in the emerging value chains. Transferability was achieved through “thick” and interpretive description of the results and their context, allowing other researchers to assess the applicability of the results in different settings (Langley, 1999).

Lesson #3: Action research enables practice-based theory development as it provides access to particularly valuable data. At the same time, this research setting allows for continuous conceptualization “in action”, as local theory can be validated and refined in recurring situations.

Being an action researcher

Unlike other research approaches, in action research, there is no strict separation between knowledge generation and transfer into practice, i.e., findings are directly applied in practical problem solving. Action research creates knowledge in an ongoing dialogue between researchers and practitioners, where practitioners engage in problem solving and generate new experiences, while the role of the action researcher is to facilitate this process and navigate between the two domains of practice and academia. On the one hand, it was important to understand the problems of the specific value chain setting and to be able to contribute to the practical change process. On the other hand, the research was expected to produce academic knowledge that would meet the requirements of the peer review process. Therefore, action researchers need to be able to engage with practice and be familiar with their contexts (zooming in) while also abstracting from the practical problems to knowledge that has relevance for the field beyond the specific value chain settings (zooming out).

Regarding the confirmability of this kind of research, a potential issue arises from the action researchers’ dual role, being actively engaged in the practical change process while also being responsible for data collection and analysis. This situation could introduce bias to the data collection and analysis process (H. C. Peterson, 2011). The present research addressed this

concern by maintaining detailed documentation of the activities and transparency about the dual role within the learning network. It was important to critically reflect on the role and adopt an agnostic stance toward the studied processes and phenomena. Therefore, the author of the dissertation engaged with academic peers outside of the present research project, including the papers' co-authors and other colleagues from the working groups at HNEE and TUM, as well as through feedback from the review processes and at academic conferences.

Lesson #4: The role of an action researcher requires the ability to both zoom in on the practical problems of the learning value chain and zoom out on the big picture of the overall research. To ensure the confirmability of action research, the researcher needs an environment for critical reflection on their role and involvement in practice.

6 Closing statement

This dissertation explored learning and change processes in agri-food value chains based on the example of a longitudinal case study in the organic vegetable sector in the Berlin-Brandenburg region. The research proposes the concept of the learning value chain, contributing to the discussion of co-innovation in local agri-food systems and the application of action research in such settings. The four elements of the learning value chain can be summarized in the analogy of the cultivation of a field (Figure 9). Like a gardener prepares the field and plants seeds, a learning value chain provides an environment for interaction and collaborative learning (space). The gardener's role is to tend the field throughout the year, which relates to the function of a value chain developer supporting change processes over time (facilitation). In a well-maintained field, crops can thrive just as new practices and structures emerge in value chains (reconfiguration). The gardener observes the progress of the field throughout the garden year and takes stock of the fruits of their labor after the harvest (outcomes). As cultivating a field enables plants to grow, the learning value chain fosters sustainable transformation—among people, in enterprises, and within regions.

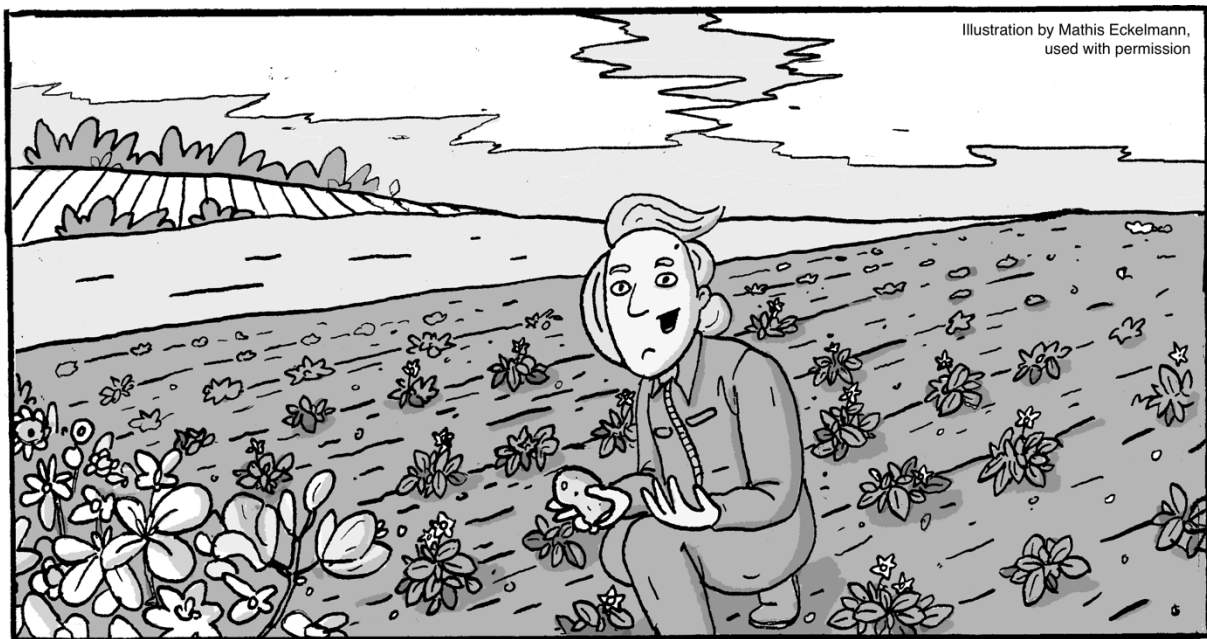


Figure 9: The cultivation of a field as an analogy for value chain development.

Beyond the academic contribution of this dissertation, the present co-innovation setting provided practical implications for local value chain actors and other stakeholders of the agri-food system. In the learning network, participating actors challenged existing value chain practices, developed shared strategies, and implemented practical changes in their enterprises

and across the chain, leading to the formation of a vegetable processing joint venture and other partnerships for local production and distribution. In addition to the formation of practical collaborations, it was important to build domain knowledge, e.g., through field days, production trials, and group-based learning activities, some of which have continued after the end of the learning network. Overall, the present learning network contributed to strengthening the organic vegetable sector in the Berlin-Brandenburg region through improved know-how and new collaborations.

The research in the learning network generated insights that are transferable to other value chain settings and regions. The findings serve as an example of how the re-localization of agri-food systems is facilitated through multi-actor settings where value chain actors come together to work on specific problems of local value creation. At the regional level, politicians and public administrators can support this type of co-innovation process, e.g., by promoting programs aimed at shortening food supply chains or by installing value chain developers in their respective regions. A number of such programs and initiatives are already underway in different parts of Germany and across Europe. As an implication for research, these initiatives provide an opportunity to refine and extend the present findings, e.g., with respect to the management and evaluation of the specialized intermediary work of value chain developers. A challenge for many existing and planned programs is that they are usually project-based and temporary, while the development of the value chains is, inherently, a continuous and emergent process. This raises the question of how the participating value chain actors can continue to learn and adapt their collaborations to changing conditions in the long term—as continuously learning value chains.

Concluding this dissertation from a personal perspective, the action research approach embedded me, the author, in real-world situations that would otherwise have not been accessible to research. The process of data analysis and conceptualization was, at times, messy and challenging, mainly because of the large and ever-expanding pool of material and the ongoing evolution of the changes in practice. It was, however, truly gratifying and empowering when new patterns and ideas surfaced from the data, forming the basis for the research papers. The learning journey showed me that deep understanding and new insights often emerge through unknown pathways and unexpected opportunities, and social settings are in a constant state of becoming. At the end of the dissertation project, I am still fascinated by action research. This dissertation serves as an example of how researchers can use this approach and embrace the openness of the process, which can make a real difference in

research and practice. The research presented here should also encourage practitioners to participate in co-innovation, as it provides an opportunity to address challenging problems, explore new ideas and perspectives, and unlock potentials that would otherwise remain unused.

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Appendix

Paper I

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Article

A Local Gap in Sustainable Food Procurement: Organic Vegetables in Berlin's School Meals

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Abstract: Organic and local food plays an important role in the discussion of sustainable public procurement for school catering services. The present study investigates the value chain supplying school catering with organic produce, using the organic vegetable industry in the Berlin-Brandenburg region in Germany as an example. The qualitative case study employs a structuration theory approach to explore value chain actors' perspectives and their practices. Data is collected by conducting 14 in-depth interviews with actors on different supply chain levels (farming, wholesale, and catering) and analyzed by means of qualitative content analysis. The results suggest that, while organic food is generally important in school catering in Berlin, locally produced organic vegetables play only a minor role. A constraining factor is the lack of incentives for the use of locally produced organic food in the procurement guidelines, combined with a very limited budget for sourcing. Also, there are no preprocessing facilities in the region, while work organization in school catering services depends heavily on preprocessed food. From a farmers' perspective, focusing on process grade vegetables is rarely a common marketing strategy.

Keywords: sustainable public procurement; school catering services; agri-food value chains; structuration theory

1. Introduction

Organic and local food plays an important role in the discussion of sustainable school catering systems. With the European Union's move towards green public procurement, a number of regions across Europe have introduced public procurement policies that prioritize the use of organic food in school meals [1–3]. Some regions also include public procurement criteria that support the local sourcing of food [4]. Sustainable procurement policies that prioritize local and organic foods aim to support public health and food literacy, preserving the environment, and stimulating local economies [4,5]. Due to differences in national policy, food cultures, and school food systems, the concrete implementation of sustainable procurement practices varies greatly between European countries as well as between regions within countries [1,6].

In Berlin, public primary and secondary all-day schools, which were attended by about 175,000 students in 2016 [7], serve hot meals at lunch time. However, as school lunch is optional in some schools, not all students eat at school. The school meals have a fixed price of EUR 3.25 and are paid for by parents, as well as subsidized by the city of Berlin. Meals are generally provided by private catering services on contracts that are awarded in individual per-school tendering processes for about four-year terms [8].

The city state of Berlin is one of the German pioneer regions striving to make its procurement practices for school catering more sustainable [1]. In 2014, Berlin's senate introduced the procurement policy for school catering which defined a set of compulsory sustainability criteria and a system of additional incentives for school caterers to improve the general quality of school meals. The compulsory criteria require the use of a minimum percentage of organic produce and include a range of other sustainability measures, such as a ban on genetically modified food and guidelines for waste reduction and recycling. Also, by combining additional quality incentives with a fixed price per meal, Berlin's procurement policy aims to create a situation where school caterers compete on the basis of quality rather than price [9]. The procurement policy incentivizes school caterers to increase the share of organic food beyond the mandatory percentage, amongst other aspects [8]. However, neither the compulsory criteria nor the additional incentives explicitly mention the use of local produce.

The present study investigates how the current procurement policy supports the local food sector, using organic vegetable value chains as an example. It builds upon the discussion on local value chains in school catering procurement and explores the perspectives of the actors in the value chain using a structuration theory approach [10,11]. By studying the value chain as a social system, it aims to identify value chain actors' practices as well as the structural factors that constrain or enable the local value chain. The study will help policy-makers, practitioners, and other stakeholders to understand the opportunities and challenges posed by using local organic produce in school catering. Food that is considered local in the present paper is produced in the federal state of Brandenburg that surrounds the city of Berlin, a region largely dominated by agriculture.

2. Local Food Value Chains in School Catering

Local sourcing of food for use in public institutions is an important issue in the discussion around sustainable procurement in school catering. One argument is that sourcing food locally can support local economies, reduce the environmental impact of food transport, and provide educational opportunities [5]. It is important to note, however, that local food systems are not by default more sustainable than national or global food systems [12]. Rather, the sustainability of public procurement practices depends on many factors, including production methods, use of resources, engagement with local communities, etc. [5,13]. In spite of some criticism, local agri-food value chains have the potential to contribute to sustainable food systems and are commonly discussed in the context of sustainable procurement policies, often in combination with organic production [4,13–16].

An agri-food value chain is a strategic partnership among interdependent businesses—such as farms, processing companies, and intermediaries—who work together to jointly create added value. To describe the level of value chain organization and partnership between firms in agri-food value chains, Peterson, Wysocki, & Harsh [17] define a continuum from low intensity, 'invisible hand' coordination (spot markets) to high intensity, 'managed' coordination (vertical integration). Several researchers have examined alternative approaches to organizing agri-food value chains for school catering. The most cited examples are farm-to-school programs, which aim to increase the share of locally produced food in school lunches in the USA by connecting food producers directly with schools in a collaborative program [18]. Local school catering value chains are commonly described using concepts such as short food supply chains and values-based supply chains, e.g., [15,19–21]:

- Marsden, Banks, & Bristow [22] define short food supply chain as an umbrella term for value chains that are characterized by 'relations of proximity' between the producer and the consumer. This can mean that there is face-to-face interaction between producer and consumer, or as in the case of local school catering, that food is sold in the region where it was produced and consumers are aware of the origin of the product [22,23]. The concept is commonly used to describe alternatives to long and complex chains that have a large number of intermediaries and diminish the proportion of total added value that remains with the original producers or within the region [22,23].

- The concept of values-based supply chains places emphasis on both the values associated with differentiated food products and the values that characterize the relationships between value chain actors [24]. Values-based supply chains are characterized by product differentiation (e.g., through social and environmental values embedded in products), as well as by partnerships, trust, shared governance, and a common commitment to the welfare of all participants [24,25]. Values-based supply chains may comprise strategic partnerships of midscale farms and other food enterprises that aim to handle high volumes of differentiated products, operate effectively on a regional level, and distribute their profits equitably between partnering companies [26].

In the present study, the concepts described above are used to explore and describe collaborations between actors at different levels in the local agri-food value chain for organic vegetables in school catering.

3. Value Chains as Social Systems

The present study uses a structuration theory approach to investigate an agri-food chain as a social system of value chain actors that interact with one other. Structuration theory is a social theory originally developed by Giddens [10] to describe and analyze the interdependence between structure and agency in social systems. A core tenet of structuration theory is the duality of structure, which describes how agency, in the form of social practices, shapes the structures within a system while the structures enable and constrain these same practices. Actors create and reproduce the structures within a system through social practices, across repeated interaction with one other. Structuration happens in a recurrent process: actors form an understanding of the system around them, draw upon rules that define what they can and cannot do, and use resources to control and influence their surroundings. In the context of the value chain, examples of resources are access to logistics and infrastructure, as well as the availability of a certain quantity of a product at a given time and place. Examples of rules are certification or procurement rules, but also non-formal norms, such as the way value chain actors interact with one other.

While structuration theory has been used in a large number of studies, ranging from sociology and information systems to value chain research, it has not gone without criticism. For instance, Giddens [10] has been criticized for conflating agency and structure [27], for not clearly defining his central concept of rules [11,28], and for an overly simplified dependency on the concept of rules in his notion of signification and legitimation [11,29]. Also, its highly abstract nature and lack of clear guidelines regarding its empirical application can make it difficult to use structuration theory in empirical research, e.g., [29,30].

To overcome the potential weaknesses of structuration theory, the present study uses Stones' refined structuration framework, which he calls "strong structuration theory" [11]. Stones [11] builds on the criticism described above and provides a re-interpretation of Structuration Theory as a methodologically sound approach to empirical research. It adds clear guidelines for the application of structuration theory and places emphasis on the analysis of the context from the actors' perspectives (actors' conduct analysis) and their understanding of the structures that define their actions (context analysis). The framework expands Giddens' original structuration concept with four analytically separate but interlinked components that can be studied empirically by focusing on each actor individually [11]:

- External structures are the actors' context. They include all conditions of action that exist independently of the actors.
- Internal structures describe what the actors know and how they think. This includes the actors' values and attitudes as well as their understanding of the context.
- Practices describe how actors draw on internal structures to interact within their context.
- Outcomes describe how both external and internal structures are produced and reproduced by actors' practices.

The present study applies a structuration theory approach that investigates the value chain as a social system. The system includes actors at different levels of the value chain, such as farmers, wholesalers, and school caterers, as well as structural factors and practices within the value chain (Figure 1). It describes how practices by value chain actors (1) shape the structures within the system of the value chain while the structures (2) enable and constrain these same practices.

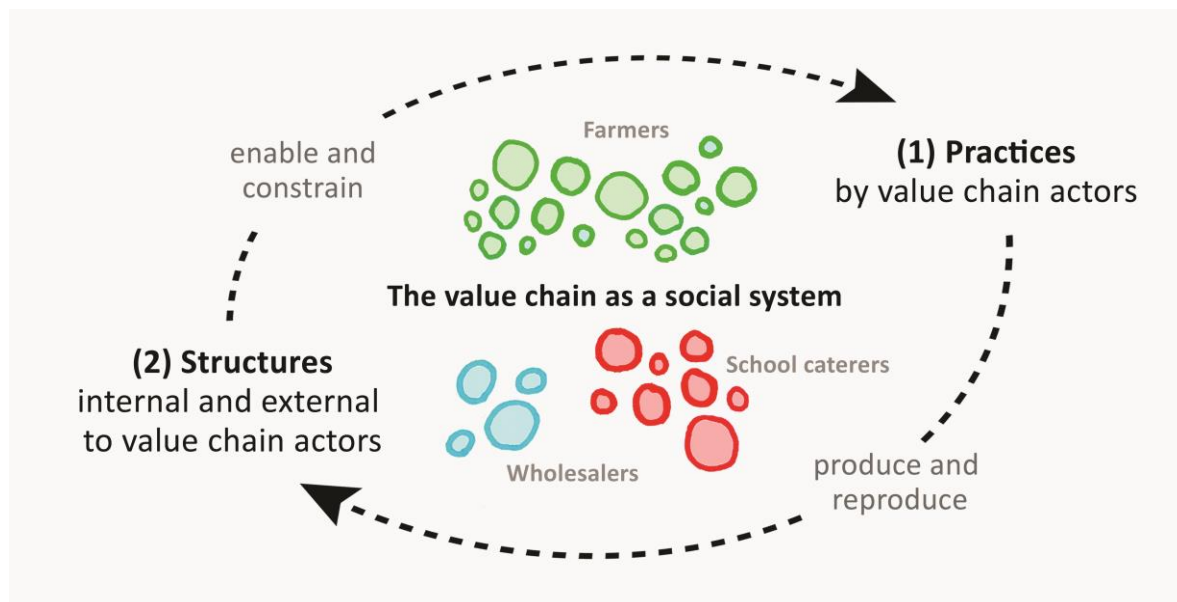


Figure 1. Structuration theory [10,11], applied to the value chain for school catering.

A number of studies have relied on Structuration Theory for organizational and management research (e.g., [30–33]), supply chain research [34], and more recently, agri-food value chain research [21,35,36]. Heiss et al. [21] investigated the organization of a farm-to-school initiative using a structuration theory approach in a qualitative case study. The study explored organizational structure and practices as well as factors that help or hinder organizing efforts. Heiss et al. [21] used Giddens' [10] structuration theory to explore how farm-to-school actors create, maintain, or change organizational structures within a farm-to-school initiative. They concluded that, while structuration theory has yet to be adopted by researchers studying local food systems and value chains, it has much to contribute to studying the ways in which physical and social practices evolve into routine value chain systems [21].

Pullman & Dillard [36] used structuration theory in their case study research into sustainability practices of a farmer's cooperative in the USA. Their qualitative case study examined the transfer of values and norms of family-owned farms into a values-based supply chain management system [36], and later the introduction of a new sustainability management tool [35]. Pullman & Dillard [36] based their theoretical framework on structuration theory as formulated by Giddens [10], and refined by Sewell [29] and Stones [11]. They suggested that structuration theory can be used as a "theoretical lens" for investigating complex relationships among value chain actors see also [34,36], particularly in research that takes emergent value chain structures and the unique values of sustainable organizations into account [36].

An alternative concept that has been used in agri-food chain research is the actor-network theory, e.g., [37,38]. It is similar to strong structuration theory in that it comprises a theoretical and methodological approach to analyzing complex systems. Actor-network theory is commonly used in the study of systems that consist of technology and human actors. It offers a different notion of the relationship between actors and systems to the one held by structuration theory, and it has been criticized for ignoring human motives and virtues [39,40]. Jack & Kholeif [41] argue that strong structuration theory is as robust and credible as actor-network theory, while also being particularly

useful for case studies that deal with clusters of actors within systems and their relationships with one other, as is the case for agri-food value chains. Hence, the present study relies on strong structuration theory according to Stones [11].

In order to broaden the understanding of the value chain as a complex system of actors and value chain practices, the present study uses the four analytical components of strong structuration theory (practices, internal structures, external structures, and outcomes). The study also follows Stones' [11] iterative analysis process to explore each actor's value chain activities and their individual perspectives, values and attitudes (actors' conduct analysis). Enabling and constraining factors were derived (context analysis) on this basis.

4. Methods

The present study used a qualitative case study approach to explore the local organic vegetable value chain in the Berlin-Brandenburg metropolitan region in the context of Berlin's procurement policy. The use of the case study approach as a research strategy aims at understanding the dynamics of a single setting [42]. As procurement practices for school meals differ considerably between countries and regions within countries, and because Berlin is a pioneer region in the use of organic food in school catering in Germany [1], the study focuses on a unique phenomenon. Thus, it is investigated as a single case study [43].

For the field of agribusiness, case study research has been deemed appropriate and successfully applied [44–46]. Moreover, case study approaches are commonly employed in research that builds upon structuration theory, which includes agri-food value chain research [21,30,35,36]. Strong structuration theory is particularly suited to case study research in management and organizational studies, as it combines theory with a disciplined methodological approach to empirical research into the relationships between actors and their context [41]. In the present study, the case study approach helps to gain an in-depth understanding of the case through the perspectives and practices of value chain actors. These include school caterers, wholesalers, and organic vegetable farmers based in the Berlin-Brandenburg region. It was not possible to identify vegetable pre-processing facilities for organic catering within the region. The present study focuses on sourcing and distribution practices for organic vegetables. End consumers, students and parents, were not considered for the study. The composition of school meals is decided by school caterers based on agreements made during the tendering process.

4.1. Data Collection

School catering value chains are complex systems in which several structural factors and the interaction between a large number of participants define value chain practices [19,21]. Potential interviewees were identified based on online research, conversations with value chain actors, and information provided by local non-governmental organizations that are active in the fields of school catering and organic farming.

To capture multiple perspectives on the case, document its many facets, and identify common value chain practices, the present study used maximum variation as a purposeful sampling strategy [47]. Interviewees were selected from each level of the value chain and within each value chain level. The selection aimed to include interviewees from companies with a diverse range of characteristics, such as different distribution channels or company sizes. Interviewees were actors in management positions who were expected to be knowledgeable about the phenomena. This included farm owners and managers in organic vegetable production, as well as managers working in wholesale and catering (Table 1).

Data was collected through fourteen in-depth interviews that served to obtain a detailed and comprehensive representation of the value chain. In-depth interviews are used to seek exhaustive information and a thorough understanding of the issue [48], as well as gather rich data about actors' perceived realities and day-to-day practices [49]. The interviews were conducted in person between

November 2017 and May 2018, and each interview lasted 60 to 90 min. To guide data collection, semi-structured interview guides were used. For each level of the supply chain, there was a specific set of questions.

Table 1. Interviewees and their backgrounds.

	Interviewee	Characteristics	Size
Farmer 1	Owner	Distribution through direct marketing	1 ha
Farmer 2	Owner	Distribution through organic wholesale	5 ha
Farmer 3	Owner	Distribution through direct marketing and organic wholesale	13 ha
Farmer 4	Production manger	Distribution through direct marketing and organic wholesale	20 ha
Farmer 5	Owner	Distribution through direct marketing and organic wholesale	25 ha
Wholesaler 1	Managing director	Organic vegetables wholesaler	3 employees
Wholesaler 2	Managing director	Full-range organic food wholesaler	50 employees
Wholesaler 3	Managing director	Full-range food wholesaler	250 employees
Caterer 1	Owner	100% organic *, operating in Berlin	900 meals/day
Caterer 2	Owner	100% organic *, operating in Berlin	1000 meals/day
Caterer 3	Kitchen manager	100% organic *, operating in Berlin	1200 meals/day
Caterer 4	Kitchen manager	56% organic *, operating in Berlin	7000 meals/day
Caterer 5	Procurement manager	40% organic *, operating in Berlin and Brandenburg	30,000 meals/day
Caterer 6	Department manager for catering services	40% organic *, operating nationwide, centralized procurement	40,000 meals/day

* Share of organic food in school meals, by value. The Berlin school catering procurement policy does not specify the product group in which the organic ingredients must be used.

The interview guides covered the following information:

- Introduction: The interviewee's background and details about their company.
- Perspectives on value chain practices: Relevant actors and their interaction within the value chain focusing on the production, distribution, and procurement of organic vegetables.
- Perspectives on the organic vegetable industry: Recent market developments focusing on the Berlin school catering procurement policy.
- Wrap up: The opportunity for interviewees to add and ask questions.

The topics were addressed using open-ended questions that were asked based on the flow of the conversation. During the interview, participants were also asked to draw a sketch of the value chain and to explain it. This activity aimed to generate deeper insight into each actor's perception of the value chain. Conducting drawing activities with participants in qualitative organizational research is a method suggested by Warren [50] as a tool for improving participant involvement and for generating an increased understanding.

4.2. Data Analysis

The interview material was prepared as the first step in data analysis. Twelve of the fourteen interviews were audio-recorded and transcribed verbatim using the f4 transcription software (dr. dresing & pehl GmbH, Marburg, Germany). Two interviewees did not consent to being recorded, field notes were therefore created. In qualitative research, it is common to use a form of transcription to prepare the interview data for analysis [51]. As in the present study, the content of the interviews is what's interesting, the personal speech characteristics were removed (e.g., dialects, pauses, filler words). In the next step, the transcriptions and field notes were analyzed using qualitative content

analysis. The latter is a method used to systematically reduce and summarize qualitative data by assigning text fragments to categories that are defined in a coding frame [52]. In the data analysis, the qualitative content analysis software ATLAS.ti (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany) was used, which supports the development of the coding frame, category assignment, and category management and their relationships [53].

The interview data was structured using a hybrid approach of deductive and inductive coding [52]. The main categories were defined deductively based on the analytical components of strong structuration theory: practices, internal structures, external structures, and outcomes (Figure 2). Following the iterative analysis process defined by Stones [11], subcategories were defined inductively in a recurrent series of steps. First, practices and internal structures were identified for each actor. This included the actors’ value chain activities and their perspectives on the phenomenon as well as their values and attitudes. In another step, the context analysis, relevant external structures were identified. Based upon the external structures, constraining and enabling factors were derived. The categories and subcategories were defined and described in ATLAS.ti.

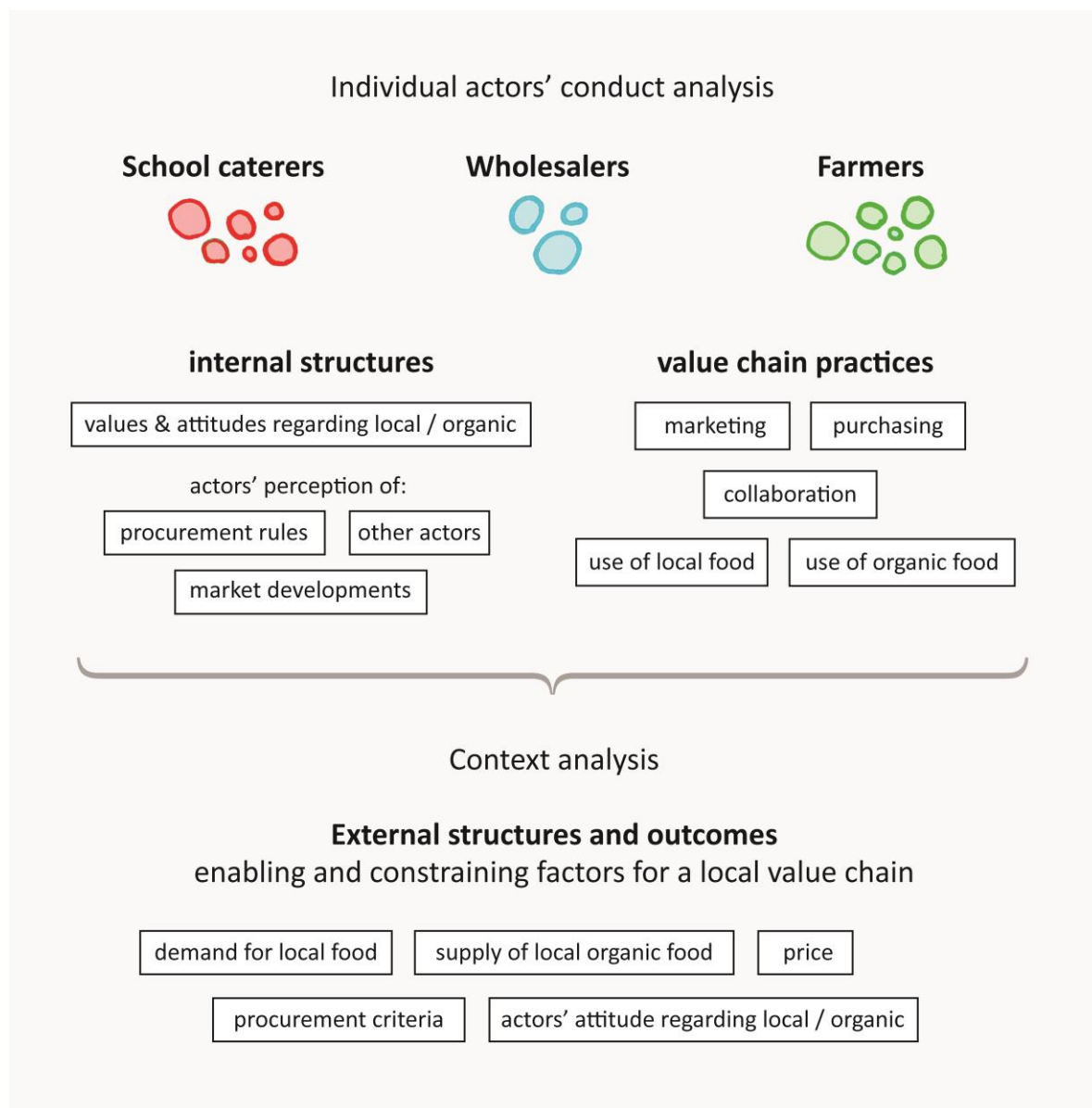


Figure 2. Coding frame: hybrid approach based on strong structuration theory.

5. Results and Discussion

Strong structuration theory reveals structural factors that influence value chains based on the analysis of value chain practices and actors' internal structures. The following sections present practices and internal structures broken down by value chain level. Based on these findings and the body of literature reviewed above, the second part discusses the structural factors that enable and constrain the use of local organic vegetables in Berlin school meals.

The participants in the present case study are school caterers, wholesalers, and organic vegetable farmers located in the Berlin-Brandenburg metropolitan region. Preprocessing facilities for organic vegetables could not be identified within the region (Figure 3).

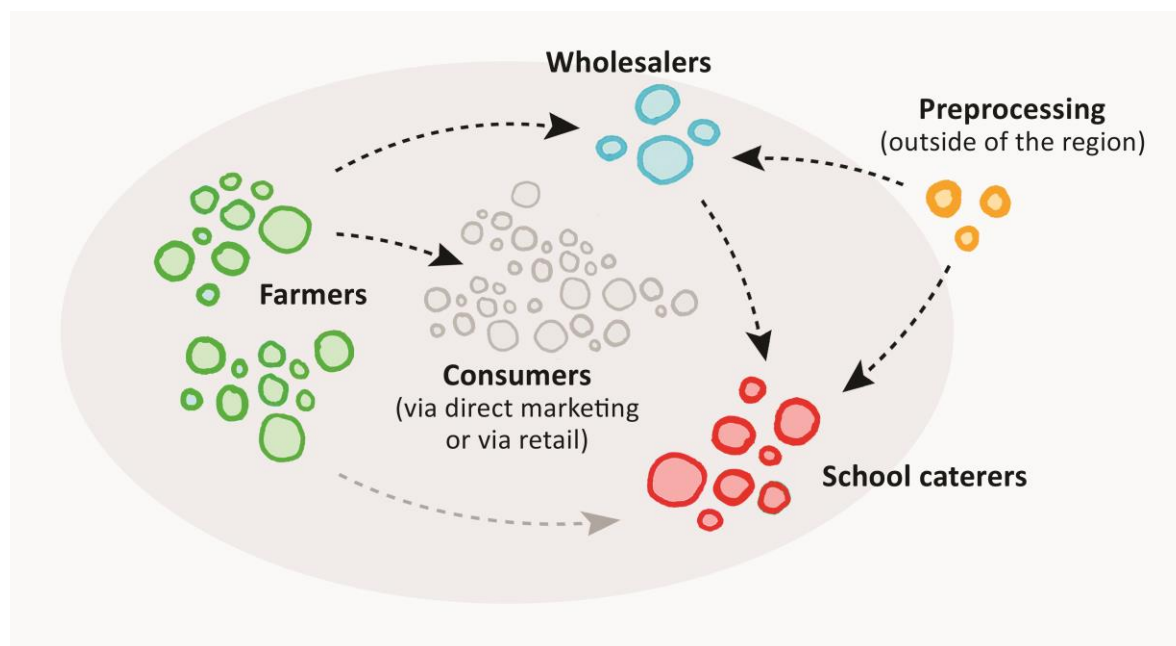


Figure 3. Actors' sourcing and distribution practices in the organic vegetable value chain in the Berlin-Brandenburg region.

5.1. Value Chain Actors' Conduct: Internal Structures and Practices

Caterers—In Berlin, school catering is handled by private catering companies. The interviewed caterers range from large companies that prepare tens of thousands of meals per day to smaller companies that prepare several hundred meals per day. The caterers specialize in school meals and run their own large-scale kitchens from which they supply schools with food. Only two of the interviewed school caterers run kitchens are actually located at a school.

Public schools select a catering company through an individual tendering process based on Berlin's rules for school catering procurement. The rules define a set of compulsory award criteria and a graded scoring system of additional incentives for school caterers to improve the general quality of school meals. Among other aspects, the compulsory criteria require the use of a minimum percentage of 15% of organic ingredients while the scoring system incentivizes school caterers to increase the share of organic food beyond what is mandatory [8]. It does not specify the product group in which the organic ingredients must be used.

The Berlin procurement rules for school catering are perceived by interviewees as a strong driver for the use of organic food. As organic food is one of the explicit reward criteria in the scoring system, catering companies compete over the share of organic food they use. A kitchen manager of a school catering company described his company's motivation to increase the share of organic food:

We use organic food because we got our school catering contracts through tenders. There are certain tendering criteria and the catering companies can offer a percentage of organic food [which they guarantee to they will use], which is equivalent to a certain number of points in the tendering process, so you are more likely to be awarded the contract. There are a maximum number of points to be awarded for an organic share of 56%, and that's what we offered. So the school meals we provide use 56% organic ingredients. (Caterer 4: kitchen manager, 7000 meals per day)

While a few caterers had focused on organic food before the procurement rules were introduced, the incentives for using organic food have also led other catering companies to increase the share of organic food on their menus. All interviewed caterers confirmed that, at the time of the interview, at least 40% of the total food they used for school meals was organic, expressed in terms of value. The graded scoring system incentivizes the use of organic food up to 56%, which is what caterers aim for when they try to win a tender. Aiming for a smaller organic percentage makes it easier to source ingredients, particularly for some large caterers who regularly need large quantities of produce to fulfill their contracts. Larger caterers also said that they primarily use organic ingredients in product groups where the price difference between organic and conventional products is small. Some smaller caterers use up to 100% of organic ingredients because they operate in a niche market segment that also serves institutions that particularly value organic food, are able to pay higher prices, and are not subject to the procurement policy, such as independent schools and nurseries.

The use of locally produced food is not incentivized by Berlin's procurement policy, unlike the sustainable procurement practices in other European regions [4]. When local food is used, this is due to a positive attitude shown towards local sourcing by some caterers, and, to a certain degree, explicit requests from parents:

It's parents, of course, who ask for local food. Local sourcing, that's one thing that's always requested. And I tell them we'll do our best. But in the end, as I said, our main supplier is [local organic wholesaler] and we can only buy what [local organic wholesaler] has to offer in terms of local food. (Caterer 1: owner of catering company, 900 meals per day)

The last statement indicates that, in practice, the use of local organic food depends on availability through the caterers' regular suppliers. Caterers describe a general need to balance several factors in their sourcing practices. Other factors that influence the use of local organic food are price, quality, and the availability of preprocessed food, such as peeled and sliced potatoes, on which they are heavily dependent. Two of the actors interviewed described their perspectives on sourcing as follows:

In general, this is a very important concept for us. Using a lot of organic vegetables, whenever possible fresh and local—because we want to provide healthy meals. But, of course, we also need to make compromises [. . .], for example, beans in winter and, of course, canned tomatoes and canned corn and preprocessed sauerkraut. And sometimes preprocessed potatoes, which we know are not from the region. [...] My cooks don't have time to peel potatoes for eight hours. We don't have the capacity and then we need to use that [preprocessed] stuff. (Caterer 2: owner of a catering company, 1000 meals per day)

We always tell our suppliers that we want it [local and seasonal produce] whenever possible. The determining factors are (a) [pre-processed] qualities and (b) price. It is that simple. (Caterer 4: kitchen manager, 7000 meals per day)

As several studies have shown, a key constraint in sustainable school catering procurement is the price premium for local or organic produce, e.g., [15,54]. With regards to the situation in Berlin, the interviewees perceived the fixed price of 3.25 EUR per meal as a limiting factor to using a significant share of local organic food, which the caterers described as more expensive than conventionally sourced or non-regional organic foods. Price is described as a decisive factor in the decision between purchasing local or non-local produce:

Of course, you have to remember that we are in a very low-price segment. A school meal costs about EUR 3.25 and of that, we can use a maximum of EUR 1 for the cost of goods. [. . .] We have committed ourselves to using organic, so we do. But if, for example, an organic apple from Germany is twice as expensive as one from Spain, we take the Spanish one. (Caterer 5: procurement manager, 30,000 meals per day)

The interviewed caterers purchase organic vegetables from local conventional and organic wholesalers as well as from specialized preprocessing and trading companies that operate nationwide. An important factor in selecting a supplier is reliable deliveries tailored to the workflow of large-scale kitchens, which a caterer describes as follows:

Delivery reliability is very important for us. We need to make sure we get what we ordered. We plan in advance. We do plan our menus and we need to follow the plan. If it doesn't work out once, that won't be the end of the world, but in general, we need to follow the menu plan. And we rely on getting what we order [...] so we have two different wholesalers that supply us with peeled potatoes, organic and conventionally produced. (Caterer 1: owner of a catering company, 900 meals per day)

This statement also underlines large-scale kitchens' dependency on a continuous supply with large quantities of certain foods. Therefore, larger catering companies commonly coordinate requirements with their suppliers ahead of time, and make arrangements to ensure delivery reliability for specific products:

We have an arrangement with our suppliers that if we need peeled potatoes, we can call them until noon and they will deliver the goods the next day. This is really important with regards to shelf life, ordering processes, and the logistics involved—and that's why we have a fixed supplier. Because we do not have large storage capacities in our kitchens, we have to be able to rely on the supplier being really flexible so that we can order often—sometimes on a daily basis. (Caterer 5: procurement manager, 30,000 meals per day)

While all interviewed caterers purchase mainly from wholesalers, direct purchases from local farms are rare and only reported by smaller catering companies. Such purchases were described as "one-off deliveries". Individual farms cannot regularly provide the foods and the reliable service required in school catering. Also, sourcing from farms means less delivery security and additional organizational effort, such as individual ordering and delivery arrangements:

If I always purchased directly from farmers, there would be a lot of effort needed for coordination and there's also the risk that their car breaks down or that something else goes wrong [...] and I'd be stuck here alone with no vegetables. (Caterer 1: owner of a catering company, 900 meals per day)

The above statement illustrates the crucial role that local intermediaries play in school catering procurement for the access to local and organic foods through bundling supply and providing logistics see also [55].

Wholesalers—The interviewed wholesale managers represent three different companies: a full-range wholesaler focusing primarily on conventionally produced food but also offering a range of organic products, an organic wholesaler specializing in organic food, and a new, specialized organic vegetable wholesaler aiming to reduce food waste by distributing farms' surplus vegetables to catering services. All three wholesalers operate within the Berlin-Brandenburg metropolitan region.

All three interviewees perceived a generally increased demand in local and organic food, both from retail and catering. The organic wholesalers link this increased demand to the procurement rules in school catering:

Organic school catering is an important factor for organic wholesale in Berlin. On one hand, there are caterers who are committed to using organic food even without any guidelines—and

have done so for a long time. On the other hand, the procurement guidelines encourage caterers who are not big fans of organic food to look into organic as well. This includes large companies that operate nationally and internationally. (Wholesaler 2: managing director, full-range organic food wholesaler)

Both the organic and the specialized vegetable wholesaler described a strong dispositional commitment to organic farming and local value creation that plays a central role in their local sourcing efforts. The organic wholesaler interviewed for this study perceives himself as deeply rooted in the local organic industry and has maintained long-standing partnerships with local farms:

In season, we source a large share [of vegetables] locally. This means from Berlin, Brandenburg, and the districts bordering Brandenburg. We definitely try to source from nearby. When it comes to local fruits and vegetables, local organic wholesalers are important because they have long-standing relationships with farmers. (Wholesaler 2: managing director, full-range organic food wholesaler)

The specialized vegetable wholesaler works with both local farmers and importers to rescue surplus harvest and non-marketable, imperfect vegetables and sell them to restaurants and caterers. They describe themselves as a mission-driven company that primarily aims to reduce food waste. The interviewee perceives it as difficult to build relationships with local farmers because for them, selling imperfect produce is often not interesting from an economic perspective due to the effort required for organization and logistics:

We thought, there are so many farmers—we just need to show them what we do and they will sign up. But that's not how it is. You need to adapt to the processes of farmers and it takes a long time to establish relationships [with farmers] in Brandenburg. (Wholesaler 1: managing director, organic vegetables wholesaler)

In contrast, the full-range wholesaler has no specific local sourcing practices for organic vegetables. The interviewees described past attempts to build direct relationships with local organic farms that were unsuccessful due to requirements that could not be met by farmers, such as a continuous supply of certain quantities and qualities. The full-range wholesaler sees business potential in trading local organic vegetables but does not currently work with local organic vegetable farms because access to the farms is perceived as difficult. This underscores the importance of the organic wholesale sector in the Berlin-Brandenburg region that actively works on establishing partnerships with local producers and connects rural farms to purchasers in urban areas.

Farmers—All interviewed farmers are based in Brandenburg, the federal state surrounding Berlin, and concentrate on growing organic vegetables. In Brandenburg, organic vegetable production spans about 790 hectares (400 hectares of potatoes and 390 hectares of other vegetables), which is a relatively small share of the total agricultural land compared to other parts of Germany [56]. The 390 hectares of organic vegetables represents 6% of total vegetable production in Brandenburg; in the neighboring federal state of Saxony this figure is 25% grown on 1000 hectares [56]. The interviewees include both managers of well-established and newly founded farms. They described a strong commitment to organic farming principles and personal values that play an important role in how they run their businesses, such as a commitment to family farming and biodiversity. In particular, newcomers express strong notions of independence and entrepreneurial daring in pursuing their individual ideas of starting up a farm while at the same time describing economic challenges that impact their value chain activities.

In our first year, we started out very idealistic, with a diversity of vegetables crops, direct marketing, and things like that. But at some point, we realized that it is so much work and just not worth it. [. . .] since then, we have developed our business in such a way that we sell 90% [through wholesale], which means specializing in specific vegetable crops. (Farmer 2: 5 ha, wholesale supplier)

All interviewees perceived organic vegetable farmers in Brandenburg as each having an individual niche, which results in what interviewees describe as very little competition between farms. At the same time, they saw an increase in demand for local organic vegetables. One actor described a demand-driven market that is still undergoing further development. Several farmers emphasized that Berlin is a very important market for their products where they can charge “good prices”, both in direct marketing and organic wholesale. Two farmers described this situation in the following statements:

If we weren't based here [near Berlin], it really would be much harder. That's just the way it is. We have the great advantage of being here. (Farmer 3: 13 ha, distribution through direct marketing and organic wholesale)

There could be more farms. There are still a lot of goods brought in from outside the region and I am not just talking about exotic fruit. Also things that we stock for January or February—onions, carrots, our supply only lasts for a certain time. Because there is so little vegetable production, so much more could be done, also with regards to storage. Demand is growing steadily. (Farmer 2: 5 ha, distribution through organic wholesale)

Despite the opportunities described above, farmers are also facing challenges. A drawback noted is the effort required for logistics, particularly for direct marketers:

Berlin is our main sales market, but the problem is that you need time to get there. If you start out growing vegetables, you don't have time for anything. You don't have time for a farmers' market and you don't have time to drive your produce to Berlin. It would take way too much time—time that you need on your fields. That's why intermediaries who take your products to Berlin are so interesting. (Farmer 1: 1 ha, distribution through direct marketing)

The interviewed organic vegetable farmers market their products primarily within the Berlin-Brandenburg region as fresh produce, both through direct marketing, independent grocery stores, and local organic wholesale. Farms that focus on direct marketing sell their produce through farmers markets, box schemes, community-supported agriculture, or directly on site at their farms. Many newcomers focus on direct marketing because it enables them to market products quickly, independently, and flexibly, and to deal with challenges in the start-up phase that may prevent them from working with wholesalers. While some of the farmers interviewed had never heard of the Berlin procurement rules for school catering, others had experience with occasionally distributing surplus produce to caterers directly. Those transactions were described as individual sales:

In high season, I sometimes need to sell surplus produce [...]. So, if a catering company calls and asks what we have, I'll tell him, say, that we have oversized celery, for example. If he then takes 100 kilos of it, it may make sense to actually drive there [to deliver it]. (Farmer 5: 25 ha, distribution through direct marketing and organic wholesale)

Other farmers distribute their products through wholesalers. Interviewees described long-standing partnerships with local organic wholesalers that involve production planning and sharing market information. Well-established farms perceived this collaboration as reliable and the partners as trustworthy. They also described information sharing and joint pricing:

Our relationship with local wholesale is based on partnership. Once a year, they bring producers together to discuss prices and requirements. And they put local first. If a product is available locally, they will go to great lengths to source it locally. (Farmer 4: 20 ha, distribution through direct marketing and organic wholesale)

The interviewed farmers mostly have well-functioning local marketing channels for fresh produce, either using some form of direct marketing or working with local organic wholesalers (Figure 3). Conventional wholesale plays a minor role. Direct marketing to catering services is also rare. Similar to the caterers, the interviewed farmers also see a lack of organic processing facilities in the region see also [57].

5.2. Context Analysis: Structural Factors

The above analysis of individual actors' practices and internal structures provides a depiction of current marketing and procurement structures in Berlin school catering and the local organic vegetable industry. It suggests that the proliferation of organic food in school catering has not supported the creation of coordinated local value chains. When local organic vegetables are used in school meals, this happens largely by chance. Local organic vegetables only find their way into Berlin's school meals when caterers can use their regular suppliers to source locally and when prices for local produce are competitive. There is no apparent local end-to-end value chain from farm to school. The present study identified four key structural factors that enable or constrain the use of locally produced organic vegetables in Berlin school catering: (1) price, (2) procurement policy, (3) supply and demand for local organic produce, as well as (4) shared values and partnerships between actors.

Price—Among the interviewed caterers, there is a general understanding that the primary limiting factor for locally-sourced organic food in school catering is price. The fixed price of EUR 3.25 per meal is perceived as too low to use a significant amount of local organic food. These findings are in line with earlier studies from other regions that also identified higher prices for local or organic food as a constraining factor for their use in institutional catering, e.g., [15,21,54].

According to Filippini et al. [14] price is not a constraint for including organic food per se, but a limit to increasing the volume of organic food in school catering. Thus, they consider sustainable procurement policies as only partially successful in overcoming the strict cost effectiveness criteria of traditional procurement, a result which is in line with the findings of the present study. While school caterers in Berlin no longer compete directly based on price, they compete in terms of cost efficiency as they try to provide higher shares of organic food at the given price. This in turn prevents them from sourcing locally, which is often less cost-efficient due to small production scales and costly logistics see also [16,54].

Lethinen [15] found higher prices for local food to be the primary barrier to the implementation of local school catering procurement when local food producers compete with supply from national or even international food markets. This is also true for the Berlin-Brandenburg region, where organic vegetable farms in Brandenburg focus on selling high-priced differentiated products through retail or direct marketing and do not usually aim to compete over price with food from national or international markets. In establishing local value chains for school catering, one challenge is to create a system that is financially viable and attractive for local organic farmers. Conner et al. [19] and Stevenson et al. [26] suggest that this could be achieved through establishing values-based supply chains, where farms form strategic partnerships with other value chain actors to produce and distribute high volumes of differentiated produce on a regional level, and distribute their profits equitably between partnering companies.

Procurement policy—Since the introduction of the current Berlin school catering procurement policy, both the organic wholesaler and the specialized vegetable wholesaler have seen an increase in the demand for organic food. These findings are in line with other studies that identified the implementation of procurement policies on a local level as a key driver for sustainable procurement practices [4,14]. However, the interviewed farmers did not perceive an increased demand for organic vegetables linked to the introduction of the procurement rules. This situation suggests that the increase in demand is satisfied by organic produce that is mostly produced outside the Berlin-Brandenburg metropolitan region. It can be seen as a result of the Berlin procurement rules not incentivizing the use of local food, which stands in contrast to other sustainable procurement policies that directly or indirectly prioritize local food [4,6]. Smith et al. [4] described examples from Scotland and Denmark where the prioritization of local sourcing in sustainable public sector food procurement is used as a policy instrument to support local economies and improve public health.

European procurement regulations are sometimes assumed to restrict the local sourcing of food for public institutions [15]. This is due to an inherent tension arising from several concerns that European public procurement policies aim to satisfy, ranging from environmental and social sustainability

on the one side, to free trade, economic efficiency, and competition on the other [6,58]. The latter can be interpreted as prohibiting the prioritization of local producers in public catering contracts. Despite this apparent restriction, there is some scope for public authorities in the formulation of their specific procurement policies [58]. Local policy-makers take advantage of this scope to prioritize local food through quality criteria that are closely associated with local sourcing, such as freshness and seasonality [6].

Supply and demand for local vegetables—Independently of the procurement rules, interviewees at all value chain levels perceived an increased demand in locally produced food. Some caterers see this as a consumer trend which is also increasingly relevant in school catering. They describe a general interest in using more local organic food in school catering but also suggest that use in practice is restricted, due to price, but also due to a lack of preprocessed, locally produced supply.

The existing organic farms concentrate on marketing fresh produce through direct marketing and regional organic wholesalers rather than producing vegetables for processing. This is also due to a lack of preprocessing facilities in the Berlin-Brandenburg region. Because of work organization and facilities in large-scale kitchens, catering companies are heavily dependent on preprocessed food, such as peeled and sliced potatoes, which they cannot source locally. Instead, they rely on specialized suppliers that operate nationwide and partially use cheap, anonymous vegetables from spot markets, which makes it difficult for school caterers to track the origin of the primary products. This situation was confirmed by value chain actors on other levels of the value chain. It is also in line with findings from other studies that identified the dependency on preprocessed food as a barrier for local value chains in school catering [18,54,59,60].

In contrast to findings from earlier studies in Northern Europe [16,61], the present study found no general issues with the availability of organic food for use in school catering. In Berlin, school caterers and wholesalers have established structures that enable them to source the required qualities and quantities from national and international providers.

Shared values and partnerships—Despite the issues described above, there is a positive attitude towards local sourcing and local organic food production that many of the interviewed actors share. Shared values among actors are considered to be key prerequisites for establishing short food supply chains or values-based supply chains [23,24], which are discussed in the context of sustainable food systems, also with regards to school catering [15,62]. In addition to this, there are some current value chain practices that could already be characterized as using short food supply chain or values-based supply chain concepts. For example, several farms that use forms of direct marketing as distribution channels are embedded in structures that could be described as short food supply chains [22]. Other farms have long-standing, trustworthy wholesalers as partners that could also be characterized as coordinated values-based supply chains [26]. The existing local value chains, however, are not geared towards school catering.

Using Peterson's [17] categorization of agri-food chains, school catering procurement in Berlin can be characterized as mostly spot market-based with a tendency towards vertical coordination, particularly in the case of larger catering companies. Some caterers have long term arrangements and coordinate requirements with their suppliers in advance. Local organic wholesalers play a particularly important role in the industry, as they supply school caterers with organic vegetables and handle the logistics to make produce from Brandenburg available in Berlin. Some wholesalers have also adjusted their services and product range to the specific requirements of public caterers. The importance of regionally-based intermediaries has also been pointed out by Izumi et al. [55] who described food distributors and their relationships to local actors as enablers for local school catering value chains.

6. Conclusions

The present research applied strong structuration theory in a case study of the organic vegetable value chain for school catering in the Berlin-Brandenburg metropolitan region. By providing comprehensive insights into the social system of the value chain, the results contribute to the discussion

on local and organic food in sustainable school catering, which is a current issue in many European regions. Using a strong structuration theory approach, it was found that the actor's existing practices prevent the formation of a complete value chain from farm to table. There is a local gap in school catering. While the current catering procurement policy has led to an increased use of organic food in Berlin's school meals, it has not contributed noticeably to local value creation in the organic vegetable industry. Without intervention which aims to support local value chains, the existing structures can be expected to continue to reproduce the local gap in sustainable procurement in Berlin's school catering.

There are several ways this situation could be addressed at the practical and policy levels. To establish sustainable school catering that includes locally-sourced organic produce, Berlin's policy-makers could support local value creation by introducing incentives for the use of local organic food in public procurement policies, by establishing award criteria that take local sourcing into account and support it financially. There are examples from other regions in Europe that have successfully integrated local sourcing incentives into public procurement guidelines see, e.g., [4]. Moreover, to evaluate the impact of procurement policy, an evaluation framework, including periodic data collection on school meals and the local vegetable industry, has to be developed. At present, there are no statistics available on the use and sourcing of organic food in school catering in the region, which also makes it difficult for both policy-makers and practitioners to make strategic decisions.

The city of Berlin has committed to implementing a comprehensive and long-term sustainable food policy. A further increase in the organic share of school catering is part of this policy [63]. The results of the present study suggest that, without an explicit focus on local sourcing as an award criterion in the procurement process those measures will not strengthen sustainable value creation in the region.

On a practical level, infrastructure problems in the processing of fresh vegetables have to be overcome in order to increase the use of local organic vegetables in Berlin's school meals. This could be addressed by equipping large-scale kitchens with the staff and facilities required to process fresh produce or by setting up pre-processing facilities in the region. Based on the current results, only the latter solution appears realistic, due to the decentralized nature of school catering in Berlin and the highly optimized work organization that generally prevails in school catering.

Policies to strengthen local organic production for schools need to provide more incentives for farmers in the region to grow vegetables for processing. Support needs to be provided to young and diversifying farms to introduce them to organic vegetable growing, produce the necessary qualities and quantities, and develop financially viable marketing strategies that are geared toward school catering services. Policy-makers and local non-governmental organizations could help to increase local organic vegetable production by providing support for farmers new to organic farming, for example by setting up and supporting training and advisory services for farmers in the region. Compared to other German regions, there are hardly any specific advisory services for organic vegetable producers in the Berlin-Brandenburg region.

Practitioners should work to improve organization of the value chain to leverage the potential for more local value creation. Strategic partnerships among actors—e.g., in the form of values-based supply chains—could help to scale up production, pool supply, and close gaps in the local value chain through joint investments in the lacking infrastructure, such as preprocessing facilities. In order to bring more local vegetables into school catering, it is particularly important to find suitable organizational structures to coordinate the value chain in a way that makes local organic vegetable production for processing in large-scale kitchens financially viable for all participants, especially farmers.

Further research is needed on how local sourcing and aspects of values-based agri-food chains can be considered as criteria in sustainable public procurement processes. For example, it may be beneficial to investigate whether local values-based supply chains exist in the context of school catering procurement in other European regions, and how they are implemented. Structuration theory could provide a theoretical lens to study the processes in developing local organic value chains, to identify

changes in actors' practices over time, and investigate how these practices are affected by value chain coordination activities.

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Paper II

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Behind the scenes of a learning agri-food value chain: lessons from action research

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Abstract

The development of sustainable agri-food systems requires not only new academic knowledge, but also concrete social and organizational change in practice. This article reflects on the action research process that supported and explored the learning process in an emerging agri-food value chain in the Berlin-Brandenburg region in eastern Germany. The action research study involved value chain actors, academic researchers, and process facilitators in a learning network. By framing the network's learning and problem solving processes in concepts of organizational learning, lessons were drawn for researchers and value chain developers. The results underline the importance of process facilitation in a learning value chain to create a social space, in which the actors in the value chain can interact and find a common basis for collaboration. In the learning process, facilitators used an iterative design to consistently align learning activities with the needs of practitioners to ensure practical relevance. To establish new practices and partnerships, value chain actors challenged existing routines and developed new ideas and visions, while at the same time improving established practices within their organizations and along the entire value chain.

Keywords Action research · Organizational learning · Process facilitation · Grounded theory · Local and organic food

Introduction

The transformation towards more sustainability in many areas of society calls for collaborative learning; in which stakeholders question existing practices, as well as frames of reference and perspectives that they sometimes take for granted (Boström et al. 2018). One such area is the agri-food system, where the importance of creating shared knowledge and understanding to address sustainability challenges has

been widely discussed in the literature (e.g., Batie 2008; Moschitz et al. 2015). Building effective and responsive agri-food systems is a complex social process that is centered around knowledge creation among all actors of a food value chain (e.g., Coughlan et al. 2016; Peterson 2009). During this process, the actors need to learn together, negotiate common goals, and develop and implement joint business models or other forms of partnerships that enable them to work together towards more sustainable systems (Peterson 2009).

This paper offers insights into a learning network that was formed to bring together a group of actors from the agri-food system—farmers, food processors, and traders—in the Berlin-Brandenburg region in eastern Germany. There is a high demand for local and organic food in the region, but structural issues in the agri-food system prevent local actors from benefitting from the potential for local capture of the value of that demand, particularly in the organic vegetable sector (Braun et al. 2018; Doernberg et al. 2016). The members of the learning network aimed to gain a better understanding of these issues, and to develop a sustainable agri-food value chain that benefits all actors involved equitably.

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The learning network was supported by a facilitation team of both academic researchers and staff members of a local advocacy group for organic agriculture. This facilitation team managed the learning process and provided the network members with access to the necessary resources, such as project infrastructure, training sessions, and other learning activities. Within the learning network, the activities were embedded in a case study that followed an action research approach. Action research provided a platform for the members to create knowledge and understanding regarding the issues at hand, by continuously discussing problems and possible solutions, experimenting with new practices, and reflecting on the outcomes. The first author of this article is a researcher in the facilitation team and was responsible for the research design and its implementation. With regard to the learning network, she was actively involved in the strategic planning of the process and engaged in the practical facilitation of network activities.

The present paper frames the collaborative learning and problem solving processes inherent in an emerging local agri-food value chain through theoretical concepts of organizational learning, and reflects on the action research process of the study. It offers a look behind the scenes of the learning network, focusing not on the details of the value chain, but on the strategies developed to enable collaborative learning and change in the network through action research. Since the establishment of the learning network, the process has led to a number of improvements in production and logistics, as well as the formation of partnerships and joint ventures in the region's organic vegetable sector. The experiences from the network can serve as an example of how organizational learning among stakeholders of local agri-food systems can be facilitated. The objectives of this article are, therefore, to illustrate the facilitation of the learning process, and to outline lessons learned, as recommendations for the development of other local agri-food value chains using similar participatory approaches.

Collaborative learning through action research

Action research brings together practice and research. It is not a distinct methodology, but rather a set of tools and methods that share a participatory orientation towards knowledge creation (Bradbury 2015). In action research, researchers work actively together with the people affected by a real-world problem instead of taking a more positivist and thus, more passive, observatory research approach. Action research is a collaborative learning effort, in that researchers effect change in the practitioners' world, and through this, are also able to personally experience how practitioners think and act in a particular situation. At the

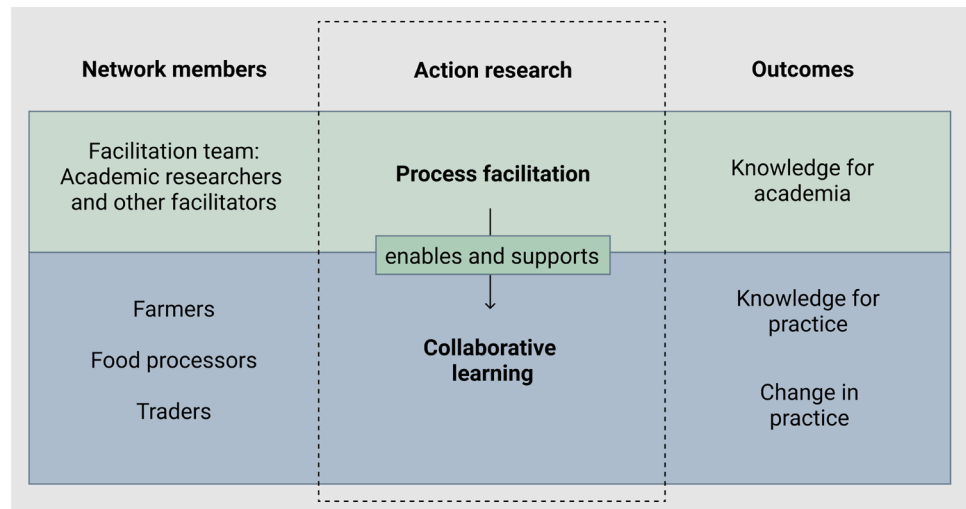
same time, practitioners learn to more systematically explore and address the issues identified in the learning process. Through the collaborative learning process, action research, thus, creates new knowledge for both academia and practice. This understanding of knowledge creation is rooted in the axiom “you cannot understand a system until you try to change it”—a notion that is based on the work of Lewin (1946), who pioneered applied research into organizational development (e.g., Schein 1996, p. 64).

In recent decades, action research has become an umbrella term for a number of different approaches aimed at organizational learning and development and, more generally, the improvement of complex social situations (e.g., Argyris and Schön 1989; Schein 1995; Shani and Coughlan 2019). Action research approaches have been used in agricultural research and development since the 1970s (Whyte 1991) and have more recently been applied to the study of local agri-food systems (e.g., Block et al 2008; Coughlan et al. 2016; Conner et al. 2010; Guzmán et al. 2013; Swords 2019). What the latter studies have in common is that action researchers brought together multiple actors and helped to manage the complexity of the problems under investigation by facilitating collaborative learning—both to create new knowledge, and to improve the participating actors' situation. For example, Coughlan et al. (2016) developed a specific action research approach they dubbed “action learning research” to explore and support several learning networks among small-scale food producers in different parts of Europe. Within these networks, food producers learn together to explore issues and create new knowledge that they later implement and exploit individually in their own organizations (Coughlan et al. 2016). Other action research studies specifically addressed the development of local agri-food value chains. Guzmán et al. (2013), for example, presented several case studies from the Spanish organic farming sector where action research was used to explore and support local networks of food producers working together to establish collaborative models for the production and marketing of organic food products.

The present paper adds to the discussion of change through collaborative learning in the agri-food sector by drawing on theoretical concepts of organizational learning as a lens for exploring the process of learning and change in a network of value chain actors (Fig. 1). The design of the action research study also included a component of process facilitation aimed at creating an environment where effective decision making and problem solving can take place, in the sense of double-loop learning (Argyris 1995).

As process facilitators, the action researchers were not mere observers, neutral and detached from the subject of the study. Rather, they were immersed in the setting they were studying and became actors themselves as they supported participants in achieving their goals. With regard to

Fig. 1 Action research applied to the present study's learning network



the concrete goals of the network, however, the facilitation team was neutral and did not pursue its own agenda. Rather, the team supported practitioners in making well-informed decisions and implementing them.

The study followed a strand of action research that is concerned with issues of management and organizational studies (e.g., Eden and Huxham 1996; Shani and Coghlan 2019) and is situated in the context of the agri-food sector in Western Europe. The learning network is not a social movement that pursues a political agenda in the sense of “activist research” (Hale 2001) where researchers work with affected people to overcome social justice issues. Rather, the purpose of the network is the improvement of the professional practice of the participating actors, along with the co-generation of practical and academic knowledge on the same topic.

Process facilitation

In an action research study, researchers act as facilitators for learning and change processes in organizations, networks, or other social settings. In the literature, the role of such facilitators is commonly discussed under the generic term of intermediation (e.g., Agogu e et al. 2017; Howells 2006; Klerkx and Leeuwis 2009; Kivimaa et al. 2019). Intermediation is performed by individuals or organizations that support the interaction between the stakeholders of a particular project, problem, or process. They act, for example, as innovation brokers that help stakeholders to develop steps towards transformational change (Klerkx and Leeuwis 2009). Their exact functions vary depending on the situation and context in which they work. In practice, they may bring actors together, manage their interaction, or provide them with resources necessary to reach a common goal (Kanda et al. 2020).

Facilitation in action research can be described based on Schein’s (1995) model of “process consultation”, where a facilitator works with a group of people to solve a practical problem. Process consultation differs from other common models of consulting, which rely on a consultant’s expert advice or special diagnostic capability to solve a problem for a client. By contrast, a process consultant is a facilitator who helps to create conditions that allow actors to uncover and address problems themselves based on their needs and objectives. In Schein’s terms, “the client owns the problem and the solution, but consultant and client jointly own the inquiry process that will reveal what the correct next step might be” (Schein 1997, p. 207).

Organizational learning

Organizational learning can be defined as a process, in which people or organizations detect a problem caused by a discrepancy between the intended and actual outcomes of their actions, and correct it (Argyris and Sch on 1996). This abstract understanding of learning is based on the idea that people have internal representations of reality, often called mental models, which they use to reason about the world and take action (e.g., Gentner and Stevens 2014; Senge 1990). Mental models are tacit knowledge structures that can be understood using Argyris and Sch on’s (1996) theory of action, which distinguishes between espoused theory and theory-in-use. Espoused theory describes people’s intentions—or how they think they act—while theory-in-use manifests itself in their actual behavior. According to Argyris and Sch on (1996), when organizational learning takes place, people better align their intentions with the consequences of their actions. Through reflection, practitioners can develop new knowledge about their work and improve future practice

(Schön 1983). Similarly, Senge (1990) emphasizes the need for reflection to become more aware of one's own mental models, and the need for inquiry through interaction with others when dealing with complex issues.

According to Argyris and Schön (1996), there are two modes of organizational learning—single- and double-loop learning. Single-loop learning refers to a situation, in which people or organizations improve their existing procedures but the mental models that guided the initial actions remain unchanged. By contrast, double-loop learning occurs when not only actions are changed, but the underlying mental models that determine them are also altered. Thus, a given problem is addressed by challenging the basic assumptions, objectives, or values that caused the problem in the first place. An environment that enables double-loop learning helps people to generate valid and reliable information, make informed decisions, develop commitment to implementing those decisions, and monitor outcomes to detect and correct errors in their behavior (Argyris 1995). The concept of double-loop learning has been used in a number of recent studies on learning related to major challenges or changes in agricultural and food systems. These include, in particular, studies concerned with behavioral change to reduce agriculture's environmental impacts (e.g., Inman et al. 2018; Tengberg and Valencia 2018), and studies that address how new practices can be established in agricultural production and management (e.g., Eshuis and Stuver 2005; Melin and Barth 2018).

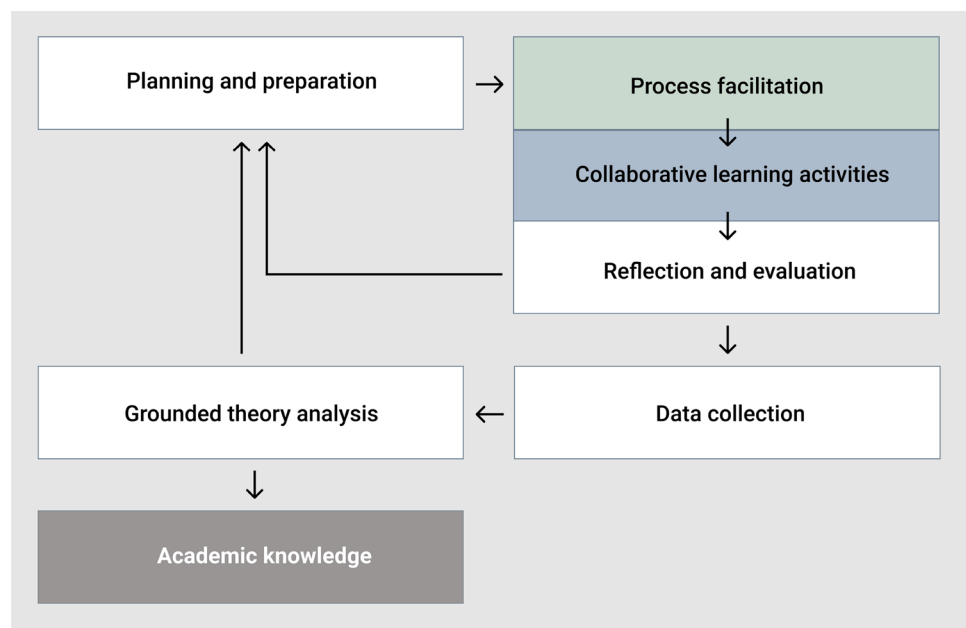
From data gathering to conceptualization in the action research process

The study integrated a grounded theory analysis into the action research process (Fig. 2). By planning, implementing and reflecting on learning activities, data were continuously collected, analyzed, and conceptualized through the grounded theory approach. The results of the analysis formed the basis for academic knowledge and were also used in the planning and preparation of subsequent learning activities.

Grounded theory, originally introduced by Glaser and Strauss (1967), is a qualitative research methodology for systematically generating theory through abduction in an iterative process of data collection and analysis (Corbin and Strauss 2015; Richardson and Kramer 2006). It is widely used to investigate social practices and processes, and has gained recognition in agri-food business research through Bitsch (2005) and Peterson (2011). In the present paper, the grounded theory approach was employed to distill lessons learned during the study's iterative action research process. Rather than looking at the value chain as such, the analysis was aimed at tracking the strategies employed in the facilitation of the network and documenting the unfolding of the learning and problem-solving processes.

A special feature of action research is that data are collected about what people say or do when they are confronted with a need for action. Data from action research are reliable and timely, in the sense that they are collected at the moment an action takes place, as opposed to being a description of a past situation (Huxham 2003). In the terms of Argyris and

Fig. 2 Grounded theory analysis embedded in the study's action research process



Schön (1996), action research has the potential to uncover theories-in-use, because it focuses on the actual behavior of actors rather than on the espoused theory they articulate, for example, in an interview. The combination of action research and grounded theory, therefore, generates knowledge that is not only grounded in data, but is also “grounded in action” (Eden and Huxham 1996, p. 82).

Data collection and analysis took place between November 2017 and June 2020. Data were obtained throughout the action research process from participant observation at workshops and business meetings, qualitative interviews and informal conversations with value chain actors, and internal process planning and reflection sessions of the facilitation team (Table 1). Data consisted of field notes, video, and audio transcripts; as well as other material collected in meetings and workshops, such as flipchart sheets or drawings produced by participants.

In the grounded theory approach, data analysis is a recursive process of constant comparison, where researchers look for similarities and differences in data (Corbin and Strauss 2015). During the analysis, the raw data are systematically broken down and compared, and recurring concepts are extracted, labeled, and annotated in a process known as open coding. Conceptually similar codes are then grouped together, refined, and abstracted into categories. Throughout the process, researchers move back and forth between data collection, coding, and category (re)conceptualization.

The analysis took place in three recursive steps. In the first step, the data collected in the context of action research was reviewed and systematically organized. This pool of data was the basis for open coding, in which codes were assigned to text fragments and other types of data (such as photographs). During this process, as new codes were

created, other codes were merged, renamed or deleted through constant comparison of new data to previously created codes. The analysis process was supported by Atlas.ti, a software package for qualitative data analysis, which provides tools for managing, labeling, and annotating unstructured data (Friese 2019). While the analysis was initially open and exploratory, the focus was narrowed as the learning process progressed. Thus, after the initial experiences with the action research process, only those parts of workshops and meetings that were relevant to the discussion of the learning process were included in the coding.

Second, the categories created in the first step were further refined. Visual mapping techniques with paper cards and pinboards were used to connect categories and identify patterns that emerged during the learning process. Newly emergent categories were regularly cross-validated within the facilitation team and with input from other network members. The final result of the analysis was a hierarchy of categories and subcategories which reflected the facilitated learning processes (Fig. 3).

As a third step, the categories derived from the grounded theory analysis were interpreted in the context of organizational learning theory. Based on comparing the results to the existing literature and discussions among the authors, lessons learned were derived for the development of emerging agri-food value chains.

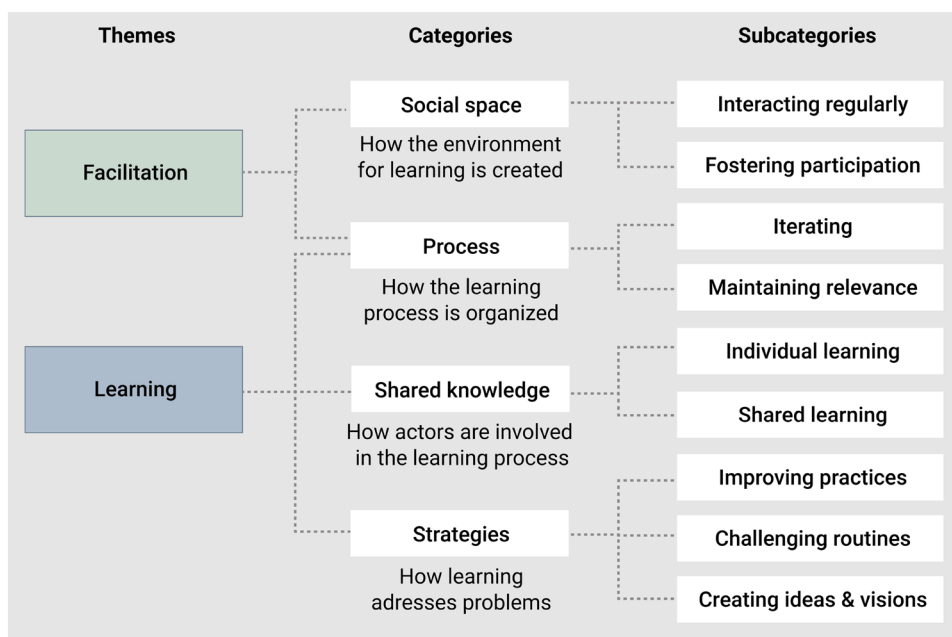
Case description: the learning network

This section illustrates the context of the present action research study and details the collaborative problem solving process that is at its core. The study is set in the

Table 1 Overview of data collected in the learning process

Data collection	Data sources
<i>Qualitative interviews:</i> Audio transcripts, photos, field notes	<i>Current situation of the vegetable sector:</i> 18 in-depth interviews with practitioners: farmers, traders, food processors (2018) <i>Evaluation of the learning process:</i> 12 in-depth interviews with practitioners (2019) 2 group interviews with practitioners (2020)
<i>Participant observation, workshop and meeting documentation:</i> Field notes, video and audio recordings, photos and other material produced at workshops and meetings	<i>Building and planning of the learning network:</i> 3 workshops with practitioners (2017, 2018) <i>Strategic business development and reflection (individual farms):</i> 2 workshops with farmers (2018, 2019) <i>Strategic value chain development and reflection (value chain):</i> 20 workshops and business meetings with small groups of practitioners (2018, 2019, 2020) <i>Reflection and planning meetings (facilitation team):</i> 11 internal workshops of the facilitation team (2017, 2018, 2019, 2020)
<i>Records of conversations:</i> Field notes	<i>Informal conversations with network members:</i> Workshops and field trips with practitioners, weekly meetings of the facilitation team, and evaluation meetings with external consultants and mentors Field notes from meetings and phone conversations Email archive

Fig. 3 Coding frame developed in the grounded theory analysis



Berlin-Brandenburg region, which consists of Berlin, a city of 3.8 million people, and the surrounding state of Brandenburg, a largely rural region dominated by agriculture. In the metropolitan area of Berlin, there is an increasing demand for organic food, both in retail and public catering, driven by consumer interest and by policies promoting sustainable procurement practices (Braun et al. 2018; Doernberg et al. 2016). While organic farming in the surrounding state of Brandenburg has also increased, a number of structural issues in the agri-food sector prevent local actors from using the potential. The cultivation area for organic vegetables is relatively low compared to adjacent regions, and there is little exchange or coordination among the various actors of the sector. Many farms used direct marketing and there were some individual partnerships between local organic wholesalers and farms, but hardly any distribution via mid-sized marketing channels (Braun et al. 2018).

Through public announcements and personal invitations, the advocacy group brought together various practitioners from the region to address the problems of the local agri-food sector. Participants included, for example, farmers who were looking for better distribution channels or wanted to diversify their operations, but also processing and trading companies interested in sourcing organic products locally. After several meetings and workshops, the network was formed to work towards a better understanding of the issues and develop solutions. To support the learning process and generate academic knowledge about the issues, researchers from a local university became involved. The activities of the learning network were supported by grants from the European Union and the state of Brandenburg.

The network included 22 farms, food processors and trading companies. Most of the actors did not have previous business relations and many did not know each other personally. All network members were located within a radius of about 100 km around the city of Berlin. The network included both start-ups and established organizations, with different capabilities in terms of resources and expertise. Some of the food businesses were certified organic, others were not certified yet. Some farms had produced organic vegetables for many years, some wanted to get into vegetable production. The range of participants was also diverse in terms of age and gender. The heterogeneity of the actors meant that many contexts, concerns and interests had to be reconciled during the collaborative learning process.

The process was supported by a four-person facilitation team which included academic researchers and staff from the agricultural advocacy group. They were an interdisciplinary team that brought together people with professional backgrounds in practical agriculture, agribusiness, food economics, and communication sciences, some of which had additional qualifications in group dynamics and coaching. The team's tasks included network building, process facilitation, and organizing targeted consulting and training activities. All of these efforts were part of the action research study and were designed to generate concrete applicable knowledge for practitioners as well as academic knowledge about the process in which they participated. The facilitation team's role in the learning process was not primarily to provide expertise based on their domain knowledge but to guide the process in the sense of process consultation (Schein 1995). For specific expertise, external consultants were brought in as needed.

The process was agile and flexible, in the sense that the final goal and the way to get there were not set from the beginning. Rather, there was an iterative planning process in which a series of consecutive phases were developed. Based on the outcome of one phase, the facilitation team planned the subsequent phase, together with the network members. Each phase was focused on a particular research question from which goals and activities were derived (Table 2). The activities of one phase were not necessarily completed with the start of the next phase. Some activities were continued throughout the study.

Phase 1: Exploring the initial situation

In the first phase, the network members discussed their needs and interests, defined common goals, and committed themselves to the collaborative learning process. They explored the issues of the organic vegetable sector in the region in several workshops, which also involved stakeholders from outside the network, such as industry experts, agricultural consultants, and policy makers. The learning activities in this phase included both group-based and individual inquiries into the actors' current situations, and workshops in which the outcomes of the research were discussed. These activities enabled the network members to get deeper insights into the current situation of the sector, to assess the potential for local value creation, and to identify specific issues to be addressed in subsequent phases.

Phase 2: Empowering value chain actors

The second phase of the action research study focused on empowering value chain actors to better understand their individual business situations and practices, and—on a higher level—to develop awareness of why they do what they do. During this phase, several group-based learning activities were facilitated, including a series of workshops on business development, farmer field schools on cultivating organic vegetables, and study trips to visit and learn from established operations in other regions. Farmers also received individual consulting and mentoring to address specific questions of organic cultivation, and to support experimentation with new practices.

As a result of the second phase, several farmers reoriented their operations towards larger-scale vegetable production, and some invested in new production technology and storage infrastructure. Others left the network to pursue other business strategies as they gained an improved understanding of their business situations. In parallel to the individual development of practitioners and their organizations, initial ideas of how to support value chain collaboration developed. To this end, meetings with market actors from outside the innovation network were facilitated to identify business opportunities and

help create greater market transparency for participants. These activities later became the focus of the third phase of the action research study.

Phase 3: Learning to collaborate

In the third phase, a year-long strategy process was facilitated to identify possible areas of collaboration, and to develop values-based value chains. In such value chains, small and midscale farmers work together with other food businesses to produce and market sustainable food products at scale (Stevenson et al. 2011). Values-based value chains focus on both the values associated with the product (such as local and organic) and the values associated with the business relationships within the chain (such as joint decision-making and fair profits).

Learning activities in this phase included workshops for developing common visions and ideas, and meetings for establishing joint business models. In addition, the participants carried out experiments that explored, for example, the potential for collaboration between farmers and processors in terms of logistics and information sharing. These experiments ultimately resulted in new supply relationships, actual collaboration in production and marketing, and the formation of new joint enterprises among different value chain actors.

Each of the three phases of the learning process involved the value chain actors in various activities of inquiry and experimentation—ranging from group-based learning activities in workshops, to practical experiments in which they explored new practices and new ways of working together. Learning activities were often supported by visual methods, e.g., collaging, aimed to visualize the perspectives and the tacit knowledge of network members on issues related to both their individual business situations and to the value chain in general (Fig. 4). Experimenting meant that the practitioners drew from their new knowledge, applied it in practice, and then reflected on the outcomes. The spectrum of experiments ranged from individual trials (e.g., trying out new production processes and cultivation methods) to more extensive ventures (e.g., negotiating the founding of a joint enterprise between several actors). Reflection took place, for example, in workshops and in individual meetings between practitioners and facilitators. Over time, a repertoire of knowledge, experience and skills, as well as common ideas and visions emerged that eventually led to new forms of partnerships among value chain actors.

Lessons from the learning value chain

This part of the paper outlines lessons learned from establishing a learning value chain as a result of linking process facilitation with organizational learning concepts, embedded

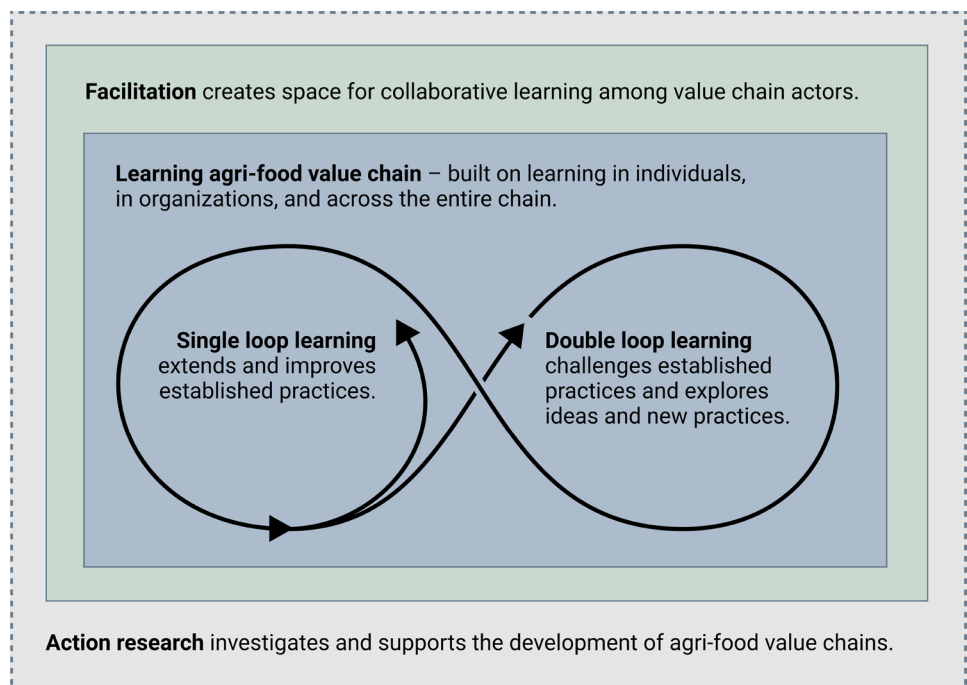
Table 2 Phases of the organizational learning process

Phases	Questions	Goals	Learning activities (Intervention)	Outcome
Phase 1 2017–2018	Who are the actors and how do they perceive the current situation?	Define the problem to be addressed through collaborative learning Establish a network of value chain actors, researchers, and consultants	Workshops for network building In-depth interviews with value chain actors within and outside the network Group discussions with industry experts and policy makers Workshop for presenting und discussing results from preliminary research	New insights and better understanding of issues concerning organic vegetable production and marketing in the region New learning network in which problems can be addressed collaboratively
Phase 2 2018–2019	How can actors better exploit the potential of local value creation?	Enable value chain actors to reflect on their business situation and opportunities for development Develop problem solving skills Establish market transparency	Workshops for facilitated reflection and strategy development (individual actors) Group based learning activities: field schools, study trips Consulting and mentoring to support experimentation with new practices Meetings with outside stakeholders to foster market transparency	Better understanding of the potential of the market and business opportunities Improved operational processes and production Realigned business strategies
Phase 3 2019–2020	How can values-based partnerships be created and established?	Think “outside the box”: Explore new ways of working together Establish and implement strategic partnerships	Workshops for facilitated reflection and strategy development (inter-organizational) Facilitated trials in logistics and information sharing Facilitated business meetings for negotiation and establishment of joint business models	Shared ideas and vision Improved communication and logistics New practices in production and marketing New partnerships: Formation of joint enterprises and other forms of value chain collaboration



Fig. 4 Examples of learning situations in the network: collaging, mind mapping, and practical training

Fig. 5 Process overview: facilitation, organizational learning, and action research



in an action research approach (Fig. 5). These lessons can be built upon for designing and implementing collaborative learning processes to support the development of local agri-food value chains, as well as for the use of action research in this context.

Social space

The starting point of the learning network were structural problems in the local organic vegetable sector, identified in the initial phase of the collaborative learning process. Problems included, for example, a lack of processing facilities and distribution channels for supplying the urban center with regional produce, and a lack of know-how, especially with regard to organic cultivation methods and the change in climatic conditions in the region. In addition, there was little exchange among actors in the sector. The network addressed these issues by bringing actors together and providing them with a learning environment to develop common understanding, from which they could work together to develop solutions. Within the network, the role of the facilitation team can be understood as that of an intermediary that supports social interaction between stakeholders. As defined by Kivimaa et al. (2019), the key functions of a process intermediary are to develop links between different actors and to support their interactions, in order to advance a particular innovation or transformation process.

Based on the problems and needs of network members, the facilitation team designed the program for the learning network and organized its activities. Network members took part in workshops and seminars, went on field trips, and established working groups around specific topics. The social space that resulted from these interactions was identified as one of the categories in the grounded theory analysis. It was derived from a metaphor used by members of the facilitation team when describing their work:

What we do is we create a space where you [the value chain actors] can come together and work on your problems so that something new can emerge. Our work is guided by what you need.

(Member of the facilitation team, in a 2017 workshop)

These regular opportunities for social interaction provided a physical space for collaborative learning, but also for getting to know each other and for building trust among the participants. Trusting relationships are a prerequisite for collaboration of any form, whether for developing a shared understanding of an issue or for building partnerships (Vangen and Huxham 2003). This applies to relationships among practitioners as well as relationships between participants and facilitators (Shani and Coghlan 2019).

The facilitation team designed the process from the outset with a focus on trust-building. On a formal level, there were

agreements on the confidentiality of information disclosed by participants, for instance at workshops where internals of each company were discussed. On a practical level, participants were encouraged to open up to each other and talk about their expectations, their ideas, and the issues they were facing. By recognizing common problems and goals, they developed a sense of “being in this together”. Over time, the actors gained more confidence in dealing with each other and formed a solid basis for communication. At this point, the facilitation team shifted the focus to sustaining the existing relationships by supporting communication and negotiations, maintaining transparency among participants, and fostering joint ownership in the process.

Lesson #1: In a learning value chain, process facilitators create a social space to support regular interactions among value chain actors. The facilitators foster an environment of openness and transparency, in which all actors can participate in a collaborative process of learning and problem solving.

Facilitating the learning process

The learning network’s facilitation team were tasked with enabling a heterogeneous group of value chain actors to harness the potential of local value creation. This objective can be understood as a “situation with a high degree of the unknown” (Agogué et al. 2017, p. 21), which involves a complex and ill-defined problem that has no definite solution and can only be addressed by intermediation—by bringing the stakeholders of the issue together in an exploratory process. To deal with the uncertainty, the learning and problem solving process within the network was designed as an iterative cycle of planning, acting, and reflecting.

The iterative design of the process is visible in the three major phases of the learning process but also in the individual interventions within each phase. The interventions of the first phase were developed on the basis of the goals, interests and needs of the value chain actors, which were jointly identified at the starting point of the process. During the first phase, the learning activities were further developed through regular reflection and evaluation within the facilitation team and together with value chain actors. The subsequent phases were planned, carried out and evaluated using the same cycle. Through this iterative approach of process facilitation, the activities of the learning network were gradually adapted to the needs of the actors in the value chain, which ensured the relevance for practice.

According to Schein (1995), a learning process and its interventions have to be developed jointly by practitioners and facilitators, based on the problems of practice. Hence, one challenge for the facilitation team was to continually involve the value chain actors in the iterative (re)design

of the process. While the practitioners were interested in the tangible outcomes of the learning network, some were reluctant to participate in the activities of inquiry and reflection that were part of the process—which they perceived as time-consuming and cumbersome. Similar issues were highlighted by Ingram et al. (2020) in an analysis of agricultural co-innovation, where facilitators also described keeping agri-food practitioners involved in processes of collaborative learning as a major challenge.

In the present study, the facilitation team was able to address this issue by designing interventions in such a way that they always contained a component that promised immediate benefits to practitioners. For example, reflection activities were combined with seminars that provided actors with practical, immediately useful information, such as knowledge on cultivation methods or current market insights. In addition, the facilitators identified and supported particularly enthusiastic and well-connected actors who took on the role of “champions” of the learning network and promoted the development of the value chain on the basis of their own intrinsic motivation. For example, one farmer had the idea of working with other farmers to bundle produce for marketing through retailers. The facilitation team organized meetings where this farmer could further develop his idea together with other interested actors from the network. Later, the facilitation team supported product development, price negotiations, and conducting a test run with a major retailer.

Managing the learning process required both domain knowledge and methodological capabilities. Their professional backgrounds in farming or agribusiness and a thorough understanding of the local agri-food sector helped the facilitators to interpret the requirements, issues, and ideas articulated by value chain actors. In addition, their training in systemic coaching and group dynamics helped with preparing and facilitating events and negotiations, bringing about decisions, and mediating conflicts. In their work, they drew heavily on techniques of visualization, ideation, and reflection. A member of the facilitation team described what enabled her to align the learning process with the requirements of practice as follows:

My practical training [in farming] and my studies [in agribusiness] are very helpful in this respect. This really helps me to understand the practitioners' needs and their ideas to shape the process. [...] It is also important to know the set of methods used in process facilitation. This does not only mean to be able to facilitate a meeting. It also means to see which methods I can use to create deeper insights and to get the best out of these meetings for everyone.

(Member of the facilitation team, in a 2019 reflection meeting)

Not all of these competencies were combined in a single person. Rather, they were distributed among team members working closely together, which allowed for a division of tasks and specialization among the facilitators. For example, one person focused on ensuring rigorous research, while another developed training activities or facilitated the process of founding the joint enterprise. Working in a team also enabled facilitators to jointly reflect on their work and improve their own practice.

Lesson #2: The facilitation of the learning process requires iterative design to gradually address a complex problem that involves many different perspectives and interests of value chain actors. The process should be (re)oriented continually based on the needs of the actors to ensure its practical relevance.

Shared knowledge and understanding

The present results indicate that a learning value chain has to consider learning by individual practitioners and their organizations as well as the value chain as a whole. During the value chain development, there was a strong interaction between intra- and inter-organizational learning (Holmqvist 2003). For example, value chain actors needed to develop a solid understanding of their companies' individual situations (intra-organizational) to assess the potential for collaboration along the value chain. Based on this, they could then develop strategic partnerships with other value chain actors (inter-organizational). A process facilitator described her experience with managing the learning process in the value chain as follows:

I have to keep an eye on the individual practitioners' issues and at the same time focus on the common goal and strategic direction [of the value chain], i.e., I have to keep switching between the bird's eye view and the frog's eye view.

(Member of the facilitation team, in a 2019 discussion with other facilitators)

The learning network provided the setting in which the participants could come together to develop shared knowledge and understanding. At the beginning of the process, the main focus was to explore the problems of the local agri-food sector and, on this basis, to define common goals for value chain cooperation. Later, the focus turned to the concrete coordination of the value chain. Issues that had to be clarified in the process ranged from the equitable distribution of profits among the strategic partners, to specific questions of product development, such as the prioritization of environmentally friendly packaging. In the literature, such a common understanding is referred to as a shared mental model, and is assumed to be essential for working effectively in

groups (Langan-Fox et al. 2000; Senge 1990). Constructing shared knowledge and understanding is also described as crucial for supporting sustainability transitions in agri-food systems (Coughlan et al. 2016; Peterson 2009). Peterson (2009) argues that the responsiveness and efficiency of agri-food chains are directly linked to their capacity for creating knowledge within networks of relevant stakeholders.

When reflecting on the process that led to the founding of a joint enterprise, participants particularly highlighted the benefits of bringing together different perspectives and fields of expertise:

We see that, for founding the company, we need the expertise of [proprietor of a food processing company] for the manufacturing and at the same time he cannot do it alone. He also needs our understanding of how the organic sector here in the region works. It is this interaction between the different partners that makes the new company what it is.

(Farmer A, in a workshop in 2020)

The decision making is different than on our farm. In the group, we first gather all opinions and experiences and create a common idea of what we want to do. [...] Discussing a topic together over a longer period of time and creating something new out of it—this way I have also learned a lot that I can build on with my own farm.

(Farmer B, in a workshop in 2020)

The latter quote also highlights how the collaborative learning process benefited the individual participants' work. Similarly, in their discussion of learning in networks, Coughlan and Coughlan (2015) describe two different levels of learning—away and at home. In their model, learning in networks involves the exploration of new knowledge and its implementation and exploitation in practice (Coughlan and Coughlan 2015; Coughlan et al. 2016). These learning activities are described as at home when they take place within organizations, and as away when they take place between organizations in a network. Results of the present study indicate that in learning value chains, exploration happens primarily in the network, while exploitation takes place both within individual organizations and among organizations, e.g., through the formation of new strategic partnerships or joint enterprises.

Lesson #3: Shared knowledge and understanding is at the core of local agri-food value chains. It is built on learning both within individual organizations and among the various organizations that make up the value chain.

Learning strategies

Following Argyris's (1995) notion of organizational learning, the learning network was aimed at enabling its members to make informed decisions, to develop the capacity to implement them, and to monitor the outcomes. Learning activities were designed to generate reliable and valid information to give practitioners a better understanding of the organizational issues both in the value chain and in their individual companies. The outcomes of the process can be described in terms of single- and double-loop learning.

The study suggests that double-loop learning is beneficial to bringing about sustainable innovations in local agri-food chains. To enable this kind of learning, process facilitation encouraged participants to challenge both their current value chain practices and the underlying frames of reference that drive them through activities involving both inquiry and reflection. The learning and negotiation processes within the network also led members to reveal and question their values and assumptions, for example, with regard to ecological standards or fair business practices. Results that can be understood as outcomes of double-loop learning are realigned business strategies and newly established practices of joint production and marketing, e.g., the bundling of produce from multiple farms for joint marketing to retailers—a type of horizontal cooperation that had not been practiced before among the network actors. Another example is the formation of joint enterprises in which actors from different levels of the value chain collaborate vertically to create added value at the local level. Challenging existing assumptions, however, led individual participants to decide not to further participate in the value chain development, which can also be seen as an expression of informed decision making in the sense of double-loop learning. This is illustrated by the following quote:

We asked ourselves in which direction our operation should develop. In the business workshop, we realized that there was little point in getting into vegetable production. This became clear while working on the vision and plans for our operation.

(Farmer, reflecting on the outcome of a workshop in 2018)

Experiences from the study also underlined that local agri-food value chains are not built on double-loop learning alone. The development of effective value chain structures also required gradual improvement and adaption of established routines and practices, which is commonly associated with single-loop learning. In the learning network, single-loop learning was demonstrated in improved operational processes and production techniques, as well as in improved logistics and communication between value chain

actors. The results suggest that both modes of organizational learning can be supported by practical experimentation, reflection, and activities of inquiry aimed at participants' tacit knowledge structures. Double-loop learning, however, requires deeper reflection and inquiry, which can only be gradually established through process facilitation.

Eshuis and Stuiver (2005) also noted that both single and double-loop learning are necessary when developing sustainable practices in agriculture. In addition, they describe "learning how to learn" as a third learning strategy (Eshuis and Stuiver 2005, p. 143). Similarly, Coghlan and Coghlan (2015) highlighted that as learning networks develop, participants become more experienced and structures emerge, in which the actors continue to learn in self-organized ways. In the present study, self-organized learning could only be seen to a limited extent, for example, in a group of practitioners that was formed for a trial in vegetable production and continued to exchange information on production techniques after the end of the facilitated intervention. According to Peterson (2009), learning value chains require structures that can facilitate the continuous generation of new knowledge to adapt to changing requirements and conditions. Such structures of continuous, self-organized learning still need to be established in the emerging value chain to ensure that its members will be able to respond effectively to changing circumstances in the long term.

Lesson #4: To establish the new practices and partnerships needed to build a local agri-food value chain, actors should question existing routines and develop new ideas and visions. At the same time, it is also necessary to improve established practices and adapt them to new situations.

Reflection on the action research process

Through shared inquiry, experimentation, and reflection, action researchers and the other members of the network were involved in a collaborative learning process. Practitioners had the opportunity to explore and to address their issues, while the researchers learned more about the practical problems and the practitioners' actions and thinking processes in solving these. Action research, thereby, faces the challenge of balancing practical and scientific relevance. Shani and Coghlan (2019) propose four factors for reflecting on and evaluating the success of action research, namely the context of the action research study, the quality of relationships, the quality of the action research process itself, and the outcomes of the process.

To establish the context of an action research study, researchers need to build a thorough understanding of the environment in which their research takes place (Shani and Coghlan 2019). Action research in local value chains,

therefore, requires insight into the specificities of the region and its agri-food sector. To establish this foundation for the present study, a year-long survey was conducted in which both the initial and the evolving situation of the value chain was continuously and systematically explored. The survey drew on the perspectives of different actors at all levels of the chain as well as that of other stakeholders in the agri-food system, including agricultural consultants and policy makers.

With regard to the quality of relationships, the results presented underline the importance of regular interactions between practitioners and facilitators. For example, research results were regularly presented and discussed within the network. This helped the practitioners to gain new insights about their own professional practice and that of others in the agri-food system in their region. It also enabled the researchers to rapidly validate their results. The quality of relationships in action research also benefits from the facilitators' ability to speak the language of practitioners, and the involvement of local stakeholders who are recognized and respected by practitioners. In the present study, this was achieved through the involvement of the organic agriculture advocacy group as a boundary organization and through the facilitators' professional backgrounds in agriculture and agribusiness.

Regarding the quality of the action research process itself, the challenge is to balance scientific rigor and relevance for practice. This is particularly pertinent when action research is conducted in socially complex real-life situations, which can lead to highly dynamic and messy research processes (e.g., Cook 2009; Méndez et al. 2017). The experience from the present study suggests that for action research in emerging value chains, this challenge can be addressed by dividing responsibilities within a facilitation team. If different members of the team each advocate scientific rigor and practical relevance, a balance can be found through continuous renegotiation in the joint planning and reflection activities of the action research process.

Despite these challenges, action research is beneficial for the exploration of emerging value chains, as it allows for data to be collected in action, and can help to reveal practitioners' theory-in-use. This enables the development of insights that would not be possible using other research methods. Furthermore, it was possible to integrate both specific questions from practitioners within the network into the research and bring in new knowledge gained from outside the network, e.g., through in-depth interviews with actors in other regions. Such knowledge then directly benefited the learning network. The balancing of research and practical relevance also ensured that the outcomes of the study met the dual requirements of action research: new academic knowledge about the field of study was generated

and concrete improvements of the real world situation were achieved.

Lesson #5: Action research can support organizational learning in emerging agri-food chains while also creating academic knowledge about the topic. Action researchers need to build a sound understanding of the context of the value chain, emphasize relationships among the stakeholders, and balance scientific rigor and practical relevance.

Conclusions

This paper provides a behind-the-scenes view of a learning value chain and illustrates how a network of practitioners and process facilitators worked together to bring about targeted change in a local agri-food system. To support and investigate the learning value chain, the present study applied an action research approach. This approach removed the separation between academic research and practical problem solving as it was designed to have a direct impact in the real world through a series of interventions. Thus, it was possible to rapidly apply and test new knowledge in practice. At the same time, academic knowledge was created that is relevant to practice, as it was derived from concrete issues identified by practitioners.

In this case study, the action research intervention took the form of process facilitation, which was designed to bring agri-food practitioners together and empower them to better exploit the potential for local value creation. Through process facilitation, a social space was created, in which the actors were encouraged to explore their issues, develop new ideas and new connections, and experiment with new practices.

The study's outcomes suggest that the collaborative learning process has helped practitioners to approach complex problems in a structured and analytical way, to question existing routines, to improve their professional practice, and to establish new ways of working together. More specifically, the activities of the learning network enabled individual practitioners and their respective organizations to build up capabilities in organic vegetable production, but also to better understand their own businesses' opportunities and challenges in the context of the local agri-food system. On an inter-organizational level, process facilitation helped to form new value chain collaborations and improve the coordination of value chain activities. As part of their involvement in the study, participants made concrete economic decisions for their organizations and implemented them, for example, by founding new value chain ventures or by investing in production machinery or facilities. The learning network supported them in making these decisions, but the associated economic risk is borne by the participants themselves.

Participation in the learning network was particularly helpful to those actors who were willing and able to actively engage in the process, embrace change in their own organizations, and commit the necessary time and resources. Towards the end of the action research project, the participants faced the question of how to sustain their collaborative learning activities. The network tries to ensure that practitioners continue to learn together, both self-organized and supported by other local organizations that could provide consulting services and social spaces in the region.

Knowledge created through action research is particular and situational (Coghlan 2011). The changes in practice achieved in this case study are therefore specific to the region and the actors involved. The results depended on the actors' capabilities and external circumstances in the region. Nevertheless, the lessons regarding the learning process can, in principle, be transferred to other contexts in which agri-food practitioners work together to address a particular issue. The approach described in this paper is suitable for challenges where there are no model solutions and the situation must be improved through shared learning and negotiation among stakeholders. Overall, the learning value chain can be understood as an example of transformational learning in an inter-organizational context. In a transformational learning network, participants jointly generate new knowledge to improve the situation of all participating organizations (Coghlan and Coughlan 2015; Peterson 2009). However, it is often difficult for small and medium-sized organizations in agri-food value chains to build the necessary capacity for cooperation and organizational learning without external support. This concerns both the development of the individual organizations through continuous learning, and the networking necessary to establish values-based partnerships with other organizations. The present study shows that process facilitators can address such issues by acting as intermediaries, providing resources and organizing the learning process. In this regard, the present study underlines the importance of process facilitators in transformations towards more sustainable local agri-food systems.

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Declarations

Conflict of interest The authors declare that they have no conflicts of interest regarding this publication.

Informed consent All persons and organizations involved in the production of this publication are informed and familiar with the provided results and this publication. The participation of value chain actors in the action research study is based on their explicit consent.

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Paper III

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Developing agri-food value chains: learning networks between exploration and exploitation

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ABSTRACT

Purpose: The present study explores the development of agri-food value chains from an organizational learning perspective, using the German organic food sector as an example. We illustrate how the development of local value chains unfolds over time and outline how facilitation can support this process.

Design/methodology/approach: The study used an action research design to facilitate change in practice and to create new knowledge. Data were collected through qualitative interviews, participant observation, and documentation of workshops and other learning activities. Data analysis and conceptualization followed a grounded theory approach.

Findings: The development process of value chains occurs in three phases, from joint exploration of the problem, through a phase of experimentation and implementation, to further cultivation of established collaborations among value chain actors. The development process oscillates between intra- and inter-organizational learning as well as explorative and exploitative activities.

Practical implications: The results of this study can help to understand and to further professionalize the practice of value chain development and provide guidance for facilitators and other stakeholder working in this field.

Theoretical implications: By drawing on the theory of exploration and exploitation, the study enhances the understanding of value chains collaboration in an inter-organizational setting. The study conceptualizes the development of agri-food value chains and the role of facilitators in the process.

Originality/value: There is little research to date that considers the development of value chains as a collaborative learning process. The presented grounded theory of local value chain development may inform further research on the transition towards a more sustainable agri-food system.

ARTICLE HISTORY

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1. Introduction

Innovations in regional food systems are increasingly in the focus of agricultural policy makers. Examples include the EU Farm to Fork strategy¹ as well as the EU Organic Action Plan and its corresponding policies in member countries,² all of which acknowledge local food production and shorter supply chains as drivers for more sustainable agricultural systems. Close geographical and social relations between value chain actors are expected to generate innovative products and processes with environmental and social benefits, stimulate new business models, and support rural development (European Commission 2015).

The present study focuses on the development of value chains that connect small and medium-sized farms and other food enterprises within a regional food system. In such ‘midscale food value chains’ (Stevenson et al. 2011), the members of the value chain work together to bundle, process, and distribute their products through distribution channels that can handle substantial volumes, e.g. public catering or local retail. The members act collectively and prioritize shared values – both with regards to values embedded in their products, e.g. organic production, and the values associated with the relationships among business partners, e.g. the fair distribution of profits (Lev and Stevenson 2011).

The development of sustainable value chains in the agri-food sector is a complex problem, for which there is no blanket solution (e.g. Peterson 2009). Value chains differ depending on regional market conditions, the capabilities of the companies involved, and the types of products. At the same time, developing a value chain is a social process, in which participants from different companies have to consolidate their individual interests and goals in terms of inter-organizational collaboration (Gray 1989; Huxham and Vangen 2005; Schrujijer 2020). These negotiation processes are complex and highly ambiguous, as they occur at different levels simultaneously – among individuals, within individual companies, and among the various companies of the value chain. The processes are also often complicated by a lack of formal structures, as responsibilities, roles, and rules still need to be formed within the emerging collaboration (Huxham and Vangen 2005).

In the German organic agri-food sector, for example, these issues have been addressed by creating new specialized consultant roles, often incentivized by public funding programs. In Germany, such consultants support the development of value chains at organic farming associations, in regional development initiatives, or at research institutions, e.g. as part of agricultural innovation projects such as EIP-AGRI.³ In their respective organizations, these consultants are referred to as value chain managers, marketing consultants, or regional networkers, for example. For the study presented here, we chose the term ‘value chain developer’. It is derived from the understanding that, similarly to organizational developers, value chain developers support organizations in change and learning processes (e.g. Schein 1988). Different from organizational developers, however, their work does not only focus on individual organizations, but rather on developing vertical and horizontal collaborative relationships among multiple companies within the value chain.

Value chain developers can be seen as facilitators who support collaboration among value chain partners. Such facilitators help groups to work effectively together. They

are largely concerned with social interaction or processes rather than primarily with the content or task of the collaboration (Schumann 1996). Facilitators are specifically employed in inter-organizational contexts to support collaborative processes, such as problem solving and decision making that transcend the boundaries of a single organization (Gray 1989; Gray and Purdy 2018; Huxham and Vangen 2005; Schumann 1996).

In the context of agricultural extension and innovation, individuals and organizations acting as facilitators are commonly referred to as innovation intermediaries (e.g. Ingram et al. 2020; Klerkx and Leeuwis 2009). According to this understanding, agricultural extension activities go beyond the traditional transfer-of-knowledge model (Landini et al. 2017; Nettle et al. 2018). Intermediaries support farmers and other stakeholders of the agri-food system in co-innovation processes by facilitating exchange of knowledge and experiences among them (Ingram et al. 2020).

Thus far, there has been little research on how value chain developers actually facilitate complex change processes in practice. Previous research has shown, however, that a company's ability to learn and adapt plays a major role in organizational change processes (e.g. Argyris and Schön 1996; Holmqvist 2003; Moschitz et al. 2015). Drawing on the theory of organizational learning, we present value chain development as a process of knowledge co-creation. Using the organic food sector as an example, we explore the questions of (1) how value chain developers operate, (2) how the development of local value chains unfolds over time, and (3) how learning takes place in collaborative relationships among actors of a value chain.

2. Value chains as learning networks

The concept of the value chain according to Porter (1985) describes the sequence of value-adding activities in the production of goods. Today, this value chain often involves multiple companies that act together towards a given target. In the current study, value chains are regarded as learning networks. This term is analogous to the concept of the 'learning organization' (Senge 1990), i.e. an organization that effectively facilitates the learning of its members and is thus able to adapt and to better respond to challenges. The learning network of the value chain involves multiple companies and the individuals within these companies who learn together in order to optimize the organization of value creation. According to Peterson (2002, 2009), this ability to co-create new knowledge, in the sense of organizational learning, is a prerequisite for efficient and adaptive value chains.

The theory of organizational learning is based on an understanding of learning that transcends the mere transfer of knowledge in a specific field. According to the definition of Argyris and Schön (1996), learning takes place in organizations when the members of an organization encounter problems in their work, which then prompt them to review, adapt, or fundamentally question existing action patterns and ideas. Organizational learning means that the knowledge thus gained and practices changed have become part of the collective practice of the organization (Argyris and Schön 1996).

Taking a more applied perspective on organizational learning, March (1991) distinguishes between two categories of learning activities: exploration and exploitation (Figure 1). Exploration includes activities that involve seeking new opportunities or creating new knowledge; exploitation, on the other hand, describes the optimization of

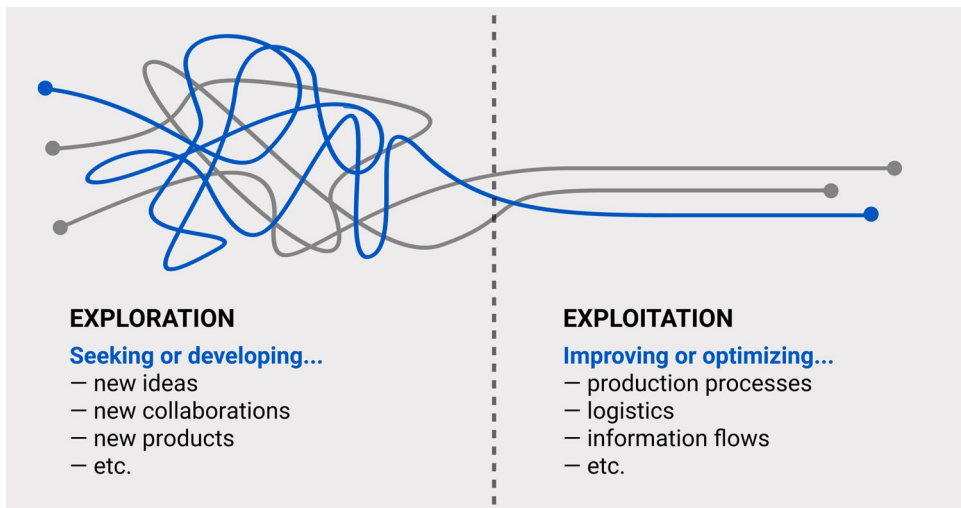


Figure 1. Examples of exploration and exploitation.

existing routines. These two categories represent different strategies in organizational development. Exploration is associated with high uncertainty and geared towards long-term change and innovation. Exploitation, in contrast, aims to better manage established processes and to improve their efficiency.

The theory of organizational learning is not limited to the observation of learning within a single organization but has increasingly included networks and other inter-organizational contexts (e.g. Coghlan and Coughlan 2015; Lavie et al. 2010; Knight 2002). Both exploration and exploitation can, therefore, occur within a single organization or between multiple organizations who work together. Value chain development is an example of an organizational learning process where exploration and exploitation transcends the boundaries of individual organizations. In value chains, several companies set out to jointly develop new ideas, products or processes (exploration). Once they have found a way to create shared value, they work to make better use of it, for example by optimizing the flow of goods or information between the companies involved (exploitation).

According to March (1991), learning organizations should seek to strike a balance between exploitative and exploratory activities to ensure lasting and sustainable success. Organizations who focus too much on exploitation and do not invest enough into exploration may achieve short-term success through optimization but risk losing their ability to innovate and adapt in the long run. In contrast, organizations who focus too much on exploration run the risk of losing their way in the process of generating ideas. A company's ability to act in a manner that is both adaptive and efficient, i.e. to pursue both exploitation and exploration, is referred to as organizational ambidexterity (Tushman and O'Reilly 1996). There are several modes, in which exploration and exploitation can be balanced to achieve ambidexterity, e.g. by temporal separation, where the focus shifts over time from exploration to exploitation and vice versa, or by organizational separation, where different organizational units focus on either exploitative and exploratory activities (Lavie et al. 2010; O'Reilly and Tushman 2008). Contextual

ambidexterity describes the ability of members of an organization to switch between exploration and exploitation depending on the situation (Gibson and Birkinshaw 2004).

3. Research design

In this study, an action research approach was used to support and explore the learning processes inherent in emerging agri-food value chains. The present paper draws on qualitative data to conceptualize these processes and the practices of the facilitators who support the value chain development. The action research approach integrated a grounded theory analysis following an iterative, abductive process of data gathering and analysis (Figure 2). It was aimed at conceptualizing the gradual unfolding of emerging value chains in the context of organizational learning theories.

Action research is an orientation towards knowledge creation that brings together practice and research in a collaborative learning process. In action research, researchers collaborate with stakeholders affected by a real-world problem to find practical solutions and, in the process, generate a better understanding of the problem for both academia and practice (e.g. Bradbury 2015, Shani and Coghlan 2019). In contrast to researchers in more positivist research approaches, action researchers take an active role, e.g. as a facilitator or consultant for the practitioners they work with. By doing so, the researchers are not neutral observers but actively engage with the problem through interventions (Huxham 2003). Action research is often used as an umbrella term for a range of approaches that have different emphases, for example, in terms of what role the researcher has, how practitioners participate, and how new knowledge is generated (Argyris and Schön 1989; Schein 1995; Shani and Coghlan 2019).

The present paper aims to conceptualize knowledge about a specific phenomenon that was derived from the learning process in an action research study. It follows Huxham

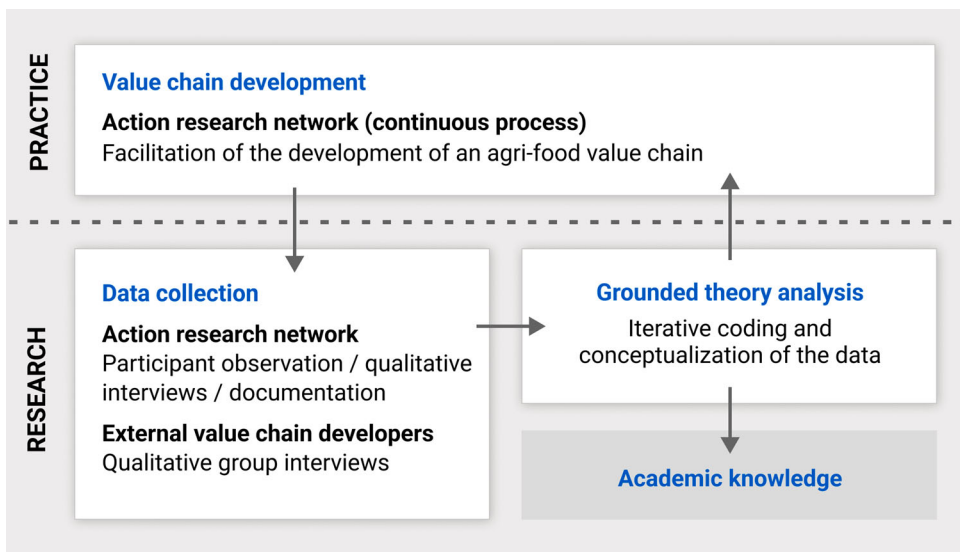


Figure 2. Research design.

(2003) who places a focus on collecting rich data and developing theory from action research. In this sense, action research is understood as a methodology for studying organizational processes and practices, comparable to case study research and ethnography (Eden and Huxham 1996). Theory generated from action research is ‘grounded in action’ (Susman and Evered 1978; Eden and Huxham 1996) because it is derived from rich data that emerge from the actual behavior of people in real-world situations. The interaction between researchers and practitioners through consecutive interventions also allows the output of research to be validated and refined in practice (Huxham 2003).

3.1. Action research setting: the learning network

In the present study, the action research approach was employed in the context of an emerging value chain for organic vegetables in the Berlin-Brandenburg region over a period of four years. In the region, there is a high demand for local and organic food but structural issues in the agri-food system prevent local actors from using that potential, especially in the vegetable sector (e.g. Braun et al. 2018; Doernberg et al. 2016). Compared to surrounding regions, the cultivated area is relatively small and there is little coordination between the actors of the organic vegetable sector. Also, the mid-sized marketing channels necessary to bring local organic produce into retail and public catering are little developed (Braun et al. 2018).

The study involved building a learning network of about 20 agri-food practitioners (farmers, food processors, and traders) who worked together with researchers, facilitators, and agricultural consultants to overcome the challenges described. The group of practitioners included, for example, farmers seeking better distribution channels or planning to diversify their operations, but also processors and traders interested in the local sourcing of organic produce (Braun et al. 2021). From 2018 to 2022, the network was funded through the EIP-AGRI program.

The learning process was supported by a four-person facilitation team consisting of academic researchers and staff from an advocacy group for organic agriculture. The team brought together people with professional backgrounds in practical agriculture, food economics, agribusiness, and communication sciences, some of which had additional qualifications in group dynamics and coaching. The first author of the present article worked as an action researcher in the facilitation team and was actively involved in the strategic planning of the process as well as the practical facilitation of learning activities.

Over the course of the project, the facilitation team established two main strands of activities. The focus of the first strand was to improve professional practice through various extension activities, including individual mentoring and consulting, farmer field schools, and other group-based learning methods. In the second strand, participants worked on building concrete value chain collaborations. Together, they developed visions and ideas for value chain activities and worked to implement them in practice. These activities led to the formation of a joint enterprise and other partnerships among value chain actors, and has improved vegetable production and logistic infrastructure in the region.⁴

The research is similar to other learning networks in the EU that support innovation in small and medium sized food enterprises, e.g. through an ‘action learning’ approach

(Coghlan and Coughlan 2015; Coughlan et al. 2021; Rigg et al. 2021). Such learning networks host activities where participants learn together, explore issues, and create new knowledge that they later implement in their own organizations. In contrast to these other learning networks, however, the focus of the present action research was specifically on the development of value chain collaborations among practitioners within a region. The inter-organizational learning process was aimed not just at improving the professional practice of participants, but also at creating an environment where negotiations and informed decision making can take place to establish practical collaborations among value chain actors.

3.2. Data gathering

The data collection took place throughout the duration of the study. Data were gathered through qualitative interviews, participant observation, and documentation of workshops and other activities in the context of the learning network (Table 1).

Qualitative interviews were conducted using a semi-structured interview guide that was created and adapted for the particular topic and interview situation. Interviews with value chain practitioners were conducted face-to-face or by telephone and lasted 45 minutes to 2.5 hours. In workshops, meetings, and other learning activities, field notes were taken to document the setting, the topics discussed by participants, the decisions taken, and other observations by the researcher. These situations were also recorded to later clarify information and be able to draw on verbatim quotes. In addition, flip charts, pinboards and other notes were photographed. The material was further supplemented by field notes on informal conversations, for example, during field trips or in telephone conversations with practitioners.

Additional data were collected during internal activities of the facilitation team, such as workshops and meetings serving to plan and reflect on interventions in the learning process. This included weekly meetings, which lasted 1–1.5 hours each, and quarterly workshops, which lasted 1–2 days and were partly supported by external

Table 1. Overview of data collected.

Data collection	Source and materials	Details
Data collected while working with value chain practitioners	Qualitative interviews (audio transcripts) Participant observation (field notes) Workshop and meeting documentation (video and audio recordings, photos, and other material) Records of informal conversations during learning activities, as well as phone and video calls (meeting minutes, field notes)	3 workshops for network building (2017–2018) 2 business development workshops with farmers (2018–2019) 32 business meetings, workshops, and other activities with groups of value chain practitioners (2018–2021) 12 in-depth interviews with individual practitioners (2019) and 3 group interviews (2020–2021) for evaluating and reflecting on the processes
Data collected during planning of and reflection on interventions (facilitation team)	Records of conversations during phone and video calls (meeting minutes, field notes) Workshop and meeting documentation (field notes, photos, and other material)	Weekly meetings of the facilitation team (2018–2021) Quarterly planning and reflection meetings, externally moderated (2017–2021)
Data collected from external value chain developers	Qualitative group interviews (audio transcripts)	5 in-depth group interviews with a total of 17 value chain developers (2019)

facilitators. These activities were also documented through field notes and meeting minutes.

Through the insider position in the facilitation team and the participation in the day-to-day work with practitioners, rich and in-depth data could be collected, which otherwise would not be accessible for research. Knowledge generated on the basis of such data is, however, specific to a particular situation, the actors involved, and the respective context (Coghlan 2011). Huxham (2003) suggests to combine data collected in an action research setting with other data in order to support theory building. Therefore, to broaden the view and to validate results from action research, the present study also included data from interviews with additional value chain developers.

From March to October 2019, five in-depth group interviews were conducted with a total of 17 value chain developers who support emerging value chains in various regions of Germany. Thirteen women and four men from different value chains were interviewed, including the meat, cereals, dairy, fruit, and vegetable sectors. Potential interview partners were identified via media coverage and via the websites of relevant institutions. Their job descriptions had to be related to the facilitation of value chain development in the organic agri-food sector. Contacts were made by calling or emailing the potential interviewees individually. The group interviews were conducted either in person or via conference call following a semi-structured interview guide. They took between 1.5 and 2 hours each. These interviews sought to capture the value chain developers' practices from their own perspective. The interview questions addressed activities as well as competencies that help with facilitating change processes in the respective value chains.

3.3. Data analysis

The study employed grounded theory analysis as a research methodology to systematically generate theory from action research through abduction in an iterative process of data gathering and analysis (Corbin and Strauss 2015, Richardson and Kramer 2006). Grounded theory analysis is widely used in research into social practices and processes in organization and management studies (Langley 1999), including agri-food business research (Bitsch 2005; Peterson 2011). At the core of grounded theory analysis is the process of constant comparison, where researchers look for similarities and differences in data (Corbin and Strauss 2015). This process moves back and forth between data collection, coding, and conceptualization of categories.

Throughout the study, data were systematically reviewed and organized. This included verbatim transcription of interviews as well as review of field notes and other material collected in workshops and meetings, such as photos or flipchart sheets. The raw data were then broken down into text fragments which were labeled and annotated in a process known as open coding. As the analysis progressed, new codes emerged, codes were combined, renamed, and deleted through comparison between new data and existing codes. In the next step, conceptually similar codes were grouped into categories and continuously refined.

The coding and category building was supported by ATLAS.ti (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany), which is a software tool that helps researchers with managing qualitative data, and with organizing the codes and categories

identified in the process (Friese 2014). Furthermore, visual mapping techniques with paper cards and pinboards were used to arrange categories and identify relationship between them. In this way, for example, it was possible to uncover patterns in the practices of value chain developers or to chronologically organize categories that map the value chain development process over time.

Insights from the data analysis were then brought together with relevant concepts from the literature on organizational learning. From the combination of existing theoretical concepts with empirical data results an improved understanding of the phenomenon under study (Gehman et al. 2018). The insights gained in this way were regularly cross-validated with other members of the facilitation team and were thus fed back into the planning of further activities of the learning network.

4. Results and discussion

The following results present the practice of value chain developers and provide insights into their professional background (4.1). This is followed by a presentation of the collaborative learning process that is inherent in value chain development and a discussion of the role of value chain developers in specific phases of this process (4.2.). Section 4.3 focusses on how intra- and inter-organizational learning occurs during this development process. In the following sections, the term value chain developers refers to both the facilitation team of the learning network and the external value chain developers who were interviewed.

4.1. Practices of value chain developers

The value chain developers perceive themselves as supporting farmers and other food businesses in building value chains. They work alone or in small teams, for example, in regional development initiatives or for organic farming associations. In their professional practice, they bring together value chain actors from a specific region and create a social space in which these actors can work in a collaborative innovation process. By organizing and facilitating regular activities, value chain developers enable the actors to build trust, to identify potential for collaboration, and to develop concrete partnerships along the value chain (Braun et al. 2021). The practices identified in the data can be categorized as belonging to different levels (Figure 3): Value chain developers build networks, organize collaborative change processes within these networks, and facilitate the group activities that constitute the change processes.

On the network level (level 1), value chain developers can be understood as intermediaries that bring together farmers, food businesses, and other actors of the agri-food system (e.g. Ingram et al. 2020; Klerkx and Leeuwis 2009). In some cases, they build on existing networks, such as those of organic farming associations. In addition to establishing an environment, in which actors regularly meet, value chain developers, or the organizations they work for, provide network members with resources, such as access to specific advisory services and project infrastructure, and they handle communication with stakeholders outside the network. In the literature, such intermediaries have been described as ‘process intermediaries’ (Kivimaa et al. 2019a) or ‘innovation intermediaries’ (Klerkx and Leeuwis 2008). This part of the work of value chain developers is related to

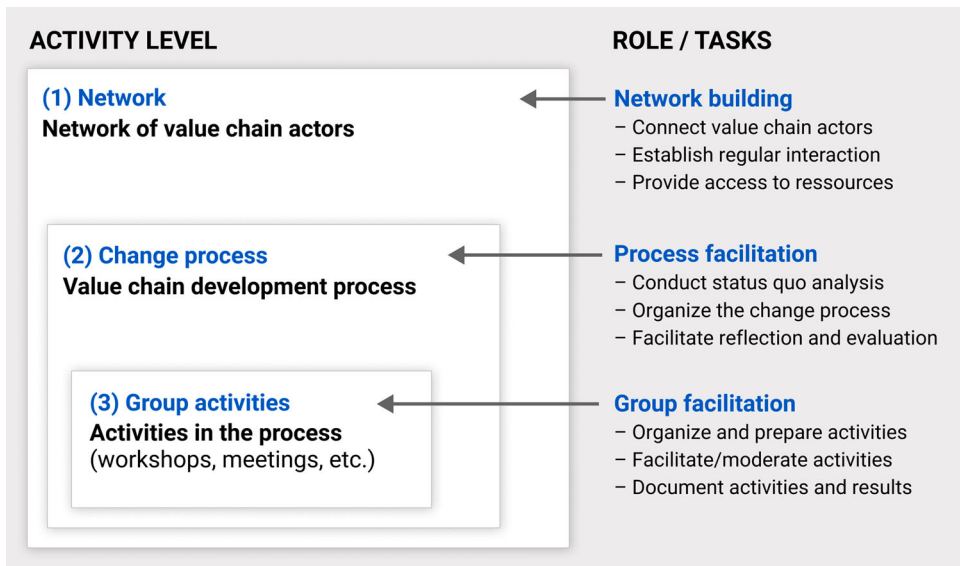


Figure 3. Activity levels of value chain developers.

the paradigm of agricultural extension that focuses on knowledge exchange and co-creation among practitioners (e.g. Landini et al. 2017; Moschitz et al. 2015). In contrast to other intermediaries in agricultural extension, however, the focus is specifically on the co-creation of knowledge as a vehicle for building the necessary capacity for value chain collaboration, in the sense of (inter-) organizational learning and development.

Within the networks, value chain developers organize and facilitate change processes (level 2). Their work can be related to ‘process consultation’ as defined by Schein (1988, 1995), where a process facilitator acts as a consultant supporting people or organizations in exploring their issues and leading them through a series of interventions that positively change their situation. In the process consultation model, the facilitators are not traditional consultants applying expert knowledge to solve a problem for a client. Rather, they organize an iterative process, in which people or organizations work to generate the knowledge needed to overcome their problems (Schein 1988). Value chain developers support agri-food practitioners in developing a mutual understanding of the problems specific to their value chain, which they then use to develop and implement their own solutions. As facilitators, value chain developers are neutral conveners who provide targeted interventions that support the process (Gray 1989; Schuman 1996). They described that they often have to clarify this third-party role to the value chain actors they work with. A value chain developer explained her stance in the process as follows:

I design the environment in which the group can work together, but I don’t make any economic decisions. This responsibility lies with the companies. My role is to create a process, to provide space for ideas that are born from practice, to discuss them, and to develop strategies together [with practitioners] on how to implement them. That’s where I see my mission. (Member of the facilitation team, in a planning meeting, 2017)

The change process is driven by meetings, workshops, and other activities in which value chain actors come together (level 3). The value chain developers prepare and

facilitate these activities, and document the results. In this role, they help to find common goals, to lead negotiations, to bring about decisions, and mediate in conflicts. They use various methods to generate ideas, develop strategies and reflect. A value chain developer reports:

I trained as a coach, which is also something I have grown to appreciate greatly. As in, bringing this set of methods to the table during process facilitation. To not only moderate a group meeting, but also to explore the methods I can use to drill down deeper, so that everyone gets as much as possible out of these meetings. (Member of the facilitation team, in a reflection workshop, 2019)

This work has been conceptualized as group facilitation (Berry 1993; Gray and Purdy 2018; Stewart 2006). Stewart (2006) argues that group facilitators need a specific set of competencies: Group facilitators combine communication skills (e.g. questioning, active listening) and other interpersonal competencies (e.g. maintaining focus, encouraging participation) with process management (e.g. planning, managing visual aids) and certain personal characteristics (e.g. self-awareness, sense of humor). They also need to be able to understand their clients' business environment and group culture (Berry 1993). This is largely consistent with how the interviewees describe the competencies that help value chain developers do their jobs. Like group facilitators, they combine the methodological and social competencies needed to organize and facilitate meetings and workshops with knowledge of the field. They report that a professional background in agriculture and food economics as well as a general understanding of agri-food value chains is needed to do their work. In addition, they need to be able to relate to the practitioners' day-to-day situations, speak their 'language', and preferably have a personal connection with the region.

I studied nutrition and food supply management. It's a bit of a mixed degree program, in which you study everything from agriculture to marketing, really. Also, food technology, and so on. It helped me a lot to understand the chain. And what also helps me in my communication with the farmers is that I was lucky to be born into a family of farmers myself. (Value chain developer, cereals value chain, in a group interview, 2019)

The data show that the practical problems the value chain developers are working on, as well as the solutions they develop together with value chain actors, greatly depend on each individual case. There are, however, certain recurring themes, such as groups of farmers who are looking for ways to process their produce, downstream actors in the value-adding process seeking to source organic raw materials regionally, and a lack of logistics to bundle goods within a certain region. Value chain developers support practitioners in facing these different challenges.

With regard to the challenges of their own role, value chain developers mentioned the complexity arising from the large number of actors they work with and their different interests and goals. They need to create an environment of openness and trust, in which the value chain actors can collaborate in a joint process of learning and problem solving. In this regard, Gray and Purdy (2018) highlight the importance of understanding group and intergroup dynamics for facilitating large group interventions. Also, the development of value chains is associated with a high degree of ambiguity and uncertainty, as each solution must be individually designed with the actors of the specific value chain and is based on their needs and capabilities. As facilitators of group

interventions, value chain developers need to engage the actors of the value chain in an iterative knowledge co-creation process that is twofold. It aims both to build consensus among actors and to bring together diverse expertise to solve problems together (Gray and Purdy 2018, Huxham and Vangen 2005). In the process, value chain developers handle many different tasks that require a wide range of professional competencies. The study showed that interdisciplinary teams can help to meet this challenge, as can networks of outside experts who can be brought in to address specific problems that go beyond the facilitation of the process, including legal or technical issues.

The role of a value chain developer is relatively new. Many of the interviewees are the first to hold that position in their respective organizations and, as a result, their responsibilities are still emerging. The present research also shows that, at times, the value chain developers' work environment fails to recognize the complex tasks and efforts involved in value chain development, especially when success only sets in after months or even years of work.

4.2. Exploration and exploitation in value chain development

According to the experience of value chain developers, their projects are usually long-term engagements with durations of up to five years. In the data, a large spectrum of activities was identified, which are presented here in a three-phase process (Figure 4). The analysis suggests that value chain development usually begins with an exploratory phase in which the stakeholders develop a common understanding of the problems and develop ideas for solutions. This is followed by a phase of designing and experimenting, which involves testing solutions in practice and gradually fine-tuning them. In the third phase, the collaboration is perpetuated, a suitable organizational structure is established and the participating companies continue to work on optimizing their processes and products. The transitions between the phases are fluid, and, depending on the status quo of the value chain, there may be a stronger emphasis on either exploration or exploitation.

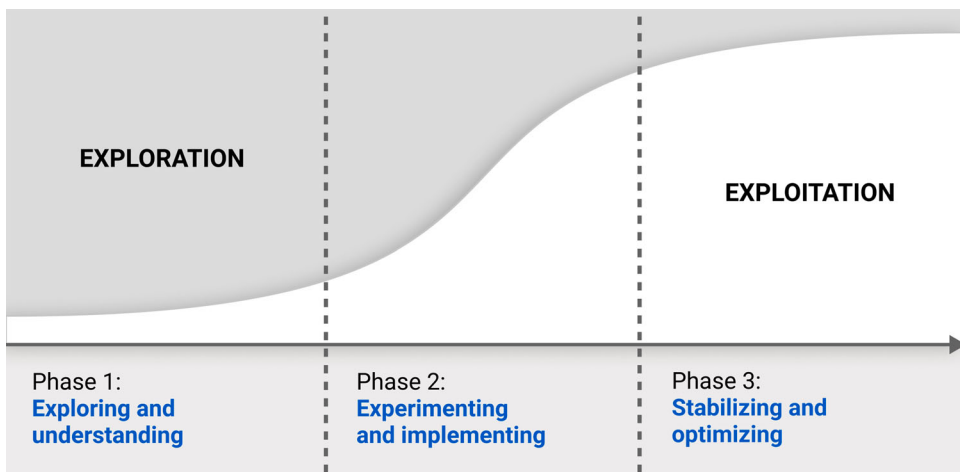


Figure 4. Phases of value chain development.

This breakdown into phases is similar to earlier observations about the work of intermediaries or facilitators in change processes. Gray & Purdy (2018) describe a life-cycle model for multi-stakeholder partnerships that has four phases, from convening a group of participants, over negotiation and implementation of agreements, to an institutionalization of the partnership. Schermer et al. (2010), in a study of facilitation in rural development, describe a very similar three-stage process (forming the group, building a network, institutionalization and handover). Also, in a literature review on intermediaries in sustainability transitions, Kivimaa et al. (2019b) condense multiple existing categorizations into a process model with three phases. Their process begins with a pre-development and exploration phase, followed by an acceleration and embedding phase where structural change begins to emerge, and ends with a stabilization phase where the transition is complete or a new process cycle begins, depending on the context. The present research develops a more specific process model of value chain development. The results relate the activities in each phase to the concepts of exploration and exploitation, in the sense of organizational learning (March 1991).

4.2.1. Phase 1: exploring and understanding

The first phase primarily focusses on exploratory activities that serve to establish new contacts among local value chain actors, to create a common understanding of the market situation, and to develop ideas. Through collaborative learning, study participants explored the value chain's challenges and potential, discussed their individual needs and expectations, and negotiated common goals. The value chain developers interviewed also emphasized the importance of getting to know each other personally and establishing trust among the participants in this process. The following comments provide insights into the activities of this phase:

First, it's about initiating things, initiating conversations. That's really the very first thing. Of course, there has to be an idea at the beginning. What are we going to do? Then it's about connecting the various partners. That's a crucial element. It's not just about talking about common goals and negotiating, but it's also about relationships really, which need to be developed. That is to say, getting to know each other and building a trusting relationship, etc. It's something that may take some time. That's the kind of networking that is required. (Value chain developer, cereals value chain, in a group interview, 2019)

We're all about organic meat processing and marketing. We have a lot of livestock farms in our region. [...] That's why there was a demand now from the farmers: we need organic slaughter facilities in the region. That's where I come in then as a regional manager [facilitator in an intermediary organization]. Ok, there is the demand from the farmers and I find out what we can do about it. That is to say, who is involved? What does the situation actually look like along the chain? (Value chain developer, meat value chain, in a group interview, 2019)

At the beginning of the process, relevant actors were identified in order to develop a network of potential value chain partners. In some cases, value chain developers were able to build upon existing networks, such as regional working groups of organic farming associations. Value chain developers connected local stakeholders and organized meetings or workshops to create a social space where they could meet and exchange

ideas. Depending on the situation in the value chain, the process already had clearly defined goals at this stage, or they still needed to be negotiated by the actors.

4.2.2. Phase 2: experimenting and implementing

The second phase contains both explorative and exploitative elements. When describing the activities of this phase, the value chain developers spoke of ‘developing’, ‘trying’, or ‘testing’ as well as ‘improving’ and ‘adapting’. Activities included sounding out areas of collaboration and discovering how the objectives may be achieved by building on existing production, processing, and marketing structures of the participating companies, or identifying where new structures needed to be developed for this purpose. In addition, test runs or practical trials were described, as illustrated by the following example:

The farmers had a bit of a trial period in advance. Who registers the animals at the slaughterhouse? When will they be slaughtered? Who transports the animals when, how and where? [...] Who processes them further? Who writes the invoices? How are the farmers paid? And when and how does it arrive [in the supermarkets]? There was a certain run-up [...]. And since then, [the product] has actually been available in various [supermarkets]. (Value chain developer, meat value chain, in a group interview, 2019)

In addition, this phase involved the development of specific practical knowledge. Value chain developers identified needs for specific training and other agricultural extension activities. They set up conversations with external experts, for example, to gain expertise in production techniques, to develop marketing concepts or to clarify any legal issues that emerged during the development of collaborations:

I actually also see very clear boundaries [for specialized subjects]. You have to purchase knowledge and I see that as part of the process, when you get to the point, for example, where you discuss setting up companies together or concluding contracts. Then, external expertise has to be brought in to ensure that more specialized questions that have arisen in the group may actually be dealt with properly. (Value chain developer, vegetable value chain, in a group interview, 2019)

Value chain developers helped the actors to negotiate the terms of their collaboration, make decisions, and generate commitment for joint enterprises. This part of the process revealed which stakeholders were willing to participate in a closer collaboration within the value chain and to take on responsibility in the long term. Value chain developers described cases in which projects failed or participants left projects at this point of the process. This may also be considered part of the learning process, as actors started to recognize which types of collaboration along the value chain held potential for their companies and which did not.

4.2.3. Phase 3: stabilization and optimization

In the third phase, the focus is on exploitation, i.e. on the efficient fulfillment of the value chain’s tasks. The companies involved in the value chain work actively together in production and marketing. They have established a suitable organizational structure and made investments into their joint enterprise. The change process now focuses on the incremental improvement of products, processes, and collaboration over time.

The value chain developers described that at this stage, they ‘passed the baton’ and had largely withdrawn from facilitating the value chains. Their role was usually limited to a

few consultations or meetings to reflect on current developments. One value chain developer summarized her role during this phase as follows:

Our goal was to market 25 lambs per week. Meanwhile, we have achieved this [...]. The participants in the value chain are communicating very well with each other. I attend the annual meetings and we have a look at what have they achieved in the previous year? What went well? What didn't go so well? What would we like to change? And that's what we are doing at the annual meetings at the moment. Apart from that, this value chain does not need any external help at the moment, rather, it has organized itself in a way that it can manage itself now. (Value chain developer, meat value chain, in a group interview, 2019)

In the beginning of the process, the focus is on the exploratory side of organizational learning to create a shared understanding of the issues at hand and enable practitioners to make informed decisions. It is about behavioral change by challenging existing practices but also the underlying values and assumptions as described by Argyris and Schön (1996). Value chain developers support this phase by facilitating activities of inquiry and reflection (Senge 1990). Later, the focus is more on stabilizing and optimizing emerging rules, structures, and practices of value chain collaboration, which can be explained as exploitation. A value chain that has reached this phase has matured from a rather loose network of individual actors to a joint enterprise with established operational processes. For facilitators, this is also a transition to new roles or responsibilities. They moved on to facilitate a new change process, or, in some cases, they continued to work with the established value chain in operational management or leadership capacities.

4.3. Ambidexterity in value chain development

In emerging value chains, there is not just a shift from exploration to exploitation over time, there is also an interplay between both modes of learning at different organizational levels. Organizational learning takes place both within the participating companies (intra-organizational) and in the interaction of the companies along the chain (inter-organizational). One value chain developer described this dependency as follows:

I have to keep an eye on the individual practitioners' issues and at the same time focus on the common goal and strategic direction [of the value chain], i.e. I have to keep switching between the bird's eye view and the frog's eye view. (Member of the facilitation team, in a reflection workshop, 2019)

Based on results from the present action research study, value chain development can be understood as a learning process represented by four quadrants (Figure 5). In the action research case, the process began with exploratory activities, both on an inter- and intra-organizational level. The focus was on activities that helped value chain actors to reflect on their individual business situations and practices, in order to prepare them for strategic decisions with regards to value chain collaboration. This was followed by a strategy process at the inter-organizational level lasting several months. In this process, the participants developed a common understanding of the situation in their local market and explored potential areas of collaboration. With regard to intra-organizational exploitation, the value chain actors worked on improving production methods and operational processes within their companies, which was supported by specific training and consulting activities. At the inter-organizational level,

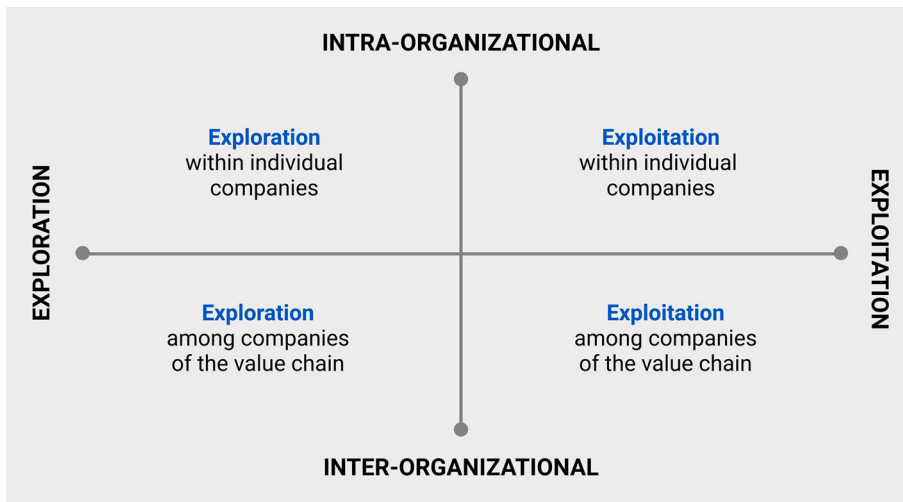


Figure 5. Four quadrants of a learning value chain.

they formalized their collaboration by formally establishing a joint enterprise. They also worked to better coordinate their production planning, and to improve logistics along the chain.

Value chain developers need to consider all four quadrants, support them with appropriate activities, and create transitions between them. Thus, value chain development is not just about network building, ideation, and experimentation (exploration). It is also crucial to move the process towards focus, stabilization, and optimization (exploitation) at the appropriate time, and to understand which steps are necessary in the individual companies (intra-organizational) and for the entire chain (inter-organizational). The continuums between exploration and exploitation and between intra- and inter-organizational learning can be understood as a sliding scale on which the value chain developer chooses the right combination of activities depending on the situation of the chain.

Intra- and inter-organizational learning are mutually dependent and intertwined throughout the learning process. Holmqvist (2003) describes this interdependency as a cyclical process that oscillates between exploration and exploitation, occurring simultaneously both within and between collaborating organizations. Other authors have used the notion of learning ‘away’ in contrast to learning ‘at home’ to discuss the relationship between intra- and inter-organizational learning in learning networks (Coughlan and Coughlan 2015; Coughlan et al. 2021). According to that notion, the learning network provides the ‘away’ setting where exploration can take place, to be later exploited ‘at home’, primarily within the individual organizations (Coughlan et al. 2021). In value chain development, however, the result of inter-organizational learning is particularly evident in both exploration and exploitation, through an increased level of collaboration and ultimately the institutionalization of value chain structures. Current research on agricultural supply chains also highlights the particular importance of both joint exploration and joint exploitation for innovation, involving a diversity of actors across the whole chain (Labarthe et al. 2021).

When a value chain can switch efficiently between exploration and exploitation, it can be related to be what O'Reilly and Tushman (1996) call an ambidextrous organization. In the value chains investigated, ambidexterity was temporally separated, because shifts occurred over time. However, interviewees also described situations; in which contextual ambidexterity (Gibson and Birkinshaw 2004) was required – when value chain actors simultaneously engaged in exploration at the inter-organizational level and in exploitation at the intra-organizational level. In such cases, value chain actors were faced with the challenge, for example, of optimizing their current production while also thinking about the future of the value chain and developing new products and processes. As described by Turner et al. (2017) and Labarthe et al. (2021) in earlier studies, intermediaries or facilitators can promote such strategic ambidexterity and thus the innovative capabilities of value chains.

5. Conclusions

This study conceptualized the development of agri-food value chains through the lens of organizational learning. The process of value chain development is presented in three learning phases, from exploring the problem together, followed by a phase of experimenting and implementing, to perpetuating the collaboration. In this process, intra- and inter-organizational learning as well as exploratory and exploitative activities are intertwined. The results are based on data collected in the German organic sector. However, the learning process presented here may also be applied to value chains in other related sectors, for example in sustainable bioeconomy value chains.

Value chain developers are intermediaries who create a structured process in which companies forge collaboration through knowledge co-creation. They act as catalysts when value chains are unable to organize on their own. This work requires expert knowledge of the context of the specific value chain as well as methodological and social competencies in the sense of group facilitation (Berry 1993) or process consultation (Schein 1988). Value chain developers design learning activities together with stakeholders and align the activities with the needs that arise in practice. It is crucial for value chain developers to strike a balance between explorative and exploitative activities and to understand in which phase of the development process a value chain is at a given point in time. They facilitate emerging value chains with the aim of building strategic ambidexterity and, more generally, innovative capacity.

The results suggest that new extension practices need to be considered in the context of the socio-ecological transformation of the agri-food system. It is essential that the training of those who support the development of value chains as facilitators or advisors includes these new aspects of their professional practice. Higher education for professionals in the agri-food sector should also include competencies that help to understand and shape collaborative change processes, such as interpersonal skills and process competencies to manage complex and ambiguous situations. Aspiring value chain developers might want to consider additional qualifications that provide such competencies, for example, through training in organizational development, group dynamics, or related fields.

For the agri-food sector as a whole, it will be important to create awareness for this kind of work and to provide adequate funding for process facilitation in emerging

value chains, in addition to more traditional agricultural extension. Many of the challenges facing the agri-food system today are complex problems that need to be addressed through collaborative learning. They require practitioners to challenge existing practices and to explore new, context-adapted solutions based on the co-creation of knowledge rather than simply relying on expert advice.

Several local value chain initiatives in Germany and other European countries that have emerged in recent years will face the challenge of perpetuating collaborative learning, as value chain developers are often only involved temporarily. To be successful in the long term, value chains need to develop structures that support exploration and optimization among value chain actors permanently (e.g. Coghlan and Coughlan 2015; Peterson 2009). It, therefore, remains to be seen how those value chains can continue to innovate and to maintain the ability to be both efficient and flexible – as learning value chains in times of change.

Notes

1. The Farm to Fork strategy is a mission statement for future policy in the European Union towards a fair, healthy, and environmentally friendly food system (European Commission 2020). It is part of the European Green Deal, which aims to make the European Union climate neutral by 2050.
2. Building upon the Farm to Fork strategy, the European Organic Action Plan aims to increase organic farming in the European Union to reach 25% organic land by 2030. It details a range of measures to boost the organic agri-food system, e.g. by supporting local and small-scale food processing and short supply chains (European Commission 2021). In Germany, for example, the ‘Organic Farming – Looking Forwards’ (Zukunftsstrategie Ökologischer Landbau) of the federal government defines a similar political framework to boost the German organic agri-food sector. It also includes policies directly related to establishing organic value chains (Federal Ministry of Food and Agriculture 2017).
3. EIP-AGRI is a financial instrument of the European Union (EU) and is short for European Innovation Partnerships to improve agricultural productivity and sustainability. It supports multi-stakeholder initiatives to foster sustainable innovation.
4. A detailed description of the learning activities and their outcomes is available in Braun et al. (2021).

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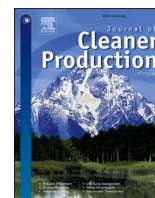
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Paper IV

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Creating spaces for change: Boundary work in emerging agri-food value chains

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ABSTRACT

The article draws on the notion of boundary work to explore innovation in emerging agri-food value chains. Based on a six-year action research study, we examined boundary work among value chain actors and interventions that enabled the reconfiguration of boundaries through learning and collaboration. Illustrated by micro cases, the findings conceptualize three modes of boundary work, which include (1) uncovering knowledge to build a shared understanding of the local food sector, (2) creating and integrating domain knowledge to improve professional practices, and (3) negotiating and implementing shared strategies for value creation. Additionally, the article emphasizes the need for higher-level boundary work that enables practices for value creation through purposeful interventions, as a form of configurational boundary work. The study serves as an example of creating spaces for change in local agri-food systems and enhances the understanding of learning and innovation in such inter-organizational settings.

1. Introduction

Imagine you are in a school canteen in the German capital, Berlin. For lunch, there is a dish based on organic vegetables, produced locally in the region around Berlin. The availability of food with such attributes could be straightforward in a sustainable food system, but until recently, it has been the exception. Even though Berlin is surrounded by large agricultural areas, the demand for organic food in the city is higher than the local supply, particularly for vegetables. There are gaps in the local value chains for organic food, especially a lack of production capacity and of coordination between the agri-food businesses in the region, among other issues. Lately, however, things have been changing. Local organic vegetables have increasingly found their way into Berlin's canteens and grocery stores. This is an outcome of a facilitated co-creative process in which actors from the region explore new ways of working together.

The situation described here is an example of a local sustainability transformation in the food system. In this example, small and medium-sized farms worked together with other local food enterprises to create midscale value chains (Stevenson et al., 2011; Peterson et al., 2022) that are situated between low-volume direct marketing and large,

international markets. Such initiatives can contribute to food security and the social and economic well-being of food producers while also maintaining a positive or neutral environmental impact. This is also the pathway that the states of the European Union have committed to in their Farm to Fork Strategy (European Commission, 2020). In the face of global crises, they seek to achieve a significant increase in organic agriculture, reduce long-haul transportation, and strengthen local value chains.

To build such value chains, farmers and other agri-food practitioners within a specific region work together across the boundaries of their individual enterprises—in the sense of inter-organizational collaboration (Gray, 1989; Huxham and Vangen, 2005). Collaboration has the potential to create synergies between the partnering organizations, allowing them to achieve something they would not be able to achieve individually, which has been conceptualized as collaborative advantage (Huxham, 1993). Specific advantages that collaborating organizations may seek are, for example, business development, risk sharing among participants, or supply chain efficiency. Collaborative advantage is not trivial to achieve, however, because emerging collaboration often bears high complexity and ambiguity, as it brings together diverse actors to negotiate a common strategy based on their individual goals, cultures,

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and resources. Therefore, collaboration is not an organizational state, but a dynamic social process, in which several organizations work towards a common goal (Huxham and Vangen, 2005; Gray and Purdy, 2018). Developing local agri-food value chains is an example of this process and requires negotiation among the actors in the chain to develop solutions that fit local circumstances. Depending on the local situation, value chains differ in market conditions, the capabilities of the actors involved, and the types of products the chain is expected to deliver. The negotiation processes among the value chain actors bring enterprises together in knowledge co-creation, thereby enabling joint entrepreneurship and innovation (Peterson, 2009).

There is a range of current initiatives in Europe aiming to build more sustainable value chains, including organic regions (e.g., Stotten et al., 2017; Mennig and Sauer, 2022) and other agricultural innovation programs (e.g., Gutiérrez and Macken-Walsh, 2022). In these initiatives, practitioners work with agricultural consultants, facilitators, or researchers on real problems of the sector. They are part of a wider family of initiatives and projects that create spaces for knowledge co-creation and innovation around specific, localized problems, e.g., in living labs or other multi-actor networks (Gamache et al., 2020; Körner et al., 2022). Such initiatives bring together people from diverse contexts and with different experiences and knowledge. The mechanisms that enable the participants of these initiatives to interact and to align their frames of reference, perceptions, and ideas, are the practices that these actors engage in at their boundaries, conceptualized as “boundary work” (e.g., Langley et al., 2019).

Our article contributes to this line of research with a practice-based perspective on innovation processes that are carried out in the interaction of farmers, food entrepreneurs, and other stakeholders of the agri-food system. We present results from an action research study that supported and investigated the development of vegetable value chains in the Berlin-Brandenburg metropolitan region. The research is primarily concerned with the mechanisms of learning and change in inter-organizational settings and less with the specific problems the individual actors experienced and the decisions they took when developing their value chains. Using the conceptual lens of boundaries and boundary work, the article explores the innovation processes in these settings. Specifically, it investigates (1) boundary work among value chain actors and (2) interventions that enabled the reconfiguration of boundaries in the emerging value chains. The present action research can therefore serve as an example of how innovation in local food systems can be supported through facilitation.

2. Boundaries and boundary work

Intrinsic to the relationships among actors of a value chain, and to the relationships with their environment, are boundaries that separate actors from each other and from the environment. From a general perspective, boundaries are conceptual distinctions that people make as they perceive and interpret the world around them, by categorizing objects, practices, people, or other entities (Lamont and Molnár, 2002). In the narrower sense of organizations, boundaries are demarcations among people or groups, i.e., the social structures that constitute organizational contexts (Santos and Eisenhardt, 2005; Zietsma and Lawrence, 2010). Boundaries manifest, for example, at the inter-organizational level in the collaboration among different enterprises in a value chain, or at the inter-personal level, in the different roles or professional backgrounds of people working together. Such boundaries are not considered to be static and fixed but are socially constructed and interpreted by people in a particular context (Lamont and Molnár, 2002; Zietsma and Lawrence, 2010). A process perspective emphasizes that boundaries are emergent and in flux, as they are produced and reproduced through interaction (Hernes, 2004; Langley et al., 2019).

Following this dynamic notion, boundaries can be influenced by actively managing the practices surrounding them. The purposeful

efforts that create, maintain, or disrupt boundaries are commonly referred to as boundary work (Gieryn, 1983; Zietsma and Lawrence, 2010; Langley et al., 2019). Such activities treat boundaries as either “junctures” that create opportunities for emerging connections, or as “barriers” that create or maintain separation (Quick and Feldman, 2014). In this regard, boundary work is a balancing act between efforts directed at opening up and closing down boundaries, e.g., within or between groups, occupations, or organizations (Chreim et al., 2013; Langley et al., 2019). Such efforts are described as competitive boundary work when aimed at enforcing separation and as collaborative boundary work when aimed at reducing separation. These two types of boundary work are not mutually exclusive, but complementary (Langley et al., 2019). For example, a strategic business partnership may be understood as a juncture at which the partners engage in collaborative boundary work, but also as a barrier that the partners enact to exclude competing market actors.

In addition to collaborative and competitive boundary work, Langley et al. (2019) define a higher-level practice related to boundaries, which is configurational boundary work. Configurational boundary work impacts a system from the outside by creating spaces in which new forms of interaction can take place, through organizing or re-arranging boundaries. Such interventions can, for example, link different fields or domains of activities, or separate conflicting individuals (Zietsma and Lawrence, 2010; Langley et al., 2019). Spaces for configurational boundary work can be embodied through boundary organizations that bring together different actors and engage them around specific issues (Guston, 2001; O’Mahony and Bechky, 2008). Examples of boundary organizations are multi-actor networks and other institutions that fulfill intermediation functions related to learning or innovation in agri-food systems (e.g., Klerkx and Leeuwis, 2009; Tisenkopfs et al., 2015; Clark et al., 2011; Kivimaa et al., 2019). A related concept is boundary objects (Star and Griesemer, 1989), which are artifacts or abstract concepts that actors use to engage in boundary work. Boundary objects can be, e.g., shared documents, tools, or narratives that help actors from different backgrounds to work together on a common issue or project at or across boundaries. These objects are flexible enough to be shared among actors from different sides of a boundary (Star and Griesemer, 1989) and help the actors create common ground by representing, transforming, and sharing knowledge (Carlile, 2002; Bechky, 2003).

A focus on the ways in which people and organizations engage at boundaries has been widely adopted in social and organizational sciences (e.g., Lamont and Molnár, 2002; Langley et al., 2019). Boundaries are used as a theoretical lens to enhance understanding of the interaction in different organizational settings, for example, how people with different professional backgrounds work together (e.g., Kellogg et al., 2006; Hale et al., 2022) or how organizations interact with and separate from their environment (e.g., Santos and Eisenhardt, 2005; Velter et al., 2020). We bring this perspective into the inter-organizational context of value chains, by focusing on the boundaries between the participating actors, and how the boundaries can be configured to enable collaborative advantages for sustainable value chains.

3. Research design

The focus of the study is on emerging agri-food value chains, investigated through a qualitative research design. We did not follow a singular methodology but rather combined several strategies to create practice-oriented theory from process data. At the core was an action research approach that produced rich data through interventions in practice (Eden and Huxham, 1996). This research was conducted in a learning network that supported emerging value chains in the Berlin-Brandenburg region in Germany over a period of five years (2018–2022), with an additional year of preparation (2017). For conceptualization, we integrated a process research strategy (Langley, 1999) with a grounded theory approach (Corbin and Strauss, 2015) to dissect and analyze detailed longitudinal data collected over the six-year

period. A qualitative approach is particularly useful for complex and emerging processes, such as sustainability transitions in the agri-food sector, because it can capture the dynamics of socially constructed systems (Bitsch, 2005; Peterson, 2011).

3.1. Action research setting

Action research creates a setting in which practitioners and researchers engage in a joint learning process to address a problem of practice (Shani and Coghlan, 2021). This approach aims to develop practical solutions and to deepen the understanding of the problem for both academia and practice. The role of the researcher differs from that in more positivist approaches as action researchers actively participate in the learning process, for example, as facilitators or process consultants. Rather than being mere observers, action researchers engage with the participants of a study (Huxham, 2003). Action research is an established strand of organizational and management research (e.g., Eden and Huxham, 1996; Shani and Coghlan, 2021), and has been used in the study of agri-food systems (e.g., Conner et al., 2010; Moschitz and Home, 2014) to facilitate and explore innovation and change processes. In the present study, action research was conducted in the context of a learning network supporting the development of value chains.

The learning network comprised a core group of practitioners from approximately 20 agri-food enterprises and a team of facilitators that supported them throughout the duration of the study. The participating enterprises were not selected purposefully but joined the network based on an open call for participation. They included farms, traders, and food processing companies that sought to develop local value chains and to better exploit the market potential for organic vegetables in the region. Most of the participants did not know each other personally before the formation of the network, and there were hardly any established business relations between them. In addition to these core members, other stakeholders of the local agri-food system took part in open network activities, for example, other market actors, industry experts, policy-makers, and nonprofit organizations. Concrete motives for participating in the learning network were, for example, to generate better insights into local markets, to connect with other actors, and, in the case of farmers and other practitioners, to improve market access and build professional competencies. The learning network's activities were funded through the European Union's EIP-AGRI program (see Braun et al., 2022, on the network formation).

The facilitation team consisted of process facilitators, agricultural consultants, and researchers, with professional backgrounds in practical agriculture, agri-food business, and communication sciences. Some of them were trained in group dynamics, coaching, and process facilitation methods. The team's tasks included network building, organizing and facilitating network activities (interventions), and providing access to specific resources, such as project infrastructure and targeted consulting. As facilitators of the change process, the team supported practitioners in making well-informed decisions and implementing them but remained neutral with regard to the outcome of the process. The interventions were designed in close collaboration with the participating practitioners, based on their practical problems and needs. In her role as an action researcher, the first author of the present article was a member of the facilitation team. To ensure scientific rigor and practical relevance in the action research, the present study maintained a clear division of responsibilities within the facilitation team and included systematic data collection and analysis as well as continuous reflection on the action research approach and the facilitators' role in the process (Braun et al., 2022).

3.2. Conceptualization from process data

A special feature of action research is that data is collected at the moment of action and thus about "theories-in-use" rather than based on the participant's own description of their behavior in past events

(Argyris and Schön, 1989; Huxham, 2003). The insider position in the facilitation team and the participation in learning activities and other interventions enabled the collection of rich and in-depth data, throughout the process. The longitudinal nature of the research design allowed data to be collected naturally in recurrent situations and preliminary findings to be fed back iteratively, for validation and further planning (Langley, 1999; Huxham, 2003). The material used for analysis included interview transcripts and field notes, as well as documents and other artifacts created in the process, including meeting documentation, photos, and project reports.

For this article, data were analyzed in three phases, using a combination of different strategies to build theory from process data, as proposed by Langley (1999), specifically visual mapping, narrative strategy, and grounded theory. In the first phase of the data analysis, we created a timeline of activities, special events, and outcomes of the learning network. This timeline served as a visual representation of the data collected over time, allowing for a clear and comprehensive overview of the process (Fig. 1). The second phase of the data analysis included a two-day workshop with facilitators and supporting staff of the learning network (8 participants). During the workshop, the timeline was validated as participants reflected on the process and developed narratives of important situations, events, and experiences. The identified narratives were not singular, isolated incidents but overlapped and influenced each other. They formed early analytical units that served as a starting point for in-depth analysis.

The third, in-depth phase of the analysis employed an abductive-iterative process of conceptualization following a grounded theory approach (Bitsch, 2005; Corbin and Strauss, 2015). The narratives identified earlier were refined based on the source data, labeled and annotated in an open coding process, and gradually developed into a system of categories through constant comparison. This analysis moved iteratively between the source material, previously constructed categories, and background concepts from the literature. The conceptualization was focused on the development of "local", practice-based theory, which is derived from this specific situation and context but is also, to a certain degree, analytically transferrable to similar scenarios and phenomena (Bitsch, 2005; Peterson, 2011).

The analysis resulted in three final categories that describe different modes of work at the boundaries of value chain actors, and higher-level themes that conceptualize the general practice of value chain development. For the presentation of the findings, we constructed three micro cases from the material to zoom in and to illustrate the identified modes of boundary work comprehensively and vividly through thick description of participants, events, and specific situations. The detailed account of the micro cases and their further conceptualization aims to enable potential users of the research to evaluate the transferability of the findings to their respective contexts (Langley, 1999; Bitsch, 2005).

4. Results and discussion

Findings are presented as micro cases, exemplifying boundaries and boundary work instrumental to value chain development in the learning network (Table 1). The focal point of each micro case is one of the three modes of boundary work we identified. The cases place the modes in the overall context of the study and ground the findings in the source material through brief vignettes. They present selected actors and sequences of events from the process.

4.1. Micro case I: Uncovering market-related knowledge

In this micro case, we elaborate on work at boundaries concerning the market-related knowledge necessary to effectively participate in local value chains. Early in the change process, it became clear that a core problem was the lack of a shared understanding regarding the local market situation. Publicly available market data was scarce, and there was limited information sharing among actors in the region. The

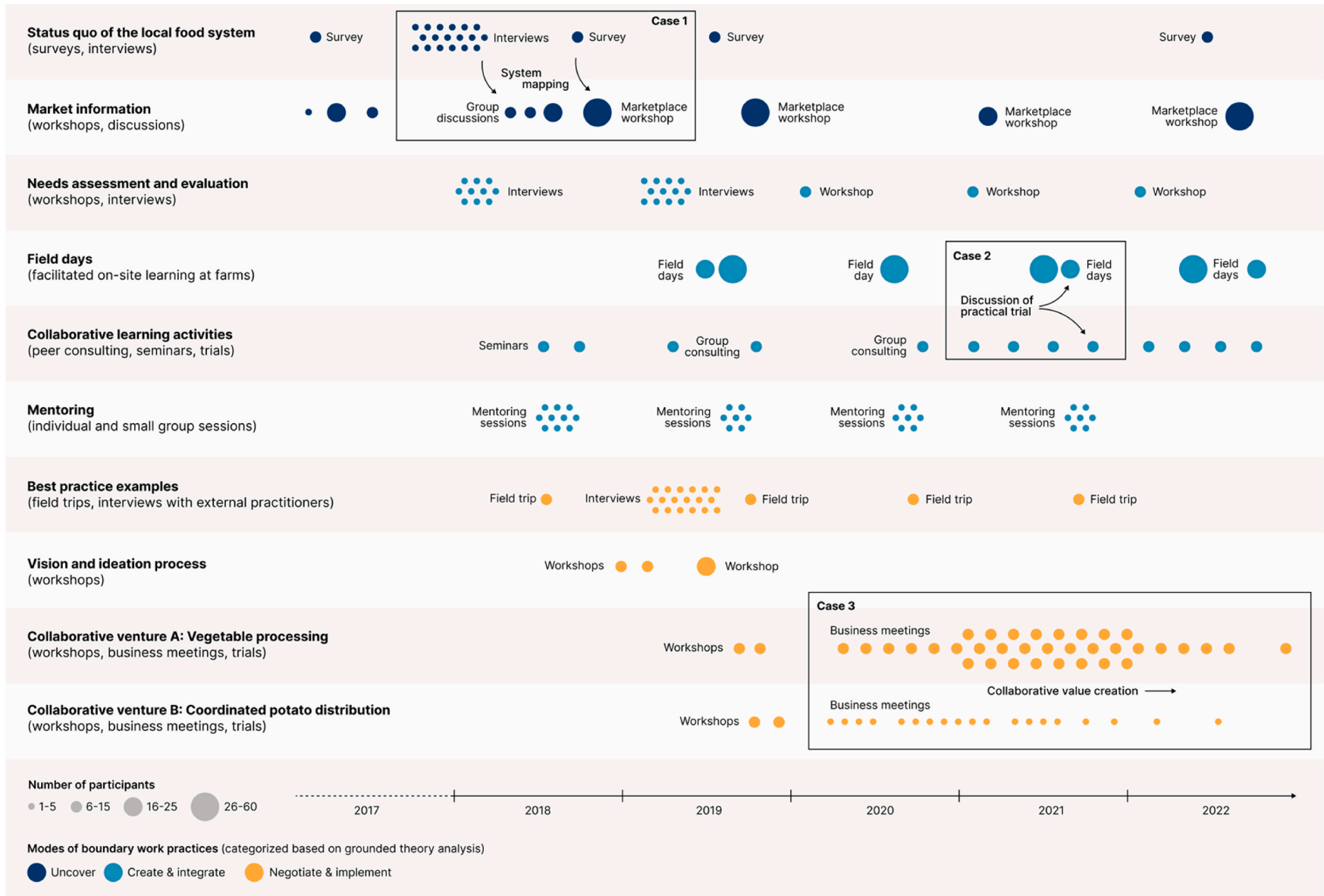


Fig. 1. Process timeline based on visual mapping.

Table 1
Overview of boundary work activities and modes.

	Micro case 1	Micro case 2	Micro case 3
Objectives	Create a shared understanding of the market situation (vertically)	Extend and improve professional practices (horizontally)	Develop and pursue a common business strategy (collaborative)
Boundaries	Boundaries among market actors and between other stakeholders of the local food system (broad group)	Boundaries among farmers; boundaries between farmers and consultants, mentors, as well as other agri-food experts (small and broad groups)	Boundaries among value chain actors (small groups)
Interventions	System mapping, marketplace workshops	Field days, variety trials, other group-based learning activities	Strategy and business development workshops, practical trials
Activities at boundaries	Collaborative inquiry into market knowledge and experiences, reflecting on present business practices, discussing challenges and opportunities of the market	Knowledge co-creation and transfer, reflecting on professional practices, sharing problems and experiences, experimenting with cultivation and production	Exploring possibilities of collaboration, developing business ideas, negotiating shared strategy, experimenting with business processes, establishing partnerships
Primary mode of boundary work	<i>Uncovering</i> —making knowledge visible at boundaries	<i>Creating and integrating</i> —co-creating knowledge and sharing it at boundaries	<i>Negotiating and implementing</i> —establishing new ways of working together at boundaries
Outcomes	Revised presumptions and shared understanding of the market situation (e.g., market transparency, potentials)	New domain knowledge and improved practices (e.g., production processes, techniques)	Individual business decisions and shared strategies (e.g., business models, collaboration)

following vignettes illustrate the isolation of actors through boundaries related to their organizations and immediate spheres of action, expressed in different experiences, business interests, and perspectives on the market.

Retailer A is a regional category manager at a major chain of retail stores with several stores in the Berlin-Brandenburg region. To differentiate from competitors, the retail chain plans to expand the product range to include organic food from local suppliers. Retailer A expects that these products will be more expensive than products that are not local and organic, but he also believes that through good marketing, they can still “boost sales.” However, he lacks insight into organic vegetable production in the Brandenburg region. Through the learning network, he wants to get in touch with farmers and see if he can source the necessary qualities and quantities in the region.

For many years, Processor A has been running a branch of a food company that produces ready-to-eat salads sold in supermarkets, at various locations in Germany and abroad. His company covers the full range of primary production, processing, packaging, and logistics, either in-house or with close partners. So far, they have only handled conventional food products, but they seek to build a new line of business around organic

food. However, he knows little about the organic food sector in the region and in general.

Caterer A runs a school catering operation that prepares 7,000 meals per day. In Berlin school meals, the use of a certain percentage of organic food is mandatory, so Caterer A already purchases organic food, usually through large wholesalers. Like most large-scale kitchens, her operations build on preprocessed ingredients, like potatoes that are provided in vacuum-sealed packs, peeled and cut. Personally, she thinks there should be more local and organic food served in schools, but it comes down to price and availability. Preprocessed ingredients that are both organic and local are often too expensive or simply not available from her wholesalers.

Together with a partner, Farmer A runs a farm that grows a variety of organic vegetables on 16 ha, specializing in root vegetables. At six years old, the farm is a relatively young enterprise. So far, they have marketed mainly through an organic wholesaler in the region. This has worked quite well, but they want to diversify their distribution channels. Through the learning network, he wants to establish contacts with other market actors and explore opportunities for new projects and collaborations.

The learning network provided a platform in which market actors from different stages of the agri-food sector engaged. The activities were



Fig. 2. Examples of activities: System mapping and discussion at marketplace workshop.

aimed at sharing market-related knowledge and experiences, by reflecting on and discussing challenges and opportunities of the market. This category of interventions also included the initial network building and annual workshops that were used to discuss current developments. The workshops were open to value chain actors and other stakeholders, e.g., policymakers and members of nonprofit organizations. The following summary of the first marketplace workshop provides an example of this mode of boundary work.

In 2018, after the formation of the network, a public workshop brought the practitioners and many other local stakeholders together in interactive marketplace activities for identifying supply and demand in the region. The preparation of the workshop was supported by system mapping activities, in which facilitators worked with practitioners to identify the relevant enterprises in the region and the connections between them through collaborative sketching activities in group discussions and interviews. In the marketplace workshop, the resulting map of the local market was used by the participants to discuss the problems they saw in the system and their ideas for solving them (Fig. 2). The participants identified several gaps in the organic vegetable market for the Berlin-Brandenburg region, as well as potential for development at these gaps. Specifically, participants identified a lack of infrastructure, e.g., for bundling, logistics, and processing, as well as a lack of production know-how that prevented them from further developing the sector.

This micro case underlines that the actors' knowledge about the local market was primarily implicit and embedded in their day-to-day practices. Each individual actor's understanding is also incomplete and largely defined by their own organizational boundaries and their own immediate market activities. The visual map of the local food system, which was created and refined in group discussions and workshops, served as a boundary object in that it engages the actors to communicate about issues of the local food sector and contrast their own understanding with that of other actors, to challenge and verify it, in a process of "co-creating common ground" (Bechky, 2003). The continuous development of the map during the process emphasizes the dynamic nature of such objects, as it changes in the interaction of the participants and, over time, as their common understanding evolves (Kellogg et al., 2006; Langley et al., 2019).

In our analysis, we categorize the primary mode of boundary work in the present case as "uncovering", i.e., explicating knowledge at boundaries. The activities the participants engaged in were centered around opening up at boundaries to enable an exchange of perspectives across different domains of the value chain and across organizational boundaries. In that sense, the social space created through the shared activities can be understood as a juncture (Quick and Feldman, 2014) at which actors address issues in a structured setting. Through work at that boundary, it was possible to develop a common picture of the market in the region, which served as a point of departure for increasing value creation.

4.2. Micro case II: Creating and integrating knowledge to improve domain practices

The second micro case presents boundary work related to the improvement of professional practices, specifically in agriculture. Based on the results from the previous case, a core challenge was to increase agricultural production to serve the mid-scale value chains that actors aimed to build in the region. Some of the farms involved in the learning network were newly entering vegetable production, while others were working on diversifying and further professionalizing their existing production. To better understand their need for specific domain knowledge, a needs assessment was conducted based on interviews with farmers. In the following, two participating farmers are presented as examples to illustrate the demand for expertise.



Fig. 3. Examples of activities: Practical trials and group consulting.

Farmer B has many years of experience in organic agriculture and runs a well-established farming operation with several permanent employees and additional seasonal workers on about 300 ha of farmland, one-third of which is cultivated with organic vegetables. That makes him one of the major actors in organic vegetable production in Brandenburg. Recently, he has recognized the potential of growing potatoes, in addition to his existing range of crops and has decided to invest in new production technology. Farmer B is aware that effective potato production requires know-how that he has yet to build. He has very specific questions about sorting and packing technology, and about the suitability of certain varieties for his location.

Farmer C is in his mid-twenties and preparing to take over the family farm his parents have run for several decades. During his vocational training, he worked on different farms, and he is now highly motivated to take responsibility for his own business. Farmer C is aware that he needs to make some changes to the farm to make sure it is economically viable, but he does not have a clear picture yet. Organic vegetables seem profitable, and he has started to grow different crops on a small plot, but he is not sure how to market them. Farmer C also has many other questions—not just about vegetable production, but also about operational management and farm succession.

These examples highlight a need for boundary work to create and share domain knowledge. Farmers sought to improve their professional practice, in general, or had questions about specific issues they encountered in their work. The learning network brought local farmers together and connected them with agricultural consultants, researchers, and experienced practitioners from other regions. This resulted in boundary work at two distinct levels, at the organizational boundaries among farmers learning from each other, and between farmers and the wider environment of the agricultural sector, as consultants, researchers, and other experts brought new knowledge into the network. Activities focused on both the more traditional format of knowledge transfer, from agricultural consultants to practitioners, and on activities of knowledge co-creation, such as practical experiments, peer consulting, mentoring, and other collaborative learning activities. This is illustrated by the following descriptions of two formats:

A recurring element of the learning network was group consulting events, which were, depending on topics, held either online or took place on-site at participating farms. In June 2021, for example, one such event was hosted by Farmer A. Twelve members of the learning network met at his production site to discuss specific issues in field crop production, particularly how to manage pests by adjusting crop rotation. This topic was derived from actual issues that Farmer A had encountered in his work. The event included a presentation by an agricultural consultant, a tour of the farm, and a facilitated peer consulting session around the questions at hand. The practitioners worked out possible courses of action together with an expert, which they could later apply at their farms.

Another recurring format were practical trials aimed at choosing suitable crop varieties and at building knowledge about cultivation under local



Fig. 4. Examples of activities: Joint production trials and product development.

conditions. These trials were conducted by farmers and supervised by agricultural consultants and researchers. Farmer B was one of the three farmers who provided plots on their farms and worked with researchers who conducted the trials. In this way, Farmer B was able to build new knowledge for his own professional practice and to share it with other participants, as the results were discussed within the network at field days and group consulting events (Fig. 3).

These activities served primarily as a mechanism to build know-how and to distribute it among the participating practitioners. We categorized this mode of boundary work as “creating and integrating” knowledge, in the sense of improving the professional practice of the participating actors, but also of building shared expertise within the region. The concept of knowledge integration has been used in previous literature to refer to the management of knowledge in groups of diverse actors (Tell et al., 2017). Applied to the present case, it involved the creation of specialized knowledge among multiple practitioners, which in turn fed into their professional practice on an individual level. Boundaries are opened intermittently when actors come together for a learning activity, to produce new knowledge and share experiences. There is collaboration in the process of knowledge creation, but the participants’ objective is primarily the use of the knowledge thus gained, “at home” in their individual organizations (see also Rigg et al., 2021). In the example presented in this micro case, the knowledge domain was agriculture, but similar kinds of knowledge integration are necessary on other value chain levels, e.g., related to food processing.

4.3. Micro case III: Negotiating and implementing value chain collaboration

The third micro case focuses on work at boundaries to develop concrete partnerships and patterns of collaboration in the value chain. The learning network supported several small groups of actors in exploring opportunities for value chain collaborations. The groups were formed following a vision and ideation process, which was informed by insights gained from the system mapping described in the first case, and by studying best practice examples from other regions, at field trips, and through interviews. The following example illustrates how actors explored new ways of working together in the value chain.

In 2019, two main groups formed to work on specific collaborative projects, to address certain gaps in the value chains for organic vegetables. Processor A planned to set up a vegetable processing operation with Farmer A and five other farmers from the network, while Farmer B worked with Farmer C and others to bundle their potato production and to eventually supply Retailer A. The actors worked closely together on the development and implementation of the projects in facilitated business meetings from 2020 through 2022.

In the case of the vegetable processing venture built by Processor A and Farmer A, the process went through several stages. Following an

exploratory phase, in which the participants experimented with product development and production processes, they developed a business plan and negotiated contracts that ultimately led to the founding of a joint enterprise in the summer of 2020. Subsequently, the actual operation was set up with, e.g., employee recruitment, product development, and finally, the start of production and distribution to retailers in the summer of 2021 (Fig. 4). In early 2022, the new enterprise extended the product range and began to also supply canteen kitchens, like that of Caterer A, with pre-processed vegetables. Since the founding of the joint enterprise, Farmer A has had a new role. He no longer is simply an independent farmer but also a co-owner of a food processing enterprise. Processor A also has a new role. As managing director of the new company, he not only runs the day-to-day operations but also manages relations with his partners.

Boundary work took place at the organizational boundaries of the involved enterprises, both horizontally, i.e., between actors of the same value chain stage, and vertically, i.e., across different stages of the chain, as in the collaboration of Farmer A and others with Processor A’s food processing company. The activities described in this example formed the space in which actors negotiated concrete changes in their business practices, made decisions for their individual companies, and for the strategic direction of the chain. Also, some actors left the group in the process, because they decided to rather pursue other business strategies. The facilitators not only helped actors uncover or create knowledge about how to collaborate but put them in a “trading zone” (Kellogg et al., 2006), in which actors explored, negotiated, and eventually committed to partnerships and coordinated actions in the value chain. The actors who found a common basis for collaboration developed joint strategies, which can be understood as boundary objects that connect the actors. In the process, these objects took different forms, for example, as a joint business plan, the design specifications of a new product, or the shareholder agreement for a new enterprise. A strategy statement made explicit in this way is a “shared meta-strategy” (Huxham, 1993), containing the common goals and individual responsibilities agreed upon.

From a boundary work perspective, a new boundary is manifested in the process of negotiating and implementing the shared strategy. Through this boundary, the collaborating actors engage and, at the same time, separate themselves from other market actors. Despite their partnership, the collaborating actors maintain a degree of autonomy and rearrange their individual boundaries to protect their economic interests in other areas, i.e., by maintaining a competitive relationship with regards to products or distribution channels outside of the area, in which they collaborate. We conceptualize this mode of boundary work as “negotiating and implementing”, in the sense of bringing actors together to establish new ways of working together across the chain. It includes both collaborative and competitive aspects of boundary work. The results highlight that, for the participants of an emerging value chain, this mode of boundary work is a balancing act between their individual

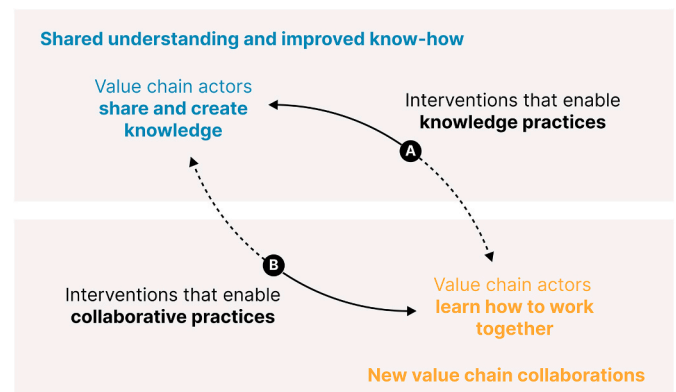


Fig. 5. Configurational boundary work for value chain collaboration.

business interests and the collaborative advantage of pursuing a shared meta-strategy with others.

4.4. Configurational boundary work in emerging value chains

The boundary work categories established in the previous part of this article are instrumental in the development of local value chains. They are modes of boundary work rather than phases of a process, in the sense that they do not necessarily run sequentially, but are, to some extent, concurrent, interdependent, and intertwined. This leaves the question of how this complex process can be facilitated in an appropriate manner. A special feature of newly emerging value chains is that they are inter-organizational settings in which formal partnerships or common organizational structures still need to be formed. As a result, there often is neither explicit leadership nor a focal company that could manage the change process or make decisions for the entire chain, which is a common challenge in emerging inter-organizational settings (Huxham and Vangen, 2005; Gray and Purdy, 2018).

In our study, it was the learning network that, through facilitation, engaged the value chain actors in boundary work. As value chain developers (Braun et al., 2023), the facilitators of the learning network set up the scaffold, within which the participants were enabled to build collaborative structures. In doing so, the value chain developers performed different functions, depending on the mode of boundary work. While in the first micro case, their focus was primarily on networking and facilitating collaborative inquiry, in the second case, the focus was on organizing learning activities, facilitating co-creation and transfer of knowledge, and providing access to domain experts. In the third micro case, the role of the value chain developers was to facilitate negotiations for shared strategies and to assist in organizing and evaluating practical trials. The learning network can thus be understood as an intermediary supporting sustainability transitions (e.g., Kivimaa et al., 2019), or, more specifically, as a boundary organization (Guston, 2001; O'Mahony and Bechky, 2008). The learning network created temporary spaces that supported effective interaction among participants, through shaping and re-shaping of boundaries, in the sense of configurational boundary work (Langley et al., 2019). Our findings suggest that this type of higher-level boundary work is the defining feature of value chain development.

Configurational boundary work in value chains enables both knowledge practices and collaborative practices (Fig. 5). Component A concerns interventions that have a primary focus on knowledge creation, in which the participating actors share and create specialized knowledge across organizational boundaries. This results in improved domain practices and understanding among value chain actors. Component B refers to interventions that focus on collaborative practices, where actors learn how to work together, which can lead to new value chain collaborations. In the process, there is a recursive relationship between knowledge and collaborative practices. By learning to collaborate, value chain actors also improve the capacity for knowledge co-creation in the value chain. Conversely, by sharing and creating knowledge, e.g., about the situation of the local food system or new strategies, they build the basis for value chain collaboration.

The configurational boundary work described here is similar to that in other practice-based research into learning networks or multi-actor settings in agri-food systems (e.g., Tisenkopfs et al., 2015; Rigg et al., 2021). In contrast to our study, that body of research has a primary focus on boundary work aimed at creating new knowledge. The participants of such networks work together on various practical issues and then implement the knowledge thus gained, but primarily on an individual basis, in the context of their own organizations (Rigg et al., 2021). As our findings suggest, configurational boundary work in value chain contexts involves not only the co-creation of domain knowledge, as illustrated in the second micro case (create and integrate). It also entails the development of local market knowledge, as illustrated in the first micro case (uncovering), combined with the negotiation of strategic collaboration

in the value chain, as illustrated in the third case (negotiating and implementing).

The configurational boundary work, in its parallel creation of knowledge and collaboration, is an ongoing process that has no pre-determined end, emphasizing the notion by Langley et al. (2019) that boundary work is, by its very nature, open-ended and continuous. Through the combination of the described interventions, existing value chain practices and boundaries are challenged in a process that can, over time, reshape local food systems. While ideally, the need for external facilitation in value chain contexts diminishes in the long term, the process of re-configuration continues as chains evolve and adapt to shifting conditions—with changing objectives and intensity, depending on the situation and future challenges in the value chains.

5. Conclusions

In this article, we used boundary work as a lens to conceptualize the nature of value chain development in local food systems. Over a period of six years, we conducted action research in a learning network of small and medium-sized agri-food enterprises in the Berlin-Brandenburg region, identifying several modes in which participants of emerging value chains engage at their boundaries. These modes include uncovering knowledge to build a shared understanding of the local food sector, creating and integrating domain knowledge to improve professional practices, as well as negotiating and implementing shared strategies for value creation. We also outlined how the configurational boundary work enabled new patterns of collaboration and knowledge co-creation in the value chain.

The present article contributes to the literature on innovation in local food systems (e.g., Stotten et al., 2017; Gamache et al., 2020; Gutiérrez and Macken-Walsh, 2022) by showing how the concept of boundary work can be used to explore learning and change in emerging value chains. Expanding on this prior work, our study demonstrated a pathway that took a group of agri-food practitioners from learning together to strategic business partnerships in the chain. We suggest that a boundary work perspective is appropriate for studying such emerging inter-organizational settings because it enables a dual focus on both the structures (boundaries) and the practices (boundary work) that shape the settings over time. While the practice-based theory we developed is limited to the specific context of our research, further research could transfer the findings and analytical approach to similar change processes, for example, in other sustainability-oriented value chains in the agricultural sector.

Our findings emphasize the crucial role of facilitated spaces in emerging value chains. With regards to practical implications, value chain developers and other facilitators can use the presented modes of boundary work as a guideline for designing such spaces, tailoring interventions to the specific problems of their region and the needs of the value chain actors they work with. Interventions towards more collaboration in the chain should not, however, be an end in itself. The objective of configurational boundary work is to help actors make well-founded decisions that enable sustainable business practices, which may, or may not, culminate in formal partnerships. Rather than prioritizing the creation of formal patterns of collaboration, configurational boundary work in value chains is about consciously exploring whether and how the actors can achieve a collaborative advantage through new ways of working together. Participating in an emerging value chain requires practitioners to challenge existing business practices and to develop and implement new strategies (Braun et al., 2023). It meant building capacity for knowledge-creation and collaboration, and effective changes in the individual enterprises. The development of value chains is, therefore, an essential part of their strategic organizational development.

For the value chain collaborations developed in the present learning network, it remains to be seen how the actors involved will be able to sustain and to further develop the established partnerships, which will

have to be evaluated in the future. Currently, a number of new initiatives for the development of local agri-food systems are underway in different regions of Germany and across Europe. In Germany, policymakers have acknowledged the need to support local value chains, for example, to supply public catering services with organic produce (Federal Office for Agriculture and Food, 2023). The implementation of such programs must be embedded in the regions to address the specific situations and issues on a local level. Local initiatives, politicians, and public administrators can play an important part because they can set the course for the re-localization of food systems at the level of municipalities or micro-regions, for example, by promoting local sourcing in public catering services, participating in innovation programs, or installing value chain developers in their regions. A remaining challenge is that many of the existing and planned programs are temporary and project-based. It would be important to also create more permanent boundary organizations that can facilitate newly emerging value chains and help existing value chains to continuously adapt to changing conditions, to support innovative local agri-food systems in the long term.

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CRedit authorship contribution statement

Charis Linda Braun: Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing, Visualization, Project administration. **Vera Bitsch:** Conceptualization, Methodology, Writing – review & editing, Resources, Supervision. **Anna Maria Häring:** Writing – review & editing, Resources, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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