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Farming on the margins: Just transition and the resilience of peripheral farms

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ABSTRACT

Sustainability transition demands fundamental changes taking place at the farm system level. At the same time, many farms are operating on the verge of financial profitability, especially in geographically disadvantaged peripheral regions with a limited range of production opportunities. These observations raise concerns about the transition's justice aspects. Using the concept of resilience, we analysed farmers' capacities for transformation in a peripheral context in Finland. The results from our farmer survey ($n = 577$) indicated that the regime exerts a strong cost-price squeeze on farmers, escaping of which is difficult also for farmers deliberately seeking new pathways beyond it. Due to farmers' dependence on the regime, drastic changes to 'the rules of the game' could undermine their resilience. We argue that for transition processes to be both sustainable and just, proactive restorative justice should aim at promoting resilience at the farm level by deliberately building inclusive and accessible transition pathways.

1. Introduction

The current food regime has created a number of persistent environmental problems, such as climate change, environmental degradation and biodiversity loss, while it has also driven many farms to the verge of financial profitability. Addressing these problems through a fundamental reorientation of the food system—a sustainability transition—calls for substantial changes taking place at the level of farm systems. However, farmers have been frequently described as being amongst the least powerful actors in food systems, acting mostly as price-takers, which makes them ill-equipped to act as transition agents (Gottlieb and Joshi, 2010; Glover and Touboulic, 2020; Kaljonen et al., 2021; Tribaldos and Kortetmäki, 2021; Vermunt et al., 2022). The contemporary food system is pushing farms towards more specialisation, intensification and growth to keep up with the cost-price squeeze (van der Ploeg, 2017; Huttunen, 2019; Stringer et al., 2020), while the pressures for a fundamental reorientation in farming are mounting for the sake of environmental sustainability.

The traditional approach to confronting sustainability problems as related to production practices (Garnett, 2013) and farm management has been advocated for decades through, for example, agri-environmental policies within the European Union. However, critics argue that many such strategies do not challenge the systemic features that contributed to the problems in the first place (Clapp et al., 2018) and are thus inadequate to address the root causes of sustainability problems. The consumption approach takes a different position, attributing the environmental crisis to consumption patterns, especially overconsumption of high-impact animal-based products (Garnett, 2013; Westhoek et al., 2014). Under this approach, a dietary transition towards more plant-based consumption is

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the most critical solution to address the sustainability problems of the food system. However, the dietary transition translates as a threat to the livelihood of especially many peripheral regions where farms and farmers lack feasible production and employment alternatives due to unfavourable growing conditions and paucity of non-agricultural jobs (Kaljonen et al., 2019; Kuhmonen and Kuhmonen, 2019; Huan-Niemi et al., 2020; Yli-Viikari et al., 2021; Puupponen et al., 2022).

The problem with both production- and consumption-oriented perspectives is that they do not address questions of power and agency that are fundamental elements of the unsustainability of the contemporary food system (Neufeld et al., 2020). Accordingly, as Garnett (2013, 34) states: "The concern lies not just with production, and not just with consumption: it is the outcome of unequal relationships between and amongst producers and consumers, across and within countries and communities." Yet the questions of power, agency and social justice have received limited research interest in relation to initiatives promoting sustainability and climate change mitigation amongst food systems (Clapp et al., 2018; Janker et al., 2018). To this end, an emerging area of 'just transitions' research has been gaining a stronger foothold amongst the sustainability transitions literature (Newell and Mulvaney, 2013; McCauley and Heffron, 2018; Köhler et al., 2019). In the context of food systems, research on just sustainability transitions draws from existing scholarship on food justice, which is devoted to studying power and agency in food system, food system transformation, and distribution of harms and benefits of food system activities across various social groups and spatial scales (Gottlieb and Joshi, 2010; Cadieux and Slocum, 2015; Kortetmäki, 2019).

Despite the urgency of efforts to promote sustainability transition within the food systems, and the observations related to farmers' weak power position, there is very limited understanding about farmers' capacities to transform (Darnhofer, 2021; Vermeulen et al., 2018). In this study, we examine the transformative capacities of farmers in a peripheral context to understand how they are positioned relative to the prospective sustainability transition. We operationalise farmers' transformative capacities through the concept of resilience: by referring to resilience as persistence, adaptability, and transformability (Folke et al., 2010; Meuwissen et al., 2019), we analyse the 'fit' of farms with the external system, characterised by rigidity and path-dependency on the one hand and mounting pressures for a disruptive transition on the other. The concept of resilience allows us to move beyond analysis of production lines or practices to be promoted or debilitated and analyse the position of farms as parts of the food system: whether and under which conditions peripheral farms can participate in the main function of food systems—food production.

We discuss our findings in the context of just transition, which addresses social inequalities and tensions related to transition processes along the dimensions of distributive, procedural, recognitive, cosmopolitan and restorative justice (Kaljonen et al., 2021). While the uneven consequences of transition processes are usually analysed in terms of distributive justice (e.g., Kaljonen et al., 2021; Tribaldos and Kortetmäki, 2021), we argue that the concept of restorative justice offers a theoretically unelaborated but promising pathway to understand the ways forward from the detected inequalities: how to compensate or restore the actors' positions shaken by the transition processes (McCauley and Heffron, 2018; Kaljonen et al., 2021). In particular, we elaborate on the recently developed proactive elements of restorative justice (Schiff and Hooker, 2019) and argue that restoration should go beyond only reacting and compensating for harm created but also promoting the actors' resilience in transition processes.

Our empirical context is Finland, particularly its eastern, peripheral regions, where the livelihoods of many farmers (especially those employed in agriculture full-time) and, partly, regional economies are dependent on cattle production. This is due to the region's climatic conditions and soil properties being particularly suited for grass production, whereas crop cultivation suffers from profitability problems or from a short growing season (Huan-Niemi et al., 2020). Furthermore, crop production does not offer possibilities for full-time employment in peripheral areas, which also lack the abundant job markets of economically prosperous regions (Yli-Viikari et al., 2021). We base our findings on representative survey data retrieved from farmers in eastern Finland in 2018 ($n = 577$).

2. Conceptual framework

Our conceptual framework builds on three key concepts: sustainability transition, agency and resilience. These are interlinked by the concepts of just transition, adaptive and transformative capacities, and transformation pathways (Fig. 1). In the following, we will discuss the framework in more detail.

2.1. Sustainability transition and the resilience of farms

Social systems, such as food systems, may accommodate several stability domains. These stability domains (Kauffman, 1993; Kuhmonen, 2016) are analogous with regimes as temporally stable configurations of a social-ecological or socio-technical system.[1] We understand regimes as dynamically stable configurations of social systems prevailing over specific timeframes. Sustainability transitions can thus be conceptualised as regime shifts (Runhaar et al., 2020) or moves into new stability domains. These systemic transformations affect the subsystems residing within larger-scale systems, such as farms as parts of food systems. The specific transformation pathways that farms take can be conceptualised in terms of resilience.

Resilience refers to the capacity of social-ecological systems to fulfil their function in changing conditions, thus withstanding disturbances and being able to adapt and transform while delivering on their main goal (Gunderson and Holling, 2002; Walker et al., 2004). Although resilience is sometimes portrayed as stability, resilient systems can—and should be able to—transform. The strategies

[1] A food system can be conceptualised both as a social-ecological and a socio-technical system. The schools of thought behind these concepts have developed largely isolated from each other, but they also share some common vocabulary and research topics, and similarly embrace system dynamics as giving rise to processes of social change.

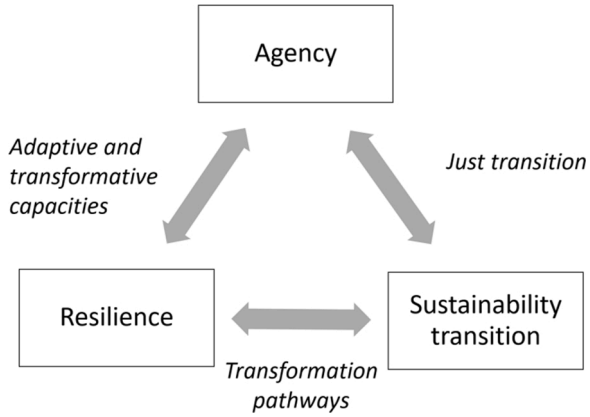

Fig. 1. The conceptual framework of the study.

through which a social-ecological system may retain its resilience can be characterised in terms of persistence or robustness, adaptability, and transformability (Fig. 2; Walker et al., 2004; Folke et al., 2010; Darnhofer, 2014; Meuwissen et al., 2019).

Robustness refers to the capacity of the (farming) system "to withstand stresses and (un)anticipated shocks" (Meuwissen et al., 2019, 4). Adaptability, in turn, entails "the capacity of actors in a system to influence resilience" (Walker et al., 2004, 5) by, for example, changing "the composition of inputs, production, marketing and risk management in response to shocks and stresses but without changing the structures and feedback mechanisms of the farming system" (Meuwissen et al., 2019, 4). Lastly, transformability is about "the capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable" (Walker et al., 2004, 5). Such changes can imply a changing function of the farming system (Meuwissen et al., 2019).

A farm system may employ different resilience strategies over time. The food system and the embedded farm systems are in a flux of constant interaction: the dynamics on both levels condition each other. The employed resilience strategy depends on the transformative capacities of the farm and the farmer—what they can do with the resources they have. This makes resilience a question of agency and power. In a situation where the regime is strongly locked-in, farmers' choice space becomes substantially limited (Kuhmonen, 2020). The pressures are manifest in how farmers are acting mostly as price-takers and carry the responsibility for mitigating environmental impacts in the food system (Glover and Touboulic, 2020). However, not all farmers are similarly affected by transition processes, which calls for analyses of the transformation pathways accessible to farms.

2.2. Resilience, agency and adaptive capacities

Agency and power are longstanding areas of research in social sciences. Agency can be seen as the actors' capacity to act, and it constitutes power, intentionality, freedom of choice and reflexivity (Dietz and Burns, 1992; Teerikangas et al., 2021). Power, in turn, is understood here as "the capacity of actors to mobilise resources and institutions to achieve a goal" (Avelino, 2017, 507).

When resilience is understood as the capacity of a system to achieve its goal, the notion of power in achieving that goal is central to the analysis of resilience. Resilience requires adaptive capacity, which refers to the potential of system agents to fulfil their goals, act independently, and exert their own agency (Folke et al., 2010; Berkes and Ross, 2013; Olsson et al., 2014). As such, the concept of adaptive capacity is practically identical to the concept of social power. Analyses of resilience and adaptive capacity at the level of farm systems require identifying the kinds of goals farmers hold regarding food production, the resources available, as well as the capacities to utilise them to achieve those goals (Rauschmayer et al., 2015). Thus, even though the concept of resilience has sometimes been used without being attentive to the societal context, questions of regime reproduction, or social power (MacKinnon and Derickson, 2013; Taylor, 2018; Darnhofer, 2021), it holds potential in analysing questions of agency, power, and social justice related to systemic transformations (Olsson et al., 2014; Ingalls and Stedman, 2016; Popke et al., 2016)

As systems may employ very different strategies to retain their resilience, it is presumed that system actors also employ different capacities in accordance with their resilience strategy. Avelino (2017) argues that transformative capacities are different from capacities that reproduce the existing structures, as in the case of persistent or adaptive versus transformative types of resilience. According to Patterson et al. (2017, 9), "Transformative adaptation approaches take as a starting point that power relations condition the options available to marginal and vulnerable groups to shape their own desirable futures, thus requiring keen attention to issues of social difference, power, and knowledge." Tribaldos and Kortetmäki (2021) see capacity development as a criterion for a just transition in the sense of whether food system actors can respond to transition pressures. Thus, resilience capacities depend on what people can do and be with those resources and goods they possess or have access to (Nussbaum, 2003; Sen, 2009). How farmers as system actors employ their capacities is a function of their internal goals and the external conditions defined by the food system (Eakin et al., 2016). When the distributive effects of external conditions fall unequally upon the food system actors, restorative justice can reveal new perspectives on mitigating these effects.

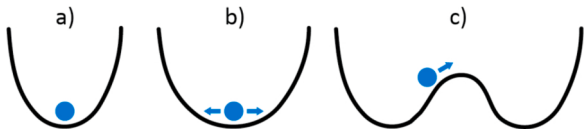

Fig. 2. Modes of resilience: a) persistence, b) adaptability and c) transformability (after Meuwissen et al., 2019).

2.3. Restorative justice in the sustainability transition

Restorative justice approach is traditionally understood as a non-adversarial response to harm and conflict that derives from violations of law, rules, ethics, or a general sense of moral obligation (Walker, 2003). The concept originates from criminal justice studies seeking to repair the damage and restore the dignity and wellbeing of all those involved in causing harm (Eglash, 1977). However, restorative justice has increasingly been acknowledged in the field of sustainability, particularly from the perspective of energy transition, nature conservation, food transition and human rights (Figueroa and Waitt, 2010; Heffron and McCauley, 2017; Schormair and Gerlach, 2020; Hazrati and Heffron, 2021). The common characterisations of restorative justice emphasise face-to-face dialogue between different parties configured as offenders or perpetrators of harm and the subjects-of-harm (Hazrati and Heffron, 2021). The latter is often conceptualised as a "victim", a condition under which agency and relationship with offenders are to be transformed. The

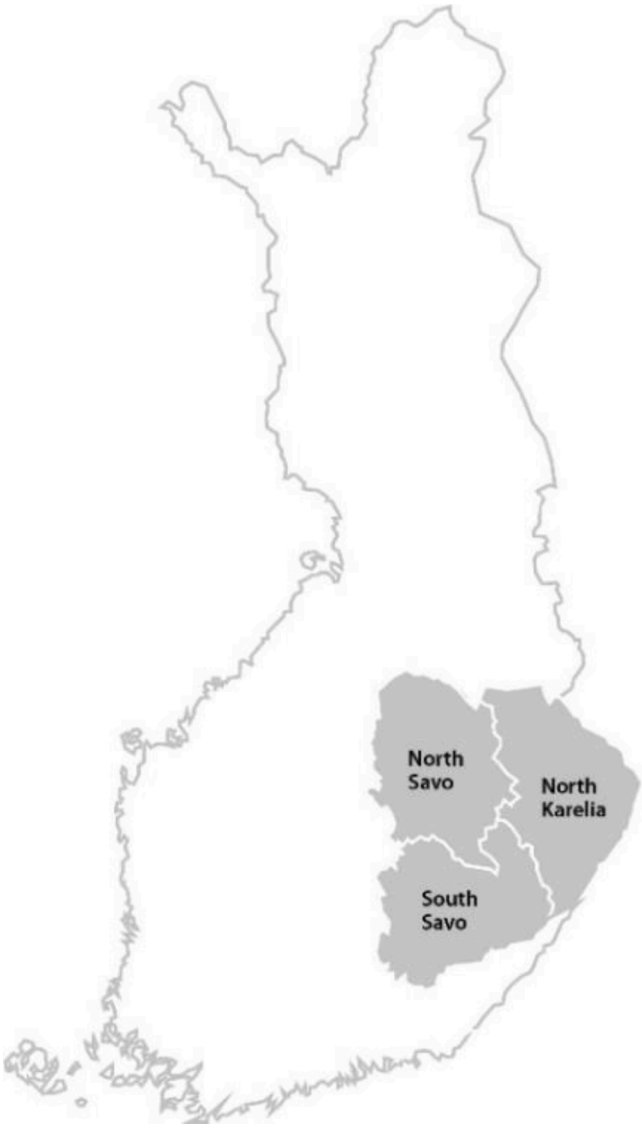

Fig. 3. Location of the research area in Finland.

process of restorative justice involves a reactive mechanism to address the damage already done. In other words, the process seeks to restore justice within the structures of the existing system. Accordingly, the individual is expected to undergo a transformation process (to move from the position of victim into non-victim) while the surrounding system does not change.

Recent proactive approaches to restorative justice have emphasised more anticipatory elements of restorative justice. This means involving a range of actors and adopting a forward-looking approach that is both preventive and strategic (Hazrati and Heffron, 2021). However, to be genuinely proactive and transformative, justice cannot be achieved by restoring the status quo ex ante (Schiff and Hooker, 2019). We further argue that the main challenge of restorative justice during systemic changes is that the transformation is not only about individuals but the system itself. Thus, individuals cannot be easily 'restored' with the logic of a system on the move. In systemic transitions, this would mean that those at risk of becoming 'transition victims' should also have the opportunity not to become ones.

However, the application of the restorative approach to sustainability transition is not unproblematic, as the actors who fall victim to the transition processes have at the same time contributed to the problems that call for a transition in the first place. To what extent this contribution can be credited to the deliberate choices of the actors or just to them operating by the rules of the game remains debated. However, the current financial position of farmers suggests that the system itself is the most crucial factor in delimiting their choice space. The just food transition poses a fundamental challenge to restorative justice; the food system itself is enduring a major transformation which is also expected from the actors within the system. We argue that a genuinely transformative and proactive approach to restorative justice should aim at resilience and capacity building not only in terms of the existing system, but also in terms of the systemic transformation. We now move on to examine farmers' transformative capacities and then discuss our findings from the perspective of restorative justice.

3. Research design

In this section, we present the research design through which we explore the transformative capacities of farmers. We base our exploration on farmers' self-stated goals and development intentions, which reflect their resilience strategies within a given moment in time. By analysing the resilience profiles against various background variables, we describe the source and content of farmers' adaptive capacities. Finally, we discuss the justice implications of our findings against the backdrop of the contemporary food regime, as well as the pressures exerted by the sustainability transition. Our study area is a peripheral region with limited livelihood options, thus highlighting the pregiven power imbalances of the socio-economic system.

3.1. Research area and data collection

The research area in Eastern Finland comprises three provinces: North and South Savo and North Karelia (Fig. 3). The area is characterised by a sparse settlement structure and rather unfavourable socio-economic development patterns. The area adds up to 18% of the total area in Finland and 10% of the total population, with 557,000 inhabitants. On average, the farms in Eastern Finland are smaller than the national average, and the fields tend to be fragmented into small plots. The share of utilised agricultural area (UAA) in Eastern Finland is 5% of the total area in comparison with the Finnish average of 7.4% (Natural Resources Institute Finland, 2021). The climatic conditions and soil properties are particularly suitable for grass production, and consequently, the role of cattle production is pronounced with 33% of all farms in Eastern Finland being cattle farms in comparison with the Finnish average of 20% (Natural Resources Institute Finland, 2021). A significant share of the yields produced on crop farms are used for feed on cattle farms in the area (A. Huuskonen, personal communication, February 2022). Regarding farm sales, in Eastern Finland 68% comprises animal products in comparison with the 58% average of mainland Finland (Natural Resources Institute Finland, 2021).

This study is based on survey data collected during the mid-term evaluation of the 2014–2020 Rural Development Program (RDP) of Eastern Finland (Kuhmonen et al., 2018). The programme addresses a wide range of social, economic, and environmental issues of farms and rural areas by channelling the funds of the second pillar of the EU's Common Agricultural Policy for farmers, rural firms, and non-profit organisations. A survey request was sent to all farmers in Eastern Finland who had received agricultural support from the programme and who had registered an email address in the IACS farm register (7796 farmers). All active farmers in Eastern Finland with at least 5 hectares of arable land are entitled to LFA support, and in Finland, the support encompasses nearly all agricultural land (Niemi and Väre, 2018). As a result, 577 responses were retrieved, with a response rate of 9% despite several requests to fill out the questionnaire. The low response rate was partly due to unfavourable timing of the survey at the beginning of spring but is in line with many recent farmer surveys conducted in Finland.

The survey addressed issues related to the farm and its production activities, the farmer and the farming family, farming as a livelihood, environmental aspects related to farm management, and the main types of subsidies received and their perceived effectiveness. The basic characteristics of the surveyed farms are presented in Appendix 1 in comparison with all farms in Eastern Finland and all farms in mainland Finland. The survey respondents farmed slightly larger farms than farmers in the area on average but were broadly representative of farmers in the area. Most of the survey respondents (30%) were cattle farmers (dairy and beef), followed by other crops (typically hay production; 29%) and cereal production (22%). Garden crops, especially strawberry and currant, are typical crops in eastern Finland and had a share of 9% in the dataset.

3.2. Analysis

We performed an analysis to understand the farms' adaptive and transformative capacities as contributing to their resilience.

Farms' resilience was operationalised based on the farmers' goals and future plans for farming, thus reflecting three distinct resilience strategies: persistence, adaptability, and transformability. The resulting farmer groups were then profiled against a set of background variables to make sense of the various resources and capacities that gave rise to the observed resilience strategy. By multivariate analysis, we identified the factors most strongly contributing to the adaptive and transformative capacities of farms. In what follows, we will present these steps in more detail.

3.3. Operationalisation strategy for resilience

We operationalised the concept of resilience according to the three dimensions of resilience: persistence, adaptability, and transformability. In addition, we also identified a non-resilient group. The operationalisation strategy was based on three variables: 1) the future strategic orientation stated by the farmer (closed question), 2) an additional open question related to the farmer's strategic orientation asking the respondent to specify his or her plans, and 3) freely expressed goals for farming (open question). Out of the 577 responses, 575 were analysable in terms of resilience; thus, the final dataset consisted of 575 responses.

Coding farm resilience was an iterative process between the three variables. Table 1 presents the coding principles for each resilience group. In short, a farm was coded as *persistent* when the farmer aimed at business-as-usual and did not indicate development intentions. Those farms that aimed at developing the farm within the existing operations were coded as *adaptable. Transformable* farms indicated a deliberate search for a new direction for the farm business by diversifying the farm operations or doing something new in comparison with the existing operations. *Non-resilient* farms aimed to quit farming by retirement or moving into another business; they did not have successors and their intention was to lease or afforest the fields.

3.4. Profiling farms according to the resilience typology

The resulting four farm groups with diverging resilience orientations were profiled in terms of variables concerning the farm and its production activities (e.g., farm size, forest acreage, line of production, business model), the farmer and the farming family (e.g., age, gender, children, education), farming as a livelihood (e.g., share of farming income, assessment of profitability, past development strategy), environmental aspects related to farm management (e.g., soil condition, existence of wetlands and seminatural habitats), and the main types of subsidies received and their perceived effectiveness (adoption and perceived effectiveness of agri-environmental scheme (AES), adoption of agri-environmental (A-E) contracts, investment support, organic farming, extension support). These variables reflect the availability of resources, as well as how farmers make use of them and how they relate to environmental management at the farm level, reflecting the mobilisation of environmental values and motivations. A complete list of the variables included in the analysis is given in Appendix 2.

To determine whether the differences between the resilience groups were statistically significant, ANOVA tests were performed for continuous variables for the comparison of means, and contingency tests (X^2) were performed for categorical and dummy variables for comparison of the distributions.

A set of variables representing farmers' goals, the perceived barriers in achieving their goals, problems related to soil condition, and the approach for preventing waterway eutrophication were derived from content analyses, as these questions were open-ended. The responses were analysed with conventional content analysis, in which the coding categories were derived from the data (Hsieh and Shannon, 2005). Content analysis allows the qualitative organisation of large amounts of text into a restricted number of categories (Weber, 1990), which may then be analysed using quantitative methods. The categories were retrieved iteratively; thus, the coding categories were detailed during the coding process. The codes for each category derived from the content analysis were given as 0/1; 0 indicated that the category was not mentioned in the response, and 1 indicated that it was mentioned. Thus, it was possible to observe more than one category in one response. A more detailed description of the content analysis is provided in Appendix 3.

Table 1
Coding principles for the resilience typology.

	Future development strategy	Specification of the development strategy;goals for farming
Persistent farms	Business-as-usual	With no development orientation
Adaptable farms	Growth within existing line of production	(All)
	Business-as-usual	With a development intention or farm succession
	Downsizing	By giving up extra workforce or giving up animal production; coinciding with a development orientation
	Major turn	But search for a new direction missing
Transformable farms	Diversification strategy	(All)
	Major turn	With a deliberate search for a new direction
Non-resilient farms	Quitting farming within the next ten years	(All)
	Business-as-usual; downsizing	With the intention to move into another business, lease the fields, or retire

3.5. Regression analysis

To differentiate the strongest predictors for the resilience groups, we performed multinomial logistic regression analysis. With this method, it is possible to describe the relationships and interdependencies of one research variable with several explanatory variables simultaneously. Logistic regression is feasible in cases where the dependent research variable (the resilience typology) is categorical and the independent variables are categorical or continuous. A forward stepwise method with 18 explanatory variables was used with an entry probability of 0.05. Out of this group of variables, the analysis indicated predictors for the membership of the farms in the resilience groups step by step, starting from the strongest predictors. The analysis was based on 489 observations when cases with missing values were excluded.

The regression function can be written as follows: $\text{logit}(p) = \log(p/1\text{-}p)) = \beta_0 + \beta_i X_i$; $i = 1 \ldots n$, where p is the probability of a given value of the research variable, β_0 is the constant term (intercept), and β_i is the set of parameters (regression coefficients) for the set of the independent variables (X_i) (Hosmer and Lemeshow, 2000). Maximum likelihood was utilised for the estimation, and the statistical significance of the coefficients was evaluated by Wald statistics. The results are given as regression coefficients (β).

4. Results

In this section, we first present the profiles of the farms as classified in the four-group resilience typology based on the distribution of the explanatory variables, and then identify the strongest predictors for group membership with multinomial logistic regression. The results thus indicate how the resilience of the surveyed farms in Eastern Finland was composed of their adaptive and transformative capacities, as well as their robustness, as in the case of persistence.

Table 2
Resilience profiles of the surveyed farms in Eastern Finland based on the distribution of explanatory variables.

	Persistent	Adaptive	Transformable	Non-resilient
n	212	176	48	139
Share	37%	31%	8%	24%
Description	Satisficing; aims at business as usual	Regime aligners; aims at continuous improvements, development strategy	Experimenting at the outskirts; looking for new paths, aims at multifunctional strategy, major turn	Quitters that aim at giving up farming
Farm	Smallish farms Cereals, other crops Produce raw materials only	Large farms Dairy and cattle farms, garden crops and other animals emphasised Also upgrading activities	Large farms Other animal production, special crops and garden crops emphasised Also upgrading activities	Small farms Garden crops and other crops emphasised Produce raw materials only
Farmer and the farming family	Vocational education Living alone No children emphasised	Younger farmers Higher education Farming couple with children	Younger farmers Higher education No children emphasised	Oldest farmers Vocational or basic education Have children
Farming as a livelihood	Farming not that important source of livelihood, small farming income Business-as-usual in the past Satisfied with profitability emphasised Economic and personal goals, barriers in markets and physical environment	Farming important source of livelihood, relatively high farming income Growth in the past Satisfied with profitability emphasised Economic and social goals, barriers related to markets, policies, economic performance	Farming important source of livelihood, farming incomes are both small and large Diversified or changed in the past Not satisfied with profitability Economic and social goals, barriers in markets and the farm	Farming not that important source of livelihood, small farming income Business-as-usual or downsizing in the past Not satisfied with profitability Economic and personal goals, personal barriers, social barriers emphasised
Environmental aspects related to farm management	Moderate soil condition	Good soil condition emphasised, hydrological problems. Prevention of eutrophication through runoff prevention and farming methods.	Good soil condition emphasised, hydrological problems. Prevention of eutrophication through runoff prevention and farming methods. Wetlands and semi-natural habitats most commonly identified	Moderate soil condition (also weak); nutrient and pH related problems. In the prevention of eutrophication, reducing input use emphasised.
Subsidies	When assigned to agri-environmental scheme (AES), perceived no effect, not assigned emphasised	Effectiveness of AES: done something new Adoption of subsidy schemes larger than average apart from A-E contracts	Effectiveness of AES: done something new Most likely to have opted into A-E contracts, organic farming, extension support, investment support	When assigned to AES, perceived no effect, not assigned emphasised Least likely to have opted into subsidy schemes apart from A-E contracts.

4.1. Resilience profiles of farms

The largest proportion of farms in Eastern Finland were categorised as persistent (37%), followed by adaptable (34%), non-resilient (24%), and transformable (8%) farms. In Table 2, we summarise the farm profiles according to the resilience typology in terms of the background variables. The distributions upon which the profiling is based, along with test results for the statistically significant deviations of the distribution amongst the entire survey population, are provided in Appendix 2.

The main strategy of the **persistent farms** can be characterised as satisficing: doing the things that have been done previously without major attempts for development, let alone trying out new things. These farms were small farms typically producing cereals or other crops (typically hay). Farmers on these farms most often received less than 50% of their total income from farming (typically less than 5000 EUR annual income). However, the farmers were relatively satisfied with the profitability of farming. Environmental aspects did not play a major role in this group, and the persistent farmers were less likely than average to have signed into any of the subsidy schemes observed here. Their farming goals were related to the economy, but also personal goals, such as living on the farm, or a general surrender mentality in which there were no longer any grand goals identified, were relatively common in this group. The farmers of these farms typically had their educational background from vocational schools, and relatively many of these farmers lived alone and did not have children. In sum, the robustness of the persistent farmers arose from them not being dependent on agricultural income, which also meant that they did not have major ambitions for the farm development neither in terms of economy nor the environment.

Adaptable farms aimed at continuous development of the farming business while having a good fit with the existing food regime. The farm size was the largest in this group, as these farms had also previously proceeded on the growth track. Half of the adaptable farms practiced animal husbandry—mostly dairy or cattle; garden crops were also a typical production line. Farming was an important source of income for the adaptable farms, typically constituting 75–100% of their total income. On over half of the farms, the income from farming was more than 15,000 EUR. These farmers perceived the profitability of farming most positively. Farmers in this group were younger than average, and they farmed typically with a spouse and had children. Approximately half of farmers on adaptable farms were highly educated. Almost all adaptable farmers identified economic goals, but also social goals such as continuity over generations, sustainability, and contribution to food provision within the society were prevalent. Environmental management played an important role in this group. Larger than average share of farmers managed wetlands and semi-natural habitats on their land. They described the soil condition as good, indicating a tendency for active soil management. These farms had most often opted into the agri-environmental scheme, which the farmers also perceived as effective. Other subsidy schemes, including the organic scheme, extension support and investment support, were relatively widely utilised by the adaptable farms. The group was by and large characterised by a commitment to farming as a source of livelihood, and a focus on operating by the rules of the regime. To make a living from farming, they had enlarged their farming business in order to keep up with the cost-price squeeze, as well as committed to agri-environmental management on various fronts.

Transformable farms also held a development strategy. However, instead of developing the existing business, they were looking for a new path for their farm-based ventures. Transformable farms were large, and they represented all lines of production, but special crops (such as pulses, oil plants, potatoes and seed crops) and animal husbandry other than cattle and dairy (such as sheep, pig and poultry) were overrepresented within this group. Farmers in this group were young, had the highest education level of all groups and typically had a spouse but farmed alone. For these farms, farming was either the primary source of income or constituted less than 50% of income. Most transformable farmers evaluated profitability as weak, and they were driven by a search for better profitability. However, such a search had been ongoing in the past as well, as these farms had diversified or applied major changes to farm operations also in the past, indicating the difficulty to find a profitable direction fitting the goals of the farmer. These goals were related not only to the economic performance, as a substantial proportion of transformable farmers also mentioned social goals such as sustainability. Indeed, the environmental aspects played the biggest role in this group, encompassing management of soil condition and nutrients, identification of wetlands and management of seminatural habitats, important for agricultural biodiversity. Transformable farmers were the most active in utilising the available subsidy measures. Transformable farms encompassed the largest share of farms (10%) that also practiced upgrading of products by on-farm processing instead of only producing raw material. In short, transformable farms were trying to do things differently. The need for transformation stemmed from the efforts to increase the profitability of farming, to make farming a full-time profession, and to reconcile economic aspects with environmental ones. Their perceived barriers were mostly related to markets but also to the farm and its management, entailing issues such as lack of time due to being employed at the farm only part-time or lack of fields.

Non-resilient farmers—who form a strikingly high proportion of all farmers—faced a dead-end in terms of agriculture and had the aim of running down the farming business altogether. Non-resilient farmers had a low education level, and they were the oldest in all groups. Even though they were likely to have children, they did not have successors interested in taking over the farm, and thus they aimed at retirement, afforesting, or leasing the fields. The farms were small, and they typically farmed other crops or were in other production. The farmers were mostly part-time farmers, with agriculture constituting less than 50% of their total income, and the farming income was less than 15,000 EUR in 71% of cases. Over half of these farmers had proceeded on a business-as usual track previously, and a substantial proportion had downsized their production in the past. Most non-resilient farms assessed the profitability of farming as weak. Although the majority held economic goals, their frequency was clearly lower than in other groups, and the largest share of farmers in this group identified personal goals such as retirement or maintenance of good health. On the barrier side, social and personal barriers prevailed. Social barriers typically included the lack of a successor or a buyer, and personal barriers included high age and poor health. The soil condition was perceived as weaker in comparison with other groups, and the identified problems in soil condition were often related to the pH status of the fields and lack of nutrients. At the same time, even though these farmers felt

that the fields suffered from a lack of nutrients, they also mitigated waterway eutrophication by reducing input use. Non-resilient farmers were most likely to have opted out of the agri-environmental scheme, and those enrolled frequently cited that the scheme did not have any effects whatsoever. These farmers were least likely to be organic farmers and to have received extension support or investment support.

4.2. Regression analysis

With regression analysis, we took a closer look at the predictive power of the explanatory variables in comparison with the general descriptions based on the distributions of the variables. The results of the regression analysis are presented in Table 3, including the statistical significance and odds ratios (Exp(β)). When the value of the odds ratio is larger than 1, it implies a positive effect, while a value smaller than 1 implies a negative effect. The model was statistically significant. In the stepwise regression, we included seven explanatory variables that demonstrated the strongest predictive power to classify farms into the resilience groups: farmer age, farmer's assessment of the farm's profitability, farm size, education, use of subsidised extension services, adoption and perceived effectiveness of agri-environmental subsidies, and whether the farmer had children.

In comparison with the non-resilient farm group, a farm was more likely to end up in the persistent group when the farmer had no children, had a high education level (statistical significance 10%), assessed the profitability of farming as moderate or good instead of weak, and was young. In a similar comparison, the adaptable farm group was characterised by a high education level, positive assessment of the farm's profitability, large farm size, and young age of the farmer. The farmers on adaptable farms were also likely to have indicated that they had implemented some measures earlier than planned because of the agri-environmental subsidies (statistical significance 10%). Similarly, farmers on transformable farms were young, had a high education level, had used subsidised extension services, and had large farms. Farmers on transformable farms were more likely to have adopted agri-environmental subsidies, which also had an effect on farm management in comparison with the subsidies having no effects.

Table 3
Results of the regression analysis, including the step summary and parameter estimates for included explanatory variables.

STEP SUMMARY FOR STEPWISE REGRESSION						
Effects	Model	Model Fitting Criteria	Effect Selection Tests			
		−2 Log Likelihood	Chi-Square	df	Sig.	
Intercept	Step 0	1261.5				
Farmer age	Step 1	1170.6	90.94	3	0.000	
Assessment of profitability	Step 2	1138.3	32.25	3	0.000	
Farm size	Step 3	1116.7	21.69	3	0.000	
Education	Step 4	1089.8	26.85	9	0.001	
Extension subsidies	Step 5	1075.1	14.75	3	0.002	
Agri-environmental subsidies	Step 6	1045.8	29.30	15	0.015	
Children	Step 7	1037.7	8.06	3	0.045	
PARAMETER ESTIMATES FOR MULTINOMIAL LOGISTIC REGRESSION						
	Persistence		**Adaptability**		**Transformability**	
	Exp(B)	Sig.	Exp(B)	Sig.	Exp(B)	Sig.
Intercept		0.001		0.002		0.152
Children (reference: no children)						
*Have children	0.539	0.046	1.020	0.959	0.484	0.136
Education (reference: only basic level)						
*University	2.175	0.056	2.927	0.026	16.750	0.011
*Vocational school	1.428	0.325	1.010	0.982	3.136	0.307
*High school	0.801	0.671	0.597	0.413	5.493	0.160
Assessment of profitability (reference: weak)						
*Moderate or good	1.896	0.036	3.866	0.000	1.114	0.822
Agri-environmental subsidies (reference: not adopted)						
*No effect	0.760	0.491	0.534	0.227	0.185	0.021
*Done something new	0.808	0.598	1.084	0.871	0.647	0.498
*Done something earlier than planned	0.842	0.843	4.371	0.085	0.389	0.489
*Done something differently	0.871	0.783	2.231	0.160	0.383	0.251
*Has preserved something	0.787	0.574	1.005	0.993	0.447	0.253
Extension subsidies (reference: not adopted)						
*Has adopted	1.067	0.837	1.635	0.151	4.908	0.000
Farm size	1.007	0.151	1.016	0.001	1.015	0.012
Farmer age	0.942	0.000	0.907	0.000	0.905	0.000
n	178		152		42	
Reference category: non-resilient. $n = 119$						
−2 log likelihood	1037.7					
Likelihood ratio	223.84. $p < 0.000$					
Cox & Snell R2	0.37					
Nagelkerke R2	0.40					
McFadden R2	0.18					

5. Discussion

5.1. Who is resilient in the face of a sustainability transition?

From our data, we have identified four different resilience strategies and differing capacities giving rise to these strategies. The central differences between these strategies lie within their relationship with the contemporary food regime and the related capacities for transformation. The persistent and adaptable farmers (altogether 68% of respondents) stick to the logic of the dominant regime, while the transformable and non-resilient farmers (32% of respondents) are looking to shift towards new stability domains outside the dominant regime. This intent is driven by financial concerns: both the transformable and non-resilient farmers are not satisfied with the financial performance of their farms. However, the conclusion drawn differs between these two groups. The non-resilient farms do not have the resources necessary for transformation: they are old, their farms are rather small, they do not have successors, and their education level is low; thus, exiting farming altogether is a consistent intent. The transformable farmers represent the opposite in almost all respects: they are young, their farms are large, they are well-educated and development oriented.

The transformable farmers hold latent potential to act as change agents in sustainability transition, but this potential remains so far largely unfulfilled. This is due to the tightness of the contemporary regime: the transformable farmers aim at playing by new rules that do not yet exist. Their operations are not very well aligned with the commercial logic of the dominant regime, yet they have utilised the agricultural policies to the fullest extent; in this sense, they are also confined by the regime. The previous attempts of these farms of doing things differently suggests that finding a profitable direction is a struggle, highlighting the rigidity of the current regime (Kuhmonen, 2020). In this sense, resilience at the farm level is significantly more challenging to achieve by creating entirely new and profitable paths than by adapting to the current macro structure (see also Eakin et al., 2016).

Adapting to the current macro structure, i.e., the regime logics, is what the persistent and adaptable farmers were doing. Apart from being relatively content with what the regime has to offer in terms of profitability of farming, the strategies of the persistent and adaptable farms were quite different. The persistent strategy was enabled by non-agricultural income. Because of not being dependent on agricultural income, these farmers are relatively robust and possibly able to persist considerable hardships in their operational environment, but for the very same reason, their incentives to continue farming might also be easily lost. These farmers did not have much development intentions and their environmental orientation was weak. On the contrary, the adaptable farmers were dependent on agriculture for their income. They had been striving to align their farm operations according to the regime rules in terms of continuous growth and investments to production factors. The growth strategy had allowed these farmers to make farming the primary source of income. At the same time, it makes these farms most vulnerable to changes in the 'rules of the game', such as disincentivising animal production.

Even though the adaptable and transformable groups had a different orientation in terms of the contemporary regime, they were both characterised by a development orientation, which had spillover effects in terms of the orientation toward environmental management. These farms were likely to commit to several practices promoting soil carbon sequestration, prevention of nutrient run-offs, and biodiversity protection. Previous studies have also noted the coexistence of a general development orientation and susceptibility toward an environmental agenda (e.g., Wilson et al., 2013; Morgan et al., 2015; Peltomaa, 2015; Kuhmonen, 2020), which can be credited to the capacities the farmers hold (such as intellectual capital manifesting as high education levels), and the possibility and necessity of gaining a livelihood from farming.

The capacity and willingness of transformable and adaptable farmers to commit to sustainable modes of production reflect the production-oriented approach of addressing sustainability problems as part of day-to-day farm management (Garnett, 2013) and can be instrumental in the search for sustainability transition. However, from the perspective of dietary transition, such changes may not suffice and need to be accompanied by increasing share of animal farms converting to crop production (Huan-Niemi et al., 2020). The inherent transformative capacities of peripheral farms to face these challenges are limited, as indicated by our analysis. A small minority of farms are deliberately pursuing transformation. Non-resilient farms—a quarter of all—are likely to be driven out of the food system at all events. The adaptable farms have fine-tuned their production systems according to the current regime's requirements, highlighting the difficulties of diverting away from the contemporary trajectory. The persistent farms, in their turn, are unlikely to act as transition agents, as their operations are characterised by satisficing rather than development aspirations.

5.2. Towards proactive restorative justice in sustainability transitions

Our analysis of the peripheral farmers' resilience strategies and the capacities giving rise to them indicates that farmers are currently profoundly interwoven with the regime, including those farmers who search for a new direction beyond it. The contemporary regime is a double-edged sword from the viewpoint of farmers. On the one hand, a significant share of farms depends on it to survive, yet it is the very same regime that weakens their long-term resilience by continuously increasing the cost-price squeeze and dependence on agricultural subsidies for income. The contemporary regime undermines farmers' agency, yet finding an alternative pathway is a difficult task for them. The situation exemplifies, how within many resilience initiatives, resilience is framed as a capacity to be expected from those facing a disruption, rather than something to be facilitated and built at a systemic level (Fougere and Meriläinen,

2021). This leads to only those with the capacity to act and mobilise within the existing system to be able to maintain or become resilient. We, therefore, argue that just food transition should address proactive restorative justice through systemic resilience-building beyond the traditional approaches involving transition periods and compensation systems (Alkon et al., 2011).

Traditional conceptualisations of restorative justice are based on a linear understanding of systems. In linear systems, compensation for the harm created would be enough to restore the position of marginalised groups, but this does not hold true in complex systems. Even a proactive stance on restoration does not necessarily change the situation. When transformative changes take place in complex systems, they are usually irreversible due to the system moving into a new stability domain. Taking these concerns into account, proactive restoration within transition processes in food systems and beyond should aim at building resilience, especially for those actors most vulnerable in the face of systemic transformations. Our observations concerning the transformative capacities of peripheral farmers indicate that consumption-led dietary transitions are likely to signify hardships for regional food systems, where the role of animal production is pronounced. This threatens to exacerbate existing inequalities caused by effective socio-economic relations (Karlsson et al., 2018; Ciplet and Harrison, 2020; Golubchikov and O'Sullivan, 2020). Such hardships cannot be addressed through short-lived compensations, as the previous positions of the actors cannot be restored in the case of systemic transitions.

Instead, resilience-building requires systematically creating alternative pathways suitable to a wide diversity of geographical contexts and production conditions (Knickel et al., 2018; Stringer et al., 2020; Vermunt et al., 2020). In this vein, the premise for proactive restoration in a complex system should lay on an understanding of the future as yet to be determined. Accordingly, proactive restoration calls for dialogic means that enable diversity in the visions of sustainability transitions (see, e.g., Kuokkanen et al., 2018) and conceptualisations of alternative transition pathways. Proactive restorative policies could offer a space for acknowledging possible solutions and pathways ranging from systemic innovations, such as agroecology, to more incremental approaches of creating markets for new or underexploited agricultural products, such as pulses, fibre plants or energy crops.

The resilience of food systems depends on the resilience of the farms. We are currently witnessing a looming food crisis due to increased costs of production inputs and the war in one of Europe's most important food production areas, Ukraine, which highlights the need for resilience-building across food systems. Retaining food production ability in different regions is an elemental part of food system resilience. Thus, transition policies should address the inherent limitations in the production capacity of different areas while attending to the transformative capacity of farms. While the unsustainability of the current food regime is related to several mutually enforcing attractors (Karlsson et al., 2018), which cannot be addressed only through production or consumption, similarly the transition policies should build on a variety of measures that target several dimensions of the system.

6. Conclusions

For long, the change processes in food systems have overlooked aspects of justice in the pursuit of sustainability transitions. By analysing farmers' transformative capacities in a peripheral context, we have found that while there is potential for transformation amongst a minority of farmers, the change-oriented farmers are at the same time vulnerable to regime-level changes affecting farm income. Our findings call for more contextual designs of sustainability transitions that acknowledge the limitations of the different regions and farms in achieving these goals. For a transition to be genuinely sustainable and transformational, it also needs to address power imbalances that squeeze farmers' room for manoeuvre, as well as take a stance on new openings that could offer new sources of livelihood for peripheral farms.

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Declaration of Competing Interest

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

Appendix

Appendix 1

Distribution and means of background variables and data representativeness (data source for farms in Eastern Finland and mainland Finland: Natural Resources Institute Finland, 2021). $n = 577$.

Variable Share of respondents (%)	Survey farms	All farms in Eastern Finland in 2018	All farms in mainland Finland in 2018
South Savo	28	30	
North Savo	42	44	
North Karelia	30	26	
Farm size (ha)	44	39	48
Line of production (%)			
- Dairy	20	29	13
- Beef	10	10	6
- Pork	1	0	1
- Poultry	0	0	1
- Other cattle	3	6	4
- Cereals	22	9	32
- Other crops	29	41	33
- Horticulture: garden crops	9	6	3
- Horticulture: greenhouse production	0	1	2
- Other production	6	2	4
Farmer age (years)	52	52	53

Appendix 2

Distribution and average values of explanatory variables within the resilience typology. Statistical significance for ANOVA or X^2 tests is indicated in the second column. The third column indicates the share for the categorical variables or average for the continuous variables in the whole survey population, and the subsequent columns within the resilience classes. Larger than average values are bolded.

Variable	**Test and significance**	**Share or average**	**Persistence**	**Adaptability**	**Transformability**	**Non–resilient**
Farm						
Farm size (ha)	Anova: 0.000	44.4	36.5	**65.6**	**52.8**	25.7
Share of rented field (%)	Anova: 0.000	28	24.7	**34.5**	**34.0**	21.3
Forest acreage (%)	Anova: 0.449	81.8	74.1	**87.4**	**84.2**	**85.7**
Length of shoreline bordering fields (m/ha)	Anova: 0.048	8.2	6.4	7.7	13.5	9.9
Region (%)	X2: 0.172					
*South Savo		28.3	**31.1**	26.1	**31.3**	25.9
*Northern Karelia		29.6	**34.4**	26.7	22.9	28.1
*Northern Savo		42.1	34.4	**47.2**	**45.8**	**46.0**
Line of production (%)	X2: 0.000					
*Dairy		20.2	16.0	**29.0**	14.6	17.3
*Cattle		9.6	9.0	**13.6**	6.3	6.5
*Other animal husbandry		4.7	0.5	**7.4**	**14.6**	4.3
*Cereals		22.1	**25.0**	22.7	18.8	18.0
*Special crops		4.5	4.7	3.4	**14.6**	2.2
*Garden crops		8.5	4.7	**11.4**	**12.5**	**9.4**
*Other crops and other production		30.4	**40.1**	12.5	18.8	**42.4**
Business model (%)	X2: 0.029					
*Produce only raw material		94.8	**97.6**	92.0	89.6	**95.7**
*Also upgrading of products		5.2	2.4	**8.0**	**10.4**	4.3
Farmer and the farming family						
Farmer age (years)	Anova: 0.000	52.3	52.5	48.3	47.2	**59.1**
Gender: female (%)	X2: 0.250	15.3	12.3	18.2	20.8	14.3
Children: yes (%)	X2: 0.024	75.0	68.9	**79.9**	68.8	**80.5**
Education (%)	X2: 0.000					
*Primary		12.6	12.4	8.0	2.1	**22.5**
*Secondary (high school)		8.2	7.1	7.4	**12.5**	**9.4**
*Secondary (vocational school)		45.2	**50.0**	38.9	33.3	**50.0**
*Tertiary (university)		34.0	30.5	**45.7**	**52.1**	18.1
Livelihood and family relation (%)	X2: 0.022					
*Farming couple		39.6	33.7	**47.6**	39.1	38.8
*In a relationship but farms alone		38.4	37.1	38.2	**41.3**	**39.6**
*Lives alone		22.0	**29.3**	14.1	19.6	21.6
Farming as a livelihood						
Share of income from farming (%)	X2: 0.026					
*< 50%		52.2	**58.0**	40.3	52.1	**58.3**
*50–74%		13.2	11.3	**17.0**	10.4	12.2
*75–100%		34.4	30.7	**42.6**	**37.5**	28.8
Farming income (%)	X2: 0.000					
*Less than 5.000 euro		33.0	**42.7**	18.5	27.7	**38.4**

(*continued on next page*)

Appendix 2 (*continued*)

Variable	Test and significance	Share or average	Persistence	Adaptability	Transformability	Non–resilient
*5000–14,999 euro		28.6	24.6	27.2	**40.4**	**32.6**
*15,000–24,999 euro		15.5	12.3	**20.2**	12.8	15.2
*25,000–34,999 euro		9.1	9.0	**12.7**	2.1	7.2
*35.000 euro or more		13.7	11.4	**21.4**	**17.0**	6.5
Assessment of profitability (%)	X2: 0.000					
*Weak		66.0	64.9	53.4	**77.1**	**79.7**
*Moderate or good		34.0	**35.1**	**46.6**	22.9	20.3
Development during the past 10 years (%)	X2: 0.000					
*Business as usual		49	**61.3**	36.9	22.9	**56.1**
*Growth within existing line of production		22	18.4	**42.0**	22.9	2.2
*Growth by diversification		5	1.4	5.7	**18.8**	2.9
*Major change		7	5.2	7.4	**22.9**	2.9
*Downsize production		17	13.2	8.0	12.5	**35.9**
Goals for farming						
*Had identified an economic goal (%)	X2: 0.000	91	87.4	**98.0**	**93.0**	80.9
*Had identified a social goal (%)	X2: 0.000	16.3	8.4	**23.2**	**30.2**	5.9
*Had identified a personal goal (%)	X2: 0.067	16.0	**19.3**	11.9	9.3	**23.5**
Barriers in achieving the goals						
*Barriers in the physical environment (%)	X2: 0.417	3.7	**5.7**	3.5	0.0	3.3
*Market barriers (%)	X2: 0.000	43.2	**45.3**	**48.3**	**58.1**	16.7
*Political barriers (%)	X2: 0.854	21.0	20.8	**23.1**	18.6	18.3
*Social barriers (%)	X2: 0.001	6.3	1.9	6.3	2.3	**16.7**
*Personal barriers (%)	X2: 0.013	14.8	11.3	11.9	14.0	**28.3**
*Farm-related barriers (%)	X2: 0.002	7.7	5.7	7.7	**20.9**	1.7
*Economic barriers (%)	X2: 0.804	25.6	24.5	**28.0**	20.9	25.0
Environmental aspects related to farm management						
Soil conditions (%)	X2: 0.035					
*Weak		3.8	3.8	2.3	2.1	**6.5**
*Moderate		57.1	**61.6**	50.0	52.1	**61.2**
*Good		39.0	34.6	**47.7**	**45.8**	32.4
Identified problems related to soil condition						
*Hydrology (%)	X2: 0.012	60.0	55.4	**66.7**	**76.9**	39.4
*pH or nutrients (%)	X2: 0.135	29.3	29.2	23.5	26.9	**45.5**
*Locational factors (%)	X2: 0.741	21.0	18.5	**23.5**	15.4	**24.2**
*Other factors (%)	X2: 0.352	15.1	**18.5**	12.3	**23.1**	9.1
Existence of wetlands: yes (%)	X2: 0.012	9.7	8.0	**11.9**	**20.8**	5.8
Prevention of waterway eutrophication						
*By reducing input use (%)	X2: 0.114	22.8	**23.5**	20.1	13.2	**31.6**
*Through farming methods such as tillage practices (%)	X2: 0.012	36.2	34.8	**41.0**	**50.0**	22.4
*Through preventing runoffs with riparian zones etc. (%)	X2: 0.015	61.0	51.3	**68.8**	**71.1**	56.6
Existence and management of seminatural habitats (%)	X2: 0.12					
*No habitats		72.5	**78.8**	69.9	54.2	72.7
*Yes but unmanaged		8.5	6.1	7.4	**14.6**	**11.5**
*Yes and managed		19.0	15.1	**22.7**	**31.3**	15.8
Subsidies						
Effectiveness of agri-environmental subsidies (%)	X2: 0.003					
*Not received		14.9	**17.8**	8.8	13.3	**18.6**
*No effect		22.4	**26.9**	15.6	13.3	**27.1**
*Preserved something		17.9	**18.3**	**18.1**	15.6	17.8
*Done something earlier		4.9	2.5	**9.4**	4.4	3.1
*Done something differently		12.4	10.7	**17.5**	11.1	9.3
*Done something new		27.5	23.9	**30.6**	**42.2**	24.0
Agri-environmental contract: yes (%)	X2: 0.108	16.9	14.6	15.9	**29.2**	17.3
Organic farming: yes (%)	X2: 0.010	16.9	14.2	**22.7**	**25.0**	10.8
Extension support: yes (%)	X2: 0.000	28.3	21.7	**36.4**	**54.2**	19.4
Investment support: yes (%)	X2: 0.000	8.7	5.2	**15.3**	**22.9**	0.7

Appendix 3. Coding process and main results of the content analysis

Farmers' goals were identified on three dimensions: economic, social, and personal. Out of the 577 responses received, 381 farmers answered the question concerning the goals for farming. Most of the respondents (91%) expressed economic goals, such as attaining profitability or decent livelihood; 16% expressed social goals, such as continuity over generations, sustainability, or maintaining rural landscapes; and 16% expressed personal goals, such as quality of life or retirement plans.

The respondents were asked about the *barriers* they faced while pursuing their goals. This question received 352 responses. The barriers related to the market environment such as low producer prices (57%), financial performance, such as profitability of farming (27%), political environment, such as contents of the policies (24%), the farmers themselves, such as high age (17%), the farm and its management, such as lack of time (9%), social environment, such as lack of successor (7%), and physical environment, such as weather (4%).

The respondents were asked to rate the soil condition of their fields and then to specify the *kinds of problems they had identified in terms of soil condition*. This question was answered by 224 respondents. The problems were coded under four categories: hydrology, which refers to drainage issues (60%); pH or nutrients, referring to lack of nutrients or the need to add lime to the fields (29%); locational factors, such as stony fields and small plot sizes (21%); and other factors, such as weeds, crop rotations, compaction, and lack of organic matter (15%).

In a similar vein, the respondents were asked whether their fields were bordered by lakes or rivers, whether they had wetlands in their lands, and *whether and how they mitigated the nutrient leakages to waterways*. This question was answered by 371 respondents. Three main groups of mitigation practices were identified: preventing runoffs from fields with different kinds of filter strips and/or riparian zones (61%), applying farming methods that prevent nutrient leakages, such as specific tillage practices (36%), and reduction of input use (23%).

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