



Investigation of Managerial Practices Related to Calves' Survival in Dairy Cattle Farms: The Case of Çorum Province

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<p><i>Research Article</i></p> <p>Received : 13.11.2025 Accepted : 01.01.2026</p> <p>Keywords: Calf Management Herd Management Colostrum Management Dairy Cattle Calf</p>	<p>This study was conducted using a Cross-Sectional Observational Design to determine the effects of current managerial practices applied in commercial dairy cattle farms in Çorum Province on calf survival. The main material of the study consisted of 120 active farms, which represent the general structure of the dairy cattle sector in the region. Data were collected via face-to-face surveys, and the scale's reliability was confirmed (Cronbach's Alpha: 0.742) and suitability for Factor Analysis (KMO: 0.710) was verified. The results showed that while 88.33% of the farmers were members of a cooperative/union and 57.50% reported timely colostrum administration (within the critical <4 hours), these positive indicators contrasted sharply with low biosecurity and poor practical application. Specifically, calf mortality was high (42.50% of farms reported mortality rates >5%), mainly due to diarrhea and pneumonia, with 65.83% of deaths occurring in the first 30 days. Critical management deficiencies included uncontrolled colostrum feeding (85.00% via suckling, risking failure of passive transfer), severe biosecurity breaches (85.83% of calves housed with adult animals), and delayed introduction of solid feed. In conclusion, the primary challenge in Çorum is not lack of institutional access or basic knowledge, but rather a critical disconnection between theoretical knowledge and practical management implementation. To improve calf survival, management strategies should shift from traditional suckling to controlled colostrum protocols and emphasize the transition from group housing to individual calf hutches to ensure biosecurity.</p>

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Introduction

Dairy cattle farming is a sector that forms the basis of global food security and holds strategic importance for the national livestock economy (Bayraktar and Genç, 2021; Mekhantseva et al., 2025; Priyashantha et al., 2025; Sait et al., 2024). The sustainability, profitability, and genetic progress of farms are directly tied to the success of calf rearing due to the necessity of ensuring herd renewal (Bayraktar et al., 2019). Calves are considered the future productive members of a dairy farm and are therefore the most critical investment and capital resource (Ssekibaala et al., 2025; Adam et al., 2025). However, the early period from birth to weaning is a sensitive phase when the risk to life is highest and disease and mortality rates are most intense (Davies et al., 2025; Alemu et al., 2025).

Consequently, the survival rate of calves has become the most critical performance indicator revealing the productivity, management quality, and economic risk level of a business (Tosun, 2025; Jammer et al., 2025). Structural and operational dynamics, such as the lack of professional breeder training, insufficient health record-keeping, and the absence of animal insurance, lead to significant financial losses for producers, especially during the neonatal period. These managerial gaps increase economic vulnerability in the event of potential epidemics or disasters (Bigelow et al., 2025; Alkheraije, 2025; Shakil et al., 2025; Ferrara and Tejeda, 2025; Bose and Siva Kumar, 2025).

The survival of calves depends on a series of management practices implemented after birth, starting with the mother's transitional nutrition (Pirota et al., 2025). At the forefront of these practices is colostrum management, the key to calf health (Palczynski et al., 2020). Due to the epitheliochorial structure of the bovine placenta, calves cannot transfer antibodies (immunoglobulins) from the maternal bloodstream before birth and are born immunologically vulnerable (Chucrí et al., 2010; Jawor et al., 2021). It is vital for the calf to receive sufficient (usually a minimum of 2 liters) (McGuirk, 1992) and high-quality colostrum (e.g., 50 g/L IgG concentration) within the first few hours following birth to successfully achieve Passive Immune Transfer (Yang et al., 2025; Uyama et al., 2022). Since the intestinal wall's ability to absorb immunoglobulin molecules decreases rapidly in the first 6-12 hours after birth, timely administration is a scientific necessity (Duan et al., 2024; Yang et al., 2025). Failures in this process are the primary triggers of diarrhea, one of the main causes of calf deaths (Carter et al., 2021; Davies and Denholm, 2025).

Diseases such as gastrointestinal infections and respiratory diseases (pneumonia) lead to high morbidity and mortality rates (Bigelow et al., 2025; Alemu et al., 2025). To mitigate these risks, housing in single or isolated pens significantly reduces cross-infection and improves overall health (Bentum et al., 2025). Furthermore, early feeding protocols affect not only survival but also future milk yield potential (Yang et al., 2025). Intensive feeding protocols (accelerated growth programs) increase disease resistance and enhance enterprise profitability by potentially bringing the first calving age earlier (Salaudin et al., 2025; Kasimanickam et al., 2025).

Çorum province, located in the Central Black Sea Region with a transition to the Central Anatolian climate, considers cattle presence (203,905 units according to 2023 data) and calf breeding as vital economic activities (Anonymous, 2023). In this region, the continuity of milk production and farm profitability are closely related to local calf management practices.

In this context, given the farm size, management diversity, and regional conditions in Çorum Province—and considering the discrepancy between high institutional membership and high reported calf mortality rates—there is an urgent need for a specific field study. The primary objective of this study is to examine in detail the current management practices (colostrum, housing, feeding, and health protection) and to analyze the critical disconnect between management knowledge and field implementation. The findings aim to provide a scientific basis for improving management practices and reducing calf losses in the region.

Materials and Methods

This study was conducted on dairy farms in Çorum province. 120 active farms were selected as study material. Approval for the study was obtained from the Hitit University Non-Interventional Research Ethics Committee Protocol number: 30.12.2025 and Decision Number: 2025-0584). Face-to-face surveys, observations, and measurements were conducted on these farms to determine

the general structural characteristics, biosecurity, and calf management practices of dairy farms in Çorum province.

Determination of Population Size

The study population consisted of all commercial dairy farms in Çorum Province. According to the 2025 records of the Çorum Provincial Directorate of Agriculture and Forestry (TÜRKVET), the total number of commercial dairy cattle farms in the region is 16,290 (N). To determine a representative sample size, the proportion approach formula proposed by Miran (2003) was used:

$$n = \frac{N \cdot t^2 \cdot p \cdot q}{(N - 1) \cdot d^2 + t^2 \cdot p \cdot q}$$

By substituting the research data into the formula:

N = 16,290 (Population size)

t = 1.96 (Table value for 95% confidence interval)

p = 0.5 (Maximum variance ratio)

q = 0.5 (1 - p)

d = 0.089 (Accepted margin of error)

The calculation is as follows:

$$n = \frac{16290 \cdot 1.96^2 \cdot 0.5 \cdot 0.5}{(16290 - 1) \cdot 0.089^2 + 1.96^2 \cdot 0.5 \cdot 0.5} \approx 120$$

Reliability analysis was conducted, and the Cronbach's alpha value was calculated as 0.742, suggesting the data possesses acceptable reliability. Furthermore, the KMO measure was 0.710, validating the suitability of the data. The Cronbach's alpha coefficient was utilized for this purpose. According to Büyüköztürk (2018), reliability is classified by coefficient value as follows: $0.40 < \alpha < 0.60$ is considered borderline; $0.60 < \alpha < 0.80$ is acceptable; and $0.80 < \alpha < 1.00$ indicates high reliability. In this study, the Cronbach's alpha value was calculated as 0.742, suggesting the data possesses acceptable to high reliability. Furthermore, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.710. The findings from Bartlett's test of sphericity confirmed a statistically significant relationship among the variables in the scale, thus validating the suitability of the data for further analysis. The study was conducted through face-to-face interviews with business owners actively engaged in farming in the central province of Çorum. The comprehensive survey consisted of four main sections: the first covered demographic characteristics of the participants; the second included 10 questions on the general characteristics of the enterprises; the third comprised 15 questions on Basic Care Practices; and the fourth contained 12 questions on feeding practices in the enterprises. Participant responses were assessed using a combination of multiple-choice (yes/no) and open-ended questions.

Statistical Analysis

The information obtained at the end of the study was evaluated using the IBM SPSS Statistics (Version 29.0) software (IBM Corp., 2022). The collected data is presented as numerical frequency (N) and percentage frequency (%). These descriptive statistics were primarily employed to detail the demographic, structural, and operational characteristics (covering basic care and feeding practices) of the commercial dairy cattle farms included in the study.

Results

As a result of the study, demographic characteristics, farm management practices and calf loss data of 120 breeders were examined in detail and critical managerial and environmental factors that directly affect calf health and welfare were identified.

Findings Regarding Grower Profile and Business Structure

The research findings reveal distinct trends in the demographic and structural characteristics of farms. The largest age group among breeders is concentrated between the ages of 31 and 40 (34.17%), indicating that the sector's workforce represents a relatively young and active segment. When examining educational attainment, secondary school graduates constitute the highest percentage at 33.33%, indicating that the level of knowledge required for farming activities is beyond basic literacy but below advanced professional training. Livestock farming experience, at 25.00%, is most concentrated between 6 and 10 years, suggesting that the majority of farms are in a recently established or modernized development phase, rather than possessing long-standing traditional experience. When analyzing farm structure and capacity, the almost equal distribution of farming models between closed systems (50.83%) and semi-open systems (49.17%) suggests that different intensities of farming are employed depending on regional conditions and investment scale. The fact that 38.33% of farms have an animal capacity of 31-50 head, most commonly found in the 31-50 range, demonstrates that these farms are economically sustainable, medium-sized commercial dairy operations (Table 1).

The farms' cattle breed preference is clearly in favor of Crossbreds, at 72.50%. This preference is based on a strategy of achieving the optimal balance between adaptation to local conditions and high milk yield (40.83%, ranging from 11-20 kg/day). Organizational and risk management dynamics, however, present a contradictory picture. The fact that 88.33% of breeders are members of unions or cooperatives and 89.17% benefit from livestock support are strong indicators of high institutionalization and access to financial incentives in the sector. However, the fact that 70.00% of farms do not have animal insurance creates significant economic vulnerability for farms with high livestock values in the event of a potential epidemic or disaster. In addition, the fact that 55.00% of breeders do not attend animal husbandry-related courses and trainings constitutes a potential source of knowledge gaps regarding modern animal husbandry techniques, biosecurity protocols and current feeding approaches. The high rate of cooperative membership (88.33%) contrasts with the low participation in vocational training (45.00%), indicating that regional organizations are not effectively providing technical extension services to farmers.

Findings on Pregnancy Management and Birth Safety Practices

In fertility management, the high rate of estrus monitoring at 95.00% demonstrates that breeders closely monitor their cows' reproductive cycles and prioritize fertility in herd management. The most preferred time for

insemination after estrus is 8 hours, 57.50% of the time, a scientific practice aimed at maximizing fertility in accordance with the cattle's ovulation physiology. The combined use of natural and artificial insemination (47.50%) as insemination/insemination methods demonstrates that while artificial insemination provides genetic improvement, natural insemination is also used as a rescue method for herd infertility problems.

Table 1. General characteristics of grower demographics and business structure.

Survey Questions	Frequency	
	N	%
Breeder age		
18-30	33	27.50
31-40	41	34.17
41-50	29	24.17
51 and older	17	14.17
What is your educational background?		
Literate	6	5.00
Primary School	28	23.33
Middle School	40	33.33
High School	32	26.67
University	14	11.67
How many years have you been farming?		
0-5	16	13.33
6-10	30	25.00
11-20	27	22.50
21-30	26	21.67
30 and over	21	17.50
What type of farming model do you use in your business?		
Open	0	0.00
Closed	61	50.83
Semi-open	59	49.17
What is your farm's animal capacity?		
0-10	13	10.83
11-30	33	27.50
31-50	46	38.33
51-100	19	15.83
More than 100	9	7.50
What breeds of cattle do you have on your farm?		
Native	7	5.83
Culture	26	21.67
Culture Hybrid	87	72.50
What is your animals' average daily milk yield (kg)?		
1-10	25	20.83
11-20	49	40.83
21-30	38	31.67
>30	8	6.67
Are you a member of growers' associations and/or cooperatives?		
Yes	106	88.33
No	14	11.67
Do you receive support for your livestock activities?		
Yes	107	89.17
No	13	10.83
Whether businesses have animal insurance		
Yes	36	30.00
No	84	70.00
Do you attend animal husbandry courses and training?		
Yes	54	45.00
No	66	55.00

Table 2. Practices in terms of pregnancy management and birth safety in enterprises

Survey Questions	Frequency	
	N	%
Are the animals at your business regularly checked for health?		
I do it myself.	58	48.33
A veterinarian does it.	45	37.50
No	17	14.17
Are health records for animals at your business regularly kept?		
Yes	68	56.67
No	52	43.33
Does your business have a sick animal section?		
Yes	46	38.33
No	74	61.67
Does your business have a birthing area?		
Yes	53	44.17
No	67	55.83
Does your business have a milking parlor?		
Yes	81	67.50
No	39	32.50
Do you clean udders and equipment before and after milking?		
Yes	78	65.00
No	42	35.00
What is the annual mastitis incidence rate in your farm?		
0-5%	79	65.83
6-15%	23	19.17
More than 15%	18	15.00
Do you monitor the heat of the cows on your farm?		
Yes	114	95.00
No	6	5.00
What is the post-estrus insemination time (hour) on your operation?		
5 Hours	18	15.00
8 Hours	69	57.50
12 Hours	33	27.50
Do you separate your cows from the herd when they are nearing calving?		
Yes	97	80.83
No	23	19.17
What is your preferred insemination/mating method for your animals?		
Natural insemination	24	
Artificial insemination	39	32.50
Natural insemination and artificial insemination	57	47.50
What is the number of inseminations/matings per pregnancy on your farm?		
1 time	23	
2 times	57	47.50
More than 2 times	40	33.33
How long is the postpartum insemination/mating period (days) on your farm?		
At first estrus	0	0.00
After 60 days	103	
After 90 days	17	14.17
After 120 days	0	0.00
What is the sterility rate on your farm? (%)		
<5	51	42.50
5-15	53	44.17
>15	16	13.33
What is the live birth rate on your farm? (%)		
<80	29	24.17
80-90	72	60.00
>90	19	15.83
What is the calf abortion rate on your farm? (%)		
<5	83	69.17
5-15	31	25.83
>15	6	5.00
What is the calf mortality rate on your farm? (%)		
<5	69	57.50
5-15	29	24.17
>15	22	18.33

When examining health infrastructure and biosecurity practices, breeders are the most likely to conduct regular animal health checks themselves (48.33%), and the lack of sick animal pens in 61.67% of farms demonstrates inadequate disease monitoring and isolation of infected animals. Furthermore, the absence of a birthing pen in 55.83% of farms indicates unhygienic birthing conditions that could increase the risk of infection in both the calf and the mother during birth (Table 2).

Reproductive performance indicators were found to be relatively successful, with live birth rates concentrated in the 80-90% range, with a 60.00% live birth rate. However, despite a low calf abandonment rate (69.17% at <5%), the total proportion of farms with calf mortality rates above 5% reached 42.50% (24.17% at 5-15% and 18.33% at >15%) (Table 2), clearly demonstrating the inadequacy of calf management, particularly during the postpartum period, and the extent of losses.

Findings Regarding Calf Care and Feeding Practices

Regarding colostrum management, which is critical for calves' survival, it was determined that 57.50% of breeders administered colostrum in less than four hours. This rapid administration demonstrates that newborn calves' intestinal absorption capacity, crucial for passive immune transfer, is at its highest. However, the fact that colostrum administration is specified as 85.00% alongside the dam and the initial amount given as 2 liters (58.33%) could lead to potential control gaps in terms of ensuring adequate, high-quality colostrum is delivered to the calf and hygienic administration conditions are maintained. Furthermore, the fact that 81.67% of breeders do not store remaining colostrum suggests that there is no emergency reserve for calves receiving insufficient colostrum or becoming orphans. In the care and feeding regimen, it is common practice to separate calves from their dams after birth in 64.17% and wean them after 3 months in 76.67%. When examining transition practices to solid feed, the introduction of concentrates (73.33%) and roughage (77.50%) to calves, starting at day 30, represents a relative delay compared to modern feeding protocols that promote early rumen development and reduce weaning stress (Table 3).

An examination of calf losses reveals that 65.83% of deaths occur largely within 0-30 days, with a combination of diarrhea and pneumonia accounting for 54.17% of deaths. These findings demonstrate that the primary causes of calf deaths in the first month are infectious pathogens and inadequate immune protection against these pathogens. This is closely related to housing conditions: 85.83% of calves are housed in the same barn with adult cattle, and 90.83% are group-housed, dramatically increasing the risk of disease transmission to calves. The high neonatal mortality rate (65.83% occurring within 0-30 days) is a direct consequence of a synergistic failure in biosecurity and nutritional management. The fact that 85.83% of calves are housed in the same barn with adult cattle, combined with the 90.83% prevalence of group housing, creates a high-pressure infectious environment. When this environmental stress is coupled with uncontrolled colostrum intake (85.00% via suckling), which jeopardizes passive immune transfer, the calves become highly vulnerable to the identified primary causes of death: diarrhea and pneumonia.

Table 3. Calf care and feeding practices in farms

Survey Questions	Frequency	
	N	%
How often do you give colostrum to your newborn calves?		
With the mother (for the cow)	28	23.33
<4 hours	69	57.50
4-8 hours	23	19.17
How do you feed colostrum to your calves?		
Bottle feeding	18	15.00
By mother's side	102	85.00
What is the initial amount of colostrum you give to your calves?		
By mother's side	43	35.83
2 liters	70	58.33
3 liters	7	5.83
4 liters	0	0.00
Do you store the remaining colostrum for later use?		
Yes	22	18.33
No	98	81.67
Do you disinfect the umbilical cords of newborn calves?		
Yes	86	71.67
No	34	28.33
Do you separate your calves from their mothers after birth?		
Yes	77	64.17
No	43	35.83
When do you wean your calves?		
After 3 Months	92	76.67
After 4 Months	28	23.33
After 5 Months	0	0.00
What is the average amount of milk given from birth to 30 days of age?		
With the mother	32	26.67
< 5 Liters	54	45.00
> 5 Liters	34	28.33
What is the average amount of milk given to a calf from 31 days of age to weaning?		
< 5 Liters	26	21.67
> 5 Liters	94	78.33
When do you start giving water to calves after birth?		
From the 1st week	72	60.00
From the 5th day	41	34.17
From the 10th day	7	5.83
When do you start giving concentrates to calves after birth?		
From the 1st week	32	26.67
From the 30th day	88	73.33
When do you start giving roughage to calves after birth?		
From the 1st week	27	22.50
From the 30th day	93	77.50
What is the calf mortality rate on your farm? (%)		
<5	69	57.50
5-15	29	24.17
>15	22	18.33
How long (in days) does calf death occur after birth?		
0-30	79	65.83
31-45	24	20.00
>45	17	14.17
What is the primary cause of calf deaths on your farm?		
Diarrhea	23	19.17
Pneumonia	32	26.67
Diarrhea+Pneumonia	65	54.17
When do you experience the most animal losses on your farm?		
Spring	53	44.17
Summer	23	19.17
Autumn	18	15.00
Winter	26	21.67
Do you dehorn calves?		
Yes	11	9.17
No	109	90.83
What is the arrangement of calf shelters within your farm?		
In the same barn with adult cattle	103	85.83
In a separate barn for calves	17	14.17
How are your calves housed?		
In groups	109	90.83
In individual pens	11	9.17
What is the bedding material for calf shelters?		
Straw	69	57.50
Straw+sawdust	42	35.00
Other	9	7.50

This triad shared housing, group stress, and unverified immunity represents the most critical risk factor for farm sustainability in the region.

In addition, the fact that 90.83% of the calves were not dehorned shows that an important practice regarding animal welfare and occupational safety in herd management was neglected.

Discussion

This study aimed to investigate the effects of calf rearing practices on calf survival in commercial dairy farms in Çorum Province. The findings indicate that management approaches deviate from scientific optimums, particularly in critical areas that directly impact early calf health, and that this may be associated with high calf losses. Calf mortality is the most important indicator of economic losses in dairy farms, and when these losses exceed acceptable scientific thresholds, it indicates administrative and biosecurity vulnerabilities (López et al., 2025).

Based on the sample, 42.50% of farms had calf mortality rates above 5%, which is well above the generally accepted upper limit for modern dairy farming. Furthermore, 65.83% of deaths occur within the first 30 days of life, a period when calves are most susceptible to infection due to the failure of Passive Immune Transfer (Yanar, 2022).

The primary cause of loss was a combination of diarrhea and pneumonia (54.17%), which strongly parallels findings in similar traditional regions like Erzurum (Koçyiğit et al., 2015). In contrast, lower loss rates in regions like Sakarya are attributed to effective management and better housing (Karaca, 2020), supporting the notion that high losses in Çorum result from traditional and inadequate practices.

Colostrum management is vital as the first line of defense against infectious diseases (Uyama et al., 2022; Umar et al., 2024). In our study, while 57.50% of breeders demonstrated theoretical awareness by giving colostrum within four hours, a critical "management paradox" was identified: 85.00% preferred uncontrolled suckling from the mother. This finding is critically similar to practices in Gümüşhane (86% suckling) (Kaygısız et al., 2023) and various districts of Erzurum (Koçyiğit et al., 2015; Diler et al., 2017; Koçyiğit, 2022). Suckling prevents control over colostrum quantity and quality, increasing the risk of passive immune transfer failure (Koyuncu & Karaca, 2018). Conversely, modernized farms in Sakarya show that controlled feeding improves as managerial knowledge increases (Karaca, 2020). Therefore, the high calf mortality in Çorum is strongly linked to this core knowledge-to-practice disconnect.

Shelter management and biosecurity practices are of strategic importance (Barnhardt and Raabis, 2025). In Çorum, 61.67% of farms lacked a sick bay and 85.83% of calves were housed in the same barn with adult cattle. This fundamental violation of biosecurity principles directly fuels infectious diseases and is significantly parallel to other traditional farms in Gümüşhane and Erzurum (Kaygısız et al., 2023; Koçyiğit et al., 2015, 2018; Koçyiğit, 2022). Exposure to adult cattle increases the risk of early-life transmission of infections such as Johne's

disease (McGill et al., 2025). The significantly higher rate of individual pen use in the Marmara Region (60%) compared to Çorum (9.17%) (Karaca, 2020) supports the positive correlation between modernization and biosecurity adherence.

Calf feeding practices are vital for future production potential (da Costa Freitas and Barbosa, 2025). Early feeding of concentrates and roughage accelerates rumen development and reduces weaning stress (Xiao et al., 2020; Govil et al., 2025). However, most breeders in Çorum start solid feed only from day 30, deviating from modern standards that recommend the first week (Diao et al., 2019). This delay leads to growth retardation and increased vulnerability to disease (Govil et al., 2017; Li et al., 2025). While this practice shows similarities with traditional husbandry in regions like Erzurum (Koçyiğit et al., 2015; Koçyiğit, 2022), it differs from commercial farms in Sakarya (Karaca, 2020). This reinforces the conclusion that delayed solid feeding, combined with biosecurity breaches, represents a major limiting factor on calf health and farm profitability in Çorum.

Conclusion

In conclusion, the findings of this cross-sectional observational study examining managerial practices affecting calf survival in commercial dairy cattle farms in Çorum Province have revealed critical management weaknesses that threaten the sustainability of the regional livestock sector. The study determined that a significant portion of calf losses occur during the first critical month of life (the neonatal period), and that the primary causes are passive immune deficiency, inadequate hygiene, and delayed early feeding practices. Preventing these losses is of paramount importance as calves represent the primary capital resource and the future genetic potential of a dairy operation. High mortality rates not only impose a severe economic burden on producers through direct financial losses but also hinder long-term profitability by reducing the number of heifers available for herd renewal. Furthermore, ensuring calf survival and health in the early stages is a critical determinant of future milk yield and the overall productivity of the enterprise. While the findings confirmed that critical factors such as timely colostrum administration and barn hygiene positively impact calf survival, common practices such as housing with adult animals, lack of disease isolation pens, delayed introduction of solid feed, and low participation in breeder training were found to dramatically increase the risk of infection. The most crucial conclusion is that the high calf mortality observed in Çorum stems from a fundamental management paradox: the coexistence of strong theoretical knowledge with the widespread use of scientifically deficient field applications. Therefore, to minimize losses in the sector and permanently improve farm profitability, it was concluded that it would be appropriate to increase intensive, hands-on training and consulting services focused on colostrum management protocols, early feeding programs to support rumen development, and biosecurity standards for local agricultural authorities and stakeholders. In this context, to overcome the identified 'management paradox' and ensure biosecurity, it is essential to transition from traditional practices to modern

standards. Specifically, the widespread practice of housing calves with adult cattle (85.83%) must be replaced with individual calf hutches to break the cycle of infection. Furthermore, the traditional 'suckling' method (85.00%) should be phased out in favor of controlled colostrum administration via bottles or esophageal feeders to guarantee successful passive immune transfer. Finally, the common delay in introducing solid feed should be corrected by promoting calf starter intake within the first week to enhance rumen development and reduce neonatal mortality.

Declarations

Ethical Approval Certificate

The study was conducted after obtaining approval from the Hitit University Non-Interventional Research Ethics Committee (Protocol number: 30.12.2025 and Decision Number: 2025-0584).

Author Contribution Statement

The contributions of the authors to this study are specified below using their initials:

Gökşad Cemil Kotan: Collection of field data through surveys and observations, analysis of the structural characteristics of enterprises, preparation of the initial draft, and comprehensive literature review.

Bülent Bayraktar: Development of research hypotheses and the study model, planning and execution of statistical analysis, general supervision, methodology contribution, and final text editing.

Şeyma Aydemir: Supervision of the article, determination of animal welfare criteria, evaluation of analysis results, and text editing.

Vecihi Aksakal: Cleaning and validation of the dataset, visualization and reporting of findings with tables and figures, and organizational support for fieldwork.

Hilal Ürüştan Altun: Contribution to the theoretical framework in Zootechnics, evaluation of findings regarding animal production and welfare criteria, and review of the discussion section.

Emre Tekce: Providing technical support for data analysis processes and contributing to the development of the discussion section based on research findings.

Yaşar Edoğan: Critical review of the literature, management of ethical processes, and scientific and grammatical control of the final version of the article.

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Conflict of Interest

The authors declare no conflict of interest.

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