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Housing and feeding management practices of crossbred dairy cattle in Khasi and Jaintia hill districts of Meghalaya

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Abstract

A study was conducted on housing and feeding management practices of crossbred dairy cattle in Khasi and Jaintia Hill districts of Meghalaya. The main aim of the study was to analyze the present housing and feeding management strategies adopted by the farmers in the two combined districts. The interview schedule was developed, and the data was collected randomly from two districts, Khasi hill (60 farmers) and Jaintia hill (60 farmers) by using of multistage sampling method. The data collected for housing management were types of housing, manger, floor, roof and roofing materials, microclimatic measures, floor space availability and feeding space availability and for feeding management like types of feeding, different fodders available, various ingredients used for feeding of dairy cattle and source of water available. Most farmers used tie-barn (100.00%) housing system with fence line feeding (94.17%). All the farmers used galvanized iron sheet as roofing material (100.00%) and majority (82.50%) used wood as floor materials which caused slippery floor with poor drainage (85.83%). The available floor space per SAU in various farmer groups was found to be 57.65 ± 2.34 ft². Broom leaves, guava leaves and para grass were provided by the majority (60.00%) of dairy farmers as green fodder and all the farmers used paddy straw as dry fodder. The study concluded that the farmers still practice the old method of rearing the dairy cattle but for better improvement of the management practices, the dairy farmer need to adopt to modern type of rearing the dairy animals.

Keywords: Housing, feeding, dairy cattle, fodder

Introduction

In Meghalaya, dairy farmer at present used traditional methods of housing and constructed their farm using woods for wall and floor and tin for the roof. Farmers did not use quality green fodders, but instead collected them from the forest to fed their cattle and also paddy rice straw was used as dry fodder. Managing the housing and feeding of dairy animals is essential to optimizing their potential (Sinha *et al.*, 2009) [13]. Understanding of livestock management practices followed by the farmers is crucial to identify the strengths and weakness of the animal rearing system and to devise appropriate. Young stock that is underfed experiences undergrowth, delayed maturation, and subpar productivity once they reach breeding age (Sabapara *et al.*, 2010) [11]. The main constraint to livestock development in developing countries is the scarcity and fluctuation in the quality and quantity of animal feed (Makkar, 2006) [5].

The present study was conducted to acquire information regarding existing housing and feeding management techniques of dairy cattle in the Khasi and Jaintia Hill Districts of Meghalaya.

Materials and Methods

The study was carried out in the Khasi and Jaintia Hill Districts of Meghalaya. Data was collected from 120 dairy farmers from two districts, Khasi hills (60 farmers) and Jaintia hills (60 farmers). The sampling method used was multistage sampling. The data was collected from the dairy farmers with the help of an organized interview schedule with all relevant questions and remarks about variables was developed. The schedule was pre-tested with non-sample respondents from the study area.

Based on the responses, the schedule was altered as needed to ensure that both appeared professional. To collect genuine data, a modified interview schedule and observational approaches were used. The data was analyzed using frequency, percentage, mean standard error and ANOVA with the help of SPSS Software and MS Excel.

Results

Housing Management Practices

Type of housing

Based on the result of present study as shown in table 1, it was observed that all farmers (100.00%) in the study area used tie barn and none employed the loose housing system for rearing of dairy cattle.

Type of manger

The present study revealed that fence line feeding (94.17%) was the method most frequently employed in the research area, while 5.83 percent used elevated type of manger (Table 1).

Type of roof and their roofing materials

The results of the present study revealed that the dairy farmers in the study area favoured slanting roofs (100.00%) and galvanized iron sheets (100.00%) as roofing materials the most.

Type of floor

The present study found that majority of farmers (85.83%) used floors that were both slippery and had poor drainage and only 14.17 percent of farmers used flooring that were non-slippery and had good drainage. A substantial proportion of farmers (82.50%) had wooden flooring, whereas 9.17 percent and 8.33 percent had concrete and mud floors, respectively. Roughly 85.00 percent of the floor is plain, 2.50 percent is made of groove materials and 12.50 percent is made of both plain and groove materials (Table 1).

Microclimatic protection measures

Based on the present study, 95.00 percent of farmers bathed their animals once, 4.17 percent bathed them twice and 0.83 percent used fans as microclimate protection measures during summer (Table 1).

Floor space availability for dairy animals

Based on the present study, the average area sq ft/SAU for farmers with small, medium and large herds was 100.36 ± 10.55 , 54.73 ± 2.27 and 47.65 ± 2.25 sq ft, respectively. The overall average sq ft/SAU was 57.65 ± 2.34 (Table 2).

As per the data (Table 2), the study reported that in the small, medium and large herd categories of farmers, the average roof height of dairy animal sheds was 11.20 ± 0.55 , 11.13 ± 0.19 and 12.67 ± 1.25 ft respectively. The overall average roof height was 11.33 ± 0.22 .

Feeding space availability for dairy animals

The study revealed that in small, medium and large herd categories of farmers, the average length of the manger per SAU was 115.80 ± 6.10 , 105.20 ± 1.63 and 105.63 ± 5.85 cm respectively, however, the overall average manger length per SAU was found to be 106.14 ± 1.57 cm, and the overall

width and height of the manger was 87.87 ± 2.04 and 38.61 ± 1.36 ft respectively (Table 3).

Feeding Management Practices

Feeding practices by the dairy farmers

The present findings reported that all (100.00%) dairy farmers fed their animals in stalls and 82.50 percent fed and water their cattle three times daily. Additionally, all farmers (100.00%) preserved hay, while none (0.00%) did the same with silage (Table 4).

Type of fodder provided to the dairy animals

Based on the present study, majority of farmers (60.00%) provided guava leaves, broom leaves and para grass to their cows, while 28.33 percent provided banana leaves and broom leaves, 1.67 percent provided napier and broom leaves and the remaining 10.00 percent provided no green fodder at all (Table 5).

The study revealed that all farmers (100.00%) fed to their cattle with paddy straw as dry fodder, especially during the dry season (Table 5).

Concentrate feed ingredients

As per the data in table 4, the study revealed that all farmers used wheat or rice bran (100.00%) as the primary ingredient, followed by rice grains (100.00%) and MOC (75.83%). Additionally, 100.00 percent of farmers supplied common salt to their livestock, whereas just 35.63 percent fed them mineral mixture (Table 5).

Feeding of mineral mixture and common salt

According to the present study (Table 5), only 35.63 percent of farmers supplied mineral mixture to lactating animals only while the remaining 64.33 percent did not provide mineral mixture to their animals. Additionally, 100.00 percent of farmers provided common salt to all types of animals

Source of water supply

The main supply of water for the farmers in the study area was found to be the tap water from the water tank (63.33%), followed by ground water (25.83%), streams (6.67%) and ponds (4.17%) (Table 5).

Discussion

All farmers (100.00%) in the study area used tie barn housing system for rearing of dairy cattle (Table 1) because most of the farmer in the present study had marginal size of land and were operated in hilly region of Meghalaya state. For rearing of dairy animals under loose housing system, it required bigger size of land and animal should be protected from extremes of weather such as heavy rain, very low or very high temperature particularly under open paddock. The result of the present study was found to be similar with Sabapara (2010) ^[11], who reported that majority of respondents (55.33%) used tie-barn type of housing in coastal areas of South Gujarat. Rathva *et al.* (2019) ^[9] and Deb (2022) ^[2] share similar results with the present study. On the contrary, Sreedhar *et al.* (2017) ^[14] reported that 82.08 percent of dairy farmers in Kadapa area of Andhra Pradesh followed a loose housing system for rearing dairy cattle.

Fence line feeding (94.17%) was the method most frequently employed in the research area (Table 1). In

Meghalaya people mostly used locally made housing and preferred fence line type of manger. In the study area, it was observed that the dairy farmers were not aware of the advantages of mangers in terms of hygienic practices and less feeding waste (Sreedhar *et al.*, 2017)^[14]. The results of the present study were similar with Sreedhar *et al.* (2017)^[14], who reported that 40.83 percent of the dairy farmers fed their livestock using fence line feeding system in Kadapa region of Andhra Pradesh.

Dairy farmers in the study area favoured slanting roofs (100.00%) and galvanized iron sheets (100.00%) as roofing materials the most because Meghalaya is the state which experiences abundant of rainfall due to its topography and geographical location which is why most people used slanting roof (Table 1). It was observed in the study area that farmers used to collect rainwater during the rainy season and prevent water from pooling on the roof. Galvanized iron sheet is also a cost-effective material that farmers can readily purchase. The results of the present study were similar with Deb (2022)^[2], who stated that 99.17 percent of the dairy farmers used the slanting roof type and 85.83 percent used corrugated GI sheet as roofing material in Tripura state. Malsawmdawngliana and Rahman (2016)^[6], Sreedhar *et al.* (2017)^[14], Patel *et al.* (2019)^[9] and Rathva *et al.* (2019)^[9] share similar results with the present study.

Majority of farmers (85.83%) used floors that were both slippery and had poor drainage, a substantial proportion of farmers (82.50%) had wooden flooring, and roughly 85.00 percent of the floor is plain (Table 1). The floor should be paved or least made of bricks on edge. The floor should be at least made hard by good ramming using kankar and moorum as the material. The surface should be even and dry (Thomas and Sastry, 1991)^[15]. In the study area, it was observed that the farmers were unaware of the benefits of utilizing a suitable drainage system for hygienic purposes. Wooden floors reduce the capital expenses and make it easier for farmers to expand or relocate their farms which might be the reason that farmers preferred wooden floor. The results of the present study were in agreement with Malsawmdawngliana and Rahman (2016)^[6], who found that 78.00 percent of the dairy farmer used wooden floor in Mizoram. Kumar *et al.* (2017)^[4], Sreedhar *et al.* (2017)^[14] and Saurav *et al.* (2023)^[12] also share similar findings.

The present study found that 95.00 percent of farmers bathed their animals once (Table 1). This is because the climate of the Khasi and Jaintia hills is distinct and refreshing. It is not too hot in summer but cold in the winter. Most farmers gave their animals accessed to cold drinking water, shady areas and water bath as part of their summer management practices (Kour *et al.*, 2019)^[3]. Meghalaya is one of the states in India who received highest amount of rainfall and yet people still suffer from scarcity of water due to poor water storage facilities especially in the village areas. In the study area, it was observed that the lack of water supply might be the main cause of farmers bathing the animals once. The results of the present study were in consistent with Deb (2022)^[2], who reported that 46.67 percent of the farmers used one time bathing as the microclimatic protection for the dairy cattle during summer in Tripura. The findings of Kour *et al.* (2019)^[3] also share similar results with the present study.

The average area sq ft/SAU for farmers with small, medium and large herds was 100.36±10.55, 54.73±2.27 and

47.65±2.25 sq ft. respectively. The overall average sq ft/SAU was 57.65±2.34 (Table 2). The average area sq ft per SAU for small herd size farmer was found to be significantly ($p<0.01$) larger than that of medium and large herd size categories. In the study area, it was observed that the famers constructed a farm to house around 5-6 cattle but had a herd size of only 2.27±0.18 which might be the main reason why the area/SAU in small herd is larger rather than medium and large herd size. The results of the present study were similar with those published by Chandra (2018)^[11], who reported that the total floor area was 55.46±6.97 sq. ft in Haryana.

The study reported that in the small, medium and large herd categories of farmers, the average roof height of dairy animal sheds was 11.20±0.55, 11.13±0.19 and 12.67±1.25 ft respectively. The overall average roof height was 11.33±0.22 (Table 2). In the study area, it was observed that majority of the farms were built in a single row with no central ridge ventilation and hence the height from the floor to the roof was found to be short. On the contrary, the result of the present study were higher than that of Rajpoot (2019)^[8] in Haryana and Deb (2022)^[2] in Tripura who reported that the roof height was 10.45±0.25 and 9.38±0.19 ft respectively.

The study revealed that in small, medium and large herd categories of farmers, the average length of the manger per SAU was 115.80±6.10, 105.20±1.63 and 105.63±5.85 cm respectively, however, the overall average manger length per SAU was found to be 106.14±1.57 cm, and the overall width and height of the manger was 87.87±2.04 and 38.61±1.36 ft respectively (Table 3). This is because the fence line type of manger was most commonly used which might be the reason why the length and width of the manger was longer and the height was shorter. On the contrary, the result of Rajpoot (2019)^[8] in Uttar Pradesh, reported that the average length per SAU and height was 171.74±7.82 cm and 70.58±1.44 cm respectively which was higher and width was 66.38±1.18 cm, lower than the results of the present study.

The present findings reported that all (100.00%) dairy farmers fed their animals in stalls and 82.50 percent fed and water their cattle three times daily. Additionally, all farmers (100.00%) preserved hay, while none (0.00%) did the same with silage (Table 4). In the study area, it was observed that grazing of dairy cattle was not practiced. Most farmers reared their cattle in hilly areas, having marginal areas of land and lack of crops available for grazing which might be the reason the farmers engaged in stall feeding. The farmers have less knowledge about the importance and preservation of silage. They found that majority of the farmer fed and watering their cattle three times daily under stall feeding and conserved only hay but not silage. The results of the present study were in agreement with Saurav *et al.* (2023)^[12], who found that majority of the farmers (92.77%) used group stall feeding and he also reported that 67.77 percent of the farmer provided feed and water twice daily to cattle in North Bihar which was contradictory to the results of the present study. The results of the present study share similarities to that of Sabapara *et al.* (2010)^[11], Malsawmdawngliana and Rahman (2016)^[6], Kumar *et al.* (2017)^[4] and Mohan *et al.* (2018)^[7].

Based on the present study, majority of farmers (60.00%) provided guava leaves, broom leaves and para grass to their cows (Table 5). In the study area, it was found that majority

of the farmers do not have the land to grow their own fodder, they collected whatever green fodder they got from the forest and fed their animals. Malsawmdawngliana and Rahman (2016)^[6] reported that 75.00 percent of farmers fed green fodders to their animals in Mizoram which share similarities with the results of the present findings. Kumar *et al.* (2017)^[4] also reported findings that were similar.

The study revealed that all farmers (100.00%) fed to their cattle with paddy straw as dry fodder, especially during the dry season (Table 5). It was observed that paddy straw is the only dry fodder available in the study area. The results of the present study were in agreement with Sabapara *et al.* (2010)^[11], who concluded that 98.00 percent of the respondents fed paddy straw to their cattle in Gujarat.

As per the data in table 4, the study revealed that all farmers used wheat or rice bran (100.00%) as the primary ingredient, followed by rice grains (100.00%) and MOC (75.83%). Additionally, 100.00 percent of farmers supplied common salt to their livestock, whereas just 35.63 percent fed them mineral mixture (Table 5). In the study area, it was observed that farmers fed homemade concentrate to their cattle as it was cost effective as compared to the readymade concentrate. The results of the present study were in agreement with Malsawmdawngliana and Rahman (2016)^[6], who reported that majority (95.00%) of the farmers fed salt and concentrate mixture to the cattle in Mizoram. Similar findings were reported by Mohan *et al.* (2018)^[7] and Saurav *et al.* (2023)^[12].

According to the present study (Table 5), only 35.63 percent of farmers supplied mineral mixture to lactating animals

only while the remaining 64.33 percent did not provide mineral mixture to their animals. Additionally, 100.00 percent of farmers provided common salt to all types of animals. It was observed that many farmers in the study area were unaware of the advantages of mineral mixture for the health, productivity and reproductive performance of dairy cows. They found that common salt is cost effective and also increases the feed intake of the cow which might be the reason why they provided common salt to their dairy animals. The findings of Sabapara *et al.* (2010)^[11] reported that 54.44 percent of the dairy farmers fed common salt to all type of animals and only 23.89 percent fed mineral mixture to only lactating animals in North Bihar, share similarity with the result of the present study. The findings of Kumar *et al.* (2017)^[4] and Saurav *et al.* (2023)^[12] were also comparable with the results of the present study.

The main supply of water for the farmers in the study area was found to be the tap water from the water tank (63.33%) (Table 5). In the study area, it was observed that most of the farmers in village were situated away from the water bodies and unable to used underground water might be the main reason why farmers depend only on tap water. The results of the present study were in agreement with Deb (2022)^[2], who found that 48.33 percent of the farmers used tap water from the water tank in Tripura.

The study found that the farmers in the Khasi and Jaintia Hill districts of Meghalaya practice the old method of rearing the dairy cattle and for better improvement of the management practices, the dairy farmer must adopt modern method of rearing the dairy cattle.

Table 1: Housing management practices by the dairy farmers

S. N	Particulars	Categories (In Years)	Small herds farmers (10)	Medium herd farmers (95)	Large herd farmers (15)	Overall (120)
			N (%)	N (%)	N (%)	N (%)
1	Type of housing	Loose	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Tie barn	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Others	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Type of manger	Elevated	1 (10.00)	2 (1.67)	4 (3.33)	7 (5.83)
		Fence Line	9 (90.00)	93 (77.50)	11 (9.16)	113 (94.17)
		Others	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
3	Type of roof	Plain	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Slanted	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
4	Roof materials	Thatched	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Tin	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Cement concrete	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Wooden	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Asbestos	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
5	Type of floor	Non-slippery (Good Drainage)	3 (30.00)	11 (11.58)	3 (20.00)	17 (14.17)
		Slippery (with poor drainage)	7 (70.00)	84 (88.42)	12 (80.00)	103 (85.83)
		Concrete	2 (20.00)	5 (5.26)	4 (26.66)	11 (9.17)
		Earthen	0 (0.00)	9 (9.47)	1 (6.67)	10 (8.33)
		Wooden	8 (80.00)	81 (85.27)	10 (66.67)	99 (82.50)
		Groove	0 (0.00)	3 (3.15)	0 (0.00)	3 (2.50)
		Plain	1 (10.00)	12 (12.63)	1 (6.67)	102 (85.00)
Both	3 (30.00)	7 (7.37)	5 (5.26)	15 (12.50)		
6	Microclimatic protection	1 time bathing	10 (100.00)	91 (95.79)	13 (86.67)	114 (95.00)
		2-3 times bathing	0 (0.00)	3 (3.16)	2 (13.33)	5 (4.17)
		Fans	0 (0.00)	1 (1.05)	0 (0.00)	1 (0.83)

Table 2: Floor Space requirements and height of the cattle shed provided for the dairy animals

Particular	Category	Small herd farmers (Mean ±SE)	Medium herd farmers (Mean ±SE)	Large herd farmers (Mean ±SE)	Overall herd farmers (Mean ±SE)
Floor space	Area/SAU (ft ²)	100.36 ^a ±10.55	54.73 ^b ±2.27	47.65 ^b ±2.25	57.65±2.34
Roof Height	Total height (ft)	11.20±0.55	11.13±0.19	12.67±1.25	11.33±0.22

Means bearing superscript in a row differ significantly ($p < 0.01$)

Feeding space availability for dairy animals

Table 3 Feeding space availability for dairy animals in different categories of farmers

Manger dimension	Small herd farmers (Mean ±SE)	Medium herd farmers (Mean ±SE)	Large herd farmers (Mean ±SE)	Overall herd farmers (Mean ±SE)
Length/ SAU (cm)	115.80±6.10	105.20±1.63	105.63±5.85	106.14±1.57
Width (cm)	76.21 ^a ±6.81	87.90 ^a ±2.13	95.49 ^b ±7.79	87.87±2.04
Height (cm)	36.58±6.09	37.86±1.37	44.70±5.25	38.61±1.36

Means bearing superscript in a row differ significantly ($p < 0.01$)

Table 4: Feeding practices by the dairy farmers

S. N	Particulars	Categories	Small herds farmers (10)	Medium herd farmers (95)	Large herd farmers (15)	Overall (120)
			N (%)	N (%)	N (%)	N (%)
1	Feeding type	Stall	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Grazing	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
		Both	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
2	Frequency of feeding (In a day)	Twice	1 (10.00)	20 (21.05)	0 (0.00)	21 (17.50)
		Thrice	9 (90.00)	75 (78.95)	15 (100.00)	99 (82.50)
3	Frequency of watering (Both in summer and winter)	Twice a day	1 (10.00)	20 (21.05)	0 (0.00)	21 (17.50)
		Thrice a day	9 (90.00)	75 (78.95)	15 (100.00)	99 (82.50)
4	Hay conservation		10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
5	Silage conservation		0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)

Table 5: Feeds available for the dairy cattle

S. N	Particulars	Categories	Small herds farmers (10)	Medium herd farmers (95)	Large herd farmers (15)	Overall (120)
			N (%)	N (%)	N (%)	N (%)
1	Green Fodder Availability	Guava leaves +Broom leaves +para grass	8 (80.00)	58 (61.05)	6 (5.00)	72 (60.00)
		Banana leaves +Broom leaves	1 (10.00)	26 (27.37)	7 (5.83)	34 (28.33)
		Napier +Broom leaves	0 (0.00)	1 (1.05)	1 (0.83)	2 (1.67)
		Not given	1 (10.00)	10 (10.53)	1 (0.83)	12 (10.00)
2	Availability of dry fodder	Paddy Rice Straw	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Wheat straw	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
3	Ingredients used	MOC	7 (70.00)	71 (74.74)	13 (10.83)	91 (75.83)
		Wheat/Rice Bran	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Rice grains	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		Mineral Mixture	4(40.00)	33 (34.74)	6 (40.00)	43 (35.83)
4	Feeding of mineral mixture	Common salt	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
		To lactating animal only	4 (40.00)	33 (34.74)	5 (33.33)	42 (35.67)
5	Feeding of common salt	Not Fed	6 (60.00)	62 (65.26)	10 (66.67)	78 (64.33)
		All animal type	10 (100.00)	95 (100.00)	15 (100.00)	120 (100.00)
6	Water Source	Ground water	2 (20.00)	25 (26.32)	4 (26.67)	31 (25.83)
		Ponds	0 (0.00)	4 (4.21)	1 (6.67)	5 (4.17)
		Streams	0 (0.00)	7 (7.37)	1 (6.67)	8 (6.67)
		Tap Water	8 (80.00)	59 (62.11)	9 (60.00)	76 (63.33)

Conflict of Interest

There is no conflict of interest for the authors of this work.

Data Availability Statement

The corresponding author will have access to the data mentioned in the article.

Author's Contribution

ES: Involved in investigation, data collection, preparing original draft; GK, RG, SR, FAA, SP: Engaged in conceptualization, methodology, supervision and final

editing; JKC: Involved in editing, technique and statistical analyses.

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