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Effect of different housing systems on feed consumption and body performance of crossbred heifers

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Abstract

The present study was conducted to compare the effect of conventional and loose housing systems on feed consumption and body performance of crossbred heifers. The experiment was carried out for 120 days at the Livestock Instructional Farm, Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, during 2025-2026. A total of 24 crossbred heifers were selected and allotted to two housing treatments, viz., T₁: conventional housing and T₂: loose housing, with 12 animals in each treatment. Feed consumption was recorded throughout the experimental period, while body weight was recorded at the beginning and at 30, 60, 90 and 120 days of the experimental period. Body weight gain, average daily gain, body length, chest girth and body height were used to assess body performance. Feed intake increased progressively in both housing systems. At 120 days, the mean feed intake was 15.82 kg/day/heifer in conventional housing and 16.93 kg/day/heifer in loose housing, with the difference being statistically significant at the final observation. Mean body weight increased from 226.92 to 254.17 kg in conventional housing and from 231.52 to 271.00 kg in loose housing. Total body weight gain was 28.00 and 37.83 kg/heifer, with average daily gains of 233.33 and 315.25 g/day in conventional and loose housing, respectively. Body length, chest girth and body height also increased progressively in both systems, with comparatively higher values in loose-housed heifers during the later stages. The findings indicate that loose housing provided comparatively better feed consumption and growth performance than conventional housing under the conditions of the present study.

Keywords: Crossbred heifers, conventional housing, loose housing, feed consumption, body weight, body weight gain, body measurements, growth performance

1. Introduction

Livestock production is an important component of Indian agriculture, and dairy farming contributes substantially to food security and rural livelihoods. The productivity of dairy animals is influenced by several interacting factors, including genetic potential, nutrition, environmental conditions and management practices. Among these factors, housing plays an important role in determining animal comfort, health, welfare and productive performance. (Bewley *et al.* 2017; Nalon and Stevenson, 2021) ^[1, 7].

Housing systems provide protection against unfavourable environmental conditions and create an environment suitable for feeding, resting, movement and other normal activities. This is particularly important for growing replacement heifers because their growth and development influence their subsequent productive and reproductive performance (Jat *et al.* 2021; Costa *et al.* 2016) ^[5, 2]. The rearing period also represents a considerable investment in feed, labour, healthcare and housing.

Conventional housing generally confines animals to individual stalls and permits close individual observation and feeding management. However, prolonged confinement can restrict locomotion and behavioural expression. In contrast, loose housing provides greater freedom of movement within an open or semi-covered area and permits animals to walk, exercise, rest and interact more freely (Nalon and Stevenson, 2021; Linstädt *et al.* 2025) ^[7, 6].

The difference in freedom of movement and environmental conditions may consequently influence feed consumption and growth.

Feed consumption is an important component of growth performance because adequate feed intake is necessary to meet the nutrient requirements of growing animals. Similarly, live body weight, body weight gain and linear body measurements provide useful indicators of growth and physical development (Costa *et al.* 2016; Nalon and Stevenson, 2021) [2, 7]. Therefore, comparative evaluation of different housing systems is important for identifying management practices that can support efficient heifer rearing.

Although both conventional and loose housing systems are used in dairy production, their relative effects may vary according to breed, climatic conditions, housing design and management practices. Hence, evaluation under local farm conditions is useful for determining the suitability of a housing system. (Bewley *et al.* 2017; Linstädt *et al.* 2025) [1, 6].

Therefore, the present investigation was undertaken with the following objectives:

1. To compare the effect of different housing systems on feed consumption.
2. To study the effect of different housing systems on body performance.

2. Materials and Methods

2.1 Experimental site and duration

The experiment entitled “Comparative Studies on the Performance of Crossbred Heifers under Conventional and Loose Housing System” was conducted at the Livestock Instructional Farm, Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, during 2025-2026 for a period of 120 days.

2.2 Experimental animals and design

A total of 24 crossbred heifers were selected for the experiment. The animals were divided into two housing treatments with three replications (four heifers per replication). The treatments were:

T₁-Conventional housing system

T₂-Loose housing system

The animals were allotted on the basis of average body weight and age. The experimental groups were maintained under comparable feeding and general management conditions during the experimental period.

2.3 Housing systems

Under conventional housing, the animals were maintained in individual tie-stall arrangements and were tied with a neck chain except during shed cleaning. Green and dry fodder were offered twice daily, while water was provided three times during 24 hours.

Under loose housing, animals were maintained in a system consisting of a shaded roofed area and an open area. A common feeding manger and water trough were provided. Green and dry fodder were available throughout the day, and the animals were allowed freedom of movement between the open and shaded areas.

2.4 Feeding management

The experimental animals were fed according to ICAR feeding standards based on body weight and nutrient

requirements. The ration consisted of chickpea straw, soybean straw, hybrid napier, silage and concentrate mixture. Feed quantity was adjusted according to the dry matter requirement of the animals.

2.5 Measurement of feed consumption

Chaffed green and dry fodder was weighed before being offered to the animals. Feed was offered twice daily at 08:00 and 17:00 hours, while the predetermined quantity of concentrate mixture was offered at 10:00 hours. The leftover feed was collected and weighed the following morning. Actual daily feed consumption was calculated as the difference between feed offered and feed leftover. Feed consumption was recorded throughout the 120-day experimental period.

2.6 Assessment of body performance

Live body weight of individual heifers was recorded at the beginning of the experiment and subsequently at 30, 60, 90 and 120 days. Body weight was recorded in the morning before feeding and watering using a digital weighing balance and expressed in kilograms.

Body weight gain was calculated as:

Body weight gain (kg) = Final body weight – Initial body weight

Body length was measured from the point of shoulder to the point of hip. Chest girth was measured as the circumference immediately behind the shoulder, while body height was measured from ground level to the highest point of the withers. Body measurements were expressed in centimetres.

2.7 Statistical analysis

The experimental observations were analysed using the statistical procedure adopted in the study for comparison of the two housing treatments. Treatment differences were interpreted using the standard error of mean and critical difference at the 5 percent level of significance.

3. Results and Discussion

3.1 Effect of housing system on feed consumption

Feed consumption increased progressively with advancement of the experimental period in both housing systems. In conventional housing, mean feed intake increased from 14.10 kg/day/heifer initially to 15.82 kg/day/heifer at 120 days. In loose housing, it increased from 14.58 to 16.93 kg/day/heifer over the same period.

Table 1: Feed intake of crossbred heifers under conventional and loose housing systems (kg/day/heifer)

Treatment	Initial	30 Days	60 Days	90 Days	120 Days
T ₁ Conventional housing	14.10	14.56	14.89	15.41	15.82
T ₂ Loose housing	14.58	15.09	15.66	16.15	16.93
SE m±	0.180	0.139	0.141	0.140	0.166
CD at 5%	NS	NS	NS	NS	1.011

The differences between the treatments were not significant during the initial observation periods. However, at 120 days, loose-housed heifers recorded significantly higher feed consumption than conventionally housed heifers, with a critical difference of 1.011 kg/day.

The findings suggest that housing conditions may influence voluntary feed consumption. The greater freedom of movement and availability of feed throughout the day in the

loose housing system may have contributed to the higher intake observed at the end of the experimental period. Similar findings were reported by Jat *et al* (2021) [5].

3.2 Effect of housing system on live body weight

Live body weight increased progressively in both housing systems. The mean body weight of heifers under conventional housing increased from 226.92 kg initially to 254.17 kg at 120 days, whereas in loose housing it increased from 231.52 kg to 271.00 kg.

Table 2: Live body weight of crossbred heifers under conventional and loose housing systems

Treatment	LIVE BODY WEIGHT				
	Initial	30 Days	60 Days	90 Days	120 Days
T ₁ Conventional housing	226.92	232.17	239.17	246.67	254.17
T ₂ Loose housing	231.52	240.83	250.00	259.17	271.00
SE m	2.474	2.418	2.357	2.131	2.013
C D at 5%	N S	N S	N S	N S	12.253

The differences in body weight were not significant during the earlier observations, whereas a significant difference was observed at 120 days. Loose-housed heifers therefore attained a higher final body weight than conventionally housed animals. The higher final body weight may partly be associated with the greater feed consumption recorded under loose housing. Similar results were described by Gautam Kumar and Siddiqui (2012) [3].

3.3 Effect on body weight gain and average daily gain

Body weight gain is an important indicator of growth performance (Cost *et al.* 2016) [2]. During the 120-day experimental period, heifers maintained under conventional housing gained 28.00 kg/heifer, corresponding to an average daily gain of 233.33 g/day. In contrast, loose-housed heifers gained 37.83 kg/heifer, with an average daily gain of 315.25 g/day.

Table 3: Body weight gain and average daily gain of crossbred heifers under conventional and loose housing systems

Treatment	Body weight gain over 120 days (kg)	Average daily gain (g/day)
T ₁ Conventional housing	28.00	233.33
T ₂ Loose housing	37.83	315.25
SE m $\pm$	0.588	4.829
CD at 5%	3.582	29.386

Loose-housed heifers gained approximately 9.83 kg more body weight per animal than conventionally housed heifers during the experimental period. The greater average daily gain indicates a comparatively better growth response under loose housing.

3.4 Effect on body length

Body length increased progressively in both treatments. In conventional housing, body length increased from 129.03 cm initially to 133.83 cm at 120 days, whereas in loose housing it increased from 129.70 to 136.00 cm.

The comparatively greater body length recorded in loose housing during the later stages was consistent with the higher body weight and weight gain observed in this treatment. The increase in body length reflects continued

skeletal development of the growing heifers. (Costa *et al.* 2016; Heinrichs *et al.* 2017) [7, 4].

3.5 Effect on chest girth

Chest girth also increased progressively in both housing systems. In conventional housing, the mean chest girth increased from 150.87 to 156.63 cm, while in loose housing it increased from 151.67 to 159.17 cm during the 120-day period.

Table 4: Body length of crossbred of heifers under conventional and loose housing systems

Treatment	BODY LENGTH				
	Initial	30 Days	60 Days	90 Days	120 Days
T ₁ Conventional Housing	129.03	130.27	131.73	132.67	133.83
T ₂ Loose Housing	129.70	131.20	132.70	134.33	136.00
SE m	0.912	0.169	0.047	0.192	0.192
C D at 5%	N S	N S	0.286	1.173	1.173

Table 5. Chest girth of crossbred of heifers under conventional and loose housing systems

Treatment	CHEST GIRTH				
	Initial	30 Days	60 Days	90 Days	120 Days
T ₁ Conventional Housing	150.87	152.27	153.77	155.17	156.63
T ₂ Loose Housing	151.67	153.47	155.27	157.20	159.17
SE m	0.216	0.216	0.216	0.209	0.239
C D at 5%	N S	N S	1.314	1.274	1.455

The higher chest girth observed in loose-housed heifers during the later stages corresponded with their higher body weight and body weight gain. Progressive increase in chest girth in both groups indicates continued body development during the experimental period.

3.6 Effect on body height

Table 6. Body height of crossbred of heifers under conventional and loose housing systems

Treatment	BODY HEIGHT				
	Initial	30 Days	60 Days	90 Days	120 Days
T ₁ Conventional Housing	97.55	98.13	98.57	99.07	99.57
T ₂ Loose Housing	98.50	98.50	99.10	99.73	100.40
SE m	0.1414	0.047	0.623	0.084	0.062
C D at 5%	N S	0.286	0.379	0.517	0.379

In conventional housing, mean body height increased from 97.55 to 99.57 cm, whereas in loose housing it increased from 98.50 to 100.40 cm.

The increase in body height in both treatments indicates normal skeletal growth. Although the differences in body height were comparatively small, loose-housed heifers generally recorded higher values during the experimental period.

4. Overall Discussion

The results of the present study demonstrate a favourable numerical response of crossbred heifers maintained under loose housing in terms of both feed consumption and body performance. Feed consumption increased in both systems

as the animals grew, but the increase was greater under loose housing, particularly at the final observation.

The higher feed intake under loose housing was accompanied by higher final body weight and greater body weight gain. Loose-housed heifers gained 37.83 kg during the 120-day experimental period compared with 28.00 kg under conventional housing. The average daily gain was also higher in loose housing (315.25 g/day) than in conventional housing (233.33 g/day) (Jat *et al.*, 2021; Pempek *et al.* 2016)^[5, 8].

The improvement in body performance under loose housing may be related to the greater freedom of movement, availability of open and shaded areas and opportunity for normal feeding and resting behaviour. The study document also indicates that loose housing provided comparatively favourable conditions for growth and performance of the heifers.

The progressive increases in body length, chest girth and body height in both treatments further demonstrate normal physical development. The comparatively higher values recorded under loose housing, particularly at the later observations, were consistent with the greater body weight gain observed in this treatment.

5. Conclusion

The present study revealed that both conventional and loose housing systems significantly influenced feed consumption and body performance of crossbred heifers during the 120-day experimental period. Feed consumption increased progressively in both conventional and loose housing systems, significantly higher feed intake at 120 days was recorded in heifers under loose housing.

The significant higher final body weight, body weight gain and average daily gain was also recorded under loose housing system. The total body weight, body length, chest girth and body height increased progressively in both housing systems, with comparatively higher values generally observed under loose housing.

Based on the observations of the present study, the loose housing system showed better overall feed consumption and body growth performance than the conventional housing system for crossbred heifers under the conditions of the experiment. Further studies involving larger animal populations and different agro-climatic conditions may help to confirm these findings.

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