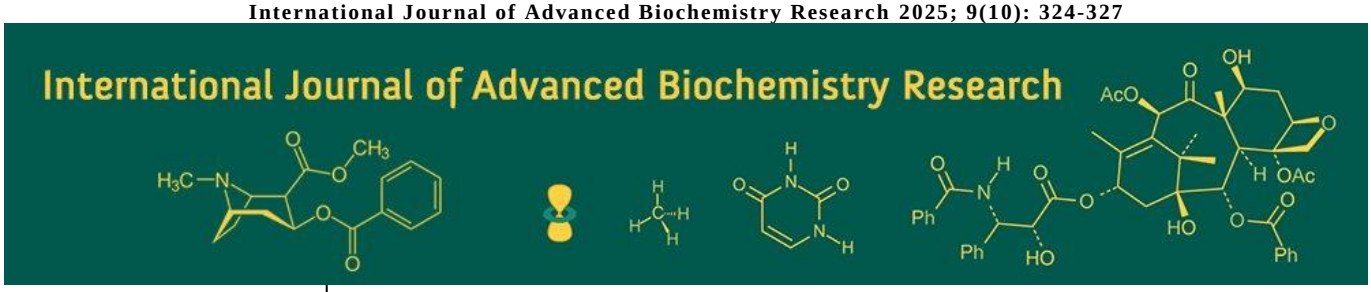

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(10): 324-327
www.biochemjournal.com
Received: 20-07-2025
Accepted: 25-08-2025

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Assessment of welfare scorecard with respect to feeds and feeding practices for pigs in peri urban regions of Bengaluru

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10e.6020

Abstract
An experiment was conducted in the peri-urban region of Bengaluru to assess pig welfare concerning feeds and feeding practices across farms of different sizes. Four key welfare parameters feed ingredients, feeding practices, feed storage hygiene, and water availability were evaluated using a structured scoring system. Results showed that small farms achieved significantly higher scores for feed ingredient diversity, while large farms performed better in feed storage hygiene. Medium farms recorded lower scores across most parameters. Overall, the findings emphasize that efficient feed management, hygiene, and resource quality are vital to enhancing welfare and productivity in pig farming systems.

Keywords: Pigs, welfare, feeding practices, storage, water

Introduction
From an early age, pigs naturally explore their surroundings and examine potential food sources through rooting, biting, sniffing, and tasting to assess the nutritional content. These behaviours have developed over thousands of years and remain deeply embedded in today's domestic pigs. Even when housed in familiar environments and given nutritionally complete diets, these instinctive behaviours persist. In fact, when domesticated pigs are placed in woodland settings, they still devote about 75% of their active time to foraging and feeding activities, despite having unlimited access to feed (Laskoski *et al.*, 2019) [1]. The current study was undertaken to study the assessment of welfare score card for pigs with respect to feeds and feeding practices in peri urban region of Bengaluru.

Review of literature
Behaviours such as biting, pushing, and head-butting at the feeder, along with a rise in tail and ear biting, have been observed when poor environmental conditions lead to heightened competition and aggression among growing pigs (Laskoski *et al.*, 2019) [1].
The various stages of lactation present significant challenges for both animals and farmers, as the nutritional demands shift throughout this period. Although sows are typically limit-fed before farrowing, their need for nutrients and energy increases substantially after giving birth to support adequate milk production for their fast-growing piglets (Cools *et al.*, 2014) [2]. Ensuring sufficient feed intake during lactation is crucial to prevent a negative energy balance and to reduce excessive breakdown of body fat and muscle proteins (Pedersen *et al.*, 2016) [3].
Currently, lactating sows are fed using a variety of feeding strategies, ranging from *adlib* (continuous 24-hour access to food) to restricted feeding (a set amount of feed given at fixed times). Research indicates that *adlib* feeding benefits lactating sows by promoting higher feed intake (Cools *et al.*, 2014) [2], better body condition and increased time spent standing and feeding.

Early mechanical sow-controlled *adlib* feeding systems allowed sows to manually release feed but did not track the quantity or timing of feed intake. More recently, computer-monitored *adlib* feeding systems have been introduced, where sows activate an electronic sensor to access feed. These advanced systems allow sows to eat whenever they choose while accurately recording feed amounts and feeding times, offering farmers superior tools to monitor and tailor the sow's diet throughout lactation (Poulopoulou *et al.*, 2018) [4].

From an early age, pigs naturally explore their surroundings and examine potential food sources through rooting, biting, sniffing, and tasting to assess the nutritional content (Studnitz *et al.*, 2007) [5]. These behaviours have developed over thousands of years and remain deeply embedded in today's domestic pigs. Even when housed in familiar environments and given nutritionally complete diets, these instinctive behaviours persist (Studnitz *et al.*, 2007) [5]. In fact, when domesticated pigs are placed in woodland settings, they still devote about 75% of their active time to foraging and feeding activities, despite having unlimited access to feed.

Water plays a vital role in the nutrition and overall well-being of pigs. Sufficient water intake is necessary to ensure proper hydration, aid digestion, regulate body temperature, and support healthy growth and development. However, the amount of water pigs require varies depending on their age, physiological condition, and environmental factors. By recognizing and meeting the specific water needs at different stages of a pig's life, farmers can enhance animal health and contribute significantly to the productivity and success of their pig farming operations (Hasahya *et al.*, 2023) [6].

Trace minerals (TMs) are vital nutrients required for numerous physiological functions in livestock. A deficiency in these minerals can lead to poor health and decreased productivity. Essential micronutrients such as manganese (Mn), zinc (Zn), and copper (Cu) play key roles in managing oxidative stress and are also crucial for the proper functioning of digestive enzymes and hormones involved in nutrient digestion and absorption. To meet the mineral requirements necessary for optimal growth and the production of high-quality animal products, inorganic trace minerals (ITMs) have traditionally been used as dietary supplements (Zhang *et al.*, 2024) [7].

Materials and Methods

Location of the study: Bengaluru Rural district lies in the southeastern part of the state, covering a geographical area of 229,519 hectares, which accounts for 1.2% of the state's total area. Located at 13°18′56.5″ N latitude and 77°30′53.1″ E longitude, the district is part of Bengaluru's peri-urban zone.

Parameters: The data from twenty piggery farms in peri urban region of Bengaluru was collected with regard to feeds and feeding practices to assess welfare scores, through structured schedule in person. The farms were divided in to small (<100), medium (100 to 200) and large farms (>200) based on the number of pigs. Four welfare measures were considered *viz.*, Feed ingredients, Feeding practices, Feeds storage space, Adequate supply of clean water for the study.

Scoring criteria (Total-30 marks)

Parameter	Ideal	Medium	Poor
Feed ingredients	*Adlib* (14)	Limited (7)	Not given (0)
Feeding practices	Good (14)	Medium (7)	Poor (0)
Feeds storage space (3)	Adequate (3)	Limited (2)	Not given (0)
Adequate supply of clean water (5)	*Adlib* (5)	Intermittent supply (2.5)	Inadequate (0)

Tabulation and analysis: After collecting responses from the participants, the data was carefully reviewed, verified, and numbered. The data were then coded, compiled, and tabulated according to standard procedures consistent with the study's objectives. statistical analysis will be carried out using Duncan's Multiple Range Test (DMRT). This post-hoc test is applied following a significant ANOVA result to determine which specific group means differ significantly from one another.

Results and Discussion

Table 1: Welfare score of 'Feeds and feeding practices' component in pig farms of different size.

Parameter	Maximum score	Small farms	Medium farms	Large farms	Overall average	P value
Feed ingredients	14	11.30 ± 0.73^{a}	5.2 ± 0.35^{b}	5.4 ± 1.34^{bc}	6.77±0.78	0.011
Feeding practices	8	6.00±0.89	5.80±0.36	6.00±0.63	5.90±0.31	1.000
Feeds storage space and hygiene	3	1.00 ± 0.63^{a}	1.20 ± 0.33^{a}	2.50 ± 0.20^{b}	1.47±0.26	0.037
Adequate supply of clean water	5	5.00±0.00	5.00±0.00	5.00±0.00	5.00±0.00	1.000
Overall score	30	23.30±2.02	17.20±0.94	18.90±1.22	19.15±0.91	0.054

Note: Means within a row with different superscripts differ significantly

The detailed data of all the welfare measures pertaining to feeds and feeding practices is presented in Table 1.

Feed ingredients: The mean scores were lowest in (5.4±1.33) large farms and highest in (11.3±0.73) small farms. The statistical analysis indicated highly significant (p<0.011) differences among the groups. This indicates that the small farms had better in collecting and usage of feed ingredients, might be due to ease of handling the feed ingredients for smaller number of pigs. This in case of medium and large farms due to a greater number of animals, farmer where force depend on uniform commercial rations, leading to lower diversity scores. Similar patterns have been reported in India, where smallholder pig farmers frequently use kitchen waste, vegetables, and farm by-products to feed pigs, in contrast to larger farms using standardized feeds

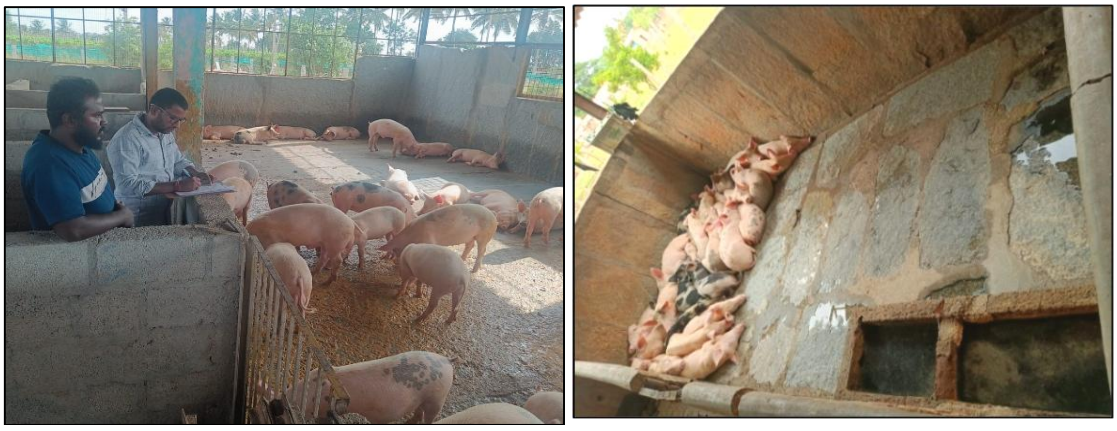
(Bhuyan, 2018) [8]. Such diversity may enhance welfare through variety but may not always ensure balanced nutrition.

Feeding practices: The mean scores for the feeding practices was lowest in medium farms (5.8±0.36) and highest in small farms (6±0.89). The statistical analysis indicated non-significant (p<1.000) differences among the groups. Proper feeding practices are crucial to ensure adequate nutrient intake, reduce competition at feeding points, and promote uniform growth. While the scores indicate that farms generally follow acceptable feeding methods, further improvements in feed distribution and frequency could enhance pig welfare and productivity (Patience *et al.*, 2015) [9].

Feeds storage space and hygiene: The mean scores for feeds storage space and hygiene was lowest in small farms (1.00±0.06) and highest in (2.50±0.20) large farms. The statistical analysis indicated highly significant (p<0.037) differences among the groups. Further, it was found that the feed storage space and hygiene was significantly (p<0.037) higher in large farms when compared to small and medium farms. This suggests that large farms maintain better storage facilities, reducing contamination risks and spoilage, while small farms often lack proper storage structures, leading to compromised feed quality. Similar observations were reported by Kumaresan *et al.* (2009) [10], who noted that smallholder pig farmers in North-Eastern India frequently stored feed in unhygienic conditions, increasing the risk of fungal contamination and reduced pig performance.

Adequate supply of clean water: The mean scores for Adequate supply of clean water was found to be similar in similar in all the piggery farms (5.00±0.00). The statistical analysis indicated non-significant (p<1.000) differences among all the farms. Water is the most essential nutrient, and unrestricted access to clean water is fundamental for maintaining hydration, digestion, thermoregulation, and overall welfare in pigs. Lack of clean water or inadequate supply can lead to dehydration, reduced feed intake, and impaired growth performance, whereas continuous availability supports health and productivity (Verdon *et al.*, 2018) [11]. The uniform scores suggest that all farms recognized the importance of water provision, though water quality monitoring remains equally critical.

Overall welfare score for Feeds and feeding practices: The overall mean welfare scores for Feeds and feeding practices lowest in medium farms (17.20±0.94) and it was highest in small farms (23.30±2.02). The statistical analysis indicated non-significant (p<0.054) differences among the groups. Further it was found that overall welfare score for feeds and feeding practices was significantly higher (p<0.004) in small farms when compare to medium and large farms. This indicates that feed-related welfare standards were generally maintained across farm sizes, aligning with earlier studies that highlight consistent feeding management practices in pig farms regardless of scale (Nkansah *et al.*, 2019) [12].



(a) (b)

Plate 1: Collection of information and giving welfare scores with respect to Feeds and feeding practices in and around peri-urban regions of Bengaluru.

Conclusion

Feeding-related welfare indicators demonstrated clear differences among farm sizes. Small farms ensured better feed quality and ingredient diversity, while large farms maintained superior feed storage hygiene. Medium farms lagged behind in most parameters. Overall, effective feed management and hygienic storage practices are crucial for improving welfare and productivity in pig farms.

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