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Die hard: On the persistence of Swedish upland farming

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\textbf{Abstract}

Using an inductive quantitative approach, this article examines empirically the main characteristics of upland farming in the northern periphery of Sweden. This approach allows us to stepwise ‘reconstruct’ upland farming in its north Swedish manifestation. The data features farm-level and aggregated data from four municipalities stretching from the Bothnian Gulf to the Norwegian border. The combination of GIS and advanced statistical analysis (clustering and regression) provides a robust evidence-base characterising upland farming at the nexus of multiple dimensions: territoriality (e.g. remote location, harsh climate, scattered settlement structure), style (e.g. labour extensive, small-scale, mixed farming) and livelihood (e.g. pluriactive, diversification, subsidy dependent). The article emphasizes the potentially central role of upland farming in bringing into coherent policy initiatives promoting sustainable community development in the periphery. The study also looks ahead and urges scholars to adopt more systematically mixed methods in future upland farming studies in order to render the complexity of this socio-spatial phenomenon.

1. Introduction

Viewed solely through the lens of the agricultural ‘productivist project’, small scale farming in Europe’s sparsely populated north (referred to here as ‘upland farming’) is an economic anomaly and a cultural relic of past agrarian societies. In spite of this, Scottish experience at least suggests that small family farms in some upland areas have proven to be highly resilient (Shucksmith and Rønningen, 2011). Furthermore, in 2013, the European Parliament reasserted the importance of small-scale farming as a vector of agricultural and community development in rural areas across Europe (Parliament, 2013). Small-scale farming epitomizes the interdependencies between nature (including biodiversity and animal welfare), society (by providing stable local work force and ecosystem services) and culture (by perpetuating traditions and crafts) in rural communities (Sutherland et al., 2017). Upland farming, therefore has the potential to contribute to community development if it can locate itself within an industrial environment that is otherwise acting against this model of agriculture.

The purpose of this paper is to examine the contemporary features and the future prospects for upland farming in Sweden’s northern periphery and to characterise their ‘resilience’ in relation to the adaptation of farm sizes and locations, products and sources of income to the variability of that landscape. As with Scotland, the Swedish case region is considered as ‘less-favoured’ both for the Common Agricultural Policy (Less Favoured Areas, LFA) and Cohesion Policy (sparsely populated areas, SPA). Previous European studies on upland farming tend to portray it as an homogenous practice, e.g. the crofting heritage of the Scottish Highlands & Islands (Lee, 2007; Sutherland et al., 2014), but there has yet to be an empirical examination of its key characteristics in northern Sweden. So instead of “fitting in an \textit{a priori} typology”, we opted for an inductive approach aiming to “discover and characterise development trajectories from the data” (Smithers and Johnson, 2004, p198). This approach allows us to stepwise ‘reconstruct’ upland farming in its north Swedish manifestation. We achieve this by analysing multiple datasets revealing different facets of upland farming such as farm size and location, production types, and diversification activities. We focus on a transect of 4 municipalities in the county of Västerbotten which is representative of the diverse economic, social, and environmental conditions found in the region. A fuller picture of Swedish upland farming thus emerges by way of analysing relevant ‘quantitative markers’ within the context of territorial diversity.

The average size of a Swedish farm has increased over the last decade, up to 40ha in 2017 (Jordbruksverket, 2017). In Västerbotten the average farm size is however lower at about 30ha (Jordbruksverket, 2017). The agricultural system in Västerbotten consist predominantly of dairy and beef cattle based on fodder production from temporary grassland, with a farm structure ranging from a mix of large and medium-scale farms on the coastal areas and of small-scale and...
medium-scale farming towards the inland (Andersen, 2017). With respect to the implementation of the CAP in Västerbotten, Cupus and Knoblock (2007) noted that agri-environmental payments and support for organic farming have been instrumental in increasing the chances of survival of smaller, less competitive farm holdings.

This paper inscribes itself in a long tradition of studies that have investigated small-scale family farming in Europe's Less-Favoured Areas. Upland farming has been treated as a specific case of territorially embedded farming practices found in northerly or high-altitude, climatically harsh, heritage rich and demographically thin rural areas of Europe. Our analysis seeks to position the development of upland farming, past and present, within the ‘big picture’ of contemporary processes of agricultural change. We approach upland farming as a heuristic based on ‘conceptual pointers’ garnered from the literature about the specificity of its style of farming (Van der Ploeg, 2000), including low intensity, small size, mixed farming, agroforestry and pluriactivity, and subsequently ‘flesh them out’ using spatial data analysis. Despite the fragility inherent in these characteristics, the food sustainability transition which is, rightfully so, the centre of attention of contemporary scholars and policymakers necessitates not leaving any agricultural asset ‘untapped’. Echoing Persson’s diagnostic three decades ago, sustaining upland farming is then “a way to develop marginal rural resources that would otherwise remain untouched” (Persson, 1983, p60). We acknowledge that upland farmers have the possibility to make a decisive contribution to achieve this goal by carefully exploiting the natural potential of remote rural regions. In terms of policy anchoring, this study contributes to a reflection about the role of upland farming/ers in achieving sustainable multifunctional agriculture and rural livelihoods ‘at the edge’ of the European Union by following up on Ilbery et al. (2004, p332)’s vision to ‘reinstall the farm as a central arena for delivering ‘socially managed’, sustainable rural development’.

In summary, the extant literature suggests that upland farming can be characterised by issues of territoriality (its location and relationship to the land), style of farming (products and approaches), and its role in the livelihoods of farm owners.

1.1. Farming in the Swedish periphery: past and present

The development of farming activities in the Swedish north needs to be understood in the historical context of the colonization of this territory through the settlement of community outposts primarily in the 18th Century. Farming was instrumental in fixing the new settler population in the inner parts of the Swedish north near the location of natural resources to be exploited (e.g. mining, forestry) (Enequist, 1960). During the settlement period, grain and potato were cultivated for self-consumption, and animal husbandry was the most important activity, mainly for dairy production (Rudberg and Bylund, 1959). The importance of animal production meant that the majority of arable land was used for grazing and producing hay and forage instead of cropping. This trend was even more marked in the inland, with Rudberg and Bylund (1959) estimating 70–75% of arable land used for grazing and fodder in the coastal strip and about 90% in the inner parts. Despite the harsh climatic conditions, Rudberg and Bylund (1959) stated that pre-industrial farm productivity in both coastal and inner areas of the north was higher than the Swedish average.

Upland farmers were recorded to have engaged early on with multi-occupational life-styles in order to generate “the necessary cash” (Rudberg and Bylund, 1959, p279) to support their farming activities. The continuation of upland farming was dependent on the emergence of new industries offering subsidiary occupation to farming, such as forestry and hydropower projects (Enequist, 1960). Multi-occupational lifestyles nonetheless introduced “the problem of the balance between the principal occupation (farming) and subsidiary occupation” (Rudberg and Bylund, 1959, p277). Stone (1962) also noted that although the construction of dams for hydropower introduced new job opportunities for farmers at that time, it also took away the best farming land in the innermost parts along the rivers. Forestry played a critical role in supporting upland farming in the sense that access to woodland property became a key to farm viability (Norling, 1960). For many farmers, the main revenue stream was derived from woodland exploitation, not farming itself (Norling, 1960; Rudberg and Bylund, 1959).

After the 1950s, agriculture diminished in importance in the north because, in many areas, it could not provide sufficient income to support a family (Enequist, 1960; Norling, 1960). Stone (1962) suggested that large parts of the inland should be abandoned for farming because of the inherently unfavourable conditions there. Farm abandonment increased with differentiated impacts for the long-term development of local agriculture in the north. Whereas farm abandonment near larger settlements of the inland would allow for the consolidation of local agriculture into larger, more competitive units, in the more remote parts of the inland, the abandonment of even a few farms would exacerbate the perception of isolation of remaining farmers and accelerate the process of farm abandonment (Stone, 1962).

As of today, farming has very little bearing in the local economies of northern communities (Carson et al., 2017). Increased farm abandonment and the decline of agriculture as an economic sector in rural areas (Wästfelt and Zhang, 2016) are important markers of decline that impact both the physical environment and local societies. However, for Hedlund et al. (2017), the agricultural restructuring process in this part of Sweden entailed less the development of ‘super-productive’ units (common in the agrarian southern half) than a shift towards more resilient and versatile forms of small-scale agriculture. In terms of agricultural policy, the 1990s proved to be a critical moment for contemporary Swedish agriculture. First, Sweden became the second country, after New Zealand, to deregulate its agricultural markets and remove farm subsidies (Wästfelt and Eriksson, 2017). Accession to the EU in 1995, and thus the alignment with the Common Agricultural Policy (CAP), led to the re-regulation of Swedish agriculture. Finally, the decoupling of subsidies to production levels and the shift to the single payment scheme in 2005 transformed European and Swedish farming with the aim to stop over-production, achieve better environmental standards and accommodate the new rules following the signing of free trade agreement between the EU and the WTO in 2005 (Wästfelt and Eriksson, 2017; Wästfelt and Zhang, 2016). Still, in the context of EU agricultural policy, Sweden retains its ‘liberal spirit’ by striving for increased deregulation, supporting the inclusion of food products in free trade agreements and actively pushing to terminate the CAP (Eriksson, 2016).

1.2. Less-Favoured Areas and agricultural restructuring

Under the Common Agricultural Policy (CAP), Less-Favoured Areas (LFA) designate territories facing natural handicaps such as adverse climate, short growing season, steep slopes or high latitudes (i.e. north of the 62nd parallel), which constrain agricultural productivity (Eliasson et al., 2010; Morgan-Davies et al., 2015). A limited local customer base and high transportation costs are additional locational constraints to the distribution and sale of agricultural produce (Shucksmith and Rønnening, 2011). North Sweden falls in its entirely under these criteria.

While current research about farming in northern Sweden is scarce (Brouder et al., 2015; Dubois, 2018), accounts of farmers’ experiences in other ‘unfavourable’ places for agriculture provide valuable insights into what might be expected here. There is a wealth of literature from other northern European countries (Bjørkhaug and Rønnening, 2014; Shucksmith and Rønnening, 2011; Sutherland et al., 2017) or from more distant countries with extensive remote rural regions such as Canada (Blay-Palmer, 2005; Mundler and Laughrea, 2016) or Australasia (Andrée et al., 2010; Chalmers et al., 2009; Cheshire et al., 2013; Dixon and Richards, 2016; Klocke et al., 2018; Woods, 2011). The agricultural modernisation paradigm advocated by contemporary
agricultural policies embraces market principles for food production, seeking higher profitability and economies of scale, optimising labour resources (rationalisation, mechanisation) and eventually leading to the diversification of rural economies towards non-farming sectors (Hogan and Lockie, 2013). This process leads to the concentration of land (van der Ploeg, 2017) and profits (Argent and Tonts, 2015) to a larger proportion of large-scale farmers. Van der Ploeg (2017, p6) summarizes the inherent logic of the modernisation paradigm as “a selective process in which the small farms lose and the larger ones win”. For small farms, ‘losing’ means either abandonment of farming activities or incorporation of these farmlands into larger agricultural holdings (van der Ploeg, 2017). There is a clear bias towards large-scale farming and the ‘progress’ it represents in comparison with former peasant societies in how agricultural restructuring is framed in scholarly and policy circles alike.

van der Ploeg (2017) unpacked the ‘agricultural restructuring’ thesis as resulting from the convergence of multiple farm development processes: (1) a reduction in the total number of farms; (2) an increase in the average farm size; (3) a decrease in the number of small farms; (4) an increase in the number of large farms; and (5) a concentration of land among large farms. However, the indicator the most consistently used in both scholarly and policy circles to corroborate the reality of the ‘agricultural restructuring’ thesis is the increase in the average farm size (Wästfelt and Zhang, 2016). Although easy to compute analytically, the choice of this indicator to monitor agricultural change is flawed conceptually as it tends to promote the ‘mid-sized’ farm as an ideal farm type. Such an approach is difficult to reconcile with the ‘disappearing middle’ hypothesis (Bjørkhaug, 2012; Buttel, 1982; Smithers and Johnson, 2004) for which middle-of-the-pack farms are structurally challenged as they are too small to fully embrace economies of scale, mechanisation and specialisation, compensating for smaller margins with higher volumes, and too large to consolidate new revenue streams through off-farm employment, farm diversification or value-adding via short food chains (Legun and Bell, 2016). Legun and Bell (2016, p105) even suggested a “hollowing out of everything in-between”. However theoretically sound and intriguing, most empirical studies of the ‘disappearing middle’ have nonetheless failed to deliver empirical evidence of such a drastic evolution (Bjørkhaug, 2012; Munton and Marsden, 1991).

Finally, the delineation of LFA suggests by definition the non-applicability of any of these ‘classic’ theories of agricultural change. A much more ‘telling’ story in the context of our study may be “the persistence, rather than the disappearance, of the family farm” (Shucksmith and Rønningen, 2011, p276). One explanation advanced by Sutherland et al. (2017) is that small size increases adaptation and resilience capabilities in the face of constantly changing external conditions. The literature has also shown how smaller farms are able to exploit short food supply chain initiatives (Mundler and Laughrea, 2016) which generate new income sources (Andrée et al., 2010; Kneafsey et al., 2013; Legun and Bell, 2016).

1.3. Multifunctionality and pluriactivity

The importance given to farm size in explaining agricultural restructuring, however, invokes a certain determinism in the development trajectories of farms. Van der Ploeg (2017, p17) critiqued this perspective when advocating that “size (be it physical or economical) does not determine future development trends”, and instances of small farms that develop and large farms that fail and disappear remain mainly untold. Farm-level trajectories should be understood as inserted within a large spectrum of ‘plausible’ multifunctional pathways (Wilson, 2008) which “can be moulded, at the farm level, in highly different ways” (van der Ploeg, 2017, p20). A second point is about the role of the territorial context in shaping these farm trajectories. Munton and Marsden (1991), for instance, found a large diversity of farm development strategies adopted in different locales.

Bjørkhaug (2012, p288)’s examination of family farming in Norway suggests that multifunctionality and pluriactivity are instrumental in understanding how upland farming “as an institution has survived”. Wilson (2008) considered that farms located in agriculturally disadvantaged areas are more likely to be strongly multifunctional and feature low farming intensity and productivity. Multifunctionality takes into consideration the wider social and environmental values created by agriculture locally and beyond. In the multifunctional paradigm, subsidies are an instrument to recognise and consolidate this societal added-value and valorise farmers’ contribution beyond food production, such as sustainable rural development, landscape and heritage preservation, and biodiversity protection (Merckx and Pereira, 2015). In this scheme of things, policy subsidies aim at translating this societal contribution in monetary retribution, even though scholars have flagged that it may create an over-reliance on external revenues for smaller farms (Shucksmith and Rønningen, 2011; Sutherland et al., 2017). However, Shucksmith and Rønningen (2011) also noted that upland farmers tend not to participate in agri-environmental schemes, due to heavy bureaucracy and stringent regulations, and that (larger) farms located in more favourable agricultural areas tend to benefit the most from agricultural subsidies.

In our understanding, pluriactivity ought to be considered as an everyday practice of multifunctionality conceived as a place-sensitive and community-driven paradigm for contemporary agriculture, and especially so in the case of upland farming. Wilson (2008) posited the potential multiplier effects of economic activities linked to strong multifunctionality, such as tourism or ‘deep’ diversification, in upland areas. On this basis, subsidies function as local investments supporting a transition to the ‘new rural economy’. Studies on ecosystem services in mountain regions also emphasized the economic contribution of multifunctional agriculture to rural development (Bermués et al., 2015; Briner et al., 2013; Debarbieux and Price, 2012).

Pluriactivity refers to the combination of multiple on-farm activities and off-farm employment in addition to farming (Smithers et al., 2005). Early accounts of pluriactivity in Sweden considered it as a “transitory phenomenon in the process of structural change” (Persson, 1983, p50). From a productivist perspective, pluriactivity is accused of distorting the rules of the game by diverting valuable farmland from being used for intensive, monocultural and large-scale farming purposes. For this reason, pluriactivity creates tensions as it is viewed “as hampering efficient, modern agriculture” (Shucksmith and Rønningen, 2011, p282). However, it has been long established that pluriactivity is a durable phenomenon integral to the welfare and ‘business model’ of family farming (Bjørkhaug, 2012; Eikeland, 1999; Evans and Ilbery, 1993; Kinsella et al., 2000; Shucksmith and Rønningen, 2011). From a multifunctional perspective, pluriactivity creates numerous points of contact between farming households and surrounding communities creating and consolidating agriculture-community linkages (Little, 2001). As a coping strategy, pluriactivity allows farmers to stay on the land and continue living in their community (Bjørkhaug, 2012; Kinsella et al., 2000). Upland farmers are able to generate income through agri-tourism, renewable energy, handicrafts, fisheries, forestry or green care as well as from off-farm professional occupations (Bjørkhaug and Rønningen, 2014; Shucksmith and Rønningen, 2011; Sutherland et al., 2017). In concrete terms, this means that farming revenues often are not the major source of revenue for upland farmers: Bjørkhaug (2012) showed, in the Norwegian context, that only about 40% Norwegian farmers collect a majority (over 50%) of their income from farming. Hence, addressing the paradox of multifunctional trajectories in upland farming requires placing the farm as “the constant in an equation where subsidiary pursuits were the variables” (Enequist, 1960, p216).

A more ‘natural’ explanation to the importance of pluriactivity in ‘climatic’ upland farming (i.e. in the Nordic countries compared to continental mountainous regions) is the short vegetation period due to extensive snow cover. This means that, in practice, farming activities are undertaken from late April (at best) to September leaving farmers time to pursue other gainful activities for the remaining two-thirds of
the year. The seasonal dimension of pluriactivity has been widely overlooked in family and upland farming studies: farming is indeed a full-time occupation, but only for a portion of the year. In that sense, revenues from farming are often ‘secondary’ although it is the ‘primary’ reason why people live in those places.

1.4. Case study

The case study region consists in four municipalities situated in the county of Västerbotten (Umeå, Vindeln, Lycksele and Storuman). The case study region, extending from the coast of the Gulf of Bothnia (Umeå) to the upland areas at the Norwegian border (Storuman), is a representative transection of the north Swedish geography and of its territorial diversity (see Fig. 1). This transect follows a natural landscape along the Ume river and an important transport axis (E12, the Blue Route) towards Norway. The transect thus represents an integrated territorial system for natural heritage and human activities in the north. From Umeå to Storuman, the terrain becomes progressively hillier, the landscape more forested, and the settlement structure more dispersed (see Table 1). The socio-economic profiles of municipalities are diverse too: Umeå is a growing university-town, Vindeln has a strong manufacturing heritage and Lycksele and Storuman host many resource-based communities. The share of agriculture in local employment is marginal although farm holdings represent a sizable portion of the registered local enterprises (see Table 1).

The settlement pattern, which was historically constrained by the enforcement of the cultivation line (odlinggräns), protecting the reindeer herding areas of the indigenous Sami population, is changing as well: inland demographic thinning out contrasts with growing regional coastal areas (e.g. Umeå) further polarising the settlement structure. The region is largely absent of industrialised agricultural collectives. The key exception to this is the dairy cooperative Normjejerier. The cooperative sells essentially to the regional market where it competes with nation-wide cooperatives and food retailers’ own dairy brands. It is well-documented that dairy farming is both capital and labour intensive, as well as land intensive in the case of Sweden due to the importance given to outdoor grazing. In our case study area, While Normjejerier farms tend to agglomerate close to the coast (Normjejerier, 2019), their impact on the overall farming landscape has thus far not been investigated.

1.5. Data and methods

The literature review indicated that upland farming could be characterised in relation to territoriality (e.g. remote location, harsh climate, scattered settlement structure), farming style (e.g. labour extensive, small-scale, mixed farming) and livelihood (e.g. pluriactivity, diversification, subsidy dependent). A point largely unaddressed in this literature is the extent to which the singularity of upland farming can be formalised and delineated based on an analysis of quantitative markers. To cater for this, we propose to investigate the following questions: is there a single form of farming in the north? To what extent does geographical location influence the structure and evolution of local agriculture? How do policies impact the resilience and persistence of upland farming?

The study uses both aggregated (municipal level) and register-based, farm-level data. Aggregated datasets were compiled from the Swedish Board of Agriculture (Jordbruksverket) and included data about farm size structure (from 1981 to 2016), farmers’ responses about diversification activities in the triennial structural survey (2010, 2013 and 2016) and subsidy payments (2016). As for the latter, and in relation to the scope of our study, we limited the data compilation and analysis to the three larger schemes available for north Swedish farmers: Direct farm payments, based on type and area of production for farms of at least 4ha; Compensation schemes, supporting farming in areas with low agricultural productivity; and the National scheme supporting north Swedish farming, stemming from the Sweden EU accession deal, entirely financed by the Swedish State with the objective of maintaining traditional agricultural production specific to the north Swedish climatic context.

The register-based dataset included information for all farm holdings registered in the case study region in 2014. The dataset was created by Sweden’s Statistical Office (SCB) specifically for the purpose of the study by extracting and cross-referencing records from the farm holding database (Lantbruksregistret maintained by Jordbruksverket) and the company database (Företagsregistret maintained by SCB). This dataset includes information about turnover classification and primary and secondary activity sectors for 2007, 2010 and 2014 as well as postal address, age and sex of the owner and production type (as of 2014). Primary and secondary activities are distinguished on the basis of economic weight for the holding, i.e. “the value added of a secondary activity must be less than that of the principal activity” (Commission, 2008).

An initial analytical sequence was geocoding the postal addresses of farm businesses for analysis of territoriality using geographical information system (GIS). We then tested the pertinence of the ‘agricultural restructuring’ and ‘disappearing middle’ theses for the north Swedish context by plotting the evolution of different farm size categories since the 1980s. We combined cartographic representation (using the QGIS software) and advanced statistical methods (clustering and regression analyses using SPSS Statistics) to explore our data. Different cluster analysis methods have previously been used to classify farming systems (Morrison et al., 2017). In this study, we used, for different purposes, K-means clustering and Two-Step clustering methods, the latter being appropriate for clustering categorical variables. The analysis included ‘territoriality’ in the sense of the evolution of the overall farming structure and the spatial distribution of farm clusters (based on areal size and location), ‘style’ in the presence of different farm types (based on production type, areal size and turnover size) along the transect and ‘livelihoods’ the importance of non-farming gainful activities and subsidies for farming households in the four municipalities (see Table 2 for more details about indicators and tools).

2. Results

2.1. Territoriality

In all four municipalities, there has been a significant reduction in the overall number of farms (see Fig. 2). Besides two short-lived ‘bumps’ caused by major shifts in Swedish and European agricultural policies (first in 1996–98 corresponding to the accession of Sweden to the EU; and then in 2005–07 with the introduction of the CAP’s single payment scheme), the number of small farms in 2016 in all four municipalities (2–5ha and 5–10ha) has been significantly reduced compared to the 1981 levels.

In Storuman in 2016, almost all farms (48) were smaller than 10ha, with few notable exceptions (3 farms between 50 and 100ha). Since 1981, the number of such smaller farms has been reduced by 75% (from 198 to 48). However, the most notable change in the farming structure of Storuman is the disappearance of mid-sized farm holdings. The number of farms between 10 and 50ha changed from 43 in 1981 to none in 2016. In Lycksele, the long-term trend showed essentially a reduction in the number of all farm size categories, with the exception of larger farms 50+ ha that increased from none to 6 and 30-to-50ha farms that remained stable (5). In Vindeln, there were 90 10-to-20ha farms and 27 20-to-30ha in 1981; in 2016, there were respectively 23 and none left. In Umeå, the number of large farms substantially increased from 8 in 1981 to 31 in 2016, while the number of farms in all

Note that farm size is important as an indicator of ‘style’ as well as ‘territoriality’.

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other categories significantly decreased. Since about the turn of this century, however, there has been a slight increase in the number of smaller farm units (from 5ha to 20ha) in Umeå, while the number of larger farms has declined.

Notwithstanding the earlier comments about the utility of ‘average farm size’ as an indicator, Table 3 shows that in all four municipalities the average farm size significantly increased between 1981 and 2016: doubling in Storuman, Lycksele and Vindeln and increasing by 50% in Umeå. In 2016, the average farm size in Storuman was nonetheless still about 50% less than in the coastal municipalities of Umeå and Vindeln (14ha against 30ha).

Fig. 3 also shows that the relative similarity of the farming profiles in Vindeln, Lycksele and Storuman. These consists mainly of two clusters: cluster 5 (in dark grey), combining a handful of small farms (4) with one apiece mid-sized and large farm; and cluster 9 (in light grey) which consists of a single small farm. In Lycksele, a slightly higher number of small farms (9) are agglomerated around the town of Lycksele (cluster 7 in dark blue). While these clusters are also found in the two eastern-most municipalities, the outstanding feature of Fig. 3 is that, in Lycksele and Storuman, low density farming clusters are indeed separated by extensive non-farming areas.

2.2. Style

We combined here three characteristics that are recurrently used in agri-food studies in order to assess the level of ‘performance’ of farms: areal size (in ha), production type (main agricultural output) and economic size (turnover in SEK).

Results of the cluster analysis relating to pluriactivity show a ‘good’ cluster quality with the 8-cluster model solution. Table 4 synthesizes the profiles of these clusters. In the north Swedish context, large-scale farming ventures appear to be most strongly associated with dairy production (cluster 8). However, large farms are found in two additional clusters: in cluster 5, it is associated with Low Income and Husbandry (5); and in cluster 6 with Medium Income. Smallholding is associated with 3 different clusters (1, 3 and 7) together with Small or
Table 1. Key features of the selected municipalities.

|          | Umeå    | Lycksele | Vindeln | Storuman |
|----------|---------|----------|---------|----------|
| Total municipal population (SCB, Dec 2016) | 125,434 inh | 54,20 inh | 12,263 inh | 5,912 inh |
| Size of largest settlement (SCB, Dec 2016) | 84,761 inh | 2,397 inh | 8,546 inh | 2,191 inh |
| Population potentiala (ESPON GEOSPECS, 2012) | 114,839 | 27,868 | 12,128 | 3,679 |

Resource periphery + intermediate-agricultural areas

Socio-economic classification (Hedlund, 2016) Middle-class within the urban

Urban-rural structure (Glesbygdsverket, 2008)

Manufacturing periphery and intermediate-

Share of local employment in agriculture in 2016 (Source: Jordbruksverket)

Value-adding of farm products is around 15% on average in Storuman. Value-adding and marketing of farm products (Jordbruksverket, 2016).

2.3. Livelihood

Results from the triennial surveys showed that farms in the case study region tend to have a lower level of involvement in gainful activities outside agriculture than the national average (37% compared to 43%) (Jordbruksverket, 2016). In the county, the diversification activities that have increased the most since 2013 (the previous survey) are ‘value-adding and marketing of farm products’, which has surged by 114% (Jordbruksverket, 2016). The report concludes that, in Swedish farming, the level and scope of the involvement in other gainful activities is correlated with farm size: larger farms tend to be more involved in other gainful activities than small farms, and are especially undertaking contracting works, whereas small farms are focusing on value-adding and marketing of farm products (Jordbruksverket, 2016).

Analysis of survey responses for municipalities showed that, in 2010, the estimated overall engagement of farms in non-farming gainful activities amounted to 32% in Umeå, 27% in Vindeln, and 21% in both Lycksele and Storuman. The results compiled in Table 7 show that agricultural and other contracting activities are the most common types of diversification activities across the case study area: 20–25% of the farms surveyed in Umeå, 15–20% in Vindeln, 40% in Lycksele and around 15% on average in Storuman. Value-adding of farm products is still marginal in the case study area with only a small share of the surveyed farms (about 4%) stating being involved, and these all essentially in Umeå and Vindeln. However, crafts are found in Vindeln
Table 2
Analytical methods employed in the study.

| Analytical domains | Implementation in data analysis |
|--------------------|---------------------------------|
| Territoriality     | Evolution of the farm structure testing the ‘agricultural restructuring’ and ‘disappearing middle’ theses at municipal level. Plotting of historical aggregated data (1981–2016) measuring the number of farms for different farm size groups (2–5ha, 5–10ha, 10–20ha, 20–30ha, 30–50ha, 50–100ha, > 100ha). Realization of a hexagonal grid cell background using QGIS. Implementation of K-means cluster analysis (using SPSS) to identify 9 profiles of the local farming system (clusters) based on the coexistence within each cell of farms of different sizes regrouped in three categories: Small (2–20ha), Medium (20–50ha) and Large (> 50ha). We performed several iterations of the K-means cluster analysis and chose the solutions with 9 clusters as it was the one that provided the better fitted classification. Calculation of the physical distance separating each farm from Umeå using geocoded coordinates as an indicator of ‘double disadvantage’: the longer the distance, the larger the transportation cost to the main regional food outlets and the harsher the geographical preconditions (topography and climate). |
| Style              | Implementation of a two-step cluster analysis using SPSS on our farm-level dataset using three main types of attributes: (1) Areal size: Very Small (< 5ha), Small (5–10ha), Mid-sized (10–30ha) and Large (> 30ha); (2) Economic size (2014): No Income (no registered turnover), Low Income (< SEK 199,000), Medium Income (SEK 200,000 to 749,000) and High Income (> SEK 750,000); (3) Production type: Fodder, Dairy, Husbandry (including beef, sheep, poultry, pigs and/or goats) and Smallholding. ‘Smallholding’ (småbruk in Swedish) in the official Swedish farm production typology (Jordbruksverket, 2017b) refers to farm holdings that require less than 400 h of annual work on the farm. Each attribute is coded for the SPSS computation as dummies variables (i.e. 1 when the attribute is true, and 0 otherwise). We performed the cluster analysis on several iterations by changing the number of clusters (up to 10 after which we consider clusters too numerous to be pertinent for interpretation). SPSS provides an overall score for the cluster analysis overlaid on three gradings poor, fair or good. The score for the 8-cluster solution that we eventually chose had the better score within the ‘good’ solutions. |
| Livelihood         | Proportion of farmers with self-assessed participation in other gainful activities derived from the triennial surveys. The figures between the three years available are not fully comparable as the farm sampled for the survey changed. The number of farms to be surveyed is decided at county level (Västerbotten in our case). Within each county, the farm to be surveyed are randomly chosen, and thus the number of farms in each municipality is not the same between each survey. Differentiation of farms by municipality based on the registered primary and secondary sectors of economic activity (4-digit NACE codes). Analysis of subsidies paid on average to farms in each municipality. No data were available for Storuman for the national scheme. Descriptive statistics compiled and calculated using a tabulator (Microsoft Excel). |

Note that the categorization of farm size in the Two-Step clustering is different than the one used in the K-means clustering as the scope of analysis changes.

![Fig. 2. Evolution of the number of farms by size according to land coverage between 1981 and 2016 (Data: Jordbruksverket).](image)
Concerning other activities linked to natural resource exploitation, value adding of forestry products is important in Lycksele (19%) and Storuman (15%) and renewable energy production (including windfarms, wood chips and pellets) was claimed by 18% of surveyed farms in Storuman in 2013, and 8% of farms in Umeå (in 2013) and Vindeln (in 2016). Finally, tourism was identified by 14% of surveyed farms in Umeå, 7% in Storuman and 6% in tourism in 2016 (see Table 8).

Analysis of average payments made under the various subsidies (Table 9) shows that farms in Storuman and Lycksele get a lower level of subsidies than those in Vindeln and Umeå from the direct payment and compensation schemes. Looking at the data breakdown by type of production reveals that both schemes have predominantly benefitted cattle farmers in those areas. The national scheme benefits fewer farms than the other two schemes and the beneficiaries are essentially large cattle farms (more than 100ha).

### Table 3

|                | 1981 | 1985 | 1989 | 1993 | 1995 | 1997 | 1999 | 2003 | 2005 | 2007 | 2010 | 2013 | 2016 |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| **Storuman**   | 7.4  | 7.8  | 8.1  | 9.1  | 10.1 | 9.2  | 10.6 | 14.9 | 10.4 | 10.6 | 12.8 | 13.0 | 14.2 |
| **Lycksele**   | 9.7  | 10.1 | 10.5 | 12.3 | 12.3 | 11.7 | 13.9 | 20.3 | 17.6 | 17.7 | 18.4 | 21.2 | 22.1 |
| **Vindeln**    | 15.3 | 15.9 | 16.6 | 18.1 | 20.7 | 19.6 | 22.0 | 32.9 | 25.1 | 25.4 | 27.6 | 29.7 | 30.9 |
| **Umeå**       | 19.1 | 20.3 | 20.9 | 21.4 | 23.0 | 22.4 | 24.6 | 32.2 | 26.1 | 26.0 | 27.8 | 28.5 | 29.4 |

3. Discussion

Despite the apparently poor conditions for agriculture in northern Sweden, particularly in its mountainous inland areas, farming has persisted as an important enterprise across our case study region. While the number of farms of all sizes declined across the region between 1981 and 2016, the rate of decline has slowed down leading to some stability in recent times. Additionally, there is a strong spatial differentiation of the farming structure in the north. Along the coast, the farming system is dense and diversified in terms of production type, farm sizes and diversification opportunities. In the upland areas, farming is essentially structured around a small number of smallholding farms for which forest-based revenues are critical. Arguably what makes upland farming specific is less the existence of a unique farming style that may define it than the scattered spatial distribution combined with the absence of large farms, which are essential elsewhere to the structuration of a rich agri-food ecosystem including abattoirs, artisan food professionals and advisory services. The loss of farms in upland areas exacerbates the physical and social isolation of the remaining farmers. In practice, this means that not only are upland small-scale farmers located far away from the main consumer markets to sell their food produce (Umeå), but also have few, if any, neighbouring fellow farmers to collaborate with on operational matters (e.g. sharing machinery or pooling labour force at critical moments of the farming year).

When mapped against van der Ploeg’s (2017) model of agricultural restructuring at the regional level, the data suggests support for axiom 1.
supporting a ‘thinning out’ hypothesis. Vindeln and Lycksele, farms of all sizes have reduced in number, again farms, and thus reveals a clear thinning out of the farming structure. In but in this area, ‘middle’ sized farms were typically the larger farm units ‘large’ farm units. farms becoming slightly larger, rather than small farms consolidating to Lycksele and, to a lesser extent, Vindeln, is indicative of very small consolidation (axiom 5). Increasing ‘average’ farm size in Storuman, changes have only been associated with an increase in the number of number of small farms, at least until very recent times. However, these changes have only been associated with an increase in the number of large farms (axiom 4) in Umeå. In other parts of the region, farm (business) abandonment appears as a more significant factor than farm consolidation (axiom 5). Increasing ‘average’ farm size in Storuman, Lycksele and, to a lesser extent, Vindeln, is indicative of very small farms becoming slightly larger, rather than small farms consolidating to ‘large’ farm units. In Storuman, the ‘disappearing middle’ has been an obvious trend, – a reduction in the total number of farms. There is also support for axiom 2 – increase in average farm size, and axiom 3 – a decrease in the number of small farms, at least until very recent times. However, these changes have only been associated with an increase in the number of large farms (axiom 4) in Umeå. In other parts of the region, farm (business) abandonment appears as a more significant factor than farm consolidation (axiom 5). Increasing ‘average’ farm size in Storuman, Lycksele and, to a lesser extent, Vindeln, is indicative of very small farms becoming slightly larger, rather than small farms consolidating to ‘large’ farm units. In Storuman, the ‘disappearing middle’ has been an obvious trend, but in this area, ‘middle’ sized farms were typically the larger farm units in the early part of the period examined here. Hence the ‘disappearing middle’ has not been accompanied by an increase in smaller or larger farms, and thus reveals a clear thinning out of the farming structure. In Vindeln and Lycksele, farms of all sizes have reduced in number, again supporting a ‘thinning out’ hypothesis.

Table 4

Results from the Two-Step Cluster Analysis performed in SPSS.

| Cluster # | Key attributes (% of ‘true’ value number within the cluster) | Number of farms (% of case study total) |
|-----------|---------------------------------------------------------------|----------------------------------------|
| 1         | Small (57.4%)                                                | 108 (18.0%)                            |
|           | No Income (69.4%)                                            |                                        |
|           | Smallholding (91.7%)                                         |                                        |
| 2         | Mid-sized (100%)                                             | 73 (12.2%)                             |
| 3         | Very Small (100%)                                            | 73 (12.2%)                             |
|           | Low Income (100%)                                            |                                        |
|           | Smallholding (100%)                                          |                                        |
| 4         | Mid-sized (100%)                                             | 103 (17.2%)                            |
|           | Low Income (100%)                                            |                                        |
| 5         | Large (63.2%)                                                | 57 (9.5%)                              |
|           | Low Income (96.5%)                                           |                                        |
|           | Husbandry (52.6%)                                            |                                        |
| 6         | Large (100%)                                                 | 53 (8.8%)                              |
|           | Medium Income (64.2%)                                        |                                        |
| 7         | Small (100%)                                                 | 80 (13.4%)                             |
|           | Low Income (100%)                                            |                                        |
|           | Smallholding (100%)                                          |                                        |
| 8         | Large (100%)                                                 | 52 (8.7%)                              |
|           | High Income (100%)                                           |                                        |
|           | Dairy (57.7%)                                                |                                        |

Predictor importance: Mid-sized (100%), Low Income (99%), Large (87%), High Income (71%), Smallholding (68%), Very Small (67%), Small (67%), No Income (46%), Dairy (33%), Medium Income (31%), Fodder (22%), Husbandry (17%).

Table 5

Key features of farm clusters.

| Cluster # | % of cases by municipality | Gender % of male owner | Age in 2014 | Distance to Umeå (km) |
|-----------|---------------------------|------------------------|--------------|----------------------|
|           | Storuman (n = 53)        | 24.5% 5.7% 26.4% 11.3% 7.5% 1.9% 18.9% 3.8% | 69.4% 83.6% 86.3% 83.5% 82.5% 84.9% 77.5% 92.3% | 60.1 58.4 62.7 60.1 56.4 55.0 60.3 50.8 | 60.6 54.1 76.7 42.1 56.5 40.3 59.2 39.4 |
|           | Lycksele (n = 63)        | 17.5% 15.9% 14.3% 9.5% 11.1% 1.1% 14.3% 6.3% |               | 12.4 11.1 12.1 11.4 13.8 13.0 12.4 9.7 | 71.8 50.5 92.5 48.5 76.7 41.0 70.8 46.4 |
|           | Vindeln (n = 89)         | 20.2% 7.9% 11.2% 16.9% 7.9% 14.6% 12.4% 9.0% |               |                     |                     |                     |
|           | Umeå (n = 394)           | 16.8% 13.5% 10.2% 19.3% 9.9% 8.1% 12.7% 9.6% |               |                     |                     |                     |

The net result of these processes is a farming environment in Umeå that has somewhat followed ‘classic’ restructuring processes, at least in part as a result of the organisation of dairy farming, although it may no longer be doing so, and an environment in the more inland districts that is quite distinct from these classic models. Territoriality therefore emerges as a significant influencing factor against the singularity of ‘upland farming’ in the northern Swedish context.

Using size, income, and product types as indicators of farming style, the cluster analysis (See Table 4) reveals a similarity between farms of very small, small, and mid-size. These are typified by low or no income, and diverse products. However, the analysis reveals that large-scale farming can generate very different outcomes with regards to the revenue generated. In that respect, one can conjecture that, although small size indeed appears to be a good indicator of low productivity, large size is not a good indicator of high performance: areal size, on its own, is indeed not a reliable predictor of how farm development trajectories are ‘moulded’ and stresses the role of other farming and business management practices in the process. Similarly, large farms can be associated with a dominant farm product (dairy), or with more diverse product offerings. The prominence of dairy reflects the importance of the Norrmejerier cooperative which is one of the few organising forces for northern agriculture. However, it would be inaccurate to portray large scale farming in northern Sweden as simply or even primarily a dairy-based industry.

Large farms in this region are concentrated towards the coast in areas which are relatively advantaged in terms of terrain, climate and access to local and regional markets. These attributes also make the eastern parts of the transect attractive to many small farm enterprises, but perhaps inappropriate for very small farms whose low incomes might make it difficult to justify the costs of land and infrastructure in more advantaged areas. Large scale farms also appear to be engaged in more sustainable intergenerational handover processes, with lower average ages of owners (between 50 and 55 years) than small and very small farm businesses (in excess of 60 years). Contrary to Persson’s (1983) expectation that new generations may be attracted to small scale farming as a result of the opportunities for pluriactivity, it may be that alternative sources of income and ‘part time’ farm work have allowed older farmers to maintain their businesses for longer, and therefore kept younger farmers out of the business (at least at the ownership level).

Pluriactivity is not, however, a universal characteristic of farm enterprises, even in the more disadvantaged western parts of the region. The majority of farm businesses (around 70%) have no registered secondary activities, which may suggest, particularly for smaller farms, that farmers’ age allows them to maintain a farm business that requires only seasonal work and produces low or even no income, with personal income derived from pensions and investments or from off-farm employment, for instance in local public services. Where there are secondary activities, they are primarily of a type that can exploit the land on which farms are located (particularly forestry), farm related skills (contracting), or, to a lesser extent, value adding to farm products.
Table 7
Engagement of farms in other gainful activities (source: Jordbruksverket).

| Year      | Other contracting | Agricultural contracting | Value-adding -farm products | Value-adding -forest products | Renewable energy | Crafts | Other | Tourism | Education | Number of farms |
|-----------|-------------------|--------------------------|-----------------------------|-------------------------------|-----------------|-------|-------|---------|-----------|----------------|
| Umeå 2016 | 17.39%            | 10.87%                   | 4.59%                       | 3.38%                         | 7.73%           | ..    | ..    | ..      | ..        | 414            |
| Umeå 2013 | 11.38%            | 7.37%                    | 2.46%                       | 2.01%                         | 8.71%           | 1.34% | 12.05%| 5.13%   | ..        | 448            |
| Umeå 2010 | 14.25%            | 9.50%                    | 1.73%                       | 1.94%                         | 3.24%           | 1.30% | 9.07% | 3.02%   | ..        | 463            |
| Vindeln 2016 | 12.66%        | 9.49%                    | ..                          | 5.70%                         | 8.23%           | 8.23% | 10.76%| 6.33%   | 3.80%     | 158            |
| Vindeln 2013 | 7.14%          | ..                       | 3.97%                       | ..                            | 3.97%           | 3.97% | 4.76% | ..      | ..        | 126            |
| Vindeln 2010 | 10.48%         | 6.45%                    | 3.23%                       | ..                            | 4.84%           | 4.84% | 4.03% | 4.03%   | ..        | 124            |
| Lyckeå 2016 | 15.79%          | 24.56%                   | ..                          | 19.30%                        | ..              | 12.28%| ..    | ..      | ..        | 57             |
| Lyckeå 2013 | 32.26%          | 22.58%                   | ..                          | ..                            | 8.06%           | 9.68% | ..    | ..      | ..        | 62             |
| Lyckeå 2010 | 9.41%            | 7.06%                    | 3.53%                       | ..                            | ..              | ..    | 4.71% | ..      | ..        | 85             |
| Storuman 2016 | –               | 9.09%                    | ..                          | 15.25%                        | 18.64%           | ..    | ..    | ..      | ..        | 9900          |
| Storuman 2013 | 20.34%          | –                        | 15.25%                      | 18.64%                        | ..              | ..    | ..    | ..      | ..        | 59             |
| Storuman 2010 | 7.46%           | 4.48%                    | 4.48%                       | ..                            | ..              | ..    | 5.97% | ..      | ..        | 67             |

* Estimated based on the number of farms responding to the survey.

Table 8
Primary sector of activity registered for small farms (2–5ha, 5–10ha & 10–20ha) in 2014 (Source: Jordbruksverket).

| Primary activity                      | Umeå 2014 | Vindeln 2010 | Lyckeå 2010 | Storuman 2010 |
|---------------------------------------|-----------|--------------|-------------|---------------|
| Growing of non-perennial crops (NACE 011) | 28.8%    | 16.4%        | 8.2%        | 15.4%         |
| Animal production (NACE 014)          | 9.5%      | 6.0%         | 24.5%       | 13.5%         |
| Mixed farming (NACE 015)              | 16.5%     | 14.9%        | 12.2%       | 19.2%         |
| Forestry and logging (NACE 02)        | 22.5%     | 38.8%        | 38.8%       | 40.4%         |
| Specialised construction activities (NACE 43) | 4.9%     | 3.0%         | –           | 3.8%          |
| Other activities                      | 8.4%      | 11.9%        | 6.1%        | 3.8%          |
| Not specified                         | 9.5%      | 9.0%         | 10.2%       | 3.8%          |
| Total                                 | 285       | 67           | 49          | 52            |

Table 9
Average subsidies paid to farmers in case study municipalities by support area in 2016 (Source: Jordbruksverket).

| Compensation area | Storuman | Lyckeå | Vindeln | Umeå |
|-------------------|----------|--------|---------|------|
| Compensation scheme tkr/farm (n) | 35.9 (14) | 71.3 (18) | 58.6 (44) | 107.9 (68) |
| Direct payment (including greening) tkr/farm (n) | 24.1 (14) | 36.7 (23) | 41.7 (55) | 59.6 (94) |
| National support for north Sweden tkr/farm (n) | N/A | N/A | 281.8 (8) | 341.3 (18) |

through manufacturing and tourism. There has not been a consistent pattern of change at least in recent times in terms of which of these activities are favoured by farmers in different parts of the region, although there is some evidence of an increase in ‘agricultural contracting’ which may serve as means of sharing skills and resources between distantly spaced farms and thereby somewhat counter the increasing isolation brought about by the thinning out of farm properties particularly in the west.

From the farm payment data at hand, it is difficult to draw definitive conclusions about the dependency of farmers in upland areas towards subsidies. However, it appears that, in spite of the traction at EU level to support small farms as vectors of a robust multifunctional local agriculture, and in spite of the expressed objectives by Swedish agricultural policy to support ‘traditional farming’ in the north, these ambitions have failed to translate into a sizeable aid for farmers in locations where small-scale operations dominate.

4. Conclusions

When implementing the inductive approach, we chose not to propose an ex ante delineation or definition of upland farming. In doing so, we let analytical results to build an evidence-base characterising farming in remote rural settings using three dimensions of territoriality, style and livelihood. This study confirmed that some characteristics are important to understanding upland farming at the level of individual farms: they tend to be small in size, low productivity and labour extensive. Other farming types do, however, persist, particularly (but not exclusively) at the coast. The specificity of upland farming emerges more clearly at the landscape level: it is the increasingly scattered nature of the resulting relational space (farm-to-farm and farm-to-community) that emerges as one travels from coast to mountains and makes such a farming landscape specific. Our analysis also emphasizes the importance of the demographic and sociological component (age of owner) for grasping the future prospects for sustaining upland farming.

Despite conditions that are known to be less favourable for agriculture, farming activity continues to persist in Sweden’s north. Furthermore, it has persisted in a variety of forms, ranging from small and very small ‘family’ holdings to large scale and highly industrialised dairy properties. No single style of ‘upland farming’ has emerged, although the diversity of farm sizes at least is a product of a high concentration of larger farms in the eastern part which also has more favourable terrain and climate than the west, and has at least one relatively local market for farm produce (the city of Umeå). Even in the east, however, large farms come in several forms and are not uniform in productivity or products. Likewise, while more westerly regions are dominated by small and very small farms, products and income are diverse. The role of farming in the overall livelihoods of farmers is also diverse, with different levels and types of non-farm activities engaged in across the region. Upland farming might therefore be considered as a diverse practice delineated by territoriality, farming style, and livelihoods.

This paper has provided insights into upland farming in northern Sweden that have previously been hidden in national or transnational modelling of agricultural restructuring. The quantitative data have revealed opportunities for farming’s persistence through pluriactivity, exploitation of subsidies, and product diversity. The data also reveals threats through the thinning out processes, particularly in the extent to which these might lead to isolation of farm enterprises and limited opportunities therefore for farm consolidation. There may also be significant challenges in intergenerational handover of farm businesses, meaning that the two major processes of farm sustainability have a weak foothold in the north.

In this study, we highlighted how geography shapes upland farming...
as a socio-agricultural phenomenon. From a policy perspective, we argue that supporting the continued presence of upland farming is a territorial matter that has systemic effects on the resilience of remote rural communities. Because these places and actors are considered as marginal in the grand scheme of European and national policymaking, policy practices, tools and instruments are often badly equipped to efficiently support them. The implementation of multi-fund Community-Led Local Development initiatives could provide leverage to better integrate the development of upland farming in wider community development processes, for instance in relation to social marginalisation, food niche transition, biomass production and tourism development.

Putting the issue of the future of upland farming on the policy agenda will depend on the ability of scholars to provide the empirical evidence to build a case. Most upland farming studies are, to date, performed using qualitative research methods. Analysing this experiential knowledge provides invaluable insights on the complexity and critical factors of the farmers’ decision-making process. In this study, we wanted to show that we could also get valuable findings based on quantitative research methods, even with a limited dataset. Future research on upland farming should be designed to integrate more seamlessly the advantages of qualitative and quantitative methods. By framing such research in the context of territoriality, farming styles and livelihoods, a nuanced picture of the diversity as well as the commonality of upland farming practices and experiences in Sweden’s north can be created, and can contribute more broadly to understanding farming’s role in marginal landscapes in Europe and further afield.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrurstud.2019.04.010.

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