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Assessment of Grasslands Improvements for Faunistic Purposes in a Mountain Area of Central Italy

Giovanni Argenti[1*], Alessandro Messeri[2], Maria Paola Ponzetta[1]

[1] DAGRI, University of Florence, Piazzale delle Cascine 18, 50144, Firenze, Italy
[2] Consorzio LaMMA, Via Madonna del Piano 10, 50019, Sesto Fiorentino (FI), Italy
* Corresponding author's e-mail: giovanni.argenti@unifi.it

ABSTRACT

Restoration of grassland habitats useful for wildlife is an intervention often carried out in various marginal environments (such as some mountainous areas) where agriculture and grassland management have undergone deep changes in recent decades. To assess some of these interventions, a study was conducted in an Apennine reserve in Central Italy, where some grassland areas recovered through different techniques were identified, represented by shrub clearing followed by sowing of a forage mixture and shrub clearing alone, which were compared with natural areas on which no interventions were carried out. Several parameters related to the botanical composition and quality of the recovered pastoral resources were analysed. In addition, in three different experimental sites, further in-depth investigations were carried out to assess the actual animal frequentation and the impact of the intake of the wild animals present (mainly red deer) on the occurring vegetation. Results highlighted the importance of recovery interventions in these situations, the success of mechanical treatments (even if represented by clearing shrubs alone), and the real appreciation for the recovered areas by wildlife, whose utilisation on different vegetal species could be assessed, highlighting a diverse feeding behaviour for some taxa, compared to domestic animals.

Keywords: pasture restoration, biodiversity, fern, wild ungulates, defoliation rate, pastoral value.

INTRODUCTION

Since the middle of the last century, the depopulation of mountainous areas caused remarkable changes in the use of European upper lands (Faccioni et al. 2019), sometimes exacerbated with the impact of foreseen climate change (Dibari et al. 2020). The causes of the abandonment of mountainous agricultural and pastoral areas are to be found in the socio-economic changes that have occurred decisively in Italy and in many other European countries since 1950s (Giustini et al. 2007; Pittarello et al. 2020). One of the most evident consequences due to abandonment is the contraction of the surface occupied by open habitats (Orlandi et al. 2016), especially grasslands and pastures, in marginal territories that are re-colonised by shrubs and trees (Grau et al. 2019). This is because many of these areas are mainly semi-natural resources and were created in the past to provide forage available to grazing animals (Feurdean et al. 2018), their conservation is thus deeply linked to a proper management (Ponzetta et al. 2010; Kulik et al. 2020). The progressive afforestation causes as a consequence the reduction of biodiversity in these environments, particularly with respect to some plant species (Valkó et al. 2018). In addition to the loss of open areas useful for feeding animals, the reduction of grassland habitats results in the loss of ecosystem services associated with these environments, ranging from erosion control, carbon storage, and the aesthetic and touristic value of the landscape (Hao et al. 2017; Bengtsson et al. 2019).

The loss of efficiency of these resources previously described may result in the reduction of foraging areas for many ungulate wildlife species, which also find possible refuge and breeding sites in these grassland environments (Michel et al. 2019). The maintenance of these open habitats is therefore important for the survival of many wildlife animals (Cervasio et al. 2016) that may otherwise move to other areas, with reduction of density in their territory of origin, possibility of damage to agricultural and forestry resources, and even enhanced the risk of road accidents while moving. In this context, it becomes important to assess the possibilities of maintaining and recovering grassland areas that are being re-colonised by undesirable species, such as shrubs or fern (*Pteridium aquilinum*), a vegetal evolution that can result in a rapid deterioration of the environmental conditions of open habitats (Cox et al. 2008) that are less frequented by wild animals occurring in the area. In this way, environmental improvements for wildlife purposes become important for the conservation of many animal species (Watchorn et al. 2022), but in mountainous and marginal areas they can be very expensive considering the location and the scattered distribution of the intervention sites (Bergman et al. 2014). Thus, an appropriate assessment of the efficiency of these interventions and the real possibilities of grassland recovery becomes essential.

Taking into account the above considerations, a research was conducted in an area of central Italy, the main purposes of which were as follows: (i) to test different intervention techniques for the restoration and improvement of pasture areas encroached by undesirable species, (ii) to evaluate the efficiency of the proposed interventions in comparison with untreated control areas, and (iii) to assess the success of the recovery programs by estimating the actual frequentation of restored areas by wild animals, mainly represented by red deer.

MATERIALS AND METHODS

The test area is the Acquerino-Cantagallo Natural Reserve, which covers about 1,800 hectares in Central Italy (Tuscany region). The Reserve is located in an Apennine belt about between 450 and 1200 m a.s.l., where the landscape is mostly characterised by forest formations, with oak and chestnut forests at lower elevations and beech forests at higher ones. The area is characterised by cold and snowy winters as well as hot summers. Figure 1 shows the climodiagram of the Acquerino weather station, located at 950 m a.s.l, which roughly represents the average altitude of the reserve. Description of the climatic conditions is based on the data of Regional Hydrologic Service of Tuscany (SIR).

Within these forests, some open areas are present, mostly pastures that have been abandoned for about 60 years, and now encroached by shrubs and invasive species, among which the most represented is *Pteridium aquilinum*. For these reasons, local municipalities have performed restoration interventions on some open area grasslands, adopting different techniques. With a general survey, three different treatments adopted for these grassland improvements were identified:

- grasslands recovered by clearing of invasive vegetation (shrubs and fern), harrowing and reseeding of a forage mixture of *A. sativa*, *L. perenne*, *L. multiflorum* and *D. glomerata* (hereafter Sown, S);
- grasslands recovered by clearing of invasive vegetation alone (Cleared, C);
- no recovery intervention at all (Natural, N).

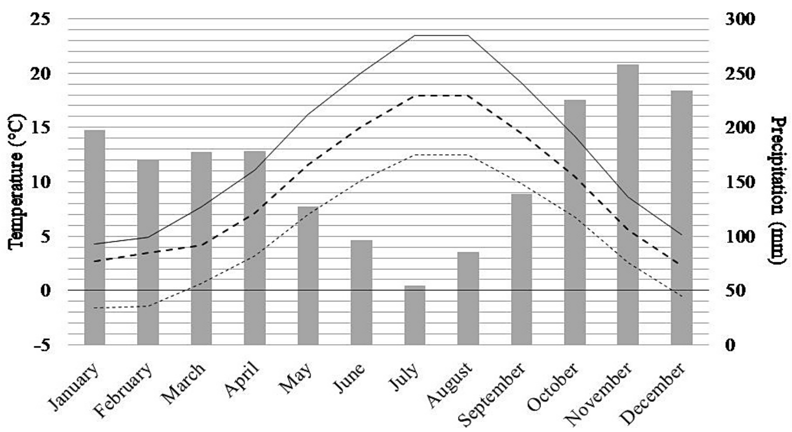

Figure 1. Climodiagram of Acquerino (950 m a.s.l) with monthly average temperature (lines) and monthly average precipitation (bars) for the period 1955–2010. Black line: average of maximum temperatures; dashed line: average temperature; dotted line: average of maximum temperatures. Data source: Regional Hydrologic Service of Tuscany (SIR)

Table 1. Average characteristics of the investigated sites for each treatment

Treatment	Number of sites	Altitude (m asl)	Slope (%)	Rocks (%)
Sown (S)	5	838	13.6	3.4
Cleared (C)	7	834	9.2	5.5
Natural (N)	6	918	14.1	10.3

In Table 1, the number of areas for each treatment and some geo-topographic characteristics for the investigated sites are reported for each category.

Three years after every intervention, a botanical survey was conducted in each area during the full vegetation period (June) to assess the occurring vegetation for a pastoral assessment and to determine some biodiversity indices. The botanical survey was conducted by means of the Braun-Blanquet approach as modified by Pignatti (1975), *i.e.* by a visual estimation of the cover of each botanical species in classes of occurrence. Afterwards, the classes were transformed using the Van der Maarel scale (1979) to obtain the specific contribution (SC) of single species in the investigated grasslands, *i.e.* the percentage presence of each species in the canopy. In further elaborations, the identified species were assembled in functional groups (grasses, legumes and forbs) as generally performed in forage studies (Wilson et al., 2020).

To assess the canopy forage value and its overall quality, the Pastoral Value (PV, Daget and Poissonet 1972) of each investigated area was calculated with this formula (1):

$$PV = (SC_i \times SI_i)/5 \quad (1)$$

where: SC_i – the percentage presence of each occurring species as previously reported,
SI_i – a synthetic index (ranging from 0 to 5) that summarises the overall forage importance of each species (Roggero et al. 2002),

PV can thus range between 0 and 100 and it can be considered a parameter to compare different vegetation types under a forage point of view (Cavallero et al. 2007). Moreover, specific richness (the number of species in each botanical sample), Shannon index (H') and Simpson index (D) were calculated to assess the biodiversity features of plant communities in each site (Magurran 2004).

To assess the impact on vegetation and the real frequentation of the studied sites by wild animals occurring in the area, specific analyses were conducted in three representative sites where all the three treatments were present. To this aim, in each site and treatment, vegetation was investigated by means of linear analysis (Daget and Poissonet 1971), on transect 20 m long in which at every 50 cm, the species touching a steel needle were identified and recorded (40 observations per transect). In this way, SC of each taxa was obtained, representing the percentage presence of the given species in the vegetation.

Moreover, an intake value obtained by visual estimation for each plant touching the needle was performed (Iussig et al. 2015), using the following scale:
- 0 – no sign of animal intake on occurring plant;
- 0.5 – partial utilisation of the plant;
- 1 – high utilisation of the plant.

In this way it was possible to calculate the utilisation rate (UR) for each transect (Argenti et al. 2017), as the ratio between the absolute browsing score observed along a line (*i.e.* the sum of all browsing scores recorded for each species in the transect) and the maximum potential score (*i.e.* the total number of contacts along a transect). Investigation was performed in two different periods on the same transect, at full vegetation development (June) and at the end of the growing season (September) to evaluate the eventual differences on animal utilisation due to the moment of data collection. On the basis of the same data, the Electivity index (Ivlev 1961) was adopted as an indicator to assess browsing preference of grazing animals on each species. The index E_i for each *i*-species was obtained by the following formula (2):

$$E_i = (r_i - p_i)/(r_i + p_i) \quad (2)$$

where: r_i – represents the utilisation of the *i*-species, in the considered case the percentage utilisation recorded along a botanical transect,
p_i – is the abundance of the *i*-species in each vegetation type, in our case represented by SC_i.

The E index ranges between -1 and 1, with negative values indicating an avoidance of the species by animals and positive value a selection of the species by occurring animals. A value of 0 indicates no selective preference, as in this case a given species is utilised in proportion to its occurrence in the canopy. A preferred species was considered as having an E_i value higher than 0.2 (according to Nagaike 2012).

Comparison among different treatment was performed by means of ANOVA, eventual post hoc test by t test or Tukey test if involving a comparison among more than two treatments. Statistical analyses were performed with SPSS software release 28 (IBM 2021).

RESULTS

Effect of recovery on vegetation characteristics

Vegetation structure (Figure 2) was remarkably different in recovered areas (under both treatments) and natural ones, as herbaceous components were sensibly higher in S or C, with percentage presence of more than 75% and not differing statistically from each other, while natural areas presented the herbaceous components with very reduced values (roughly 25%). Conversely, fern presence was extremely high in N sectors (on average about 60%) with respect to sown or cleared ones. Other invasive non-herbaceous species such as shrubs were relatively less abundant and not significantly different among treatments.

Botanical composition of vegetation under different treatments is reported in Table 2. Grasses were the most represented group in recovered areas, both in S and C, with no differences in terms of percentage occurrence (SC) or number of taxa recorded, whereas natural areas were dominated by other botanical families (mainly represented by fern), even if the number of this functional group in natural areas was lower than that observed for cleared ones. Legumes species were poorly represented in general, and not significantly different in terms of percentage, although their number was significantly affected by treatments, with higher values for C and S, even if the number of legumes in sown areas was not significantly different from natural areas.

Different treatments affected remarkably forage features and diversity indicators of vegetation (Table 3). Pastoral value was significantly higher in S and C than N, highlighting a high variability of this parameter and the great importance of recovering treatments to restore grassland with high forage value in these contexts, as clearing itself was able to produce significant increasing of pastoral value with respect to natural condition. The same trend is observed for total richness, with a higher and significant number of species in S and C in comparison to N, testifying that clearing without sowing is also a powerful method to improve species diversity. The effect of treatments is evident also in the indicators adopted to assess the biodiversity at ecosystem level. H' is higher in C and S, even if this latter value is not significantly different form N, while Simpson index indicates that natural areas are dominated by a reduced number of species with respect to S and

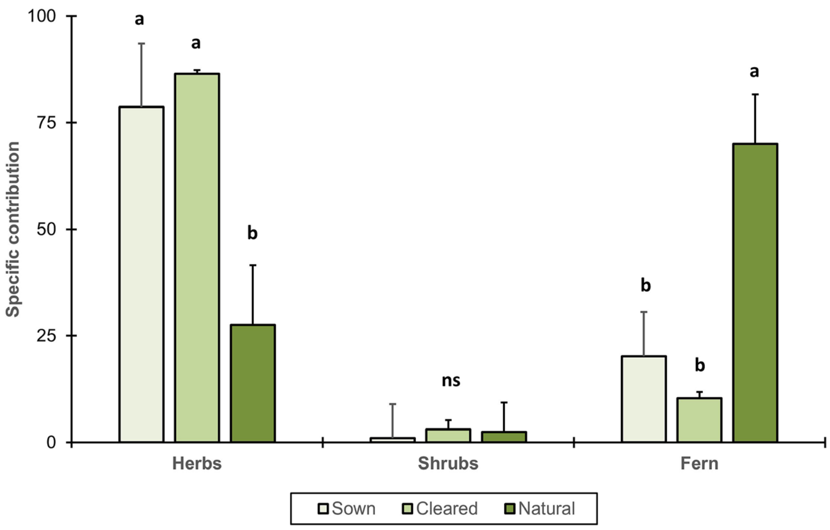

Figure 2. Average vegetation composition in each treatment arranged for functional groups. Lines on each bar represent standard error. Bars with the same letter at top are not significantly different ($p < 0.05$); ns= not significant

Table 2. Specific contribution and number of species for different treatment. Values are average ± standard error

Treatment	Specific contribution			Number of species		
	Grasses	Legumes	Forbs	Grasses	Legumes	Forbs
Sown	72.4±14.1a	2.2±0.8ns	25.4±14.4b	8.2±0.8a	4.4±0.9ab	23.4±1.2ab
Cleared	65.9±8.6a	8.8±4.7ns	25.3±9.3b	9.4±1.3a	5.1±0.9a	29.1±2.7a
Natural	18.6±5.5b	5.2±4.1ns	76.2±9.2a	4.8±0.7b	1.7±0.6b	17.0±3.3b

Note: Values with the same letter inside each column are not significantly different ($p < 0.05$) according to Tukey test; ns = not significant.

Table 3. Pastoral value, richness, Shannon index and Simpson index for different treatments. Values are average ± standard error

Treatment	Pastoral value	Richness	Shannon index (H')	Simpson index (D)
Sown	45.8±26.6a	36.0±4.8a	1.64±0.5ab	0.13±0.008b
Cleared	27.5±13.1a	43.6±9.9a	2.09±0.4a	0.15±0.001b
Natural	7.4±5.4b	23.5±9.7b	0.97±0.6b	0.26±0.001a

Note: Values with the same letter inside each column are not significantly different ($p < 0.05$) according to Tukey test; ns = not significant.

C, as observed in Figure 2 in which an elevated occurrence of fern was highlighted.

Effect of recovery on animal browsing

Concerning impact of animal browsing on different vegetation types, overall utilisation rate was sensibly higher in restored areas, with an average among the two collecting date of 42.3% and 34.7% (average of each sampling date) in S and C respectively, while in not treated areas this value scored only 4.0 (Figure 3).

Thus, the effect of a higher frequentation by animals in the areas after the improvement of original habitat is evident. Moreover, the different behaviour of occurring wildlife along the vegetative season is also evident, as value of percentage browsing was always significantly higher in September than in June for S (52.1% *vs.* 32.4%) and for C (51.4% *vs.* 17.9%), while in control areas covered by natural vegetation, no significant effect due to date of sampling was observed. The collected data also permitted evaluating the role of the presence of fern on the occurrence of animal browsing in all studied situations. It was possible, in fact, to find a significant relationship between specific contribution of fern observed along the transects and the utilisation rate recorded on the same line (Figure 4).

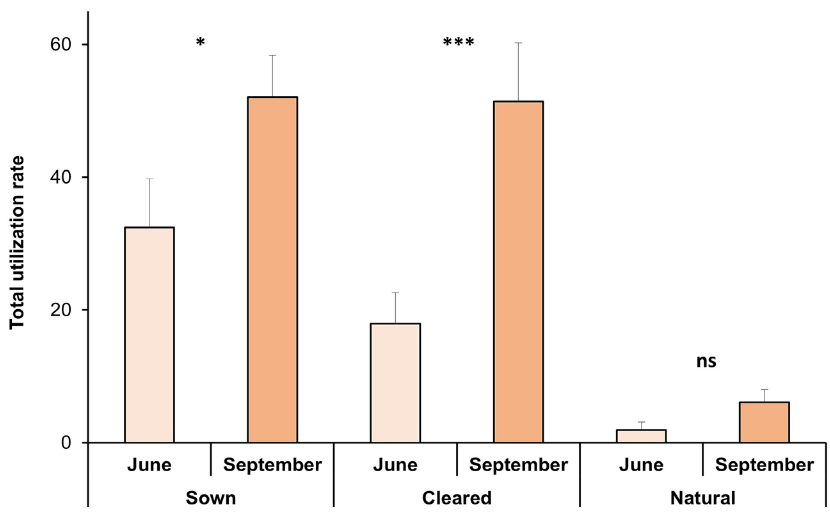

Figure 3. Values of total utilization rate in different date of sampling for different treatments. Lines on each bar represent standard error. Bars with the same letter at top are not significantly different ($p < 0.05$); ns = not significant.

The logarithmic form of the regression line shows that utilisation rate decreases quickly when the presence of fern increases, so also a reduced presence of fern can remarkably negatively affect the occurrence of wild animals that utilise the grassland. Number of preferred species (*i.e.* those with E>0.2) in each vegetation type and in each date of sampling is reported in Figure 5.

The average number is always decreasing from S to C to N, but in June the recorded differences were not significant, whereas in September sown and cleared areas were significantly different from natural ones. The trend is similar to what was already verified by the overall utilisation rate (Figure 3), with a sensible increase of browsing activity of animals in all kinds of areas in September with respect to June. Single species with high value of E were represented mainly by some grasses present in the original mixture used for the restoration when occurred (such as *Dactylis glomerata* and *Lolium* sp.), but also by species naturally occurring in the environment (such as *Poa trivialis*, *Holcus mollis* or *Arrhenatherum elatius*). Moreover, some legumes showed remarkable value of E, such as *Lotus corniculatus* or *Trifolium campestre*, as well as *Cytisus scoparius*, considered an invasive shrub with no forage interest, which was on the contrary actively browsed, especially in September.

DISCUSSION

Effect of recovery on vegetation characteristics

Management is acknowledged to affect remarkably different characteristics of semi-natural grassland, under productive and ecological point of view (Kun et al. 2021). Shrub clearing is one of

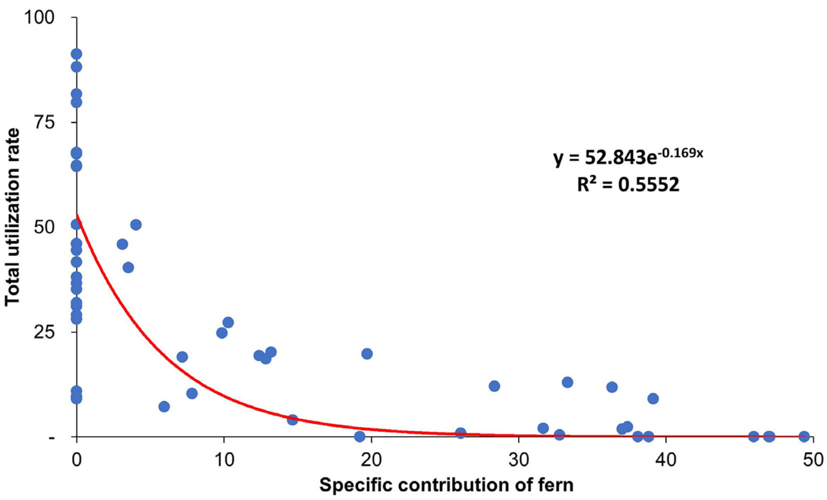

Figure 4. Evolution of total utilization rate in relation to specific contribution of fern

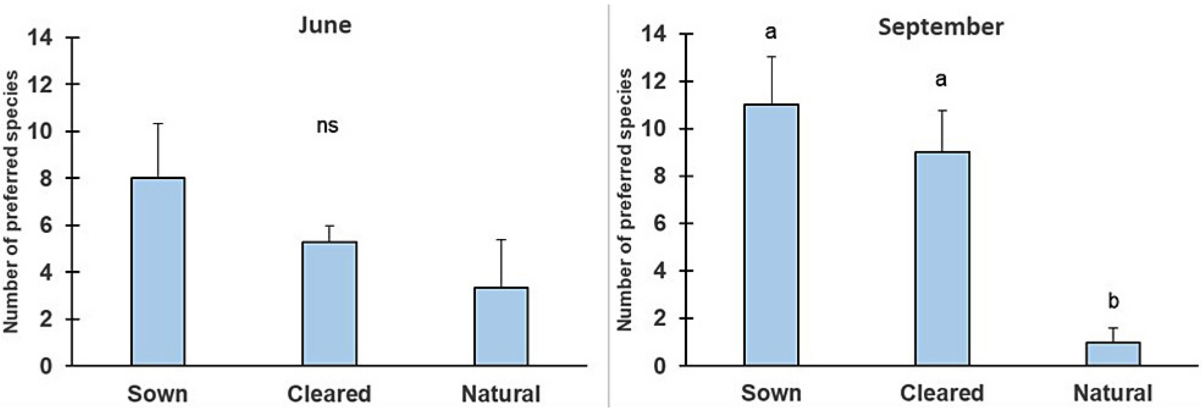

Figure 5. Number of preferred species for browsing (Electivity index > 0.2) in different date of sampling for different treatments. Lines on each bar represent standard error. Bars with the same letter at top are not significantly different ($p < 0.05$); ns= not significant.

the most common techniques adopted to recover grassland and pasture in mountain environment (for restoring areas useful for domestic or wild animals, Cervasio et al. 2016) as it generally represents a simple and mechanical treatment able to recover wide surface with reduced cost (Cavallero et al. 2002), since interventions represented by ploughing or arrowing of degraded areas followed by sowing of adapt forage mixtures can be limited by high cost and difficulty of operation in marginal lands (Soldatov et al. 2020). Thus, the technique to be adopted to restore grasslands, and also the possible following management, should be properly assessed also under the economic point of view (Kelemen et al. 2014). The obtained results concerning effectiveness of interventions on botanical composition are in line with previous literature. For instance, Probo et al. (2016) found a deep relation between vegetation structure and restoration techniques: in their experiment, shrub cover was almost the half with respect to original data after four years since restoration, represented by improvements of targeted grazing of cattle by means of attractive points in the Western Alpine chain. At the same time, the authors observed remarkable increase of high quality species and pastoral value as in the conducted study. The same results were observed by Cervasio et al. (2016) that, after 5 years since recovery by arrowing and sowing of a forage mixture in an upper pasture encroached by fern in the northern Apennine, found a remarkable increase of pastoral value in comparison with natural areas. Improvement in the quality of forage recorded in these interventions can be attributed to different mechanisms that are stimulated by grassland restoration: introduction of species of forage interest when sowing occurs, reduction of forbs considered of reduced quality, enhancement of occurrence of legumes that can benefit from shrubs and tall grasses removal due to their heliophilous behaviour (Doležal et al. 2011; Probo et al. 2016). In the conducted study, both restoration techniques were highly effective in reducing the occurrence of fern, which is acknowledged to depress the presence of autochthonous vegetation (sometimes of high conservative value) and to reduce the ecological importance of encroached grassland (Prach et al. 2014). Comparison among improvement techniques for pastures restoration was also reported by the same team of researchers in similar environments (Argenti et al. 2012). In this trial, establishment of a commercial grasses/legumes mixture was performed after two mechanical interventions, ploughing or arrowing, and in the former case the sowing was followed by maintenance cutting once a year. The obtained results showed that the most complex technique was more effective in achieving effective recovery of the grassland, with higher occurrence of species of high forage interest (grasses and legumes), a greatly reduced presence of fern (comparable to the results obtained after four years since sowing) and an increase of pastoral value remarkably related to the presence of legumes in the canopy. In this case, cutting performed on restored grassland played a very important role to enhance success of establishment of an efficient and valuable botanical composition, and this is in accordance with previous studies. For instance, Lengyel et al. (2012) highlighted the importance of further management after grassland restoration, to counteract the homogenizing process due to different local factors.

Restoration techniques were also important for ecological parameters, concerning diversity, richness and dominance of some species in the sward. Both establishment approaches produced a significant increase in number of species observed with respect to natural areas. Remarkable reduction of occurrence of fern seems to be the most important factor that permitted a development of richer grassland in terms of number of species, as already pointed out by many authors (*e.g.* Mitchell et al. 2017). It is not easy to compare data with other studies, as many of these results are site-specific (Walden and Lindborg 2016). Even if some authors questioned to the use of richness as an indicator to assess success of restoration (Hillebrand et al. 2017), the use of this parameter is widely used in many studies to describe evolution toward natural environment and reference habitat (Török et al. 2010). Similar results to what was found in the conducted experiment were reported by Winsa et al. (2015), who highlighted the great importance of time that elapsed since restoration and edge effect on evolution of species richness. Ramos et al. (2008) gave evidence of improving species richness by means of shrubs clearing also under oak stand, as restored understory presented higher richness in comparison to unmanaged test sites. Comparison of Shannon and Simpson indices with previous literature is not easy, as it depends on the method of survey. While analysing many different case studies coming from Central Europe grasslands, Lengyel et al. (2012) highlighted the importance of age since restoration for the increase of these indicators, and also the importance of the seed mixture used (if any) at the moment of grassland recovery. The obtained data are in line with those reported by studies in which monitoring was performed after similar time since pasture recovery as in the presented case, such as Argenti et al. (2012) under comparable environmental conditions or by Pittarello et al. (2016) for alpine vegetation, operating with animals to restore pastures highly encroached by sub-alpine shrubs cover. Thus, even if performed with different techniques and in very different environmental conditions, grassland restoration can produce deep change in vegetation in terms of composition and diversity, also in a reduced timespan since recovery intervention.

Effect of recovery on animal browsing

Many studies on deer browsing have been conducted to assess the impact of animals on forest regeneration, due to the overabundant presence of these ungulates, and some were also performed in order to evaluate the preference of grazers on grasslands (Iijima and Nagaike 2017). Deer population can affect the development of herbaceous vegetation, and this process is controlled by many different factors, such as population density, botanical composition, resistance of plant to animal browsing, but also by deer preference on vegetal species (Iijima and Otsu 2018). Assessment of animal impact is crucial to understand the evolution of vegetation in a grassland, as animal utilisation can produce an indirect effect on botanical composition, as a great occurrence of unpalatable or resistant species to browsing activity can reduce or inhibit the development of other species (Tanentzap et al. 2012). The methodology adopted in the present study was effective in evaluating the overall utilisation of grassland but also assessing the preference of animal on single taxa, and in this way it was implemented in other previous experiments on natural or artificial grasslands (Nagaike et al. 2012; Argenti et al. 2017). Moreover, the observations permitted assessing that the impact of deer occurring in the study area generally reflects the same behaviour of domestic animals, showing a deep preference for grasses and legumes usually used in forage mixtures used to establish artificial grasslands (such as those adopted in the studied site for grassland restoration or deriving from natural recolonisation), but in some cases deer-preferred species were considered unpalatable for domestics, such as broom. Thus, wild animals can benefit for their diet also from species encroaching pastures considered of no forage quality or even toxic, as reported by Boulanger et al. (2015). Being very time consuming, in some cases assessment of animal defoliation was performed observing the browsing activity on functional groups instead of single species, but, also taking into account this approach, it could properly estimate the animal impact on vegetation and detect eventual behaviour in different vegetative season (Baum 2021). Differences in selectivity in two seasons in the considered case are consistent with previous studies. Argenti et al. (2017) operating on different vegetal material in artificial grassland, observed increase of browsing ratio of roe deer in summer with respect to spring, and this could be due to different animal behaviour and reduced availability of forage biomass that induces animals to utilise the plant species that they would otherwise reject. In the considered specific case, a higher frequency of red deer during late summer could be due to hunting practice which is performed in September in the surrounding territory but not in the study area which is a reserve where hunting activity is forbidden; thus animals would have benefited from the protected area as a refuge. Different performance of browsing intensity induced by seasonality was observed also in white-tailed deer by Baum (2021) so it can be argued that wild animals show generally a very opportunistic behaviour that is affected by forage availability, as reported by Freschi et al. (2016). Nevertheless the interventions performed produced a remarkable decrease of presence of invading plants, in the considered case represented mainly by fern, and this had deep effects not only on vegetation composition but also on following utilisation by wildlife, as testified by values of browsing ratio. In this way, restoration was useful to induce a higher frequentation on recovered areas, and a direct relationship between occurrence of fern and utilisation rate was observed, with a trend very similar to that reported by Argenti et al. (2012) in analogous environments. The presence of a shrub layer and browsing rate were negatively correlated in an experiment carried out by Morrison et al. (2022) in United States, but other researchers found inverse correlation also between wild animals and invasive herbaceous species, as reported for instance by Adhikari et al. (2022). Finally, in the long term, a higher frequentation by wild animals on the restored areas can affect botanical composition, as the effect of animal browsing on the survival of some species, for instance those highly preferred but with low occurrence was reported (Nagaike 2012); thus, management of density of deer population is a pivotal factor to conserve open areas in an efficient way, as wild animal browsing, if performed in a balanced way, is able to maintain high diversity in herbaceous communities in which no domestic animal is present (Riesch et al. 2020).

CONCLUSIONS

The two types of environmental improvements techniques monitored in this work allowed the authors to highlight their effectiveness in terms of reconstituting a functional herbaceous plant cover consisting of species of good forage quality, with values for the studied parameters always significantly higher than those observed in the natural control areas. Even the simplest intervention, consisting of clearing alone, achieved acceptable results as many parameters that were monitored were significantly not different from those where reseeding of a mixture of forage species was also included. The effect was similar especially on the presence of fern, which seems to be the most limiting factor for deer to frequent these areas. The feeding behaviour of this animal in some cases has been very similar to that of domestic animals, with high defoliation rates on species of great forage value, but in some cases very high browsing rates have been observed, even on species considered undesirable. For this reason, in order to properly evaluate the success of habitat improvement interventions, it would be necessary to have in mind the real appreciation that wild animals can have on all components of herbaceous community, so as to have a real monitoring of these interventions.

The main strength of this study is that the results are suitable to be used in the operational field suggesting how periodic clearing of invasive vegetation occurring in open areas can be a valid alternative to sowing, with considerable advantages both from an executive and economic point of view. In fact, sowing operations, especially in marginal areas, can be very complex (for example high slopes of the areas, choice of sowing time and suitable mixture, climatic conditions, etc.) and may not always produce desired results, or at least justify their use rather than simple cutting or clearing. Future developments of the study could focus on the economic aspect and in particular on the economic quantification of the ecological restoration of open areas, both as a function of the technique used and as a function of the benefit to the community.

The main limitation of this study is represented by a limited number of case studies, which should also be replicated in other contexts, for example in areas with different characteristics both from a vegetational and climatic point of view. Furthermore, the vegetational analysis should be replicated even many years after the restoration intervention, in order to better evaluate the vegetational evolution and the forage characteristics of the recovered grazing areas.

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