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REVIEW ARTICLE

Expression of Natural Behaviour in Domestic Goats *(Capra hircus)*: Implications for Welfare and Farm Management

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ABSTRACT

Natural behaviour is a key indicator of animal welfare, reflecting an animal's ability to express species-specific patterns essential for survival and well-being. This review outlines the principal natural behaviours of domestic goats (*Capra hircus*) and their relevance to farming systems. Goats demonstrate adaptive feeding strategies, complex social structures with clear dominance hierarchies, and notable cognitive abilities including long-term memory and problem-solving. They show strong preferences for elevated areas, shelter, and hiding spaces, which can reduce aggression and social stress when incorporated into housing design. Maternal and neonatal behaviours, particularly early bonding and timely suckling, are critical for offspring survival. Overall, enabling goats to express their natural behaviours through appropriate management and housing is fundamental to improving welfare and productivity.

KEYWORDS

• Goats • Behaviour • Management • Animal welfare • Productivity

INTRODUCTION

Animal welfare has become an increasingly important concern in modern livestock production systems. Among the various indicators used to assess welfare, the ability of animals to express their natural or species-specific behaviours is widely recognized as a fundamental component of well-being. Natural

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behaviour refers to the normal behavioural patterns that animals have evolved to perform in their natural or semi-natural environments, including feeding, social interaction, exploration, reproduction, and maternal care. When livestock are prevented from expressing these behaviours due to restrictive housing, inadequate management, or environmental limitations, it may lead to stress, frustration, health problems, and reduced productivity.

Domestic goats (*Capra hircus*) are one of the most adaptable and widely distributed livestock species in the world. They play a significant role in the livelihoods of smallholder farmers, particularly in developing countries, due to their ability to thrive under diverse climatic and management conditions. Goats are valued for their contributions to meat, milk, fibre, and manure production, and they often serve as an important source of income and nutritional security for rural households. Despite their economic importance, goat production systems frequently overlook behavioural needs when designing housing, feeding strategies, and general management practices.

Goats exhibit a wide range of distinctive natural behaviours that reflect their evolutionary adaptation as browsing ruminants and social herd animals. Unlike strict grazers, goats prefer a selective browsing feeding strategy, consuming leaves, shrubs, and woody vegetation, and they spend a considerable portion of the day exploring their surroundings in search of diverse feed resources. Socially, goats form structured groups with recognizable dominance hierarchies that influence access to feed, resting spaces, and other resources. In addition, goats demonstrate notable cognitive abilities, including learning capacity, long-term memory, and problem-solving skills, which allow them to adapt effectively to changing environments.

Understanding and accommodating these behavioural characteristics is essential for designing welfare-friendly goat production systems. Management practices that allow goats to perform their natural behaviours not only improve animal well-being but can also enhance productivity, health, and overall farm sustainability. Therefore, integrating behavioural knowledge into housing design, feeding systems, and herd management strategies is an important step toward achieving both ethical and efficient goat farming. This review aims to outline the principal natural behaviours of domestic goats (*Capra hircus*) and examine their implications for welfare-oriented management and housing systems in modern goat farming.

SPECIFIC BEHAVIORS OF GOATS

Domestic goats (*Capra hircus*) evolved from the wild goat (*Capra aegagrus*), a species adapted to mountainous and rugged environments where animals must move extensively, explore diverse vegetation, and interact within social groups. As a result, modern goats still retain many behavioural traits associated with their evolutionary history. These include selective browsing behaviour, strong exploratory tendencies, social interactions within structured hierarchies, climbing and preference for elevated resting places, as well as complex maternal and reproductive behaviours. When goats are kept in environments that restrict these natural activities such as barren housing, limited space, or lack of environmental enrichment their behavioural expression can be significantly altered, potentially affecting their welfare and productivity.

Naturalness is widely recognized as a fundamental component of animal welfare. According to Fraser *et al.* (1997), good welfare is closely associated with the ability of animals to perform behaviours that are typical of their species. Observations of behaviour in wild and feral animals provide valuable reference points for evaluating the welfare of domesticated populations. By comparing the behavioural repertoire of animals in natural environments with those kept under farming conditions, researchers and farmers can better assess whether livestock are able to express their innate behavioural patterns. The presence, frequency, and diversity of species-specific behaviours in farm environments are therefore considered important indicators of welfare status (Friend, 1989; Yeates, 2018).

Many natural behaviours in animals are highly motivated, meaning that goats will actively seek opportunities to perform them even when resources are limited. Activities such as exploration, browsing, social interaction, grooming, and maternal care are not only functional for survival but are also intrinsically rewarding for the animal.

When these behaviours are prevented or severely restricted, animals may experience frustration, which can lead to abnormal or stereotypic behaviours, increased aggression, or physiological stress responses. Friend (1989) noted that such behavioural restrictions can compromise both the psychological and physical well-being of farm animals.

Housing conditions and management practices play a crucial role in determining how freely goats can express their natural behaviours. Factors such as stocking density, group size, feeding systems, availability of climbing structures, access to outdoor areas, and shelter design influence behavioural opportunities in farm systems. Miranda-de la Lama and Mattiello (2010) emphasized that appropriate environmental design can facilitate behavioural expression and reduce stress-related problems in livestock. For example, providing sufficient feeding space can minimize competition among animals, while incorporating elevated platforms or resting areas allows goats to perform climbing and surveillance behaviours that are typical of the species.

Understanding the specific behavioural needs of goats is therefore essential for developing welfare-oriented production systems. Management practices that consider the behavioural ecology of goats can improve welfare while also enhancing productivity, health, and adaptability. In the following sections, the major natural behaviours of goats such as feeding and foraging behaviour, social interactions, exploratory and climbing activities, and maternal and neonatal behaviours are discussed in relation to their significance for animal welfare and farm management.

1. Feeding Behaviour

Goats exhibit highly adaptive feeding behaviour that distinguish them from other domestic livestock. They are browsers and can forage in a bipedal stance, a behaviour that has been recorded for approximately 8% of their feeding time, highlighting their unique ability to access diverse vegetation (Pfister *et al.,* 1988). They exhibit a narrower oral aperture and shorter jaw structure than other ruminant species, adaptations that enhance dietary selectivity and increase chewing efficiency. This morphology allows for rapid, successive bites that effectively harvest small, tender leaves from shrub vegetation (Mellado *et al.,* 2007).Goats use their muzzle to probe the leaves and avoid ingesting leaves with web worms (Berman *et al.,* 2017). Goats moving from browsing scrub in open-range environments to eating green forage or concentrates in intensive systems need a gradual adaptation period of 2–3 weeks. This adjustment time helps them get used to new feeding habits and allows their gut microbiota to adapt.When kept in confined housing, limited feeding space can lead to increased aggressive behavior in goats (Jorgensen *et al.,* 2007). Goats have the ability to tolerate the high level of tannin (Silanikove *et al.,* 1996) is the result of combination of salivary protein, rumen microbes. The feeding behaviour of goat reflects remarkable adaptability, selectivity and efficiency. These traits not only enhance their survival in harsh environment but also play significant role in improving their welfare and productivity.

2. Social Behaviour

Goats are gregarious species and their social structure is both complex and dynamic. Goats live in groups that are constantly changing known as fission fusion dynamics, this means individual may split off temporarilyto forage or to avoid competitionbut later rejoin the herd. Despite this flexibility, goats formed and "clique" of around 12 to 13 animals (Stantley and Dunbar, 2013).Within these group goat establish a clear dominance hierarchy. Larger groups of goats (24 individuals) tend to be more defensive and are more prone to breaking apart, while also exhibiting increased social activity and spending less time resting compared to smaller groups of six goats (AWIN, 2015). Horns play a key role in the social behavior of goats, with male feral goats, particularly those possessing the largest horns, generally dominating females (Shi & Dunbar, 2006).

Goat show agonistic behaviour which is natural and necessary part of their social structure. Agonistic behavior occurs in all social species and plays a crucial role in forming and maintaining social hierarchies (Blanchard *et al.,* 1993). It allows individuals to gain and protect access to essential resources, including food, shelter, and mates. In goats, agonistic behavior can be divided into actions that involve physical contact, like biting and head-butting, and those that do not, such as

threat displays and chasing (Miranda-de la Lama & Mattiello, 2010).

3. Cognitive Behaviour

Cognition refers to the way animals gather, interpret, store, and act on information from their surroundings, including abilities such as perception, memory, learning, and making decisions (Shettleworth, 2010). Goats are naturally curious and motivated to explore challenges. Goat have long term memory as they can master the complex foraging task and retain the solution for upto 10 months (Briefer *et al.,* 2014). Goat provide the clear evidence of contrafreeloading,(Rosenberger *et al.,* 2020) which refers to phenomena where animal choose to work for resources such as food and water even when the identical one is freely available, this behaviour suggest that the act of overcoming a cognitive challenge is inherently rewarding in itself. Goats exhibit object permanence, defined as the ability to understand that objects continue to exist even when they are no longer visible. In goats, this cognitive capacity has been demonstrated in experimental studies showing that individuals can track the movement of a reward hidden under an opaque cup (Nawroth *et al.,* 2015).

4. Elevation Preferences

Goats are highly adaptable animals, capable of navigating rugged, mountainous, and variable landscapes (Zobel *et al.,* 2019). These abilities persist in farmed goats regardless of housing system (Zobel & Nawroth, 2020). Consequently, providing elevated structures, firm surfaces, opportunities for activity and concealment, and diverse feeding options is important for supporting goat welfare. Studies of feral goats indicate a strong preference for elevated and sloping areas (Shi *et al.,* 2003), as these environments offer distinctive foraging resources and enhanced ability to detect and evade predators. Such features are uncommon in commercial production systems; however, when elevation is made available, goats readily use it, often resulting in positive social outcomes. For example, Andersen and Bøe (2007) demonstrated that indoor-housed dairy goats showed significantly lower levels of aggression when their lying areas included two levels rather than a single level with the same space allowance. Similarly, Zobel *et al.* (2017) found that all dairy goats inexperienced with climbing utilized a raised platform, either by climbing onto it or sheltering beneath it.

5. Hiding Behaviour

Feral goats commonly use natural shelters, such as caves, particularly at night, during inclement weather (e.g., rain or wind), and in situations involving predator risk (Shi *et al.,* 2006; Stachowicz *et al.,* 2019; Zobel *et al.,* 2019). In contrast to sheep, Lickliter (1984) reported that most goat kids began hiding shortly after birth when enclosed spaces were available, maintaining this behaviour for approximately five days. Does have also been observed to separate themselves from the herd during parturition. In Australian bush goats, nearly half of all does gave birth at distances of 60 metres or more from the group and remained isolated for an average of 14 hours (Kilgour & Ross, 1980 When vegetative cover is present, feral goat kids typically hide; in its absence, they remain in close proximity to the doe (Kilgour & Ross, 1980). Opportunities for isolation during kidding and subsequent kid hiding are seldom available in commercial farming systems.

Bøe and Ehrlenbruch (2013) showed that goats preferred indoor areas during poor weather conditions and made greater use of outdoor spaces when these included overhead shelter compared with uncovered areas. Although outdoor access is valued by goats, it does not necessarily fulfil their ranging requirements (Stachowicz *et al.,* 2019). Covered or concealed areas are rarely incorporated into indoor housing designs; however, goats actively seek hiding opportunities even in the absence of climatic stressors or predation risk (Zobel *et al.,* 2019). Such shelters may function as refuges from social conflict. Supporting this, Zobel *et al.* (2017) observed that while some goats used elevated platforms, othersparticularly individuals with more submissive or avoidance-oriented temperamentspreferred to rest and conceal themselves beneath these structures. The provision of hiding spaces may be especially important in systems with large group sizes and limited space allowance, where aggressive interactions are more frequent.

6. Behavior and neonatal survival

Maternal behaviour in parturient ewes and goats is broadly comparable (Poindron *et al.,* 2007). During and immediately following

parturition, both species show a strong attraction to the odour and taste of amniotic fluids, actively licking these fluids and directing this behaviour toward the newborn. In the hours after birth, maternal care is characterized by intensive licking and grooming of the neonate, frequent low-pitched vocalizations, and acceptance of the offspring at the udder. Grooming serves to dry the young and plays a critical role in establishing a selective olfactory bond between the dam and her offspring. This exclusive recognition is typically formed within the first hour postpartum, after which maternal care is directed solely toward the recognized lamb or kid. If this bond fails to develop, the dam may not identify the neonate as her own and may reject its attempts to suckle. Once olfactory recognition is established, mothers subsequently learn to recognize their offspring visually at a distance and later through vocal cues (Poindron *et al.,* 2007). Ewe maternal behaviour can assist suckling by standing still and positioning the udder to facilitate teat access; however, inexperienced ewes are initially less cooperative, which may partly explain the lower survival rates observed in lambs born to primiparous females. Nevertheless, maternal behaviour alone is insufficient to initiate suckling without appropriate responses from the lamb (Dwyer & Lawrence, 1999).

Neonatal behaviour is a key determinant of survival. Following birth, lambs progress through a sequence of behaviours aimed at standing, locating the udder, and initiating suckling. Standing reduces conductive heat loss to the ground, thereby supporting thermoregulation, while coordinated reflexes guide the lamb along the ewe's body toward the udder. The speed with which these behaviours are performed is closely associated with survival likelihood (Dwyer *et al.,* 2003). Early suckling supplies essential nutrients for energy and temperature regulation, as well as immunoglobulins that confer passive immunity. Furthermore, suckling and colostrum intake contribute to the development of the lamb's attachment to its mother (Goursaud & Nowak, 1999).

CONCLUSION

Behaviour is central to the welfare and productivity of stall-fed goats. Goats are intelligent, social animals with strong motivations to browse, explore, climb, and interact. Restricting these behaviours in intensive systems can cause stress and reduce performance. Observing behaviour is a non-invasive tool to assess welfare and detect problems early. When goats are comfortable and able to express natural behaviours, they eat better, grow faster, and produce more milk, creating a positive cycle between welfare and productivity. Incorporating behavioural knowledge, enrichment, and welfare-friendly housing is essential for sustainable and efficient goat farming, especially in tropical and smallholder systems.

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