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# Comparative Response of Hay Versus Green Fodder Feeding and Loose Versus Barn Housing on Labor Utilization and Economics of Rearing in Murrah Buffalo Heifers

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## ABSTRACT

The study was undertaken to investigate the effect of hay versus green fodder and loose versus barn house on labor utilization and economics of rearing of buffalo heifers. Twenty heifers based on similar body weight (BW) and age were divided into four treatments; T1: conventional barn housing+ berseem hay and concentrate mixture (CM); T2: conventional barn housing+ berseem green fodder and CM; T3: loose housing+ berseem green fodder and CM; and T4: loose housing+ berseem hay and CM. The interactive relationship between two housing and feeding systems was also studied. The cleaning time of sheds and feeding time was higher (P<0.05) in T1 and T2 compared to T3 and T4.The feeding time in T3 was higher (P<0.05) than that of T4.The watering time in $T_1$ was higher (P<0.05) than those of T2, T3 and T4. The watering time in T2 was higher (P<0.05) than those of T3 and T4. The time spent for cleaning, feeding and watering in conventional barn was higher (P<0.05) as compared to loose housed heifers due to individual cleaning, feeding and watering of the animals. The total cost of raising a heifer was higher in T2 and T3as compared to those of T1 and $T_4$ because of more concentrate feeding in T2 and T3 which increased the feed cost. The cost per kg BWG was higher in T2 and T3 as compared to T1 and T4. The cost per kg gain was the least in hay feeding along with loose housing (T4). It was concluded that the labour requirement for cleaning of sheds, feeding and watering to heifers was higher (P<0.05) in conventional barn than those housed in loose house and remained uninfluenced due to feeding systems.The total cost and cost per kg body weight gain was less in heifers raised under hay feeding along with loose housing.

**KEYWORDS:** Barn housing, Green fodder, Hay, Labor utilization, Loose housing, Murrah heifer

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## INTRODUCTION

Buffalo is an indispensable livestock and serves as a capital reserve or a cash crop to rural folk by providing nutritional security, economic stability as well as a social status (Yadav et al., 2022). Owing to its superior quality of milk, disease resistance ability, longer productive life and higher milk productivity, buffalo is preferred over cattle in several parts of the country (CIRB, 2015). The growth potential of buffalo calf is best upto 2.5½ years of age and half of the mature body weight is attained by 1.5½ years of age. Therefore, this growth has to be exploited by appropriate feeding. Unfortunately, at this age they are most neglected on farm due to scarcity of green fodder as available fodder is mostly offered to milch buffaloes and growth rate of heifers decline due to negative nutrient balance (Bhardwaj and Khanna, 2016). As per degree of animal confinement, it is not uncommon to use loose and the conventional barn housing systems. Compared to the conventional barn, loose housing has the advantage of better udder health (Hultgren, 2002; Regula et al., 2004), lower risk of ketosis and better fertility (Valde et al., 1997). Loose housing system has the disadvantage of a higher risk of lameness (Cook, 2003; Sogstad et al., 2005). Also,

availability of quality forage throughout the year is the major concern of the dairy farmers in India. Berseem is the main leguminous crop commonly growth during Rabi season in Northern India. This crop contains (20-25%) protein and 60-62% TDN as compared to conventional concentrate mixture containing 20 percent protein and 70-72 percent TDN (Chauhan et al., 1993). Berseem is available surplus during February to May in Northern India and can be easily dried as hay (95% DM) in the sun. The *in vitro* organic matter digestibility of dried processed berseem varies from 60 to 75 percent depending upon the stage of harvesting as against *in vitro* OMD 80-85 percent of conventional concentrate mixture available in India (Chauhan et al., 2004). The objective of the present investigation was to study efficiency of labour utilization and economics of rearing of Murrah heifers under different feeding and housing systems.

## MATERIALS AND METHODS

### Animals and Treatments

Twenty Murrah heifers of 12 to 15 months of age were selected from the Buffalo Research Centre, Department of Livestock Production and Management, College of Animal Sciences, CCS Haryana Agricultural University, Hisar and equally divided into four treatment groups (T1 to T4) based on their body weight and age as below. The berseem hay was prepared and berseem green fodder was produced at Buffalo Research Centre.

T1: conventional barn housing+ berseem hay and concentrate mixture (CM).

T2: conventional barn housing + berseem green fodder and CM.

T3: loose housing +berseem green fodder and CM.

T4: loose housing+ berseem hay and CM.

The heifers were dewormed and sprayed against external parasites and subjected to 15 days of adjustment period and 120 days of experimental periodi.e. during 1st February to 31st May, 2004.The detailed particulars of the animals in T1 to T4 are presented in Table 1.

Table 1. Particulars of Experimental Animals

| Treatments | Animal Number | Date of birth | Age (Days) | Initial BW (Kg) |
|---|---|---|---|---|
| T1R1 | 069 | 22.08.2002 | 524 | 181 |
| T1R2 | 076 | 11.09.2002 | 504 | 158 |
| T1R3 | 077 | 13.09.2002 | 502 | 159 |
| T1R4 | 083 | 04.10.2002 | 482 | 125 |
| T1R5 | 085 | 05.10.2002 | 481 | 179 |
| Mean | | | 498.6 | 160.4 |
| T2R1 | 065 | 05.08.2002 | 540 | 183 |
| T2R2 | 071 | 28.08.2002 | 518 | 131 |
| T2R3 | 087 | 09.10.2002 | 477 | 171 |
| T2R4 | 098 | 11.11.2002 | 444 | 178 |
| T2R5 | 102 | 19.11.2002 | 428 | 153 |
| Mean | | | 481.4 | 163.2 |
| T3R1 | 080 | 22.09.2002 | 493 | 140 |
| T3R2 | 092 | 24.10.2002 | 462 | 187 |
| T3R3 | 097 | 11.11.2002 | 444 | 176 |
| T3R4 | 104 | 22.11.2002 | 425 | 173 |
| T3R5 | 109 | 06.12.2002 | 420 | 151 |
| Mean | | | 448.8 | 165.4 |
| T4R1 | 066 | 13.08.2002 | 533 | 190 |
| T4R2 | 089 | 20.10.2002 | 466 | 175 |
| T4R3 | 100 | 16.11.2002 | 439 | 174 |
| T4R4 | 111 | 11.12.2002 | 415 | 144 |
| T4R5 | 117 | 12.01.2003 | 384 | 143 |
| Mean | | | 447.4 | 165.2 |

**Feeds and feeding**

CM (Wheat 40; GNC 30; Deoiled rice polish 30%) containing mineral mixture 2 and common salt 1kg/100 kg was prepared. An equal and weighed amount of hay and green fodder was fed to all the heifers daily and its CP content was taken into consideration while fixing the allowance of concentrate for each group. The heifers in each group were fed extra amount of wheat straw to meet the TDN requirement as per NRC (2001). The feed intake was determined on the basis of feed and fodder offered and left over individually for two consecutive days in a fortnight. Samples of wheat straw, green fodder, hay and CM offered were taken and analysed for proximate principles as per AOAC (1995) (Table 2); and the DM, CP and TDN intakes were determined.

Table 2. Proximate composition (%) of feed and fodders on DM basis

| Feedstuffs | DM | CP | EE | CF | Ash | NFE |
|---|---|---|---|---|---|---|
| CM | 90.7 | 19.1 | 2.21 | 7.77 | 8.55 | 62.3 |
| Berseem green | 13.3 | 22.2 | 1.96 | 17.8 | 9.82 | 48.0 |
| Berseem hay | 79.2 | 17.5 | 2.17 | 17.3 | 15.6 | 47.4 |
| Wheat bhusa | 91.1 | 3.67 | 2.28 | 19.4 | 9.27 | 65.3 |

The feed and fodder records were maintained to calculate the feeding cost of heifers under different treatments.A measured quantity of fresh clean water offered *ad libitum* individually to each heifer by placing a graduated bucket full of water twice a day (11.00 A.M. and 2.30 P.M.). Refusals were measured for two consecutive days to know the actual voluntary water intake. Simultaneously, the water available from the feed and fodder consumed by the heifers on that particular day was also calculated on the basis of their moisture content. The total water intake was thus obtained by adding the voluntary water intake and water consumed through feed and fodder.The efficiency of labour utilization in terms of time spent by the labour for carrying out various farm operations such as cleaning of shed, feeding and watering of heifers. The data was recorded for two consecutive days in each fortnight during the whole experimental period. The data so collected was analysed by using 2x2 factorial design as described by Snedecor and Cochran (1967).

**RESULTS AND DISCUSSION**

**Labour utilisation**

The data pertaining to time spent by a single labour in cleaning, feeding and watering under different treatments, and two housing and feeding systems was recorded at fortnightly intervals and presented in Table 3. With regard to cleaning time, it was higher ($P<0.05$) in T1 and T2 compared to those of T3 and T4. The cleaning time betweenT1 and T2; and between T3 and T4 did not differ significantly. The feeding time in T1 and T2 was higher ($P<0.05$) than those of T3 and T4.The feeding time in T3 was higher ($P<0.05$) than that of T4.The feeding time between T1 and T2 did not differ significantly. The watering time in T1 was higher ($P<0.05$) than those of T2, T3 and T4. The watering time in T2 was higher ($P<0.05$) than those of T3 and T4.The watering time in T3 was statistically similar to that of T4.Thetime spent for cleaning, feeding and watering under different feeding systems was not significantly different but significantly ($P<0.05$) different between the housing systems. The interaction was also found significant ($P<0.05$) for feeding and watering time to the heifers. The time spent for cleaning, feeding and watering in conventional barn was higher ($P<0.05$)as compared to loose housed heifers due to individual cleaning, feeding and watering of the animals.

Table 3. Time spent (minutes) by one labour for various farm operations under different treatments and rearing systems

| Treatments | Cleaning | Feeding | Watering |
|---|---|---|---|
| T1 | 26.6± 0.32[a] | 38.0± 0.96[a] | 30.0± 0.64[a] |
| T2 | 25.8 ± 0.55[a] | 36.7± 0.82[a] | 24.8± 0.49[b] |
| T3 | 22.2± 0.49[b] | 29.6± 0.53[b] | 21.2± 0.42[c] |
| T4 | 22.3± 0.40[b] | 26.1± 0.49[c] | 21.5± 0.38[c] |
| Housing systems | | | |
| Conventional Barn | 26.2± 0.32[a] | 37.3[a]±0.63[a] | 27.4± 0.60[a] |
| Loose housing | 22.3± 0.31[b] | 27.8[b]±0.47[b] | 21.3± 0.28[b] |
| Feeding systems | | | |
| Green fodder | 24.0 ± 0.48 | 33.1±0.80 | 23.0 ± 0.45 |
| Hay | 24.5 ± 0.46 | 32.0±1.19 | 25.7 ± 0.84 |

Means having different superscripts differ significantly (P<0.05)

In the present study, the animals reared in conventional barn required more time in cleaning of shed, feeding and watering of animals compared to their loose housing counterparts. In earlier study, Singh (1982) also reported that the calves reared in loose house required less time for different farm operations than those tethered in shed and shed + open. Similarly, Yadav (1984) observed that group reared calves required less time for management operations than those grazed or reared individually. Similar observations were also noticed by Sarma (1991),Fasil (1999), and Shenu (2000) wherein group rearedcalves required less time in various farm operations than those reared individually. Also, Singh et al. (1993) reported that loose housing required less average labour timefor different operations as compared to shed + open and shed. They further reported that the calves could be raised economically in loose housing than shed and shed + open housing system. Similarly, Legha and Tomer (2000) concluded that more time per day per calf was required in conventional barn than loose house groups which was mainly due to tethering operation and individual feed and fodder supply in conventional barn groups.Similarly, Hawkins et al. (2019) reported that labor cost of individual housing and group housing contributed 33% and 26%, respectively and total cost per hourly laborer were decreased from inside individual housing to group housing by 36% per animal.USDA (2016) also reported that labour cost of raising heifers is influenced by different housing systems.

**Economics of raising**

The cost of raising a heifer in terms of total cost and cost per kg body weight gain (BWG) under different treatments; and two housing and feeding systemswas worked out and presented in Table 4 and 5, respectively. The total cost of raising a heifer was higher in T2 and T3as compared to those of T1 and T4 because of more concentrate feeding in T2 and T3 which increased the feed cost. The cost per kg BWG was higher in T2and T3 as compared to T1 and T4. The cost per kg BWG might be higher in T2 and T3 due to restricted feeding and poor growth due to heat stress during night wherein most of energy might be utilized to maintain their normal body temperature. The cost per kg BWG was the least in hay feeding alongwith loose housing (T4). The total BWG during the experiment was 86.34, 96.30, 88.68 and 93.96 kg in conventional barn, loose house, green fodder feeding and hay feeding as per NRC feeding standards, respectively. Less cost per kg BWG in loose house was because the heifers of this group grew faster than those raised in conventional barn. It was also observed that hay feeding increased the live weight gain and reduced the cost per kg BWG. This result was in agreement with earlier reports of Yadav (1981), Singh (1982), Yazdani (1996), Jat (2002), and Gupta et al. (2004). On the contrary, Sarma (1991),Chakrabarti et al. (1994),Fasil (1999), and Shenu (2000) reported lower cost per kg BWG in individual rearing with 100 percent NRC standard fed calves due to their faster growth. Similarly, Nandra et al. (1982),

Chauhan (1986), Chauhan and Chopra (1986), Antil (1988),Sangwan et al. (1992), and Chauhan et al. (1993) reported significantly lower cost per kg BWG due to hay feeding. However, lower cost per kg BWG due to green fodder feeding was reported by Gupta et al. (1988),Chauhan et al. (1993;1994; 2004), and Kumar et al. (1999) in buffalo calves. On the other hand, Chaudhary (1998) and Rai (2003) reported no significant effect of green fodder feeding on the feed cost per kg BWG in the buffalo calves.Also, earlier studies reported that replacement heifers are the second largest farm operating expense, behind only feed cost (Tozerand Heinrichs, 2001); the cost of raising a replacement heifer plays an important role in dairy enterprise economics which is influenced by feeding and housing systems (Gabler et al., 2000; Heinrichs et al., 2013; Hawkins et al., 2020).

Table 4. Cost (Rs.) of raising of a heifer under different treatments

| Parameters | Treatment | | | |
|---|---|---|---|---|
| | T1 | T2 | T3 | T4 |
| Green fodder cost | 1541.2 | 1765.2 | 1806.9 | 1601.6 |
| Dry fodder cost | 258.0 | 295.8 | 311.0 | 264.8 |
| CM cost | 508.3 | 582.9 | 540.6 | 445.0 |
| Total feed cost | 2307.6 | 2644.5 | 2658.6 | 2311.4 |
| Labour cost | 234.8 | 253.2 | 232.3 | 220.4 |
| Total raising cost | 2542.4 | 2897.7 | 2890.9 | 2531.8 |
| Total BWG (kg.) | 88.9 | 83.7 | 93.6 | 99.0 |
| Feed Cost/Kg BWG | 25.9 | 31.5 | 28.4 | 23.3 |
| Raising Cost/Kg BWG | 28.5 | 34.3 | 30.8 | 25.5 |
| Quantity of feeds and fodders (Qtl) fed and their prices | | | | |
| Green fodder @ Rs.77/-Qtl. | - | 22.9 | 23.4 | - |
| Hay @ Rs.308/-Qtl. | - | 5.00 | - | 5.20 |
| CM @ Rs.600/-Qtl. | 0.84 | 0.97 | 0.90 | 0.74 |
| Dry Fodder @ Rs.158/-Qtl. | 1.63 | 1.87 | 1.97 | 1.68 |
| Labour (Daily) @ Rs.60/-daily (Onemanday=8h) | 3.91 | 4.22 | 3.87 | 3.67 |

Table 5. Cost (Rs.) of raising of a heifer under different housing and feeding systems

| Parameters | Rearing systems | | | |
|---|---|---|---|---|
| | Conventional barn | Loose house | Green fodder feeding | Hay feeding |
| Green fodder cost | 1653.5 | 1704.2 | 1786.4 | 1571.4 |
| Dry fodder cost | 276.9 | 287.9 | 303.4 | 261.4 |
| CM cost | 545.6 | 492.8 | 561.7 | 476.6 |
| Total feed cost | 2476.1 | 2485.0 | 2651.6 | 2309.5 |
| Labour cost | 244.0 | 226.3 | 242.7 | 227.6 |
| Total raising cost | 2720.1 | 2711.4 | 2894.3 | 2537.1 |
| Total BWG (kg.) | 86.3 | 96.3 | 88.6 | 93.9 |
| Feed cost/kg BWG | 28.7 | 25.8 | 29.9 | 24.6 |
| Raising cost/kg BWG | 31.48 | 28.93 | 32.63 | 27.08 |

## Conclusion

It was concluded that the labour requirement for cleaning of sheds, feeding and watering to heifers was higher ($P<0.05$) in conventional barn than those housed in loose house and remained uninfluenced due to feeding systems.The total cost and cost per kg body weight gain was less in heifers raised under hay feeding along with loose housing.

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