

## The grazing characteristics of the donkey (*Equus asinus*): a review article

Virag Oroszi<sup>1</sup> – Tunde Szabo-Szollosi<sup>2</sup> –  
Daniel Kaczko<sup>2</sup> – Karoly Penksza<sup>2</sup> – Peter Poti<sup>1</sup> –  
Szilard Szentes<sup>3</sup>

<sup>1</sup>Institute of Animal Sciences, Hungarian University of Agriculture and Life Sciences, Godollo

<sup>2</sup>Institute of Agronomy, Hungarian University of Agriculture and Life Sciences, Godollo

<sup>3</sup>Animal Breeding, Nutrition and Laboratory Animal Science Department, University of Veterinary Medicine, Budapest  
tarkakolibri@gmail.com

### ABSTRACT

*This review paper focuses on the grazing ecology of the donkey (Equus asinus). It addresses the species' origin and traditional as well as contemporary uses, with particular emphasis on its grazing behaviour. The review examines feeding habits, including diet composition, plant species selection, and the degree of grazing selectivity exhibited by donkeys. In addition, it discusses the role of donkeys in grassland management and their broader ecological and practical benefits. Based on a synthesis of relevant literature, the paper analyses the significance of grazing as an ecological process. The review aims to provide a comprehensive overview of current knowledge on donkeys – or closely comparable large ungulates – and to outline general ecological principles that support the interpretation of donkey grazing behaviour.*

**Keywords:** grazing, dominant species, dietary spectrum, selectivity

### ÖSSZEFOGLALÁS

*Ez az áttekintő tanulmány a szamár (Equus asinus) legeltetésével foglalkozik. Kitér a szamár eredetére, alkalmazására. Kitér a szamár legelési szokásaira, arra is, hogy mely növényeket legeli, mennyire szelektív a legelése. Az áttekintés kitér a szamár gyepgazdálkodási és egyéb hasznára is. Az áttekintés irodalmi forrásokra alapozva elemzi a legeltetés fontosságát. Az áttekintés törekszik arra, hogy minél szélesebb körben mutassa be a számára (vagy a közvetlenül összehasonlítható nagy patásokra) vonatkozó ismereteket, illetve általános ökológiai elveket szolgáltatassanak, amelyek a szamarak legelési viselkedésének értelmezésére alkalmasak.*

**Kulcsszavak:** legeltetés, domináns fajok, táplálék-spektrum, szelektivitás

### INTRODUCTION

Grazing is typically practiced on areas unsuitable for arable farming and is most commonly carried out using cattle, sheep, horses, and increasingly water buffalo; in recent years, donkey grazing has also gained growing attention. Grazed habitats may include marshes and fen meadows (Szabó et al., 1999; Penksza et al., 2009, 2010, 2025; Péter et al., 2023; Szentes et al., 2009b, c, 2023, 2024, 2025), although dry grasslands are more widespread. In these habitats, biomass availability is often extremely low, and the

standing crop and its annual dynamics largely determine the livestock carrying capacity of grasslands (Magyar et al., 2017; Szentes et al., 2023; Fűrész et al., 2023c; Balogh et al., 2025).

Short-grass swards are primarily suitable for sheep grazing (Hajnáczki et al., 2021; Kiss et al., 2011; Penksza et al., 2023, 2024; Zimmermann et al., 2014), but they are also used for grazing Hungarian Grey cattle (Szentes et al., 2011b; Penksza et al., 2025), and even water buffalo (Turcsányi-Járdi et al., 2026). Donkeys, similarly to water buffalo, can also be applied in wet habitats, such as alkaline meadow communities (Szentes et al., 2025). Water buffalo further contribute to the maintenance of grazing ponds (Fűrész et al., 2023a) and can be effectively used to control invasive plant species (Fűrész et al., 2023a, b).

When appropriate grazing technologies are applied, grazing plays a significant role in maintaining biodiversity (Stilling et al., 2023; Penksza et al., 2025). Grazing has even been shown to positively influence the quality of milk (Pajor et al., 2013, 2014; Pilla et al., 2010; Nazzaro et al., 2010). Horses are preferably grazed on grasslands with loose soil structure; however, their grazing exerts intensive pressure on the sward (Szentes et al., 2009a). Determining appropriate stocking rates is therefore crucial, as overgrazing may lead to vegetation degradation and soil erosion, while undergrazing can result in shrub encroachment (Szabó et al., 2010, 2011, 2021; Magyar et al., 2017; Penksza et al., 2009; Szentes et al., 2007a, b, 2008, 2009a, b, 2011a, 2012; Kiss et al., 2011).

Mowing (Házi et al., 2011, 2022, 2024; Takács et al., 2024) and even military activities (Bajnok et al., 2024) may also contribute to maintaining the ecological condition of grasslands. Consequently, it is essential to understand the precise and expected effects of different management practices on grassland ecosystems (Magyar et al., 2017; Szentes et al., 2007b; Bartha et al., 2014; Deák et al., 2011).

### RESULTS

#### *Donkey grazing and utilisation*

The donkey (*Equus asinus*) is a domesticated ungulate belonging to the genus *Equus*, whose ecological and behavioural characteristics – including

grazing patterns – are well documented in both wild and domesticated populations (Zhang et al., 2021; Wang and Wang, 2024; Lundgren et al., 2022; Masebo et al., 2025; Lamoot et al., 2004). Several reviews in animal science emphasise that feeding practices aligned with the donkey's natural behaviour and grazing requirements enhance management efficiency and have positive implications for animal welfare.

The ancestor of the donkey (*Equus asinus*) is the African wild ass (*Equus africanus*). Although the exact timing of domestication remains debated, the process is generally assumed to have begun between the fourth and sixth millennia BCE in northern Africa (Johannes, 2000; Rossel et al., 2008; Meena et al., 2024; Visszló et al., 2023). Throughout history, the donkey has played a crucial role as a working animal, primarily used for water and fuel transport, short- and long-distance carriage, load bearing, and traction. Families keeping donkeys paid particular attention to protecting their animals: they were often confined in enclosures at night to prevent predation, while being allowed to graze freely during wetter seasons (Rossel et al., 2008). Johannes (2000) also reports the grazing of large donkey herds. Donkeys preferentially consumed tree leaves, shrubs, and other plant species of relatively low forage value.

In Hungary, the Hungarian native donkey is the most commonly kept type. To support the conservation and breeding of this indigenous breed, the Hungarian Donkey Breeders' Association was founded in 2002, and in 2004 the Hungarian native donkey was officially recognised as a distinct breed. Within domestic nature conservation and grassland management practices, the use of donkeys has gained increasing importance. Donkeys readily consume thorny plant species as well (Visszló et al., 2023), a finding supported by the results of a LIFE+ project conducted in the Nagy-szik area (LIFE07NAT/H/000324). Management was carried out on a 10-hectare site, where a herd of 20-25 donkeys effectively suppressed nearly all thorny weed species, in addition to grazing the vegetation of the alkaline lake basin. Ecsedi et al. (2020) recommend donkeys for the management of alkaline lakebeds, as they can be kept with minimal inputs, even under semi-feral conditions.

According to Johannes (2000), donkeys may spend entire days grazing under warm and dry conditions; however, due to their relatively small stomach capacity, continuous grazing throughout the day is required to meet their energy demands. Donkeys are typical components of mixed grazing systems, yet relatively little information is available on their management in single-species herds. Consequently, donkey breeding has historically received limited attention, and mating was often ensured simply by keeping a stallion in close proximity (Visszló et al., 2023).

According to data from the Hungarian Central Statistical Office, the donkey population in Hungary reached approximately 3,200 individuals in 2024, representing a moderate increase compared to previous years. Based on 2021 data, this trend

parallels global changes in donkey populations; however, the highest growth rates are observed in Africa, while donkey numbers in Eastern Europe continue to decline, largely due to differing socio-economic factors (Norris et al., 2021).

Regarding donkey grazing, Segarra et al. (2023) investigated the effects of grazing by Catalan donkeys (*Equus asinus* var. *catalana*) on pasture biomass and grassland vegetation diversity in a mountainous region of northeastern Spain. The study involved grazing by eight donkeys from July to September 2020 and concluded successfully. Grazed areas exhibited a reduction in accumulated biomass, supported by decreases in the Normalized Difference Vegetation Index (NDVI) derived from satellite imagery. Moreover, higher plant diversity was recorded in donkey-grazed sites compared to control grasslands. The authors concluded that moderate-intensity grazing by Catalan donkeys contributes to increased plant diversity while simultaneously reducing pasture biomass.

Donkey grazing is also applied in fire prevention strategies, particularly in Mediterranean regions where wildfires have become increasingly frequent. When grazed in combination with goats, donkeys have been shown to reduce combustible biomass in forested areas (Bartolomé et al., 2020).

#### *Grazing of donkeys (Equus asinus)*

Based on their evolutionary and domestication history, as well as the characteristics of their gastrointestinal microbiome, donkeys are well adapted to the utilisation of low-quality pastures; however, grazing management should be tailored to individual needs, particularly during lactation, pregnancy, and periods of work (Kimura et al., 2010; Renaud et al., 2018). In urban and working donkeys, limited access to grazing opportunities combined with high workload represents an increased risk, potentially leading to undernutrition and welfare problems. In such cases, supplementary feeding and targeted management interventions may be required (Geiger and Hovorka, 2015; Shah et al., 2019; Khan et al., 2022). Comparative microbiome studies indicate that the donkey digestive system and its associated microbiota maintain functional traits that enable the efficient utilisation of energy and nutrients from relatively low-quality, fibre-rich forage. While this represents an advantage in grazing system design, it does not eliminate the need for supplementary nutrient provision when required (Liu et al., 2020).

The diet of donkeys typically consists of grasses, a wide range of herbaceous plant species, and – especially in arid and semi-desert environments – shrubs and thorny woody vegetation. Evidence from wild ancestors (*Equus africanus*) and feral populations demonstrates that the species has a broad and flexible dietary spectrum (Danel et al., 2022; Hanley and Brady, 1977). Donkeys are often capable of consuming sparse, low-quality forage, a trait that contributes to their successful persistence in dry habitats; this high forage-use efficiency is also

reflected in breeding and performance studies (Zhang et al., 2021; Freeland and Choquenot, 1990). These observations support the classification of donkeys as generalist grazers: they are able to exploit a wide range of plant types, yet may also exhibit selective feeding behaviour depending on local environmental conditions (Hanley and Brady, 1977; Marshall et al., 2008).

In accordance with general principles governing large herbivores, donkeys do not select grazing areas randomly. Instead, pasture use and patch selection are influenced by forage quantity and quality, proximity to water sources, topography, and perceived predation risk (Hirata et al., 2007; Myrsetrud, 1998). Specifically for *Equus asinus*, growth conditions and nutrient availability determine both behavioural and demographic constraints of pasture use, that is, the relationship between carrying capacity and actual resource utilisation (Choquenot, 1991; Freeland and Choquenot, 1990).

Based on the available ecological and nutritional literature, donkeys primarily rely on broad dietary categories – grasses (Poaceae), herbaceous forbs, and woody shrubs/browse – and are generally characterised by a mixed grazer–browser strategy. However, there is no reliable evidence that any plant species is consumed exclusively by donkeys among domestic livestock species (such as cattle, sheep, goats, or horses). Instead, dietary overlap among herbivore species is common and strongly region-dependent (Marshall et al., 2008; Soultan et al., 2023; Freeland and Choquenot, 1990; Carrión et al., 2006).

Studies of semi-natural and natural populations further demonstrate that donkeys are capable of efficiently exploiting low-nutrient, sparsely

distributed plant resources, which explains their high adaptive capacity in arid and nutrient-poor environments (Marshall et al., 2008; Carrión et al., 2006).

#### *The economic significance of donkey grazing in Europe and worldwide*

The macroeconomic impacts of grazing practices – including those involving donkeys – vary depending on local economic structures, product portfolios, labour availability, and market linkages (Erenstein et al., 2021; Godber and Wall, 2014). Grazing systems, and the condition of grassland cover in particular, exert direct effects on soil, water, and biodiversity parameters. Grazed grassland cover influences soil infiltration and hydrological processes, while grazing intensity, management practices, and species composition affect grassland productivity and the provision of ecosystem services at the landscape scale (Hervé-Fernández et al., 2023).

From an economic perspective, these ecological effects are reflected in the sustainability of production systems and the costs associated with ecosystem degradation and restoration. Consequently, grazing management – such as the application of appropriate stocking densities and rotational grazing systems – directly influences long-term economic efficiency and resilience (Young et al., 2023).

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