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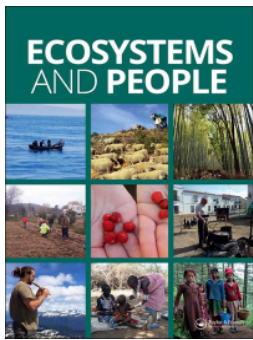
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RESEARCH



Navigating overgrazing and cultural values through narratives and participatory mapping: a socio-cultural analysis of sheep grazing in the Faroe Islands

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ABSTRACT

Long-term livestock grazing has shaped landscapes, biodiversity, societies, cultures, and economies in the North Atlantic over time. However, overgrazing has become a major environmental sustainability challenge for this region, covering the Faroe Islands, Greenland, Iceland, Norway, and Scotland. The objective of this study was to elicit narratives and spatial patterns of local people's management preferences for sheep grazing in the Faroe Islands through a socio-cultural lens. We collected data via a Public Participation Geographic Information Systems (PPGIS) survey with an open question about hopes and concerns for sheep management in the Faroe Islands and a mapping exercise for expressing spatial preferences for sheep management. Four distinct narratives emerged from a qualitative analysis of responses to the open question ($n = 184$): (1) Sustainable sheep management, (2) Nature without sheep, (3) Sheep as part of Faroese culture, and (4) Sheep as nuisance. Visual inspection of narrative-specific maps with locations where either no or fewer sheep were preferred indicated that sheep management is not simply a 'sheep vs. no sheep' issue but embedded in a more nuanced consideration of the place of sheep in the landscape and society. For example, for some residents sheep-farming is not a commercial enterprise but a social activity and local source of food. Our combined methodological approach using qualitative and spatial data can help researchers in other fields identify the interplay between place-specific areas of grazing management concern and socio-cultural values, enabling more targeted land-use management policies or plans.

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Introduction


Rangelands comprise grasslands, shrublands, woodlands, wetlands, and savannas and cover almost one third of the ice-free land on earth (Ellis and Ramankutty 2008). They are predominantly composed of grasses, grass-like plants, forbs, and shrubs that are suitable for livestock grazing (Huntsinger and Sayre 2017). Rangeland management aims to maintain or enhance the functioning of natural processes, which in turn support people's well-being and livelihoods. The resilience, adaptability, and transformability of livestock farmers as part of a social-ecological system have been well-studied in arid and semi-arid regions (Roe et al. 1998; Hruska et al. 2017).

Previous research on the socio-cultural values of rangelands suggests that land management practices carried out (e.g. shepherding, traditional hay making)

involve local ecological knowledge (Bocco and Winklerprins 2016); have potential to nurture skills, social cohesion, and meaningful action in people's local environment, thus contributing to human well-being (Kaltenborn et al. 2017); and constitute cultural ecosystem services (e.g. heritage values, aesthetic values, identity) and provide meaning through interaction with nature, thus shaping relational values (Chan et al. 2016; Kaltenborn et al. 2017).

Public Participation Geographic Information Systems (PPGIS) and narrative analysis present different approaches for eliciting socio-cultural values for landscapes (Scholte et al. 2015; Wolff et al. 2015). In the context of rural landscapes, PPGIS approaches have been used to examine the spatial associations between landholders' socio-cultural values and land

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cover (e.g. Fagerholm et al. 2016, 2019), to identify areas of conflict between conservation and development of land (e.g. Brown and Raymond, 2014; Brown et al. 2017; Karimi and Brown 2017; Karimi et al. 2020; Lechner et al. 2020), and to understand user group-specific preferences for particular landscape features (e.g. Engen et al. 2018; Gerstenberg et al. 2020). In sum, the mapping of community preferences using a variety of spatial analyses techniques (Fagerholm et al. 2021) can be useful for assessing the local acceptance of land management practices (Engen et al. 2018; Brown et al. 2020).

Narrative analysis is a structured way to empower people to express meaningful emotions and beliefs about how ‘things should be’ (Fraser 2004, p. 180). For example, narratives have been useful to elicit life stage- and gender-specific themes of rangeland management (Wilmer and Fernández-Giménez 2016) and land manager values and management practices around tree survival and recruitment (Sherren et al. 2010). Community-based narratives provided the foundation for delimiting culturally significant areas in a marine spatial planning context (Gee et al. 2017). Recently, narrative and PPGIS approaches have been merged to identify and explain potential land-use conflicts that are influenced by a wide range of pressures and drivers of change (Plieninger et al. 2018).

Not many studies have employed such methods to investigate the socio-cultural values of rangelands in the wet North Atlantic region, covering the Faroe Islands, Greenland, Iceland, Norway, and Scotland. In this region, sheep husbandry has been part of the agricultural systems since the first settlement by humans and it has played an important part in the development of North Atlantic culture and economy (Austrheim et al. 2008; Ross et al. 2016). Rangelands are known as ‘outfields’ in this region (Edwards 2005; Thorsteinsson 2008) – marginal lands that are often grazed as commons. Although the economic importance of sheep farming has decreased over the last century in the North Atlantic region, livestock grazing pressure has often increased (Austrheim et al. 2008).

In this paper, we focus on sheep grazing in the Faroe Islands – a small archipelago in the middle of the North Atlantic located 320 km north-west of Scotland, midway between Norway and Iceland. The social values of sheep grazing in this part of the North Atlantic region are well-described in Faroese literature (Joensen 2015; Í Brekkunum 2017), but largely missing from the English scientific literature, which focuses on ecological dynamics. One exception is a PPGIS study on the Island of Sandoy by Nikula et al. (2020) where people could map places for sheep grazing, as part of a broader study that also included cultural values and land use conflicts. However, residents’ preferences for sheep management have not

been considered across the entire Faroe Islands, nor with respect to different narratives supporting these preferences.

To fill these research gaps, our study aims to elicit narratives and spatial patterns of local people’s management preferences for sheep grazing in the Faroe Islands through a socio-cultural lens. Uniquely, we explore the associations between perceived acceptable and inappropriate areas for sheep farming, and the narratives which underpin these management preferences. We study these preferences in the context of the controversial topic of overgrazing. While intensive livestock grazing over time has shaped landscapes and biodiversity of the rangelands in the North Atlantic, ecologists have frequently pointed out that overgrazing is a major environmental sustainability challenge in this region (Austrheim et al. 2008; Ross et al. 2016). Being aware that it is contested and value-laden, we use the term overgrazing to describe situations where grazing occurs at a more intensive level than wanted relative to a specific management objective. Overgrazing can have effects on biodiversity, ecosystem function, forage plant biomass quantity and quality, and soil stability, thus undermining the environmental and economic sustainability of rural communities over time (Mysterud 2006, Ross et al. 2016). In the Faroe Islands, overgrazing has been related to degradation of vegetation and soils (Bjarnason et al. 2008; Bogadóttir 2020a).

Our specific objectives are:

- To explore prevailing narratives on current and future management preferences for sheep grazing in the Faroe Islands;
- To identify spatial patterns of management preferences for sheep grazing in the Faroe Islands;
- To compare spatial patterns of management preferences among different segments of the population based on socio-demographics and preferences identified in the narratives.

Background

The Faroe Islands are characterised by its sheep, which probably have been on the Islands since they were settled by humans in 400 AD (Church et al. 2013; Arge 2014; Curtin et al. 2021). Sheep are the main domesticated animal in the Faroe Islands and are present on most grasslands, except some inaccessible mountain tops and cliffs. Palaeoecological analyses have indicated that the introduction of domestic animals by the first settlers had a profound impact on the vegetation, with tree species such as *Juniperus*, *Betula* and *Salix* more abundant prior to the settlement, while grass species became more abundant after the settlement (Jóhansen 1985; Hannon and Bradshaw 2000). The present vegetation in the outfields can be classified into four main vegetation

types: open grassland vegetation, *Racomitrium* vegetation, moist grassland vegetation, and moist dwarf shrub vegetation (Fosaa 2004).

Over centuries the sheep population had considerable annual fluctuations with numbers of ewes (or mother sheep) between 75,000–100,000. However, this number stabilized when medicine came into common use in 1920 (Bjarnason et al. 2008). The numbers of ewes is now around 70,000, giving birth to around 50,000 lambs in early May (Mortensen et al. 2006; Thorsteinsson 2020). Lambs are slaughtered almost six months later, in the middle of October. About ninety-two percent of the total land area of the Faroe Islands (1,396 km²) are ‘outfields’, i.e. uncultivated land normally used for pasture (Mortensen et al. 2006). Outfields are fenced from the ‘infields’, i.e. the cultivated land and settlement areas (Figure 1 and 2). In most villages, the infield is only available for sheep during the winter period from 25 October to 14 May.

Agricultural policies of the Faroe Islands have over the centuries divided the outfields into 481 land lots (each lot is called *hagi*) (Thorsteinsson 2020). Sheep are typically free-roaming within a *hagi* and graze the outfields year-round. The number of sheep allowed in each *hagi* is based on self-determination and agreement among farmers who have common outfields. Sheep density varies greatly among these areas, from 13 ewes per km² in Flatnahagi in Tórshavn, Streymoy, to 546 ewes per km² in Tvøráhagi – Uttaripartur, Vestari, in Froðba, Suðuroy (Appendix 1). However, on average the brood stock is about 50 ewes per km² (Thorsteinsson 2020). The tradition of having a high density of ewes (which have less than one lamb annually on average) originates from circa 1900 when sheep farming was optimized to produce wool. The value of wool is now almost negligible; instead, the main product is the meat, of which most is wind-dried and used as either fermented ‘hung meat’ or ‘dried meat’ (Bjarnason et al. 2008).

Today, agriculture, including sheep farming, is only a very small part of the Faroese national economy and employment sector. In 2017, agriculture made up only 0.25% of the total Faroese gross domestic product (Statistics Faroe Islands 2020), of which less than half came from sheep farming, and only 114 people were employed in the agricultural sector, corresponding to 0.4% of the total number of employees (Statistics Faroe Islands 2019). Thus, sheep farming in the Faroe Islands is nowadays more a lifestyle (or form of recreation) than an industry. However, Faroese sheep farming is mainly based upon an ‘in kind’ economy (where trades occur through family and friend networks rather than on open market) and there is no official registration of household consumption. This means that sheep farming remains

important for many Faroese households because it allows them to be self-sufficient in meat, mainly in the smaller villages.

In the Faroe Islands, the regulation of sheep numbers and sheep grazing is managed regionally and locally rather than by the state. Outfields have been managed as common-pool resources since the 13th century, when the Faroese ‘Sheep Letter’ codified management of the outfields as common-pool resources (Brewington 2016). The Sheep Letter stated the number of sheep to be kept on an area of land while not exceeding an overall carrying capacity (Brandt 2021). While this common-pool system has been considered leading to ‘sustainable cultural landscapes’ (Bogadóttir 2020a; Brandt 2021) or ‘resilient social-ecological systems’ (Brewington 2016), it has over the past decades been disrupted by modernization processes. In particular, the import of supplementary feed for winter and improvements in animal health led to more stable populations of larger animals all year round, increasing the grazing pressure on the outfields (Bjarnason et al. 2008; Ross et al. 2016). During the last years, there has been an increasing awareness of the impact of overgrazing, not so much due to the impact on the landscape as on the size of the slaughtered lambs. To counter this, some villages have decreased their stock considerably without a considerable loss of meat, because the lamb carcasses in general are larger in smaller herd sizes. Still, overgrazing remains an issue of ecological concern with negative impacts such as soil erosion (Mortensen et al. 2006). Plot experiments showed that the roots of grazed plants are finer and more colonised by mycorrhizal fungi, affecting the plant’s ability to increase the nutrient uptake which is needed for regrowth (Fosaa and Olsen 2007). A combination of low biomass above ground and a weak root system below ground can have a serious impact on the resilience of the system, making it vulnerable for soil degradation and erosion, and might increase the risk and frequency of debris-slide events, especially on steep slopes with overgrazing (Dahl et al. 2013).

Methods

PPGIS data collection

To explore prevailing narratives and spatial patterns for management preferences for sheep grazing in the Faroe Islands, we conducted a PPGIS survey among Faroese residents. Data were collected between June and September 2017 through a digital online participatory mapping survey operated via a Maptionnaire platform (Maptionnaire n.d.). After testing the survey with twelve local residents, we invited all Faroese residents (both full- or part-time local residents)



Figure 1. Map of the outfield system in the Faroe Islands. The Islands are separated in 481 outfields with a mean size of 268 ha and a SD of 197 ha (map a). The red rectangle shows the location of the Island of Fugloy (map b). Fugloy is divided into 10 outfields (black outline), clearly separated from the ‘infields’ around the two townships of Kirkja and Hattarvík shown with green colour (map b).



Figure 2. Examples of how sheep are part of, and form, the Faroese landscape. (a) Sheep in the infield of Kunoy village, showing the fenced border with the outfield further away from the village. (b) Traditional haymaking on infields in the village of Viðareiði. (c) Free roaming sheep in the outfield, with mountain top showing signs of erosion. (d) Mountain top of Klubbin on Kunoy, well-known for its vegetation, as it is one of the few areas where sheep do not have access. Photos a-c by Laura Verbrugge. Photo d by Pól Sundskarð.

through crowdsourced sampling using a dedicated website (landslagskanning.fo – in English: ‘landscape survey’). The survey was advertised by: (i) a Facebook site and several Facebook groups, (ii) sending information to Faroese newspapers and media sites, and (ii) participating twice in a live show of the National Faroese Radio. The survey was completed by 337 respondents and time for completion was around 15 minutes.

The survey comprised of spatial and aspatial components. One part of the survey gathered spatial data about landscape values and preferences for future development of tourism, wind power and hydro-power, fish farming, and sheep farming (see Plieninger et al. 2018 and Appendix 2). In addition to mapping points, respondents could provide qualitative descriptions about landscape values and development preferences. The mapping tasks were performed on a map that could be zoomed to different scales and had two options: a topographic map with MapTiler (MapTiler 2017) and OpenStreetMap (OpenStreetMap contributors 2017) contributions and satellite image provided by Google Maps (Google Maps 2017) (Appendix 2). Both options included place names. The survey also covered socio-demographic characteristics, including age, gender, level of education, and place of residence. The University of Copenhagen Human Research Ethics Committee did not require full ethics application to be submitted because the study was deemed low risk.

This article reports the findings of two mapping questions and one open question included in the PPGIS survey; those that relate to sheep farming (Appendix 2) and were not included in the previous study by Plieninger et al. (2018). The mapping questions asked respondents to use point markers to pinpoint places or areas (1) where they believe sheep farming should decrease (because of soil erosion) and (2) where they believe sheep farming should not occur. The open question asked respondents to share two or three main hopes and/or concerns about the future development of sheep farming. Our sample includes 184 respondents who provided an answer for the open question. A subset of this group ($n = 82$) also provided mapped points for at least one of the mapping questions.

Segmentation based on narrative analyses

We conducted a qualitative analysis of 184 open responses about residents’ hopes and concerns with regard to the future development of sheep farming in the Faroe Islands. When prompted to share these views, many respondents wrote elaborate answers (up to 202 words and 28 on average) detailing specific actors (‘Who is involved?’), problems (‘What is happening?’) and actions (‘What can or needs to be

done?’). As such, we had the opportunity to analyse these answers as representing a narrative or story told by the respondents, which subsequently could be interpreted as ‘models’ of social-ecological systems and how they could be managed (c.f. Lejano et al. 2013).

The narrative analyses were conducted by three of the authors (LV, TP, and EO) during a three-day workshop and subsequent discussion and consensus approach to assign the codes. A coding scheme was developed during the workshop held online in August 2020, where they first explored and coded the responses, while discussing about the content and views expressed in the set of responses. While coding the individual responses, we searched for either coherent stories or contrasting views within the dataset to identify prevailing narratives with a distinctive outlook and supported by a larger group. The final categorization of responses into four narratives emerged from an iterative process of re-reading the responses and refining the coding scheme as well as continuous discussion to reach a consensus on the assigned codes. Respondents could be assigned to multiple narratives depending on the length and nature of their answer. We used Chi-square tests to statistically compare the socio-demographic variables (including age, gender, level of education, and home location) between groups of respondents assigned to each narrative (IBM SPSS Statistics version 27). Thirty respondents were assigned to multiple narratives and were excluded from the Chi-square tests.

Spatial analysis

We calculated the total and average number of preference points mapped per respondent for ‘less sheep’ and ‘no sheep’ – per narrative. We then created a series of maps showing the locations of points mapped for the two management preferences per narrative. To ease the interpretation of these map results, we used kernel density to create heatmaps for each narrative group’s spatial sheep management preferences (cell size of 500 m, distance of 2000 m).

The resulting heatmaps were then visually compared with four background maps of the Faroe Islands showing (i) road networks and larger settlements, (ii) Ramsar protected wetland sites (the only international protected area category used in the Faroe Islands), (iii) density of sheep per outfield, and (iv) village population numbers. Data sources are reported in Figure 3 caption. The density of sheep and village population are shown with five classes and natural breaks categorization. In addition, we summarized mapped places of sheep management preferences per outfield in order to compare them with the map of density of sheep per outfield (also

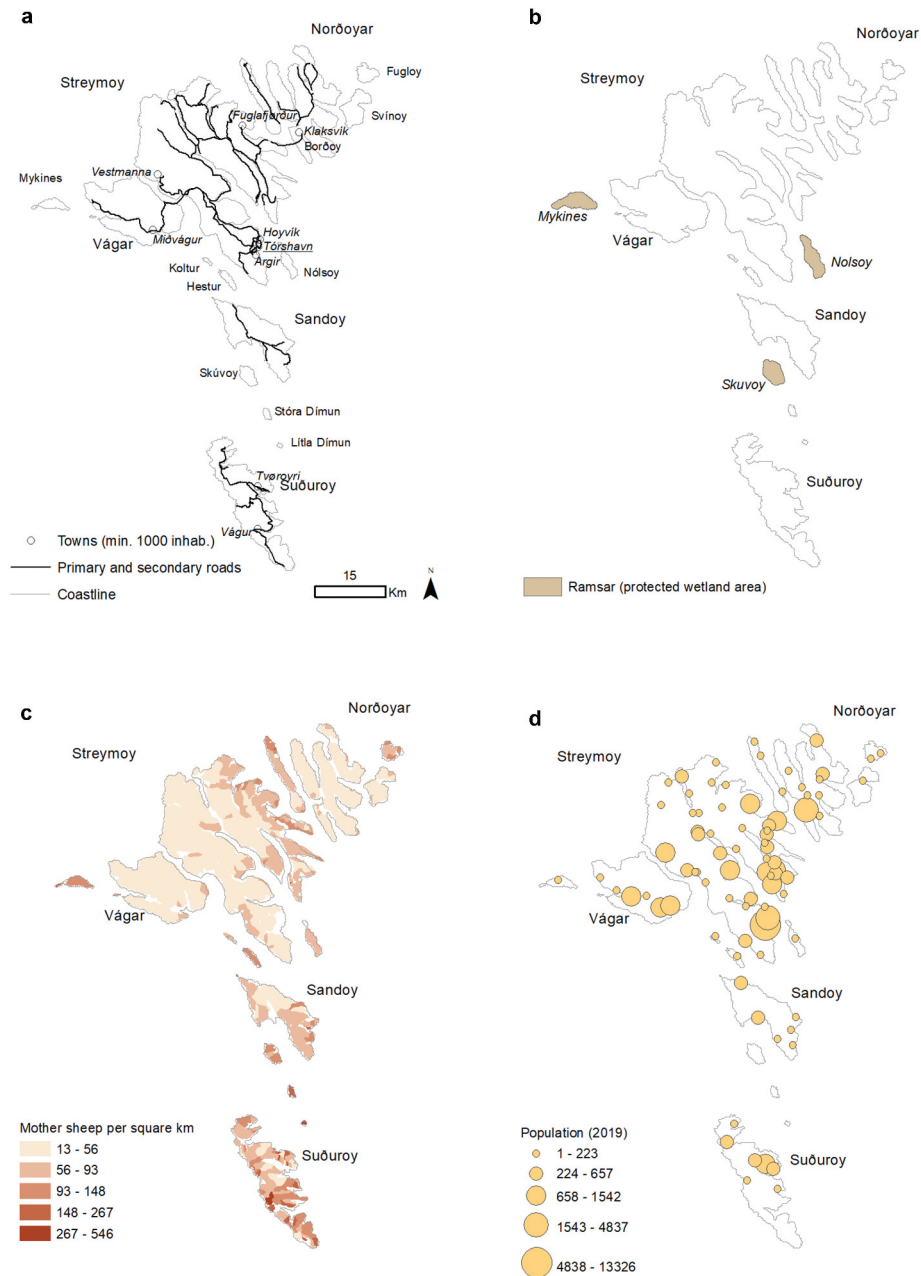


Figure 3. Background maps of the Faroe Islands. (a) The road network, larger settlements, and place names (source: Open Street Map). (b) Ramsar protected wetlands (source: <https://rsis Ramsar.org/>). (c) Density of sheep measured as mother sheep per km² (source: Thorsteinnsson 2020) – see also Appendix 1). (d) Human population numbers within villages (source: Statistics Faroe Islands 2019).

categorised by natural breaks). To support the visual interpretation, we further conducted a Spearman Rho correlation test between the two spatial sheep management preferences and sheep density per outfield.

Results

Sample characteristics

Respondents ($n = 184$) were between 14 and 72 years of age, with an average age of 43 years. There were slightly more men (55.5%) than women (44.5%) in our sample. Most of them were full-time residents of the Faroe Islands (94%) with only a few being part-

time or former residents. More than half of the respondents (58%) completed a form of higher education (including polytechnic, undergraduate and postgrad degrees). About half of the respondents (53%) lived in the capital region of Tórshavn.

Narratives

Four narratives emerged from the responses to the open question about sheep management in the Faroe Islands: (i) sustainable sheep management, (ii) nature without sheep, (iii) sheep as part of Faroese culture, and (iv) sheep as nuisance. This section includes

a description of each narrative supported by quotes (additional quotes are presented in Table 1). A comparison of the socio-demographic characteristics of respondents assigned to each narrative showed that they differ for age and education level but not for home location (i.e. whether respondents lived in Tórshavn municipality or elsewhere) (Appendix 3).

N1 - Sustainable sheep grazing – The most popular narrative (42.9% of 184 respondents) centred around the belief that there are too many sheep in the Faroe Islands which causes (local) problems such as erosion and overgrazing (Table 1). Respondents also considered sheep farming to be ‘unmanaged’ or ‘uncontrolled’ in terms of numbers of sheep. Some specifically mentioned the need for knowledge, decision tools, or regulations to decide on suitable grazing levels or sheep numbers per area. For example, one respondent pointed to the relation between winter feeding and numbers of sheep, by stating: ‘*The grazing pressure is too in high many places. The grass isn’t cut on the infields and instead foreign hay is imported, that should not be allowed. It should be determined by law how the sheep farming should occur and how the feeding is handled*’. Negative effects of sheep grazing that were mentioned included impacts on nature, soil, grass, plant diversity, rare plants, outfields, terrain, bird nests, and trees. This group included more men than women (62.3% and 37.7% respectively) and respondents were on average 47 years old. Respondents between 40 and 60 years old and highly educated respondents were overrepresented (61.3% and 68.9% respectively) while respondents below 40 years and with low education level were underrepresented (24.5 and 8.2% respectively).

N2 - Nature without sheep – Respondents adhering to this narrative (12.5%) specifically called for having places without any sheep (Table 1). The main motivations for so-called ‘no sheep experiments’ expressed within this narrative were that it will allow for nature or trees to grow in the Faroe Islands. Simply learning or gaining knowledge about what happens to an area without sheep was another reason. Many responses included specific names of places where sheep should or could be removed. For example, one respondent wrote: ‘*It is a shame that there are no cliffs and gorges without sheep, because it could be interesting to see how Tindhólmur and Litla Dímun would be if the sheep farming would stop there*’. While only one in ten respondents adhered to this narrative, it was clearly distinguishable as a result of the strongly expressed views and the specific locations that were mentioned. Slightly more men than women composed this narrative group (54.5% and 45.5% respectively) and respondents’ average age was 48 years. Respondents above 60 years old were overrepresented (33.3%) compared to the total sample. Two-thirds of the respondents in this group were highly educated.

Interestingly (albeit no significant finding due to the smaller group size) almost three-quarters of this group lives outside of Tórshavn.

N3 - Sheep as part of Faroese culture – One in three respondents (35.3%) expressed strong beliefs that sheep and sheep farming are an important part of Faroese culture, history, landscape, or identity (Table 1). Many responses emphasized that sheep farming is not a commercial enterprise but a spare time and social activity, as well as a local source of food and other resources. For example, one sheep owner shared: ‘*I have eight sheep and would like to keep them. I don’t know when the number of sheep per unit is too high. But it is important that we are allowed to have the sheep in the old traditional way and that we can slaughter at home*’. Another respondent also highlighted this emotional connection by noting that even when the land is not the most suitable, ‘*it is used for sheep farming because of emotional reasons*’. While some respondents saw tourism as an opportunity for farmers (e.g. by receiving payments for crossing their land), others saw it as a threat that could influence a farmer’s way of life. Respondents supporting this narrative were on average 43 years old. Again, there were slightly more men than women (54.2% and 45.8% respectively). Respondents with medium level education were overrepresented in this group (29.8%) compared to the total sample.

N4 - Sheep as a nuisance – One in four respondents (27.2%) referred to sheep as a nuisance, mainly within the context of traffic accidents caused by sheep and sheep entering villages, especially during winter (Table 1). Frequently expressed wishes included having sheep-free villages as well as improving roadside fencing to keep sheep away from roads. As one respondent puts it: ‘*I like to see the sheep in the Faroese nature, but I am afraid that they lead to car accidents*’. Pollution or other damage to the environment due to fertilizing was also mentioned. These feelings of nuisance also emerged from other human activities that were described as ‘industrializing sheep farming’, including driving of large vehicles, use of heavy machinery and fertilizing (Table 1). Unlike the other narrative groups, this group consisted mostly of women (65.5%), respondents below 40 years old (56.3%), and less educated respondents (45.2%).

Spatial analysis

Sixty-one respondents mapped 159 places where sheep farming should decrease (median of 1 place per participant, max 26 places). Fifty respondents mapped 95 places where no sheep farming should occur (median of 1 place per participant, max 9 places). In line with our expectations, we found that (i) respondents from N1 and N2 mapped more places for decreasing

Table 1. Coding scheme and supporting quotes for each narrative about sheep management preferences in the Faroe Islands (in response to the question: 'Please share with us 2–3 of your main hopes and/or concerns about the future development of sheep farming').

Narrative	Types of answers identified in coding	Example quotes
Sustainable sheep management (N = 79)	Too many sheep cause erosion, overgrazing, damage to landscape Too many sheep in outfields/per unit Number of sheep needs to be reduced (to avoid erosion or overgrazing) Sheep farming is unmanaged/uncontrolled Any reference to old or new systems to decide on number of sheep Any reference to suitable levels of grazing	'A disaster for the Faroese nature. Sheep farming should decrease everywhere [...]. Truly destroying for the nature and very undemocratic that a few people have the right to ruin all nature on land and earn money from it'. 'When it comes to the outfields, the Agricultural Agency should make a recommendation on how many sheep should be in the different outfields. It has shown that too many sheep in the outfields, make damage on the flora'. 'It would be good if experts would take a closer look on how overgrazed the terrain is in some places and after that pull a mark on how many sheep should be in that specific place'. 'My subjective impression is that the imported food for wintertime and twin-lamb has increased the grazing level and thereby the erosion. But it is subjective, maybe new wounds are more visible in landscapes than old wounds that are growing together slowly again'.
Nature without sheep (N = 23)	Having places without sheep to allow for nature/trees to grow 'No sheep experiments' to learn about what happens Any reference to stopping sheep farming as a whole in certain places	'If we had fenced areas, it would probably see another composition of plants, and not just the green Islands. I wish that Koltur would have been protected from all livestock, so we could get a picture of how the Faroe Islands looked like before the first people arrived'. 'I wish that more areas would become protected from sheep, to benefit the plant diversity and bird nests'.
Sheep as part of Faroese culture (N = 65)	Sheep farming as part of Faroese culture, history, landscape or identity Any reference to farming as an activity or hobby Seeing sheep farming as opportunity Overall positive attitude towards sheep and sheep farming	'Sheep farming in the Faroe Islands is quite misunderstood. It is a spare time activity. Probably the most normal spare time activity in the Faroe Islands. It is more economically efficient to buy foreign meat than to buy land for sheep farming'. 'It is important that we help the farmers in the Faroe Islands! Without them we lose a big part of our culture. Who are the Faroe Islands without the farmer and the sheep?' 'Sheep farming in the Faroe Islands is not commercialized, because we don't compete with the rest of the world, and by making it commercial, will the common Faroese lose the sheep, because the sheep will be in the hands of 10–30 big farmers. It can be compared to the fishing industry, where there is a big difference between a small fishing boat and a big trawler. The trawler is way more efficient. The sheep farming in the Faroe Islands is cultural, and because of that, it shouldn't be commercialized'. 'Sheep farming is something we should preserve, it is a part of our food, unity and culture. The bits and pieces that aren't used for human food, should be used for the animals [...]. It is a shame that the very nice wool isn't used a lot [...].' 'Sheep farming is an important part of Faroese culture and identity. The traditional sheep farming will not be changed a lot in the future [...].'
Sheep as nuisance (N = 50)	Any reference to accidents or sheep being too close to the road Any reference to sheep free villages Mention of neglected fences or other neglected infrastructure Mention of wool in field that cause problems for birds Pollution or other perceived damage from sheep farming	'I am pleased that many villages are free of sheep during wintertime. I think it is very cosy to hear sheep outside. But not when they jump in the gardens to eat the trees and plants'. 'Sheep farming is too uncontrolled in many places, and it is not good, that the farms feed the sheep next to the road. This is directly dangerous – especially for the tourists, that don't know, how often the sheep jump out on the road'. '[...] industrialize sheep farming. To make a road to the sheepfold, to drive with ATV vehicles in the outfields, to get machines to shear, to get an electrical machine to slaughter, to get machines to cultivate and drain, to fertilize with cow dung and salmon pickle. The result is that the sheep farming doesn't have the positive influences that a spare time activity should have for people, and worse, the nature gets irreparable damage by this spare time activity'.

Table 2. Average and total number of points mapped by respondents (n = 82) for 'decrease sheep' and 'no sheep' per narrative group.

	Average per respondent		Total number of mapped points	
	Decrease sheep	No sheep	Decrease sheep	No sheep
N1 – Sustainable sheep management	1.4	0.7	110	57
N2 – Nature without sheep	1.4	1.4	32	33
N3 – Sheep as part of Faroese culture	0.6	0.3	38	18
N4 – Sheep as nuisance	0.7	0.4	35	22

numbers and for no sheep per respondent, (ii) respondents from the most sheep supporting narrative (N3) mapped fewest places per respondents, and (iii) respondents supporting N2 mapped most places per respondents for no sheep (Table 2).

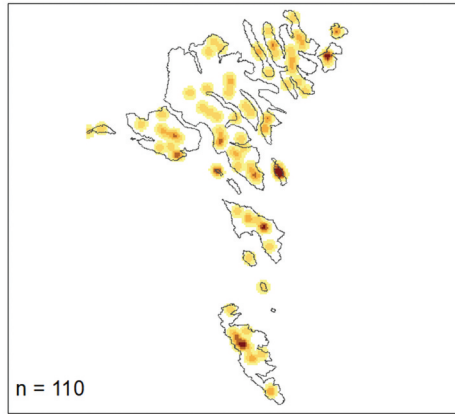
A number of general and narrative-specific findings emerged from the visual comparison of the maps in Figures 3 and 4. First, and more generally,

respondents mapped places on all Islands, indicating that concerns about the number of sheep are not limited to certain regions but widespread. A second general observation is that there is a substantial overlap between the locations of the mapped points, indicating an overall spatial preference agreement between narrative groups. This observation holds for both places where sheep numbers should decrease

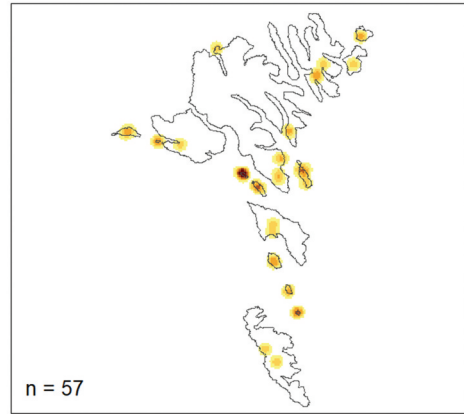
Narratives:

N1 - sustainable sheep grazing

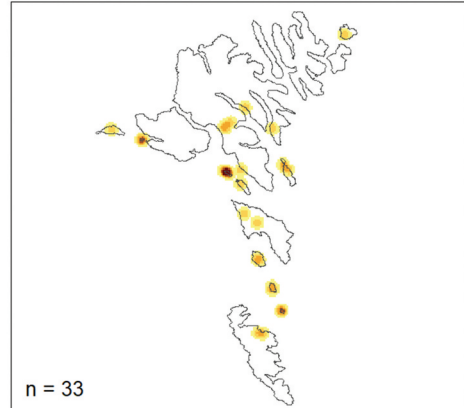
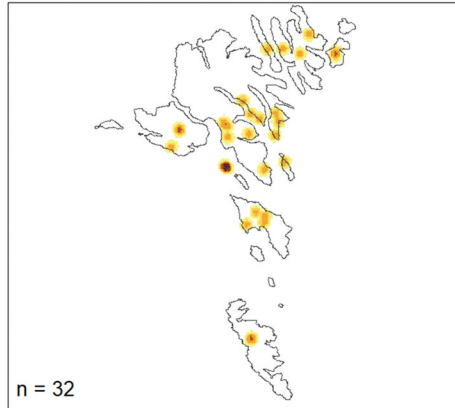
Places where sheep numbers should decrease:



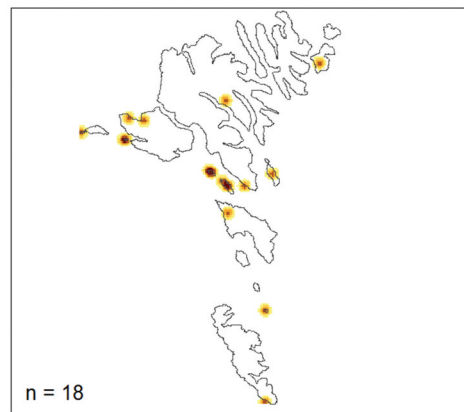
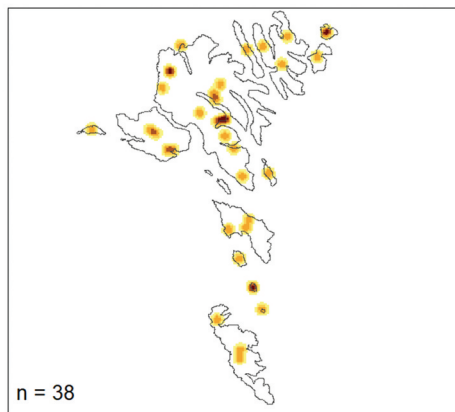
Places for no sheep:



N2 - nature without sheep



N3 - sheep as part of Faroese culture



N4 - sheep as nuisance

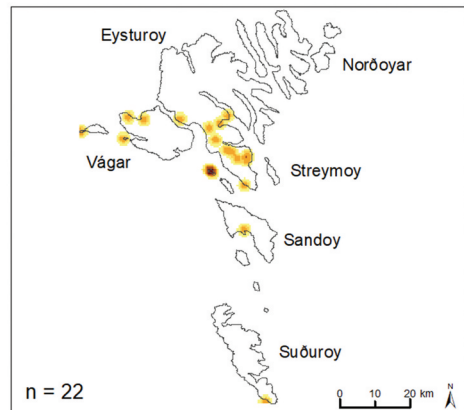
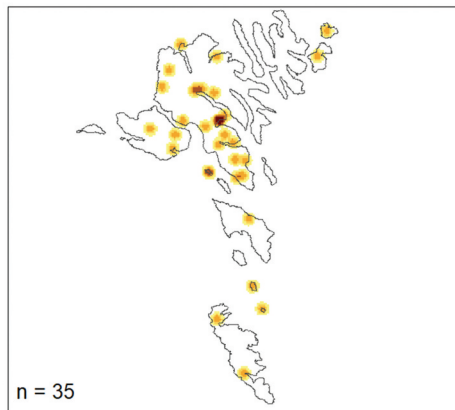


Figure 4. Locations of mapped points (kernel density) for the two management preferences for sheep farming per narrative. The number of mapped locations is shown as 'n'.

and places with no sheep. Smaller Islands, such as Koltur, Nólsoy, and Mykines, in particular were

suggested as possible places for no sheep. Koltur is the second smallest Island of the nation and

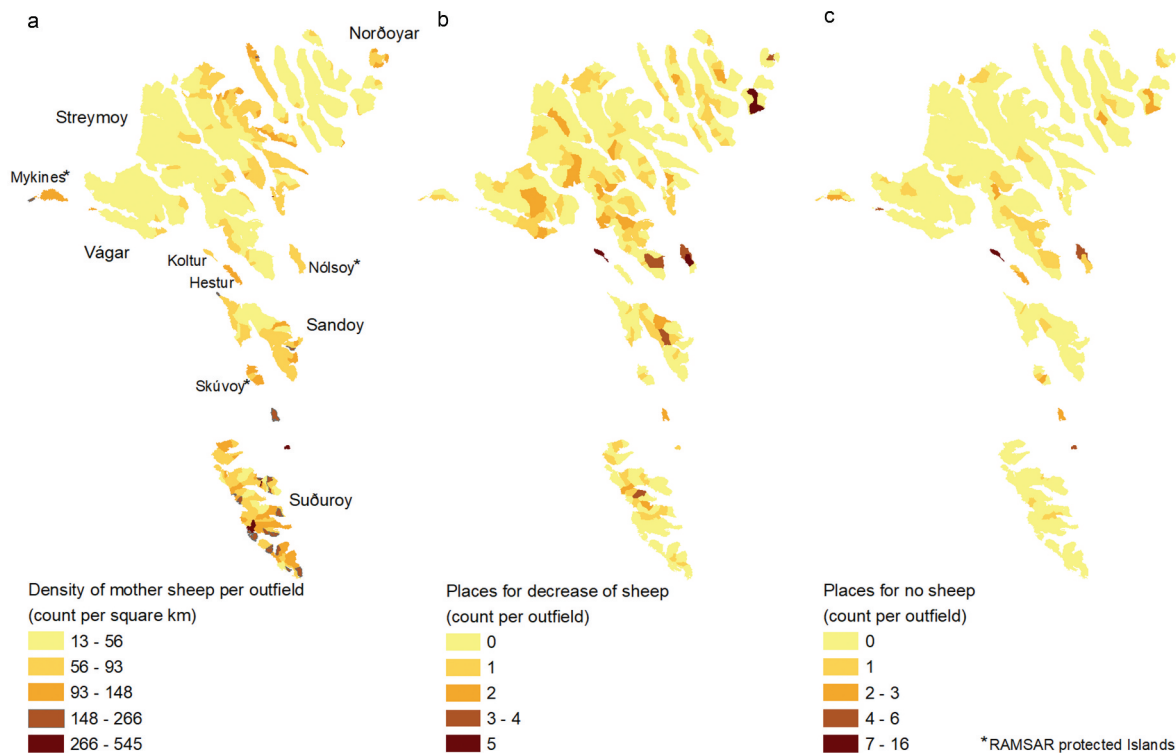


Figure 5. Sheep density (mother sheep per km²) compared to counts of summarised sheep management preferences (all data included). The maps highlight that the outfields with highest density of sheep (map a) are not the most mapped fields as places for decrease of sheep (map b) and places for no sheep (map c). The small Ramsar designated Islands are marked with an asterisk.

especially known for its cultural heritage value and potential for listing as a national park. Mykines and Nólsoy are wetlands of international importance as indicated by their designation as Ramsar sites (Figure 3, map b). For example, Mykines, the most Western Island provides breeding and feeding habitat for an estimated 250,000 pairs of seabirds of 15 species, including the Atlantic puffin (*Fratercula artica grabae*) and the Northern gannet (*Morus bassanus*) on Mykineshólmur.

When comparing spatial patterns across narrative groups, the fourth narrative ('Sheep as a nuisance') shows a slightly different spatial pattern where mapped places for 'no sheep' are clustered around the capital Tórshavn and other more populated regions (Figure 3, map d). This proximity to built infrastructure is clearly linked to the two main concerns expressed by this group, with regards to traffic accidents and sheep roaming in villages.

Finally, the visual map interpretation revealed that there was no clear spatial overlap between the sheep management preferences and the actual distribution of sheep on the Islands (Figure 3, map c). This interpretation was confirmed by a correlation test between an overall count of frequencies of sheep management preferences per outfield and sheep densities per outfield (Figure 5). In fact, the test showed a negative correlation between decrease and density (Spearman $Rho = -0.163$, $p < .001^{**}$). For example, areas with high

densities of sheep, such as Suðuroy, Sandoy, and the Eastern part of Eysturoy, have few mapped locations.

Discussion

In this study, we investigated public preferences for sheep management in the Faroe Islands. Our combined narrative and PPGIS approach revealed a gradient of perspectives on sheep management which can be understood visually through maps and through discourses. We showed that multiple narratives exist among the Faroese population and how each narrative is informed by different motives and has a different outlook on the future of sheep management. Our findings indicate that this is not simply a 'sheep vs. no sheep' issue but a more nuanced consideration of the place of sheep in the landscape and society. Figure 4 shows that respondents who regarded sheep as part of Faroese culture also identified places for no sheep – particularly small Islands. Those belonging to the narrative that sought nature without sheep named specific places and reasons but often also mentioned the socio-cultural values associated to sheep herding in the Faroe Islands. Our approach, similar to that of Lechner et al. (2020), was able to surface these nuanced perceptions within a population. We also demonstrated that concerns about sheep numbers do not necessarily spatially align with the actual distribution of sheep in the

Faroe Islands, suggesting sheep overgrazing concerns are, in part, socially constructed.

Respondents adhering to the ‘Sheep as nuisance’ narrative – expressed a strong wish to keep sheep outside of the major villages, and this was supported by spatial patterns where the mapped places were located in the vicinity of villages and roads (Figure 3 and 4). Even though our maps did not show the boundaries between infield and outfield, the responses indicated that these boundaries are becoming increasingly important and contested. In fact, sheep no longer have access to the infield in many of the larger villages (> approx. 1,500 inhabitants), as was the case previously. This conflict between traditional usage of the land and many of the modern inhabitants’ way of living is likely a sign of: (i) the diversification of the Faroese economy from sheep farming to other activities, including tourism (Raymond et al. 2021) and salmon farming (Bogadóttir 2020b), (ii) changes in land ownership patterns (Statistics Faroe Islands 2019), and (iii) growth in urban populations, increasing the divide between urban and rural life.

More generally, our findings confirm that the practice of sheep farming is driven by socio-cultural factors and not by economic incentives. More than 92% of the land in the Faroe Islands is used for sheep-farming, but the economic revenue is marginal (only 0.1% of the total Faroese gross domestic product). The third narrative ‘sheep as part of Faroese culture’ strongly supports this view. Respondents that were assigned to multiple narratives often referred to both the cultural importance of sheep husbandry and its negative impacts for nature. Small and remote Island communities are increasingly confronted with trade-offs between development (e.g. tourism, industry) and maintaining a sense of community as well as the natural value of their landscapes (e.g. Lechner et al. 2020) and the Faroe Islands are no exception (Raymond et al. 2021).

We interpret the negative correlation between areas mapped for decreasing sheep numbers and areas of high sheep densities as reflecting the expressed nuances in the narratives in terms of both expressing wishes for decrease and removal of sheep, but at the same time also acknowledging the importance of sheep for the Faroe landscape and culture. Hence, decrease areas designated by locals were the most marginal areas in terms of numbers of sheep. However, we also interpret this result as reflecting desired decrease areas to relate to promoting alternative preferred landscape functions and qualities, such as gardening and traffic in populated regions and protected area values (i.e. the three small Islands highlighted across all narratives).

Relevance for policy and practice

Narratives can provide practical guidance to planners, policymakers, and managers. For example, emerging

or changing narratives can provide windows of opportunity for new policy directions by intervening in different parts of the policy process (e.g. agenda-setting, policy adoption, or policy implementation; Lejano et al. 2013). Policy changes in the Faroe Islands are unlikely given the long history of sheep husbandry and its strong traditional and cultural roots within the society (Brandt 2021). While many of our respondents seem to be in favour of regulating sheep numbers, either by establishing sheep free zones or through better-informed decision-making, there is also a strong counter-narrative that supports sheep farming practices and values the old ways of working. We did not encounter any evidence or examples of ongoing disputes or societal pressure on the government to force change.

Two other reasons may explain the dominant discourse of agriculture and reluctance to change. First, previous studies reported a lack of data to support decisions on management of sheep in the Faroe Islands, such as erosion maps or biodiversity maps (e.g. Bjarnason et al. 2008). Second, in contrast to other countries in the North Atlantic region (Petursdottir et al. 2013, 2017), there are no ecological restoration projects in the archipelago so that the appearance and benefits of ungrazed or less grazed outfields are virtually unknown (Hagen et al. 2013). However, our findings also indicate that if it becomes political opportune to regulate sheep numbers, there are certain areas where such regulation would be supported across the different narratives about sheep management in the Faroe Islands, e.g. the small Islands of Koltur, Nólsoy, and Mykines.

Limitations and future directions

We acknowledge that our study has some limitations. The sampling of respondents was presumably affected by self-selection bias, meaning that respondents with a particular interest in the topic of landscape values were more willing to participate. Self-selection may have led to a sample with a higher education level than the average population, possibly resulting in an overrepresentation of the popularity of N1 (sustainable sheep grazing) and N2 (nature without sheep) that both were dominated by people with higher education levels. Hence, we expect that the popularity of these narratives would be less pronounced with a fully representative sample.

Previous studies show that individuals with more education are in general more concerned about the environment (Gifford and Nilsson 2014; Vaske et al. 2001). Reports specific to the Faroese context note that ‘People with the second longest and longest educations have less confidence than the rest of the population that the Faroese nature is managed in a responsible manner’ (Rørbo 2004, p. 69, translated

from Danish). The narratives presented in this study provide a way of identifying a spectrum of perspectives on sheep management independent of education level, thus moving beyond dichotomies of 'high or low concern' or 'support' or 'oppose' sheep management. Policies can then be tailored to a wider variation of concerns, which are also grounded in the socio-cultural values assigned by residents to specific places in a given region.

Online surveys in general, and especially mapping exercises, may be challenging for elderly groups in society (Gottwald et al. 2016). This may explain why we have fewer older people (above 60) represented in our sample compared to the national population (see Appendix 3). More than half of the respondents only provided qualitative data and did not map any points. This reluctance for mapping could relate to perceptions of the mapping exercise as being more demanding and time consuming compared to simple text replies. It could also be explained by the fact that we had limited options for mapping places, including only places where sheep numbers should decrease or where there should be no sheep at all. In future research, it may be more straightforward to include a question of where in the landscape the number of sheep should stay the same or increase, which could be the preferred scenario for some respondents.

Our findings point to several areas of interest for future research. A number of respondents referred to the importance of, or the need for, specific types of knowledge to decide on suitable grazing levels or sheep numbers per area. While some called for a better scientific understanding of grazing effects, others were of the opinion that farmers know best. Future studies could look into the role of different types of knowledge in decision-making and how they influence or guide people's opinions (Tengö et al. 2017). Further research could also compare prevailing narratives between different societal and policy actors, for example by conducting interviews with government officials or analysing policy documents from other sectors affecting sustainable land use (e.g. agriculture, tourism, environment).

Conclusions

Land use for sheep management in the Faroe Islands is strongly linked to historical and social rules, and these are still prevalent today. We provided a novel spectrum of attitudes toward sheep management representing the interplay between place-based management concerns and broader narratives of sheep management. Drawing on the results, we argue that sheep management needs to be not only based on the perceived impacts that sheep are having in a given area but also on the deeper socio-cultural values and meanings associated with sheep that are grounded in

nature conservation, cultural and agricultural practices. This interplay moves discussion of sheep management beyond 'go' and 'no go' areas, to a spectrum of narratives that take account of sheep as a public nuisance, sheep as core components of nature, sheep as a core part of culture, sheep as part of sustainable grazing, and sheep needing to be removed from the socio-ecological system. Public concerns related to the impacts of overgrazing on nature and road safety co-exist with the appreciation of the cultural value of sheep farming and sheep meat. Future management of sheep in the Faroe Islands will depend on how these values are prioritized.

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