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Social-ecological Resilience for Sustainable Development Master's
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Telling a different story:
Farming resilience in hay-milk farms
in Salzburg province

Julia Fritzsche

“Our choice of methods to collect and analyze data, how we choose to write, how we choose to present and communicate our results, how we choose to engage with participants or in public meetings, are all performative elements, through which we engage, participate, intervene in the world.”

(Darnhofer, 2020, p. 521)

Telling a different story:

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Abstract

Foregrounding relations and processes in resilience thinking has the potential to enable more holistic analyses and account for complexity, which could lead to more resilient actions, interventions, or ways of being. The concept of farming resilience builds on a process-relational understanding of resilience and thus offers a move away from more substance-based understandings of resilience as outcome. To operationalize the concept of farming resilience, I picked the case study of two small-scale Austrian dairy farms working with hay as feed conservation method instead of silage. Working on the two farms as embodied researcher, using active participant observation and narrative interviews, allowed me to deepen my analysis by adding nuances and detail to my data while not only observing but experiencing and being part of the farming processes. These empirical insights then contributed to unravelling what farming resilience is or may be. I present ethnographic stories and excerpts of my diffractive journaling of my experiences on the two farms by looking closer into feeding the cows and the involved processes such as mowing. These relational processes unravel farming resilience as the re-assembling of farming practices on the farm. Keys to the persistence of the small-scale hay-milk farms are experimentation and an open and flexible mindset to engage in persistences, adaptations, and transformations to changes. A process-relational approach brings forward resilience not as a stable state, but as constantly in the re-making. Resilience can never be taken for granted, nor acquired but requires continuous work. Re-thinking resilience as a bundle of processes stresses the importance of how we conduct research on resilience: We as researchers shape the world by revealing insights about it. We also get to choose how and whom we portray. With this there comes a certain responsibility because resilience requires specification at the point of intervention.

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The researcher's motivation – A prologue

Before me an idyllic mountain landscape. The October sun has set behind the mountains and let to a mystical twilight atmosphere. Farmer Robert and I are standing next to the stable, at the foot of the pasture. Four young cows graze in the far distance. Robert forms a funnel with his hands and begins shouting: "Kooosseeiii" [kouzai]. One, two cows raise their heads. "Kooosseeiii". All cows have raised their heads and start moving into our direction. "Kooosseeiii". The cows start running and stop right in front of us. Robert pets the head of the cow closest to us. I ask: "Why do you call them like this?". "I don't know. We have always called them this way."

Change of scenery

"So, the births are really our most beautiful moments (laughs), for the cows and for me." I am following farmer Rosa into the stable for the becoming mothers. A new life has just been born. Rosa starts drying the baby with a towel. Then she cleans the udder of the mom with wood wool and milks the fresh milk into a bottle by hand. Next, rubs the nose of the baby, so the sucking reflex is triggered. Then she carefully opens the baby's mouth by putting her finger into it and then the bottle. Swallowing sounds arise. I ask why she does what she does. "The first milk contains lots of antibodies. And by me giving it to the calf, it gets used to me."

....

When I thought about what kind of thesis I want to pursue, I asked myself:

In a world that is getting hotter and hotter. In a world where people seem to not act quickly enough. In a world where people are not listening to the numbers, science has been putting forward since years. In such a world, do we need more numbers to try and convince people to act? Can more numbers really contribute to a resilient biosphere for all? For me the answer was: No.

Hence, I decided to go full-on qualitative to be able to tell stories, stories from people and places that are already living in a resilient way. Maybe those stories can convince people to act. But what stories to tell? Where to find these people and places?

Here, Jamila came in. My main supervisor. She told me about her research on small-scale dairy farming she was planning to pursue in the Austrian Alps.

I was immediately hooked. I grew up close to the Austrian border in Germany in between agricultural fields, but not on a farm. I have always been interested in understanding farming in a practical way. Not by looking at and comparing outputs and efficiency. Not by studying distant legal documents stating how much subsidy a farm gets.

I wanted to look at farmers' everyday lives. Those farmers that have been neglected in common European narratives of growth, efficiency, and intensification. Those farmers that are often described as backwards and old-fashioned. Those farmers that have the potential to tell a different story. A story about more resilient ways of farming.

This is my story about two of such farms.

1 Farming resilience – an introduction

*“To be a farmer, you need many different skills and talents:
You have to be willing to dedicate your whole life to the farm,
the animals, the plants and nature.”*
(Farmer in Porsche & Rosenstatter, 2017, p. 44)

Consider a farmer. In a substance-based ontology, she might be considered as an independent entity, with an inherent and unchanging identity that exists apart from her relationships and the farm itself. In a relational ontology, however, she would be defined by her relationships to the farmland, the animals, the soil. Her interactions over time with these other farm actors are crucial aspects of her identity in the context of farming.

Substance-orientated methods and frameworks in resilience thinking are limited in studying complexity because they focus on stable objects, while relations are subordinate (Hertz et al., 2020). A relational approach instead foregrounds relations and their interconnectedness; it acknowledges that knowledge is contextual and reality dynamic (e.g., Walsh et al., 2021; West et al., 2020; Wildman, 2006). Relational ontology has been suggested in a number of fields to better study complex and changing systems, such as social-ecological systems (West et al., 2020).

This so-called ‘relational turn’ in sustainability science (and resilience thinking) enables novel research areas and questions to find more resilient ways to live (Hertz et al., 2020; West et al., 2020). Working with relational thinking is a transformative project in itself: it is about rethinking the world as relational processes (Darnhofer, 2020). Using relational methods and frameworks in resilience thinking has the potential to overcome the dualism between the social and ecological in social-ecological systems (Folke et al., 2021; West et al., 2020). In ecosystem management and natural resource governance social-ecological resilience is commonly defined as *“the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human wellbeing”* (Folke et al., 2016, p. 41). Everyday practices can define pathways of resilience and enable a better understanding of how people such as farmers continuously re-invent their practices to persist, adapt, or transform at the individual level (Haider & Cleaver, In review). Taking a relational approach allows not only more dynamic and holistic analyses regarding human-nature relationships, but also enables empirically informed knowledge production to include diverse knowledges, and underacknowledged practices and relations to nurture them (West et al., 2020).

When applying resilience to study farming, Darnhofer (2020) argues to shift from *farm resilience* to her newly introduced concept of *farming resilience*. Farm resilience is often studied in terms of resilience assessments, which use a variety of indicators to assess the system’s resilience (e.g., Cabell & Oelofse, 2012; Meuwissen et al., 2019) building on a substance-based ontology (e.g., Darnhofer et al., 2016). Similar to organic farming assessments (Darnhofer et al., 2010), such structural resilience assessments fail to address the interrelatedness of indicators. Adopting a process-relational approach to study farms’ resilience according to Darnhofer (2020) means seeing the farmer embedded in their social-ecological context, where they handle many relational processes between different actors; these can be human actors, but also tools, animals, plants, and nature, which can be affected but also affect other actors. These relational processes influence and depend on

each other and reality is actively made and remade, and thus ever-changing. For resilience this means, that *“a farm ‘is’ not resilient, but farming resilience is continuously made and re-made”* by enabling change (Darnhofer, 2021, p. 6). Farming resilience is hence *“the ability to respond and to shape changes by navigating a bundle of processes”* (Darnhofer, 2021, p. 6-7).

While there are conceptual papers on farming resilience and resilience thinking from a process-relational perspective, little has been implemented in empirical case studies (e.g., Darnhofer, 2020, 2021; Haider & Cleaver, In review; Walsh et al., 2021). I argue that engaging in empirical work can deepen the understanding of farming resilience and ultimately provide new theoretical insights. Looking into farmers’ everyday practices and *their ability to respond and to shape change by navigating a bundle of processes* enables unravelling persistence and adaptations on the farms. These processes at the micro-level of daily practices might enable the larger farming system’s resilience, i.e., its *capacity to persist, adapt, and transform* over a long time.

A process-relational approach is not limited to conceptualizing farming resilience, it also has methodological implications (Darnhofer, 2020). Indeed, relations are discovered in experience (Hertz et al., 2020). I work as an embodied researcher, going beyond data collection and analysis towards engaging in data. To operationalize a process-relational approach to empirical work, I thus took a short-term ethnographic approach.

As a case study, I selected two small-scale hay-milk¹ family farms in Salzburg province, Austria. This choice was made for several reasons: 1) The millennial-old tradition of hay-milk farming is a potential source of memory and (retro-)innovation because the practices involved in producing this milk have coevolved with the surrounding landscapes by responding to changing social-ecological contexts (Haider et al., 2021). 2) While other European countries have developed into intensified agricultural systems, in Austria small-scale family farms have prevailed especially in ‘disadvantaged’ mountain regions (Augère-Granier, 2018; Wallenbeck et al., 2019). Nevertheless, the number of farms is decreasing (Haider & Cleaver, In review) and hay-milk farmers also have doubts about long-term economic viability and need to adapt to changing environments (Scheurich et al., 2021). 3) Hay-milk (whether conventional or certified organic) is a certified quality product, which provides a source of additional income in comparison to conventional milk (ARGE, n.d.; Scheurich et al., 2021). This added value is especially important for small-scale farmers. 4) Certified hay-milk farming is associated with farming practices sustaining permanent grassland and enhancing biodiversity and animal welfare (ARGE, n.d.). This broader context frames the empirical research puzzle as to how small-scale family hay-milk farms could persist in Austria.²

The aim of this thesis is to contribute to the relational turn in resilience thinking by operationalising the concept of farming resilience through applying it to an empirical case study. Or put differently: The aim of engaging in empirical work on hay-milk farming in Salzburg is to see whether the concept of farming resilience can work in the field. Thus, I ask:

¹ Hay-milk is a European Commission geographic indication, a ‘Traditional speciality guaranteed’, and is defined in particular by how the cows are fed: *“hay-milk cows feed on fresh grasses and herbs in summer and hay in winter (...) entirely without fermented feedstuffs such as silage”* (ARGE, n.d.).

² I started this research journey with an empirical research question that involved experimentation with a process-relational approach. Throughout the analysis I shifted from an emphasis on empirical results, towards emphasizing primarily methodological aspects. This was part of my becoming/transforming process.

How can a process-relational approach to empirical work deepen the understanding of farming resilience?

Concretely, the research objectives are as follows: 1) operationalizing the theoretical concept of farming resilience building on a process-relational onto-epistemology; 2) developing and engaging in a process-relational approach to empirical work; 3) exploring some empirical insights allowed by this approach, by showing how farming resilience may be expressed on hay-milk farms; 4) reflecting on how this approach contributes to the relational turn in resilience thinking.

2 Towards process-relationality: Related literature and theoretical grounding

“Reconceptualising farming in relational terms is not just a theoretical but also a political project: it spurs different imaginations, making other worlds thinkable.”
(Darnhofer, 2020, p. 505)

Relational ontology informs this study. In this section I briefly review this literature body’s research implications, explain how I derived a conceptual framework, and how I operationalized it to engage in empirical work. Because the different ologies are extremely relevant for this study, I included their definitions in **table 1**.

Table 1: Definitions of different ologies relevant for the philosophy of science, source: Hertz & García (2017), p. 4.

Ology	Definition
Ontology	<i>“A particular commitment to the nature of being or the kinds of things that have existence.”</i>
Epistemology	<i>“The study or a theory of the nature and grounds of knowledge especially with reference to its limits and validity.”</i>
Methodology	<i>“Defines what forms of reasoning are valid in view of arriving at knowledge, defined by an epistemological position.”</i>

2.1 Relational onto-epistemology and its implications for research

Relational thinking opposes a number of assumptions about science and knowledge generation inherited from the Enlightenment period: rationalism, reductionism, empiricism, mechanism, dualism, causality, objectivism, and representationalism (e.g., Bhattacharya & Kim, 2020; Lange, 2018; Walsh et al., 2021). Instead, it sees the world as dynamic and evolving process, and all entities as relational (Lange, 2018). To study farming resilience relationally thus involves *“shifting away from what a farm has or what a farmer is able to do, towards the relations that are involved in the farming process”* (Darnhofer et al., 2016, p. 119).

For research this means, that there is no researching subject nor a researched object, rather real phenomena emerge from intra-action, including the human body and mind (Hultin, 2019). Knowledge is hence produced in a process of co-construction, which can generate new ways of thinking in being, or becoming (ibid). *“I as a researcher, and my research practices do not represent reality, they enact it as such”* (ibid, p. 93). In other words: ontology and epistemology, which are usually understood as separate (see **table 1**) are no longer separate. To convey this entanglement, physicist-philosopher Barad (2007) coined the term ‘onto-epistemology’, arguing that ethics, ontology and epistemology are inseparable (Lange, 2018). The concept of entanglement itself emerged from quantum mechanics describing the intertwined nature of two objects (Lange, 2018). Being entangled in the world has ethical implications, researchers can no longer treat ethics, politics, biases, etc. separate from their work (ibid). Many indigenous and Eastern philosophies are rooted in relationality and see reality as a web of relations between beings and the environment (e.g., Lange, 2018; Nxumalo & Cedillo, 2017). In that sense, quantum physics and indigenous philosophies share key ideas (Lange, 2018).

Social science researchers are part of the world they study, hence re-presentation always involves self-presentation (Mauthner & Doucet, 2003). With the texts and results social science researchers produce, they are *“trying to say something about the intertwined relationship and mutual transformations in this flow of encounters taking place, rather than trying to reveal and incarnate a specific phenomenon or quality of ‘being-in-the-world’”* (Hultman & Lenz Taguchi, 2010, p. 537). This shifts scientific objectivity: it is not about accurately reflecting the world like a mirror, but for social science researchers it involves being accountable and responsible for the effects of our actions on other entities, and recognizing our participation in larger relational networks (Lange, 2018). Our knowledge practices shape our understanding of the world, therefore, Barad proposes to use diffraction as a better metaphor than reflection (Kaiser & Thiele, 2014; Lange, 2018)³. Diffraction accounts for the performativity of research⁴ and places the researcher’s own becoming in the centre of knowledge production (Jenkins et al., 2021). I applied the concept of diffraction by making my own becoming/thought processes/understanding throughout the research process visible. Working with diffraction provides the possibility of integrating different ways of knowing (Walsh et al., 2021), and thus becomes crucial when studying the sometimes tacit knowledge of farmers.

Many other authors have argued for a fluid and dynamic understanding of ontology and epistemology, recognizing the interconnectedness of all things, including Haraway (1990), Latour (1987), Pickering (1995), Stengers (2012), Whatmore (2004), Smith (2021) and Anzaldúa (2002). Anzaldúa for example promotes deep introspection on prejudices for intellectual honesty (Bhattacharya & Kim, 2020). These intellectual journeys point towards the researcher’s own relationalities and hence bear the possibility to create *“new ways of knowing, being, and relating”* (ibid, p. 1178). This process of making oneself the object of knowledge is necessary to overcome *“Western superiority of their onto-epistemological positions”* (ibid, p. 1178). Onto-epistemology thus requires ethical transformation in the form of the researcher’s self-disclosure of positionality and perspectives, as well as *“critical self-awareness, vulnerability, and an openness to working with the unknown, incorporating methodological flexibility”* (Bhattacharya & Kim, 2020, p. 1179).

I define a process-relational approach to research based on Barad (2007) as noticing the dynamic nature of relations, knowledge, and reality using body and mind.

2.2 Conceptualizing farming resilience

When taking a process-relational approach to study farming resilience, the empirical focus encompasses not only relations, but the ever-changing nature of them. The question for research becomes then *“how [the study] can highlight these always-already-there openings*

³ Barad referred to Bohr’s ‘two-slit diffraction experiment’, in which he showed that light behaves differently depending on how we observe it. If we don’t know which path a photon takes, it creates a wave pattern, but if we use a detector to track its path, it behaves like a particle. Hence, light can show both behaviours and this paradox shows that our measurements and observations affect what we see and understand (Kaiser & Thiele, 2014).

⁴ Pickering (1995) argued that scientific research is not simply a passive process of discovering and representing the world but an active process of engaging in the world and shaping it using scientific practices. This performativity of research and its outcomes can hence shape how people think and (inter)act. Language becomes thus important in process-relational approaches and complex resilience challenges because it actively intervenes and shapes the world (West et al., 2020). In this sense, the interview for example is a place where meaning is created, and the text narrates and depicts a story based on its unique interpretation of truth and logic (Denzin, 2003).

for change, and how it can contribute to a context that strengthens the ability of farmers to make use of them” (Darnhofer, 2021, p. 2). My research purpose of telling different stories of farms’ resilience fits very well with using a process-relational approach because the approach potentially can show ways in which small-scale farmers live farming resilience. Darnhofer (2020) furthermore stresses 1) the need for diffraction because of the entanglement of the researcher and the research process and with this a different way of communicating the findings; 2) identifying a way to re-present the relational processes; and 3) accounting for the performativity of the research.

2.2.1 A conceptual framework

For researchers concepts are the tools to understand reality, just as for farmers the tractor with a mower is a tool to mow the meadows. Because concepts determine our thinking, they play a decisive role in the possible solutions we find for the problems we study (Hertz et al., 2020). Based on Darnhofer and colleagues (2019) I came up with a preliminary conceptual framework prior to fieldwork. After fieldwork, I adjusted the actor groups, see **figure 1**. Importantly, the groups are not set in stone, as certain actors are located between those groups or may belong to several groups. Moreso, the framework serves as a graphical understanding of a process-relational approach to study farming resilience.

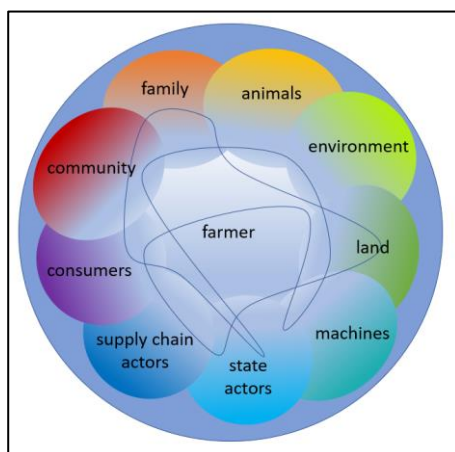


Figure 1: Conceptual framework of a process-relational approach to study farming resilience. Farming resilience is comprised of multiple relational processes between different actors. The different groups are animals (predominantly cows, but also chicken, dogs, pigs), family (farming couple, their children and eventually parents), machines, community (some neighbours, friends, wider family, other farmers, village clubs), customers (buyers of dairy products and guests), state actors (chamber of agriculture, municipality, Schools on Farms, etc.), supply chain actors (dairies, advocacy groups, supermarkets), environment (soil, biodiversity, weather), and land.

2.2.2 Unit of observation: Relational processes involved in farming routines

Daily practices can be used as analytical units to observe change processes, the everyday forms of resilience (Haider et al., 2021). Practice⁵ bears the possibility to observe “*thinking and acting through the body*” (Whatmore, 2006, p. 604). This is vital when engaging with tacit knowledge; the farmers embody their farming practices and hence might be much better in showing how they interact with the world, rather than explaining it with words.

As Hultin (2019) notes, practices have a temporal component, as each repetition bears the possibility of enacting in different ways. Thus, there is value in observing and experiencing these from different perspectives (ibid). In common language we like to use the term ‘routine’ to describe a repeating practice. Routines, according to Feldman and colleagues (2016), are patterns of action. However, they are neither stable entities, nor the same every day, but rather dynamic. Routines as practices “*emerge through their own enactment and in relation to other practices*” (ibid, p. 506). Within each farming routine there are several

⁵ I acknowledge that there is a body of literature on practice theory, but I use practice here in the colloquial way.

relational processes involved, e.g., the relational process between the farmer and the cow while feeding. I thus decided to focus on the relational processes as analytical unit by engaging in the everyday routines on the two hay-milk farms.

According to Darnhofer (2021) the nature of a relational process is that it is dynamic, and it needs effort to uphold the relation between the actors involved. Relations are diverse and have many different aspects (e.g., material, emotional, discursive) and may be contradictory and unfinished (ibid).

The relational processes involved in farming routines change every day, often in small ways, due to changing environments. Hence, the farmers need to persist, adapt, or transform in response to these changes. To be able to distinguish between the three capacities of resilience, I outline their definitions in **table 2**. Darnhofer (2021) argues that from a process-relational approach, adaptive and transformative capacity can only be distinguished retrospectively. However, I use the three characteristics proposed by Moore and colleagues (2014, p. 4) to distinguish between adaptive and transformative capacity: “[A]n *intentional SES [Social-ecological system] transformation* (1) can be triggered by a deliberate change in the key elements of either the social or ecological parts of the system across more than one scale, (2) that this change has impacts on the current dominant social-ecological feedbacks, and (3) that this leads to further changes in the structure of both the social and ecological parts of the system.”

Table 2: Resilience capacities, source: Haider and colleagues (2021), p. 1305.

Capacities	Definition
Absorptive capacity	Leads to persistence
Adaptive capacity	Leads to incremental adjustments and adaptive changes
Transformative capacity	Leads to structural or systemic reconfigurations

2.3 In between theory and methodology: operationalizing a process-relational approach

Studying farming resilience empirically requires an operationalization of this process-relational onto-epistemology. Since there are no established methodological rules, experimenting is sought-after (Darnhofer, 2020, 2021). In the following I explain two models that were crucial to me in operationalizing farming resilience.

2.3.1 The embodied researcher: Mind and body are not separate

Building on a process-relational approach, implies that knowledge cannot be generated by being outside of the system. Rather it involves taking part in the relations to “*get sufficiently close to the practice at hand and recognize its material and embodied nature*” (Hultin, 2019, p. 97). I thus chose to engage in the research as an embodied researcher (Horlings et al., 2020). But what does ‘being an embodied researcher’ mean?

The concept of embodiment opposes the idea that the mind and the body are separate entities based on Descartes and Greek philosophy, who saw the body belonging to the natural world, while the mind didn’t (Fraser & Greco, 2020). This was the prerequisite to see science and knowledge production separate from subjective experience (ibid). Instead of this mind/body dualism, phenomenologist philosopher Merleau-Ponty (2011) argued that our experiences of the world are shaped by our bodily interactions with it, and these interactions are always influenced by our subjective perspectives and previous experiences.

As Spatz (2017, p. 3) puts it succinctly: *“To be a person is to be embodied.”* This suggests that embodiment can be a powerful method to operationalize a process-relational approach to empirical work, to overcome the dualism of body and mind and to generate knowledge by thinking in being.

Vervoort and colleagues (n.d.) summarized the methodological role embodiment can have in sustainability science. 1) Embodiment allows personal change through experiencing different perspectives; by reflecting on our own subjective truth, we may be able to identify a shared truth. 2) Embodiment nurtures emotional communication with other people and 3) is entangled with the context (Vervoort et al., n.d.). Several authors have shown the value of working with embodiment in rural studies (e.g., Pini, 2002; Rodriguez Castro, 2018; Woods, 2010).

Building on these new insights on embodiment and sustainability research, I adopted the model of the embodied researcher, **figure 2**, who *“integrates different roles during the research process, depending on the relations developed with the place and with communities (feet), theoretical understanding (brain), normative positionality (heart) and capacities and networks (hands)”* (Nieto-Romero & Pisters, n.d.). In **table 3** I detail my application of this heuristic model in the research process. This choice was ethically motivated; as Haraway puts it: Response-ability means to respond ethically to the needs of others (Horlings et al., 2020). Research is seen as a *“a process of place-based inquiry [and] self-transformation”* (Nieto-Romero & Pisters, n.d.). Embodiment requires continuous diffraction because *“our embodied experiences as researchers influence our understanding”* (Rodriguez Castro, 2018).

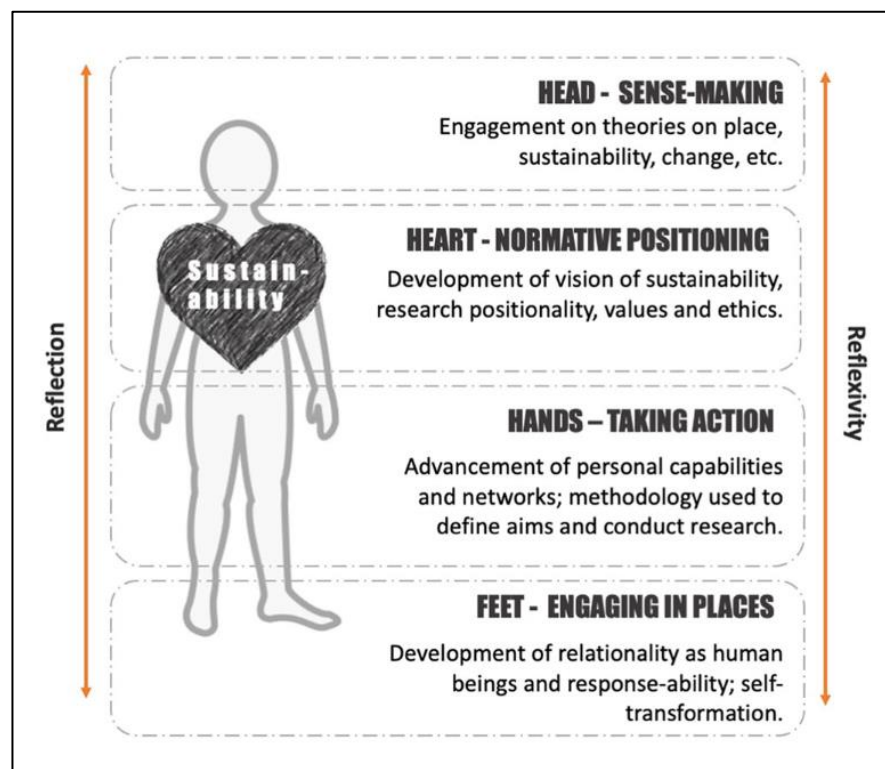


Figure 2: The embodied researcher, source: Horlings and colleagues (2020), p. 479. Continuous reflexivity and reflection eventually lead to the researcher’s self-transformation.

Table 3: Explanations of the embodied researcher's different body parts, source: Nieto-Romero and Pisters (n.d.).

Body parts	Explanation	Application
Brain	<i>"Relates with the heart. Theories catalyse a process of self-questioning, sense-making and self-transformation affecting the commitments towards sustainability and the methods used."</i>	Inner motivation changed towards an emphasis on methodology and self-learning
Heart	<i>"Is the 'spark' and the inner compass of the research process, a wish to support change towards sustainability. Visions and commitments change throughout the research process."</i>	Inner motivation started off as to tell stories about the resilience of small-scale farming
Hands	<i>"Represent the (ethical) engagement in action. 'How' research is conducted is often more important than the outcome, reflecting a process-based approach. Methods can be 'performative' in the sense that they bring alive themes or transformative mindsets such as inclusivity, reciprocity, aesthetics, vulnerability or trust."</i>	Methods have been at the core of this research project. E.g., I engaged with the farmers by living and working with them.
Feet	<i>"Illustrate the engagement of the researcher as a 'human being' (challenging dominant visions of 'objectivity' in science). For doing good research, researchers must develop personal connections and ethical response-ability towards the places and communities they research"</i>	Living with farming families and working on the farms to develop personal connections to the people and places (rather than shorter interviews).

2.3.2 Data is not neutral: engaging in data

Several authors, among others Haraway (1990) and Latour (1987), have argued that there is no neutral and objective observer, rather knowledges are situated and are shaped by the diverse contexts in which they emerge. This has ethical, theoretical, and methodological implications for how qualitative researchers engage with data (Ellingson & Sotirin, 2020).

Assuming that data can be 'collected' in qualitative research follows the positivist assumption that 'the data' pre-exists the research process and hence doesn't account for the entanglement of the researcher and research process, the subjectivity being involved in qualitative research, and the situatedness of knowledges (Ellingson & Sotirin, 2020). Ellingson and Sotirin (2020) suggest the process of 'data engagement', which states that *"data are made rather than found, assembled rather than collected or gathered, and dynamic rather than complete or static"* (ibid, p. 3) with an ethical underpinning of committing to pragmatism, compassion, and joy (ibid). Since the process of engaging with data coincides well with a process-relational approach and the embodied researcher, I followed it in my research, see **table 4** for further definitions and application.

Table 4: The process of engaging with data, source: Ellingson and Sotirin (2020).

Elements	Explanation	Application
Making data	<i>"Involves inventing, imagining, encountering, and embracing lived experience and material documentation as methodological praxis" (p. 3).</i>	I embedded myself in the farming context by working on the farms.
Assembling data	<i>"Researchers engage in the ongoing process of assembling data through the intra-action (mutual constitution) of researchers, participants, material objects, and cultural discourses within particular places and times" (p. 4).</i>	I considered the farmers and human actors as 'knowledge experts' throughout the data-making process. Knowledge was produced by the intra-action between the farmers, human actors, and my interpretation/understanding of the situations.
Becoming data	<i>"Data engagement situates all data as dynamic, as always already becoming, and this dynamic state both reflects and produces agentic data" (p. 5).</i>	I reflected (Barad, 2007) on my biases, positionality, interpretation, and feelings throughout the research process. I noted down different interpretations, and approaches to data throughout the process.
Pragmatism	<i>"Making qualitative data embodies the pragmatic goal of balancing imagination with practicality, that is, getting the job done" (p. 7).</i>	I adapted the research question, objectives and aims throughout research process to match time constraints (pragmatism) and own ambition (imagination).
Compassion	<i>"Compassion is not limited to how we relate to other people but is an affective force entangled in human engagement with the material world" (p. 7).</i>	While staying on the farms longer and embedding myself in the family farming contexts, I tried to witness, connect with, and act kindly towards the farmers and other actors.
Joy	<i>"Through joy, engagements among data, researcher, and event are thresholds that can initiate new thoughts, novel actions, and ways of being that were heretofore unknown or unavailable (...)" (p. 8).</i>	I tried to remain open towards changes in my understanding, interpretation, the ethnographic stories and foremost embrace my joy/eagerness to learn.

3 Making, assembling, and becoming with data – Methods

“If we want to contribute to shaping change towards sustainability through research, we need to shift away from the assumption that researchers should be separate from the processes of change that they investigate.” (Caniglia et al., 2021 p. 98)

To operationalize a process-relational approach I took a short-term ethnographic approach to fieldwork (Pink & Morgan, 2013), as it allowed me to engage deeply – even if only for a few weeks – in the farming practices and their contexts. Engaging in data was guided by abduction, which describes the iteration between theory and empirical data (Schwartz-Shea & Yanow, 2011). The aim of this study was to see whether the concept of farming resilience can work in the field, not to study Salzburg’s hay-milk sector, nor to report representative data on hay milk farms. This research and its findings are hence not about re-presenting truth because I am not an objective observer mirroring the events on two farms (Lange, 2018), rather I worked with diffraction to show my own interpretations and to encourage the reader to have different possible interpretations.

I embedded myself in the farming practices by working on two farms and living with the farming families. I spent four weeks on Hirtl farm and one week on Schäferl farm. During the time on Hirtl farm, I also interviewed seven representatives from four actor groups related to hay-milk in Salzburg province to understand the relational processes within the farms’ broader context, Salzburg’s hay-milk sector.

Because our understanding of a place is shaped by our positionality (Rodriguez Castro, 2018), I include a short note on my positionality here and an elaborated version in [annex 1](#). Having grown up on the countryside and studied farming from different perspectives I brought my own prejudices to the field (Bhattacharya & Kim, 2020): Romanticising the small and working in harmony with nature (peasant logic⁶) while coming from a tertiary, educated middle-class, non-farming background. Differences between actors and me arose in terms of age, nationality, partially social class, and familiarity with farming. Simultaneously my relationships with interviewees were characterized by openness and mutual trust. Reflections on my ethical considerations can be found in [annex 8](#).

3.1 Preparing for fieldwork

I selected Salzburg province within Austria as the case study region and boundary because it is one of the few areas in Europe where the millennial-old tradition of hay-milk farming is still pursued (ARGE, n.d.). The case study design is depicted in **figure 3**: Dairy farming in Salzburg serves as context for the case study of hay-milk. The two farms are two distinct embedded units of analysis within the case study.⁷

⁶ More information on peasant logic: (e.g., van der Ploeg, 2008)

⁷ This study is part of Dr Jamila Haider’s postdoctoral project “Development as coevolution: How can resilience inform sustainable development in biocultural landscapes”, which comprises two case studies, traditional practices of 1) Transhumance (led by Dr Jamila Haider) and 2) Hay-milk farming (led by me, Julia Fritzsche).

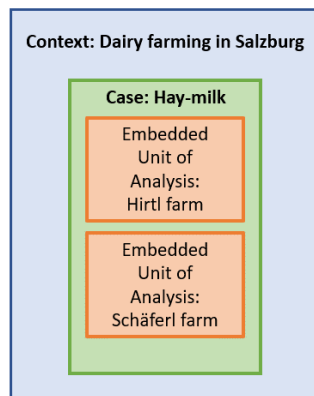


Figure 3: The case study design based on Yin (2014).

Before going to the field, I reviewed context-specific literature on farming resilience and websites on hay-milk in Salzburg province to 1) find my unit of observation of relational processes in farming routines for fieldwork, 2) to identify relevant (human) actors, and 3) to design the interview guides (see [annex 2](#)) in a theoretically grounded way (St. Pierre & Jackson, 2014; Yin, 2014).

I chose to focus on two farms to be able to intensely engage in these farming families' lives because a key element of short-term ethnography is this intensity (Pink & Morgan, 2013). I selected the two farms, the Hirtl and Schäferl farm, with the help of contacts⁸ and following purposive sampling criteria: 1) both farms needed to produce hay-milk, and 2) contrast each other in terms of different environments, flat land, and mountain region in Salzburg province, as well as 3) in selling their milk (to a dairy and self-processing) and 4) certification (certified organic vs. conventional). For the narrative interviews on the farms I formulated themes based on existing literature (e.g., Darnhofer, 2020, 2021). One example theme was significant events and how things changed afterwards as events are understood not as existing individually, but as happenings, unfolding over a longer time (Darnhofer, 2021).

The preliminary work also allowed me to select relevant actor groups in the hay milk sector. This was done based on Darnhofer and colleagues' (2019) conceptualisation of the Austrian organic sector and a web search. With farmers' recommendations I then identified relevant interview partners within these groups (see **table 5**) (snowball sampling). The aim was to have at least one representative for each of the four groups. While the groups might differ formally, they overlap in practice (Darnhofer et al., 2019). For the interviews I developed a semi-structured interview guide, which was informed by literature.

Table 5: Actors and their groups interviewed.

Actor group	Interviewees (pseudonyms used)
Dairy processor	Andreas; Emilia and Franz
Advocacy	Bernard
Supermarket	Casper
Advocacy; state/regulation	Dietrich; Georg

⁸ To engage with someone else's life demands trust. Therefore, I tried to overcome the initial trust barrier by engaging with the farms via already established connections.

3.2 Making and assembling data as embodied researcher

During my stays on the two farms, I made and assembled data (Ellingson & Sotirin, 2020) on the relational processes involved in the farming routines in several ways:

- Active participant observation (Spradley, 2016) by working with the farmers and following their daily routines. I noted my observations, daily learnings, and doings down in a diffractive journal. In this journal, I also kept track of the personal side (e.g., ideas, fears, confusions) as embodiment requires continuous diffraction (Rodriguez Castro, 2018).
- On-going informal conversations in a narrative format, where I raised various themes based on literature, but also issues that came up in my observations during my stay on the farms (Bryman, 2016). The questions were open-ended and invited the farmers to tell stories related to farming resilience. I asked most of the questions during the work on the farm in a 'normal' conversation while observing the farmers' practices and working with the farmers. This allowed me to notice the farmers' expressions beyond words (Chadwick, 2017). To avoid disrupting the flow of work and the conversation I chose to not record these conversations but noted the answers later in my diffractive journal.
- One semi-structured interview with the four farmers with more specific questions to follow up on the informal conversations and observations (Bryman, 2016). I decided to include this method during my stay on Hirtl farm, because I was collecting many questions while reflecting in my diffractive journal. I wanted to ask these during a dedicated time while sitting down with the farmers and record their answers.
- Sketching of observed events, taking photos and videos. These were meant to allow me to re-engage in the context, during the data analysis (Pink & Morgan, 2013; West et al., 2019).
- Semi-structured interviews with the representatives of the actor groups.

In total 249 pages of data were made and assembled (see **table 6**).

Table 6: Data made.

Data-making - assembling method	Data made
Active participant observation and notes on informal conversations in/and the diffractive journals	80 pages
Transcripts of the semi-structured interviews with farmers	88 pages
Visual material	463 items
Transcripts of the semi-structured interviews with actors	81 pages

Because hay-milk farming practices were new to me, my learning process throughout data-making, data-assembling, as well as data-analysis, can be depicted as hermeneutic spiral (see **figure 4**) where theory and empirical data sources reiterate (Schwartz-Shea & Yanow, 2011). The different methods complemented each other in making sense of the relational processes. For example, after having spoken with the dairy processor, the Hirtl farmers deliver their milk to, I could better understand both sides of the relational process. Noting down the narrative conversations and observations gave me time to reflect on what the farmers said and did. I could then ask follow-up questions in a more semi-structured interview.

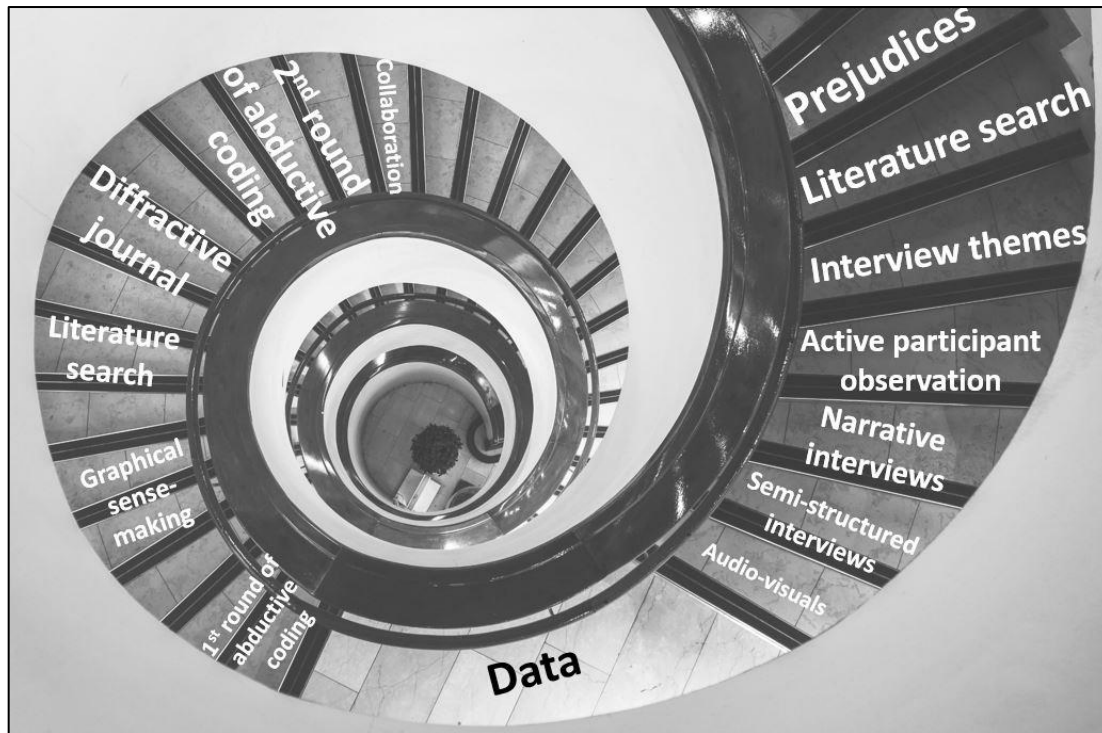


Figure 4: Hermeneutic spiral of data-making and -assembling, and analysis process. The understanding of an abductive process as circular-spiral is based on Schwartz-Shea and Yanow (2011). The different methods informed each other and helped me to make sense of the data. I also acknowledge that prejudices influenced the process (Bhattacharya & Kim, 2020). The different coding and sense-making tools helped me to interpret the data and produce outcomes. The photo was taken by Letunova (2018).

3.3 The process of becoming: analysing data

With analysing the data made, I aimed at producing ethnographic stories (Verran, 2021) of my personal experience on the farms and the relational processes involved in the farming routines.² This choice was inspired by Tsing's beautiful writing with which she shows how humanities' tools such as storytelling can support the presentation of science (e.g., Tsing, 2010). I acknowledge that not only data and theory constitute each other, but also that the data shaped me and my understanding, as much as I shaped the data in a process of becoming (Hultman & Lenz Taguchi, 2010), see **figure 4**.

In the first round of coding, using the software MAXQDA, I focussed on identifying thematic, factual, and in-vivo code categories to identify core relational processes as themes to inform the second round of coding (Saldaña, 2013). I coded all written data and selected pictures that were important to understand the written material. Between the first and second round of coding, I read more literature on process-relationality and further refined my understanding of emerging themes as relational processes.

For the second round of coding, I decided to focus on one hay-milk specific relational process: feeding and the involved relational processes. I made this choice because feeding emerged as one of the central themes being connected to multiple other themes in the first round of coding; and I had made and assembled rich data on feeding, which would allow me to write the stories. In the second round of coding, I thus re-coded existing codes and raw data into the larger theme on feeding. Moreover, to address farming resilience, I focused on one significant change event on each farm: changing to a higher quality milk standard at Hirtl

farm and changing from silage to hay at Schäferl farm. These events were selected because of their connection to hay-milk and because they came up during the conversations with the farmers. The coding systems are attached in [annex 3](#), examples of my coding plus a more detailed description in [annex 4](#).

To better understand my interpretation of the data, I used graphics such as collages, mind maps, and visualisations of the relational processes throughout the coding process (Ballesterio & Winthereik, 2021; Capous-Desyllas & Bromfield, 2018). Furthermore, I utilized memos and a diffractive coding journal to firstly keep track of my iterative process of e.g., dividing broader categories into sub-categories and then applying the newly generated codes to the whole material to ensure consistency and coherence (Rädiker & Kuckartz, 2020), and secondly to reflect upon my own understanding and feelings (e.g., Eakin & Gladstone, 2020) and the influence data itself had on me (Hultman & Lenz Taguchi, 2010). These techniques also helped me with writing the stories.

Because “*reflection is always done in the midst of a complex network (...) and never the product of an isolated individual*” (Hultman & Lenz Taguchi, 2010, p. 536), I collaborated with peers throughout my becoming with the data process, and on the graphics and artistic reflection with a befriended illustrator (e.g., Burleigh & Burm, 2022).

3.4 Hay-milk in Salzburg province: the case study context

In this section, I want to give an overview of the Salzburg province’s characteristics of dairy farming and the key-relational processes of hay-milk in Salzburg since the 1950s and introduce the two farms in relation to hay-milk.

Broadly speaking, Salzburg province can be divided into two areas of dairy production, the flat land area, and the mountain area (Andreas), see **figure 5**. The flat land area experiences a tendency towards larger farms, while in the mountain area small-scale farming can be preserved relatively well due to additional income from tourism (Andreas). With hay-milk, farmers and processors try to preserve the small-scale farming structure also in the flat land (Andreas).

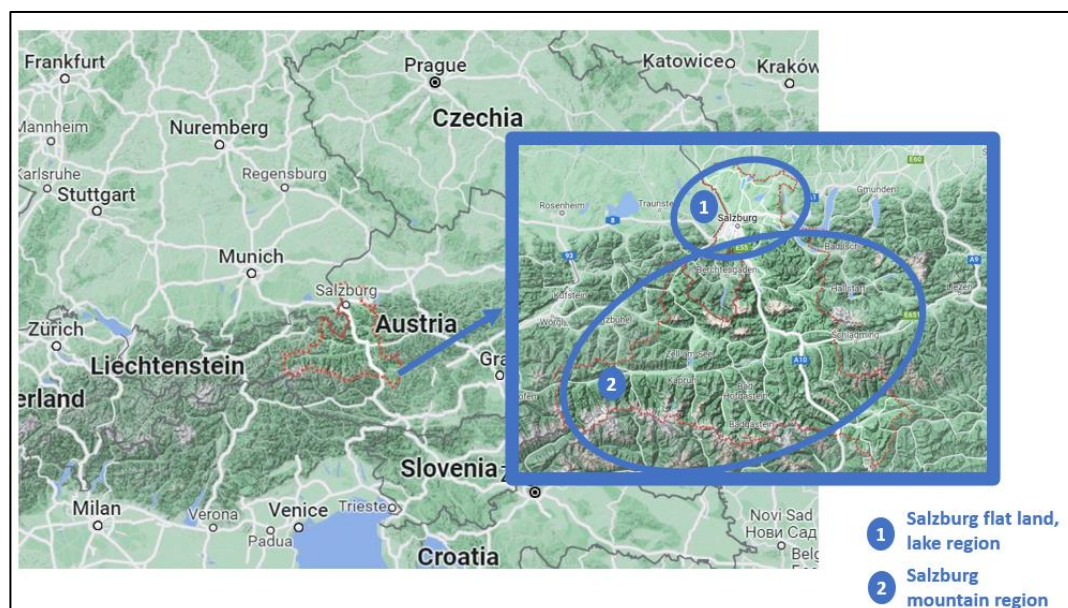


Figure 5: Map of Salzburg highlighting the two areas, flat land and mountain region of the province. The distinction is also based on delimitation of less favoured areas in Austria (BMLFUW, 2015, p. 91) and Andreas, map derived from Google Maps (Salzburg, Austria, n.d.).

To produce the traditional Austrian hard cheeses, i.e. cheeses with longer ripening periods such as Emmentaler, without strong mechanical treatment, nor chemical additives, the milk can't contain Clostridium bacteria which is frequently found in milk from farms feeding silage (Darnhofer & Strauss, 2015). Hay-milk fulfils these requirements (Dietrich). When silage as less weather-dependent feed conservation practice for the winter was imported from the U.S. in the 1950s, the Austrian government introduced a ban on working with silage in certain areas, which lasted until 1993 (Linda). This was intended to ensure enough Clostridium-free milk to maintain the production of hard cheeses, (Darnhofer & Strauss, 2015).

After 1993, many farmers upheld those practices and collectively started organizing themselves to protect the tradition of haymaking by communicating its value to consumers (Bernard). The successful marketing of organic milk prepared the way, so that Austrian farmers and processors producing or working with hay-milk joined forces to found the ARGE Heumilch in 2004, which seeks support from politics and collaboration with similar groups, tourist organisations and gastronomy. Farmers also agreed on paying a voluntary marketing contribution. Filling a niche market since 2009 and having built trust among consumers the price for hay-milk is largely independent from market volatility and competition (Dietrich). Recent drying technologies made hay production less dependent on the weather since it no longer needs to be dried outside on the field (Bernard).

Additional factors that might have contributed to the preservation of hay-milk in Salzburg province are (Bernard): 1) Salzburg province is a tourist destination and visitors want to see and consume traditional products. 2) In Salzburg province most land is mountainous, which prevents an entire shift to intensive agriculture. More facts on hay-milk can be found in **table 7**. **Figure 6** (page 25) shows some of the timeline processes artistically.

Table 7: Facts about hay-milk according to interviewees.

Facts about hay-milk
Hay-milk makes up 3% of the European milk market (including production countries such as Germany, Italy, France, Belgium, and Slovenia).
In Austria 520 million kg of hay-milk are produced every year, which make up about 15% of the Austrian milk production.
Austria has 69 hay-milk processors (processing or manufacturing the milk).
60% of Austrian hay-milk cheeses are exported, mostly to Germany.
Many sustainable farming practices, like extensive pasture management, increased animal welfare, organic farming, and biodiversity areas are present in certified hay-milk farming.

3.5 The two case-study farms

Hirtl farm is located close to the lake region of Salzburg province in the flat land area. The farm is certified organic, since the former generation, and produces certified hay-milk. They have always produced hay-milk since the farm is in the family since current farmer Walter's great-grandparents, and adapted to modern technology, including a drying system for hay and two photovoltaic systems on the roofs to produce the needed electricity. The cows graze on the pasture behind the stable at least 120 days a year. All their milk is sold to the regional dairy. Rosa, the farmer being mostly responsible for the cows, likes to be a hay-milk farmer. She thinks it's important that the feed for the cows is produced in the area and that it shouldn't come from South America. The circulation of resources should be as closed as possible. That's why she is an organic farmer, too. They also support biodiversity on the land managed by them; of which one-third is nature protection area. **Table 8** lists some of the

farms' important actors and a more elaborate introduction of selected actors of the farms can be found in [annex 5](#).

Schäferl farm is located at 1000 metres above sea level in the mountains of Salzburg province. It uses traditional, extensive production methods, and also identifies as organic and hay-milk producer but is not certified for either. The farm has been in the family since about 250 years. In 2003/4 farmer Robert changed from silage to hay feeding, as the only farmer in the whole valley. They use a drying system, too. The cows graze on different mountain pastures at different altitudes throughout the vegetation period. From the milk they make yoghurt and cheese for direct marketing. Robert and his wife Linda like to be hay-milk farmers because they are convinced that they can offer higher quality feed to their cows and hence higher quality products to their customers. They don't mind that making hay and direct marketing involves extra working hours. They also participate in the state's biodiversity programme with their "*butterfly-meadow*". Additionally, they rent two apartments and one room in their farmhouse to guests – which is common as the valley in which they are located is known for skiing in the winter, and hiking and mountain biking in summer.

Table 8: Some of the most important actors on the two farms in the moment of observation (September-October 2022). The families can make a living from the farm and their off-farm job/guests.

Some important actors on Hirtl farm	Some important actors on Schäferl farm
<ul style="list-style-type: none"> • Farmer Rosa • Farmer Walter • 3 grown-up children (only visiting) • 39 Simmental milk cows and some of their offspring in different ages • The 5-year-old boar and 2 piglets • A bunch of Sulmtaler chickens of all ages • Many cats • Machinery including 3 tractors, 1 farm loader, and Maxi, the electric manure scraper • 10 ha of land including forest and the only pasture next to the main stable, plus 30 ha leased land • 4 stables for different purposes including two photovoltaic systems on the roofs (main herd stable including milking area, advanced in pregnancy and pig stable including the hayloft, calves' stable) • A garage including the hay ventilation system • The farmhouse 	<ul style="list-style-type: none"> • Farmer Linda • Farmer Robert • Their 10-year-old son • Robert's mother, needs nursing • 3 Jersey and 4 Simmental milk cows, 10 youngsters, 3 calves • 7 old chickens • The pet dog Bonny • Many cats • Machinery including 1 tractor, 1 farm loader, 1 shared trailer for wood and 1 cesspool barrel • 32 ha of land of which about 11 are arable plus rights to use the common pastures • One stable including the hayloft and ventilation system • A garage • The farmhouse including 2 guest apartments and one guest room

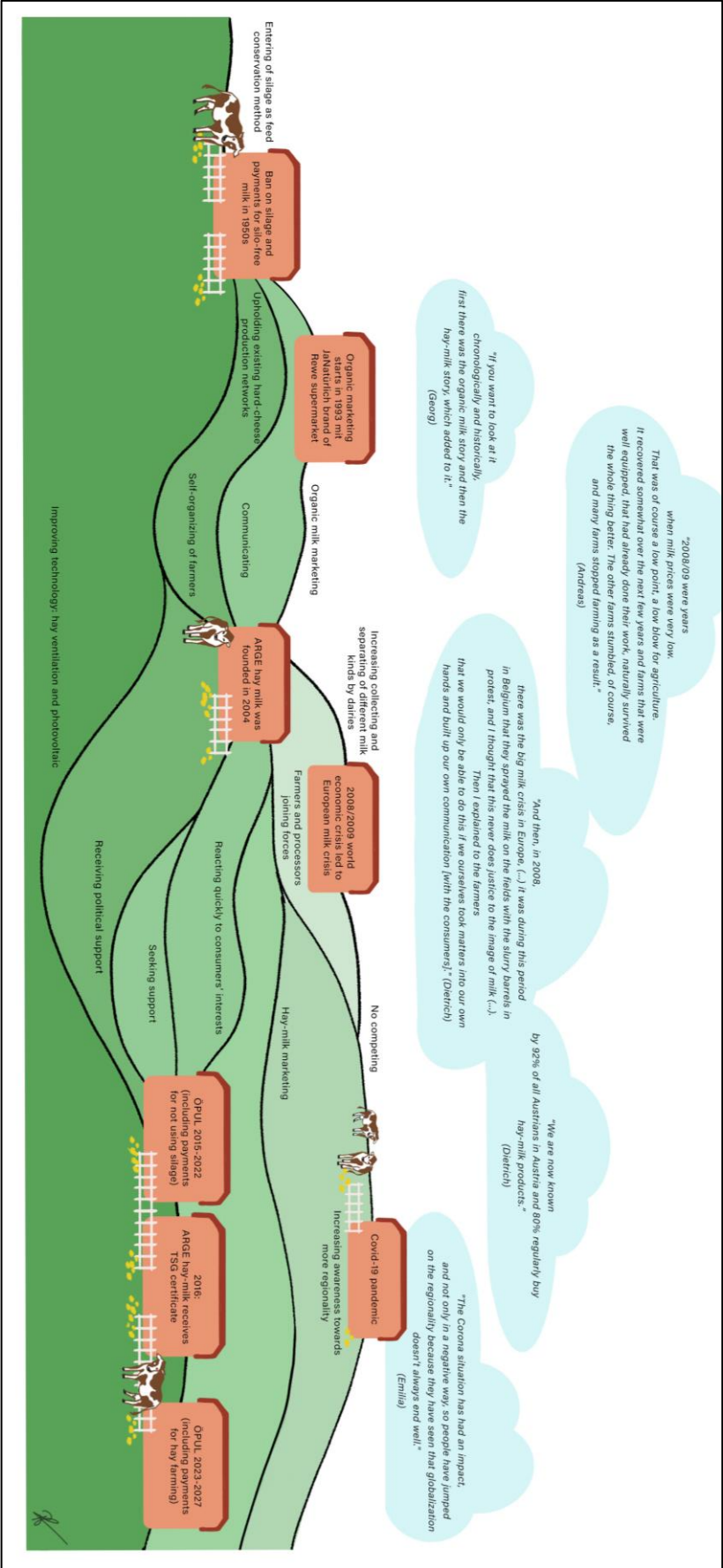


Figure 6: Artistic interpretation of timeline characterizing the development of the hay-milk sector in Salzburg province. Illustration by Ramona Arbinger for the author.

4 Making other worlds – The findings

“As such, the task of the researcher is to ‘think with’ a changing world instead of trying to ‘represent it as it is.’” (Hertz et al., 2020, p. 335)

In this section I don’t seek to claim *what* makes farming resilient (or not). Rather, I aim to show what farming resilience can look like ‘on the ground’, based on the understanding that farming resilience is *“the ability to respond and to shape changes by navigating a bundle of processes”* (Darnhofer, 2021, p. 6-7). To answer the research question, **how can a process-relational approach to empirical work deepen the understanding of farming resilience**, I made use of 1) ethnographic stories of the hay-milk specific feeding relational process on the two farms, followed by 2) an outline of some of the involved relational processes, 3) examples of the dynamic character of routines, and finally 4) persistences, adaptations, and transformations in significant change events on each farm. Each of these sections starts with an answer to my research question, which emerged from the stories and guided the structure of this section.

Suited to my embodiment into the context, I chose to write the stories from my perspective. In this section, I interweave the farm stories with diffractive paragraphs (in blue and italic). These paragraphs are meant to illustrate the process through which I made and assembled the data, keep present my relationality with the data, include my reflections on embodiment, and highlight the ambiguities and uncertainties I faced in the analysis. They are intended to remind the reader that these stories are but one potential reality (Law, 2011). Through these very personal accounts, I encourage the reader to engage and become with the story.

4.1 Lively farming resilience

Farming resilience and relational processes are ever-changing. Engaging in data and being an embodied researcher can reveal relational processes and their ever-changing nature by being there, by feeling, by living with the farmers. My personal, embodied experience of the feeding routines on the farms illustrate this value of a process-relational approach to empirical work.

Diverse actors appear in the feeding process. The feeding process itself hence consists of all the relations between these actors, as well as past relational processes of indirect actors, such as the soil producing the feed plants or all the actors along the protein feed⁹ supply chain.

A tumult – the September morning feeding routine at Hirtl farm

It is 8:30 in the morning and I have just changed into my working clothes and walk through the small corridor between the pig stable and the future mothers’ stable to get to the big stable. The sun is shining, and it smells, like animals, like manure, like soil...to me like a farm. On my way I greet the cows with a *“Good morning”* and one or two raise their heads. Chickens cluck here and there. A group of one chicken mom and three rooster youngsters runs hectically in front of me until they finally escape the narrow corridor and make a turn to get away from me. The cow herd is waiting in the big stable for a special treat after having

⁹ Protein feed is usually fed because cows need a lot of energy to produce milk, especially in the period after birth (HBLFA Raumberg-Gumpenstein Landwirtschaft, 2021). When producing certified hay-milk certain feeding supplements are allowed, e.g., lucerne and maize pellets (ARGE, n.d.).

been milked: one to two shovels of protein feed. Before they get it, the feeding area needs to be cleaned from yesterday's evening meal, so the dirt doesn't impair the cows' digestion. I take a large broom leaning on a hay bale and scrub the leftover grass with soil towards the pig stable. Some cows line up already because they know what is coming up. Others carefully watch me and stretch out with their long tongues for the grass piles I am creating. I put the piles on a plastic sheet and carry it to the pigs to feed it to them – it is heavy, and I need to watch my steps to not stumble and lose the grass on the way. When I come back, farmer Rosa is already driving the wheelbarrow to the feed silo, where the protein feed gets delivered to, while she shouts: “Come girls, come”. She then opens the silo, and a massive flush of pellets piles up in the wheelbarrow. With this sound also the last cows get up and join the lining up. Rosa asks me to tether the cows with the metal holder when some teasing emerges; the herd has a hierarchy, and some older cows make use of their status to push away the younger ones from the first feeding spots in the line. I drive the wheelbarrow slowly, while Rosa is shovelling one to two shovels to a group of two to three cows. Within seconds the protein feed is gone. – A distant motor sound appears. Farmer Walter is coming with a load of freshly mowed grass directly from one of their meadows.¹⁰ He carefully manoeuvres the large tractor with trailer into the stable while releasing piles of grass. Chickens of all sizes join the feeding spectacle to find insects. When Walter has turned off the tractor and the first grass piles are in the cows' stomachs, it becomes silent. I start brushing the distant piles towards the cows. Rosa opens the metal holder, and the cows leave sooner or later. Finally, Rosa also opens the gate to the pasture and the feeding tumult is over – or can continue on the pasture.

On the first days at Hirtl farm I felt uncomfortable because I was very afraid of the cows with their giant horns, who seemed to sceptically watch me, the newcomer. I even felt that they were trying to make my life harder by trying to eat the piles of soil and old grass I was trying to remove from them. Linda had told me that the dirt is not good for their digestion. – With time I learned to be quick so the cows wouldn't have started lining up. But on some days Rosa would already open the feed silo and the cows knew exactly what sound it made and were quickly approaching the feeding line – I was too slow. – As much as I describe my embodiment, the farmers act through their bodies, too, which then might influence their decisions and ultimately how some relational processes are adapted. However, my research encompassed only my embodiment because involving the farmers' embodiment would have demanded a more co-productive research set up for which farmers often don't have time. – While I am writing this experience, I try to remember as many details of the morning feeding routine as possible. I re-experience the event five months after having lived it. I ask myself how much words can re-present the experience. Therefore, I included a collaborative piece of art (figure 7), intended to re-picture the experience, too.

¹⁰ When Walter is off-farm to do his off-farm job during three to four days a week, Rosa is mowing and driving the grass to the cows.



Figure 7: Artistic interpretation of the morning feeding routine at Hirtl farm. Illustration by Ramona Arbinger for the author.

A good night hay snack – the October evening feeding routine at Schäferl farm

It is 18:00 on my first evening on Schäferl farm. The sun is disappearing, and it is getting cold outside. Farmer Robert and I have just been milking their five cows when he warns me of the very steep ladder to the hayloft. I slowly and carefully follow him holding onto the thick rope on my right side. When he opens the door, a strong smell of hay enters my nose. It takes a while until the light turns on, but then I see the huge amounts of loose hay stored under the ceiling of the stable. Robert explains me that each mowing round has its own place. There is the first cut pile, the second, and of course the very special one from the mountain pasture. As the cows were outside on the pasture close to the stable all day, they only get a little hay after milking for their digestion. He shows me how to open the hatchway and then starts pulling hay with the fork towards it from the nearest pile of hay. After a pile about the size of two cubic metres has fallen on the corridor between the cows' and the youngsters' boxes, we switch off the light and carefully walk down. Then Robert spreads the hay on the whole feeding corridor with a fork that was leaning on the wall ready to be taken. He explains to me that the milk cows get more hay than the others. The cows have started lining up and fetch hay as he distributes it. One cow is causing a hassle by changing where she wants to line up and thus hinders the other cows from lining up. *"That's the self-appointed chief of the herd Camila"*, Robert tells me. We then walk out of the stable to call the youngsters in.

I remember that on the second day I wanted to be helpful and offered to do the hay feeding on my own. Up in the loft, I almost couldn't move the fork and barely got any hay out of the pile. Eventually, I managed to get a big enough pile down to the feeding corridor. I felt embarrassed about taking so long – but at least I managed to not be so afraid of the cows: I was probably more familiar with cows already after my four weeks on Hirtl farm.

Additionally, the cows don't have horns and are used to being petted on their head. – Robert, on the other hand, thanked me a lot for my help, and we continued with the evening routine. – While I am writing the stories, I think about whom to include and whom not to include. Isn't the soil food web as important as the cows, and hence should appear as actor in my story? But then I think that they are not active actors in the routines I have observed, so I don't include them. – While I intuitively adopted creative approaches in the field, I only later in the analysis came across the terms and models of data engagement and embodied researcher, which seemed to summarize what I did very well. Thus, I used the models and terms to situate my experimental research in existing concepts and approaches.

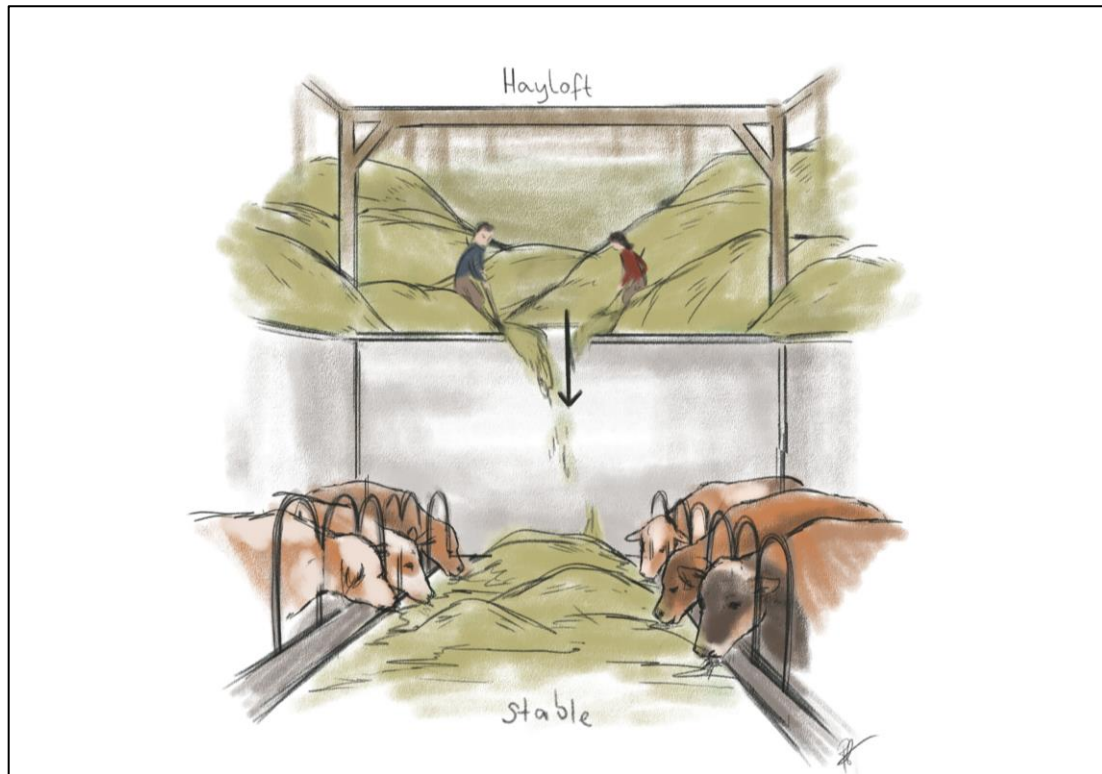


Figure 8: Artistic interpretation of the evening feeding routine at Schäferl farm. Illustration by Ramona Arbinger for the author.

4.2 Farming resilience as re-assembling of farming practices

Farming resilience can be observed as the **re-assembling of farming practices** (or processes) on the farm. To illustrate this, I outline some relational processes involved in making hay, being the key relational process in feeding hay-milk cows.

Haymaking at Hirtl farm

Rosa and Walter are owning and leasing various meadow types. They manage these differently. For example, many of their nature protection meadows are situated in a former wetland and are designated for biodiversity protection. They mostly use the harvest from these meadows as straw for the cows' beds because they mostly contain plants from the sedge family, a lot of crude fibre and not many nutrients such as starch and protein. The cows don't like to eat this combination very much and it doesn't produce milk. Their productive meadows with different soil and vegetation are manured to be mowed more often; Rosa describes this as "*giving and taking*".

Deciding when and where to mow for haymaking involves, next to paying attention to the biodiversity guidelines, watching a lot of weather forecasts to determine when to mow: The sunnier and drier and the later in the day, the drier the vegetation, and thus, the better to mow for making hay. The mowing itself thus involves relational processes between:

- the people: Walter, their youngest daughter, and a befriended farmer, whom they pay for coming with his hay baler,
- the machines, e.g., the tractor with mower, mower conditioner, the farm loader, and the hay baler
- the grass
- the weather: the humidity, the sunshine, etc.
- the experiential and tacit knowledge on when and how to mow which field to ensure high quality hay (e.g., Walter told me that they mow the first time in May, and this is often challenging because the vegetation contains a lot of water).

After the grass has been cut, pre-dried on the field and compressed in haybales, the haybales were transported to the farm, where they are stored in the barn containing the drying system for the hay. For the drying system they produce their own electricity with two photovoltaic systems. Storing involves often at the end of summer rearranging leftover haybales from last year with this year's, as the storage has just enough space.

While I consider what to include in the text, I ask myself: How do I best describe the relational processes, which ones to include, isn't one relational process entangled with various others? In the end, I decided to focus only on the ones that I observed or that were mentioned. – How did my understanding of farming resilience change throughout the process? I must admit that I didn't fully grasp the concept before going into the field, but then once I was there, I could identify dynamic relations everywhere. To me the concept made sense. When I started the analysis process, I quickly discovered that it was challenging and confusing to assess/analyse resilience. I went back to reading about a process-relational approach and ultimately shifted my research question to a primarily methodological one.

Haymaking at Schäferl farm

Haymaking at Schäferl farm starts with deciding when and where to mow depending on different factors. One example is the meadow behind the stable. It is used for pasturing and mowing. The meadow is mowed three times a year, the first-time end of May, the second time six weeks later, and after another six weeks the last time.

The most special hay is the hay coming from their highest meadow close to their mountain hut up at 1800m and is 3.2ha. They have developed a certain way of mowing to be able to mow on the steep meadow: Robert mows the flatter parts with the tractor and mower, and the steep and wets parts with the motor mower – this takes around six hours. Linda rakes the hay into piles, so they can transport it down with the loader. They mow this meadow only one time a year; roughly between mid of July and beginning of August, and not too early, so the grass is high enough and all the “*healthy flowers and herbs*” are in the hay. They take the extra effort because they are convinced that this hay is the best for the cows, and they see how much the cows like it.

The hay then is stored loosely in their barn. They buy the electricity for the drying system. Robert carefully calculates the drying time: not too short for good quality hay and not too long because of the high electricity prices.

I changed my approach to the analysis during the process. In the beginning I was aware of the evolving/becoming with the data but didn't know about techniques such as the voice-centred relational method of data analysis. This method involves three rounds of reflexive reading of interview transcripts to execute the becoming/diffracting. While this reading might have been helpful in discovering different interpretations such as noting which actors should be mentioned, I reflected mostly during my writing and in conversations with peers where other possible interpretations appeared.

4.3 Farming resilience entails experimenting

Closely observing one specific practice such as feeding, enables the unravelling of tiny differences from day to day, which highlight the dynamic character of routines. These changing conditions demand flexibility, an open mind, or put differently: experimenting. Rosa and Linda for example experiment with routines and numbers. Experimenting then enables adaptive practices on the farm.

Experimenting with summer night pasture at Hirtl farm

During my time there I noticed the little daily changes in the morning feeding routine in relation to other practices such as milking or feeding the pigs.

- Cows would get more protein feed on one day, depending on stages of lactation and how well they behaved during milking.
- Some days there was more grass left over from the evening, and I would bring a huge portion to the pigs, on other days, it was only a small amount. This can have several reasons: The cows don't like the taste (because of e.g., dirt or the smell) and if there is a lot, the more the cows can select.

Next to the seasonal feeding changes, Rosa told me that after having tried night pasture occasionally during past years, this year she led the cows out in the night during summer consistently because the cows don't like to go out on the pasture during the day if it's too hot. After this year's success she will do it again next summer. Furthermore, the heifers came back from the mountain pasture during my stay, and Rosa experimented with letting them directly on the pasture with the herd. It worked well; according to Rosa because they know each other.

While I did consider including practices of care in the analysis because they could have been identified and Rosa also mentioned caring for the cows for example to me, I decided because of simplicity to not introduce more concepts.

Experimenting with resizing at Schäferl farm

Since Robert took over the farm from his parents and Linda arrived on the farm, many relational processes have changed because both engaged in re-structuring the whole farm. The goal was to make it manageable for only two people as before they were dependent on external help.

Looking into the relational process of feeding, one example that has changed over time was the number of cows they keep at Schäferl farm. 12 years ago, they used to have a third more cows but not enough hay to feed them, so they had to buy hay in Spring. However, Linda explained to me that as soon as one must buy additional hay, one must pay on top of each litre of milk. So, they experimented year after year with how many cows they can keep in autumn to be able to feed them with their own hay during winter and spring. Now they keep 20 in total over the winter out of which five to six are milk cows.

Another example centres around mowing on the mountain pasture. Relatives used to help, and they would be around eight people. However, they had to pay for the help and Linda didn't enjoy working in a large group. So, they organized the mowing in the way described above, which they can do with the two of them. The whole re-structuring process took them about ten years.

4.4 Building up farming resilience

Looking closer into one event on each farm enables the unravelling of the capacity to absorb shocks as, well as to adapt and transform following significant events. These resilience capacities strengthen *the ability to respond and to shape change* on the farm level because farming resilience is built on, the flexibility, open mind set, insights etc. that are acquired during the change process.

Changing to the golden milk standard at Hirtl farm

Since about five years, Rosa and Walter take part in their dairy's golden standard programme. It is the highest quality milk the dairy is collecting, involving the highest price per litre. When the dairy started with the programme, Rosa was hesitant to join because she wasn't sure she could increase the number of pasture days to at least 120 per year, which the programme required; she used to not bring the cows on pasture during midsummer. However, a neighbouring farmer who was part of the programme told her about it, and she used to have the cows even less out on pasture than Rosa did, so they decided to apply and got into the programme. Walter told me that those programmes depend on the conditions of the pasture (e.g., whether the herd can use it for 120 days a year without overgrazing) and the dairy's decision on whether the farm's specific circumstances are good enough to get into the programme.

Rosa, since then, has brought the cows more often on pasture and is even aiming for 160 days a year, including night-time pasture during midsummer, because she is a proponent of pasturing. She would even like to have only pasture for the cows, but they would need three times more land directly adjacent to the farm or a smaller herd for the current pasture. Additionally, she is running the farm on her own during the week, and to get the cows from a larger meadow into the stable for milking is hard by herself.

Now there is a long waiting list to get into the golden standard programme, because the dairy would have to market/sell more before letting more producers in. Rosa is happy that she was one of the early ones signing the contract because now the 120 pasture days a year are required for all organic farms. She reflected that she by chance took the right decision at the right time.

In the case of changing to the 'golden milk', Rosa and Walter responded to the talk with the neighbour by navigating several relational processes:

- being flexible and open-minded to consider the dairy's new programme,
- considering their pasture's conditions and the increase in pasture days,
- applying to the programme early.

They then engaged in the adaptation of increasing the number of pasture days, which involved many micro-adaptations. They got rewarded by a slightly higher milk price per litre (in September 2022 they received 3% more per litre than without the golden standard). Additionally, they didn't need to adapt out of a sudden to the change in regulation but because of being an early bird they could do it when and how they wanted to do it. Hence,

the system's, in this case the farmers', adaptive capacity is trained by adapting to the course of events.

Of course, there were many more relational processes involved in the event. I would have liked to be more thorough but unfortunately the event had happened in the past and I could not directly observe it. Similarly, a peer and I ponder about whether experimentation does entail a knowing, a level of tacit knowledge or familiarity with the practices that the farmers embody but don't articulate. How are we as researchers able to unravel this? Maybe longer collaborative research practices would allow some degree of discovery. I would advise future researchers working with a process-relational approach to pay explicit attention to time and the set-up of the research process. – While writing, I reflect upon the link between my answers to my research question: An event might trigger experimenting because it demands adaptation. For example, the experimenting with the night pasture during midsummer might have been activated by the event of changing to the golden milk standard.

Changing from silage to hay at Schäferl farm

In 2003/4 after taking over the farm from his parents, Robert changed from silage to hay. Why? *"That is usually the ideology behind producing a product (...), you simply have it in your mind that you say, I want the best quality"* (Robert). He reflected that he didn't enjoy working with silage. It was heavy physical work with the seven-metre tower silo and then some got mouldy, and he had to throw that precious feed away.

With this change he became the only hay-milk farmer in the valley and some people declared him a bit mad because silage was seen as a progress, as an accomplishment. It made preserving feed in the 'disadvantaged' mountain area much easier and less time consuming. Robert also thinks silage has its justification; making hay-milk is a lot of extra work.

But the change has paid off as they estimate that now around 90 percent of their customers come to them because of their good quality hay-milk cheese and yoghurt. Linda said that some customers told them that they can only eat their yoghurt (while being intolerant to others). They value their hay a lot for the quality feed, the diversity they can offer to their beloved cows, and for the quality of the products they can offer to their customers.

Robert responded to his relational process of not liking to work with silage and wanting to produce a high-quality product by adapting the relational processes involved in feeding. This reorganization ultimately led to becoming the only hay-milk farm in the valley.

*To observe which changes exactly happened, Linda and Robert thought the event was too long ago. And again, I am sad I couldn't observe a big event during the time I was there and only rely on discursive material. – While I am writing about adaptations and transformations, I wonder how to draw a line between these two. How fundamental does the re-structuring process needs to be to consider it as a transformation? In the end I settle on the three characteristic defining transformation by Moore and colleagues (2014) (see **section 2, table 2**) and conclude that the re-structuring process on Schäferl farm consisted of many incremental adaptations. – While I think and read about the best terms to use to further describe farming resilience, I feel grateful to the farmers. Grateful because they are taking this huge responsibility of upholding small-scale farming. So, I really hope that they continue re-assembling their resources with an open mind, so they can persist in a changing climate, environment, and society.*

5 Discussing the findings and research approach

“In the past, our children didn't dare to say at school that they were still hay-milk farmers, because they were the hicks who missed out on progress, now the young generation says we have an organic hay-milk farm, we produce for [supermarket brands such as] ‘JaNatürlich’, for ‘Zurück zum Ursprung’, (...) that [perception] has changed completely.”
(Dieter)

5.1 Farming resilience as an on-going re-assembling of farming practices

5.1.1 Re-assembling as filtering practices and bricolage

Key to farming resilience is the *ability to navigate a bundle of relational processes* (Darnhofer, 2021). Based on my empirical work this can also be described as the re-assembling of farming practices on the farm.

The re-assembling of farming practices can be compared to the filtering and bricolage of practices of Haider and colleagues (2021)'s coevolutionary perspective of resilience. The *“filtering [involves] which old practices to maintain, and when and which new practices to try and to adopt”* (Haider & Cleaver, In review, p. 27). For example, after having experimented with letting the cows out occasionally on pasture in the night in midsummer during past years, farmer Rosa let the cows consistently out in the night last summer. She adapted her previous farming practice of letting the cows inside during midsummer. As a result, the relation with the pasture changed towards being used during midsummer. Since it worked well, Rosa said that she will continue with this practice next summer. ‘Filtering practices’ poses the explicit recognition of coevolutionary dynamics, thus emphasizing the ever-changing nature of practices, thereby linking it to the ‘re-assembling of practices’. Complementarily, the conceptualization of ‘filter practices’ connects to the three resilience capacities stressing different development pathways.

Key to re-assembling practices is experimentation. Next to Rosa's experimentation with night pasture, the re-structuring process on Schäferl farm consisted of experimentation, too (e.g., the number of cows they can feed with their own hay during winter). Experimentation emphasises that the outcome/future of adapting practices is always unknown. Rosa reflected that they simply took the right decision at the right time when increasing the number of pasture days and applying to the golden milk standard. That it was the ‘right’ decision she can only know in hindsight. Looking through the lens of the co-evolutionary perspective, the farmers responded to changes in their environment, and from this re-assembling of practices a new/different development trajectory emerged.

Bricolage is the *“process of piecing together in which different configurations of practices are selected, retained and adapted by actors (practically and discursively) to shape development trajectories”* (Haider & Cleaver, In review, p. 19). In combination with filtering practices, bricolage offers a useful way to describe the *“intimate knowledge of the resources available [that is] acquired over time, and the ability to make use of potentials”* (Darnhofer, 2021, p. 6). Bricolage emphasises the process/dynamic character of persistence, adaptation, and transformation (Haider & Cleaver, In review). It also highlights the learning, flexibility and open mindset that is needed for farming resilience. In events such as the change to the golden milk standard, Rosa and Walter needed to remain flexible and open-minded, so they were able to make use of the resources they had, assembling them differently, and thereby engage in a trajectory which was suited to both their available resources, their preferences,

and the changing environment. Learning/training this during these small events, reflecting on how they managed the events might help them to make use of opportunities and overcome external changes in the future.

5.1.2 The ever-evolving nature of farming resilience

Simon and Randalls (2016) argue *“that the only way to critically interrogate resilience is to force the question of particulars in its diverse articulations”* (p. 3) because the path towards resilience is unclear. When resilience is portrayed as a universal concept, it does not express what, where, who, how, and why. However, *“[r]esilience always involves choices and demands, even if the choice is to continue on current paths”* (ibid, p. 15). What is important for resilience are thus the imaginations of the future, the actions taken in the present, and the strategies to implement those actions (ibid).

Hence, assessing, engaging, interpreting resilience in a particular moment of time is political. It involves the researcher’s choices to interpret something as resilient or not. A process-relational approach enables seeing resilience instead as ever-evolving, as dynamic, as process consisting of multiple relations. Resilience is not a stable state, it is not defined by a specific set of farming practices nor by a specific way to assemble them; rather it is continuously re-made.

For example, one key to farming resilience is the ability of farmers to question what was previously accepted as an unchangeable and permanent fact to facilitate change/to engage in adaptations and transformations (Darnhofer, 2021). Farmer Robert questioned the narrative of seeing silage as progressive and outperforming hay as feed conservation method in the valley and hence engaged in adapting his practices to become the only hay-milk farmer in the valley. Because Linda and Robert now seem to value hay highly and prefer it over silage, their adaptive capacity might have evolved into an absorptive capacity (=persisting), namely, to persist as the only hay-milk farmers in the valley. Or put differently, their ability to question hay as permanent factor on their farm might have decreased because producing hay-milk products became an ideology to them.

Farming resilience also involves *“the ability to engage in or disengage from various relations, incline propensities, shaping the unfolding processes in a promising direction”* (Darnhofer, 2021, p. 7). Here the choices and demands of resilience come in with the question: what is a promising direction for Schäferl farm? On the one hand, strong beliefs about hay in this case might hinder the ability to disengage from the hay-milk specific farming practices, and hence, risk missing out on adapting to changing environments. Same accounts for the Hirtl farm, which has been a hay-milk farm since decades. Nevertheless, focussing on hay-milk quality products and direct marketing of these has worked in the past and the now for the Schäferl farmers. Stubbornness might sometimes work to maintain and preserve traditional practices, as the case of the hay-milk sector shows. A pathway to persistence might sometimes be desirable, for example if precious cultural landscapes like the Austrian Alps are maintained – in my normative perception of what is to persist.

But stubbornness might also limit the ability to explore new, emerging options, as is the case of the other farmers in the valley where the Schäferl farm is located. The key to resilience is thus the ability to continue re-assembling resources, filtering practices, experimenting to adapt practices (because adapting appeared to be the main one out of also transforming and persisting), piecing together the old and the new, i.e., the ability to initiate change in response to changes on the farm and in its environment. This *“response-ability is not a*

given, is never acquired once-and-for-all, can never be taken for granted, but emerges anew through each engagement” (Darnhofer, 2021, p. 7).

5.1.3 Bridging farming logics

To be able to explain the underlying rationality of farmers’ choices, it is helpful to look into two different modes of farming, the peasant and the entrepreneurial, put forward by van der Ploeg (2008). The main difference between the modes is *“the degree of autonomy that is built into the resource base”* (ibid, p. 5). The entrepreneurial, or rather economic rationality frames farmers as rational decision-makers characterized by aiming to improve efficiency and maximize profit (Darnhofer, 2022). In peasant logic on the other hand subjective perception, individual preferences, and social norms inform the choices of farmers (ibid).

The value of a process-relational perspective is to drop dichotomies and allow for contradictions. What might matter to family farmers’ resilience is the striving towards autonomy to maintain a self-managed resource base (Darnhofer, 2022). This is often the case because family farmers tend to focus on the long-term and are thus aware of the need to adapt to a changing environment (ibid).

Next to being the only hay-milk farmers in the valley, Robert and Linda certainly do a couple of things differently than other farmers in the valley. Linda and Robert chose to resist the common strategy of ever-increasing the size of their farm. They decided to be autonomous from external feed, which led them to decrease the number of cows. To secure an income from only seven cows, they process their milk on-farm and sell their cheese and yoghurt directly to consumers. These choices might be seen as reflecting an entrepreneurial mindset since the milk prices for conventional hay-milk might be too low to make a living from it, thus on-farm processing adds value to their milk and increases their income. Yet, these choices also reflect a peasant logic, since the adaptations involved in the re-structuring process on Schäferl farm led to more autonomy because it made the farm and the farmers less dependent on external labour, less dependent on external feed, and less dependent on the prices for milk as set by the dairy. Moreover, Linda and Robert only need to negotiate with each other when they want to adapt a farming practice, while before, they might have had to consult other family members, too. More autonomy might thus enable more flexibility to ultimately engage in adaptation.

Rosa and Walter also show degrees of autonomy. They for example autonomously engaged in adaptation by increasing their pasture days instead of waiting for the regulation to tell them so. Simultaneously, this decision might have been motivated by an entrepreneurial mindset to receive a higher milk price, too. As on the Schäferl farm, changes are rarely motivated by just one factor, as the impact of any change needs to be considered on various resources (e.g., feed, labour, income, knowledge).

Bringing in the different modes of farming emphasises the importance of striving towards autonomy to persist long-term as small-scale farmers. The emphasis should be put on the ‘striving towards’ because following a process-relational approach and my observations farmers don’t follow the peasant, nor the entrepreneurial logic or any other, but bricolage both together to continue small-scale farming.

5.2 Diffracting on the research approach

This study shows that a process-relational approach to empirical work can deepen the understanding of the concept of farming resilience by adopting the model of an embodied researcher and engaging in data (see **section 2.4**).

Reading about farming resilience before going into the field allowed me to interpret situations in the field in a process-relational way. Instead of focussing on hard facts of the farms and the farming practices, I paid attention to the relations and the smallest changes from day to day. Tiny day-to-day differences were useful to study farming resilience because they can reveal the flexibility and adaptability of farmers, e.g., Rosa changing how much protein feed a cow receives based on her behaviour during milking. Even though these changes happen at the micro level these observations were useful to highlight the process-character of relations. It furthermore can be hypothesized that changes on a larger level are trained/practiced/enabled by these on-going micro changes. Future research could hence focus on longer fieldwork periods or time scales to gather data for this hypothesis. These observations in the end led to my understanding of farming resilience as the re-assembling of farming practices. By re-presenting my experience of the relational processes involved in the farming routine of feeding and re-constructing some relational processes involved in two events that led to change, I portrayed the always-already-there openings for change and how the farmers made use of their resources to persist, adapt or transform.

As detailed in **sections 3** and **4**, my aim wasn't to re-present 'truth'. This enabled me to escape the limitations of classic positivist empiricism (Darnhofer, 2020) by embracing my becoming with the data and my positionality. Becoming an embodied researcher was very useful in operationalizing a process-relational approach because it allowed me to include my feelings and emotions into the analysis. This dissolved the boundary between the researching subject and a researched object (see Hultin, 2019). Thus, my operationalization of a process-relational approach highlights the importance of methodological choices, of being open to change throughout the research process, and of being transparent about one's interpretations. This links to the ethical transformation that is required from a researcher when working with relational onto-epistemology (Bhattacharya & Kim, 2020).

Nevertheless, there are also several limitations of my development and engagement in process-relational approach to empirical work.

5.2.1 Critical reflections on methods

- While my intention was to avoid making a clear distinction between humans and non-humans, I also orientated myself on the outcome of the research process, a written thesis. Hence, I didn't think specifically about how to include non-human actors in an appropriate way and ended up silencing them, by heavily relying on discursive data and putting the farmers and their resilience capacities in the centre. I thus faced a common dilemma: if I would have engaged more with the non-human, I might have had less time to engage with the humans. The complexity and multi-faceness of farming requires me as a researcher to make choices, choices which relational processes will be emphasized, and which rendered invisible although they are no less important in shaping farming resilience.
- Some things I planned didn't work out in the field. To be transparent about these, I included an overview of the intended and actual data-making and -assembling in [annex 6](#).

- A short-term ethnographic approach is often critiqued for being ‘superficial’. Pink and Morgan (2013) argue however, that it is suited for turning theory to practice and for nonrepresentational everyday life, which I aimed at. I also ensured data intensity by engaging directly in the farming practices, which evolved together with theory, while the taken videos and photos led to a process of ‘re-engaging’ during the analysis (ibid). Nevertheless, there might be advantages to staying longer or re-visiting the farms throughout the research process.
- Using interviews for data-making and -assembling is always performative in the sense that it’s a place where meaning is created by the researcher and the interviewee (Denzin, 2003). Therefore, I combined interviews with engaging in the farming practices and active participant observation to add to the farmers’ descriptive meaning.
- Because narrative research is related to ethnographic stories in studying stories, I ensured the validity of my stories by looking into what makes narrative research valid: continuous transparency and diffraction (Polkinghorne, 2007). Concretely, I accounted for validity by ensuring that the readers can follow the way I made and assembled data as well as the meaning I have given to the data by presenting 1) deep descriptions of my interpretations including thought processes and emotions, and 2) my prejudices in [annex 1](#) (ibid). For more transparency, I included a checklist for reporting of qualitative research in [annex 7](#).
- Although I tried to be as reflexive and diffractive as possible with my own understanding and feelings, there are always limits to reflexivity. Mauthner and Doucet (2003) therefore argue to rather consider ‘degrees’ of reflexivity. For example, as I worked the first time with a process-relational approach, I was unsure into how much detail I needed to go in my diffractive journals – and in the end I could have been more thorough here and there. Additionally, my diffractions of the two farms were limited by the short amount of time I spent there. Hence, while I tried to be as reflexive as possible, my interpretations are only constituted by degrees of reflexivity.

5.3 Farming resilience in Salzburg’s hay-milk sector and practical implications

The ability to respond and to shape change on the farm level can be linked to the ever-evolving of hay-milk in the broader context: Hay-milk is characterized by specific relational processes in its production. These have changed and are changing over time and are, hence adapting the tradition¹¹. For example:

The modern drying systems on both farms show how new technology allows making hay less weather dependent, and thus hay-milk farming attractive to farmers. Indeed, drying systems increase the temporal flexibility in cutting the grass, which is crucial in the light of weather changes due to climate change and increasing electricity prices. Moreover, the photovoltaic system on Hirtl farm shows a trend towards energy self-sufficiency and renewables.

Similarly, the ever-evolving collaboration between farmers and processors and the efforts at marketing hay-milk have enabled the persistence of hay-milk farming in the area. This led to

¹¹ By using the word tradition, I refer to the definition put forward by the Regulation (EU) no 1151/2012 for the Traditional specialities guaranteed certificate which relates the term ‘traditional’ to “*the usage of the name, the raw materials and the mode of production for a period that allows transmission between generations. This period is to be at least 30 years. (Article 3)*” (BML, n.d.).

a wider appreciation for hay-milk farming practices among consumers and policy makers, which is beneficial for Hirtl and Schäferl farm.

These examples show very well how the old tradition of making hay as feed conservation practice is pieced together with employing new technology and marketing. Hay-milk farming as it is practiced nowadays is itself a bricolage.

Filling a niche market and having achieved their own certificate (Traditional specialities guaranteed) shows how the organisation 'ARGE Heumilch' is striving towards autonomy and independence of market volatility. While the certificate might be beneficial for all hay-milk farmers that fulfil the requirements of the certification, farmers such as Linda and Robert, who strive for full autonomy by direct marketing are left out. Thus, the certification makes the hay-milk sector less flexible to adapt to the needs of individual farmers.

Yet, processes are shaped by trade-offs, they are shaped by a multitude of choices and influenced by various demands as well as different interests and preferences. Key to farming resilience is hence to keep adapting, remaining flexible, striving for persistence and autonomy by continuously negotiating all interests involved. This involves continuous adapting of traditional farming practices.

6 Conclusions

“All together we will find a way to rescue agriculture.” (Rosa)

The aim of this thesis was to contribute to the relational turn in resilience thinking by experimenting with one way to operationalise a process-relational approach to farming resilience by applying it to the empirical case study of two small-scale hay-milk farms in Salzburg province. To do so I adopted the models of the embodied researcher and data engagement, which highlight the necessity of working with mind AND body to notice the dynamic nature of relations, knowledge and reality (Barad, 2007) required by a process-relational approach.

I tested this process-relational approach in the field, and I found that it allowed me to get closer to the concept of farming resilience. Working empirically stressed the value of being an embodied researcher and engaging in data to unravel the ever-changing nature of relational processes and farming resilience. My empirical work revealed the following about farming resilience: 1) It can be understood as the re-assembling of farming practices on the farm entailing experimentation, 2) farming resilience in this case study highlighted especially adaptations, and 3) it hinted at how these processes might ultimately strengthen the ability to respond and to shape change on the farm level.

Relating the findings to broader literature stresses that keys to farming resilience are an open and flexible mindset, learning, and striving towards autonomy, which are expressed in the change processes at micro-level. Linking back to more common ways farms' resilience is studied like resilience assessments, this study builds upon the understanding of resilience not as a stable state, but as constantly in the re-making. Farming resilience can never be taken for granted, nor acquired but requires continuous work. This has implications for how to conduct research: 1) The boundary between the researching subject and the researched object dissolves. Embodiment can overcome this boundary and unravel insights to farming resilience. 2) A process-relational approach requires the researcher's ethical transformation. Engaging in data and being an embodied researcher enables a process of becoming throughout the research process and embracing one's own positionality and interpretations.

The process-relational approach I pursued, enables to see the differences at micro-level and unravels the process character of relations, that might be overlooked in resilience assessments. Nevertheless, this approach might be limited in assessing the state of resilience at a specific moment in time. Here it could be combined with resilience assessments. Similarly, resilience assessments would benefit from adopting more fluid and more relational social-ecological indicators, and longer time frames to account for the process character of relations.

For me the methodological experimentation enabled me to be open and creative in the empirical work. This led to flexibility and my becoming/transforming of views throughout the research process. Hence, this research and its findings invite foremost scientists to choose their research approaches wisely, to be open and transparent about their worldview, and to be open to change it, too.

Consider the resilience of a family farm. In a substance-based ontology, the researcher might consider resilience as a stable state that can be assessed objectively as outside observer at a particular moment in time. In a relational ontology, however, studying resilience involves looking into the changing relations between the different actors

including the researcher. The researcher must acknowledge her own positionality, interpretations, and worldview that shape the research process and ultimately outcomes.

Epilogue: Words of gratitude

I wanted to look at farmers' everyday lives. And I did. And I am really happy about it because I have learned so much from the farming families. Next to finally understanding what adaptative capacity, complexity, and context-specificity can look like in practice, I am mostly inspired. Inspired to start my journey of contributing to a more sustainable and resilient world. And I have finally seen examples of how that could like – at least for me. A huge thank you for this!

...

On the last morning before Linda brought me to the train, Robert said to me: "We hope you have enjoyed your stay. We really hope you got a holistic impression about our farm life including the history of the valley. We hope you have learned to see the value of small farmers, because growing bigger here in the mountains is simply not possible. If a farmer closes his stable here, it will be closed forever."

...

I left both farms with a warm, fuzzy feeling and a mission to tell as many people as possible about a different story of farms' resilience. A story about the importance of small farmers with the example of those two farms...

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Annexes

Annex 1: My personal connection to farming – stating my positionality

“How we feel about food is arguably inseparable from such ‘embodied practices, socio-institutional arrangements, and cultural conventions whence it came’”
(Clay & Yurco, 2020, p. 11-12)

With this section, I hope to convey the performativity¹² of my research, at least partially.

For me the first days on Hirtl farm helping and getting to know their farm life was a huge step out of my comfort zone, which I noticed especially by feeling utterly stupid. Stupid in not knowing how to use ‘typical’ farming tools, how to behave towards the cows, how to work practically.

The following positionality statement aims at explaining the underlying worldview of this thesis by describing my connection to farming. Why does my life story matter? Because as every human, my thinking is imbued by own biases, beliefs of how the world works. And especially in the research process of ‘becoming’ my understanding of the data is heavily influenced by those beliefs and biases – on which I elaborate a bit more in the following (e.g., Horlings et al., 2020).

I grew up on the countryside in the district of Lower Bavaria, Germany, in a renovated farmhouse between fields of mostly salad, corn, and wheat. However, I have no family farming background. I went to school with children from farming families, we had a good connection with our farming neighbours from whom we would get our eggs, and I had this natural, beautiful, and direct connection to how food comes to our plates. Yet, I was also raised with certain beliefs about conventional farming of the area, which was seen as conservative, backwards, and not open to change.

When I grew older, I slowly started connecting the dots between the cheap meat and cheese from the big supermarket chains on my plate and my beloved animals. Visiting my uncle’s pig farm up in Northwest of Germany and seeing 2,000 pigs being materialized finally convinced me to become vegetarian (much later also vegan). I also became frustrated and obsessed with climate change, and these feelings motivated me to start acting right away. By searching for organisations in the area, I could only find the local nature protection association. There, I learned about the impacts of industrial farming and of pesticides on biodiversity. Although it’s the farmers spraying the pesticides, I never believed it is only their fault. That’s why I demonstrated together with farmers in Berlin for higher milk prices and a change to more sustainability in the European Common Agricultural Policy. To summarize, my heart was divided between on the one hand the detrimental impacts of intensive agriculture on nature and on the other hand the pressured farmers being neglected in policy making.

“Thinking-with [care] makes the work of thought stronger.” (De La Bellacasa, 2017, p. 77)

When I went to study sustainability science, I was convinced that one can achieve the biggest change by altering policy and regulation. I was always interested in the opinions of especially small-scale farmers, which I think were being neglected in the European Union

¹² My aim was never to mirror reality, but to show my interpretations of my experience on these two small-scale hay-milk farms (Verran, 2021).

(EU), so I did my first small research study on the impacts of the abolition of the milk quota on different farmers. It showed that indeed small-scale farmers were not comfortable with the abolition of the milk quota and feared bankruptcy.

“Data are never neutral but always already imbued with discourses of power within local, national, and global contexts that perpetuate massive and tenacious social, economic, and political inequities.” (Ellingson & Sotirin, 2020, p. 6)

Learning about the systems perspective in my masters at the Stockholm Resilience Centre helped me to make sense of the division in my heart: there is a difference between large farms in Europe often in the hand of cooperations and small farms under pressure by international markets. There are several reasons why I believe that small-scale farmers deserve to be studied. 1) Agricultural science is only about five percent relevant for small-scale farmers (Nature, 2022); 2) Small-scale farming can be more productive, efficient, and vital for economic development than large-scale farming (Rosset, 2000); 3) Small-scale farming often goes hand in hand with community-driven initiatives that aim at preserving local food, cultural identity, and food sovereignty (‘Ernährungssouveränität’, n.d.; IPBES, 2019). In this sense, I romanticize old farming traditions, community action, and peasant logic¹³. Hence, my interests have shifted from systemic structures such as policy to the small, the local, the practical.

Applying a process-relational approach to empirical work was another huge step out of comfort zone as I love structure and certainty, yet also challenges. Farming resilience made sense to me to understand the resilience of farms. Beneath process-relationality and peasant logic lies a complex system worldview, in which *“future developments are unpredictable, surprises are the rule, and opportunities emerge in unexpected ways; The system is in an open process of becoming”* (Darnhofer, 2022, p. 234). This means understanding farming resilience as *“no matter how carefully a project is planned, many processes beyond the farmer’s control will influence how the project will actually unfold. Thus, the key to persistence over the long-term is not to plan ever more carefully, but to remain responsive, to nurture the ability to engage with processes as they unfold, by (re)assembling resources differently”* (Darnhofer, 2022, p. 236).

I had practised working with this worldview throughout different research projects in the first year of my master and thus selected my methods for this thesis carefully. For example, I tried to remain open as much as possible throughout data-making to observe the many strategies the farmers used to ‘re-assemble’ their resources. The research question is framed from my point of view: a master student with a personal interest in small-scale farming (Schwartz-Shea & Yanow, 2011). As integral part of a process of ‘becoming’, and for more transparency about my biases and decision-making in the analysis, I included summarizing paragraphs of my reflections in the results section.

Did I change in the course of the thesis?

Yes, definitely. One of the biggest learnings concerns my own beliefs on animal rights and eating meat and dairy: While I still believe animal rights campaigns and the call for eating less meat and dairy make absolute sense, I now think they need to clearly indicate about what farming systems, farmers, and animals they are talking about. I did change my opinion especially about vegetarianism: In the first week at Hirtl farm, Rosa told me: *“Tomorrow, we*

¹³ More information on peasant logic: (e.g., van der Ploeg, 2008)

are selling two beautiful male calves." I asked where they would go to. Rosa answered to one of the calf fattening farms in the neighbouring province. Then, I finally connected the dots: To close the cycle of life, one can only eat dairy AND meat; Yet can only truly know where these products come from and how they are produced by buying them directly from the farmers.

Annex 2: Interview guides

Interview themes for narrative interviews on the farms

Theme 1: Characteristics of the farm

Location: While taking a walk on the farm

- 1.1 Land size (in ha) and usage (forest, meadow, etc.)
- 1.2 Kind of farm: BIO/conventional, certified/not certified, main/supplementary income, livelihood, production, etc.
- 1.3 Ownership: own/rent, family farm (inheritance), employees, etc.
- 1.4 Animals: kind, number, seasons, feed, movement, etc.
- 1.5 Machinery/equipment: kind, number, seasons, etc.
- 1.6 Let farmer draw map of their land, plus explanation why. Include how cows move.

Theme 2: Traditions and practices

Location: While working together

- 2.1 Farming processes: everyday/seasonal routines, good day, mowing, milking, yoghurt- and cheesemaking, etc.
- 2.2 Comparison to other farms in community/valley/village: practices, values/emotions, etc.
- 2.3 Values: primary motivation to farm, farming identity/skills, (working) relationships with family/community/cows/machinery/etc., enjoy working with cows/equipment/family/etc., impacts on environment/nature, success of farms
- 2.4 (Life) Story of farmer and farm (look together at old pictures of the family and farm)
- 2.5 Disruptive changes over time: area, family, community, etc. (pick one or two recent events to focus on)

Theme 3: Finances, policies, and decisions

- 3.1 Income: subsidies/loans/tourism, marketing/selling/most important economic product/prices
- 3.2 Running costs: maintenance of machinery/etc.,
- 3.3 Consumption: relationship with consumers, fair prices, own consumption
- 3.4 Decision-making on farm: agency, expansion, recent important decision on farm, EU/Austrian influence on farming decisions, new national regulation in Spring/Covid
- 3.4 Threats: biggest threats to farming, coping mechanisms (also of other farms), support/help, forces that constrain decision-making

Theme 1: Information about organisation

- 1.1 Can you tell me about the tasks and responsibilities of your organisation?
- 1.2 What are the core values of your organisation and why?
- 1.3 Since when does your organisation exist and how has it developed over time?
- 1.4 *For supermarkets/dairies:* Why and when have you started marketing hay-milk? // *For other actors:* What was the motivation to found this organisation and how did it relate to hay-milk?
- 1.5 Do similar organisations exist in Salzburg and if so, how do you differ/relate to each other?

Theme 2: Supply chain and relations to other actors in the sector

- 2.1 Could you draw a map of the supply chain of hay-milk and hay-milk products including actors/organisations?
- 2.2 Where in this map does your organisation act and how?
- 2.3 How does your organisation relate to the other supply chain actors? How would you characterize the relationships?
- 2.4 What role does local/farmer's knowledge play in the hay-milk sector?

Theme 3: Farming practices and traditions over time

- 3.1 How would you describe farming identity in Salzburg?
- 3.2 Has this farming identity changed over time in your opinion, and if so, how?
- 3.3 What are traditional farming practices in your opinion? // Would you characterize hay-milk farming as a traditional farming practice? Why/why not?
- 3.4 Why does/doesn't your organisation support hay-milk farming?
- 3.5 *Show timeline map:* I drew this timeline map with important political influences over time in the alpine dairy sector in Salzburg. Can you identify other important events that I missed?
- 3.6 What was a recent important event that has influenced the dairy sector in Salzburg/Austria and more specifically the hay-milk sector? Why did this event occur in your opinion?
- 3.7 How did people/organisations cope with this event? What did change?
- 3.8 How will the hay-milk sector develop in the future in your opinion?
- 3.9 How would you/your organisation like to see the development of the hay-milk sector?
- 3.9 What is in your opinion needed for this development?
- 3.10 What is in your opinion needed, so that the hay-milk sector stays viable/flexible to changing circumstances? What role do diverse/small-scale farming practices play here?

Coding system after first round of coding

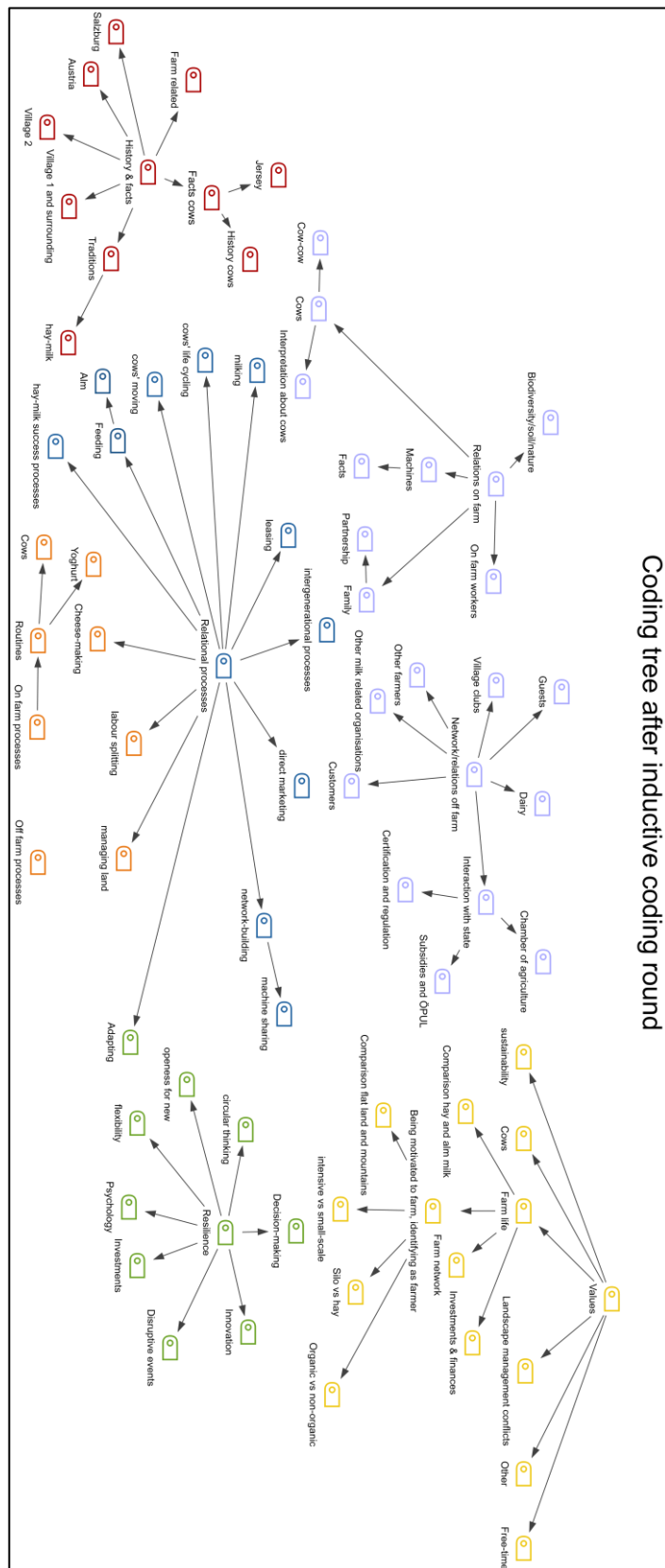


Figure 9: Coding tree after first round of coding. The main themes were resilience, values, history & facts, relations, and relational processes.

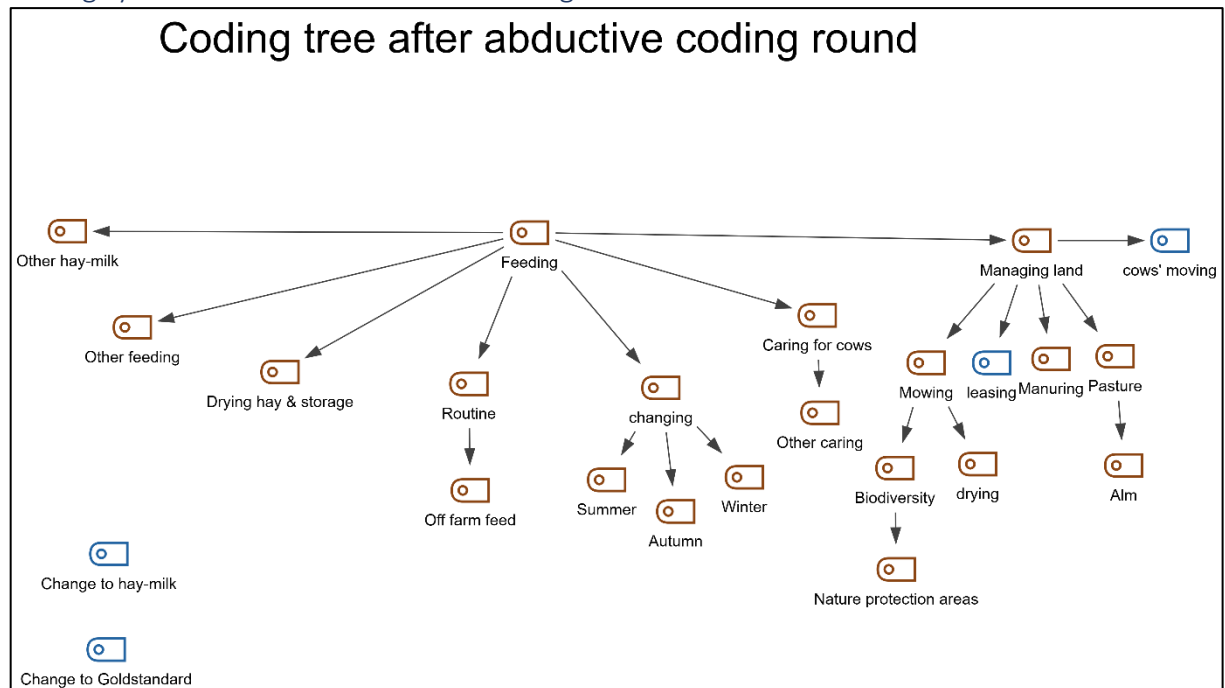


Figure 10: Coding tree after second round of coding. The main themes became feeding, change to Goldstandard and change to hay-milk.

Annex 4: Coding examples

First round coding example

In the first round of coding, I combined thematic, factual, and in-vivo code categories. I mostly identified the sub-categories with in-vivo, while the main themes were pre-determined.

Thematic and in vivo categories do not necessarily have to exclude each other. Concretely, I pre-determined the themes 'relational processes' and 'resilience' before going into the field and hence specifically looked out for them. However, I tried to remain as open as possible and let myself surprise by the stories the farmers told me. **Table 9** shows how I identified the pre-determined theme 'Resilience' but then the sub-code of 'Decision-making' emerged in-vivo; and that several sub-codes like 'Other farmers' came up during coding and hence I grouped them under the theme 'Off-farm relations' (see **annex 3** for complete coding system).

Table 9: Example of combining thematic and in-vivo coding in the first round of coding.

'Resilience' → sub-code 'Decision-making'	<p><i>"Um, yes, I think you grow, so you have to make decisions quickly, whether it's right or wrong. So, you become more decisive. So maybe you can imagine it as being similar to when you build a house and at some point, you just stop thinking and asking your neighbour or something, but then you just decide, because...well, you decide much faster."</i></p> <p>Transcript excerpt of semi-structured interview with Rosa, translated from German</p>
'Off-farm relations' → subcode 'Other farmers'	<p><i>"They share their cesspool barrel and trailer for wood with two neighbours. He made an announcement in the local newspaper to share it with other farmers. It's not a friendship, it's only business. This was in 2020. Without a contract, collaboration wouldn't be possible: he had a big fight with one of them but then he stepped back to not risk the project. He considers himself as the stupid one for storing the equipment. In the contract it says e.g., that it has to be clean when given back, so that the equipment can only be used with one own's tractor, so it cannot be borrowed to other farmers."</i></p> <p>Excerpt of reflexive fieldwork journal on Schäferl farm</p>

Second round coding example

Coding in the second round involved firstly, defining 'feeding' as main theme, and then going through existing coded segments and parts of the raw data¹⁴ to look for anything involved in feeding. This meant shifting some of the existing sub-codes to the feeding theme and creating more in-vivo sub-categories (see **table 10**). Overall, it was a process of going back and forth between coded segments from the first round and raw data, between writing the stories and the raw data, between reflecting on my process and re-coding (see **table 10**).

Table 10: Examples of elaborating on the 'Feeding' theme.

'Feeding' → sub-code 'Autumn'	<p><i>"In autumn routine changes: don't bring them out every day, especially if it's super rainy and the way to pasture is soaked."</i></p> <p>Excerpt of reflexive coding journal on Hirtl farm</p>
'Feeding' → sub-code	<p><i>"Robert: You always have to find the golden mean when you go here and say</i></p>

¹⁴ Due to the elaborate first round of coding, I had a good overview where to find what in my data. Hence, going through all the material again seemed too time-consuming, especially because I wanted to work with as much coded data as possible (Rädiker & Kuckartz, 2020).

<p>'Mowing' → sub-code 'Biodiversity'</p> <p>'Biodiversity' was first on the same level as 'Mowing' but then I shifted it into 'Mowing' because according to the data in that code 'Biodiversity' in hay-milk is linked to 'Mowing'.</p>	<p><i>with the biodiversity area, yes, we are committed to it, we have our biodiversity area over there and you are not allowed to mow it until...</i></p> <p><i>Linda: from 1 July. Unless, like this year, you were allowed to mow it 3 days earlier because there was so little fodder in general, drought, then it will be cleared earlier, but what's the use of 2 days now. I always say that this is our butterfly meadow, because everything is so colourful, and it's set so that the beetles and all that are then through and then you can mow it."</i></p> <p>Excerpt of semi-structured interview with Linda and Robert, translated from German</p>
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Annex 5: Introducing the farms, or the art of including cows and milking machines

“The cows react to me. To where and what I do. They lift their ears, look at me, follow me with their eyes, some even lift their head. One of the youngsters comes towards me, observes me, snuffles, and seems as if she would lose interest, because she turns towards the right and leaves me with my thoughts (I am sitting behind the electric fence)”

- Excerpt of participant observation on Hirtl farm -

Suited to my embodiment into the context, I would like to introduce the farms by presenting important actors, through combining storytelling, and graphics. These presentations are based on my interpretation of the actors and are not intended to represent reality; rather they re-present interpretations of my experience (Verran, 2021). The descriptions are solely based on my observations and my interpretation of the farmers' words.

Hirtl farm

The Hirtl farmers

Rosa is from a farming family from Vorarlberg in Austria. She met Walter in Vienna where both studied and stayed after graduating. When they were around 40, they decided to take over the farm of Walter's parents, who had converted to organic farming already: the Hirtl farm, a traditional hay-milk farm, belonging to the family since Walter's great-grandpa. Walter continued working outside of the farm, while Rosa became the main farmer. In the beginning of the take-over, Walter and his father helped a lot, but as the health of Walter's father got worse, Rosa took over more and more responsibility. Rosa and Walter clearly divided tasks and responsibilities according to their preferences: Rosa is managing the cows and the house, while Walter is mostly responsible for the farm's economics and machinery including mowing.

Since the take-over they have doubled the number of cows to 39 (in the moment of observation) and leased more land, but Rosa wants to downsize to 30 cows now, as the stable is only built for that many. The cows go out on the pasture at least 120 days a year. All their milk is sold to the regional dairy.

This summer Rosa has been busy with learning more about insects in seminars. Furthermore, she feels that everyone has a responsibility to change towards more sustainability. Her job is to care for the cows, and she likes to work a lot, be out on the farm, with the animals, she would not like to sit on the couch, if she does so, she gets twitchy. She told me while smiling. She also likes the freedom she has running their own farm. If she wants to work towards more sustainability, she can directly implement it. Walter shared with me that he has been involved in the farm since an early age, as his father used to work outside.

Rosa can retire in two years. Until then she wants to take part in take-over seminars. Whether there will be a take-over is not yet clear. Their oldest daughter is now doing a programme, so she could lease the farm in two years. However, both Rosa and Walter don't exert pressure on any of their children.

Mala and Erik

Mala likes to tease the other cows and bosses them around. She lived in the small cow stable, that is for the cows that are advanced in pregnancy when I arrived. During my stay she gave birth to her son, Erik. Mala lived together with her son for a couple of days until the next cow about to give birth arrived and we transported Erik to the calf box. Mala and Erik

called and looked for each other for around three days. Rosa told me that she doesn't like to separate the calves from the cows, but the big stable wasn't built to keep mom and baby together for longer. With leaving them together for a couple of days, Rosa's practice is quite unusual, most farmers separate them directly after birth. But Rosa thinks the first days are especially important for the calf's health as it doesn't have an own immune system yet. This practice showed me that a strong relational process comprises of many different care practices between the farmer and the cows at Hirtl farm.

The milking machine

Connecting farmer and cow twice a day and representing technological progress. Rosa explained to me that she preferred an older mechanic model, so she has the control over the process. In their stable, three cows can be milked at the same time, the milk is directly pumped into the neighbouring room in the milk tank. This makes a lot of noise...

The earthworm

An indication of good soil quality. I came across many of them on two of their most productive mowing grass fields when stabbing dock. For me they represent the interdependent relationship between the farmer, soil health, the cows, and ultimately nature, biodiversity, and the environment.

Schäferl farm

The Schäferl farmers

Robert took over the Schäferl farm from his parents after finishing the agricultural school. The farm is in the family since about 250 years. He directly changed the farm from silage to hay in 2003/4 as the only farmer in the whole valley. He met Linda at the local skiing school as both were skiing instructors. Some years later they met again and decided that Linda moves in. Soon they got their son and bought their first Jersey cow for better quality of their self-made yoghurt and cheese; the milk of Jerseys has a high amount of fat.

They also divide tasks according to preferences, although they could do the tasks of the other one in case of emergency. Linda does the cooking, laundry, bookings, and communication with their guests. Robert works with the machinery, feeds, and milks the cows, and makes the cheese. Next to yoghurt and cheese, they also sell home-made jam, made by Linda, and schnaps, distilled by Robert. There are some years left until the take-over. Both Linda and Robert encourage their son to pursue whatever he wants to do.

Beauty and Cara

Beauty just spent her first summer being pregnant on the mountain pasture and had her first calf, a bull named Jonas. Beauty appears to be very much loved because she was the only girl so far from her beloved mom, named Bambi. When standing in the line to be milked, she was always hesitant to enter the milking area, so Robert often had to go into the stable and lead her a bit.

Cara was born in 2018 and is a mixed breed. Her mom was a Simmental that didn't get pregnant anymore, so the veterinarian suggested to try inseminating her with sperm from a different breed, the Pinzgau, and it worked. Although for breeding Cara is not good to keep, Robert told me they couldn't give her away and hope she will only give birth to male calves where the breed doesn't matter so much. Linda explained to me that she managed to stay on the farm because she became friends with one of their Jerseys, and because they don't separate friends, she could persist on the farm even though being a mix. I could also

recognize here the different care practices¹⁵ involved in a strong relational process between the Schäferl farmers and the cows.

The wooden stick

Mountain farmers traditionally make use of the different climatic zones on a mountain by bringing their cows up or down the mountain following the seasons. When I was at Schäferl farm, I joined the whole family to bring the last youngsters down from their forest pasture to another meadow further down the mountain. Linda walked in the front, their son and I in the back, and Robert secured the way with the car. To lead the cows, one uses a wooden stick and slaps gently on the cow's rump when walking behind them – and they find the grass on the way more interesting than walking.

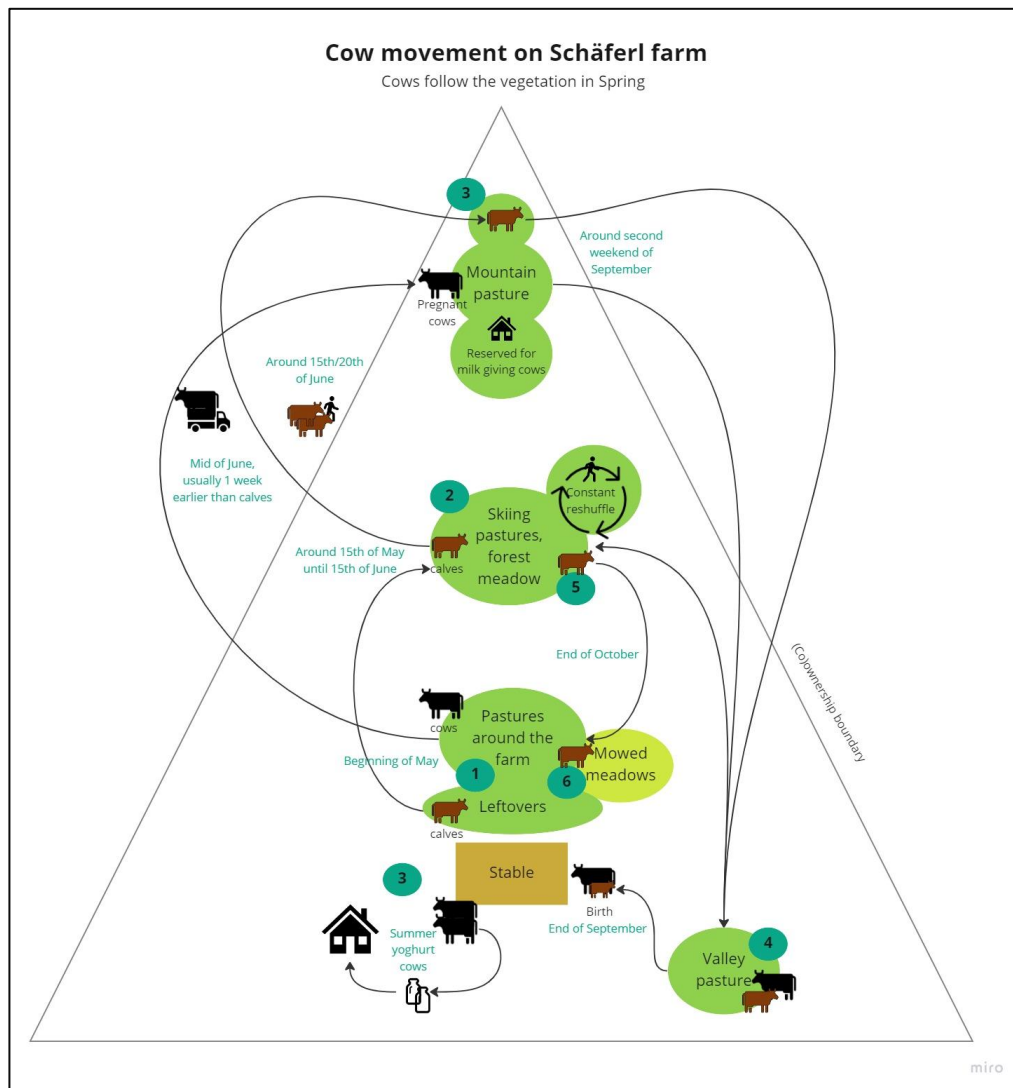


Figure 11: Graphic of the cow movement on the Schäferl farm throughout the different seasons of a year; based on conversations with the farmers. The exact date of leaving the mountain pasture might differ per cow depending on how advanced the pregnancy is.

The yellow gentian

Appears on European mountains and typically grows on pastures and unfertilised hay meadows (Kooperation Phytopharmaka, n.d.). During my stay Robert went up to the very

¹⁵ I am aware that there a whole body of literature on care practices, but I use care here in a colloquial way.

top of the mountain where the youngsters graze during summer to collect the plant's roots for their apple-gentian schnaps. He had to walk several hours and then carry his multiple kilogram harvest down. This tradition and usage of every treasure nature provides represents for me a deep bio-cultural relational process between the farmers, the cows, and the mountain environment.

Annex 6: Intended and actual data-making

Table 11: Intended versus actual data-making.

Data making method	Intended data making	Actual data making
Active participant observation	I intended to stay longer on my first farm visit, the Hirtl farm, to familiarize myself with the farming practices as I come from a non-farming background. I would have liked to stay at least two weeks on Schäferl farm to get a similar depth of data even though the time difference might lead to a difference in the depth of my observations.	I stayed four weeks on Hirtl farm and only one week on Schäferl farm. The farmers on Schäferl farm didn't have more time and I of course respected their preferences. The large time difference on both farms led to a different depth and amount of data.
	I decided to do WWOOFing ¹⁶ against data extraction ¹⁷ on the first farm to give something back. I thought this is the ideal way to combine making and assembling data while also helping the farmers.	Being engaged in the WWOOFing practices and following my tasks, halted me sometimes from observing or engaging in activities the farmer was pursuing. Hence, while the combination of working and making data on the farm worked partially, it would have been good to set specific times for each practice.
	Photography and videos were intended as support, not as the primary material.	I underestimated the potential of visual collaboration (e.g., Rodriguez Castro, 2018). One farmer took the initiative to take photos of me while doing certain farming practices. I could have given the audio-visual data-making a more central place in my methods.
Narrative interviews	I intended to not cause any interruption through for example recording to have 'normal' conversations.	The recordings may not have been intimidating or disrupting (Ellingson & Sotirin, 2020). I could thus have worked with more recording instead of relying on my memory.
Semi-structured interviews	Initially I had designed a two-part study analysing the hay-milk context and the two farms separately from each other.	This design limited my perception of actors for interviews. It could have been interesting to interview the farmers' neighbours for example.

¹⁶ WWOOF: Willing Workers On Organic Farms, an network of volunteers on organic farms, see: <https://www.woof.at/>

¹⁷ I am aware of the literature body on extractive research practices, but it goes beyond the scope of the thesis.

Annex 7: Checklist for reporting of qualitative research

Table 12: Filled in checklist of reporting criteria for qualitative research based on (Tong et al., 2007).

Domain 1: Research team and reflexivity	
Personal characteristics	
1. Interviewer/facilitator	Julia Fritzsche
2. Credentials	Master student
3. Occupation	Student
4. Gender	Female
5. Experience and training	Conducting journalistic interviews, and semi-structured interviews for bachelor thesis
Relationship with participants	
6. Relationship established	There was only initial contact via phone and/or mail with the participants prior to the study
7. Participant knowledge of the interviewer	The participants received a short text about me and my relation to farming and a Plain Language Statement prior to the research visit naming the study aims, and the larger research project's objectives and research questions
8. Interviewer characteristics	I let the participants know where I am from, where and what I study, and that I want to speak with them for my master thesis.
Domain 2: Study design	
Theoretical framework	
9. Methodological orientation and theory	Short-term ethnography, process-relational approach
Participant selection	
10. Sampling	The farmers were selected with purposive sampling, the other human actors via snowball sampling.
11. Method of approach	The participants were approached via mail first and if they requested via telephone.
12. Sample size	There were four farmers from two farming families and seven human actors taking part.
13. Non-participation	No one dropped out.
Setting	
14. Setting of data collection	The farmers were interviewed and observed at home, the other human actors were interviewed at the farmers' homes, their offices or at a public meeting centre.
15. Presence of non-participants	Only one interview took place at a public meeting centre and then a few people passed by.
16. Description of sample	The two farms are both hay-milk family farms, one located in the flat land area and one in the mountain area typical for Salzburg province. The other human actors were working along the food supply chain of hay-milk or involved in advocacy and state regulation.
Data collection	
17. Interview guide	Interview guides can be found in annex 2 .
18. Repeat interviews	There were no formal repeat interviews, more follow-up questions at the farms in the form of normal conversations.
19. Audio/visual recording	All semi-structured interviews were recorded after participants gave consent. On the farms photos and videos were taken after the farmers gave consent.
20. Field notes	Field notes were taken for participant observation at the end of each day.
21. Duration	The semi-structured interviews ranged between 15 and 90 minutes.

22. Data saturation	I noticed repeats in the other human actor interviews with the fourth interview.
23. Transcripts returned	The transcripts were not returned to not demand more time from the participants. Most participants showed no interest in being further involved. Only one person wanted the recording, which I shared with him.
Domain 3: Analysis and findings	
Data analysis	
24. Number of data coders	Only one with feedback on coding from peers.
25. Description of the coding tree	Coding system can be found in annex 3 .
26. Derivation of themes	Themes were derived from the data.
27. Software	MAXQDA was used to transcribe and code the data.
28. Participant checking	The participants weren't involved in checking the findings to not demand more time from them.
Reporting	
29. Quotations presented	Quotations were used to illustrate the findings.
30. Data and findings consistent	In my findings I only selected one relational process to illustrate what a process-relational approach can reveal about resilience. Therefore, my approach was never meant to be consistent.
31. Clarity of major themes	I selected one minor theme of one major theme to illustrate the usefulness of the approach I was taking.
32. Clarity of minor themes	I went into details for both farms within the selected minor theme.

Annex 8: Ethics review – final review

Unforeseen ethical dilemmas: During my time on Hirtl farm, I got to visit one other farm to better understand hay-milk farming practices and the uniqueness of the certain ones on Hirtl farm. This visit emerged spontaneously. But because I didn't formally want to include this farm, I didn't bring a consent form and chose to just take anonymous notes for my own memory. I didn't end up using any of this data as it was only for my own understanding. Please find a review of my ethical procedures in **table 13**.

Table 13: Review of ethical procedures.

Ethical procedure	Followed: yes/no	Explanation
Plain Language Statement	Yes	
Consent form	Yes	
Storing personal data only externally	Partially	While the name and addresses were stored separately on my external hard drive, I uploaded the interview recordings to the analysis software MAXQDA as it links the recording and transcribed text. This allowed me to go back to the recording easily during the analysis. MAXQDA is considered GDPR approved, and my interviewees consented to use transcription software. If I had known about this practicality before I would have included this step in my ethics review. No full names or other personal data were mentioned in these recordings, hence, there are no ethical implications.
Anonymization	Yes	
Regarding personal bias, reflexive journal during data collection and analysis, as well positionality statement in publication	Yes	
Password protection during documentation	Partially	While I used password protection for personal data, I didn't protect my journal documents on my laptop because of practical reasons. However, I used pseudonyms in these documents. Therefore, there are no ethical implications of these changes.

