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Effect of Floor Space Allowance on Growth Performance of Vizianagaram Lambs

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Abstract

This study evaluated the effect of different floor space allowances on the growth performance of Vizianagaram lambs under intensive rearing. Twenty-four healthy post-weaned lambs were randomly allotted to three groups with eight animals in each group. The lambs were maintained at floor space allowances of 0.4 m² (T₁), 0.8 m² (T₂) and 1.2 m² (T₃) per animal for a period of 90 days under uniform management practices. Growth performance was assessed based on body weight and selected morphometric traits. Body weight was recorded at regular intervals, while body measurements were taken periodically during the study. Body weight showed a steady increase in all groups throughout the experimental period. However, the differences among treatments were not statistically significant ($p>0.05$). Similarly, morphometric measurements such as body length, chest girth and thigh circumference remained comparable across treatments. The findings suggest that the range of floor space provided did not significantly influence growth performance under the present conditions.

Keywords: Floor space allowance, Growth performance, Vizianagaram lambs, Body weight, Morphometry

Introduction

Sheep were first domesticated in the Fertile Crescent and later spread to different parts of the world, including India. According to archaeological studies, sheep were raised for meat, milk and fiber during the Indus Valley Civilization, indicating their historical relationship with human society. Traditional pastoral societies established migratory grazing methods over time, which continue to significantly contribute to sheep production in various parts of India. In India, sheep rearing supports the livelihood of smallholders, landless labourers and pastoral communities. Where it continues to be a significant part to livestock industry. Sheep produce a variety of products, including meat, wool, skin and dung. They make efficient use of marginal lands, unproductive lands and crop wastes that would otherwise be inappropriate for development. They are a reliable source of revenue, especially in arid and semi-arid areas, due to their capacity to flourish under challenging climatic circumstances with little input (Wadhvani *et al.*, 2016). According to the 20th Livestock Census (2019), India has one of the world's largest sheep populations, with an estimated 74 million, underscoring their economic and social relevance in rural production systems (Pathak *et al.*, 2020). Apart from economic value, sheep also play an important role in rural traditions and social practices. In addition to their economic significance, having sheep is typically a symbol of financial stability for low-income families, and they are closely tied with traditional customs, rituals, and community routines. Sheep farming is a source of revenue as well as a cultural practice in many communities.

Vizianagaram sheep are an important meat-type breed in Andhra Pradesh's northern coastal districts, having adapted to the area's agro-climatic conditions. These sheep are generally grown under large grazing systems by smallholder farmers and have a moderate body size, relatively fast growth, and a high dressing percentage, making them commercially appealing for mutton production (Gangaraju, 2010; Veena, 2014) ^[3].

With the gradual move from traditional grazing to semi-intensive and intensive rearing systems, effective housing management has become increasingly important for assuring productivity and animal welfare. Allowing floor space is a crucial component of housing since it has a direct impact on the animals' social interactions, resting habits, and feed intake.

Insufficient space can lead to increased competition and stress, diverting energy away from growth and decreasing performance (Bøe *et al.*, 2006; Jongman *et al.*, 2017) [4]. Adequate space promotes comfort, successful feeding, and improved weight gain. As a result, determining the ideal floor area for indigenous breeds like *Vizianagaram* lambs is crucial for enhancing growth performance, welfare, and sustainability in sheep production under modern management approaches.

Materials and Methods

The study was carried out at the Sheep Unit of the Livestock Research Station (LRS), Garividi, Vizianagaram district, Andhra Pradesh. Under intensive system of rearing for a period of 90 days. For the study, 24 healthy post-weaned *Vizianagaram* lambs were selected from the station flock. The lambs were clinically examined prior to the experiment and only healthy animals were included.

Before commencement of the trial, all lambs were kept for a 15-day pre-experimental period to acclimatize them to the housing conditions and management practices. During this period, the animals were dewormed with albendazole at a dose rate of 10 mg/kg body weight and deworming was repeated once during the mid-phase of the experiment.

After acclimatization, the lambs were randomly allotted into three treatment groups based on body weight, with eight lambs in each group. Animals were managed under uniform and hygienic conditions throughout the study period. Each group were provided with a different floor space allowance as follows:

- T₁: 0.4 m² per lamb
- T₂: 0.8 m² per lamb
- T₃: 1.2 m² per lamb



Fig 1: Experimental housing partitions for *Vizianagaram* lambs under different floor space allowances (T₁: 0.4 m², T₂: 0.8 m² and T₃: 1.2 m²)

Growth Performance

Growth performance of the lambs was evaluated to assess the effect of different floor space allowances on productive traits under intensive rearing. Body weight of individual lambs was recorded at regular intervals, and parameters such as weight gain, body condition score and morphological measurements were calculated to compare growth among treatments.

Body weight

Body weight was recorded at fortnightly intervals throughout the 90-day experimental period to assess weight gain and overall growth among treatments.



Fig 2: Recording of body weight in lambs using weighing balance

Body condition score

The body condition score (BCS) of the lambs was evaluated on a regular basis using a standard scoring system to determine their fat stores and general nutritional health under various space allowances. This provided a subjective assessment of health and the efficacy of management practices. BCS was assessed at the beginning of the experiment and subsequently at 30-day intervals until the end of the study period.

Table 1: Body condition scoring system used for *Vizianagaram* lambs

Score	Discription
1	Emaciated-prominent bones, no fat
2	Thin-slight muscle covering
3	Moderate-smooth body outline
4	Fat-soft tissue deposition evident
5	Obese-excessive fat accumulation

Morphological measurements

Morphological measurements were collected to investigate the impact of floor space on physical development. Traits such as body length, height at withers, chest girth and other pertinent body measures were evaluated at regular intervals to assess the lambs' skeletal growth and body conformation. They were measured at the start of the experiment and thereafter at 30 day intervals for 90 days.

Table 2: Morphological traits recorded in *Vizianagaram* lambs

Trait	Method of Measurement
Body length	Point of shoulder to pin bone using measuring tape.
Height at withers	Ground to highest point of withers using measuring stick.
Chest girth	Circumference of chest just behind forelegs.
Abdominal girth/ Paunch girth	Circumference of abdomen at widest point.
Thigh circumference	Circumference around thigh region.



Fig 3: Measuring of Thigh circumference



Fig 4: Measuring of Abdominal girth



Fig 5: Measuring of Chest girth



Fig 6: Measuring of Height at withers



Fig 7: Measuring of Body length

Statistical Analysis

The data pertaining to growth performance parameters were analyzed using one-way analysis of variance (ANOVA) following the procedure described by Snedecor and Cochran (1994). The statistical analysis was carried out to evaluate the effect of different floor space allowances on the performance of lambs.

Results

The results obtained during the experimental period are presented and analysed in this section. The observations recorded during the experimental period were compiled, analysed statistically and the results obtained are presented in this chapter.

Effect of floor space allowances on growth performance in lambs

Growth performance of *Vizianagaram* lambs maintained under different floor space allowances was assessed for a period of 90 days based on observations on body weight, body condition score and morphometric measurements.

Body weight

The Body weight increased consistently from day 0 to day 90 in all treatment groups. However, no statistically significant differences were observed among the treatment groups ($p>0.05$). At the beginning (day 0), body weights were similar, with 11.44 ± 1.13 kg in T1, 11.16 ± 1.13 kg in T2 and 12.21 ± 1.13 kg in T3.

By day 15, weights increased to 12.90 ± 1.05 kg (T1), 12.81 ± 1.05 kg (T2) and 13.47 ± 1.05 kg (T3), maintaining a comparable trend. At day 30, lambs recorded 14.05 ± 1.00 kg in T1, 14.26 ± 1.00 kg in T2 and 14.57 ± 1.00 kg in T3, showing gradual growth across all groups.

At day 45, body weights were 14.92 ± 1.11 kg in T1, 15.91 ± 1.11 kg in T2 and 15.81 ± 1.11 kg in T3. On day 60, values were 15.73 ± 1.14 kg (T1), 15.67 ± 1.14 kg (T2) and

15.47±1.14 kg (T3), indicating minor fluctuations but no significant differences.

Further, at day 75, weights were 15.34±1.10 kg in T1, 15.61±1.10 kg in T2 and 15.99±1.10 kg in T3. By the end of the experiment (day 90), lambs attained 16.29±1.23 kg (T1), 16.56±1.23 kg (T2) and 17.43±1.23 kg (T3).

Overall, although lambs in the higher space group (T3) showed slightly higher numerical body weights, the absence of significant differences suggests that floor space allowance had no marked effect on growth performance under the present study conditions.

Table 3: Effect of treatment on body weight (kg) of lambs at different ages

Day	T1 (Mean ± SE)	T2 (Mean ± SE)	T3 (Mean ± SE)	p-value
0	11.44 ± 1.13	11.16 ± 1.13	12.21 ± 1.13	NS
15	12.90 ± 1.05	12.81 ± 1.05	13.47 ± 1.05	NS
30	14.05 ± 1.00	14.26 ± 1.00	14.57 ± 1.00	NS
45	14.92 ± 1.11	15.91 ± 1.11	15.81 ± 1.11	NS
60	15.73 ± 1.14	15.67 ± 1.14	15.47 ± 1.14	NS
75	15.34 ± 1.10	15.61 ± 1.10	15.99 ± 1.10	NS
90	16.29 ± 1.23	16.56 ± 1.23	17.43 ± 1.23	NS

Values are expressed as Mean ± SE. NS = Non-significant ($p > 0.05$).

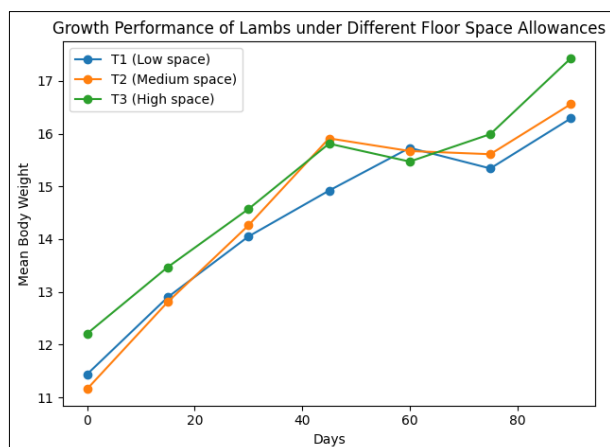


Fig 8: Effect of different floor space allowances on body weight changes of lambs over time

Effect of floor space allowances on Morphometric measurements in lambs

The body measurements of lambs did not differ significantly ($p > 0.05$) among the different floor space allowance groups, indicating that space variation had no measurable effect on morphometric traits during the study period. Body length was comparable across treatments, with values of 49.33±0.94 cm in T1, 47.62±0.83 cm in T2 and 49.96±0.80 cm in T3. Although T3 showed a slightly higher value, the differences were statistically non-significant.

Chest girth followed a similar trend, ranging from 48.42±1.03 cm in T1 to 50.62±1.06 cm in T3, with T2 recording 49.04±1.17 cm, indicating only minor variation among groups. Paunch girth values were also closely aligned, with 63.12±0.49 cm (T1), 62.75±0.85 cm (T2) and 64.50±0.61 cm (T3), showing no significant effect of space allowance.

Abdominal length remained almost uniform across treatments, with values of 68.29±1.14 cm in T1, 68.42±0.98 cm in T2 and 68.25±1.21 cm in T3, suggesting that this parameter was unaffected by housing density. Similarly, thigh circumference showed slight numerical variation, with

30.42±0.26 cm in T1, 29.88±0.57 cm in T2 and 31.42±0.48 cm in T3, but the differences were not statistically significant.

Table 4: Effect of Treatments on Body Measurements (Mean ± SE)

Parameter	T1 (Mean ± SE)	T2 (Mean ± SE)	T3 (Mean ± SE)	Significance
Body Length (cm)	49.33±0.94	47.62±0.83	49.96±0.80	NS
Chest Girth (cm)	48.42±1.03	49.04±1.17	50.62±1.06	NS
Paunch Girth (cm)	63.12±0.49	62.75±0.85	64.50±0.61	NS
Abdominal Length (cm)	68.29±1.14	68.42±0.98	68.25±1.21	NS
Thigh Circumference (cm)	30.42±0.26	29.88±0.57	31.42±0.48	NS

NS = Non-significant ($p > 0.05$)

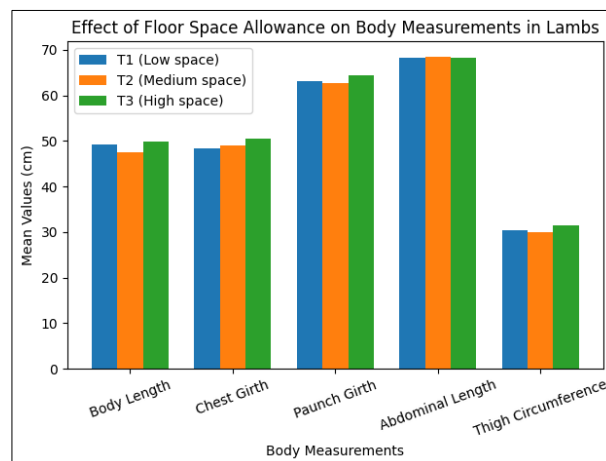


Fig 9: Effect of different floor space allowances on body measurements of lambs

Discussion

The findings of this study indicate that variation in floor space did not significantly affect growth performance of the lambs. Although lambs maintained under higher space allowance (T3) exhibited slightly higher body weights, the differences were not statistically significant.

Similar observations have been reported by previous studies, which also found no significant effect of space allowance on weight gain Norouzian *et al.* (2017) and Jongman *et al.* (2017) [4], who reported no significant effect of increasing floor space on body weight gain in lambs beyond a certain level. Similarly, Mayes *et al.* (2022) [6] observed only marginal improvements in body weight with increased space allowance, indicating that growth response may be limited under short-term conditions.

In contrast, a few studies have reported improved growth under higher space allowance conditions. Karimi *et al.* (2018) [5] and Badavath *et al.* (2019) [2] observed higher weight gain in lambs provided with larger floor space, possibly due to improved feed intake and reduced competition. Likewise, Sharma and Bhatt (2021) and Viswanathan *et al.* (2021) reported better growth and metabolic status in animals maintained at lower stocking density.

The lack of significant differences in the present study may be due to uniform feeding and management practices, which could have minimized the impact of space variation. It also suggests that moderate space allowance may be sufficient to maintain normal growth performance under well-managed intensive systems.

Summary and Conclusion

The study was conducted to evaluate the effect of floor space allowance on the growth performance of *Vizianagaram lambs* under intensive rearing conditions. Twenty-four post-weaned lambs were randomly allotted to three treatments with floor space of 0.4 m² (T₁), 0.8 m² (T₂) and 1.2 m² (T₃) per lamb and maintained for 90 days under uniform management.

Body weight and morphometric traits increased progressively in all groups; however, differences among treatments were non-significant ($p > 0.05$). Lambs provided with higher space showed slightly better numerical values, but the variation was not statistically meaningful.

In conclusion, the results indicate that floor space allowance within the range of 0.4 to 1.2 m² per lamb did not significantly influence growth performance under the present conditions. Therefore, moderate floor space appears sufficient when proper management and nutrition are maintained.

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