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Behavioral Responses of Rabbits Housed in Wooden and Metallic Hutch Types with Floor-Based and Suspended Feeder Placements in Benin City, Nigeria

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ABSTRACT: The success of rabbit farming depends on housing and feed management techniques that support animal comfort and production efficiency in addition to nutrition. Therefore, the objective of this study was to evaluate the behavioural responses of rabbits housed in wooden and metallic hutch types with floor-based and suspended feeder placements in rabbit husbandry in Benin City, Nigeria. Four treatment groups were established: wooden hutch with earthen feeder at floor level (WHEF, control), wooden hutch with suspended aluminum feeder (WHSF), metallic hutch with aluminum feeder at floor level (MHFF), and metallic hutch with suspended aluminum feeder (MHSF). Behavioural metrics such as ease of entering feeders (EOREF), scratching and removal of feeder, injury incidence, ease of feeding (EOFD), leftover feed (LOF), urination and defecation in feeders, and rodent presence were monitored. Results revealed that rabbits housed in metallic hutches with suspended aluminum feeders (MHSF) demonstrated the most favourable behavioural profile, characterized by minimal contamination, low injury risk, efficient feeding, and absence of rodent activity. In contrast, the control group (WHEF) demonstrated high frequencies of undesirable behaviours, including feeder contamination, injuries, and feed wastage. The WHSF group showed moderate improvement, while MHFF showed notable improvements over the control. These findings highlight the importance of both hutch material and feeder placement in enhancing rabbit welfare and productivity. The metallic hutch with suspended feeder is recommended for rabbit farming operations, offering advantages in hygiene, feed conservation, and animal comfort.

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Rabbits (*Oryctolagus cuniculus*) have become increasingly important in smallholder and commercial livestock systems due to their high reproductive efficiency, rapid growth rate, and adaptability to diverse environmental conditions (Gidenne *et al.*, 2017). In many developing countries, including Nigeria, rabbit production is viewed as a sustainable source of protein and income, particularly for

resource-poor households (Aduku and Olukosi, 1990; Lukefahr, 2007; Agbonghae and Nwokoro, 2023). However, the success of rabbit farming hinges not only on nutrition and genetics but also on optimal housing and feeding management practices that promote animal welfare and production efficiency (Gidenne *et al.*, 2017; Ayoola *et al.*, 2024). Housing design is a critical factor in rabbit welfare, as it

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influences thermoregulation, hygiene, movement, and behavioural expression (Ayoola *et al.*, 2024). In tropical climates, wooden and metallic hutches are widely used, each with distinct benefits and drawbacks. Wooden hutches are cost-effective and thermally insulating but susceptible to wear and microbial contamination. Metallic hutches, on the other hand, are more durable and hygienic but may pose thermal discomfort under high ambient temperatures if not well ventilated (Das and Sikka, 2007). Despite these considerations, few studies have evaluated how the material composition of hutches combined with feeding system design impact rabbit behaviour and productivity. Feeder type and placement are equally important but often ignored in rabbit husbandry. Conventional floor-placed feeders, particularly earthen or lightweight types, are prone to contamination from urine, faeces, and feed wastage, all of which compromise animal health and increase production costs. In contrast, suspended feeders are a simple innovation that can minimise contamination, discourage destructive behaviours like feeder scratching, and improve feed utilization efficiency.

However, there is a limited study on how suspended versus floor-based feeders perform under different hutch conditions, especially in hot, humid environments such as those found in Nigeria. Therefore, the objective of this study was to evaluate the behavioural responses of rabbits housed in wooden and metallic hutch types with floor-based and suspended feeder placement in rabbit husbandry in Benin City, Nigeria.

MATERIALS AND METHODS

Experimental site: The study was conducted at a rabbitry located in Benin City, Edo State, Nigeria. The region lies within the humid tropical zone, characterised by an average annual temperature of 27–30°C and relative humidity ranging from 65% to 90% (NAA, 2014). All experimental procedures adhered to ethical guidelines for the humane treatment of animals, in compliance with institutional animal care protocols.

Experimental design and housing treatments: Forty-eight weaned rabbits (mixed breeds, aged 8–10 weeks, average weight 950 ± 50 g after acclimatization) were randomly assigned to four treatment groups (12 rabbits each), with balanced sex distribution. The treatments were as follows

Wooden hutch plus earthen feeder (WHEF) – Control group featuring wooden-framed hutches (60 x 60 x 60 cm) with earthen feeder (20 cm diameter) placed on the floor of the hutch.

Wooden hutch plus suspended feeder (WHSF) – Same wooden hutches (60 x 60 x 60 cm) with aluminum feeders placed at 4 inches above the floor of the hutch.

Metallic hutch plus floor feeder (MHFF) – Metallic hutch (30 x 22 x 30 cm) with aluminum feeder placed on the floor of the hutch.

Metallic hutch plus suspended feeder (MHSF) – Metallic hutch (30 x 22 x 30 cm) with aluminum feeder placed at 4 inches above the floor of the hutch. Hutches and equipment, which were washed and disinfected before the commencement of the experiment, were placed inside a dwarf-walled house with wire mesh at the upper part for sufficient ventilation and covered roofing sheets. Each rabbit was housed individually to prevent aggressive interactions and ensure independent behavioural assessment.

Feeding and management: Rabbits were fed a standard commercial pellet diet (18% crude protein, 2700 kcal/kg metabolizable energy) and had ad libitum access to water. Feeders and drinkers were cleaned daily; hutches were sanitised weekly. Animals were monitored for health and behavioural issues throughout the study.

Behavioural observation and data collection: Behavioural assessments were conducted twice daily (08:00–10:00 and 16:00–18:00) for six weeks. The following parameters were recorded: EOREF – Ease of rabbit entering the feeders, indicating the ability of rabbit to access feeders without difficulty; SCRATCH – Scratching of feeders, indicating observable attempts to scratch the feeders before or during feeding; REMOVAL – Removal or falling of feeders, indicating incidents where feeders were overturned or dislodged; INJURY – Injury caused by feeders, indicating presence of visible wounds or abrasions associated with feeders; EOFD – Ease of feeding, indicating efficiency and ease with which rabbits consumed feed; LOF – Leftover feed in feeders, indicating quantified of feed left uneaten after 24 hours; UIF – Urinating inside feeders, indicating presence of urine inside the feeder; FAECES – Defaecating inside feeders, indicating presence of urine and faeces inside the feeder; and ROD – Rodents inside feeders, indicating signs of rodent activity (e.g., droppings, gnaw marks, feed loss).

Statistical analysis: Data were analyzed descriptively using SPSS Version 25 and visualised with Microsoft Excel.

RESULTS AND DISCUSSIONS

Behavioural characteristics of rabbits across treatment groups: The behavioural response of rabbits varied widely based on the combination of hutch type and feeding trough placement. The behavioural metrics evaluated included: ease of entering feeders (EOREF), feeder scratching, feeder removal or displacement, feeder-induced injuries, ease of feeding (EOFD), leftover feed (LOF), urination inside feeders (UIF), faecal contamination (FAECES), and rodent presence (ROD). These parameters served as indicators of both animal comfort and hygiene efficiency across the four experimental groups.

Wooden hutch plus earthen floor feeder (WHEF - Control group): Rabbits housed in wooden hutches with earthen floor-based feeders demonstrated multiple undesirable behaviours (Fig. 1). EOREF was very high in this group, as the ground-level placement of feeder facilitated easy physical access.

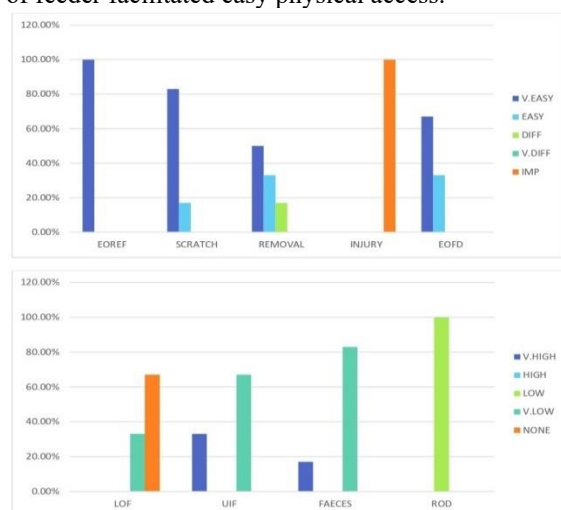


Fig 1: Wooden hutch plus earthen feeder on the (WHEF) – Control

EOREF = Ease of rabbit entering the feeders; SCRATCH = Scratching of feeders; REMOVAL = Removal or falling of feeders; INJURY = Injury caused by feeders; EOFD = Ease of feeding; LOF = Leftover feed in feeders; UIF = Urinating inside feeders; FAECES = Defaecating inside feeders; ROD = Rodents inside feeders

However, the convenience of entry also resulted in an elevated incidence of feeder scratching behaviour. Rabbits often entered the feeder with their front limbs or whole bodies, disturbing feed content and promoting waste. Scratching was observed in 87% of individuals. Feeder removal was observed in this group, primarily due to the relatively lightweight structure of the earthen troughs, which were easily overturned or displaced during feeding or exploratory behaviours. The feeding trough did not inflict any injury on the rabbits in this group. The EOFD of majority of rabbits in this group was very easy, and there was no form of difficulty in this group. Rabbits

often had to dig or reposition themselves to feed effectively, leading to stress and prolonged feeding times. There was no left over feed in higher percentage (35%) of rabbit in this group, and the remaining rabbits in this group had very low left over feed in their feeding trough. The control group also recorded the highest frequency of feeder contamination, with 68% of feeders displaying urine presence and 74% showing faecal matter. Additionally, rodent intrusion was low in this group, likely attracted by spilled feed around the feeders.

Wooden hutch plus aluminum suspended feeder (WHSF): The introduction of suspended feeders in wooden hutches markedly improved feeding behaviour and sanitation outcomes as shown in Fig. 2. EOREF was mostly impossible for approximately 80% of the rabbits, with the remaining rabbit finding it very difficult to enter inside the feeder. With the suspension of the feeder, rabbits displayed more organised feeding behaviour, approaching the suspended feeder in a bipedal or semi-upright posture. Scratching behaviour was still very high in this group, and no significant feeder damage was recorded across the duration of the study. Feeder removal incidents were very difficult in majority of the rabbits in this group (65%), and the other rabbits found it very difficult to remove the feeder, probably due to improved anchoring of the suspended feeder. Injury was not observed in this group, likely due to the reduced likelihood of rabbits overturning the feeder. Similar to the WHEF hutch set up, it was very easy for majority of the rabbit to feed in the WHSF set-up. Leftover feed was high, low, and very low in 50, 17, and 33% of the rabbits in this group, respectively. The design also discouraged urination and defecation into the feeder area, resulting in a drastic reduction in UIF and FAECES. Similar to that observed in WHEF, ROD was low in WHSF.

Metallic hutch plus aluminum floor feeder (MHFF): The MHFF configuration demonstrated improved results over both wooden hutch systems. As shown in Fig. 3, EOREF and INJURY were impossible in this treatment. Scratching behaviour was still very easy in approximately 90% of the rabbits in this group. Approximately 83% of the rabbits found it very difficult to remove the feeder. It was very easy for all the rabbits to feed using the feeder in this set-up. Approximately 50% of the rabbits in the group had very low left over feed, and there was no left over feed in approximately 5% of the rabbit. Urination and defaecation inside the feeder was impossible in majority of the rabbits (approximately 62 and 66%, respectively) in this group. Rodent activity was very

low in approximately 68% of the rabbit and impossible in approximately 22% of the rabbits in this group.

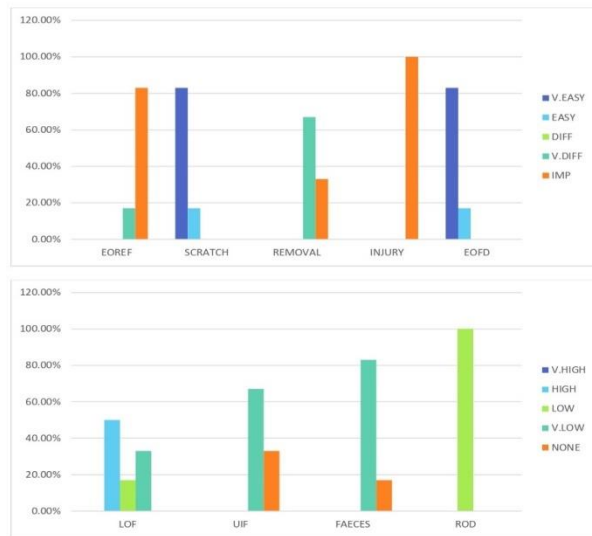


Fig. 2: Wooden hutch plus suspended aluminum feeder (WHSF)

EOREF = Ease of rabbit entering the feeders; *SCRATCH* = Scratching of feeders; *REMOVAL* = Removal or falling of feeders; *INJURY* = Injury caused by feeders; *EOFD* = Ease of feeding; *LOF* = Leftover feed in feeders; *UIF* = Urinating inside feeders; *FAECES* = Defaecating inside feeders; *ROD* = Rodents inside feeders

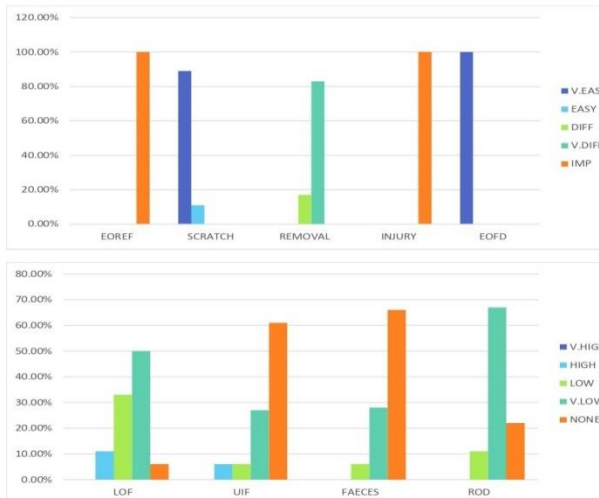


Fig. 3: Metallic hutch plus aluminum floor feeder (MHFF)

EOREF = Ease of rabbit entering the feeders; *SCRATCH* = Scratching of feeders; *REMOVAL* = Removal or falling of feeders; *INJURY* = Injury caused by feeders; *EOFD* = Ease of feeding; *LOF* = Leftover feed in feeders; *UIF* = Urinating inside feeders; *FAECES* = Defaecating inside feeders; *ROD* = Rodents inside feeders

Metallic hutch plus aluminum suspended feeder (MHSF): In this treatment, metallic hutch with a suspended feeder, yielded the most favourable results across all behavioural and sanitation metrics. *EOREF* was impossible, while *EOFD* was very easy with minimal difficulty (Fig. 4). Rabbits exhibited stable,

controlled feeding postures, with minimal lateral movement and negligible feed spillage. Scratching behaviour was still observed in this group but there no injury observe in all the rabbits. Feeder removal was very difficult in majority of the rabbits (60%). This can be attributed to the structural integrity of metallic hutches and the elevated feeder design that eliminated sharp edges and fall-prone surfaces. Approximately 72% of the rabbits had very low left over in this group. Urination into the feeder were almost nonexistent, but faecal samples were found in some of the rabbits (28%). Approximately 72% of the rabbits could not defaecate inside the feeder in this group. This likely stemmed from the combination of optimal feeder height and limited physical contact with the feeding space of feeder. Rodent activity was impossible in approximately 68% of the rabbit and very difficult in approximately 32% of the rabbits in this group, suggesting a strong containment effect due to the enclosed and elevated design.

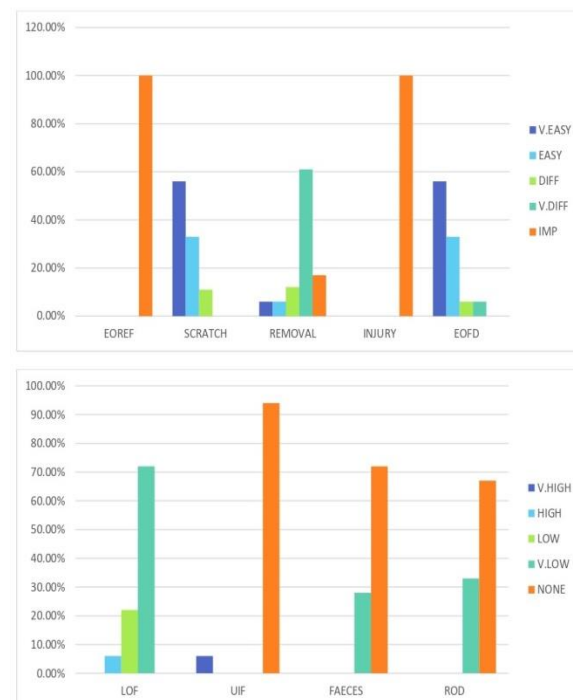


Fig. 4: Metallic hutch plus aluminum suspended feeder (MHSF)

EOREF = Ease of rabbit entering the feeders; *SCRATCH* = Scratching of feeders; *REMOVAL* = Removal or falling of feeders; *INJURY* = Injury caused by feeders; *EOFD* = Ease of feeding; *LOF* = Leftover feed in feeders; *UIF* = Urinating inside feeders; *FAECES* = Defaecating inside feeders; *ROD* = Rodents inside feeders

Influence of hutch type and feeder position on rabbit behavioural responses: The findings from this study underscore the critical role of both hutch material and feeder positioning in influencing rabbit welfare, behavioural patterns, and feeding hygiene (El-Sabrou, 2018). MHSF proved to be the most effective

configuration across virtually all parameters assessed. This supports the hypothesis that the integration of durable, non-porous materials and elevated feeder systems significantly enhances animal comfort and biosecurity. The parameter EOFD (ease of feeding) was optimal in suspended configurations, with the MHSF group exhibiting particularly efficient feeding behaviours. This can be attributed to the ergonomically favourable feeding posture induced by suspended feeders, which align with the natural foraging behaviour of rabbits and their upright or semi-upright body orientation, corroborating the report of Melissa (2022). In contrast, floor feeders, particularly earthen ones, were prone to feed wastage. These inefficiencies can contribute to increased feed costs and affect commercial productivity. Sanitary control is paramount in rabbit production, especially given the sensitivity of the species to gastrointestinal pathogens (Atsbha *et al.*, 2019). The metallic hutch systems (MHFF and MHSF) were consistently associated with very low and impossible incidents of faecal and urinary contamination. Wooden cage with floor-level feeders (WHEF) proved more susceptible to contamination due to unregulated access. This behaviour not only introduces faecal and urinary pathogens but can also facilitates inter-rabbit aggression and injuries in group rearing system, consistent with the reports of Gidenne *et al.* (2012) and Elsayed *et al.* (2024). Metallic hutches presented a significant advantage over wooden ones in terms of structural hygiene and maintenance. Their impermeable surfaces reduce microbial colonization and are easier to disinfect, aligning with the review of Krunt *et al.* (2020) regarding the effects of housing system on production and welfare in growing rabbits. Additionally, metallic structures have greater resistance to chewing, thereby preserving feeder integrity and minimizing maintenance costs (Upadhyay and Mohanty, 2021). Wooden hutches, while potentially more thermally insulating, are associated with increased scratching behaviour and high rodent infiltration. The porous nature of wood also poses long-term hygiene concerns, as moisture absorption can facilitate microbial growth. Rodent presence was significantly lower in hutches using suspended feeders, especially in metallic structures. This is an important finding in the context of biosecurity. Rodents are known vectors of zoonotic diseases and can consume or contaminate large quantities of feed. The suspended feeder design inherently restricts rodent access. Injury rates were inversely proportional to feeder stability and design. Suspended feeders, especially those integrated into metallic hutches, minimised contact-related injuries and reduced aggressive interactions, suggesting a calming effect due to predictable and non-competitive

feeding conditions. The improved ergonomics and visibility of suspended feeders may also serve as behavioural enrichment tools, promoting mental stimulation during feeding sessions.

Conclusion: The behavioural responses of rabbits housed in wooden and metallic hutch types with floor-based and suspended feeder placements was evaluated to conclude on the most welfare-friendly and effective housing-feeding system for small to medium-scale rabbit production systems. Data obtained demonstrates that the interaction between hutch type and feeding trough placement plays a fundamental role in shaping the behavioural and sanitary outcomes of rabbit husbandry. The metallic hutch with a suspended feeder (MHSF) emerged as the optimal configuration, maximizing feeding efficiency, possibly minimizing contamination, reducing injuries, and effectively preventing rodent intrusion. For farmers and animal welfare advocates alike, these findings offer evidence-based design recommendations for enhancing both productivity and ethical standards in rabbit production systems.

Conflict of Interest: The authors declare that there is no known conflict of interest or personal relationships that could have influence the work reported in this paper.

Data Availability Statement: Data are available upon request from the corresponding author.

REFERENCES

- Aduku, AO; Olukosi, JO (1990). Rabbit management in the tropics: Production, processing, utilization, marketing, economics, practical training, research and future prospects. Living Books Series, GU Publications, Abuja, Nigeria, Pp 43-56
- Agbonghae, OW; Nwokoro, SO (2023). Growth performance and nutrient digestibility of growing rabbits fed diets containing pawpaw (*Carica papaya L.*) leaf protein concentrate. *Trop. Anim. Health.* Prod. 55: 332. <https://doi.org/10.1007/s11250-023-03730-0>
- Atsbha, T; Wayu, S; Gebretsadkan, N; Kidane, H; Degf, K (2019). Demonstration of improved feed trough for efficient utilisation of crop residue: The case of southern zone of Tigray region, Ethiopia. *Int. J. Agric. Biosci.* 8 (2): 67-74.
- Ayoola. MO; Sasona, K; Akinmoladun, OF; Faniyi, TO; Oguntunji, AO; Lawal, TE (2024). Effects of housing and feeding types on growth and physiological performance of growing rabbits

- (*Oryctolagus cuniculus*) in humid tropics. *Adv. Anim. Vet. Sci.* 12(2): 327–336.
- Das, SK; Sikka, AK (2007). Effect of different housing and feeding systems on the performances of broiler rabbit in Eastern Himalayan Region of India. *Livest. Res. for Rural Dev.* 3(9.30): 46-51.
- El-Sabrou, K. (2018) Does the blindness affect the behavioural activities of rabbit? *J. Anim. Behav. Biometeorol.* 6(1): 6-8.
- Elsayed, M; Soliman, F; Elghalid, O; El-Sabrou, K (2024). Using different cage enrichments to improve rabbits' performance, behavior, and welfare. *Animals* 14(15): 2271. <https://doi.org/10.3390/ani14152271>
- Gidenne, T; Combes, S; Fortun-Lamothe, L (2012). Feed intake limitation strategies for the growing rabbit: Effect on feeding behaviour, welfare, performance, digestive physiology and health: A review. *Animal.* 6(9): 1407–1419.
- Krunt, O; Zita, L; Kraus, A (2020). A review of the effects of housing system on production and welfare in growing rabbits. *Anim. Sci. Pap. Rep.* 38(4): 321-33
- Lukefahr, SD (2007). Strategies for the development of small- and medium-scale rabbit farming in South-East Asia. *Livest. Res. for Rural Dev.* 19(9):34-40.
- Melissa, W (2022). What do different bunny positions mean? PetMD Newsletter. Accessed 05/05/2025 at <https://www.petmd.com/rabbit/what-do-different-bunny-positions-mean>
- NAA (2014). Meteorological Department, Nigeria Airport Authority, Benin City, Edo State, Nigeria.
- Upadhyay, AK; Mohanty, A (2021). Rabbit raising - A case study. *Bhartiya Krishi Anusandhan Patrika* 36(2):167-70.
- Gidenne, T; Garreau, H; Drouilhet, L; Aubert, C; Maertens, L (2017). Improving feed efficiency in rabbit production, a review on nutritional, technico-economical, genetic and environmental aspects. *Anim. Feed. Sci. Technol.* 225:109-22.