

Article

# Resilience in Mountain Farming in Norway

Karoline Daugstad

Department of Geography, Norwegian University of Science and Technology, 7491 Trondheim, Norway;  
karoline.daugstad@ntnu.no

Received: 2 May 2019; Accepted: 21 June 2019; Published: 25 June 2019



**Abstract:** The concept of socio-ecological farm resilience is used to understand how farmers manoeuvre in a context of change, what choices and priorities they make, and how that subsequently influences the development of the farming landscape. The author uses farm resilience, the capabilities of buffering, adaptation and transformation, and the response of bouncing back or forward as a conceptual frame in a study of farmers in a mountain community in Norway. Interviews were held with selected farmers. The results indicated that the resilience framework is useful in order to understand farmers' priorities and situations. The author finds that the responses and decisions are in line with all three capabilities as well as with bouncing back and forward. However, most responses were categorized as bouncing back (i.e. adjustments and changes) but the logic of the farm system remained the same.

**Keywords:** mountain farming; socio-ecological resilience; landscape change

## 1. Introduction

In agrarian studies there is a substantial and increasing body of literature on the sustainability of farming, structural changes in farming, and environmental issues, as well as a focus on the social and cultural aspects of farming and the farming community. In the last decade, a new concept has been introduced into this literature: farm resilience [1–4]. Resilience thinking is seen as a conceptual framework that points to processes of change and transformation in a new and more dynamic and holistic way, and it recognizes the intertwined nature of social and ecological systems [5,6]). Darnhofer et al. [2] point to the resilience concept in the context of farming as a means to grasp the complexity of farming as an adaptive and ever-changing system or set of systems spanning several spatial scales and involving ecological, economic and political-social domains. Wilson et al. [7] add to the concept by writing about ‘the five resilience domains’: economic, social, cultural, political, and natural. The literature points to resilience as a concept that is able to include perspectives of transformation and change, risks, and uncertainty to a greater extent than can the concept of sustainable development, and that resilience can represent a further development of the sustainability concept [2,4,7].

This paper aims at contributing to the literature on farm resilience through a study in the context of a Norwegian mountain community. Several studies pinpoint that structural changes in the agricultural sector affect farming in mountain communities more than lowland areas [7–13], which is due to variables such as remoteness, limited alternative sources of income to support farming, a small-scale land use pattern with limited possibilities for intensification, an ageing population, out-migration and lack of successors to farms, and climatic instability. At the same time, the mountain communities with landscapes formed by low-intensive land uses with a long continuity has led to valuable biodiversity and cultural heritage, as well as landscapes praised for their scenic beauty [8,9]. In order to be upheld, such values are dependent on continuation of the farming methods that have formed them [9,13,14].

The study area, Oppdal Municipality in Norway, includes one of many mountain communities in Norway where farming has been a cornerstone of the economic viability. Although, farming is still an important business, Oppdal has experienced falling employment figures in farming, as elsewhere

in Norway. Oppdal also has a long history of tourism in both winter and summer seasons. For the summer season especially, the well-kept cultural landscape shaped by a long continuity of mountain farming is seen as a major asset [15]. The visual qualities as well as the biodiversity qualities dependent on traditional agrarian methods make Oppdal farmers benefit from a fair share of agri-environmental measures in the region.

The focus on farm resilience has arisen from the increased concerns about changes in European farming and the agricultural sector related to socio-economic change, environmental aspects and risk and/or safety aspects, market, and economy [3,13,16]. Herman [6] summarizes studies of resilience in agriculture as focusing mainly on financial and economic approaches, agro-ecological management methods, subsidies and policy, or mental health. Darnhofer et al. [3] discuss how farm resilience have been approached in the literature and distinguish between two main approaches: one focuses on material structures and the role of different farm types and ecological dynamics, and the other focuses on actors, farmers' agency and social structures in a wider context. Furthermore, Darnhofer et al. [3] suggest a third approach, one that links the aforementioned two approaches: a relational approach. Embedded in the relational approach is an understanding of farm resilience as social-ecological resilience and as the need to adapt and change rather than the ability to buffer shocks and return to a 'normal' state.

Resilience encompasses the farmer's capability to navigate change in relations that are never stable [13,17]. The three different capabilities of resilience are buffer, adaptive and transformative capability [17]. *Buffer capability* has to do with persistence and the ability to assimilate change without altering the farm system's structure or function. *Adaptive capability* is the ability to adjust and develop within the current regime; this might mean use of new technologies or a change in product characteristics. *Transformative capability* has to do with the ability to implement radical changes and transform to a new system, such as changing from cattle production to ecotourism. Adaptation is about 'bouncing back' and returning to what is seen as a normal state, whereas transformation is about 'bouncing forward' [7]. According to Darnhofer [17], farm resilience depends on the farmer's ability to draw on all three capabilities in the face of change.

Further, Darnhofer et al. [2] distinguish between the nature of change as stress, in the sense of a predictable slow change, and change as shock, which is a sudden, major disturbance. Farm-level responses to stress versus shock differ. The differences can be understood from the two perspectives of persistence and adaptation. From a persistence perspective, one may respond to stress by exploiting it, which in the context of farms means to take advantage of successful activities that seems to be well adapted to change and place less emphasis on other activities. From the same approach, one may respond to shock by absorption, which means that the farm has sufficient buffer capability, such as savings, to deal with, for example, a sudden drop in market prices. With the adaptation approach, one may respond to stress by adjusting, which means making some adjustments at farm level such as introducing new production methods or new crops. From the same approach, one may respond to a shock through transformation, which means a major realignment of resources and the introduction of activities outside traditional farming, such as agri-tourism or care farming.

The author aimed to investigate how the concept of socio-ecological resilience can be used to understand present practices, views on future practices and 'room for manoeuvre' in mountain farming. The following questions have guided the study: How can mountain farmers' views and decisions regarding how they run their farm be understood in the light of socio-ecological resilience? More specifically, how do farmers' reasoning and decisions correspond to the capabilities of buffer, adaptation or transformation, and do their responses indicate bouncing back or forward?

## 2. Materials and Methods

A qualitative interview study was undertaken in Oppdal Municipality in Trøndelag County, Norway. In Oppdal, the two main modes of production within farming are dairy production (where milk is the main product but in addition calves are sold on the meat market) and sheep farming

(where meat is the main product but in addition wool is sold). There are ca. 250 active farms in Oppdal. Of those 53 are dairy farms and 124 sheep farms [18]. The remaining farms are involved in stockbreeding (beef), poultry, a few goat farmers, and some potato production. The elevation of Oppdal, with the farms located at about 550–650 m.a.s.l., implies that grain production is very limited and vegetable production is mainly potato. One of the most active villages in terms of farming in Oppdal was chosen for the interviews. Here there are 20 farms in operation. A strategic selection of farms was undertaken based on information obtained from the municipality administration. As well as covering both main types of farming, the aim was to ensure a certain spread in age and, if possible, that both genders were represented among the interviewees. A total of 10 interviews with 15 farmers were held, of which four were women and 11 were men. In cases when more people contributed, the interviews involved a main spokesperson and the other interviewees contributed supplementary information. When interviews were scheduled, all people involved in farming were encouraged to take part but it was up to each household to decide whether to participate. Most of the farm households consisted of a couple, and even if it became clear through the interviews that both men and women undertook farming activities, in most cases the man acted as the main representative of the farm in the interviews. The age of the interviewed farmers (the 10 spokespersons) varied: the eldest was 67 and the youngest 33, but most of them were in their 40s and 50s (see Table 1). The average age was 50, which is the same as the average age of farmers on a national level [19]. With regard to the length of time they had been involved in farming, one took over the farm in 1972, three in the 1980s, two in the 1990s, and four in the 2000s. All farmers had taken over the farm by inheritance. According to the inheritance system for farms in Norway farm properties over a certain size are handed over to the children. The eldest son or daughter has the first right to take over, the second eldest the second right and so on.

**Table 1.** Overview of the 10 farms: Mode of production, age of the farmer (the main spokesperson at the interviews), and what year the farmer took over the farm.

Informant	Mode of Production	Age of the Farmer	When Took Over the Farm
1	Dairy production	57	1980
2	Dairy production	49	1989
3	Dairy production in combination with stockbreeding (beef)	48	2003
4	Stockbreeding (beef)	39	2012
5	Sheep	47	1991
6	Sheep	56	1995
7	Sheep	48	2003
8	Sheep	33	2010
9	Sheep in combination with stockbreeding (beef)	55	1982
10	Sheep in combination with stockbreeding (beef)	67	1972

The interviews took place in the interviewees' homes at times that suited them. Each interview followed a semi-structured interview guide covering the following general topics: Present and previous practices, changes in practices and reasons behind change, motivation to stay in farming and identity as a farmer, the status of farming in the community, the uptake of agri-environmental schemes, views on and plans for the future (including farm succession, economic concerns, potential changes on the farm). The interviews lasted between one and two hours, and all interviews were recorded and transcribed. Based on the transcripts, a qualitative content analysis with coding was undertaken [20,21].

### 3. Results

#### 3.1. The Farms and the Farmers

All the farms in our study were well established in the sense that they had existed as properties and been farmed for generations. Of the 10 farms included in the study, three had dairy production as their main production (which in one case was in combination with stockbreeding (beef)), one had stock breeding (beef), and six had sheep farming (two of which were also involved in stockbreeding (beef)) (see Table 1). All farm households relied on additional income; either one of the couple at the farm had a full-time or part-time job elsewhere or, in some cases, both had additional income. This corresponds with the national picture regarding income on farms in Norway: Farmers defined as full-time farmers, meaning that 90% or more of the household income comes from farming, make up only 13% [22].

Although the employment figures for farming have decreased in Oppdal, as in the rest of the country in recent decades, the total land area under cultivation has remained stable. What is defined as cultivation in Oppdal is mainly grass production where fields are ploughed up and re-sown every 5–7 year, and in addition some potato production. The stability of land area under cultivation is due to the practice of land tenancy, whereby, a farm owner who has stopped farming rents his or her land to a farmer in the community. The picture is the same nationally. According to Dramstad and Sang [23], the total amount of land under cultivation (including all types of cultivation from grain and vegetable to grass) has remained the same since 1950, although the numbers of farms in operation (with the owner in charge) have reduced considerably. From 1999 to 2014, the number of farms in operation (including all modes of production) reduced by close to 40%. However, the percentage for land tenancy differed from region to region; the national average was 44%, meaning that, of the total land area under cultivation, 44% was rented land [24].

Of the 10 farms involved in the Oppdal study, only one did not have any rented land and relied entirely on its own property. Transport is an issue when renting land: in some cases, the land they use is spread over a wide area and therefore the transport of manure, equipment and harvested crops is considerable. It adds to their expenses but since the farmers do not have enough land to sustain the number of cattle necessary for profitability, renting land is the only option. In other words, to respond to the main structural trends of increasing the size of the farm activity in order to take out large-scale benefits, invest in new technology, etc, also implies increased costs in providing fodder for a larger livestock.

#### Motivation to Stay in Farming

When asked about their motivation to stay in farming, none of the dairy farmers were explicit in their responses, in contrast to the other types of farmers. It might have been the case that question was sensitive, since dairy farming in Oppdal is facing more pressure than sheep farming.

The sole farmer with beef production expressed that her farm was run as a hobby. Both she and her husband had full-time jobs outside farming. She referred to farming as a lifestyle that they both enjoyed. They took over the farm purely for pleasure and not out of a sense of duty: 'Many others quit farming but we deliberately want to keep up. It might be that we are somewhat romantic.' Her parents, who were retired, still lived on the farm and from time to time they helped with taking care of the grandchildren and in doing farm work.

One of the sheep farmers stated:

You may wonder what keeps me going. My parents told me to look for other types of jobs because the farm was hard work and low profitability. I am educated as a teacher and have been at the university, but there are some mechanisms that draw me to farming, I think it's interesting and fun. I like to wear myself out. It is not mainly a commitment. It is something I like doing.

Yet another sheep farmer spoke about a combination of a sense of duty or obligation to keep the farm running and fulfilling a lifestyle choice. Her husband, who was also involved in farming, worked offshore in the oil industry and, according to him there was no better pastime than sheep farming when he returned home for several weeks at a time.

### 3.2. Changes

What did the interviewees draw attention to when asked about changes on their farms or in the farming community?

#### 3.2.1. Changes in Mode of Production

One change that the farmers talk about and which they also said was a concern for the local agricultural authorities and advisory services concerned the different trajectories of the two main modes of production: dairy and sheep farming. Oppdal Municipality has had a strong and viable dairy farming community. Currently, there are c.250 active farms in total (including all modes of production). In the last decade or so there has been a 20% reduction in the number of farms, and a much steeper reduction in the number of farms involved in dairy production — as much as 50% — while by contrast there has been an increase in sheep farming [13]. It is not necessarily the case that the farmers who ceased dairy production switched to sheep farming. A rather large change in outbuildings is required when changing from dairy to sheep farming, which is costly. Sheep farming is easier to combine with a job outside the farm, whereas dairy farming is more intensive and the farmer is ‘tied to the farm’ to a greater extent than in other types of farming, according to one of the farmers.

All of the interviewed farmers involved in dairy and sheep reported a change in the professional environment in farming in Oppdal. The sheep farmers talked about a common professional as well as social environment, as they met at various courses and meetings initiated by the sheep and goat farmers’ association. They took pride in their occupation:

Before, sheep was something you did in addition to dairy or it was a hobby and not ‘real farming’. Now we have big sheep farms in terms of number of animals, and the status of sheep farming has increased considerably (interviewed sheep farmer)

There was also good cooperation between sheep farmers with regards to lending each other machinery such as mowers or ploughs. Co-operation was also a necessity with regard to grazing, as sheep move over large grazing grounds in outlying land (open, unfenced grazing land, typically moors, mountain plateaus, and birch forests) together with a number of other flocks, which makes it necessary for several farmers to co-operate in ‘grazing teams’ in order to manage flocks with multiple owners.

Within dairy farming, there was less mention of positive aspects; on the contrary, the farmers spoke about a crumbling work environment and pessimism. The social system in the villages that used to be considerate about milking hours no longer exists. One of the farmers, a former dairy farmer who had shifted to sheep farming, stated:

When my kids were small, the local community were considerate and parents meetings at school or kindergarten were not scheduled in conflict with milking hours. Now, it is impossible to attend if you do not have a partner who can attend when you do the milking.

One of the other dairy farmers talked about the same change in the municipality but said that in ‘their corner of the municipality’ there is still a certain understanding: to a large extent, the primary school schedule parents meeting after milking hours.

#### 3.2.2. Landscape and Climate Changes

The form of landscape change on agrarian-influenced land that all farmers spoke about is bush encroachment. This was seen by all interviewees as a negative development, that is an inevitable

consequence of agrarian policies and changes in profitability that makes some methods of land use less viable than others are. Bush encroachment is especially seen in outlying land where the grazing pressure has been considerably lower in recent decades. The encroachment changes semi-open forests to much denser forest: an expression used by many interviewees was 'The vegetation is so dense that you can hardly walk through it.' This change refers to the quality of forested area due to much lower grazing pressure. According to one interviewee, 'Now the trees cover all hills and are "creeping up" in altitude on mountain slopes', thus indicating an increase in the extent of forested area.

Most of the infield land – fenced grass meadows for harvesting and rough pasture close to the farm — is used in Oppdal. Slopes and 'edges' close to streams and roads were once mowed or grazed, but are now covered in bushes and trees as a consequence of being regarded as too small-scale and steep for the machinery used in today's farming practices. Furthermore, the interviewees mentioned that the high degree of land leasing contributed to less favourable land going out of use; according to some of the interviewees, when one rents land one tends not to care so much for it as if it were used as one's own land. Hence, 'second-class land' in terms of accessibility, steepness and patchiness tends to fall out of use more readily when rented. This mechanism has been studied on a national scale in Norway but to date the situation reported by the Oppdal farmers has not been documented [23,24].

Although landscape change as a response to less grazing or mowing pressure was the main logic expressed by the farmers, some referred to landscape change with bush encroachment as partly also a consequence of climate change to a warmer and wetter climate and with more extreme fluctuations during the year. For most farmers, the climate change contributing to bush encroachment results in a negative landscape change. However, one of the farmers was quite explicit in pinpointing a positive outcome of changes in climate:

The temperature has generally increased. We get higher yields from the fields than 30 years ago. We still harvest mostly two times during summer but we get a higher yield each time. It is possible to harvest a third time but we stick to two [harvests].

This finding is in line with findings in other Nordic studies and from studies conducted in the Swiss and Austrian Alps [7,8,25,26] showing that even if unstable climate is a challenge for most mountain farmers some point to positive effects in terms of higher temperatures and shorter winter giving higher yields from their fields and a longer grazing season.

Some of the farmers did not talk about climate change but rather about the weather and how it was shifting to a larger extent than before. They were referring to both very dry summers that reduced their crops and to long periods of heavy rain that made it difficult to harvest because the fields were too wet.

### 3.2.3. How do the Farmers Cope with Change?

When the farmers were asked how they coped with landscape change, they talked about different ways to prevent or slow down bush encroachment. Some of the farmers described how, when open land started to convert to forest land, they deliberately chose which fields to keep open and which to abandon more or less. With regard to the question of whether to use outfields or infields, they tried to keep some infields open at the cost of the outfields. They sometimes shortened the period in which their animals would normally have grazed in the outfields and moved them to graze the infields (after the last mowing) in order for the animals to have sufficient fodder. The method kept the infields in use but was disadvantageous for the outfields because less grazing led to an increased rate of bush encroachment.

Almost all of the interviewed farmers were involved in agri-environmental schemes of some type. However, there were divided views about keeping landscape open through such schemes. While some farmers saw such measures as a necessary means to create viable incomes, other farmers were more sceptical towards the measures. One sheep farmer was relieved that he did not have to use special machinery to keep the land open but that his sheep could graze with the same effect. According to

him, 'Just to mow and leave the grass to rot does not make sense.' He derived great joy from seeing how well-kept the cultural landscape was due to sheep grazing. Other farmers indicated that staying in farming had to do with producing food for people and not producing landscapes or amenity values. This issue concerned the identity of a farmer and has been documented in a number of other studies (see for example Daugstad et al. [9]).

One of the farmers had a wider perspective on the issue of agrarian budgets:

It is somewhat wrong to spend public money on schemes to keep the cultural landscape. The money should go to support agrarian production first and foremost, and not to the 'bi-product', which is the cultural landscape.

One farmer elaborated on the idea of increased use of biofuels, by using bushes from overgrown fields as fuel to heat water pipes, possibly with priority given to heating public buildings.

How did the farmers cope with changes related to climate change? In periods of heavy rain, the fields are too wet to harvest, so they have to delay the harvest, which constituted an adaptation in time. Sometimes, when harvests were postponed, the quality of the grass was poorer and then some farmers needed to compensate by including supplementary feed for the animals during the winter. One farmer who normally kept fodder in a silo changed his storage method to hay bales when wet conditions prevented compact harvesting in time for silo storage. None of the farmers reported that they changed the equipment they used on wetter ground (e.g. to lighter tractors or harvesters) and this finding was in accordance with other studies within a Nordic context [26]. Some of the farmers spoke about weather changes occurring also during winter, with less predictable snowfall and a shorter season.

### 3.3. Views about the Future

Several of the farmers thought there would be farming in Oppdal in the future but perhaps more in combination with niche production such as food and tourism products. They were uncertain about the decisions that would be taken by the next generation; some said that the present farming generation was most likely the last generation running the farms, while others were somewhat more optimistic and had children who were interested in farming. Some farmers pointed to the need for renovation of their outbuildings in the near future and feared that the costs would discourage the next generation from taking over their farms.

The co-existence of farming and tourism has been beneficial for Oppdal for generations. Farmers have combined jobs in farming with tourism-related jobs, such as working as caretakers of ski lifts, in construction, and as janitors. However, according to some farmers, such practices had a downside. For example, involvement in the tourism business could be a way out of farming:

Farmers have been attractive workers in a range of jobs. They are handy and have gone into service, maintenance, as janitors, etc. For many, this has also been a way out of farming. You see that you can earn 'easy money' with less effort than in work-intensive farming. Then it is tempting to quit farming.

Similar responses have been documented in studies from other mountain communities elsewhere in Europe where farming and tourism coexist: additional income can be a way to stay in farming or, for some, it can be an easy way out of farming [7,12].

Another means of earning extra income for the farm from tourism-related activities is for farmers to sell land for the construction of second homes, as this can generate the necessary capital to, for example, renovate a barn or build a new one. Many of the interviewees commented on this possibility and saw it as positive. One of the sheep farmers said:

I have restored the dwelling house but not the barn. I have plans. I even have drawings for a new barn, but I also have a plan for a new cabin estate, which I need to get approved in order for the new barn to be realized.

Another sheep farmer said: 'I have six cabin-plots ready to sell. They are my safety net if something unforeseen should happen.' A third sheep farmer referred to selling land for second homes as a deliberate step-wise strategy to secure the necessary capital for investment purposes:

When I took over the farm, I sold five cabin plots and built the new dwelling house. After some years I sold five more [plots] and extended the barn. Last year I sold two [plots] and bought a new tractor. It is positive for the farm. Without the cabin plots, there would be no farming here.

According to some of the interviewees, there was a downside to the plot-selling strategy. One saw fellow farmers selling land for second-home development as a risk-filled option, and had observed its disadvantages. Farmers sell land to increase their income from farming by obtaining capital in for renovation and in practice this is the first step towards ending their work as farmers. According to the farmer, when the experience of obtaining 'easy money' from selling plots is compared with earning an income from labour-intensive farming, it is tempting for farmers to stop change their practices:

This happens gradually. First step is to switch from dairy to only meat production. Next step is to quit meat and lease the land to someone else and the farmer starts in transport or something. Parallel to this you sell out land for cabin development. So, in a way, easy money, but the end of farming.

The practice of selling land for second homes changes the farming community visually as well as functionally, as one farmer said:

When driving through the village, for example as a tourist, you see well-kept farms with nice lawns. Then I say 'OK, but check if there is anyone in the cowshed', [and] then you find empty buildings. When farms are in use they are somewhat 'messy' because things are happening. Too tidy and neat is, for me, a warning sign.

The farmer went on to say that in many respects tourism had been good for the Oppdal farming community as it provided extra income but that it might also have masked the effects of changes in farming such as falling profitability, and made farmers postpone tough choices about changes in their mode of production or possibly to stop farming.

Others farmers embraced the plot-selling strategy and stated that there should be more opportunities for landowners to sell their land for second-home development in order to provide cash to maintain their farm. Their reasoning was that the practice would, for example, make it possible for them to restore buildings that were no longer needed for farming, such as old hay barns, but that might have historic value.

One issue mentioned by some of the farmers concerned constraints on land that has documented valuable biodiversity. Such biodiversity is due to the long continuity in farming methods, such as mowing, grazing, and not adding chemicals. Thus, the biodiversity has been conditioned by culture. Many of the farmers received agri-environmental subsidies to maintain farming methods they might otherwise abandon if they did not receive such support. According to one farmer, biodiversity could pose a threat to continued farming. She referred to a specific case when a rare species was found in one area where the farmer, as landowner, had plans for the development of second homes in order to keep the farm running. The species' presence was due to traditional farming methods, but the farmer no longer had the possibility to continue using those methods. However, the local authorities did not approve the conversion of the pasture to plots for second homes due to the need for protection of the natural habitat. This was presented as a tricky challenge: On the one hand, the farmer could choose to keep up the low-intensive traditional farming methods on the land in question and receive agri-environmental measures to uphold the valuable biodiversity. On the other hand, the need for capital to invest in the farm and keep it running was much larger than what agri-environmental payments could bring in. Hence, selling land for second homes development was the chosen strategy.



#### 4. Discussion and Conclusions

With the aim of contributing to the literature on farm resilience, the following research questions have been addressed in this paper: How can mountain farmers' views and decisions regarding how they run their farms be understood in the light of socio-ecological resilience? More specifically, how do farmers' reasoning and decisions correspond to the capabilities of buffer, adaptation or transformation, and do their responses indicate bouncing back or forward?

First and foremost, the study findings have proven that socio-ecological resilience in a farming context is useful as a conceptual tool in order to understand farmers' views, choices and decisions both at present and in the future. With regard to the different capabilities of resilience and, subsequently, whether a farmer's response to change – stress or shock – represents bouncing back or forward, the study from Oppdal Municipality shows that this is a complex issue.

The three capabilities can be approached from different perspectives. From the perspective of the pragmatic actions, the study showed how farmers were coping with change in terms of bush encroachment or more extreme weather (wet weather or drought). One example was that farmers changed their time schedule slightly regarding when their animals grazed in the outfields as opposed to in the infields or when they postponed harvesting due to wet fields. This finding can be seen as corresponding to buffer capacity and bouncing back; small adjustments are made but the system stays the same.

From the perspective of interpreting resilience as keeping a viable farm household in terms of securing sufficient income, it was documented that farmers rented their land in order to have enough fodder and they joined various agri-environmental schemes. This may be seen as a combination of buffer and adaptive capabilities, but is still bouncing back in the sense that the overall system in how they ran their farms remained largely the same.

The practice of combining farming with jobs in tourism or, more recently, with selling land for the development of second homes brought in money but did not change how the farmers farmed. The practice may correspond to persistence by absorption [2], but not as a response to a shock but rather to continual stress.

A version of transformation and bouncing forward in the study could be applied to those who changed mode of production from labour-intensive dairy farming to sheep farming or to those who stopped farming but leased their land to a neighbour. It might be that such choices are a resilient response in terms of keeping the land in use.

Identity in farming was mentioned in the interviews, and some farmers said that to keep up farming practices through agri-environmental schemes did not make sense and removed their identity as food producers. Hence, the issue of identity concerns what is the main logic in a farming community. It might be the same logic at play when farmers are sceptical towards land being sold for second-home development because it takes them down a risky route to a farming community with the visual qualities of farming but without the function of farming.

There are some critical considerations when applying the resilience concept to a socio-ecological setting. Davidson [27] points to the limitations of the resilience concept when applied to social systems. Resilience puts weight on equilibrium and stability, whereas social systems are complex, and include feedback mechanisms and human agency. Ashkenazy et al. [1] point to the fact that resilience in some parts of a system might hinder resilience in other parts of the system, or that an action or adjustment that is resilient at an individual level is not necessarily resilient at a regional level. Lastly, what seems to be a manoeuvre towards resilience today might not be in the future. This point of conflicting approaches to resilience was illustrated by the farmer who is not allowed to sell land for second homes development due to valuable biodiversity at risk. The plot selling strategy can be seen as resilient from an economic point of view in keeping the farm running and contribute to Oppdal as a viable farming community. Environmental resilience and, more specifically, biodiversity concerns of national interest, is not compatible with the economic resilience approach. Hence, the main message is to consider scale. Scott [7] points to the risk of the resilience concept becoming too stretched and too

diffuse, and therefore not really helpful as an analytical tool. The findings presented in this paper have to some extent incorporated this criticism, but socio-ecological resilience in the way that it is coined by Darnhofer et al. [2,3] still makes sense for bringing new insights into farmers' choices and development trajectories.

**Acknowledgments:** This study took place within the project REGARDS (Resilience of marginal Grasslands and biodiversity management Decision Support), which was supported by ERA-Net BiodivERsA under EU Horizon 2020 Framework Program for Research and Innovation and sections.

**Conflicts of Interest:** The authors declare that there is no conflict of interest

## References

1. Ashkenazy, A.; Calvao Chebach, T.; Knickel, K.; Peter, S.; Horowitz, B.; Offenbach, R. Operationalising resilience in farms and rural regions—Findings from fourteen case studies. *J. Rural Stud.* **2018**, *59*, 211–221. [[CrossRef](#)]
2. Darnhofer, I.; Fairweather, J.; Moller, H. Assessing a farm's sustainability: Insights from resilience thinking. *Int. J. Agric. Sustain.* **2011**, *8*, 186–198. [[CrossRef](#)]
3. Darnhofer, I.; Lamine, C.; Strauss, A.; Vanarrete, M. The resilience of family farms: Towards a relational approach. *J. Rural Stud.* **2016**, *44*, 111–122. [[CrossRef](#)]
4. Poláková, J. Sustainability-Risk-Resilience: How Does the Case of Good Agricultural and Environmental Conditions Measure up? *Sustainability* **2018**, *10*, 1614. [[CrossRef](#)]
5. Davoudi, S. Resilience: A bridging concept or a dead end? *Plan. Theory Pract.* **2012**, *13*, 299–307. [[CrossRef](#)]
6. Herman, A. Enchanting resilience: Relations of care and people-place connections in agriculture. *J. Rural Stud.* **2015**, *42*, 102–111. [[CrossRef](#)]
7. Wilson, G.A.; Schermer, M.; Stotten, R. The resilience and vulnerability of remote mountain communities: The case of Vent, Austrian Alps. *Land Use Policy* **2018**, *71*, 372–383. [[CrossRef](#)]
8. Bardsley, D.K.; Bardsley, A.M. Organising for socio-ecological resilience: The role of the mountain farmer cooperative Genossenschaft Gran Alpin in Graubünden, Switzerland. *Ecol. Econ.* **2014**, *98*, 11–21. [[CrossRef](#)]
9. Daugstad, K.; Fernández Mier, M.; Peña-Chocarro, L. Landscapes of transhumance in Norway and Spain: Farmers' practices, perceptions, and value orientations. *Nor. J. Geogr.* **2014**, *68*, 248–258. [[CrossRef](#)]
10. Gretter, A.; Ciolli, M.; Scolozzi, R. Governing mountain landscapes collectively: Local responses to emerging challenges within a systems thinking perspective. *Landsc. Res.* **2018**, *43*, 1117–1130. [[CrossRef](#)]
11. López-i-Gelats, F.; Milán, M.J.; Bartolomé, J. Is farming enough in mountain areas? Farm diversification in the Pyrenees. *Land Use Policy* **2011**, *28*, 783–791. [[CrossRef](#)]
12. O'Rourke, E.; Charbonneau, M.; Poinot, Y. High nature value mountain farming systems in Europe: Case studies from the Atlantic Pyrenees, France and the Kerry Uplands, Ireland. *J. Rural Stud.* **2016**, *46*, 47–59. [[CrossRef](#)]
13. Schermer, M.; Darnhofer, I.; Daugstad, K.; Gabillet, M.; Lavorel, S.; Steinbacher, M. Institutional impacts on the resilience of mountain grasslands: An analysis based on three European case studies. *Land Use Policy* **2016**, *52*, 382–391. [[CrossRef](#)]
14. Darnhofer, I.; Schermer, M.; Steinbacher, M.; Gabillet, M.; Daugstad, K. Preserving permanent mountain grasslands in Western Europe: Why are promising approaches not implemented more widely? *Land Use Policy* **2017**, *68*, 306–315. [[CrossRef](#)]
15. Snoeijer, M.; Krøvel, K.; Daugstad, K. *Landscape Change in Mountain Grasslands: A Case Study of the Oppdal (Agri)Cultural Landscape, Norway*; NTNU: Trondheim, Norway, 2012; Volume A.
16. Weis, T. The accelerating biophysical contradictions of industrial capitalist agriculture. *J. Agrar. Chang.* **2010**, *10*, 315–341. [[CrossRef](#)]
17. Darnhofer, I. Resilience and why it matters for farm management. *Eur. Rev. Agric. Econ.* **2014**, *41*, 461–484. [[CrossRef](#)]
18. *Styringsgruppen for beiteplanregulering: Beiteplan for Oppdal 2018–2025; Vedtatt i kommunestyret; Oppdal municipality: Oppdal, Norway, 2018.*
19. Statistisk Sentralbyrå: Landbruksteljning. 2010. Available online: <https://ssb.no/jord-skog-jakt-og-fiskeri/statistikker/landt/arkiv/2011-11-28> (accessed on 4 March 2019).

20. Crang, M. Analysing qualitative materials. In *Methods in Human Geography*; Flowerdew, R., Martin, D., Eds.; Pearson Prentice Hall: Harlow, UK, 2005; pp. 218–232.
21. Cope, M. Coding qualitative data. In *Qualitative Research Methods in Human Geography*; Hay, I., Ed.; Oxford University Press: Oxford, UK, 2010; pp. 281–294.
22. Statistisk Sentralbyrå: Fakta Om Jordbruk. Available online: <https://ssb.no/jord-skog-jakt-og-fiskeri/faktaside/jordbruk> (accessed on 4 March 2019).
23. Dramstad, W.E.; Sang, N. Tenancy in Norwegian agriculture. *Land Use Policy* **2010**, *27*, 946–956. [[CrossRef](#)]
24. Landbruksdirektoratet. Leiejord—Avgjørende for norsk matproduksjon. In *Utredning om Drivepliktsbestemmelsen og Leiejordandelen i Norsk Landbruk*; Rapport No 27; Norwegian Agriculture Agency: Oslo, Norway, 2015.
25. Juhola, S.; Klein, N.; Käyhkö, J.; Neset, T.-S.S. Climate change transformations in Nordic agriculture? *J. Rural Stud.* **2017**, *51*, 28–36. [[CrossRef](#)]
26. Wiréhn, L. Nordic agriculture under climate change: A systematic review of challenges, opportunities and adaptation strategies for crop production. *Land Use Policy* **2018**, *77*, 63–74. [[CrossRef](#)]
27. Davidson, D. The Applicability of the Concept of Resilience to Social Systems: Some Sources of Optimism and Nagging Doubts. *Soc. Nat. Resour.* **2010**, *23*, 1135–1149. [[CrossRef](#)]



© 2019 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).