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Management practices of dairy animals in Tarai region of Uttarakhand

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ABSTRACT

The existing dairy farm housing, milking, feeding and calf management practices in Tarai region of Uttarakhand along with performance traits were studied. Total 30 households with 596 livestock were considered for this work. Agriculture is the mainstay in the locale with animal husbandry as subsidiary occupation. Dairy animals mainly comprise 76% crossbreds and 21% Murrah buffaloes. Farms with 43% concrete, 30% bricks on edge and 10% *kuchha* flooring were recorded. Only 37% herds had 24 hour access to drinking water, 43% farmers fed commercial concentrate preparations, Stripping was practiced by 70% at the end of milking, 93% herdsman bred their cows within 12-18 hour of estrus with 3-5 months service period, and 60% dairymen consulted a veterinarian for services. Least squares mean (LSM) and standard error for Age at first calving (AFC), Calving Interval (CI), Dry Period (DP), Number of service per conception (NS/C), Milk yield per day (MY/D) and Lactation length (LL) were 427.31±5.80 days, 706.74±6.23 days, 378.76±1.48 days, 95.17±2.06 days, 1.32±0.03, 8.98±0.11 litre/day/animal, 315.14±1.65 days, respectively in cattle and 708.06±6.05 days, 948.62±10.09 days, 384.82±2.65 days, 139.08±6.07 days, 1.31±0.03, 9.54±0.15 litre/day/animal and 311.80±2.7 days, respectively in buffaloes. Effect of location on MY/D, LL and CI; of parity on CI and DP; and of AFC on DP was significant in cattle. In buffaloes, CI was significantly affected by location; MY/D, DP and LL by parity; and CI and NS/C by AFC. The results revealed a requisite to focus on stress management, calf care and sick animal management to improve animal performance.

Keywords: Dairy, Management, Production traits, Reproduction traits, Tarai, Uttarakhand

The role of Indian dairy farming is quite appreciable in economic terms. Livestock has become an integral part of all interventions aimed at ensuring food security and enhancing economic status of the country. Improved milk yield, milk quality, animal health and reproductive performances are the mandates for the success of dairy farms (Kansal *et al*. 2020). Adoption of advanced management practices leads to the higher milk yield and quality improved health and breeding performance and higher economic returns. Various researches suggest an increased animal welfare and reduced stress levels with proper shelter management and sensitive handling of dairy animals (Singh *et al*. 2020). Therefore, embracing appropriate management practices becomes imperative for dairy owners to achieve the desired results. Uttarakhand has 1.85 million cattle and 0.86 million buffalo population (20th Livestock census). Here, livestock serves as an integral part of the mixed farming system where agriculture manages feed and fodder requirements of livestock to avail draught power and manure in return. Thus, present investigation assesses dairy management practices in Haldwani tehsil of tarai region in Uttarakhand.

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MATERIALS AND METHODS

Source of data: Tarai region of state was selected due to presence of high number of dairy farmers and milk procurement centres. From each block, 30 farmers with minimum herd size of 10 were randomly selected. Thus, total 30 farmers with 596 livestock were interviewed on a pre-set interview schedule based on common housing, feeding, breeding, milking, health and calf management practices. Production and reproduction data of 235 breeding cattle and 87 buffaloes was also collected.

Classification of data: Data was classified based on location, parity and AFC to examine their effect on reproduction and production traits. Location was earmarked as rural, semi-urban and urban. Number of parity was 6 and 4 for cattle and buffaloes respectively. In cattle, AFC was categorized in 3 groups (<640, 640-790, >790 days); (<900, 900-1,000 and >1,000 days) respectively. Statistical analysis of the data was done as per the standard procedure (Snedecor and Cochran 1994). Descriptive statistics and Chi-square test was applied for analysis of various management operations. The production and reproduction data was also analysed using IBM SPSS, version 20. *p*-value of <0.05 was considered to assess significant associations between dependent and independent variables.

RESULTS AND DISCUSSION

General observations: Agriculture, dairy farming and other occupations as main income source was noticed in 75, 9 and 15% households respectively. The landholdings of 2.5, 2.5-5.0 and 5-10 acres were recorded by 3, 60 and 37% farmers respectively. Majority of livestock was 76% Jersy and Holstein Friesian crossbreds, 3% indigenous cattle and 21% Murrah buffaloes. 43% dairy farmers maintained medium size herds (11-20) followed by 30% large (>20) and 27% small herd (<11). Similar findings were reported by Tewari *et al.* (2018a) in Tarai, Uttarakhand. Common management practices are enlisted in Table 1 and Table 2.

Housing management practices: As Tarai region is mainly hot and humid; livestock were kept in semi-closed houses in close vicinity. Farms with 67% single sloped and 33% gabled roofs were mainly observed in the area. Bhagat *et al*. (2021) also reported 66% single sloped farms in Chhattisgarh. Galvanized iron (GI) sheets as roofing material were used by 70% farmers because of high durability and cost effective nature. Panchbhai and Gubbawar (2021) observed similar results (67%) in their study. Average roof height of 10-15 feet in 60% farms and 15-20 feet in 27% farms was observed to maintain ventilation and escape of gases. 43% Shelters with concrete floor, 30% bricks on edge and 10% *kuchha* floor were recorded. Rubber mats over concrete floor to avoid hoof injuries, 17% respondents used which suggests awareness regarding hoof health. In contrast, Saurav *et al.* (2023) and Bhagat *et al*. (2021) mentioned *kuccha* floor in majority of the farms. Adequate space was available in 73% farms. It was also found that 77% farmers had *pucca* mangers ensuring uniform availability and reduced feed wastage. In spite of humid climate, only 37% dairy herds had 24 hour access to drinking water. Only 10% farms had *pucca* water troughs.

Table 1. Housing and feeding management practices in Tarai region of Uttarakhand

Housing management practices	Frequency (%)	Housing management practices	Frequency (%)	Feeding management practices	Frequency (%)	Feeding management practices	Frequency (%)
Roof type		*Winter management*		*Feeding**		*Concentrate preparation*	
Lean	20(67)	Yes	17(57)	Stall feeding	23(77)	Homemade	14(47)
Gable	10(33)	No	13(43)	Stall feeding + grazing	7(23)	Purchased	13(43)
						Both	3(10)
*Roof material**		*Ventilation**		*Feeding pattern**		*Time to feed concentrate***	
GI	21(70)	Yes	7(23)	In group	24(80)	Prior milking	22(73)
RCC	9(30)	No	23(77)	Individual	6(20)	After milking	8(27)
*Roof height**		*Pucca drain*		*Feeding standard***		*Pregnancy ration***	
10-15 ft	18(60)	Yes	16(53)	No criteria	28(93)	Last 2 months	14(47)
15-20 ft	8(27)	No	14(47)	Milk yield	2(7)	Last 15 days	13(43)
> 20ft	4(13)					No allowance	3(10)
*Floor space**		*Manger type*		*Feeding interval***		*Feed supplements*	
Adequate	22(73)	Kuccha	12(23)	Twice	30(100)	Mineral	8(27)
Inadequate	8(27)	*Pucca*	18(77)	Thrice	0(0)	Salt	7(13)
						Both	15(50)
Floor type		*Water trough*		*Greens fodder***		*Silage preparation*	
Concrete	13(43)	*Kuccha*	20(67)	Seasonal	30(100)	Not practiced	17(57)
Brick on edges	9(30)	*Pucca*	10(33)	Others	0(0)	Pea silage	13(43)
Floor mats	5(17)						
Kuccha	3(10)						
*Summer management**		*Access to drinking water*		*Dry fodder***		*Chaffing of fodder***	
Yes	22(73)	At regular intervals	19(63)	Hay, wheat straw	30(100)	Yes	30(100)
No	8(27)	Always	11(37)	Others	0(0)	No	0(0)
*Heat stress management**							
Fans	15(87)						
Shady trees	3(10)						
Water splash	4(3)						

*, Significant ($p<0.05$);**, Highly significant ($p<0.01$).

Table 2. Milking, breeding and calf management practices in Tarai region of Uttarakhand

Milking management practices	Frequency (%)	Breeding management practices	Frequency (%)	Health management Practices	Frequency (%)	Calf management practices	Frequency (%)
*Place of milking**		*Method of breeding**		*Attending sick animals*		*Cleaning of new born*	
Same place	24(80)	AI	24(80)	Immediate action	9(30)	Done	18(60)
Milking sheds	6(20)	AI + natural service	6(20)	No immediate action	21(70)	Not done	12(40)
*Milking method **		*Heat detection**		*Sick animals treatment by*		*Naval care**	
Hand milking	23(77)	Bellowing	8(27)	Veterinarian	12(40)	Yes	8(27)
Machine milking	7(23)	Mucus discharge + bellowing	22(73)	L.E.O	18(60)	No	22(73)
*Stripping at the end of milking**		*Time of insemination***		*Deworming**		*Weaning***	
Yes	9(30)	12- 18 hours after estrus	28(93)	Yes	22(73)	Before 90 days	3(10)
No	21(70)	24-48 hours after estrus	2(7)	No	8(27)	After 90 days	27(90)
*Frequency of milking***		*Pregnancy diagnosis*		*Vaccination*		*Colostrum feeding**	
Twice	30(100)	Regularly	9(30)	Yes	18(60)	Within 2 hour	21(70)
Thrice	0(0)	Not regularly	21(70)	No	12(40)	Within 4- 6 hour	9(30)
Cleaning udder before milking		*Pregnancy diagnosis by veterinarian***		*Isolation of sick animals***		*Separate sheds for calves***	
Yes	20(67)	Yes	3(10)	Yes	3(10)	Yes	5(17)
No	10(33)	No	27(90)	No	27(90)	No	25(83)
*Wipe udder after milking***		*Post-partum breeding interval*		*Cleaning of sheds regularly*		*Bedding material in winters*	
Yes	20(67)	2-3 months	14(47)	Yes	12(40)	Yes	17(57)
No	10(33)	3-5 months	16(53)	No	18(60)	No	13(43)
*Calf allowed to suckle***		*Reproductive disorder treatment*		*Use of disinfectants*		*Deworming in calves*	
Yes		Yes	17(57)	Practiced	19(63)	Yes	11(37)
No		No	13(43)	Not practiced	11(37)	No	19(63)

*, Significant ($p<0.05$); **, Highly significant ($p<0.01$).

Madkar *et al*. (2020) and Panchbhai and Gubbawar (2021) also witnessed similar findings. Optimum ventilation was maintained by 77% households using exhaust fans. None employed any amenities to manage heat stress except fans, shady trees or by splashing water. Poor drainage was observed in 47% dairies which were similar to the findings of Saurav *et al.* (2023) and Bhagat *et al*. (2021). Thus, a lower heat stress management was observed which may cause low productivity and performance.

Feed management practices: All fed their livestock twice a day either by stall feeding (77%) or group feeding (80%). Home-made (47%) or readymade (43%) concentrates were generally offered twice a day before milking (Table 1). Hay and wheat straw were offered by all while seasonal greens such as *Berseem, Maize* and *Makhhan* grass were fed by 43% farmers along with pea silage representing lower availability of green fodder in the area. Kumar *et al.* (2017) and Henry *et al*. (2021) recorded lower share of 89.17 and 92% households practicing the same. 47% herdsmen offered pregnancy allowance in last 2 months of gestation while 43% offered it during last 15 days showing lower awareness status in the *locale*. Nearly 50% fed salt and mineral mixture which was higher than reported by Henry *et al*. (2021) and Saurav *et al*. (2023).

Milking management: Major milking practices are mentioned in Table 2. All the herds practiced milking twice daily either by hand milking (77%) or by machine milking (23%).Similar results were also reported by Tewari *et al*. (2018b) and Henry *et al*. (2021). Udder hygiene was not maintained by majority with 67% cleaning the udder prior milking with only water without any disinfectant. Kumar *et al*. (2017), Tewari *et al.* (2018a) and Henry *et al.* (2021) cited a higher number of 84, 80 and 71.11%

households respectively cleaning udder. As most of them were medium sized non-commercial dairies, 90% allowed their calves to suckle with only 10% following zero day weaning.

Breeding management: Artificial insemination was in reach of 80% farmers which is the reason for superior crossbred germplasm in the region. Herdsmen mainly rely on signs like bellowing and mucus discharge for heat detection and 93% bred their cows within 12-18 h of estrus (Table 2). Regular pregnancy diagnosis was followed by only 30% farmers which may be due to lack of responsiveness. Nearly 53% dairy farms had a service period of 3-5 months with only 10% households reactive to pregnancy diagnosis. Tewari *et al*. (2018a), Panchbhai and Gubbawar (2021) and Henry *et al*. (2021) also had similar conclusions.

Health management practices: Deworming and vaccination were followed by 77 and 80% farmers respectively. Henry *et al*. (2021) reported vaccination in most of the herds. It was encouraging to observe that 60% farms cleaned cowshed twice a day but disinfectants were used by only 37% farmers. Tewari *et al*. (2018b) and Bhagat *et al*. (2021) also documented a low disinfectant usage and deworming in their study. It was observed that 70% households used local empirical knowledge with only 40% approaching a veterinarian. The above findings were in contrast with Henry *et al.* (2021) who reported 84% farmers contacting veterinarian for treatment purpose. This suggests requirement of widespread extension activities in the area and increased accessibility of veterinary services.

Calf management practices: Maximum farmers weaned their calves after 90 days of birth whereas few practiced zero days' weaning (Table 2). Nearly 70% fed colostrum within 2 hours of birth. Majority households kept calves together with dams (83%) with only 17% having separate calf sheds. No naval care and deworming were carried showing lack of calf care. Only 57% provided Straw bedding during winters. The results were in agreement with Singh *et al*. (2018) and Henry *et al*. (2021) but lower than Saurav *et al.* (2023).

Reproduction and production performances: The LSM with standard error for production and reproduction traits in cattle and buffaloes are enlisted in Table 3 and Table 4, respectively.

Reproduction performances of cattle and buffaloes: The LSM for AFS was 427.12±5.71 and 708.06±6.05 days in cattle and buffaloes, respectively. Sunitibala *et al*. (2017) reported higher AFS in crossbred cattle. AFC averaged 706.74±6.23 and 948.62±10.09 days, respectively in cattle and buffaloes. Manjusha *et al.* (2016) and Vinothraj *et al*. (2016) reported higher AFC in crossbreds. The effect of location was non-significant on both AFS and AFC. Higher AFS was observed in cattle from urban dairies whereas in buffaloes, AFS was higher in semi-urban area.

The CI averaged 378.76±1.48 and 384.82±2.65 days in cattle and buffaloes respectively. Manjusha *et al.* (2016) also recorded a CI of 389.46±13.49 days in crossbred cattle. The locale of the dairy impacted CI significantly in both the species. CI was the shortest in semi urban area in cattle (371.47±1.99 days) and urban area in buffaloes (377.14±5.18 days) which may be due to better nutrition and insemination facilities available in these areas. The effect of parity on CI was significant in cattle. This was in agreement with Vinothraj *et al.* (2016). CI was the shortest in 3rd parity (374.55±2.84) and longest in 6th parity (390.00±0.00 days). In buffaloes, a significant effect of AFC on CI was noticed. CI was the shortest in 900-1000 days AFC group (374.40±3.52 days) and the longest in >1000 AFC group (390.00±3.97 days) in buffaloes suggests better breeding management in the animals with lower AFC. CI was shortest in 4th parity (367.50±7.50 days) and longest in 3rd parity (390.97±4.28 days) in buffaloes.

The LSM of DP was 95.17±2.06 and 139.08±6.07 days in cattle and buffaloes, respectively. Manjusha *et al.* (2016) reported 90.32±16 and 121.86±27 days DP in cattle and buffalo respectively. The effect of location was noticed to be non-significant in both the species while in cattle, the influence of AFC on DP was significant. DP was the shortest in 640-790 days AFC group (91.57±2.11 days) and the longest in >790 days AFC group (107.67±7.87 days) in buffaloes. Parity affected DP significantly in both cattle and buffaloes. It was noticed to be the shortest in 3rd parity (89.35±2.11 days) in cattle and 1st parity in buffaloes (112.50±17.68 days).The results were in agreement with Gupta *et al*. (2019) for cattle and Thiruvenkadan *et al*. (2014) for buffaloes.

NS/C in cattle and buffaloes averaged 1.32±0.03 and 1.31±0.03 respectively which was supported by Vinothraj *et al*. (2016) in crossbreds. However, Manjusha *et al.* (2016) reported higher NS/C in both the species. Location did not impact the NS/C in both cattle and buffalo herds. NS/C was non-significantly influenced by AFC in cattle while a significant effect of AFC on NS/C was witnessed in buffaloes. NS/C was the lowest in 900-1,000 days AFC group (1.68±0.14) and the highest in <900 days AFC group (1.78±0.18) in buffaloes. Parity effect was non-significant on NS/C in both species.

Production performance in cattle and buffaloes: Average MY/D was recorded as 8.98±0.11 and 9.54±0.15 litre/day in cattle and buffaloes, respectively. Manjusha *et al*. (2016) observed 10.61±4.14 and 9.29±2.58 litre MY/D per animal in cattle and buffalo respectively. AFC was observed to exert a non-significant effect on MY/D in both the species. The effect of Location and parity was noticed to be significant MY/D in cattle. Thiruvenkadan *et al*. (2014) also reported significant effect of parity on MY/D in buffaloes. Wondifraw *et al*. (2013) observed non-significant effect of AFC on MY/D. MY/D was the highest in urban area in cattle (9.60±0.26 litre/day/animal) and buffaloes (9.70±0.27 litre/day/animal) indicating better management in urban dairies due to higher awareness. 4th parity buffaloes (9.94±0.18 litre/day/animal) had the highest MY/D whereas 1st parity buffaloes (7.67±0.76 litre/day/animal) had the lowest MY/D. Higher MY/D in

Table 3. Least squares mean of production and reproduction traits in cattle of Tarai region of Uttarakhand

	Trait						
Factor	AFS	AFC	CI	DP	NS/C	MY/D	LL
μ	427.31±5.80 (235)	706.74±6.23 (235)	378.76±1.48 (235)	95.17±2.06 (235)	1.32±0.03 (235)	8.98±0.11 (235)	315.14±1.65 (235)
Location	NS	NS	*	NS	NS	*	*
Rural	432.32±8.02 (138)	708.13±8.28(138)	382.89±2.49 (138)	93.73±2.34 (138)	1.29±0.04 (138)	9.14±0.15 (138)	286.26±3.81 (138)
Semi-urban	423.82±10.29 (68)	704.29±10.37(68)	371.47±1.99 (68)	97.48±4.24 (68)	1.36±0.06 (68)	8.38±0.21 (68)	267±7.28 (68)
Urban	447.59±16.23 (29)	716.58±16.68(29)	380.68±3.36 (29)	96.62±7.77 (29)	1.27±0.11 (29)	9.60±0.26 (29)	274.41±13.04 (29)
Parity	-	NS	*	*	NS	NS	NS
1	-	704.43±18.02(37)	385.14±3.59 (37)	102.97±4.36 (37)	1.38±0.10 (37)	8.97±0.28 (37)	282.16±5.50 (37)
2	-	722.40±10.88(100)	379.80±2.42 (100)	89.35±2.11 (100)	1.38±0.05 (100)	8.92±0.18 (100)	290.45±3.47 (100)
3	-	691.27±8.75(66)	374.55±2.84 (66)	94.03±4.86 (66)	1.20±0.05 (66)	9.03±0.20 (66)	280.52±5.48 (66)
4	-	694.38±13.99(26)	375.00±3.43 (26)	102.31±8.03 (26)	1.23±0.08 (26)	9.00±0.31 (26)	272.69±9.15 (26)
5	-	699.00±44.16(4)	382.50±7.50 (4)	116.25±19.72 (4)	1.50±0.29 (4)	9.63±1.14 (4)	266.25±19.08 (4)
6	-	654.00±15.00(2)	390.00±0.00 (2)	145.00±45.00 (2)	1.50±0.50 (2)	9.50±0.50 (2)	245.00±45.00 (2)
AFC	-	-	NS	*	NS	NS	NS
<640 days	-	-	375.69±3.19 (33)	107.39 ±6.84 (33)	1.17±0.08 (33)	8.35±0.40 (33)	268.26±6.61 (33)
640-790 days	-	-	377.47±5.74 (182)	91.57±2.11 (182)	1.31±0.04 (182)	9.10±0.13 (182)	285.90±2.64 (182)
>790 days	-	-	388.00±5.74 (30)	107.67±7.87 (30)	1.47±0.11 (30)	8.87±0.29 (30)	280.33±9.16 (30)

*, Significant ($p<0.05$).

Table 4. Least squares mean of production and reproduction traits in buffaloes of Tarai region of Uttarakhand

	Trait						
Factor	AFS	AFC	CI	DP	NS/C	MY/D	LL
μ	708.06±6.05 (87)	948.62±10.09 (87)	384.82±2.65 (87)	139.08±6.07 (87)	1.31±0.03 (87)	9.54±0.15 (87)	311.80±2.7 (87)
Location	NS	NS	*	NS	NS	NS	NS
Rural	627.90±16.23 (43)	940.00±16.40(43)	389.30±3.80(43)	149.88±7.93(43)	1.41±1.42(43)	9.41±0.23(43)	239.41±8.09(43)
Semi-urban	649.00±13.29 (30)	963.00±13.39(30)	382.00±4.76(30)	124.66±8.74(30)	1.23±1.23(30)	9.70±0.27(30)	257.33±9.93(30)
Urban	632.14±25.40(14)	944.28±24.73(14)	377.14±5.18(14)	136.78±21.54(14)	1.21±1.21(14)	9.57±0.40(14)	240.35±20.57(14)
Parity	-	NS	NS	*	NS	*	*
1	-	860.00±58.82(6)	385.00±5.00(6)	112.50±17.68(6)	1.67±0.33(6)	7.67±0.76(6)	272.50±20.32(6)
2	-	945.87±14.52(46)	382.17±3.89(46)	124.34±9.04(46)	1.72±0.11(46)	9.52±0.23(46)	257.82±9.60(46)
3	-	971.94±12.44(31)	390.97±4.28(31)	161.45±4.95(31)	1.71±0.13(31)	9.94±0.18(31)	229.51±7.17(31)
4	-	932.50±33.26(4)	367.50±7.50(4)	175.00±32.27(4)	2.00±0.41(4)	9.50±0.29(4)	192.50±34.97(4)
AFC	-	-	*	NS	*	NS	NS
<900 days	-	-	387.39±5.94(23)	125.00±11.67(23)	1.78±0.18(23)	8.91±0.36(23)	263.92±12.72(23)
900-1000 days	-	-	374.40±3.52(25)	124.60±13.32(25)	1.68±0.14(25)	9.56±0.28(25)	250.40±.13.40(25)
>1000 days	-	-	390.00±3.97(39)	157.05±7.23(39)	1.72±0.12(39)	9.90±0.20(39)	232.94±7.52(39)

*, Significant ($p<0.05$).

multiparous animals is correlated with increased body size and mammary gland development.

Higher LL averaged to 315.14±1.65 and 311.80±2.7 days in cattle and buffaloes, respectively. Manjusha *et al*. (2016) in cows and Thiruvenkadan *et al*. (2014) in buffaloes found similar observations. On further analysis, AFC was examined to influence LL non-significantly whereas location affected the LL significantly in cattle. LL was longest (286.26±3.81 days) in rural area and shortest (267±7.28 days) LL was reported in semi-urban area. In buffaloes, parity was found to influence LL significantly. Thiruvenkadan *et al*. (2014) and Gupta *et al.* (2019) confirmed highly significant effect of parity on LL because of higher mammary development. LL was the longest in 4th parity (272.50±20.32 days) and the shortest in 1st parity (192.50±34.97days) in buffaloes. A non-significant influence of parity was observed in cows. This was in close agreement with Wondifraw *et al.* (2013).

Thus, it was seen that dairy farmers in Tarai region of Uttarakhand were well aware of colostrum feeding, udder health, and concentrate feeding but calf care, heat stress management and shed sanitation, etc. were overlooked. Scientific intervention is required in the traditional animal husbandry with improved management strategies for a profitable venture. The veterinary services should be easily amicable to save farmers from quacks. The effect of location on MY/D and CI suggests teaching technical dairy practices in rural area elevates the animal productivity through widespread awareness extension in the study area.

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