Review

ARE DONKEYS GOOD LIVESTOCK GUARDIANS?

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1. Introduction

Guard animals are familiar in many parts of the world as a method of protecting livestock from predators (Smith et al., 2000). The most common are livestock guarding dogs (LGDs), whose use is currently undergoing a revival (Linnell and Lescureux, 2015) and has spread well beyond their original Eurasian homelands (e.g. van Bommel and Johnson, 2012). Perhaps less well-known is that several other species, including equids and camelids, have been employed as livestock guardians (Dohner, 2007).

This article presents an overview of the use of guard donkeys, their pros and cons and the evidence for their ability to deter predators. Comparisons are made with LGDs and some notes on best practices for husbandry are included as well as a list of sources for more detailed practical information.

2. Donkeys as guard animals

The donkey was probably domesticated from wild asses *(Equus africanus)* over 5,000 years ago in Nubia (Wang et al., 2020), where it was used as a pack animal. It still serves this and other purposes in Africa, Eurasia and beyond (Fig. 1). European settlers took donkeys (or 'burros') to the Americas, and here as well as elsewhere they have since been put to new use as livestock guardians (Bourne, 1994).

Fig. 1a Donkeys are used around the world for transport in rural areas with little infrastructure. *(Photo: D.Mettler)*

Fig. 1b Mules are especially suitable for transporting heavy loads in difficult terrain. *(Photo: D.Mettler)*

Fig. 2 Donkeys and sheep on an alpine pasture in western Switzerland. *(Photo: AGRIDEA)*

Donkeys, unlike LGDs and some llamas, do not "patrol" pastures (for more information on guard llamas, see the article by Derron-Hilfiker and Mettler in this issue). However, they are vigilant and, when kept with other livestock, their behavioural traits can provide protection from predators for the whole flock. In contrast to horses, which are usually more skittish and flee from danger (see Janczarek et al., 2020), donkeys tend to stand their ground and confront threats. They have an inherent dislike of canines. Donkeys typically respond to intruders by vocalising ('braying'), baring their teeth, running towards them and attempting to bite and kick them (Green, 1989). Mules (offspring of a male donkey and a female horse) show similar characteristics (Braithwait, 1996; Walton and Feild, 1989) and may be more aggressive than donkeys (Marker et al., 1996). Sheep seem to regard a familiar donkey as a protector and gather behind or close to it if they perceive a threat (Dohner, 2007) (Fig.2).

3. Do they work?

According to an assessment by a panel of independent experts for the Conservation Evidence project[1], the use of guard animals to deter predators from livestock is "beneficial", with scores of 70% for effectiveness and 67% for certainty – a measure of the quality of the evidence available (Littlewood et al., 2020). However, none of the studies cited in the evaluation was on donkeys. Nor were any studies on donkeys included in a recent systematic review of damage prevention measures (Khorozyan, 2021). So, is there any evidence that donkeys are effective guard animals?

In September 2021 I conducted a targeted literature review using Google and Google Scholar web-based search engines to find information on guard donkeys in agricultural extension service publications, scientific journals, books, conference proceedings, theses, reports and other 'grey literature'. I also checked the digital libraries of the IUCN/SSC Human-Wildlife Conflict Task Force[2], the Large Carnivore Initiative for Europe[3], ResearchGate[4] and past issues of Carnivore Damage Prevention News[5]. Potential sources were screened for relevance, reliability and quality.

4. The evidence

Experience in the southern USA suggests that guard donkeys can be effective against coyotes *(Canis latrans)*, red foxes *(Vulpes vulpes)*, domestic or feral dogs and possibly bobcats *(Lynx rufus)*. In their responses to a mail survey, 17 sheep and goat producers in Texas rated 59% of 58 donkeys as good or fair. In another survey, 40% of 60 Texas sheep and goat producers

[1] https://www.conservationevidence.com/actions/2433
[2] https://www.hwctf.org/livestock-guarding
[3] https://www.lcie.org/Publications
[4] https://www.researchgate.net/
[5] https://www.cdpnews.net

rated their donkeys as fair, good or excellent against coyotes and 42% of them rated donkeys likewise against dogs (Walton and Feild, 1989). In Ontario, Canada, about 70% of guard donkeys were rated as excellent or good (OMAFRA, 2018). There are also anecdotal accounts of trapped and trained feral donkeys protecting sheep from dingoes, feral dogs and foxes in Australia (Bough, 2016).

Preliminary reports suggest that the presence of donkeys among cattle reduces predation by felines such as jaguars *(Panthera onca)* in central America (Hoogesteijn and Hoogesteijn, 2014). Smuts (2008) stated that donkeys had been "quite successful" at protecting cattle against lions *(Panthera leo)* in Kenya. He recommended them against leopards *(Panthera pardus)*, cheetahs *(Acinonyx jubatus)* and black-backed jackals *(Canis mesomelas)*. Three out of three surveyed farmers in South Africa reported decreases in losses of lambs to jackals and caracals *(Caracal caracal)* following acquisition of donkeys (Botha, 2018). Namibian farmers reported that donkeys placed in calving herds worked well against jackals, caracals and cheetahs (Marker, 2000). One mentioned seeing a mule trample a leopard to death (Marker, 2000). It has been suggested that donkeys may be suitable for deterring lynx *(Lynx lynx)* in Europe (Reinhardt et al., 2012).

Fig. 3 Winter pastures in Vashlovani, Georgia, where wolves were found to selectively prey on donkeys and horses. *(Photo: R. Rigg/FFI)*

In response to the renewed presence of wolves *(Canis lupus)* in Switzerland from the mid-1990s, several farmers bought donkeys to defend their sheep (Landry, 2000). Although there are some indications that they might protect livestock from individual wolves (e.g. Cadurisch and Lüthi, 2004), donkeys are thought unlikely to be effective when faced with high predation pressure and/or wolf packs or other large carnivores such as bears (Breitenmoser et al., 2005; Green, 1989; Macon, 2018). Moreover, they may themselves become prey. A study in Georgia (Fig. 3) found that wolves selectively preyed on donkeys and horses in winter pastures (Rigg et al. unpublished data; see Rigg et al., 2017 in *CDPnews* issue 15).

5. Recommendations for best practice

Practitioners and researchers have found that the level of success of guard donkeys can be highly variable, with improper husbandry practices and unrealistic expectations, in addition to individual differences among donkeys, apparently contributing to many of the failures (Walton and Feild, 1989). It is recommended to use medium to large donkeys, with a shoulder height of at least 112 cm/44 inches (OMAFRA, 2018). Experienced users generally recommend one 'jenny' (female), or a jenny with foal, for each flock or pasture. Geldings can be used, but most intact adult males ('jacks') are too aggressive and may harm other animals, especially young lambs and kid goats. Mare mules, castrated or intact jacks and horse mules can be used but are often more aggressive toward livestock (Braithwait, 1996; OMAFRA, 2018).

Sheep typically become accustomed to the novel presence of a donkey within 1–2 weeks, but it is recommended to allow at least 4–6 weeks for bonding (e.g. Green, 1989). While it is possible to add donkeys of any age to livestock, those without any prior

Fig. 4 If several donkeys are used there is a risk they may stay together and offer less protection to the flock. *(Photo: AGRIDEA)*

contact may initially act aggressively when placed in the same pasture (Dohner, 2007). In Switzerland, a single donkey guarding up to 50 sheep in an enclosure, or 200–250 sheep in a cohesive flock in mountain pastures, seemed to work best (Landry, 1999, 2000).

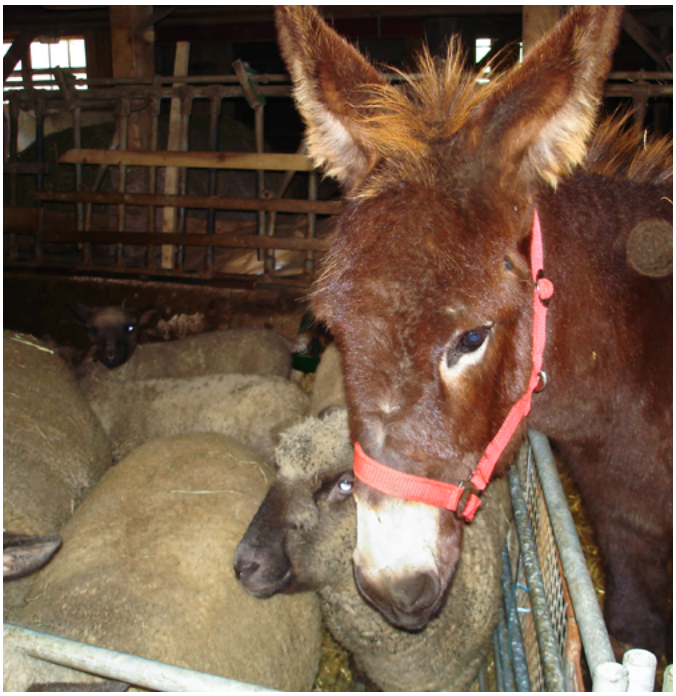

Fig. 5 If donkeys and sheep are kept in a barn during the winter, there should be enough space to separate them. *(Photo: AGRIDEA)*

Table 1 Summary of key considerations for using donkeys as guard animals (sources: in text).

Characteristics	Independent, males are territorial. Bond with other species when no conspecifics or other equines are present. Alert to possible danger, excellent hearing and vision. Aggressive to canines.
Advantages	Low cost, little training, easy management. No special feed needed. Typical lifespan of 20–30 years.
Disadvantages	Not suitable for some settings, such as large flocks and steep, large or brushy pastures. May not be effective against larger predator species and/or those in groups. Can be challenging to use with dogs, e.g. herding dogs.
Effectiveness	Provide protection against small to medium-sized predators, felines and possibly lone wolves but probably not bears or packs of canines. Best results in open, clear terrain with small to medium-sized cohesive flocks. Impaired by large or brushy pastures, large or scattered flocks, rough terrain.
Husbandry	Use medium-sized or large donkeys (not very small or miniature donkeys). One jenny, gelding or jenny with foal per flock/herd/pasture. To increase probability of bonding, raise foals with stock from birth or weaning and away from dogs. Allow 4–6 weeks for older donkeys to bond with livestock. Isolate guard donkeys from horses, mules and other donkeys. Test for and select individuals with protective behaviour. Watch for aggressive or possessive behaviour during lambing and remove donkey temporarily if necessary.

Fig. 6 Donkeys and dogs normally do not work well together but there can be exceptions, as in this example with livestock guarding dogs in Switzerland. *(Photo: AGRIDEA)*

Compared to other guard animals, donkeys act relatively independently (Müller, 2014) and, except for jennies with foals, show better protective behaviour when kept away from other donkeys (Pfister, 2009). Using several donkeys together or in adjacent pastures is not recommended (Fig. 4), as they tend to form their own group apart from other livestock (Green, 1989). Nearby horses may similarly distract donkeys. Not all individuals show optimal protective behaviour; this can be tested using dogs as surrogate 'predators' (see Cavalcanti and Knowlton, 1998) in order to identify and replace donkeys that respond passively. Such testing needs to be done carefully to avoid injury to dogs.

If livestock is confined to a barn in winter (Fig.5), donkeys should be kept close by in a stall large enough to allow them to roll on the ground (Landry, 2000). Some over-protective donkeys try to stop rams breeding ewes (OMAFRA, 2018). It may be necessary to temporarily separate a donkey from a flock during breeding and lambing to avoid such issues and to prevent harm to new-born lambs or disruption of ewe–lamb bonding (Green, 1989). It is preferable to time breeding so that donkeys give birth a month before calving/lambing, the goal being that the jenny will be protective of all young animals in the group as well as her own foal.

6. Comparisons with dogs

Donkeys have multiple advantages as guard animals (Table 1). Unlike LGDs, they do not have to be raised with livestock from a very young age or provided with their own special food on a daily basis. They need less care than dogs, have longer lifespans, are less prone to premature death (Lorenz et al., 1986) and are more compatible with lethal predator control measures that may be used concurrently (Andelt, 2004). Moreover, they are less likely to be involved in conflicts with hikers, cyclists and other land users (Mosley et al., 2020; Potet et al., 2021), to wander away from their flocks and negatively impact other people's livestock or wildlife (Smith et al., 2020).

On the other hand, guard donkeys probably offer less protection than dogs, especially against large carnivores and those in groups (Andelt, 2004; Wilbanks, 1995), although there is a lack of controlled trials in standardised conditions to confirm this assertion. LGDs are likely to be successful in a wider range of scenarios than donkeys. For example, in the USA they reportedly reduced losses to coyotes and dogs both in fenced pastures and on open range, whereas donkeys seemed best suited to fenced pastures of up to 120 hectares (Andelt, 2004). Larger flocks and bigger or brushier pastures can be protected with multiple dogs, whereas adding additional individuals is not appropriate with donkeys. In addition, donkeys may have difficulties grazing on steep mountain slopes (Landry, 1999, 2000).

7. Conclusions

Donkeys are relatively quick, cheap and easy to implement and avoid some of the potential problems and disadvantages of LGDs. This review shows that there have been very few scientific studies on guard donkeys, but many experienced users have attested to their effectiveness against a variety of canines. They might be useful where golden jackals *(Canis aureus)* predate on livestock (e.g. Fanin et al., 2018, Yom-Tov et al., 1995). There are also claims that they offer protection from felines, so they might be effective against lynx. More robust research, including controlled trials, is needed before firmer conclusions can be reached (cf. van Eeden et al., 2018; see also Rigg et al., 2019 in *CDPnews* issue 18 and Louchouarn et al., 2020 in *CDPnews* issue 19).

Husbandry practices and local conditions often have a substantial impact on the success or otherwise of damage prevention measures, including guard animals. Furthermore, not all individuals make equally effective guardians. Only those that clearly demonstrate protective temperaments should be used. Cavalcanti and Knowlton (1998) identified easily recognisable indicative traits to help select the most suitable llamas for guarding. Similar criteria are needed for donkeys.

Donkeys could be a good option for smaller operations such as hobby farms or supplementary income farms, on farms with a lot of visitors or for people not comfortable with large dogs (Dohner, 2007), especially where predation pressure is low or limited to small and mid-size predators. Before acquiring a guard animal for the first time, it is highly advisable to obtain more practical information. Detailed guidelines and recommendations on the use of donkeys and other livestock guardians are available from the following links:

- Guidelines for using donkeys as guard animals with sheep[6]
- Lamas und Esel[7] [in German]
- Livestock guard dogs, llamas and donkeys[8]
- Livestock guardians: using dogs, donkeys and llamas to protect your herd[9]
- Protecting livestock with guard donkeys[10]
- Selecting a guard donkey[11]
- Using guard animals to protect livestock[12]

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[8] https://mountainscholar.org/bitstream/handle/10217/182976/AEXT_ucsu2062212182004.pdf?sequence=1&isAllowed=y

[9] https://www.storey.com/books/livestock-guardians/

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[11] https://www.jandohner.com/

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