

NATIVE RUMINANT BREEDS AS PART OF ACTIVE GRASSLAND CONSERVATION

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Abstract

The aim of this study is to present the role played by native ruminant breeds in the management and conservation of permanent grassland. Pastures have for centuries been used as the primary, and sometimes the only, source of fodder for cattle, sheep or goats during the summer. Unfortunately, with changing socio-economic conditions, they are losing their basic functions, resulting in their degradation and the irreversible loss of often valuable natural areas. Grazing by indigenous animal breeds, which have lower nutritional requirements and are adapted to the often harsh climatic conditions, may provide an opportunity for their existence.

Keywords: grasslands, grazing, native breeds of ruminants, protection of permanent grasslands (PG)

Introduction

Changing socio-economic conditions in Poland have contributed to the abandonment of farming on many farmlands, and fewer and fewer farms are also using pasture feeding, making grazing animals an increasingly rare feature of the landscape. This situation can be changed by programmes and projects using ruminants, especially local breeds, in active conservation (Czyłok et al., 2010; Greguła-Kania et al., 2017). Meadows and pastures are semi-natural communities, meaning that they owe their origin and existence to a specific human impact (Barabasz, 1997; Bator, 2005). They were created on the site of former forest communities as a result of clearing or burning of the forest. For millennia grasslands have been, and still are, some of the best grazing land for ruminant animals and a habitat for many animal species. During this time, a specific, close relationship between the vegetation cover of the grasslands and the animals also took shape.

Biodiversity of permanent grassland

Poland's grasslands are floristically very valuable communities, located on both fertile and very poor soils, found on dry and swampy sites, in valleys, on uplifts and high in the mountains (Radkowska and Musiał, 2017). Most phytocenoses require biomass collection and abandonment of their utilisation is a threat to their biodiversity. Grassland communities are home to many valuable plant species, it is estimated that over 400 species of grasses and plants belonging to the monocotyledonous and dicotyledonous classes occur in grasslands under our climatic conditions. They also provide habitat for numerous species: insects, birds, small mammals and a feeding ground for free-living ruminants (Warda and Rogalski, 2004, Radkowska and Musiał, 2017). Observations show that there is a strong negative relationship between community productivity and species richness (Gross et al., 2009; Socher et al., 2012). The intensification of agricultural production, over-fertilisation and over-use are the reasons for the disappearance of many plant species and the simplification of the botanical composition of the sward. Research has shown the beneficial effects of extensive and ecological use systems on the genetic and biotic diversity of agricultural ecosystems (Hansen et al. 2001). Studies by Heineken (1990) have shown that the number of species on the ecological land compared to conventional land can be up to 10 times higher. Many unfavourable changes in the floristic composition of the sward of semi-natural grasslands also result from the reduction or abandonment of their use. A study by Warda (1997) showed that the number of species present in the sward after three years of grazing was higher than in the year of establishment.

Consequences of abandonment of PG management

The abandonment of management, on the one hand, reduces the occurrence of species, which may lead to the elimination of vegetation typical of the communities, and on the other hand, may lead to the appearance of new, alien species (Trąba et al., 2004). As a result of the disappearance of characteristic species, communities lose their individual characteristics, which makes phytosociological classification of communities difficult (Kryszak, 2001; Kryszak and Grynia, 2001). After abandonment of management, there is an accumulation of organic matter and an increase in soil nitrogen abundance. During precipitation, water penetrates through the overlying pile of dead plant debris, which also impedes evaporation. This leads to an increase in soil moisture and favours the growth of nitrophilous and herbaceous plant species such as wood rush (*Scirpus sylvaticus*), horsetail (*Chaerophyllum hirsutum* L.) or burdock thistle (*Carduus personata* (L.) Jacq.), as well as a grass that prefers wetter habitats - the common crested grass (*Cynosurus cristatus* L.). This results in the dominance of a few expansive species and the receding of other, more sensitive sward components (Radkowski and Grygierzec, 2005; Radkowska and Musiał, 2017). Research in the Ojców National Park has shown that the cessation of use even for one year results in the accumulation of organic matter and the appearance of nitrophilous species (Kornaś and Dubiel, 1990; Michalik, 1990). In addition, overlying dead plant debris makes it difficult for many valuable plant species to germinate.

The grasslands, meadows and heathlands present in Poland are characterised by considerable biodiversity and require active protection, e.g. through the designation of Natura 2000 areas. Their specific and unique plant species are determined mainly by climatic and soil conditions, but also by rational use. Shepherd management is one of the oldest and most important factors of anthropopression. As a result of the cessation of biomass collection, whether through grazing or mowing, grassland degradation occurs.

One of the most valuable plant communities is the xerothermic grasslands. For many years, livestock grazing on xerothermic grasslands was regarded as harmful, but it is now considered that the factors that determine their existence are their use through mowing, grazing and fertilisation. Failure to do so results in changes in habitat conditions that lead to successional changes (Kulik et al., 2015). Research carried out on the Stawska Góra xerothermic grassland belonging to Natura 2000 areas has shown that under the influence of grazing, the proportion of dead organic matter has decreased, thus creating favourable conditions for the generative reproduction of xerothermic vegetation. In the sward, there was also a significant increase in the proportion of seedlings of *Carlina onopordifolia* Besser ex DC, a species with one of the few occurrences in Poland in the Stawska Góra Nature Reserve. The selective intake of individual species by sheep has contributed to this, leading to a reduction in the development of some species and providing opportunities for others, especially rare and naturally valuable species (Kulik et al., 2016; Greguła-Kania et al., 2017).

Due to the abandonment of use, the consequence of which is progressive succession, thermophilic sand grasslands are also under threat. They tend to occur in very poor habitats. The advantage of grassland grazing is that grazing sheep do not take species characteristic of this type of community – grey hair-grass (*Corynephorus canescens* (L.) P.B.), or the mild cladonia (*Cladina mitis* Sandst.). However, animals can excessively trample, especially uncovered parts of the grasslands. Therefore, when grazing on grasslands of this type, appropriate stocking rates should be monitored (Warda and Kulik, 2012).

A major threat, especially to upland pastures, is tufted hairgrass (*Deschampsia cespitosa* L.), a species overlooked by grazing animals. The increase in the proportion of this species in the sward is indicative of inappropriate use, particularly the lack of mowing which reduces its proportion and the low abundance of sheep in free grazing.

Indigenous breeds in grassland conservation

Grazing by animals, especially sheep and goats, is an effective method of counteracting secondary succession in habitats of natural value. These animals are very keen on biting shrubs and trees up to a height of up to 130 cm (Kulik et al., 2016). Sheep also readily consume expansive species that threaten valuable communities, such as bushgrass (*Calamagrostis epigejos* (L.) Roth.), which, due to its high competitive capacity, can dominate a given community (Warda and Kulik, 2012). The preference for the plant species consumed depends on the species of grazing animals. Cows, sheep and horses are most likely to take grasses and legumes, while goats are also keen to chew on shrubs and young tree shoots.

Table 1. Preferences of plant consumption by individual animal species in the pasture (Chodkiewicz and Stypinski, 2011; Kowalski, 1997, Szymanowska et al., 2017)

Preferred plant groups	Animal species			
	Horses	Cattle	Sheep	Goats
Grasses	90	70	30	30
Legumes and herbs	4	20	50	10
Shrubs, bark, branches	6	10	20	60

Farming uses plant and animal species that have been refined by selection over hundreds of years. Natural selection, crossbreeding, controlled reproduction, climate, varied use and even disease have contributed to the emergence of a large number of animal breeds adapted to local conditions (Patkowski et al., 2017). The twentieth century saw the development of breeding methods and the commercialisation of the livestock sector as a result of the increase in demand for food and the increase in demand for animal products. New biotechnological reproductive methods have emerged to facilitate the use and transfer of genetic material (insemination, sperm cryopreservation, embryo cryopreservation and transfer). This has resulted in animal production now being dominated by a small number of selected, high-yielding, single-use breeds. It is estimated that currently, 70% of people's food needs are met by twelve varieties of plants and five breeds of livestock (Patkowski et al., 2017). This has led to so-called genetic erosion, which can result in the extinction of many valuable plant varieties and animal breeds.

A major challenge in recent times, especially in crop and livestock production, is adapting to climate change. The solution may lie in the use of native breeds, which are perfectly adapted to local, often harsh and demanding environmental conditions. They are characterised by lower productivity, making them better adapted to periodic forage shortages and more resistant to disease and stress. They are characterised by longevity, good fertility and prolificacy, light births and relatively good milk yields (Allendorf, 1986; Patkowski et al., 2017). Due to these characteristics, and in particular to their limited fodder needs, native breeds can be maintained on a variety of grassland types and can therefore be used for the management and protection of naturally valuable areas. It is less cost-effective to keep indigenous breeds due to lower productivity. However, unique quality products can be obtained from these breeds, which can provide an opportunity and compensate for losses due to lower productivity. Indigenous ruminant breeds are mainly maintained on organic and agro-tourism farms, where they are an attraction for guests and perform promotional and educational functions in relation to the region from which they originate (Sikora, 2006).

In Poland, a great deal of attention is paid to the conservation of livestock genetic resources. Maintaining valuable animal genetic resources has been an issue since the 1980s. In the 1990s, it was supported from the budget of the Ministry of Agriculture through subsidies to conservation herds (endangered populations of native breeds) and herds of so-called genetic reserve (valuable imported genetic material). In 2000, the Minister of Agriculture and Rural Development approved 32 programmes for the conservation of genetic resources, covering 75 breeds, varieties, lines and lineages of livestock and fish. Since 2002, the coordination of this work has been entrusted to the Institute of Zootechnics PIB (Krupinski et al., 2017).

In Poland, 3 species of ruminants are protected, including **4 breeds of cattle** (Polish Red, White-backed, Polish Black-and-White, Polish Red-and-White), **15 breeds of sheep** (Cakiel Podhalański, Wrzosówka, Czarnogłówka, Kamieniecka, Koridel, Olkuska, Pogórze, Pomorska, Świniarka, Uhruska, Wielkopolska, Żelaźnieńska, Merynos of the coloured variety, Polish Merino of the old type, Polish Mountain Sheep of the coloured variety) and **3 goat breeds** (Karpacka, Sandomierska and Kazimierzowska goat). Changes in herd and animal numbers covered by genetic resource conservation programmes are shown in Tables 2, 3 and 4.

Table 2. Cattle – number of herds and number of animals covered by conservation programmes in selected years (compiled from NRIAP data; <http://bioroznorodnosc.izoo.krakow.pl/>)

Species breed	Years							
	2000		2010		2021			
	No. of herds	No. of animals	No. of herds	No. of animals	No. of herds assessed for milk	No. of herds assessed for milk	No. of herds assessed for meat	No. of herds assessed for meat
Cattle	34	280	983	7841	711	7854	107	1439
including:								
Polish Red	34	280	271	2091	237	2377	88	1280
White-backed	-	-	28	265	56	639	19	159
Polish Red-and-White	-	-	445	3258	323	3533	-	-
Polish Black-and-White	-	-	239	2227	95	1305	-	-

Table 3. Number of sheep flocks and number of animals covered by conservation programmes in selected years (compiled from NRIAP data; <http://bioroznorodnosc.izoo.krakow.pl/>)

Species breed	Years							
	2005		2010		2015		2021	
	No. of flocks	No. of sheep	No. of flocks	No. of sheep	No. of flocks	No. of sheep	No. of flocks	No. of sheep
Sheep	145	8004	540	31021	706	51582	738	61013
including:								
Podhale Zackel	-	-	109	4332	118	7128	110	8052
Coloured Merino	1	84	3	191	7	572	9	794
Old-type Polish Merino	-	-	57	4465	59	6841	57	7625
Black-headed sheep	-	-	-	-	36	1546	68	3600
Kamieniec sheep	9	622	36	1671	51	4464	57	5479
Corriedale sheep	3	192	13	716	24	1543	25	2023
Olkuska sheep	11	179	42	648	54	1123	44	1159
Pogórze sheep	-	-	-	-	15	786	21	1662
Pomeranian sheep	69	2998	111	6677	108	7994	90	8300
Świniarka sheep	4	228	14	613	21	1390	36	2252
Uhruska sheep	2	228	81	4441	107	6612	113	7486
Wielkopolska sheep	13	1376	35	4208	59	7272	59	7911
Wrzosówka sheep	27	1833	126	6376	115	8467	105	8552
Zelaznienska sheep	2	122	11	453	23	1496	25	1983
Coloured Polish Mountain Sheep	4	142	11	562	27	1476	29	2187

Table 4. Number of goat herds and number of animals covered by conservation programmes in selected years (compiled from NRIAP data; <http://bioroznorodnosc.izoo.krakow.pl/>)

Species breed	Years							
	2015		2018		2020		2022	
	No. of herds	No. of goats	No. of herds	No. of goats	No. of herds	No. of goats	No. of herds	No. of goats
Carpathian goat	3	30	15	154	20	246	22	370
Sandomierz goat	-	-	-	-	-	-	6	91
Kazimierz goat	-	-	-	-	-	-	4	43

Currently in Poland, programmes are being carried out in selected protected areas to preserve biodiversity and protect landscape values using extensive grazing. The aim of these programmes is to preserve semi-natural grassland ecosystems and valuable plant and animal species, but also to maintain traditional pastoral customs.

At the National Research Institute of Animal Production, the 'Biostrateg II' project was implemented to monitor the state of the vegetation of naturally valuable habitats under conditions of grazing by native livestock breeds and its abandonment. The project involved grazing sheep, cattle and horses. Grazing was carried out on dry heathland (4030), thermophilous inland sand grasslands (6120) and xerothermic grasslands (6210). Research carried out as part of the project has shown that the grazing of local animal breeds in areas of natural value reduces the expansion of shrubs and trees and the growth of alien invasive species and native species of expansive herbaceous plants. Under the influence of grazing, the habitat undergoes beneficial changes in forage quality and increases floristic and faunal species diversity (Warda et al., 2019). In mountainous areas, too, sheep grazing is the most ecological and cheapest method of preserving biodiversity and protecting naturally valuable areas. Animals grazing on pasture are better adapted to climatic conditions, are characterised by better health, which means that less medicinal preparations are used, and consequently the products obtained have a more favourable chemical composition from a nutritional point of view and are characterised by higher suitability for processing (Kawęcka et al., 2017, Kawęcka et al., 2018).

Summary

Permanent pastures are now a small but extremely important component of agricultural land, as they perform a number of important functions in both farm and production space. Pasture use of grasslands is the most effective form of their economic use and maintenance, as well as increasing their biodiversity (Wasilewski, 2003). Grazing livestock maintenance has two equivalent functions: production (forage) and environmental protection. In areas of natural value or nature conservation, grazing is necessary and essential to maintain biodiversity and to protect against overgrowing. The combination of these two functions is particularly evident in the mountain pastures, which provide grazing for sheep but are also part of the landscape, and through grazing are reduced overgrowth of unwanted plants. In addition, livestock grazing is part of the sustainable development of the countryside promoted by the European Union and the so-called 'regional identity'. Grazing of indigenous animal breeds should be particularly promoted. These are breeds whose existence largely depends on a system of subsidies for their maintenance, as low milk or slaughter yields make their maintenance unprofitable. It is therefore important to highlight and promote traditional products made from raw materials from

local breeds of animals which, as has already been mentioned, are superbly adapted to the existing environmental conditions, more resistant to disease, long-lived, with high vitality. Ruminants of indigenous breeds are adapted to utilise forage in poor, hard-to-reach areas, especially in mountainous and foothill regions. Research results indicate that raw materials and processed products obtained from indigenous breeds of animals, fed in a traditional manner, have more favourable parameters for processing and, at the same time, a higher content of biologically active substances positively affecting human health (Krupinski et al., 2017). Thus, the cultural grazing of animals, the traditions of the region combined with the unique quality of the products can be an opportunity for areas where the terrain conditions do not allow intensive agricultural production (Yunyshev et al., 2017). Extensive grazing of local animal breeds is an effective and efficient way of reducing the effects of secondary succession, especially in habitats of natural value. The greatest changes in the species composition of meadow and pasture communities are due to the abandonment of traditional use, which is a condition of their existence and on which the maintenance of high species diversity depends.

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SUMMARY

The objective of this paper is to present the role played by native breeds of ruminants in the management and conservation of permanent grasslands. Pastures have for centuries been used as the primary, and sometimes the only, source of fodder for cattle, sheep or goats during the summer. Unfortunately, with changing socio-economic conditions, they are losing their basic functions, resulting in their degradation and the irreversible loss of often naturally valuable areas. They could be saved through the grazing of indigenous breeds of animals, which have lower nutritional requirements and are adapted to the often harsh climatic conditions.

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