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The Effect of Goat Grazing on the Biodiversity of Pannonian Dry Grassland

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Abstract: In this study, we analyzed the phytosociological data from four sample sites located in the Pannonian region. The study areas, ranging from 2.4 to 2.5 hectares, have been subjected to goat grazing and mowing for 24 years. N1: Nagyréde, an overgrazed pasture with 24 goats; N2: Nagyréde, a mown field; C1: Csokvaomány, a lightly grazed pasture with 12 goats; and meadow C2: Csokvaomány, a site that is both mown and grazed. Six phytosociological surveys were conducted randomly in each area. We also considered the conservation value, biomass production, and forage values. Phytosociological data were processed using hierarchical cluster analysis and the non-parametric Kruskal–Wallis test. The overgrazed pasture (N1) exhibited the most degraded vegetation community, dominated by weeds and disturbance-tolerant species. The overgrazed (N1) pasture had a low forage value because of the different timing of treatments. Even in the lightly grazed pasture (C1), the proportion of species indicative of degradation was significant. The species composition of the areas indicated that the mown and subsequently grazed area (C2) had outstanding values. The species richness of C2 was twice that of the mown field (N2). Based on the present study, a combination of light grazing pressure and mowing is the most suitable approach for managing and economically utilizing these grasslands.

Keywords: grazing; mowing; meadow management; *Festuca* species; forage value

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1. Introduction

The significant influence of herbivorous species on the pattern and structure of grasslands, both historically and currently, has been widely acknowledged [1–4]. Grazing

animals have played a crucial role in the formation and maintenance of grassland diversity [5]. The co-evolution of grazing and vegetation has been shaped by environmental factors, a relationship confirmed by numerous studies [6–9], although some findings contradict this [10–14]. According to Díaz et al. [15], centuries of grazing by domestic animals has favored trampling and deciduous plant species, contributing to the development of species-rich plant communities. Grazing animals enhance and maintain the spatial heterogeneity of grassland structure and vegetation composition [16–21]. Different grazing animals can exert varying impacts on grasslands [22].

Adaptation to recent climate changes poses a challenge for grassland ecosystems. Long-term data on this subject are scarce but are crucial for documenting the natural variability of grassland vegetation [23,24]. In the formation of the Pannonian grasslands, alongside original co-evolutionary impacts, human activities such as deforestation, burning, land clearing, and abandonment have played a significant role [25]. Most grassland vegetation has developed as secondary habitats due to human activities [26]. Therefore, their persistence depends on appropriate management and use [27–29], typically through mowing or grazing [30–32]. Activities that ensure the long-term survival of grasslands are particularly important [14]. In recent years, combating invasive species has also become a priority [33,34].

Hungary belongs to the continental region, characterized by a permanent grassland proportion of 10–30% of agricultural land [35]. Hungary also lies within the Pannonian biogeographic region [36–38]. In this biogeographic region, goat grazing is of lesser significance [39], with its importance primarily in areas with poorer soil, such as heathlands [40,41]. Additionally, goat grazing often occurs alongside sheep grazing [42,43]. This type of grazing has significant conservation advantages, as it promotes the development of a mosaic-like vegetation structure. Hajnáczki et al. [44] demonstrated that goats are suitable for grassland maintenance and management. Over the past 250 years, there have been numerous changes in animal feeding practices, including the forage value of certain grassland species [45]. For instance, Hajnáczki et al. [44] successfully used invasive species like *Solidago gigantea* (giant goldenrod) and *Calamagrostis epigeios* as mass forage for goat feeding.

Goat grazing is also prominent in various regions, such as the Mediterranean or in arid areas [46–52]. In these regions, goats are economically significant, especially as milk producers [53].

On the basis of the literature cited and our field experience to date, our hypotheses are as follows:

1. Moderate goat grazing prevents shrub encroachment without reducing grass cover.
2. Due to the combination of different treatments over time, the meadow is the most valuable site in terms of grassland management.

In this study, we examine and compare the vegetation of areas with long-term, 24-year grazing and grassland management under varying grazing pressures. The research question is how different grazing pressures and grassland management types (grazing, mowing, and their combination) affect the species composition of grasslands. What is the species richness and economic value of the grasslands under long-term management?

2. Materials and Methods

2.1. Study Areas

The study was conducted on two sample sites within the Pannonian biogeographic region, located in the Carpathian Basin, Hungary. The sites are situated at the western foothills of the Mátra Mountains in Nagyréde and the northern foothills of the Bükk Mountains in Csokvaomány (Figure 1). Based on the Braun–Blanquet method [54], we

conducted surveys in six randomly selected 2 × 2 m quadrats per site, recording the GPS coordinates of each. These surveys took place on 5 and 6 May 2024, at the very start of the grazing season and before mowing.

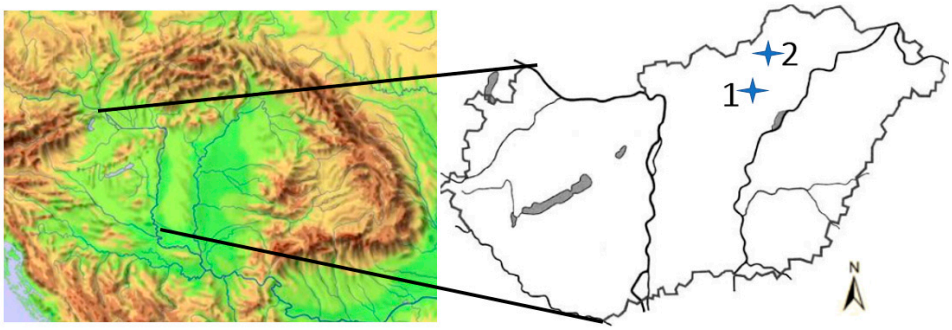


Figure 1. The location of the sample sites in Hungary (1: Nagyréde; 2: Csokvaomány).

The study sites and their vegetation are characterized as follows:

Nagyréde:

N1: 2.5 ha pasture dominated by *Festuca pseudovina* and *Lolium perenne*, with a grazing pressure of 9.6 mother goats/ha. This area has been grazed by 24 mother goats and their offspring since 1999, totaling 25 years of continuous grazing.

N2: 1 ha hayfield dominated by *Poa angustifolia* and *Arrhenatherum elatius*.

Csokvaomány:

C1: 2.4 ha pasture dominated by *Festuca pseudovina* with a grazing pressure of five mother goats/ha. This area has been grazed by 12 mother goats and their offspring since 2000, totaling 24 years of continuous grazing.

C2: 2.4 ha meadow managed by mowing the first growth and grazing the regrowth, dominated by *Festuca pseudovina*. After mowing, this area is also grazed by 12 mother goats and their offspring, with a grazing pressure of 5 mother goats/ha from July to October.

Species classification was based on Simon's [55] conservation value categories (TVK) and Borhidi's [56] sociological behavior types (SBT). Life form analysis was conducted according to Pignatti's [57] life form types. Species names followed the taxonomy provided by Király [58].

2.2. Statistical Analysis

To compare the results across the four sample sites, we performed a multivariate hierarchical cluster analysis (UPGMA—Unweighted Pair Group Method with Arithmetic Mean [59]), using Euclidean average distance.

For further analysis, the phytosociological data were grouped as follows:

- **A**: Four categories based on Simon's [55] conservation categories and Borhidi's [56] species groups: (1) Grasses (Poaceae); (2) Legumes (Fabaceae); (3) Weeds; (4) Other species.
- **B**: Five categories based on forage value according to Balázs [60], Klapp et al. [61], and Briemle et al. [62]: (1) Toxic or harmful species; (2) Neutral or low-value species; (3) Low-value forage plants; (4) Useful forage plants; (5) Forage-enhancing species.

We used non-parametric statistical methods to analyze the species coverage values across different groups and supplemental materials. The Shapiro–Wilk test indicated that these variables did not follow a normal distribution ($p < 0.05$). Therefore, we applied the non-parametric Kruskal–Wallis test ($\alpha = 0.05$). The non-parametric Dunn test with Bonferroni correction was used for multiple pairwise comparisons. Data analysis was performed using XL-STAT 5.1 V2 software [63].

From the point of view of the topic, diversity of vegetation is particularly important. Therefore, after contracting the data based on vegetation types, they were also analysed using Shannon, Simpson diversity, and using Rényi diversity profiles [64].

3. Results

Based on the cluster analysis, the quadrats of the individual min areas form uniform clades; the differences of the sample squares of the individual min areas are almost identical (Figure 2). The N1 sample area is already separated from the other clades at a level of more than 80% dissimilarity. The C1 min-area separates from the three-element clade at the highest level of dissimilarity, which also groups the quadrats of the only grazed area. The squares of the N2 sample area are closest to the squares of the C2 sample areas; the vegetation of these two areas is the most similar. In both areas, mowing is also part of grassland management.

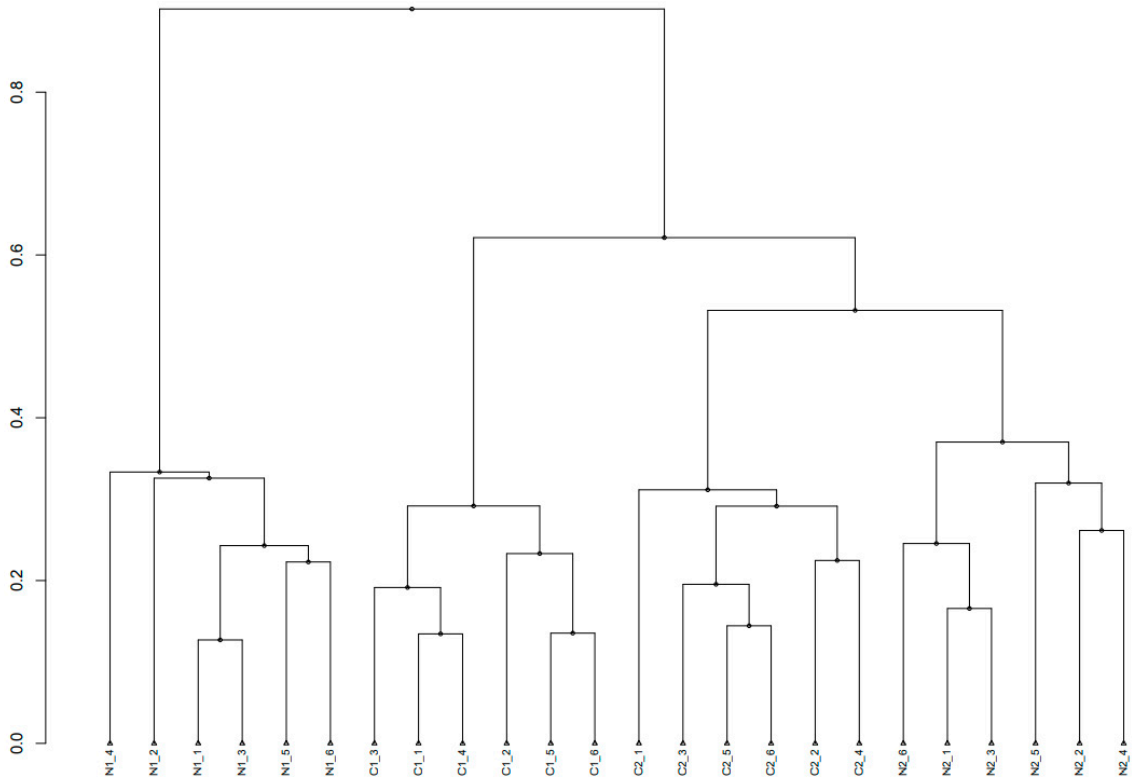


Figure 2. Classification of quadrats from the studied areas (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

Among the sample sites, the N2 hayfield exhibited the lowest species richness, followed by the heavily grazed N1 site, then the C1 site, with the C2 sample site being the most species-rich (Table 1).

Analyzing species composition (Table 1) further revealed significant differences in vegetation across the sample sites. *Festuca arundinacea* and *Festuca rupicola* were only present in the N2 area, where *Arrhenatherum elatius* also had the highest coverage. The species composition analysis showed significant differences compared to the C2 sample site, where *Festuca pseudovina* coverage was twice that of the N2 sample site.

Table 1. Species count per quadrat and average species count per sample site (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

Items and Sample Sites	**N1**								**N2**							
No of Quadrats	1	2	3	4	5	6	mean	SD	1	2	3	4	5	6	mean	SD
No of speceis	27	36	28	26	35	33	31	4.36	19	28	22	24	24	24	24	2.95
	C1								**C2**							
No of quadrats	1	2	3	4	5	6	mean	SD	1	2	3	4	5	6	mean	SD
No of speceis	21	37	33	28	39	39	33	7.17	29	46	35	42	46	44	40	6.89

Beyond species count, the composition of species constituting the vegetation is also critical. From a grassland management perspective, the most significant groups are the grasses (Poaceae) and leguminous species (Fabaceae). The coverage of grass species was lowest in the exclusively grazed areas (N1, C1) (Figure 3A), followed by the meadow-used area (C2), with the highest grass biomass found in the mown area (N2). Based on these values, the overgrazed pasture (N1, 17.8 ± 2.4%) differed significantly from the mown (N, 254.5 ± 4.0%) and meadow-used (C2) areas ($p < 0.0001$, $p = 0.003$). The mown area (N2, 54.5 ± 4.0%) differed significantly from low grazing pressure (C1, 27.0 ± 2.6%) area ($p = 0.003$). The mown area (N2, 54.5 ± 4.0%) did not differ significantly from the C2 sample site ($p = 0.141$).

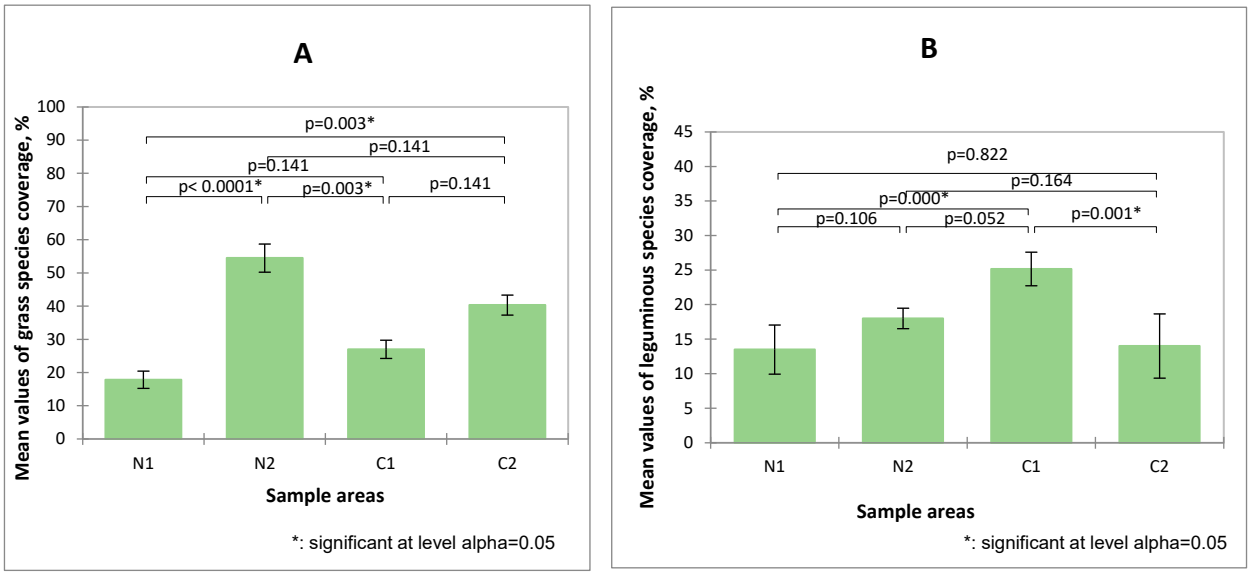


Figure 3. Significant differences in grass (**A**) and leguminous (**B**) species at the sample sites, based on statistical evaluation and Dunn's post hoc test with Bonferroni correction (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

Regarding leguminous species, the highest total coverage was observed in the low grazing pressure (C1, 25.1 ± 2.3%) sample site (Figure 3B), which significantly differed from the overgrazed (N1, 13.5 ± 3.3%) area ($p = 0.000$) and the mown and grazed (C2, 14.0 ± 4.4%) area ($p = 0.001$). The mown area (N2) had the second-highest legume abundance, but this did not significantly differ from the low grazing pressure site (C1, 25.1 ± 2.3%) ($p = 0.001$).

The coverage of weeds was highest in the overgrazed (N1, 37.1 ± 4.5%) area, reaching 35–40%, which was significantly different from the other sites ($p = 0.000$, $p = 0.001$). Weeds also appeared in significant coverage in the low grazing pressure sample site (C1, 7.0 ± 3.5%) (Figure 4A).

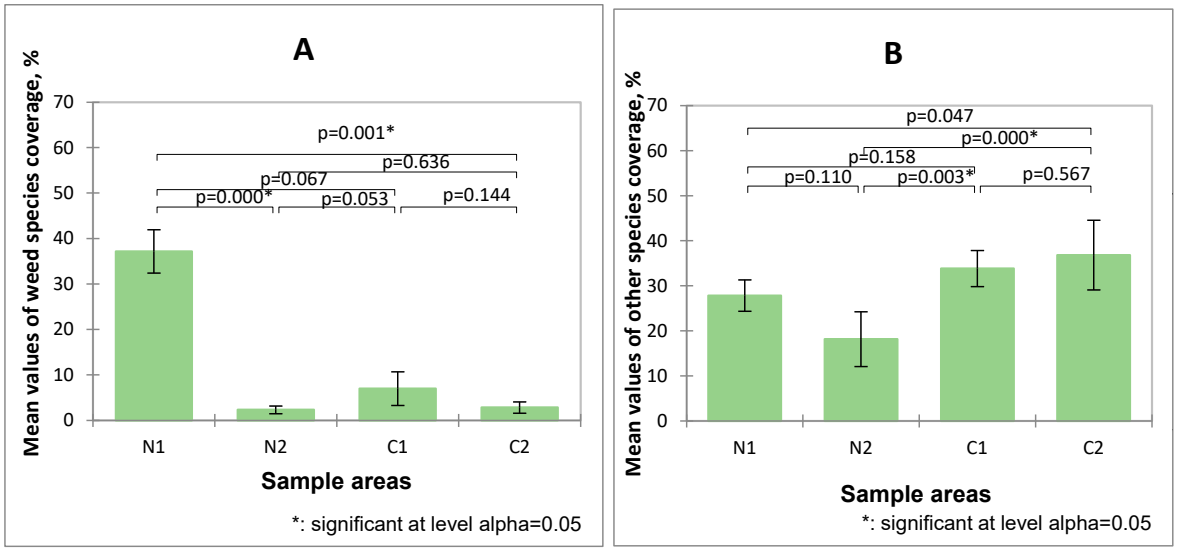
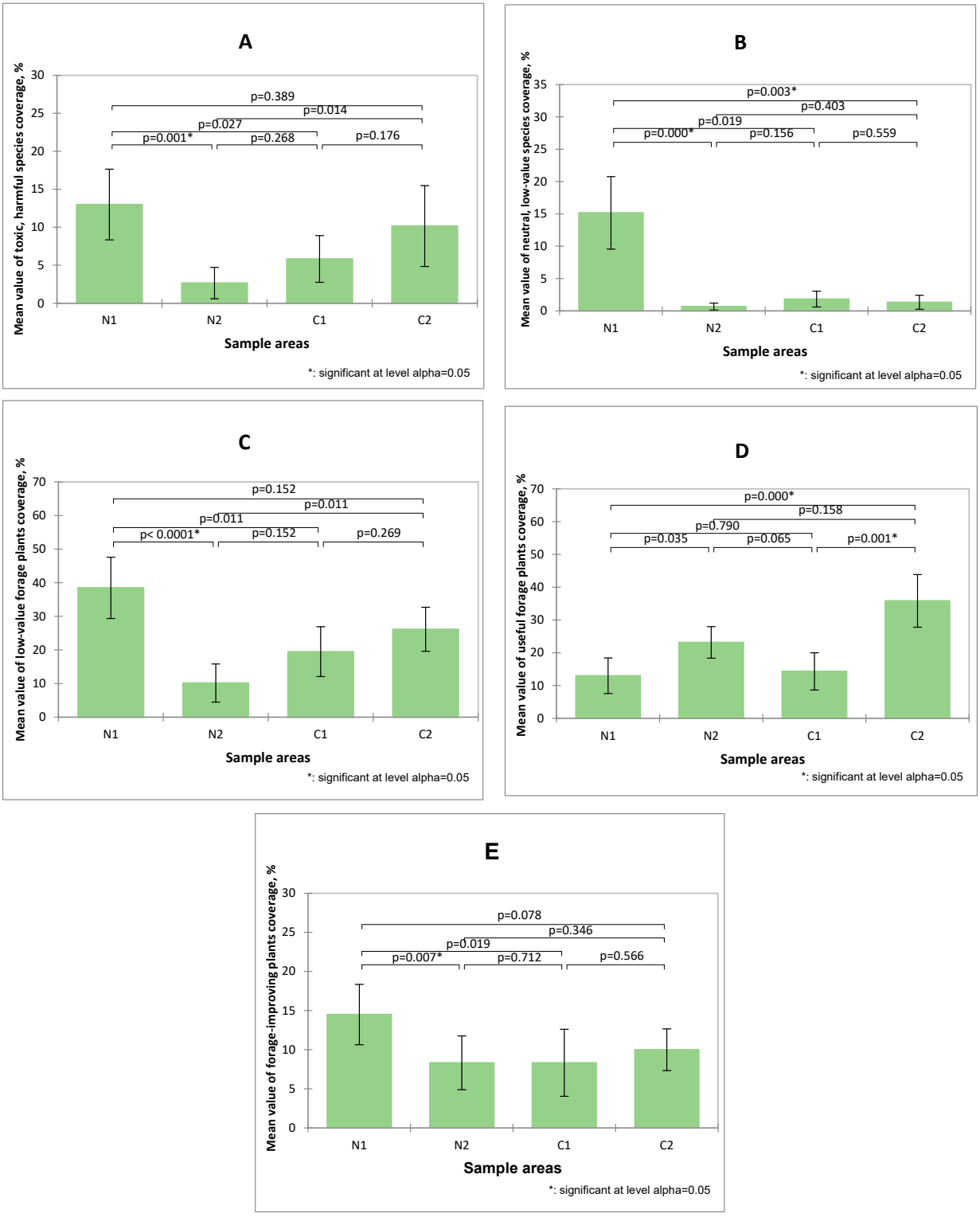


Figure 4. Mean coverage (mean, standard deviation) and significant differences in weeds (**A**) and other species (**B**) at the sample sites, based on statistical evaluation and Dunn's post hoc test with Bonferroni correction (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány, *: significant difference).

The coverage of other species was substantial across all four sample sites, but was lowest in the mown area (N2, 18.1 ± 5.7%), where it did not significantly differ ($p = 0.110$) from the overgrazed pasture (N1, 27.8 ± 3.3%). The latter significantly differed from the low grazing pressure sample site (C1, 33.8 ± 3.8%) and the mown and grazed site (C2, 36.8 ± 7.3%) ($p = 0.003$, $p = 0.000$) (Figure 4B). The coverage of other species was highest in the low grazing pressure (C1, 33.8 ± 3.8%) and mown and grazed (C2, 36.8 ± 7.3%) sites, exceeding 30%.

The amount of toxic species was the highest in the overgrazed (C1, 13.0 ± 4.4%) area (Figure 5A). They occurred in the smallest proportion in the mowing area (N2, 0.6 ± 0.5%), and their quantity was even higher in the area with low grazing pressure (N1, 15.1 ± 5.3%) and in the hayfield (N2, 0.6 ± 0.5%). The quantity of indifferent, worthless species (0) was particularly high in the overgrazed pasture (Figure 5B). It showed significantly higher values from all areas ($p = 0.000$–0.003). In the other three sample areas, their quantity was very small, only a few %. Compared to the mown area (N2, 10.1 ± 5.4%), it also differed significantly ($p = 0.001$). The amount of useful forage plants of low value was the most significant in the overgrazed pasture (N1, 10.1 ± 5.4%) (Figure 5C); this group made up almost half of the species, and it was also significantly different from the mower ($p = 0.0001$). In the other three sample areas, the amount of these species was around 10–25%. The amount of useful forage plants was the highest in the meadow (C2, 10.1 ± 5.4%), reaching 30–35% (Figure 5D). The amount of forage-improving species in the low grazing pressure area (N1, 14.5 ± 3.6%) was significantly different from the mowing area (N2, 8.3 ± 3.2%) ($p = 0.007$) (Figure 5E).



(**E**)

Figure 5. Mean coverage (mean, standard deviation) and significant differences in various plant categories: (**A**) Toxic species (-1); (**B**) Neutral, low-value species (0); (**C**) Low-value forage plants (1, 2, 3); (**D**) Useful forage plants (4, 5, 6); (**E**) Forage-improving species (7, 8), based on statistical evaluation and Dunn's post hoc test with Bonferroni correction (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány, *: significant difference).

Life Form Distributions

The proportion of annual species with ascending stems (*T scap*) was highest in the overgrazed N1 sample site, accounting for 36% of the vegetation, while the lowest proportion (3%) was observed in the mown N2 site (Figure 6). Annual species with creeping stems (*T rept*), such as Stellaria media, were exclusively found in the N1 site. Perennial species with creeping stems (*H rept*) were also most prevalent in the overgrazed N1 site and had a significant 7% coverage in the C1 grazing site. Among these species, *Trifolium repens* was the dominant component. Perennial species with a basal rosette (*H ros*) were most common in the low grazing pressure C1 site. Perennial species with ascending stems (*H scap*), typically consisting of dicotyledonous plants, were present in significant amounts (26–45%) across all sample sites. The coverage of perennial grasses was lowest (<10%) in the two grazing areas. In the N1 site, this was because the lack of regeneration time allowed the livestock to graze them down. The highest grass coverage was recorded on the hayfield N2 (51%), and they were also significantly present in the meadow C2 (39%). Shrubs (*P caesp*) were negligible, only being found in small quantities in C2. Dwarf shrubs and semi-shrubs (*Ch suffr, Ch rept*) were present at a low percentage (2–3%) across all sample sites, including species like *Thymus glabrescens* and *Teucrium chamaedrys*.

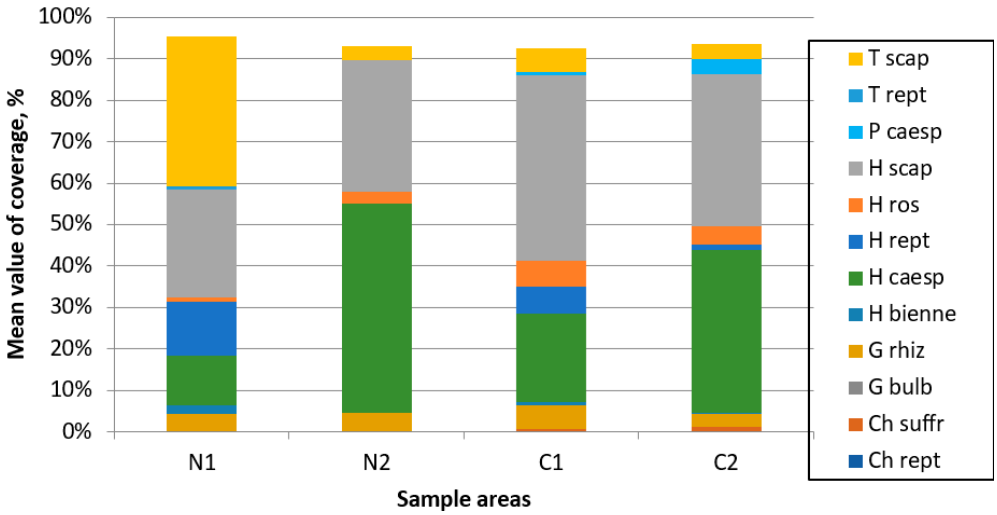


Figure 6. Distribution of species based on Pignatti's life form types across the sample areas (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány). (*H scap*: species with ascending stems; *H caesp*: tussock-forming species; *H ros*: rosette-forming perennials; *H rept*: perennials with stolons, runners, or rhizomes, *H bienn*: biennial species, *G bulb*: geophytes with bulbs; *G rhiz*: rhizomatous, creeping geophytes; *T scap*: annual species with ascending stems; *T ros*: rosette-forming annual species; *T caesp*: annual tussock species; *Ch rept*: creeping-stem dwarf shrubs; *Ch succ*: succulent dwarf shrubs).

Based on the Shannon and Simpson indices, the order of areas differ. The values of Shannon diversity show the order N2 < N1 < C1 < C2, while the order based on the Simpson index is N1 < N2 < C2 < C1. This difference highlights the important role of the Rényi's diversity profiles in the comparing of the studied sites' diversity (Figure 7).

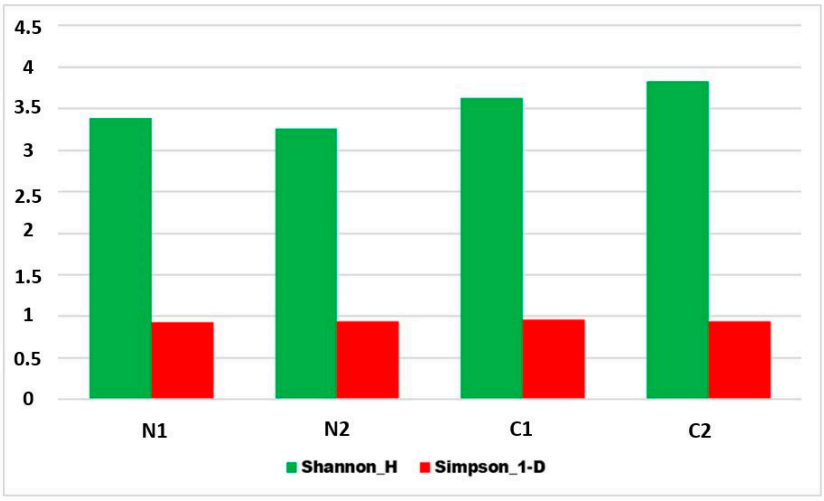


Figure 7. Shannon's and Simpson's diversity values of the examined sample areas. (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

Based on the Rényi diversity profiles, when the entire species list and cover values are taken into account, we can quite clearly see that the species exposed to low grazing pressure (C1) has a greater diversity than the meadow (N2). In the breakdown of individual species groups, the Rényi curve shows clear separations in the case of Fabacea species. The meadow (C2) is the most diverse with the highest values, surprisingly higher than the diversity of the pasture exposed to low grazing pressure (C1). These are followed by the hayfield (N2) and finally with the overgrazed pasture (N1) (Figures 8 and 9):

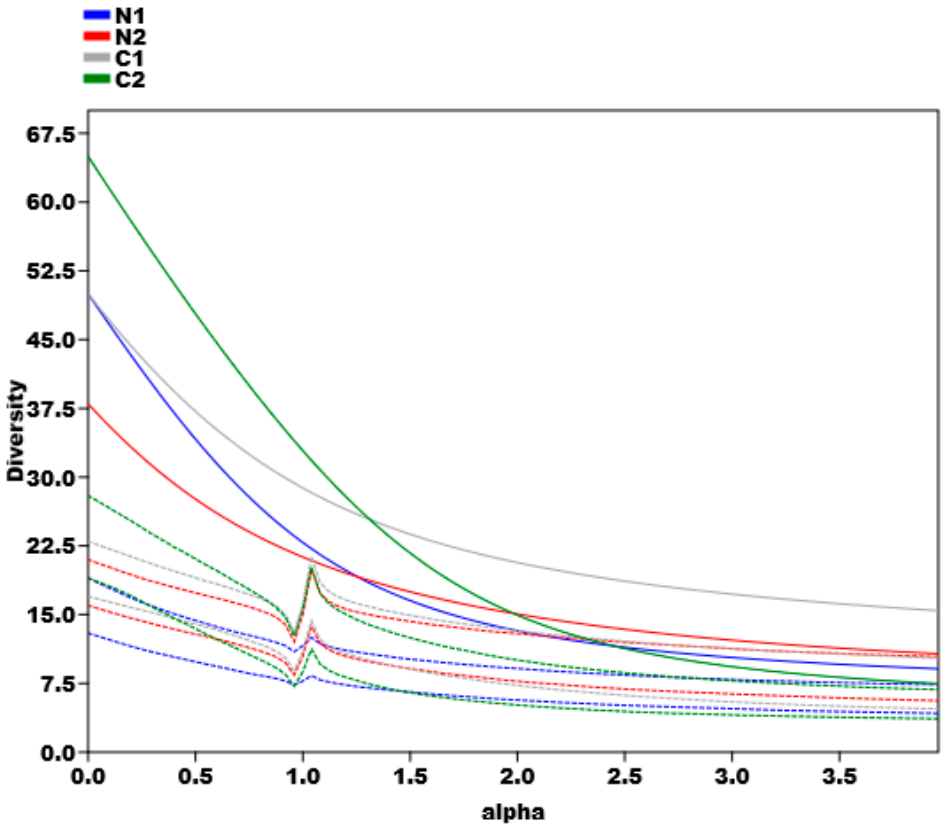


Figure 8. Rényi diversity profiles of the investigated areas based on the species that occur. (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

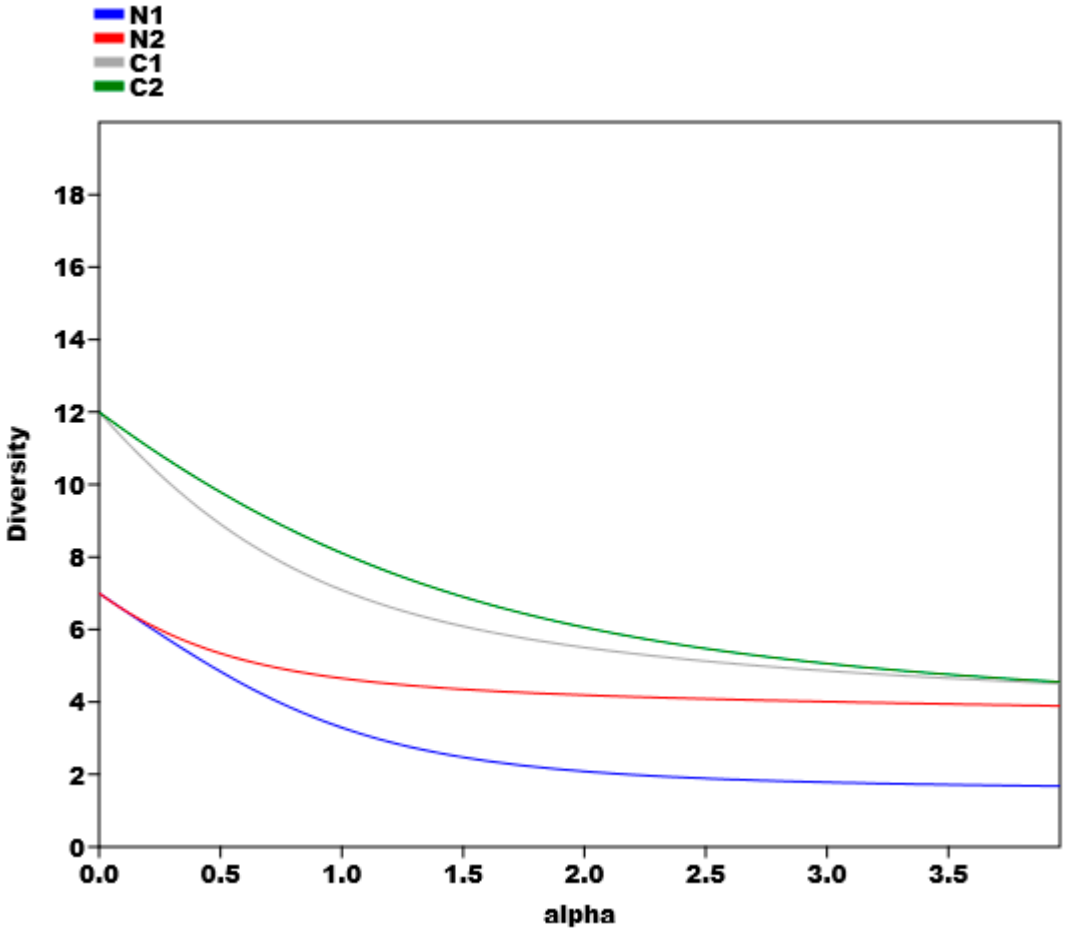


Figure 9. The Rényi diversity profiles of the investigated areas are only based on *Fabaceae* species. (N1: Overgrazed pasture in Nagyréde; N2: Hayfield in Nagyréde; C1: Pasture with low grazing pressure in Csokvaomány; C2: Meadow in Csokvaomány).

4. Discussion

Grazing is very important as a grassland management and maintenance option. Few data are available on goat grazing, especially in temperate grasslands, which is why this study is important. Point-by-point answers on how vegetation changes in response to different grazing pressures and which grassland management method might be most appropriate are important. The in vegetation in the sample sites, which have been subjected to the same management for 24 years, align with the findings of Bartha et al. [65,66], who emphasized that only long-term analysis is suitable for drawing meaningful conclusions in vegetation studies. Grazing by goats has induced significant changes in the structure of the vegetation, with grazing intensity being a critical factor influencing plant species diversity. This finding corroborates several other studies focused on dry grasslands [11,67].

Appropriate grazing pressure is crucial, as grazing intensity affects the vegetation and patch structure of the grassland [5,68,69]. The lowest species richness was found in the N2 meadow, whereas the grazed areas, including the intensively grazed pasture (N1), exhibited higher species richness. This increase is partially attributed to the proliferation of weeds [55,56], but these semi-natural grasslands can still be significant, as low-productivity grasslands are important biodiversity hotspots [19]. Overgrazing not only leads to the impoverishment of the grassland but also facilitates soil erosion and the spread of invasive species [44].

The Pannonian grasslands are dominated by grass species, which serve as the basis for their cenosystematic classification [38]. Therefore, grasses are a key starting point in

grassland management [70–72]. In the studied grasslands, the dominant species belonged to the *Festuca* genus, particularly *Festuca pseudovina*, which was present across all sites. The low forage value of this grass species confirms that the studied pastures are of limited value from a grassland management perspective. Among the high-value species, *Alopecurus pratensis* and *Dactylis glomerata* were found in the hayfield (N2) and the meadow (C2). *Poa angustifolia* and *Poa humilis*, which are excellent for trampling resistance and have good forage value due to their rhizomatous nature, had the highest coverage in the overgrazed area. The grasslands at the study sites exhibited a multi-layered community structure, with the lowest layer composed of small grasses, tiny legumes, and ephemeral plants that appear in early spring. The middle layer consisted of medium-sized grasses (*Lolium perenne, Festuca pseudovina*, *Poa angustifolia*) and legumes (e.g., *Coronilla varia*, *Lotus corniculatus*). The upper layer included valuable grass species like *Dactylis glomerata* and *Arrhenatherum elatius*. This structure enhances diversity and the resilience of the grassland. According to Farruggia et al. [73] and Koczura et al. [74], grazing animals prefer well-digestible vegetative grasses.

The amount of Fabaceae species, which are also economically important, was significant in the grazed areas, consistent with numerous studies that report an increase in legume species under grazing pressure [72]. These species provide a crucial source of raw protein for livestock, especially when grass species in the sward have aged [75]. Among the legumes, *Trifolium repens* became dominant under grazing pressure, supporting the findings of Steiner and Grabe [76] and Steinshamn et al. [77]. This study also confirms that grazing leads to an increase in the proportion of annual species [78,79].

Goats can also help suppress weeds [80–83]. However, they may reduce the abundance of legume species [79], though they are particularly effective in controlling shrubs. Therefore, goats can be successfully used in conservation management [84,85]. In this study, the lowest amount of shrubs was found in the grazed areas, but timely mowing also helped keep them under control.

Goats are important for controlling invasive species, but care must be taken during grazing, as they can also pose a threat to native species [86–89]. There can be a positive correlation between species richness and phytomass. Several authors, including Kelemen et al. [26], have found a close relationship between species composition and diversity in grasslands [90,91], a trend that is also evident in this study. The availability of grazing biomass and the amount of green plant material actually consumed by animals can differ due to their preferences [92], which has economic implications. The realized forage diversity is significantly influenced by the variety of forage available [93].

5. Conclusions

As hypothesized, goat grazing successfully inhibited shrub encroachment. Shrubs were almost absent in the pastures, with only a few essential oil-rich semi-shrubs remaining. Contrary to our initial hypothesis, grass coverage decreased with increasing grazing intensity. Pastures exhibited significantly lower grass coverage values compared to mown areas. Ove the long-term, different pasture uses resulted in significant differences in species composition and forage value across the sample sites. It is also clear that the combination of different management practices over time, particularly meadow management followed by grazing, was the most successful pasture utilization method in terms of species composition, naturalness, and species richness.

The grazing of goats greatly contributed to the species diversity values of the Pannonian dry pasture sample areas, but their use as a mower and then as pasture proved to be the highest.

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References

1. Sala, O.E.; Lauenroth, W.K.; McNaughton, S.J.; Rusch, G.; Zhang, X. Biodiversity and ecosystem functioning in grasslands. In *Functional Roles of Biodiversity: A Global Perspective*; Mooney, H.A., Cushman, J.H., Medina, E., Sala, O.E., Schulze, E.D., Eds.; Wiley: Hoboken, NJ, USA, 1996; pp. 129–149.
2. Adler, P.B.; Lauenroth, W.K. Livestock exclusion increases the spatial heterogeneity of vegetation in Colorado shortgrass steppe. *Appl. Veg. Sci.* **2000**, *3*, 213–222. [CrossRef]
3. Peco, B.; Sánchez, A.M.; Azcárate, F.M. Abandonment in grazing systems: Consequences for vegetation and soil. *Agric. Ecosys. Environ.* **2006**, *113*, 284–294. [CrossRef]
4. Meers, T.L.; Bell, T.L.; Enright, N.J.; Kasel, S. Role of plant functional traits in determining vegetation composition of abandoned grazing land in north-eastern Victoria, Australia. *J. Veg. Sci.* **2008**, *19*, 515–524. [CrossRef]
5. Milchunas, D.G.; Sala, O.E.; Laurenroth, W.K. A generalized model of grazing by large herbivores on grassland community structure. *Am. Nat.* **1988**, *132*, 87–106. [CrossRef]
6. Milchunas, D.G.; Lauenroth, W. Quantitative effects of grazing on vegetation and soils over a global range of environments. *Ecol. Monogr.* **1993**, *6*, 327–366. [CrossRef]
7. Chesson, P. Mechanisms of maintenance of species diversity. *Annu. Rev. Ecol. Syst.* **2000**, *31*, 343–366. [CrossRef]
8. Collins, S.L.; Chung, Y.A.; Baur, L.E.; Hallmark, A.; Ohlert, T.J.; Rudgers, J.A. Press–pulse interactions and long-term community dynamics in a Chihuahuan Desert grassland. *J. Veg. Sci.* **2020**, *31*, 722–732. [CrossRef]
9. Adler, P.B.; Levine, J.M. Contrasting relationships between precipitation and species richness in space and time. *Oikos* **2007**, *116*, 221–232. [CrossRef]
10. Cleland, E.E.; Collins, S.L.; Dickson, T.L.; Farrer, E.C.; Gross, K.L.; Gherardi, L.A.; Hallett, L.M.; Hobbs, R.J.; Hsu, J.S.; Turnbull, L.; et al. Sensitivity of grassland plant community composition to spatial vs. temporal variation in precipitation. *Ecology* **2013**, *94*, 1687–1696. [CrossRef]
11. Harrison, S.P.; Gornish, E.S.; Copeland, S. Climate-driven diversity loss in a grassland community. *Proc. Natl. Acad. Sci. USA* **2015**, *112*, 8672–8677. [CrossRef] [PubMed]
12. Jonas, J.L.; Buhl, D.A.; Symstad, A.J. Impacts of weather on long-term patterns of plant richness and diversity vary with location and management. *Ecology* **2015**, *96*, 2417–2432. [CrossRef]
13. Wilcox, K.R.; Shi, Z.; Gherardi, L.A.; Lemoine, N.P.; Koerner, S.E.; Hoover, D.L.; Bork, E.; Byrne, K.M.; Cahill, J., Jr.; Collins, S.L.; et al. Asymmetric responses of primary productivity to precipitation extremes: A synthesis of grassland precipitation manipulation experiments. *Glob. Chang Biol. Bioenergy* **2017**, *23*, 4376–4385. [CrossRef]
14. Bartha, S.; Szabó, G.; Csete, S.; Purger, D.; Házi, J.; Csathó, A.I.; Campetella, G.; Canullo, R.; Chelli, S.; Tsakalos, J.L.; et al. High-Resolution Transect Sampling and Multiple Scale Diversity Analyses for Evaluating Grassland Resilience to Climatic Extremes. *Land* **2022**, *11*, 378. [CrossRef]
15. Díaz, S.; Lavorel, S.; McIntyre, S.; Falczuk, V.; Casanoves, F.; Milchunas, D.G.; Skarpe, C.; Rush, G.; Sternber, M.; Noy-Meir, I.; et al. Plant trait responses to grazing—A global synthesis. *Glob. Chang Biol. Bioenergy* **2007**, *13*, 313–341. [CrossRef]
16. Wilson, J.B.; Peet, R.K.; Dengler, J.; Pärtel, M. Plant species richness: The world records. *J. Veg. Sci.* **2012**, *23*, 796–802. [CrossRef]
17. Dumont, B.; Rossignol, N.; Loucougaray, G.; Carrère, P.; Chadoeuf, J.; Fleurance, G.; Bonis, A.; Farruggia, A.; Gaucherand, S.; Ginane, C.; et al. When does grazing generate stable vegetation patterns in temperate pastures? *Agric. Ecosyst. Environ.* **2012**, *153*, 50–56. [CrossRef]

18. Rook, A.J.; Dumont, B.; Isselstein, J.; Osoro, K.; WallisDeVries, M.F.; Parente, G.; Mills, J. Matching type of livestock to desired biodiversity outcomes in pastures—A review. *Biol. Conserv.* **2004**, *119*, 137–150. [CrossRef]
19. Marion, B.; Bonis, A.; Bouzillé, J.-B. How much does grazing-induced heterogeneity impact plant diversity in wet grasslands? *Écoscience* **2010**, *17*, 229–239. [CrossRef]
20. Tonn, B.; Raab, C.; Isselstein, J. Sward patterns created by patch grazing are stable over more than a decade. *Grass Forage Sci.* **2019**, *74*, 104–114. [CrossRef]
21. Wrage, N.; Strodthoff, J.; Cuchillo, H.M.; Isselstein, J.; Kayser, M. Phytodiversity of temperate permanent grasslands: Ecosystem services for agriculture and livestock management for diversity conservation. *Biodivers. Conserv.* **2011**, *20*, 3317–3339. [CrossRef]
22. Olff, H.; Ritchie, M.E. Effects of herbivores on grassland plant diversity. *Trends Ecol. Evol.* **1998**, *13*, 261–265. [CrossRef] [PubMed]
23. Magurran, A.E.; Baillie, S.R.; Buckland, S.T.; Dick, J.M.P.; Elston, D.A.; Scott, E.M.; Smith, R.I.; Somerfield, P.J.; Watt, A.D. Long-term datasets in biodiversity research and monitoring: Assessing change in ecological communities through time. *Trends Ecol. Evol.* **2010**, *25*, 574–582. [CrossRef]
24. De Bello, F.; Valencia, E.; Ward, D.; Hallett, L. Why we still need permanent plots for vegetation science. *J. Veg. Sci.* **2020**, *31*, 679–685. [CrossRef]
25. Biró, M.; Révész, A.; Molnár, Z.; Horváth, F.; Czúcz, B. Regional habitat pattern of the Duna-Tisza köze in Hungary II: The sand, the steppe and the riverine vegetation; degraded and ruined habitats. *Acta Bot. Hung.* **2008**, *50*, 21–62. [CrossRef]
26. Kelemen, A.; Török, P.; Valkó, O.; Deák, B.; Miglécz, T.; Tóth, K.; Ölvedi, T.; Tóthmérész, B. Sustaining recovered grasslands is not likely without proper management: Vegetation changes and large-scale evidences after cessation of mowing. *Biodivers. Conserv.* **2014**, *23*, 741–751. [CrossRef]
27. Margóczi, K. Interspecific associations in different succesional stages of the vegetation in a Hungarian sandy area. *Tiscia* **1995**, *29*, 19–26.
28. Valkó, O.; Török, P.; Deák, B.; Tóthmérész, B. Prospects and limitations of prescribed burning as a management tool in European grasslands. *Basic Appl. Ecol.* **2014**, *15*, 26–33. [CrossRef]
29. Catorci, A.; Piermarteri, K.; Penksza, K.; Házi, J.; Tardella, F.M. Filtering effect of temporal niche fluctuation and amplitude of environmental variations on the trait-related flowering patterns: Lesson from sub-Mediterranean grasslands. *Sci. Rep.* **2017**, *7*, 12034. [CrossRef]
30. Deák, B.; Valkó, O.; Török, P.; Kelemen, A.; Tóth, K.; Miglécz, T.; Tóthmérész, B. Reed cut, habitat diversity and productivity in wetlands. *Ecol. Complex.* **2015**, *22*, 121–125. [CrossRef]
31. Török, P.; Valkó, O.; Deák, B.; Kelemen, A.; Tóthmérész, B. Traditional cattle grazing in a mosaic alkali landscape: Effects on grassland biodiversity along a moisture gradient. *PLoS ONE* **2014**, *9*, e97095. [CrossRef] [PubMed]
32. Valkó, O.; Török, P.; Matus, G.; Tóthmérész, B. Is regular mowing the most appropriate and cost-effective management maintaining diversity and biomass of target forbs in mountain hay meadows? *Flora* **2012**, *207*, 303–309. [CrossRef]
33. Házi, J.; Penksza, K.; Bartha, S.; Hufnagel, L.; Tóth, A.; Gyuricza, C.; Szentes, S. Cut mowing and grazing effects with grey cattle on plant species composition in case of Pannon wet grasslands. *Appl. Ecol. Environ. Res.* **2012**, *10*, 223–231. [CrossRef]
34. Szentes, S.; Sutyinszki, Z.; Szabó, G.; Zimmermann, Z.; Házi, J.; Wichmann, B.; Hufnalgel, L.; Penksza, K.; Bartha, S. Grazed Pannonian grassland beta-diversity changes due to C4 yellow bluestem. *Cent. Eur. J. Biol.* **2012**, *7*, 1055–1065. [CrossRef]
35. Milazzo, F.; Francksen, R.M.; Abdalla, M.; Ravetto Enri, S.; Zavattaro, L.; Pittarello, M.; Hejduk, S.; Newell-Price, P.; Schils, R.L.M.; Smith, P.; et al. An Overview of Permanent Grassland Grazing Management Practices and the Impacts on Principal Soil Quality Indicators. *Agronomy* **2023**, *13*, 1366. [CrossRef]
36. Mucina, L.; Bültmann HDierßen, K.; Theurillat, J.-P.; Raus, T.; Čarni, A.; Šumberová, K.; Willner, W.; Dengler, J.; Tichý, L. Vegetation of Europe: Hierarchical floristic classification system of plant, bryophyte, lichen, and algal communities. *Appl. Veg. Sci.* **2016**, *19*, 3–264. [CrossRef]
37. Wesche, K.; Ambarlı, D.; Kamp, J.; Török, P.; Treiber, J.; Dengler, J. The Palaearctic steppe biome: A new synthesis. *Biodivers. Conserv.* **2016**, *25*, 2197–2231. [CrossRef]
38. Borhidi, A.; Kevey, B.; Lendvai, G.; Seregélyes, T. *Plant Communities of Hungary*; Akadémiai Kiadó: Hungary, Budapest, 2012.
39. Dostálek, J.; Frantík, T. Dry grassland plant diversity conservation using low-intensity sheep and goat grazing management: Case study in Prague (Czech Republic). *Biodivers. Conserv.* **2008**, *17*, 1439–1454. [CrossRef]
40. Jáuregui, B.M.; García, U.; Osoro, K.; Celaya, R. Sheep and Goat Grazing Effects on Three Atlantic Heathland Types. *Rangel. Ecol. Manag.* **2009**, *62*, 119–126. [CrossRef]
41. Jauregui, B.M.; Rosa-Garcia, R.; Garcia, U.; WallisDeVries, M.F.; Osoro, K.; Celaya, R. Effects of stocking density and breed of goats on vegetation and grasshopper occurrence in heathlands. *Agric. Ecosyst. Environ.* **2008**, *123*, 219–224. [CrossRef]
42. Stilling, F.; Penksza, K.; Hajnáczki, S.; Szentes, S.; Fűrész, A.; Sipos, L.; Penksza, P.; Saláta, D.; Melenya, C.; Wagenhoffer, Z.; et al. Botanical and turf management evaluation in goat pastures established from Pannonian natural and abandoned arable land. *Small Rumin. Res.* **2023**, *229*, 107119. [CrossRef]

43. Pajor, F.; Kerti, A.; Penksza, K.; Kuchtik, J.; Szekely, Z.H.; Béres, A.; Czinkota, I.; Szentes, S.; Póti, P. Improving nutritional quality of the goat milk by grazing. *Appl. Ecol. Environ. Res.* **2014**, *12*, 301–307. [CrossRef]
44. Hajnáczki, S.; Pajor, F.; Péter, N.; Bodnár, Á.; Penksza, K.; Póti, P. *Solidago gigantea* Ait. and *Calamagrostis epigejos* (L) Roth invasive plants as potential forage for goats. *Not. Bot. Horti Agrobot. Cluj Napoca* **2021**, *49*, 12197. [CrossRef]
45. Bhardwaj, J.K.; Kumar, V.; Saraf, P.; Kumari, P.; Mittal, M. Current status and changing national scenario of goat population: A review. *Agric. Rev.* **2018**, *39*, 91–103. [CrossRef]
46. Benthien, O.; Braun, M.; Riemann, J.C.; Stolter, C. Long-term effect of sheep and goat grazing on plant diversity in a semi-natural dry grassland habitat. *Heliyon* **2018**, *4*, e00556. [CrossRef]
47. Arévalo, J.R.; Chinea, E.; Barquin, C. Pasture management under goat grazing on Canary Islands. *Agric. Ecosyst. Environ.* **2007**, *118*, 291–296. [CrossRef]
48. Fernández-Lugo, S.; Ramón Areévalo, J.; de Nascimento, L.; Mata, J.; Bermejo, L.A. Long-term vegetation responses to different goatgrazing regimes in semi-natural ecosystems: A casestudy in Tenerife (Canary Islands). *Appl. Veg. Sci.* **2013**, *16*, 74–83. [CrossRef]
49. Landau, S.; Perevolotsky, A.; Bonfils, D.; Barkai, D.; Silanikove, N. Utilization of low quality resources by small ruminants in Mediterranean agro-pastoral systems: The case of browse and aftermath cereal stubble. *Livest. Prod. Sci.* **2000**, *64*, 39–49. [CrossRef]
50. Mahieu, M.; Archimède, H.; Fleury, J.; Mandonn, N.; Alexandre, G. Intensive grazing system for small ruminants in the Tropics: The French West Indies experience and perspectives. *Small Rumin. Res.* **2008**, *77*, 195–207. [CrossRef]
51. Schlecht, E.; Dickhöfer, U.; Predotova, M.; Buerkert, A. The importance of semi-arid natural mountain pastures for feed intake and recycling of nutrients by traditionally managed goats on the Arabian Peninsula. *J. Arid. Environ.* **2011**, *75*, 1136–1146. [CrossRef]
52. Lo Presti, V.; Tudisco, R.; Di Rosa, A.R.; Musco, N.; Iommelli, P.; Infascelli, F.; Grossi, M.; Ferrara, M.; Chiofalo, B.; Lombardi, P.; et al. Influence of season on milk fatty acid profile and sensory characteristics of grazing goats in a Mediterranean environment: A sustainable agro-food system. *Anim. Prod. Sci.* **2023**, *63*, 689–703. [CrossRef]
53. Cissé, M.; Lya, I.; Nianogo, A.J.; Sané, I.; Sawadogo, J.G.; N'Diaye, M.; Awad, C.; Fall, Y. Grazing behavior and milk yield of Senegalese Sahel goat. *Small Rumin. Res.* **2002**, *43*, 85–95. [CrossRef]
54. Braun-Blanquet, J. *Pflanzensoziologie II.*; Springer: Wien, Austria, 1964.
55. Simon, T. *A Magyar Edényes Flóra Határozója [Definier of the Hungarian Vascular Flora]*; Tankönyvkiadó: Hungary, Budapest, 2000.
56. Borhidi, A. Social behavior types, the naturalness and relative ecological indicator values of the highre plants in the Hungarian Flora. *Acta Bot. Acad. Sci. Hung.* **1995**, *39*, 97–181.
57. Pignatti, S. Valori di bioindicazione delle piante vascolari della flora d'Italia. *Braun Blanquetia* **2005**, *39*, 1–97.
58. Király, G. (Ed.) *New Hungarian Herbal. The Vascular Plants of Hungary. Identification Key*; Aggteleki Nemzeti Park Igazgatóság: Jósvafő, Hungary, 2009.
59. Saitou, N.; Nei, M. The neighbor-joining method: A new method for reconstructing phylogenetic trees. *Mol. Biol. Evol.* **1987**, *4*, 406–425. [CrossRef] [PubMed]
60. Balázs, F. *Botanical and Economic Evaluation of Grasslands*; Mezőgazdasági kiadó: Budapest, Hungary, 1960.
61. Klapp, E.; Boeker, P.; König, F.; Stählin, A. Wertzahlen der Grünlandpflanzen. *Grünland* **1953**, *2*, 38–40.
62. Briemle, G.; Nitsche, S.; Nitsche, L. *Nutzungswertzahlen für Gefäßpflanzen des Grünlandes. Schriftenreihe für Vegetationskunde*; Bundesamt für Naturschutz: Bonn, Germany, 2002; pp. 203–225.
63. Addinsoft, XLSTAT. Data Analysis and Statistical Solution for Microsoft Excel. Long Island, NY, USA. 2016. Available online: https://www.xlstat.com/fr/ (accessed on 5 January 2023).
64. Tóthmérész, B. Comparison of different methods for diversity ordering. *J. Veg. Sci.* **1995**, *6*, 283–290. [CrossRef]
65. Bartha, S. Életre keltett mintázatok. A JNP modellekről. In *Teremtő Sokféleség. Emlékezések Juhász-Nagy Pálra*; Oborny, B., Ed.; Acad. Press: Budapest, Hungary, 2001; pp. 61–95.
66. Bartha, S. A vegetáció leírásának módszertani alapjai. In *Agrártájak Növényzetének Monitorozása. A Hatás-Monitorozás Elméleti Alapjai és Gyakorlati Lehetőségei*; Horváth, A., Szitár, K., Eds.; MTA ÖBKI: Vácrátót, Hungary, 2007; pp. 92–113.
67. Li, Z.; Ma, W.; Liang, C.; Liu, Z.; Wang, W.; Wang, L. Long-term vegetation dynamics driven by climatic variations in the Inner Mongolia grassland: Findings from 30-year monitoring. *Landsc. Ecol.* **2015**, *30*, 1701–1711. [CrossRef]
68. Herrero-Jáuregui, C.; Oesterheld, M. Effects of grazing intensity on plant richness and diversity: A meta-analysis. *Oikos* **2018**, *127*, 757–766. [CrossRef]
69. van Klink, R.; Nolte, S.; Mandema, F.S.; Lagendijk, D.D.G.; WallisDeVries, M.F.; Bakker, J.P.; Esselink, P.; Smit, C. Effects of grazing management on biodiversity across trophic levels–The importance of livestock species and stocking density in salt marshes. *Agric. Ecosyst. Environ.* **2016**, *235*, 329–339. [CrossRef]
70. Milchunas, D.G.; Varnamkhasti, A.S.; Lauenroth, W.K.; Goetz, H. Forage quality in relation to long-term grazing history, current-year defoliation, and water resource. *Oecologia* **1995**, *101*, 366–374. [CrossRef] [PubMed]

71. Pauler, C.M.; Isselstein, J.; Suter, M.; Berard, J.; Braunbeck, T.; Schneider, M.K. Choosy grazers: Influence of plant traits on forage selection by three cattle breeds. *Funct. Ecol.* **2020**, *34*, 980–992. [CrossRef]
72. Klimek, S.; Anne Richter gen Kemmermann, A.R.; Hofmann, M.; Isselstein, J. Plant species richness and composition in managed grasslands: The relative importance of field management and environmental factors. *Biol. Conserv.* **2007**, *134*, 559–570. [CrossRef]
73. Farruggia, A.; Dumont, B.; D'Hour, P.; Egal, D. Petit M Diet selection of dry and lactating beef cows grazing extensive pastures in late autumn. *Grass For. Sci.* **2006**, *61*, 347–353. [CrossRef]
74. Koczura, M.; Martin, B.; Bouchon, M.; Turille, G.; Berard, J.; Farruggia, A.; Kreuzer, M.; Coppa, M. Grazing behaviour of dairy cows on biodiverse mountain pastures is more influenced by slope than cow breed. *Animal* **2019**, *13*, 2594–2602. [CrossRef] [PubMed]
75. Niderkorn, V.; Baumont, R. Associative effects between forages on feed intake and digestion in ruminants. *Animal* **2009**, *3*, 951–960. [CrossRef]
76. Steiner, J.J.; Grabe, D.F. Sheep grazing effects on subterranean clover (*Trifolium subterraneum*) Development and seed production in western Oregon (USA). *Crop Sci.* **1986**, *26*, 367–372. [CrossRef]
77. Steinshamn, H.; Gronmyr, F.; Tweit, H. Seasonal changes in botanical composition of an organically managed pasture. In *Organic Grassland Farming, Proceedings of the International Occusional Symposium of the European Grassland Federation, Wirzenhausen, Germany, 10–12 July 2001*; Mecke Duderstadt.: Duderstadt, Germany, 2001.
78. Orr, D.M. Effects of sheep grazing *Astrebla grssland* in central western Queensland, Australia: 1. Effect of grazing pressuer and livestock distribution. *Aust. J. Agric. Res.* **1980**, *31*, 797–806. [CrossRef]
79. Renzhong, W.; Ripley, E.A. Effect of grazing on a *Leymus chinensis* grassland on the Sonnen plain of north-eastern China. *J. Arid. Environ.* **1997**, *36*, 307–318. [CrossRef]
80. Sala, O.E. The effect of herbivory on vegetation structure. In *Plant form and Vegetation Structure*; Werger, M.J.A., van der Aart, P.J.M., During, H.J., Verhoeven, J.T.A., Eds.; SPB: The Hague, The Netherlands, 1988; pp. 317–330.
81. Oba, G. Effects of excluding goat herbivory on *Acacia tortilis* woodland around pastoralist settlements in northwest Kenya. *Acta Oecol.* **1998**, *19*, 395–404. [CrossRef]
82. Haumann, P. Biotope conservetion with ruminants in Germany: The example of goats on shrub-infested slopes. In Proceedings of the 2nd LSIRD Conference on Livestock production in the Europen LFAs, Bray, Ireland, 5–7 December 1998; pp. 186–196.
83. Oba, G.; Post, E. Browse production and offtake by free-ranging goats in an arid zone, Kenya. *J. Arid. Environ.* **1999**, *43*, 183–195. [CrossRef]
84. DeMalach, N.; Kigel, J.; Voet, H.; Ungar, E.D. Are semiarid shrubs resilient to drought and grazing? Differences and similarities among species and habitats in a long-term study. *J. Arid. Environ.* **2014**, *102*, 1–8. [CrossRef]
85. Ramirez, R.G. Feed resources and feeding techniques of small ruminants under extensive management conditions. *Small Rumin. Res.* **1999**, *34*, 215–230. [CrossRef]
86. Anderson, P.; Radford, E. Changes in vegetation following reduction in grazing pressure on the National Trust's Kinder Estate, Peak District, Derbyshire, England. *Biol. Conserv.* **1994**, *69*, 55–63. [CrossRef]
87. Anderson, P.M.L.; Hoffman, M.T. The impacts of sustained heavy grazing on plant diversity and composition in lowland and upland habitats across the Kamiesberg mountain range in the Succulent Karoo, South Africa. *J. Arid. Environ* **2007**, *70*, 686–700. [CrossRef]
88. Baraza, E.; Valiente-Benuet, A. Seed dispersal by domestic goats in a semiarid thornscrub of Mexico. *J. Arid. Environ.* **2008**, *72*, 1973–1976. [CrossRef]
89. Kahmen, S.; Poschlod, P.; Schreiber, K.F. Conservation management of calcareous grasslands. Changes in plant species composition and response of functional traits during 25 years. *Biol. Conserv.* **2002**, *104*, 319–328. [CrossRef]
90. Pykälä, J. Effects of restoration with cattle grazing on plant species composition and richness of semi-natural grasslands. *Biodivers. Conserv.* **2003**, *12*, 2211–2226. [CrossRef]
91. Pykälä, J.; Luoto, M.; Heikkinen, R.K.; Kontula, T. Plant species richness and persistence of rare plants in abandoned semi-natural grasslands in northern Europe. *Basic Appl. Ecol.* **2005**, *6*, 25–33. [CrossRef]
92. Hodgson, J.G. *Grazing Management: Science into Practice*; Burnt Mill: Harlow, UK; Longman Scientific & Technical: New York, NY, USA; Wiley: Berlin, Germany, 1990.
93. Zanon, T.; Komainda, M.; Ammer, S.; Isselstein, J.; Gauly, M. Diverse Feed, Diverse Benefits—The Multiple Roles of Feed Diversity at Pasture on Ruminant Livestock Production—A Review. *J. Vet. Sci. Anim. Husb.* **2022**, *10*, 101.

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