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Demographic Characteristics and Zootechnical Performances of Montbéliarde Dairy Farms in Northern Regions of Cameroon

Karakteristik Demografis dan Performa Zooteknis Peternakan Sapi Perah Montbéliarde di Wilayah Utara Kamerun

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ABSTRACT

Background: In Cameroon, the production and consumption of cow milk remain limited, primarily due to inadequate herd management practices, the use of low-performing breeds, and insufficient control of reproductive activities. **Purpose:** This study aimed to contribute to the improvement of dairy productivity by evaluating the demographic characteristics, reproductive parameters, and milk production performance of Montbéliarde dairy herds in Cameroon. **Method:** A retrospective cross-sectional survey was conducted from March to May 2022 on nine Montbéliarde dairy farms located in the Adamawa and Far North regions. Data on farm structure, management practices, reproductive performance, and milk yield were collected using structured questionnaires and subsequently analyzed descriptively. **Results:** The average herd size was 15.00 ± 14.23 cows in Adamawa and 2.25 ± 0.50 cows in the Far North. The mean gestation length, age at first calving, calving interval, lactation duration, and average milk yield were 272.99 ± 8.44 days, 29.89 ± 2.62 months, 14.29 ± 1.11 months, 343.49 ± 17.51 days, and 2513.71± 540.62 L, respectively. Calving, weaning, numerical exploitation, pre-weaning mortality, and overall mortality rates were 27.08%, 47.78%, 61.93%, 42.46%, and 38.91%, respectively. All farms exhibited a negative crude numerical growth rate (-37.18%). **Conclusion:** The reproductive and productive performances of the Montbéliarde breed in Adamawa and the Far North regions were below expected standards. These suboptimal outcomes are primarily associated with poor management systems and inadequate breeding conditions, emphasizing the necessity for improved herd management, enhanced reproductive monitoring, and targeted interventions to optimize milk production efficiency in Cameroonian dairy systems.

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ABSTRAK

Latar Belakang: Di Kamerun, produksi dan konsumsi susu sapi masih terbatas, terutama disebabkan oleh praktik manajemen ternak yang tidak memadai, penggunaan bangsa sapi dengan produktivitas rendah, serta kurangnya pengendalian terhadap kegiatan reproduksi. **Tujuan:** untuk berkontribusi dalam peningkatan produktivitas susu dengan mengevaluasi karakteristik demografis, parameter reproduksi, dan performa produksi susu pada peternakan sapi perah Montbéliarde di Kamerun. **Metode:** Penelitian ini menggunakan survei potong lintang retrospektif yang dilaksanakan pada Maret hingga Mei 2022 di sembilan peternakan sapi perah Montbéliarde yang berlokasi di wilayah Adamawa dan Far North. Data mengenai struktur peternakan, praktik manajemen, performa reproduksi, serta hasil produksi susu dikumpulkan melalui kuesioner terstruktur dan dianalisis secara deskriptif. **Hasil:** Rata-rata jumlah sapi perah per peternakan adalah 15,00 ± 14,23 ekor di wilayah Adamawa dan 2,25 ± 0,50 ekor di wilayah Far North. Rata-rata lama kebuntingan, umur pertama beranak, jarak beranak, lama laktasi, dan produksi susu rata-rata masing-masing adalah 272,99 ± 8,44 hari, 29,89 ± 2,62 bulan, 14,29 ± 1,11 bulan, 343,49 ± 17,51 hari, dan 2.513,71 ± 540,62 liter. Angka kelahiran, penyapihan, eksploitasi numerik, kematian pra-sapih, dan kematian total masing-masing sebesar 27,08%, 47,78%, 61,93%, 42,46%, dan 38,91%. Seluruh peternakan menunjukkan pertumbuhan numerik kasar negatif (-37,18%). **Kesimpulan:** Performa reproduksi dan produksi sapi Montbéliarde di wilayah Adamawa dan Far North masih berada di bawah standar yang diharapkan. Hasil ini terutama disebabkan oleh sistem manajemen yang kurang baik dan kondisi pemeliharaan yang tidak optimal, sehingga diperlukan peningkatan dalam manajemen pemeliharaan, pemantauan reproduksi, serta intervensi yang terarah untuk mengoptimalkan efisiensi produksi susu di sistem peternakan sapi perah Kamerun.

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Kata kunci: Kamerun; Produksi Susu; Reproduksi; Sapi Perah; Sapi Ras Montbéliarde

INTRODUCTION

Cameroon's livestock population is mostly made up of cattle, sheep, goats, pigs, poultry and this livestock is still insufficient to meet the demand of the Cameroonian population for meat and dairy products. In Cameroon, milk is produced by smallholders, and milk production contributes to household livelihoods, food security and nutrition. Milk provides relatively quick returns for small-scale producers and is an important source of cash income. The milk of domesticated animals is also an important food source for humans, either as a fresh fluid or processed into a number of dairy products such as butter and cheese. Despite a growing local production of cow's milk, demand still exceeds supply (Kouamo, 2025; Wyrzykowski *et al.,* 2020). Dairy productivity is constrained by poor-quality feed resources, diseases, humid climates, limited access to markets and services (e.g., health, credit and training) and dairy animals' low genetic potential for milk production (World Bank, 2005). The state, through the Ministry of Livestock, Fisheries, and Animal industries (MINEPIA), has implemented the Livestock Development Project (PRODEL) with the objective of boosting national production levels in order to reduce dependency on external markets and to meet the growing demand for meat, milk and dairy products (Minepia, 2021).

In the Adamawa region, some livestock farms benefiting from the PRODEL project have seen their daily milk production increase from 20 L to 35 L, representing 75% rise. As a result, national milk production increased from 173.900 tons in 2022 to 176.600 tons in 2023 (Mercredi, 2025). Despite this increase, per capita milk production in Cameroon remained low, estimated at 14 Kg in 2023, which is negligible compared to the 120 Kg recorded in a country like Kenya (Wyrzykowski *et al.,* 2020). Cameroon continues to record an average production deficit of nearly 120,000 tons of milk each year. This imbalance between supply and demand is offset by dairy product imports, which cost the Cameroonian government nearly CFA 20 billion (30.489 million Euros) per year. To reduce this financial loss, Cameroon acquired 495 dairy cows from France between 2020 and 2023 to boost local milk production. These are gestant Montbéliarde heifers breed, whose milk production is estimated at 40 L of milk per day, and which are presented as a highly prized breed in sub-Saharan Africa due to the quality of their milk, with high quality in cheese dry matter (higher fat:protein ratio). Other reasons include adaptation to dry forage, the muscular quality of individuals, more profitable offspring, resistance to large thermal amplitudes, good fertility, and extensive longevity, in addition to the fact that crossbreeding with other dairy breeds can improve their resistance and fertility (Cartuche-Macas *et al.,* 2025). This acquisition was made within the framework of the Livestock Development Project (PRODEL), financed by the World Bank (Minepia, 2021). The Montbéliarde breed is part of the Simmental breed group, specializing in dairy production. Formation of this breed has gone through a comprehensive process improvement from one generation to another (Vidu *et al.,* 2014). This breed is characterized by: large body development, differentiated according to sex (body weight, 600-750 kg cows and 1000-1200 kg bulls) (Bugeac *et al.,* 2012). Despite the various livestock development programs and support projects targeting stakeholders in the dairy value chain, local production still falls short of meeting national demand, with the performance of the breeds in use often being identified as a major limiting factor. Studying the milk production potential of cows is essential for the development and optimization of this sector. In this regard, what are the main factors behind the poor performance of dairy production systems that hinder their efficiency. To provide a better understanding of the challenges faced in dairy cattle farming in Cameroon, this study was conducted with the perspective of identifying key strategic areas and actionable levers that farmers can adopt to improve their productivity and enhance their competitiveness in the market. It is within this context that the present study aimed to contribute to the improvement of milk production in Montbéliarde cows in the northern regions of Cameroon. Specifically, it was about determining the demographic characteristics, structural and functional components, reproductive and milk production performances of Montbéliarde dairy farms in the Adamawa and Far North regions of Cameroon.

MATERIAL and METHOD

Study area description

This study was conducted in Adamawa and Far North regions of Cameroon. The demographic and climatic aspects of these regions are presented in table 1.

Table 1. Study Area Characteristics.

Characteristics	Regions	
	Adamawa	Far North
Latitude	5°- 8° N	10° - 12° N
Longitude	11° - 14° E	14° - 15°E
Surface Area (Km²)	63 701	32 246
Climate	Sudano-guinean	Sudano-sahelian
Mean annual temperature (°C)	22–25	25–35
Mean annual precipitation (mm)	900 - 1500	800 - 900
Estimated population in 2017 (inhabitants)	1 015 622	3 111 792
Population density (inhabitant/Km²)	17	91
Vegetation	Guinean savannah becoming less and less wooded towards the north	Thorny steppe and periodically flooded meadows
Species raised and type of breeding	Large and small ruminants with a semi-intensive system as well as poultry	More small ruminants with semi-intensive system

Study population

The study involved nine (9) dairy farms organized into cooperatives benefiting from the Livestock Development Project (PRODEL) including five farms in Adamawa region, 33.33% (3/9) in Vina Division (Malao ranch (SCOOPS KOUDA BIRNI); Darang dairy farm (COOP CA COKOSSAM); Bamyanga dairy farm (SCOOPS DADA WOURO)); and 11.11% (1/9) in Mbere and Faro et Deo divisions (Gandinang ranch (COOP CA SOCAP MBERE); Libong ranch (COOP CA EBML DOUROBE OF LIBONG)); respectively, and four in Far North region, 22.22% in Mayo Kani and Diamare divisions (Maroua 1st dairy farm (SCOOPS NARRAL); Pétté dairy farm (GIC KOUTAL OF PETTE); Djodjon dairy farm (SCOOPS HAIMIN FOFTI); Guidiguis dairy farm (SCOOPS PROLVLG)); respectively (Table 2).

Table 2. Distribution of Study Population.

Regions	Division	Sub-division	Frequency	Percentage (%)
Adamawa (55.56%)	Vina	Ngaoundere 2e	1	11.11
		Ngaoundere 3e	2	22.22
	Mbere	Djohong	1	11.11
	Faro et Deo	Tignere	1	11.11
Far North (44.44%)	Diamare	Maroua 1er	1	11.11
		Pette	1	11.11
	Mayo-Kani	Mindif	1	11.11
		Guidiguis	1	11.11
Total		Total	9	100

Survey Design and Data Collection

A retrospective cross-sectional study was conducted during the period of March to May 2022 to assess the demographic characteristics and zootechnical performance of farms registered under the Regional Delegations of Livestock, Fisheries, and Animal Industries (RDLFAI) in the Adamawa and Far North regions. Only farms exclusively rearing Montbéliarde dairy cattle were included in the study, and participation was entirely voluntary with informed consent obtained from all farm owners. Data were collected using a structured questionnaire that covered information on herd size, breeding practices, housing systems, feeding management, milk production records, reproductive performance, and general farm management practices.

Demographic Characteristics

The demographic information form included questions such as ethnic group, sex, religion, age, educational level, marital status, activity level and training in cattle farming. To evaluate the characteristics of dairy production systems, certain questions were asked about permanent employees, utilized land area, cultivated areas, number of dairy cows, use of tractors and milking bucket, grazing management, milking method, reproductive system, age and sex of animals (Ferraton and Touzard, 2009).

Zootechnical Performances

Age at first calving (months), calving interval (months), gestation length (days), calving rate and weaning rate have been determined as follow (Kouamo *et al.*, 2019, 2018; Kouamo and Pa-ana, 2017). Numerical exploitation rate, gross numerical growth, pre-weaning mortality rate and overall mortality rate were determined as follow (Lhoste *et al.*, 1993). Overall milk yield per farm was determined by sum of per-cow daily milk production during the observation period (Kouamo *et al.*, 2018). Data for these variables were derived from daily milking data recorded in the herd registers, spanning from parturition to the end of lactation.

Analysis Data

The data were analysed using Statistical Package for Social Sciences (SPSS) version 26. Descriptive statistics were used to determine demographics distribution of the respondents and their farms. An independent t-test and One-Way ANOVA associated with post hoc Duncan tests analysis were used to compare characteristics of dairy production systems, reproductive and milk production performances, and Chi-squared test was used for characterization of demographic performance of the herd at 5% significance interval (Grosu et al., 2022).

RESULTS

Socio-Demographic Characteristics of Breeders

More than half of the cattle farmers had no training in cattle farming (Table 3).

Table 3. Demographic Characteristics of Cattle Farmers.

Factors		Adamawa	Far North	Total
Ethnic Group	Kotoko	1 (20)	-	1 (11.11)
	Fulbe	4 (80)	4 (100)	8 (88.87)
Sex	Male	5 (100)	3 (75)	8 (88.87)
	Female	-	1 (25)	1 (11.11)
Religion	Muslim	5 (100)	4 (100)	9 (100)
Age Range (Years)	< 50	-	3(75)	3 (33.33)
	> 50	5 (100)	1 (25)	6 (66.67)
Educational Level	None	0 (0)	1 (25)	1 (11.11)
	Primary	1 (20)	1 (25)	2 (22.22)
	Secondary	3 (60)	1 (25)	4 (44.44)
	University	1 (20)	1 (25)	2 (22.22)
Marital Status	Married	5(100)	5(100)	9 (100)
Activity Level	Main	-	1(25)	1 (11.11)
	Secondary	5(100)	3(75)	8 (88.89)
Training in Cattle Farming	Yes	2(40)	2(50)	4 (44.44)
	No	3(60)	2(50)	5 (55.56)

Characteristics of Dairy Production Systems

Means values of permanent employees, utilized land area, cultivated areas and dairy cows were significantly higher in Adamawa than Far North ($p<0.05$). The cultivated area per dairy cow ratio was 1.36 Ha / cow and 0.56 Ha /cow in Adamawa and Far North regions, respectively. None of the farms in the Far North region used tractors or milking machines, did not lead the animals to grazing areas and relied on manual milking. Whereas most farm in the Adamawa region employed milking machines and mechanical milking systems. All the farms were practiced artificial insemination (Table 4). The average selling price of a liter (L) of milk was 363.89 ± 30.9 FCFA (325-400), with an average of 360 and 369 FCFA for farms in Adamawa and the Far North, respectively ($p=0.316$).

Zootechnical Performances

The study revealed that the majority of the animals were females (82.22%), with proportions of 83.33% in the Adamawa region and 80.00% in the Far North region, and most were between 1 and 4 years of age (93.33%) (Table 5). The mean gestation length, age at first calving, and average milk yield were higher in the Far North region than in Adamawa, although the differences were not statistically significant ($p > 0.05$) (Table 6). Conversely, the calving rate, weaning rate, numerical exploitation rate, gross numerical growth, and overall mortality rate were higher in Adamawa than in the Far North, but these variations were also not statistically significant ($p > 0.05$) (Table 7).

RESULTS

This study investigated demographic characteristics and zootechnical performances of Montbéliarde dairy farms in Adamawa and Far North regions of Cameroon. Data was collected from only nine Montbéliarde farms, which limits

Table 4. Structural and Functional Components in Dairy Farm of Adamawa and Far North Cameroon.

Factors			Adamawa		Far North		P value	Total (%)
			Mean ± SD	Total (%)	Mean ± SD	Total (%)		
Structural component	Permanent employees		3.60±0.89[a]	18 (63.23)	2,00±0,81[b]	08 (30.77)	0,03	26 (100)
	Utilized land area (Ha)		46.22±43.9[a]	231.09 (97.63)	1.27±1.89[b]	5.62 (2.37)	0.01	236.71(100)
	Cultivated areas (Ha)		18.2±18,77[a]	91 (94.78)	1.25±1.89[b]	5.01 (5.22)	0.001	96.01 (100)
	Number of dairy cows		15.0±14.23[a]	67 (88.16)	2.25±0.50[b]	09(11.84)	0.02	76(100)
	Tractor	Yes	/	1 (20)	/	0 (0)	/	1 (11.11)
		No	/	4 (80)	/	4 (100)	/	8 (88.89)
	Milking bucket	Yes	/	3 (60)	/	0 (0)	/	3 (33.33)
		No	/	2 (40)	/	4 (100)	/	6 (66.67)
	Grazing management	Yes	/	2 (40)	/	0 (0)	/	2 (22.22)
		No	/	3 (60)	/	4 (100)	/	7 (77.78)
Functional component	Milking method	Mechanical	/	3 (60)	/	0 (0)	/	3 (33.33)
		Manual	/	2 (40)	/	4 (100)	/	6 (66.67)
	Reproductive system	Artificial insemination	/	5 (100)	/	4 (100)	/	9 (100)
		Natural mating	/	0 (0)	/	0 (0)	/	0 (0)

Note: [a,b] Different superscripts in the same line shows that there are significant differences (p <0.05). Ha: Hectares; SD: Standard deviation

Table 5. Structural and Functional Components in Dairy Farm of Adamawa and Far North Cameroon.

Factors		Adamawa	Far North	Total (%)
Age (years)	< 1	8 (6.67)	1 (6.67)	**9 (6.67)**
	[1 –4]	112 (93.33)	14 (93.33)	**126 (93.33)**
	Total (%)	120 (88.89)	15 (11.11)	**135 (100)**
Sex	Male	20 (16.67)	3 (20.00)	**23 (17.04)**
	Female	100 (83.33)	11 (80.00)	**111 (82.22)**
	Total (%)	120 (88.89)	15 (11.11)	**135 (100)**

the generalizability of the findings. Although the sample size is small, the findings provide valuable preliminary insights into this understudied topic. The result revealed that the majority of cattle farmers were male Fulani, with an average age of over 50 years, without training in cattle farming. These results are comparable with study undertaken in livestock farm of Vina division, Adamawa region of Cameroon Edima *et al.,* (2021); in Adamawa, North and Far North Regions of Cameroon Zangue *et al.,* (2022) and in Nde division, West region of Cameroon (Wauffo *et al.,* 2023). Indeed, in these communities, herd management and the provision of household subsistence through livestock-derived income are the responsibility of men, which may explain their predominance (Tantoh, 2021). All respondents were married and Muslim, as reported by Wauffo *et al.,* (2023) in the Nde division, West region of Cameroon, where 91.82% and 92.73% of farmers were married and Muslim, respectively. This study showed that most of the farmers had a secondary level of education, and cattle farming was a secondary activity. These findings contrast with those of Zangue *et al.,* (2022) and Wauffo *et al.,* (2023), who reported that 46.50% and 50.91% were illiterate; 84.30% and 78.18% of the respondents practiced livestock farming as their primary activity, respectively. Means values of permanent employees, utilized land area, cultivated areas, and dairy cows were significantly higher in Adamawa than in the Far North. Means values of permanent employees, cultivated areas, and dairy cows ranged from 2 to 4 employees, 1.25 to 18.20 Ha, and 2 to 15 cows per farm, respectively. A similar observation was made in a dairy production farm in western Burkina Faso with cultivated areas of 1 to 4.9 Ha (Sib *et al.,* 2017). Similarly, 4 to 9 and fewer than 5 permanent employees were reported in dairy production systems in Linguere, Senegal, and in livestock farms in the Vina Division, Adamawa region of Cameroon, respectively by Dassou *et al.,* (2017) and Edima *et al.,* (2021).

All farms in the Far North region did not use tractors or milking cans, did not take animals to pasture, and relied exclusively on manual milking practices. In contrast, most farms in the Adamawa region used milking cans and adopted mechanical milking practices. All the farms practiced artificial insemination. Similarly, Artificial insemination (AI) was the most used Assisted Reproductive Technology (ART) over time, showing the highest record ever in the history of the Montbeliarde cattle breed in Ecuador in the 2014–2019 period (Cartuche-Macas *et al.,* 2025). In dairy farming, artificial insemination allows for the rapid dissemination of semen from high-performing bulls and facilitates efficient planning of reproductive cycles to increase conception rates; however, it may also lead to an increase in inbreeding rate within herds (Lynda *et al.,* 2018). The cultivated area per dairy cow ratio was 1.36 Ha / cow and 0.56 Ha /cow in Adamawa and Far North regions, respectively. These results are similar to those

Table 6. Reproductive Performance and Milk Yield at Adamawa and Far North Regions

Factors		Adamawa	Far North	Overall Mean	P value
Gestation Length (Days)	N	90	11	101	
	Mean ± SD	272.36±9.90	273.97±8.75	272.99±8.44	0.08
Age at First Calving (Months)	N	82	10	92	
	Mean± SD	29.05±2.54	30.56±2.42	29.89±2.62	0.98
Calving Interval (Months)	N	8	0	8	
	Mean± SD	14.29±1.11	-	14.29±1.11	-
Average Lactation Period (Days)	N	59	9	68	
	Mean± SD	374.24±17.16	322.22±40.58	343.49±17.51	0.37
Average milk yield (L)	N	59	9	68	
	Mean± SD	2275.50±623.70	2597.94±999.60	2513.71±540.62	0.28

Table 7. Herd Demographic Performance Indicators (%).

Factors	Adamawa Mean± SD	Far North Mean± SD	Overall mean± SD	P-value
Calving rate	27.77±4.8	25	27.08±1.96	0.91
Weaning rate	54.33±25.94	39.58±14.43	47.78±10.42	0.10
Numerical exploitation rate	63.92±19.1	59.52±4.76	61.93±3.11	0.41
Gross numerical growth	-36.45±56.56	-38.10±19.04	-37.18±1.16	0.08
Pre-weaning mortality rate	35.10±24.49	51.66±5.77	42.46±11.71	0.30
Overall mortality rate	39.56±28.67	38.10±19.04	38.91±1.03	0.07

reported by authors who showed that the ratio of cultivated land area to the number of cows ranged from 0.5 to 1.5 Ha per cow in West, Adamawa and Far North regions of Cameroon (Nsangou *et al.,* 2021). According to the age and sex of the animals, 55.56% (5/9) of the farms had no individuals younger than one year, 4.43% and 95.57% of animals were aged less than one year and those between one and four years, respectively. Moreover, male and female animals represented 18.53% and 81.47% of the farm populations, respectively. These findings are in line with the results of other researchers conducted in smallholder dairy farms in Meru, Kenya, who indicated that 45.60% of the female cattle were between 2 and 5 years of age (Muraya *et al.,* 2018). This is because in dairy farming systems, females ensure milk production, reproduction, and herd renewal, whereas males are often used for breeding or fattening for slaughter (Sharma *et al.,* 2024).

Statistical analysis revealed no significant variation in gestation length, age at first calving, milk yield, or lactation period between cows raised in the Adamawa and Far North regions.. The milk yield of the Montbéliarde cows in the current study averaged 2513.71 ± 540.62 L. This result is comparable to 2322.53 ± 73.25 and 2931.09 ± 132.11 L reported in Ayrshire cow in Tanzania (Shija *et al.,* 2022); lower than 10323, 8277.60 and 12158 Kg as reported in Montbéliarde – Holstein crossbred cows in Jiangsu, China and in Holstein cows on the territory of southern and northern Bulgaria, respectively (Karamfilov and Kanev, 2025; Stojnov *et al.,* 2024; Weng *et al.,* 2024); but higher than 1996.10 ± 493.50 Kg reported in Friesian, Jersey and crossbreed Friesian in dairy farming systems in Zambi (Odubote and Moono, 2023). Indeed, under tropical conditions, dairy production performance remains suboptimal due to persistent exposure to environmental stressors such as heat load, nutritional deficiencies and infections, which disrupt the physiology, reproduction and productive performance of dairy cows (Sekaran *et al.,* 2021). Limiting factors for dairy cattle breeding in Cameroon include poor nutrition and the low nutritive value of local pastures, limited access to quality genetics and improved breeds, inadequate veterinary services and disease management, poor infrastructure, lack of adequate breeding services like Artificial Insemination (AI) and technical expertise, and challenging socio-economic and climatic environments with limited farmer support (Bayemi *et al.,* 2005). Elevated temperatures can lead to a reduction in milk yield, milk fat, and milk protein in dairy cows while increasing somatic cell counts (Becker *et al.,* 2020). In the Adamawa and Far North regions of Cameroon, average ambient temperatures range from 22.6°C to 35°C, potentially exacerbating environmental stress and constraining milk production in Montbéliarde dairy cows. Lactating dairy cows have an increased sensitivity to heat stress compared with no lactating (dry) cows, due to milk production elevating metabolism. Moreover, because of the positive relationship between milk yield and heat production, higher yielding cows are more challenged by heat stress than lower yielding animals. When a cow becomes heat stressed, an immediate coping mechanism is to reduce DMI (dry matter intake), causing a decrease in the availability of nutrients used for milk synthesis. Simultaneously, there is an increase in basal metabolism caused by activation of the thermoregulatory system. Mild to severe heat stress can increase metabolic maintenance requirements by 7 to 25%, further exacerbating both the existing metabolic stress and the decrease in milk production (Kouamo, 2025; Polsky and Keyserlingk, 2017).

Average lactation period was 343.49 ± 17.51 days. This result is higher than 322 and 325 days reported in multiparous and primiparous Holstein cows in Denmark, respectively (Lehmann *et al.,* 2016); but lower than 428.20 ± 61.95 to 450.59 ± 13.52 days and 429.00 ± 86.84 to 509.56 ± 25.80 days reported on Holstein-Friesian crossbreed and Ayrshire in Tanzania, respectively (Shija *et al.,* 2022). The lactation durations observed in the study area are longer than the average 10 months (305 days) lactation period typically reported in dairy cows, mainly due to the practice of prolonged lactation by some farmers. Additionally, the predominance of manual milking and the limited use of milking equipment, such as the milking pail, may lead farmers to extend the cows production cycle in order to maintain profitability. A calving interval is the time between the birth of one calf and the next from the same cow. Ideally, this interval should be one year for both dairy and beef cattle. The 82 days when a cow is not in gestation are crucial in the calving interval cycle. The result revealed calving interval of 14.29 ± 1.11 months. This result corroborates those who reported that averages of 14 to 17 months, 473.10 ± 138.50 days and 15.12 ± 0.19 months were observed in dairy farms of Holstein, Jersey, Holstein-Jersey crossbreed in Denmark, Friesian, Jersey and Friesian and Jersey crossbreed dairy farms in Zambia and in dairy cows in Jinka city of Ari zone, Southern Ethiopia; respectively (Kenasew and Kerkela, 2025; Kok *et al.,* 2019; Lehmann *et al.,* 2019; Odubote and Moono, 2023; Vellinga and Vries, 2018); and higher than 13.3 months reported by Nsangou *et al.,* (2021) in dairy cows reared in the West, Adamawa and Far North Cameroon. In the dairy farms

of Montbéliarde in Bulgaria, Karamfilov and Nikolov (2020) reported an average duration of the calving interval of the animals examined of 453±20 days. They found that the farm, year and month of calving have the biggest influence on the calving interval. Lynda et al. (2018) reported that Montbéliarde cows reared under subtropical environment conditions exhibited long calving-conception interval of 130 ± 64 days and calving interval of 404 ± 62 days. The calving interval is a crucial factor in cattle farming, influencing both productivity and profitability.

Cows typically give birth for the first time between 22 and 26 months of age, with the optimal target often set at 24 months to maximize lifetime productivity and health. An age at first calving below and above this range can reduce first 305-day lactation and lifetime milk yields, fertility, and chances of surviving to a second lactation, alongside a lower economic return. Age at first calving and average gestation length were 29.89 ± 2.62 months and 272.99 ± 8.44 days, respectively. These results are different from the age at first calving of 43.08 ± 5.88 months observed on traditional smallholder farms raising White Fulani and Red Fulani cattle in the North region of Cameroon Kouamo *et al.,* (2018) and average gestation length of 258 days reported by Nsangou *et al.,* (2021). In studies of the reproductive performance of Montbéliarde cows imported into the Republic of Karakalpakstan, the gestation period for cows brought to the farm in the spring and winter seasons was 286.7 and 285.5 days, respectively, proceeding at a normal rate (Tazhibaevna *et al.,* 2025). Cows are usually pregnant for around 9 months, or approximately 280 to 290 days. However, the exact length of gestation can vary slightly depending on factors such as breed, nutrition, environmental conditions, and livestock production system.
Calving rate is defined as the number of calves born per 100 cows mated. It's a measure of fertility on a herd basis. In this study, the calving rate was 27.08% (25 – 33.33%). This result is lower than the 77.20% reported in Friesian, Jersey, and Friesian-Jersey crossbred cows in dairy farms in Zambia (Odubote and Moono, 2023). The pre-wearing mortality rate obtained (42.46% (21.73 – 75%)) was higher than the 4.5% reported in dairy farms in the Netherlands (Santman-Berends et al., 2019). Indeed, Renaud *et al.,* (2018) reported that the high calf mortality risks were significantly associated with the use of tube feeders or buckets for colostrum feeding, the use of wood shavings or chopped straw as bedding, and the lack of regular monitoring of calf health and performance by the herd veterinarian during routine visits. The overall mortality rate (38.91% (18.66-66.66%)) was higher than the 7.5% and 6.85% reported in dairy cattle in Guinea-Bissau and in cattle from peri-urban dairy farms in the city of Bobo-Dioulasso in western Burkina Faso; respectively (Ira *et al.,*2019; Zampaligre *et al.,* 2019). These relatively high mortality rates may reflect the poor adaptation of the Montbeliard breed to local farming conditions, resulting in a negative crude numerical growth rate of -37.18% (ranging from -88% to -8%). Seasonalizing the calving season of Montbéliarde cows to the autumn-winter season has a positive effect on the survival of calves (Tazhibaevna *et al.,* 2025). Náglová and Rudinskaya (2021) reported that numerical growth was positively correlated with effective mastery of reproductive techniques, particularly artificial insemination, a high number of breeding cows, farm specialization (dairy or meat production), and adequate production subsidies. These factors positively influence farm productivity but may be negatively affected by diseases and environmental factors.

CONCLUSION

Reproductive and dairy production performances of Montbéliarde cows were low and below the actual potential of the breed. The low level of education of breeders, the lack of mechanization, heat stress and the lack of regular monitoring of cow and calf health were limiting factors of this potential. It is urgent to reconsider the dairy production intensification policy implemented through the livestock development project and to place the breeder as the main stakeholder. Finally, animal feed remains the highest expenditure item (60 – 70%) across all dairy production systems. A government policy of subsidizing feed inputs would enable producers to achieve positive returns and improve dairy production in Cameroon.

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CONFLICT of INTEREST

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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This research was performed based on approval for the scientific committee of the school of veterinary medicine and sciences of the University of Ngaoundere (Cameroon) with number [N2022/001/UN/ESMV/D/DAACRS//At of 25 October 2022].

AUTHORS' CONTRIBUTIONS

The concept and research design of the study were developed by J.K. Data collection was carried out by A.O.B., Data analysis and interpretation were conducted by C.T.Z., A.O.B., E.A. and J.K., Manuscript writing was done by A.O.B, C.T.Z, E.A., and J.K., while manuscript revision was completed by CTZ and J.K.

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