



## Review on environmental enrichments for farmed rabbits



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## Version 2

A version two of this review was published in May 2026. In order to provide more objectivity, some modifications listed below were realized.

- Page 5: in the introduction: the verb 'can' was replaced by 'could'.
- Page 6: the reference *EFSA 2020* was added, and a sentence was added for better comprehension. 'This enrichment might compensate isolation of rabbit females, for which group housing cannot be implemented in commercial farms because of the risk of injuries and aggressions (EFSA,2020; EURCAW Poultry SFA, 2023).'
- Page 7: the reference *Farkas et al 2016* was suppresses and replace by *Matrics el al 2018*.
- Page 10: the sentence below was modified for better clarity and references adapted. *Trocino et al., 2013* was suppressed and *Princz, 2007* was added.

'Other studies showed that the provision of soft wood sticks increased gnawing in does (Huang et al., 2021) while gnawing sticks reduced biting, licking barns or aggressive behaviours in growing rabbits (Princz, 2007). Despite these promising observations, the behavioural effects of gnawing materials remain inconsistent across studies.'

- Page 14: a sentence was modified for better clarity:

'In the case of rabbits that need to be reared alone, such as breeding does, the use of mirrors might reduce the effects of isolation (García, 2020).

- Page 15: the sentence below was reworded:

'Elevated platforms are an effective and practical physical enrichment, creating hiding spaces and encouraging a greater behavioural repertoire in both fattening rabbits and does.'

- Page 15, in the sensory section, the sentence below was reworded.

'Few studies on the use of sensory enrichment such as music have been published. However, the use of music is a common practice used by many farmers to get used to it and not be frightened by normal farm noises.'

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## 1 Introduction

Ensuring the welfare of domestic rabbits (*Oryctolagus cuniculus*) in husbandry systems has become a significant focus of animal science and veterinary research, particularly in light of implementation of the legislation. Rabbits are highly active, social, and exploratory animals with a behavioural repertoire that includes gnawing, digging, foraging, hiding, and social interaction, among others. In conventional housing systems, especially barren wire cages with insufficient space or stimuli, rabbits are frequently unable to perform these natural behaviours. This restriction could lead to negative welfare consequences, leading to increased stress, aggression, abnormal behaviours (e.g., bar-biting, repetitive gnawing), and poor physical health (Trocino et al., 2019; El-Sabrout et al., 2024). Environmental enrichment is broadly defined as the addition of physical, social, or sensory stimuli that promote species-specific behaviours and enhance psychological and physiological well-being (Baumans, 2005); in addition to these categories, other authors have expanded the concept to include occupational and nutritional enrichment categories (Cumbe-Nacipucha et al., 2025). Research consistently shows that enriched environments have a positive impact on rabbit welfare. Each type of enrichment addresses specific behavioural motivations. Physical or structural elements, such as elevated platforms and shelters, encourage natural behaviours like vertical movement and hiding (Trocino et al., 2019; Huang et al., 2021). These structures not only provide opportunities for exploration and retreat but also help reduce agonistic interactions and foster greater social tolerance among group-housed rabbits (Buijs et al., 2011a; Festiveau et al., 2023). Occupational enrichment, particularly in the form of gnawing materials such as wooden sticks, plays a crucial role in supporting dental health and minimizing oral frustration (Trocino et al., 2019; Huang et al., 2021). Nutritional enrichment, which can include practices like scattering feed or offering compressed hay, stimulates cognitive engagement and promotes exploratory and foraging behaviour. This type of enrichment has been associated with increased locomotor activity, reduced stress and boredom and improvements in gut health (Birolo et al., 2022; El Sayed et al., 2024). Physiological studies further support these findings, showing that rabbits in enriched cages exhibit lower glucocorticoid metabolite levels, indicating reduced chronic stress (Buijs et al., 2011b). While larger enclosures have been linked to improved musculoskeletal development and bone quality, these benefits appear to result more from increased space than from enrichment alone (Buijs et al., 2012). Despite these benefits in terms of animal welfare, the implementation of enrichment in commercial and research settings remains inconsistent, often limited by economic, hygienic, or logistical concerns. This review aims to provide a comprehensive synthesis of recent findings on environmental enrichment for breeding does and growing rabbits, focusing on the main categories of enrichment including social, sensory, physical, occupational and nutritional types, and their documented effects on animal welfare, integrating behavioural, physiological, and performance outcomes.

## 2 Enrichment types and effects on welfare of breeding does and growing rabbits

### 2.1 Social enrichment

Social enrichment can be provided in two ways: social housing within a space that involves pair or group housing and which meets the social needs of the animals through direct contact with conspecifics (members of the same species); or non-social housing that provides visual, olfactory, and auditory cues from conspecifics housed in the same room (Baumans, 2005). Social interaction appears to be a particularly significant form of enrichment for rabbits due to their inherent social behaviour. Indeed, laboratory rabbits have been reported to show a strong desire for social interaction, consistently choosing to spend time with conspecifics more than in isolation when given the choice (Held et al., 1995). In a study examining their motivation for social contact, Seaman et al. (2008) found that in some cases, female laboratory rabbits valued access to a cage allowing limited interaction with other rabbits as much as they valued access to food. The positive effects of social enrichment on rabbit behaviour are well-established (EFSA, 2020): rabbits housed in pairs or groups exhibit fewer abnormal repetitive behaviours and demonstrate a greater range of natural, species-specific behaviours (Chu et al., 2004) compared to those housed individually. Several studies have explored the impact of social enrichment—such as mirrors and movable partitions—on rabbit welfare. Mirrors, in particular, have gained popularity for simulating social interaction by enabling eye contact with reflections, which can trigger natural behaviours like olfactory exploration (Edgar, J.L., Seaman, S.C., 2010; Mastellone et al., 2019). This enrichment might compensate isolation of rabbit females, for which group housing cannot be implemented in commercial farms because of the risk of injuries and aggressions (EFSA, 2020; EURCAW Poultry SFA, 2023). As a matter of fact, Mastellone et al. (2019) demonstrated that mirrors offer a cost-effective way to promote natural behaviours in rabbits raised in small groups or individually. Their study compared three housing conditions: isolated rabbits, isolated rabbits with mirrors, and rabbits separated by wire mesh allowing visual and olfactory contact. Rabbits with mesh contact exhibited the most natural behaviours including olfactory investigation, gnawing, alertness, stretching, locomotion, while those with mirrors showed increased grooming behaviour compared to fully isolated rabbits, suggesting that mirrors can partially mimic social interaction. However, stress markers like cortisol and glucose were not reliable indicators of welfare in this context. Additional research supports the benefits of mirrors: rabbits housed in mirror-enriched cages showed improved growth performance and carcass quality, including better feed conversion and higher dressing percentages, likely due to reduced locomotion (Musco et al., 2019; Elsayed et al., 2024). Dalle Zotte et al. (2009) found a consistent preference for mirrored areas in fattening rabbits kept in pens for scientific research, even in the presence of conspecifics, and Edgar and Seaman (2010) proposed mirrors as a substitute for social contact in singly housed female laboratory rabbits. Nonetheless, caution is advised, as prolonged exposure to multiple mirrors in young rabbits may lead to anxiety or fear responses (Jones and Phillips, 2009). To address the welfare concerns associated with both continuous individual and continuous group housing—each known to pose risks to does—researchers have investigated the use of removable walls as a flexible housing strategy (Dal Bosco et al., 2019). This approach involves

a modular colony cage system equipped with removable partitions, allowing for dynamic transitions between individual and group housing depending on the reproductive phase. The effectiveness of this system was compared to conventional individual cages and a fixed colony cage setup, where does remained in group housing throughout the entire reproductive cycle. Findings indicated that while the modular colony cage system offered some behavioural improvements, it did not fully mitigate the challenges of group housing. Aggressive interactions among does, driven by the establishment of social hierarchies, led to increased injuries, elevated disease risk, and higher kit mortality. These results suggest that although removable walls offer a more adaptable housing solution, further refinement is needed to balance social interaction with individual welfare protection in does and their kits.

## 2.1 Combination of various types of enrichment

A study was conducted by Rauterberg et al. (2019) to compare the effect of a new housing system (NC) with conventional conditions (CC) on the welfare of fattening rabbits. NC housing featured larger groups and lower stocking density (mean 58 rabbits, max. 12 rabbits/m<sup>2</sup>), slatted plastic flooring, elevated platforms, and diverse enrichment materials including plastic tube and gnawing materials such as a piece of wood attached to a chain, a wood in a holder, a chain with plastic elements and a cotton rope. However, CC housing involved smaller groups and higher density (eight rabbits, 23 rabbits/m<sup>2</sup>), wire-mesh flooring, and minimal enrichment including an elevated platform, a box and one gnawing stick. Rabbits in the NC system exhibited improved welfare indicators, such as fewer lesions during mid-fattening. However, challenges such as poorer hind foot cleanliness and higher mortality were also observed, indicating a need for further refinement to address hygiene and health concerns. Similarly, Kimm et al. (2021) evaluated a housing system aligned with the new German Welfare Regulation over four fattening periods in a commercial farm of fattening rabbits. This system accommodated up to 65 rabbits per group (12 animals/m<sup>2</sup>) by merging six post-weaning units and included a large elevated platform, a smaller roofed box platform, a tube, and gnawing materials. Elevated areas supported resting and comfort behaviours, while open, non-elevated zones facilitated upright postures and locomotion. Aggressive and stereotypic behaviours were rarely observed, suggesting a low-stress environment conducive to rabbit welfare. Complementing these findings, Da Silva et al. (2021) assessed the use of a fillable teether (FT) filled with hay as an enrichment item for fattening rabbits maintained under experimental conditions. Despite the availability of hay in a rack, rabbits showed strong interest in the FT, engaging in behaviours such as sniffing and biting, indicating its potential to stimulate exploratory and foraging behaviours.

## 2.2 Physical/Structural enrichment

Physical enrichment, also known as structural enrichment, involves the modification of the animal's living environment by adding physical elements that increase environmental complexity. Examples include elevated platforms and hiding elements like tubes or boxes which, enhance both breeding does and growing rabbits' behavioural repertoire, promote more diverse spatial use, and help reduce stress. Elevated platforms, in particular, offer additional



opportunities for movement and exercise, encouraging physical activity without compromising health or productivity in growing rabbits (Postollec et al., 2008; Matics et al., 2018). These structural enrichments not only support natural behaviours but also contribute to improved welfare outcomes in various housing systems. Examples of animal-based measures may include those related to comfort around resting (“Fully stretched lying in the pen or at the elevated platform or shelter” and “Simultaneous resting in group housing”) as well as those related to expression of social behaviour (“scoring of injuries and wounds”) (Trocino and Tolini, 2024). A study conducted by Trocino et al. (2019) demonstrated that providing growing rabbits with access to an elevated plastic-slatted platform (120 cm length × 50 cm width and 30 cm above the floor; 0.60 m<sup>2</sup>) enhances their behavioural diversity and movement opportunities, without adversely affecting production parameters (i.e., live weight at 33 days and at slaughter (g), weight gain(g/day), feed intake (g/day) and feed conversion) or their responses in the open field test. For instance, the growing rabbits provided with the platform have been shown to adopt the rearing position more frequently and to rest with stretched body for longer. However, their results showed that the provision of the platform was associated with a higher rate of injured rabbits, likely due to the higher group size (37 vs. 26 rabbits/pen), rather than the platform itself. This group size difference was used to maintain a constant stocking density of 16 rabbits/m<sup>2</sup> of usable area. The same study also evaluated the effect of the inclusion of a plastic hiding tube (20 cm diameter; 50 cm length), which resulted in impaired growth performance and no significant changes in various behaviours, including resting, social, explorative and locomotor activities. The limited use of the tube may be explained by the age of the rabbits during behavioural observations (63 or 70 days old), as younger rabbits just after weaning are more likely to use and share hiding spaces due to their smaller size and social needs. Additionally, the tube’s size, shape or number might not have been optimal for collective housing conditions. The unexpected negative effect on growth performance (daily weight gain: -2.2 g/day; daily feed intake: -4g/day; live weight at slaughter: -74g) remains unexplained under the study’s conditions, highlighting the need for further research to optimize the use of hiding structures in group-housed rabbits.

The type of platform material plays a significant role in the behaviour of growing rabbits. A study has shown that plastic-mesh platforms attract more rabbits per square meter compared to wire-mesh ones (Matics et al., 2018). Similarly, breeding does and their kits at 28 days of age showed a clear preference for plastic-mesh platforms over wire-mesh alternatives (Mikó et al., 2014). Hansen and Berthelsen (2000) explored the effects of enriched cage environments incorporating shelters and increased cage height on behaviour and well-being of growing rabbit used for research. Their results showed that rabbits kept in conventional cages exhibited more stress-related behaviours, including excessive grooming, restlessness, and bar-gnawing, compared to those in enriched settings. The findings suggest that enriched cages, particularly for female rabbits, support better welfare by providing shelter and greater opportunities for environmental interaction. Rommers et al. (2014a) conducted a study on does to evaluate the impact of environmental enrichments, such as hiding places, in reducing aggressive behaviour in a part-time housing system -where female rabbits are grouped only during specific periods. In this study, does were housed individually until day 18 of lactation. At that point, four adjacent



individual cages were transformed into a single pen by removing three of the side walls, allowing the four does and their kits to be housed together. On average, 52% of the does had injuries on the body and ears, and the percentages of severe injuries were 13-39%. The hiding places (platform and 20 cm diameter and 50 cm long PVC pipe) only slightly reduced the number of injured animals and culling rate as well as aggression assessed by behavioural observations of threatening, attacking, fighting, and chasing.

## 2.3 Occupational enrichment

Occupational enrichment involves providing stimuli or challenges that promote mental engagement, learning, and problem-solving, factors that are increasingly recognized as vital for the welfare of captive animals (Clark, 2011) including domestic rabbits. Rabbits benefit from opportunities to explore, manipulate objects, and make choices, which help prevent boredom and the development of abnormal behaviours. Examples of occupational enrichment include chewable materials (e.g., cardboard, paper, gnawing sticks, wooden sticks), manipulable objects (e.g., plastic balls, toys), and digging substrates (e.g., shredded paper or sand). Similarly, rabbits provided with either a hanging toy, a destructible device or a dig bin exhibited increased time spent performing active, exploratory behaviours as compared to the control rabbits housed in non-enriched cages (Coda et al., 2020). Another example of occupational enrichment is the provision of three different toys, cardboard rolls, cardboard rings and rubber balls, with a bell inside. According to Poggiagliolmi et al. (2011), when enrichment toys are provided, male single-housed New Zealand White rabbits kept for research demonstrate a preference for chewing on these items rather than on inappropriate objects such as cage components. Moreover, the availability of a toy is associated with an overall increase in chewing behaviour. Similarly, the use of enriched floor pens has been shown to significantly enhance rabbit welfare by reducing stress-related behaviours and encouraging species-specific activities compared to individually caged laboratory rabbits (48 x 80 x 60) (Vilardo et al., 2025). These pens were enriched with a variety of objects—including plastic nests, cardboard rolls, cotton pieces, pipes, and buckets—strategically scattered to stimulate curiosity, exploration, and sensory engagement. Rabbits housed in this environment exhibited increased locomotion and interaction with novel enrichments which contributed to a marked reduction in negative behaviours including cage-bar biting, floor scratching, fur-plucking, and performing repetitive head movements, falling below 5%. At the same time, inactivity levels rose to 55.4%, likely reflecting energy compensation due to the larger space and increased physical activity. Overall, the enriched floor pen setup provided a more dynamic and engaging environment that supported both behavioural expression and emotional well-being. A study by Elsayed et al. (2024), by sampling seven rabbits from each experimental group (total experimental groups=four), demonstrated that the use of plastic-colored balls significantly enhanced rabbits' productive performance, including improvements in final body weight, weight gain, and feed conversion rate. These positive outcomes were attributed to both behavioural and physiological changes. Specifically, the enrichment promoted beneficial behaviours such as increased resting and reduced fear responses, while also enhancing rabbit's health and immunity. The rabbits were able to restore most blood biochemical and hematological parameters to normal ranges,

resulting in better overall health and immunity. Notably, a reduction in stress was evidenced by lower corticosterone levels, further supporting the welfare benefits of this enrichment. Further evidence comes from Feng et al. (2022), who found that rabbits exposed to an empty can of beans (CB) enrichment exhibited significantly lower serum cortisol levels and elevated dopamine levels compared to a control group. These hormonal shifts were linked to increased feeding and drinking times, enhanced exploratory behaviour, and a reduction in abnormal behaviours. Additionally, the CB enrichment positively influenced gut health, as shown by a decrease in harmful bacterial families such as *Erysipelotrichaceae*, *Tannerellaceae*, *Enterobacteriaceae*, *Burkholderiaceae*, and *Prevotellaceae* in the cecum. The provision of gnawing materials is widely acknowledged as a key component of rabbit welfare, as it facilitates the expression of species-specific behaviours such as gnawing (Baumans, 2005). In the absence of such materials, rabbits frequently develop abnormal behaviours, including stereotypies and aggression, as demonstrated across various housing systems (Verga et al., 2004; Princz et al., 2007, 2008, 2009; Bozicovich et al., 2016). Preference tests reinforce this need: rabbits consistently spend more time in environments where gnawing substrates are available. For example, Princz et al. (2008) found that when rabbits were given the opportunity to choose between cages without or with gnawing sticks, they spent 53% of their time in cages with a gnawing stick, (increasing to 56% during their active periods) and 47% in the cages without a gnawing stick ( $p=0.001$ ). Other studies showed that the provision of soft wood sticks increased gnawing in does (Huang et al., 2021) while gnawing sticks reduced biting, licking barns or aggressive behaviours in growing rabbits (Princz, 2007). Despite these promising observations, the behavioural effects of gnawing materials remain inconsistent across studies. While some research has shown that such enrichment can reduce stereotypic behaviours such as cage chewing (Verga et al., 2007; Buijs et al., 2011a), skin injuries, and ear lesions (Princz et al., 2008, 2009; Bozicovich et al., 2016), other studies have reported no significant effects (Jordan et al., 2008), or even increased aggression under certain conditions such as mixed-gender groups (Bozicovich et al., 2016). These discrepancies highlight the context-dependent nature of enrichment outcomes, which may be influenced by factors such as group size, housing design, and individual behavioural traits.

A further complication lies in the limited understanding of which materials are most effective in meeting rabbits' gnawing needs. Interaction time and preference vary depending on the physical and nutritional properties of the materials (Princz et al., 2007; Bozicovich et al., 2016). A wide range of substrates has been evaluated, including wooden boards (Buijs et al., 2011a), gnawing blocks (Maertens et al., 2013; Da Silva et al., 2021), and alternative items such as cardboard or rubber (Poggiagliolmi et al., 2011; Da Silva et al., 2021). Although wooden sticks are among the most commonly used gnawing materials, their effectiveness appears to vary by age group and housing context. For instance, individually housed 12-week-old laboratory rabbits showed a clear preference for hay and pressed grass cubes over wooden sticks (Lidfors, 1997). Similarly, reproducing does interact more with straw and compressed wooden blocks than with pinewood sticks, which were largely ignored when straw was available (Rommers et al., 2014a). These findings suggest that wooden sticks may have limited enrichment value, particularly for older rabbits. However, growing rabbits have shown a preference for wooden

sticks over PVC tubes (Bozicovich et al., 2016), and spent 6–8% more time in cages containing sticks compared to those without (Princz et al., 2008). This indicates that while wooden sticks may not be universally optimal, they can still provide enrichment value depending on the rabbit's age and the available alternatives. In addition to material selection, accessibility—shaped by the size, placement, and stability of the gnawing items—is critical for effective enrichment. Poor accessibility can itself become a welfare concern by preventing rabbits from expressing natural gnawing behaviour. For example, large hardwood sticks suspended from the top of the cage may be difficult to use due to their movement (Luzi et al., 2003), whereas softwood sticks mounted horizontally on the cage wall offer greater stability and ease of use (Princz et al., 2007). Moreover, environmental and social factors may influence the access to enrichment. When gnawing material is available, all the aspects related to stocking density and management should be considered in order to ensure hygiene and encourage exploratory behaviour. Although research in this area is limited, existing evidence suggests that accessibility significantly affects usage. For instance, growing rabbits consumed more of their gnawing sticks when these were placed on the floor rather than suspended (Marin et al., 2018). Similarly, lactating does increased their use of enrichment placed above the platform later in lactation, likely to avoid their kits (Rommers et al., 2014b). Since younger rabbits tend to gnaw more frequently than older ones (Katsarou et al., 2011), the lack of accessible and appropriately placed materials may have a particularly negative impact on this age group. Finally, the EFSA AHAW Panel (2020) identified a critical research gap. No studies have yet assessed rabbits' motivation to access gnawing materials using validated methods such as willingness-to-pay or other motivation-based tests. This is especially relevant given that, in the absence of suitable substrates, rabbits often redirect their gnawing behaviour toward cage components or conspecifics. However, it remains unclear whether such redirected behaviours adequately satisfy their intrinsic motivation to gnaw.

## 2.4 Nutritional enrichment

Nutritional enrichment refers to providing food in a way that encourages rabbits to forage for or work to obtain their food. This type of enrichment plays a vital role in promoting the welfare of domestic rabbits by supporting their natural behaviours such as foraging, chewing, and exploration. In a study by Birolo et al. (2022), the impact of compressed hay blocks on the productive performance, behaviour, and environmental reactivity of growing rabbits housed in a park system was evaluated. While the blocks had minimal influence on general behaviour, they significantly enhanced the rabbits' responsiveness to novel environments and unfamiliar objects. These findings suggest that incorporating gnawing blocks into rabbit housing systems can positively contribute to animal welfare by fostering adaptive behavioural responses. The presence of hay has been shown to reduce bar gnawing and excessive grooming in rabbits kept in cages (Berthelsen and Hansen, 1999), which is suggestive of reduced stress levels. Similarly, hay has been shown to reduce the aggressiveness in growing rabbits kept in large groups (Dalle Zotte et al., 2015). Rommers et al. (2014a) investigated how various feed-related materials—such as straw, plywood, and pine—affect the behaviour and welfare of commercial meat rabbit does. Their findings indicated that straw and plywood, in particular, encouraged natural

behaviours like gnawing and exploration, which are associated with improved animal welfare. Incorporating alfalfa as enrichment in multi-litter cages showed modest benefits in mitigating aggression among does housed with their litters. While no significant effects were observed on skin injuries, aggressive behaviour, or overall activity levels, the presence of alfalfa slightly reduced the percentage of injured does, suggesting a mild distracting effect that may reduce fighting (Van Damme et al., 2024). However, the continued prevalence of severe injuries, even in enriched environments, highlights the need for more effective strategies to manage social dynamics and improve welfare in group housing systems.

## 2.5 Sensory enrichment

Sensory enrichment refers to enrichment that engages the senses such as sight, hearing, smell, and touch, playing a valuable role in enhancing the welfare of rabbits by engaging their senses and promoting species-specific behaviours. As prey animals with well-developed olfactory, auditory and visual systems, rabbits respond positively to enrichment that stimulates their senses. The use of music was tested as auditory enrichment for rabbits. Low-volume instrumental music, such as soft spa or classical music, has been found to help calming female laboratory rabbits, making them less skittish and more relaxed—effects especially noted in breeds like Dutch Belted and New Zealand Whites. Conversely, loud or unexpected sounds may disturb them and increase stress. Supporting this, Peveler and Hickman (2018) studied individually housed male New Zealand White rabbits used in research, assessing stress via fecal cortisol and heterophil-to-lymphocyte ratios. Music enrichment consisting of soothing music from a commercial music disc (Pet Melodies Rabbit Edition, Pet Rhythms Research Institute, played on a model CFD-S50 Personal Audio System, Sony, New York, NY), was introduced for six months between two six-month periods without music, with each rabbit serving as its own control. Results showed reduced stress during music exposure and increased stress after its removal. However, the absence of a simultaneous control group without music limits interpretation, as age-related changes cannot be ruled out. In this study, the behaviour of the animals was not assessed, which further limits understanding of the full impact of music enrichment on rabbit welfare. Thus, while the findings of this study are promising, several limitations must be acknowledged. The sample size was relatively small, and only male rabbits were included, which may limit the generalizability of the results. Additionally, the study did not explore potential differences in response to music based on age, breed, or individual temperament. The absence of a separate control group that was never exposed to music also limits interpretation, as it prevents isolating the effects of enrichment from natural changes over time. These constraints highlight the need for further research involving larger, more diverse populations and a broader range of factors such as age, breed, etc. Such studies are essential to draw more definitive conclusions about the effectiveness and applicability of music enrichment in improving rabbit welfare.

## 3 Conclusions

The reviewed literature highlights the significant role of sensory, physical, occupational, social and nutritional enrichment in promoting the welfare of domestic rabbits. Sensory enrichment

has been shown to stimulate exploratory behaviour and reduce signs of boredom. Physical enrichment, such as elevated platforms and tunnels, supports species-specific behaviours like resting, hiding, and locomotion, contributing to both psychological and physical well-being. Occupational enrichment, including manipulable objects and problem-solving opportunities, enhances mental stimulation and reduces the incidence of stereotypic behaviours. Nutritional enrichment, particularly through foraging devices and varied feeding methods, not only satisfies dietary needs but also encourages natural feeding behaviours and engagement with the environment. Despite these positive outcomes, several gaps remain that limit the full understanding and application of enrichment strategies in rabbit housing. Long-term studies are needed to assess the sustained effects of enrichment on behaviour and health indicators such as aggressive behaviour, skin lesions, footpad condition, immune function, and mortality. Additionally, the lack of standardized assessment tools and protocols makes it difficult to compare results across studies and housing systems. Individual differences in enrichment preferences, potentially influenced by breed-specific differences or early-life experiences, are also underexplored. Moreover, the practical implementation of complex enrichment strategies in commercial settings raises questions about cost, labour, and hygiene management. Finally, the interactions between different types of enrichment—whether they act synergistically or interfere with one another—remain poorly understood. To improve rabbit welfare, future research should aim to address these gaps through interdisciplinary approaches that combine behavioural science, veterinary health, and practical husbandry. Developing evidence-based guidelines for enrichment implementation, tailored to different production systems and life stages, will be essential for translating research into practice.

## 4 Recommendations

Based on the information available and considering the gaps of knowledge, the following recommendations and considerations are proposed for growing rabbits and breeding does.

### 4.1 Social enrichment

- **Group housing (for growing rabbits only)**

Social contact is essential for growing rabbits and at certain stages in the life of breeding does. Growing rabbits should always be housed in groups, in areas where they can explore and jump (EURCAW Poultry SFA, 2022). The need for social contact between doe of the same age and the impossibility of group rearing has been widely discussed (EURCAW-Poultry-SFA, 2023).

In the case of rabbits that need to be reared alone, such as breeding does, the use of mirrors might reduce the effects of isolation (García, 2020). The use of movable partitions in promoting social enrichment discouraging aggressive behaviour needs to be further investigated.

### 4.2 Physical/Structural enrichment

- **Elevated platform**

Elevated platforms are an effective and practical physical enrichment, creating hiding spaces and encouraging a greater behavioural repertoire in both fattening rabbits and does. The use of platforms can cause increased soiling, so it is important to pay attention to the hygiene conditions of cages or parks. In addition, the platform should be made of slatted plastic or have at least one slatted plastic resting mat.

#### 4.3 Occupational enrichment

- **Natural gnawing objects**

The utilization of natural, chewable materials is the prevailing recommendation. For growing rabbits, gnawing sticks or hay cubes seem the most suitable; for breeding does gnawing materials, straw, or straw-based blocks rather than rigid wood alone are preferable. Special attention is needed to the position of the gnawing materials in order to ensure accessibility and hygiene (EURCAW Poultry SFA, 2022). Regarding not edible occupational enrichments, there is insufficient knowledge regarding their safety and usefulness in promoting rabbit welfare on-farm. Consequently, it is not possible to recommend them at this time.

#### 4.4 Nutritional enrichment

- **Natural gnawing objects**

Nutritional enrichment does not differ from the occupational enrichments recommended.

#### 4.5 Sensory enrichment

- **Gap of knowledge**

Few studies on the use of sensory enrichment such as music have been published. However, the use of music is a common practice used by many farmers for rabbits to get used to the sound and not be frightened by usual farm noises. Unfortunately, this is an area that requires more valid scientific information and no recommendation can be given.

#### 4.6 Combinations

- **Gap of knowledge**

Studies on the combination of multiple enrichments and their synergistic effect on rabbit welfare require further investigation.



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## About EURCAW-Poultry-SFA

EURCAW-Poultry-SFA is one of the four European Union Reference Centres for Animal Welfare. It focuses on poultry and other small farmed animals welfare and legislation, and covers the entire life cycle from hatch/birth to the end of life. EURCAW-Poultry-SFA's main objective is to scientifically and technically support the European Commission and Member States for implementation of welfare legislation. This includes:

- Directive 98/58/EC concerning the protection of animals kept on farms;
- Regulations 1/2005/EC and 1099/2009/EC concerning their protection during transport and slaughter;
- Directive 1999/74/EC laying down minimum standards for the protection of laying hens;
- Directive 2007/43/EC laying down minimum rules for the protection of chickens kept for meat production.

## Partners

EURCAW-Poultry-SFA receives funding from DG SANTE of the European Commission and represents a collaboration between the following four partner institutions:

- ANSES, France
- IRTA, Spain
- ANIVET, AU, Denmark
- IZSLER, Italy

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## Activities of EURCAW-Poultry-SFA

- Coordinated Assistance  
Providing support, networking and Questions to EURCAW;
- Welfare indicators, Assessment & Good Practices  
Identifying animal welfare indicators, including animal based, management based and resource-based indicators, that can be used to verify compliance with the EU legislation;
- Scientific and technical studies  
Preparing Scientific Reviews of knowledge on welfare topics, identify research needs and perform scientific and technical studies to fill the gaps of knowledge;
- Training  
Reviewing existing training activities and developing new training materials, webinars and knowledge pills for official inspectors and competent authorities;
- Communication and Dissemination  
Increasing awareness of our outputs via the website, and newsletter.

## Website and contact

EURCAW-Poultry-SFA's website offers relevant and actual information to support enforcement of poultry and other small farmed animals' welfare legislation.

We offer a 'Questions to EURCAW' service for official inspectors, policy workers, and other personnel providing advice or support for official controls of poultry and other small farmed animals welfare in the EU. For more information go to the Q2E webform available online [here](https://survey.anses.fr/SurveyServer/s/DSL/Queryw) or <https://survey.anses.fr/SurveyServer/s/DSL/Queryw>. All Q2E answers are available [online](#).