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SustAinimal Grazing Living Lab – a survey of grazing management on dairy farms in northern Sweden

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ABSTRACT

A survey was conducted on 302 Sweden dairy farms (response rate 98%) to identify grazing and grassland management strategies and main challenges to grazing in northern Sweden. The most common grazing strategy on all dairy farms was continuous grazing (59%) followed by rotational grazing (45%), while organic dairy farms preferentially adopted rotational grazing (69%). The main challenges reported in grazing dairy cows on temporary grasslands on conventional farms were trampling damage and seasonal variations in grass growth, while for organic dairy farmers, the primary challenge was weed control. Only a few farms had grazing on semi-natural grasslands. Future sustainable grazing should focus on optimising grazing strategy in relation to on-farm grazing locations and nutrient supply for high-yielding dairy cows.

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Conventional farm; dairy cow; organic farm; temporary grasslands; semi-natural grasslands; pasture; sustainable production

Introduction

Around 53% of agricultural land in Sweden is currently under temporary or semi-natural grasslands but with large regional differences. In the six most northerly counties grass leys dominate, with 77% of arable land registered as temporary grasslands, and an additional 5% as traditional meadow (Swedish Board of Agriculture 2021a, 2023a). Consequently, milk production is an important part of the agricultural food production system in northern Sweden. However, over the past decade milk production in the northernmost counties of Västerbotten and Norrbotten has declined by 7.7% and this decline is predicted to continue until 2030 (Landquist and Behaderovic 2021).

Since the introduction of the Swedish Animal Welfare Act in 1988, there has been a grazing requirement for all dairy cows in Sweden. Grazing on pasture as a feed resource is regarded as a natural behaviour for all cattle, so cows kept for milk production and aged more than six months must be let out on pasture in summer (SFS 1988:539). The Swedish grazing policy framework states in particular that between May 1 and September 15 every year, cattle used for conventional milk production should be allowed out on grazing for at least 6 h per day on 60 days in northern Sweden, 90 days in central Sweden, and 120 days in southern Sweden (Swedish Board of Agriculture 2023b). Milk production has undergone major changes since this grazing legislation came into force. The number of farms involved in milk production and the overall number of cows in milk production has decreased substantially since 2000 (by 78% and 31%, respectively, in 2022) (Swedish Board of Agriculture 2022). At the same time, the average herd size has increased, from 34 dairy cows in 2000 to 102 in 2021 (Swedish Board of Agriculture 2021b). Greater herd size in milk production can provide competitive advantages but also poses challenges in terms of rational and economically viable grazing management.

In 2020, the Federation of Swedish Farmers (LRF) called for a change to the requirement on grazing and outdoor stay for dairy cows, citing a continuing decrease in Swedish self-sufficiency rate of raw milk and more dairy farms being forced to quit (LRF 2021). LRF claimed that removing the requirement would reverse reductions in milk production and longer rearing times, while the welfare of milking cows kept in loose-housed systems would not be adversely affected (LRF 2021).

SustAinimal, a Swedish centre for knowledge on the role of production animals in competitive, sustainable,

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and resilient agriculture and food production, investigates the best solutions for food production within three regions: northern, central, and southern Sweden. The aim of the present SustAinimal study was to conduct a survey of members of the northern dairy company Norrmejerier as regards current grazing strategies and constraints and challenges to grazing dairy cattle on temporary and semi-natural grasslands in the boreal region of Sweden.

Materials and methods

Study region

The study region, northern Sweden (62°–67°N), comprises the counties Norrbotten, Västerbotten, Västernorrland, and Jämtland. A questionnaire was sent out in December 2021 to all dairy farms delivering milk to Norrmejerier, which comprised a total of 308 dairy farms (of which 53 were organic (KRAV®-certified)) in that year. Member farms had approximately 21,000 milking cows (mean 71 cows per farm) in 2021, producing 201 million kg of raw milk in total in that year. A majority (58%) of these dairy cows were kept in a loose-house system.

The farms surveyed were characterised by silty soils, mostly cropped with temporary grasslands of which leys aged between 1 and 4 years dominated (61% of farms) at the time of the survey, while leys aged more than 4 years were less common (12%). The remaining land on the survey farms was mainly used for the cultivation of cereals (particularly barley and oats), semi-natural grasslands, silvopasture, and fallow.

Questionnaire and dairy farms

The survey was based on a one-page questionnaire, to facilitate handling, and contained both multiple-choice questions and open questions. These questions covered the dairy herd, housing systems, land use (specifically in relation to pasture use and type), and daily hours spent by the dairy cows on grazing. Farmers were also asked about the type of pasture used for different groups of animals in the dairy herd. The next section of the questionnaire contained in-depth questions regarding on-farm management of temporary grasslands for pasture and the grazing system. Finally, farmers were asked to describe the greatest challenges with using temporary or semi-natural grasslands as pasture and with having their dairy cattle out on grazing.

Results

The response rate in the survey was 98%, with complete responses obtained from 302 of the 308 farms targeted in the survey. This high response rate was probably because the one-sheet questionnaire was included in a larger questionnaire that farmers had to answer in order to continue supplying milk to Norrmejerier dairy. The six farms that did not participate in the survey have decided to quit dairy farming in the near future.

Grazing on arable land dominated the dairy farms responding to the survey. Only 2% of agricultural land on participating farms was semi-natural grasslands, used for grazing by growing cattle and heifers. Around 39% of the farms kept their dairy cows on pasture for 3–3.5 months per year and 31% had their cows on pasture 4–5 months per year. The distance between barn and pasture varied, but dairy cows often grazed within half a kilometer on average (range 0–1.5 km) from the barn, while dry cows and heifers grazed on average 3.5 km from the barn (range 0–25 km). The time per day spent by the dairy cows on pasture ranged from 7 to 24 h, with an average of 13.5 h. No information about supplementary feeding was collected in the questionnaire.

Pasture on temporary grasslands

The most common grazing system on all the dairy farms participating in the survey was continuous grazing (59% of farms), where the same grazing area was available to the cows throughout the grazing season. The second most common system was rotational grazing (45%), where the grazing area was divided into different paddocks and the cows grazed one paddock at a time and then moved to the next. The least common grazing system was compartmented continuous grazing (30% of farms), where the total grazing area is large but the actual grazing area is controlled by the farmer moving fences at certain intervals. On the 53 organic farms, rotational grazing was the most common system (69% of farms), followed by continuous grazing (54%) and then compartmented continuous grazing (40%). Several farms, conventional and organic, used a combination of grazing strategies. The greatest differences between rotational grazing and compartmented continuous grazing were the size of the grazing area and the number of grazing days per paddock (Figure 1). The average area per compartment in rotational grazing was smaller than that in compartmented continuous grazing. The cows grazed on average for 6.3 days before changing paddock in rotational grazing and 22.3 days before changing paddock in compartmented continuous grazing. The number of days in which the pasture was allowed to grow between grazing occasions was 16–17 days in both rotational and compartmented continuous grazing.

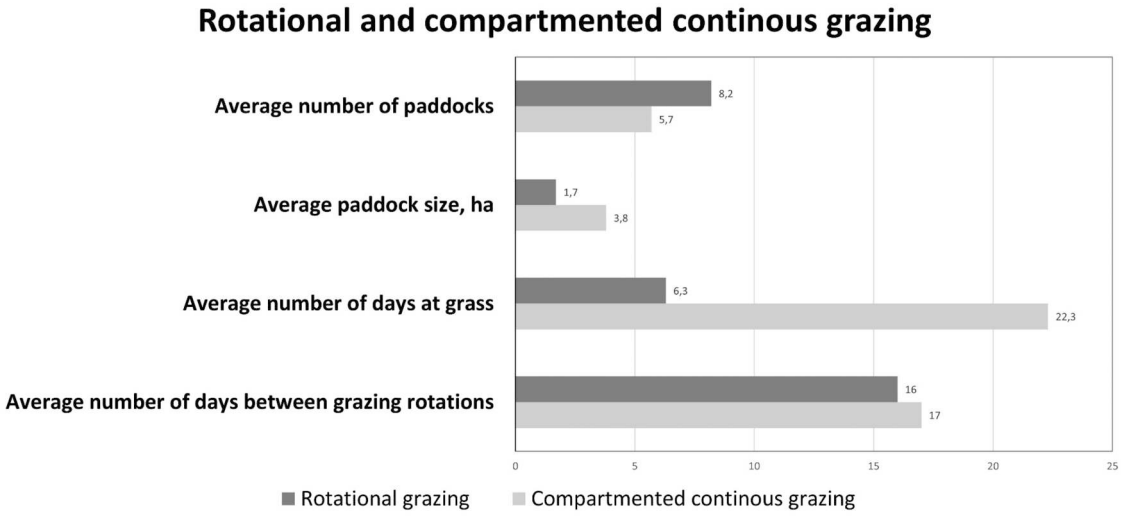

Figure 1. Details of rotational grazing and compartmented continuous grazing in northern Sweden.

The most common seed mix used in temporary grasslands (62% of farms) consisted of red clover (*Trifolium pratense* L.) and timothy (*Phleum pratense* L.) or red clover, timothy, and meadow fescue (*Festuca pratensis* Huds.). The same seed mix was used on temporary grassland for silage preservation. Around 33% of the farms used a typical pasture mix, which usually consisted of white clover (*Trifolium repens* L.), timothy, meadow fescue, red fescue (*Festuca rubra* L.), and smooth-stalked meadow grass (*Poa pratensis* L.). Some farms used a pasture seed mix with perennial ryegrass (*Lolium perenne* L.) (15% of farms) or a customised mix. Based on the survey responses, ley longevity was 4.6 years on average (range 2–11 years). Most (82%) of the farms mowed their temporary grasslands several times per season (1.8 times on average) and 24% rejuvenated their leys by adding seeds to the existing sward during autumn.

The majority of the dairy farms surveyed (at least 62%) used organic manure, mainly in the form of slurry (65% of farms) and/or urine (25%). On average, 22 tonnes of organic fertiliser were used annually, corresponding to approximately 38 kg nitrogen per hectare, and were applied in autumn (56% of farms) or spring (32%). In addition, 54% of the conventional dairy farms used mineral fertiliser supplying an average of 52 kg of nitrogen per hectare and year. The most commonly used product was NS 27-4 (80% of farms) and the second most common was some form of NPK fertiliser (18%). A few farms also used calcium nitrate.

Grazing dairy cows on temporary grasslands was reported to be associated with challenges (Figure 2). The greatest challenge on all farms was problems with wet ground, and thus trampling damage. Other challenges mentioned were lack of available land, drought, weeds, and time-consuming and labourious work in fixing and erecting fences and maintaining milk yield levels. The organic farms cited wet soil (47% of organic farms) and weeds (17%) as their greatest challenges.

Pasture on semi-natural grasslands

The greatest challenges reported for grazing on all semi-natural pastures (only 2% of participating farms) were time-consuming clearing of bushes and erecting and repairing fences (Figure 3). Other challenges mentioned were the lack of suitable semi-natural grasslands close to the farm, variable grass growth over the season, and low or variable plant nutrient availability. Some farms also mentioned challenges such as weeds, mainly docks (*Rumex crispus* L.), and the ground being too wet and semi-natural grasslands being trampled and destroyed. The organic farms cited clearing bushes (35% of farms) and seasonal variation in pasture availability (23%) as the greatest barriers to the use of semi-natural grasslands.

Discussion

Under current Swedish animal welfare legislation (Animal Welfare Act 2018:1192), production animals must be kept and cared for in a good environment where their welfare is promoted, and where they can perform behaviours that are intrinsically strongly motivated. Grazing is generally regarded as having a positive impact on the welfare of cattle, by providing them with opportunities to perform natural behaviour, and hence an annual summer grazing period is mandatory under Swedish legislation (Swedish Board of Agriculture 2014). There are conflicting opinions in Sweden regarding this grazing requirement, e.g. the Federation of

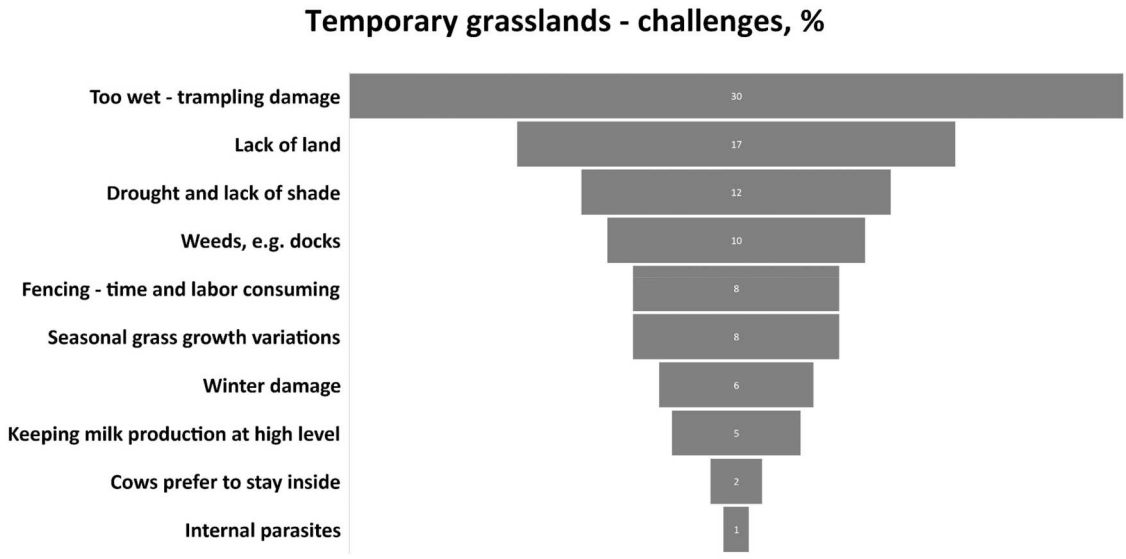

Figure 2. Challenges in grazing dairy cows on temporary grasslands in northern Sweden (based on responses from 75% of 302 participating farms).

Swedish Farmers claims that it prevents Swedish dairy farmers from being competitive as herds become larger, and argues that it is neither practically nor economically viable to legislate access to pasture. This opinion is in line with the general trend for larger farms and less grazing in Europe during the period 2010–2019, as reported by Van den Pol-van Dasselaar et al. (2020).

According to some general opinions among farmers' associations, the Swedish food strategy established in 2017 (prop. 2016/17:104) has not fulfilled the expectation of increased competitiveness of Swedish food production. Swedish self-sufficiency in milk and dairy products was around 74% in 2017 (of which cheese was just over 40%) and self-sufficiency in beef was 54% (IVA 2019), and neither value has substantially improved since then. On the other hand, a recent investigation by Gustafsson (2021) indicated that Swedish consumers view grazing as important for cow welfare, and support the existence of the grazing legislation. According to scientific studies by Arnott et al. (2017) and Crump et al. (2019), grazing on pasture provides welfare benefits such as better hoof and leg health, less mastitis, and lower mortality in dairy cows. It has

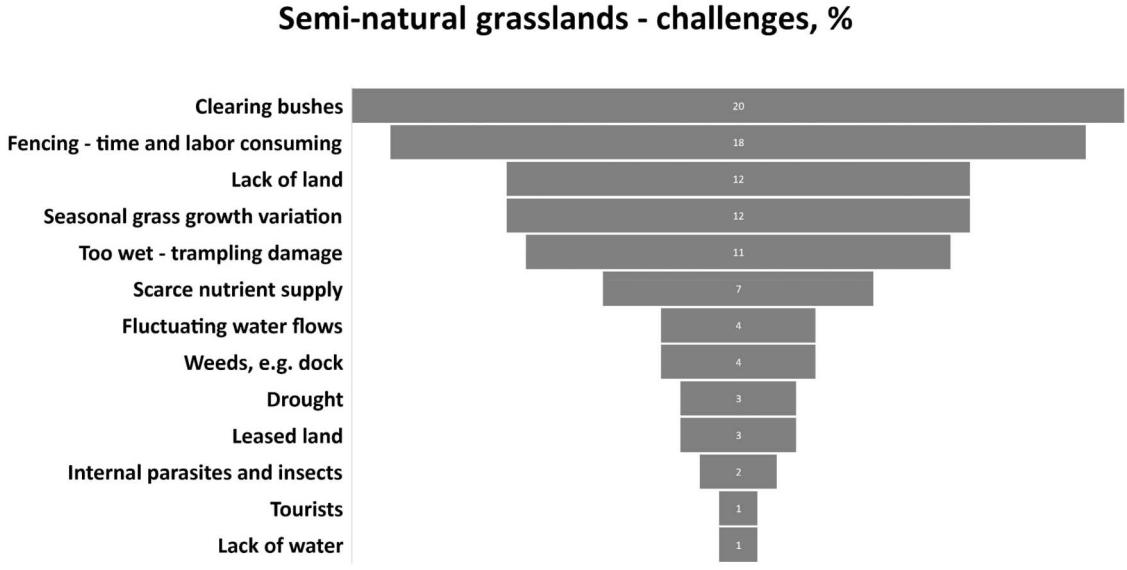

Figure 3. Challenges in grazing dairy cows on semi-natural grasslands in northern Sweden (based on responses from 36% of 302 participating farms).

also been demonstrated that grassland contributes ecosystem services, e.g. improved arable land fertility, carbon storage, and biodiversity (semi-natural grasslands) (Cederberg et al. 2018; Henryson et al. 2018).

If the ongoing structural development in Swedish milk production continues, in future, farms will be larger, while small- and medium-sized milk farms will continue to disappear. Larger herds will require better on-farm grazing logistics, which is considered the most important farm-specific constraint to grazing in Europe (Van den Pol-van Dasselaar et al. 2020). To overcome this challenge, grazing logistics must be taken into account not only around the farm, e.g. fencing and walkways, but also in the barn already at the construction stage. Dairy farms in northern Sweden that participated in the present study had on average 71 dairy cows and can be regarded as typical medium-sized dairy farms. Lack of land was ranked as the second most frequent challenge in the management of temporary grasslands for pasture in northern Sweden, and the third most frequent challenge in the management of semi-natural grasslands. The main constraint/challenge reported when using temporary grassland as pasture for dairy cows was trampling damage and wet ground, but this only ranked fifth when using semi-natural grassland as pasture. The high ranking of this challenge may relate to the prevalence of continuous grazing systems and the dominance of conventional farms in the survey sample. The main constraint/challenge to using semi-natural grassland as pasture for dairy cows was clearing bushes, while time- and labour-consuming fencing work was reported to be the second most frequent challenge.

In focus group discussions by the European Grassland Federation Working Group on Grazing 2010-2019, Van den Pol-van Dasselaar et al. (2020) identified three main types of constraints on grazing: region-related, farm-related, and famer-related. The most frequently reported challenges in using temporary grassland as pasture for dairy cows in northern Sweden can be characterised as farm-specific constraints, while for semi-natural grasslands the main constraint (time- and labour-consuming fencing work) is clearly farmer-specific. Region-related challenges, such as seasonal growth variation and drought, are more unpredictable and more difficult to overcome.

One question not addressed in the survey was herbage intake on pasture. Many farms in the study region probably use supplementary feed during the grazing season, which will affect herbage intake. Providing access to pasture in compliance with existing legislation does not necessarily result in high performance, so some farmers only allow their dairy cows to graze outdoors in order to comply with the law while fulfilling their nutritional requirements by other means.

To improve pasture-based milk production, more knowledge is needed throughout the agricultural and knowledge system (farmers, advisors, students, researchers, and the general public). Various technical management tools are available in other countries and could be applied in Sweden, e.g. a virtual fencing system that increases labour efficiency has been developed in Norway (Van den Pol-van Dasselaar et al. 2022). For temporary grasslands, decision support tools such as Pasture-Base Ireland is important (Hanrahan et al. 2017) and the FarmWalk programme for grassland management by dairy farmers is used throughout Europe (Hennessy et al. 2020). In ongoing work, SustAinimal has established Grazing Living Labs in three different regions in Sweden (north, west, and south) in order to increase the co-creation of knowledge over the coming years.

Conclusions

A survey of dairy farms in northern Sweden identified different grazing and grassland management strategies on temporary and semi-natural grasslands. The most common grazing strategy on all dairy farms was continuous grazing followed by rotational grazing, while organic dairy farms preferentially adopted rotational grazing. The survey also revealed challenges related to grazing temporary and semi-natural grasslands. The most frequently reported challenges relating to grazing dairy cows on temporary grasslands were farmer-specific constraints related to grazing logistics on-farm, partly because continuous grazing was the most commonly adopted grazing strategy on participating farms. The greatest challenges reported for grazing on semi-natural pasture were time-consuming clearing of bushes and erecting and repairing fences, and lack of suitable land close to the farm. That can partly explain the small representation of semi-natural grasslands in northern Sweden.

The next step in work by SustAinimal is to identify some dairy farms that can serve as inspiring examples of best practices and some farms that are willing to become pilot farms for the development and optimisation of pasture management. Optimisation opportunities can be derived from compartmented continuous grazing to increase production on temporary grasslands. There will also be opportunities to increase the proportion of semi-natural grasslands in northern Sweden in future, as the upcoming version of the EU Common Agricultural Policy (CAP) will increase compensation to farmers for the management of semi-natural pastures. Another goal of future work within the framework of SustAinimal is a comparison of grazing strategies in northern Sweden with those in southern and western Sweden.

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Disclosure statement

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