

HIGHLAND CATTLE – POTENTIAL FOR INTEGRATION AND ADAPTATION TO THE EXTENSIVE SYSTEM AT COJOCNA FARM

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Abstract

Considering that many pastures in Romania are not exploited to their full potential, the possibility of capitalizing on them by raising Highland cattle, which are capable of efficiently converting even low-quality grass into high-quality meat, was analyzed. The study, which focused on evaluating existing pastures and the adaptive behavior of the Highland breed in an extensive system, was carried out on the Cojocna farm, which belongs to USAMV Cluj. Pasture research covered 20 hectares of plot 11, which is part of the Natura 2000 site ROSCI0238 Suatu–Cojocna–Crairât. The goal was to evaluate the Highland breed's adaptability to the Cojocna Farm's specific soil and climate conditions by achieving the following objectives: 1) analyzing the effect of grazing with Highland cows on the ecological and agronomic value of Natura 2000 habitats; 2) determining the correlation between average daily gain (ADG) and the floristic composition of the pasture; 2) developing specific measures to improve pasture types; and formulating recommendations on technology for farming Highland beef cows in an extensive system. This research activity was conducted in 2023. The methodology included weighing calves according to the official performance control system (COP) to determine ADG, as well as geobotanical methods using the Braun-Blanquet scale to identify and characterize grassland types in two descriptive plots (PD1 and PD2).

The results show that the gains achieved fall within the performance parameter s specific to the Highland breed, despite the pastures being dominated by plant types such as *Stipa capillata*, - *Carex humilis*, and *Festuca rupicola*, which are only moderately tolerant of grazing. In this context, we recommend implementing a rational grazing system, clearing woody vegetation, and controlling toxic plants to ensure the pastures are exploited sustainably and efficiently.

Keywords: Highland cattle, grassland, adaptability, average daily gain

INTRODUCTION

Highland cattle are considered one of the oldest known pure breeds. They originated in the Highlands of Scotland. Over many centuries, it evolved through natural selection in harsh climatic conditions and marginal land. This process favored traits such as hardiness, longevity, fertility, pronounced

maternal behavior, and adaptability to grazing in harsh conditions (Nota et al., 2024).

The breed was officially recognized when the Highland Cattle Society was established in 1884 and the first Herd Book was published in 1885. Since the 19th century, the breed has spread to various areas

with severe climates, including Canada, the United States, and Germany (Svensk et al., 2023).

One of the most distinctive features of this breed is its double coat, which consists of a long, thick, oily outer layer that repels water and a thin, dense undercoat that provides thermal insulation. This adaptation enables the animals to remain outdoors year-round, even in low temperatures or high humidity (Nota et al., 2024; Sambraus, 2016).

Highland cattle have compact bodies with low centers of gravity and broad hooves adapted to muddy, rocky, or steep terrain. Their moderate weight and large hoof surface area result in low pressure exerted on the soil, reducing the impact on the vegetation layer and minimizing soil compaction (Pauler et al., 2022; Ranta & Mälinä, 2024).

Highland beef is recognized for its low fat and cholesterol content, as well as its high ratio of omega-3 fatty acids and conjugated linoleic acid (CLA). Compared to intensively raised breeds, Highland beef has a higher protein, iron, and zinc content and a lipid profile that is favorable to human health (<https://hyndmanbeef.com>). This type of meat comes almost exclusively from extensive grazing, without the use of concentrates.

Highland cattle have adaptable feeding behaviors and a preference for mixed diets, including grass, herbaceous plants, and woody species or shrubs. Studies in forested areas of the Swiss and Italian Alps

have shown that Highlanders consume 15–46% woody plants, such as *Alnus viridis*, *Rubus spp.*, and *Fraxinus*. This helps control invasive species and maintain ecosystem balance (Svensk et al., 2023; Pauler et al., 2022).

In addition to their effect on clearing and compaction, Highlands contribute to biodiversity enhancement through seed transport (endo- and epizoochory) and by maintaining plant diversity in grasslands (Nota et al., 2024). In the current context marked by the transition to sustainable agriculture and biodiversity conservation, the Highlands are regaining the attention of farmers, ecologists, and researchers. Their ability to graze a wide variety of vegetation, including woody species, and to support the conservation of semi-natural habitats makes them a valuable asset in ecological pasture management similar to Galloway cattle (Ranta et al., 2024). This study aims to assess the adaptability of the Highland cattle breed within an extensive system, in the context of the specific soil and climate conditions of the Cojocna Farm. In this context, the following main objectives were followed: a) to analyze the impact of grazing with Highland cattle on the ecological and agronomic value of habitats included in the Natura 2000 site; b) to establish the correlation between average daily gain (ADG) and the floristic composition of the pastures used at the Cojocna Farm; c) formulation of specific measures to

improve pasture types; d) development of a set of technological recommendations for

the efficient exploitation of Highland cattle in extensive systems.

MATERIAL AND METHOD

The research was carried out at the Cojocna Farm, an educational and experimental station administered by the University of Agricultural Sciences and Veterinary Medicine in Cluj-Napoca. The farm is located in Cluj County, at an altitude of 369 m, in an area with a moderate temperate-continental climate, characterized by an average annual temperature of approximately 9 °C and average annual precipitation of approximately 860 mm.

The total grassland area is approximately 267 hectares. Some of these lands are part of the Natura 2000 site ROSCI0238 Suatu–Cojocna–Crairat, a protected area of community interest, recognized for its biodiversity specific to grassland ecosystems of high ecological value.

Data analysis

An area of 20 ha of grassland located within the Natura 2000 site was used for extensive grazing by a herd of 10 Highland beef cattle. The resulting stocking rate was estimated at 0.4–0.5 livestock units (LU)/ha. The farming system was unparceled, free-range, adapted to the ethology of the breed, which shows a marked preference for large, open spaces, an essential aspect in the context of biodiversity conservation and the

maintenance of semi-natural habitats.

The growth performance of the calves was monitored in accordance with the Official Production Control (OPC) methodology, as part of an organized breeding program. The average daily growth (ADG) parameter was determined based on standardized calculations, using specific formulas for pre-established weighing intervals.

The floristic composition of the grassland vegetation was analyzed using the geobotanical method, applying the Braun-Blanquet scale, according to the methodology described by Păcurar and Rotar (2014). The grassland typology was classified based on the work of Țucra and colleagues (1987). The agronomic evaluation of the plots was carried out in accordance with the standard procedures used in pedo-agronomic studies on grassland ecosystems.

In 2022, a genetic herd consisting of 10 heifers and one bull of the Highland breed was imported from Germany with the aim of forming the nucleus of an extensive cattle breeding system on the Cojocna Farm. The imported animals and their offspring were registered in the National Herd Book and integrated into the official

breeding program, ensuring traceability and control of the genetic performance of the population. The entire imported herd, as well as its offspring, were registered in the official genealogical register and

integrated into the national breeding program, thus ensuring genealogical records and monitoring of reproductive and productive performance.

RESULTS AND DISCUSSIONS

The calves have a low birth weight, which contributes to easy calving without the need for human intervention. The age at weighing varied depending on the individual, and the average daily gain (ADG) recorded was within the range specific to the breed, with values between 491 and 671 g/day. Cows are not milked in the rearing system applied, with all milk being used for natural suckling of calves, which promotes vigorous development and efficient weight gain.

The age at weighing varied considerably, so that the live weight

and average daily gain (ADG) of the animals fell within the normal limits for the breed analyzed, with values ranging from 312 to 729 g/day. The cows are not milked, and the calves consume all their mother's milk, which contributes significantly to daily weight gain (Fig. 1, 2, and Table 1). Statistically significant differences between the weight gains of males and females were identified only at point P1, while at points P2, P3, and TDG (total daily gain), no significant differences between the sexes were recorded in terms of body weight (Table 1).



Fig. 1 Highland cattle
(Source: original)



Fig. 2 Highland cattle with calves
(Source: original)

Table 1

Official performance control of the Highland calves

Gender	Birth date	Birth weight (kg) P1	Age in days (210±45)	Weight (kg)	ADG-gr. (Average Daily Gain) P2	Age in days (365±45)	Weight (kg)	ADG-gr. (Average Daily Gain) P3	TDG-gr. (Total Daily Gain)
M	2022-12-12	26	283	117	322	343	241	627	474
M	2022-10-10	27	346	168	408	406	256	564	486
M	2022-12-20	28	275	189	586	335	272	729	657
M	2022-12-23	27	272	159	485	332	260	702	594
F	2022-12-10	22	285	115	326	345	240	632	479
F	2022-11-24	24	301	118	312	361	241	601	457
F	2022-12-29	23	266	120	365	326	245	681	523
F	2023-01-17	25	247	135	446	307	235	684	565
M	P1		P2		P3		TDG		
	27±0.41b		450.11±56.21a		655.44±37.25a		552.77±43.96a		
F	23.5±0.51a		362.28±29.87a		649.69±20.08a		505.99±23.96a		
M = Male					F= Female				

Average daily gains are given as mean of three replicates $\pm$ standard deviations. P1 - Birth weight (kg), P2 - Average Daily Gain (ADG-gr); P3 - Average Daily Gain (ADG-gr); and TDG - average total daily gain (ADG, g/day/ average). Effects were considered statistically significant when $p \leq 0.05$. Values in the same column followed by the same letter are not statistically different according to the Tukey HSD test. Beef cows are kept in an extensive system, on pasture, throughout the year. During the winter period (November-April), feeding consists exclusively of hay, in a minimum quantity of 12–15 kg per adult animal. Daily water consumption is approximately 50 -

100 liters per suckler cow, provided from available sources at will.

Following the implementation of the grazing regime, two pasture plots with distinct floristic compositions were delimited:

PD1 – *Stipa capillata* - *Carex humilis* grassland (Fig. 3), identified in plots 11; the land has a slope of 45–50% and is oriented to the south and southwest. The vegetation cover of the phytocoenosis is approximately 70%, with no woody vegetation, and the degree of vegetation consumption is low, estimated at 10–15%.

PD2 – *Festuca rupicola* grassland; this species forms perennial herbaceous tufts, with heights varying between 1 and 20 cm.

The land has a slope of 10–15% and the same south-southwest orientation. Vegetation cover is approximately 75%, with no woody vegetation, and the degree of vegetation consumption is high, estimated at approximately 70%. In PD1 of block 11, the type of grasslands *Stipa capillata* - *Carex humilis* was identified, the study plot having a slope of 45-50% and is oriented south and southwest. The general vegetation coverage of the

phytocenosis is 70%, without woody vegetation. The degree of vegetation consumption is low, approximately 10-15%. (Table 2). In PD2 of block 11, the type of *Festuca rupicola* grasslands was identified. The study plot has a slope with values between 10-15% and is oriented south and southwest. The general vegetation coverage of the phytocenosis is 75%, devoid of woody vegetation. The degree of vegetation consumption is high, approximately 70% (Table 3).



Fig. 3 The distribution of the grassland, grazed with Highland
(Source: The original map QGIS)

Table 2

Floristic composition of the type of grassland *Stipa capillata* - *Carex humilis*

Species	Vegetative cover %	Degree of vegetation consumption
<i>Botriochloa ischaemum</i>	5	
<i>Bromus arvensis</i>	0,5	
<i>Festuca rupicola</i>	2,5	
<i>Festuca valensiaca</i>	2,5	
<i>Medicago falcata</i>	5	
<i>Carex humilis</i>	12,5	5
<i>Stipa capillata</i>	17,5	3
<i>Aropyron cristatum</i>	3	
<i>Agropyron intermedium</i>	0,5	
<i>Asperula cynanchica</i>	2,5	
<i>Centaurea micranthos</i>	0,5	
<i>Centaureum erythraea</i>	0,5	
<i>Eryngium campestre</i>	0,5	
<i>Euphorbia cyparissias</i>	0,5	

<i>Filipendula hexapetala</i>	0,5	
<i>Fragaria viridis</i>	0,5	
<i>Peucedanum tauricum</i>	2,5	
<i>Viola spp</i>	0,5	
<i>Plantago media</i>	0,5	
<i>Potentilla arenaria</i>	0,5	
<i>Salvia nemorosa</i>	0,5	
<i>Teucrium chamaedrys</i>	2,5	
<i>Thymus glabrescens</i>	5	
<i>Veronica orchidea</i>	2,5	

Table 3

Floristic composition of the type of grassland *Stipa capillata* - *Carex humilis*

Species	Vegetative cover %	Degree of vegetation consumption
<i>Agropyron intermedium</i>	2,5	
<i>Bothriochloa ischaemum</i>	2,5	
<i>Bromus arvensis</i>	0,5	
<i>Festuca rupicola</i>	12,5	7
<i>Festuca valesiaca</i>	2,5	3
<i>Medicago falcata</i>	0,5	
<i>Trifolium repens</i>	0,5	
<i>Astragalus onobrychis</i>	0,5	
<i>Achillea millefolium</i>	5	
<i>Carduus acanthoides</i>	5	
<i>Centaurea micranthos</i>	2,5	
<i>Convolvulus arvensis</i>	0,5	
<i>Eryngium campestre</i>	2,5	
<i>Euphorbia cyparissias</i>	5	
<i>Fragaria viridis</i>	5	
<i>Inula britannica</i>	0,5	
<i>Peudedanum tauricum</i>	0,5	
<i>Veronica spicata</i>	0,5	
<i>Plantago lanceolata</i>	2,5	
<i>Plantago media</i>	0,5	
<i>Potentilla arenaria</i>	0,5	
<i>Salvia nemorosa</i>	0,5	
<i>Thymus glabrescens</i>	2,5	
<i>Xeranthemum annuum</i>	2,5	
<i>Artemisia austriaca</i>	2,5	
<i>Adonis vernalis</i>	0,5	
<i>Carthamus lanatus</i>	2,5	

CONCLUSION

To maintain their genetic origin and be recognized as Highland

cattle for meat production, imported cattle must be officially registered in

the national herdbook. This measure is essential for maintaining genetic traceability and properly integrating these animals into selection and breeding programs. The Highland breed has adapted well to the soil and climatic conditions of the Cojocna area. However, these animals have been observed to show a marked preference for shaded areas. Therefore, pasture management should include maintaining or planting trees in grazing areas to ensure a suitable microclimate. The extensive free-grazing system is generally suitable for this rustic breed. In some areas, however, intensive pasture use has led to overgrazing. This has favored the establishment of the region's typical *Festuca rupicola* vegetation and nitrophilous species, indicating an imbalance in the floristic composition. The Highland breed efficiently utilizes pastures with average productivity and plays an important role in maintaining and improving the conservation status of

the Natura 2000 protected habitat Suatu-Cojocna-Crairât. Through appropriate grazing, these animals contribute to maintaining biological diversity and preserving the traditional landscape. In Cojocna, under specific conditions, the Highland breed has achieved average weight gains within the breed's characteristic parameters. This confirms its adaptability and zootechnical potential in the area.

RECOMMENDATION

Research on the adaptability of the Highland breed in different farming systems and on various types of pastures should continue and expand, focusing on the impact on biodiversity and economic efficiency. Switching to an organized grazing system based on the division of grazing areas is also recommended. This management strategy enables more balanced use of feed resources, prevents overgrazing, and promotes the natural regeneration of grass.

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