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Investigation of Structural Characteristics and Flock Management Practices of Sheep Breeding Farms: The Alaca District of Çorum Province Example

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ABSTRACT

The aim of this study is to comprehensively examine the structural characteristics and herd management practices of sheep farms in Alaca district of Çorum province and to reveal their current status through a survey conducted on 130 sheep farms. The study revealed that the breeder population in the sector is concentrated in young (18-30 years old) and middle-aged (31-40 years old), with the younger generation actively participating in the sector. The vast majority of breeders view livestock farming as their primary source of income, with a predominant portion of their farms focusing on slaughter and sacrificial animal husbandry. While basic facilities such as resting areas, lighting, and ventilation are largely adequate, the lack of specialized enclosures necessary for modern herd management, such as sick animal pens (48.46%), milking parlors (86.92%), and shearing areas (100.00%), is striking. In terms of herd management practices, the most common age for first mating for females was 15 months. Rams are kept in the flock only during the breeding season in the majority of farms, and the most frequently used breeding method is reported to be free-breeding (pen breeding/pasture breeding). Underweight birth was identified as the primary cause of lamb mortality at 46.92%. Although the vast majority of farms regularly administer official vaccinations, only a small percentage conduct regular hoof checks and care, highlighting deficiencies in preventative herd protection practices. Furthermore, although almost all breeders use village communal pastures or highland pastures, 90.00% of breeders believe pastures are inadequate, primarily attributing this inadequacy to the small size of pasture areas. In conclusion, despite its young and well-organized Sheep sector in Çorum, it exhibits significant deficiencies in modern herd management infrastructure and preventative herd protection practices, and faces a critical pasture availability problem. Therefore, to ensure sustainability and enhance competitiveness, it is crucial for local governments to encourage pasture improvement and forage production, as well as expand grant/support mechanisms for the development of modern shelter infrastructure.

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Introduction

Sheep farming is not only an animal production activity but also a strategic sector that plays a critical role in global food security and human health (Bayraktar et al., 2020; Akasha et al., 2021; Bayraktar et al., 2023). Highly nutritional foods obtained from sheep, such as meat, milk, and dairy products, play a significant role in maintaining a healthy diet, especially in developing countries. These products are notably rich in protein, iron, zinc, and B vitamins (Bohrer et al., 2017; Wehrle-Martinez et al., 2025). As a crucial component of agricultural production worldwide, sheep farming holds a vital role in the rural economies of developing countries, particularly in Türkiye (Gürsoy, 2006). Within animal production, sheep farming contributes significantly to both national and local economies with its products such as meat, milk, wool, and leather. However, the sustainability and efficiency of this sector are directly dependent on the existing structural characteristics of the enterprises and the implemented animal welfare standards (Milićević et al., 2025; Paolino et al., 2025).

Animal welfare is a concept focused on a good life for an animal, where its physical and mental health are ensured, and it is free from hunger, thirst, pain, fear, and stress, allowing it to exhibit its natural behaviors (Singh et al., 2025; Contreras López and Montes Franceschini, 2025). In recent years, increasing consumer awareness and international regulations have placed the concept of animal welfare at the center of the livestock sector. This not only

improves the quality of life for animals but also directly affects production efficiency and the market value of products (Mohammadzadeh et al., 2025). The focal point of our research, Çorum province (40.55 E), is located in the transition zone between the Central Anatolian and Central Black Sea climates, with 43% of its total land area of 12,820 km used for agriculture (Anonymous, 2025). The Alaca district is a key production area for Sheeps within Çorum province, which holds a total population of 201,858 sheep (TURKSAT, 2025). The majority of sheep farming enterprises in Alaca district are small and medium-sized family businesses that generally adopt extensive or semi-extensive production models. The structural characteristics of these enterprises in the district include elements such as housing conditions, feeding habits, health management, and general production practices. The structural elements of the enterprises, such as housing conditions, feeding habits, and health management, directly determine the implemented animal welfare standards and consequently affect the sustainability and profitability of production (Bayraktar et al., 2020). However, the adequacy of this traditional structure in meeting modern animal husbandry techniques and animal welfare requirements necessitates a detaile Recent research has begun to address the structural aspects of the sector in the region, such as the study on 'Structural Characteristics of Sheep and Goat Husbandry in Çorum Province' (2025), which provides significant insights into local breeding practices (Tüfekçi and Özten, 2025). This study aims to build upon these existing findings by focusing specifically on the welfare criteria and management practices in the Alaca district.d scientific analysis. This lack of data represents a significant gap for determining region-specific policies and development strategies.This article aims to comprehensively examine the structural characteristics of sheep farms in Çorum province and assess their current status in terms of general livestock management and perceived animal welfare-related practices. The findings will provide important insights for both academics and policymakers by revealing the current potential of the sheep sector in the region, the challenges it faces, and strategic recommendations for its future development.

Materials and Methods

The research material consisted of data obtained from a survey conducted between May and June 2023 on 130 sheep enterprises in the Alaca district of Çorum province. Approval for the study was obtained from the Hitit University Non-Interventional Research Ethics Committee (Protocol number: 30.03.2023 and Decision number:2023-86). A face-to-face survey was conducted with breeders to examine the general structure of sheep enterprises in the Alaca district of Çorum province and the basic care and feeding practices of breeders. The survey form included questions regarding farm information, basic care practices, and animal feeding practices.

Determination of Population Size

According to the 2023 records of the Çorum Directorate of Provincial Agriculture and Forestry, there are 16,290 Sheep farming enterprises in the region. This figure is inclusive of both sheep and goat farms (Sheep units) registered in Alaca district. However, the current study specifically focuses on 130 sheep farms selected from this population to provide a detailed structural analysis.

The number of surveys conducted was calculated based on the regional distribution of producers engaged in Sheep farming (or sheep farming) in the region and registered with the Animal Registration System (TÜRKVET, 2016). The proportional approach method was used to determine a representative population size. The study was conducted through face-to-face interviews with breeders actively engaged in farming in the Alaca district of Çorum province. This research was carried out within the scope of a project approved by the Hitit University Non-Interventional Research Ethics Committee (Protocol number: 30.03.2023 and Decision number:2023-86). A total of 130 breeders participated in the survey, which consisted of four structured sections covering demographic, structural, and management characteristics. The second section included 10 questions on the general characteristics of the enterprises; the third section included 15 questions on Basic Care Practices; and the fourth section included 12 questions on feeding practices in the enterprises. The survey form was prepared by utilizing and adapting previous similar studies on the structural characteristics of sheep farms (Atınçekic, 2014; Kaygısız et al., 2022; Köseman et al., 2022; Aslan, 2023; Demir and Tuncer, 2023; Kaygısız and Türkman, 2024; Tüfekci and Özten, 2025). To assess the participants' responses, open-ended questions were asked by selecting options and asking multiple choices (yes/no). Using this method, the number of surveys was calculated according to the following formula (Miran, 2003):

$$n = \frac{N \times t2 \times p \times q}{(N \times 1) \times \sigma p2 \times t2 \times p \times q} \quad (1)$$

In the formula, 'n' represents the sample size, while 'N' represents the total population size. Additionally, 'p' represents the estimation ratio, and "σp2" represents the ratio variance.

The total population size for the survey study was determined as 16290. This number was calculated by taking p = 0.5 to maximize the population size since the characteristics of the producers constituting the main mass were not known at the beginning. The distribution of the surveys by province was made by taking into account the distribution of a total of 95 businesses in the region. Among the terms in this formula, n = sample size, N = total population size (number of businesses in Alaca), σp2 = Ratio variance (with a 95% confidence interval and a 5% margin of error to reach the maximum population size), t = Table value, p = The desired ratio to be calculated, q = 1-p.

$$n = \frac{16290 \times 1.962 \times 0.5 \times 0.5}{(16290-1) \times 0.12 - 1.962 \times 0.5 \times 0.5} = 95 \quad (2)$$

The calculation yielded a preliminary sample size (n) of 95. To minimize sampling error, an additional 10% was included, raising the required sample size to 105. For study reliability, 130 surveys in total were evaluated, including spare surveys distributed proportionally across farm groups. Reliability analysis was conducted to examine the scale's structural integrity and the internal consistency of

the breeders' responses. 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 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.

Statistical Analysis

The information obtained at the end of the study was evaluated using the IBM SPSS Statistics (Version 22.0) 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 Sheep businesses included in the study.

Results

Findings Regarding Breeders' Demographics and Enterprise Structure

An examination of the breeders' age distribution reveals that the population engaged in Sheep farming is concentrated in the young and middle-aged groups. The largest share of participants, 37.69%, is in the 18-30 age group, followed by the 31-40 age group at 29.23%, indicating the active presence of the younger generation in the sector. In terms of education levels, almost half of the breeders, 46.92%, are high school graduates, and an additional 24.62% are middle school graduates (Table 1). While 37.69% of the participants are young (18-30 years old), the finding that 26.15% of breeders possess 11-15 years of professional experience reveals a significant trend. This suggests that in the Alaca district, sheep farming is a family-based succession where the younger generation starts gaining expertise at an early age. This demographic structure indicates a high potential for the region to adapt to modern innovations and long-term sustainability.

Regarding livestock farming experience, a significant portion of breeders have been operating in this sector for many years, with 26.15% having 11–15 years of experience and 19.23% having 20 or more years. When these findings are cross-referenced with age groups, a clear generational trend emerges: while the older breeders (over 40 years old) represent the traditional experience base of the Alaca district, the significant presence of young breeders (37.69% aged 18–30) with nearly a decade of experience suggests that sheep farming is being passed down through family succession. This correlation indicates that the region possesses a blend of traditional expertise and a young workforce capable of sustaining the sheep sector in the long term.From an economic perspective, the vast majority of breeders (68.46%) consider livestock as their main source of income, and a dominant proportion of farms (60.77%) operate in the slaughter and sacrificial animal husbandry sector.

Table 1. Demographics of Breeders and Statistics on Some Farm Assets

Survey Questions	Frequency	
	N	%
Age		
18-30	49	37.69
31-40	38	29.23
41-50	26	20.00
51-60 and above	17	13.08
Household size		
1-2	18	13.85
3-4	61	46.92
5-7	38	29.23
7 and above	13	10.00
Educational status		
Literate	5	3.85
Primary School	14	10.77
Middle School	32	24.62
High School	61	46.92
University	18	13.85
Sheep farming experience (years)		
0-5	17	13.08
6-10	32	24.62
11-15	34	26.15
16-20	22	16.92
20 and over	25	19.23
Primary motivation for farming		
Main source of income	89	68.46
Contribution to livelihood	41	31.54
Fattening type		
Breeding + Milk	9	6.92
Slaughtering	24	18.46
Sacrificial Animal Fattening	18	13.85
Slaughtering + Sacrificial Animal Fattening	79	60.77
Animal capacity (head)		
<50	19	14.62
50-100	48	36.92
101-200	37	28.46
201-300	9	6.92
>300	17	13.08
Shelter location		
Adjacent to the house - Under the house	43	33.08
Detached	87	66.92
Shelter type		
Open	6	4.62
Semi-open	59	45.38
Closed	65	50.00
Land ownership (decares)		
None	0	0.00
<50	39	30.00
51-100	44	33.85
>101	47	36.15
Shelter building material		
Adobe	32	24.62
Stone	24	18.46
Reinforced Concrete	74	56.92
Farm ownership status		
Self	77	59.23
Tenant	14	10.77
Partner	39	30.00
Membership in associations/cooperatives		
Yes	118	90.77
No	12	9.23
Livestock support status		
Support for breeding sheep and goats	108	83.08
Bank-loan	2	1.54
Ministry grant and support projects	7	5.38
Not received	13	10.00
Labor source for care and feeding		
Family members	27	20.77
Family members - shepherd	68	52.31
Shepherd	35	26.92

It was determined that enterprise capacities are mostly in the 50-100 head range (36.92%), while barns are detached (66.92%) and enclosed (50.00%). Finally, it was determined that a large portion of breeders (90.77%) are members of breeder associations and/or cooperatives, and 83.08% benefit from various support programs, such as support for brood sheep and goats (Table 1).

Findings on Animal Welfare Practices

When the structural conditions in the farms were examined based on breeders' perceptions of animal welfare, it was found that resting areas (81.54%), lighting (91.54%), ventilation (85.38%), and watering conditions (82.31%) were reported as adequate by the respondents (Table 2). The high adequacy rates reported for lighting (91.54%) and ventilation (85.38%) represent breeder perceptions rather than objective environmental measurements. However, the discrepancy between these perceptions and the lack of specialized infrastructure, such as sick animal pens (48.46%) and milking parlors (86.92%), highlights a gap between subjective assessment and modern technical requirements. These percentages reflect the breeders' self-assessment regarding their own facilities rather than objective environmental measurements.

However, the lack of special pens to facilitate herd management is striking; it was determined that nearly half of the breeders (48.46%) did not have a sick animal pen, the vast majority of farms (86.92%) lacked a milking parlor, and all farms (100.00%) lacked a shearing area. Furthermore, it was noted that footwashing pools and sheep bathing facilities, important for preventive medicine practices, were not available in nearly three-quarters of breeders (74.62%) (Table 2).

Findings Regarding Herd Care Practices

The first mating age of breeding animals in farms is generally determined as 15 months (60.00%), and these animals are generally used for breeding for 4 years (52.31%). Rams are kept in the flock only during the breeding period (79.23%) in the majority of farms, and the most commonly used breeding method is pen breeding (86.92%). During the breeding period, 71.54% of farms use supplementary feeding, and the number of ewes per ram is generally between 30 and 40 (68.46%) (Table 3).

When considering birth and lamb care practices, 60.00% of farms conduct birth preparation activities, and 54.62% perform umbilical cord care for newborn lambs. 83.08% of farm owners recognize the importance of providing colostrum to lambs. Lambs left motherless are more often bottle-fed (59.23%), and disposal (56.15%) is the preferred method for destroying fetal membranes after birth.Weak birth is the primary cause of lamb deaths at 46.92%, followed by diarrhea at 28.46%. The fact that "weak birth" is the primary cause of lamb deaths at 46.92% points toward a critical management issue regarding dam nutrition during the late gestation period.

Furthermore, disposing of fetal membranes in the trash (56.15%) indicates a severe bio-security risk and a lack of awareness regarding infectious disease control, such as Brucella.Within the scope of general health and hygiene practices, 73.85% of farms regularly check and care for their animals' hooves, and lameness is rarely seen at 70.00%.

Table 2. Some Descriptive Statistics on Animal Welfare Practices

Survey Questions	Frequency	
	N	%
Rest area		
Sufficient	106	81.54
Insufficient	24	18.46
None	0	0.00
Lighting conditions		
Sufficient	119	91.54
Inadequate	11	8.46
None	0	0.00
Ventilation conditions		
Sufficient	111	85.38
Inadequate	19	14.62
None	0	0.00
Feeder status		
Sufficient	97	74.62
Insufficient	33	25.38
None	0	0.00
Watering status		
Sufficient	107	82.31
Insufficient	23	17.69
None	0	0.00
Lamb compartment		
Sufficient	62	47.69
Insufficient	39	30.00
None	29	22.31
Coach compartment		
Sufficient	57	43.85
Insufficient	38	29.23
None	35	26.92
Sick animal compartment		
Sufficient	41	31.54
Insufficient	26	20.00
None	63	48.46
Milking Parlor		
Sufficient	13	10.00
Insufficient	4	3.08
None	113	86.92
Birthing bay		
Sufficient	42	32.31
Inadequate	29	22.31
None	59	45.38
Shearing area		
Yes	0	0.00
No	130	100.00
Footwash pool		
Yes	33	25.38
No	97	74.62
Sheep bath		
Yes	33	25.38
No	97	74.62
Vehicle bathroom		
Yes	11	8.46
No	119	91.54
Loading ramp		
Yes	46	35.38
No	84	64.62
Administration/Caregiver Home		
Yes	9	6.92
No	121	93.08
Vaccination route		
Yes	22	16.92
No	108	83.08

Table 3. Some Statistics on Herd Care Practices in the Farm

Survey Questions	Frequency	
	N	%
Age at first mating (months)		
12 Months	14	10.77
15 Months	78	60.00
18 Months	38	29.23
Breeding life of females (years)		
2	0	0.00
3	25	19.23
4	68	52.31
>4	37	28.46
Ram management within the herd		
All year round (Continuous)	27	20,77
During the ram mating period	103	79,23
Mating method		
Hand breeding	11	8,46
Pen breeding	6	4,62
Free breeding/Flock mating	113	86,92
Number of ewes per ram		
<10	0	0,00
10-20	17	13,08
20-30	24	18,46
30-40	89	68,46
Supplementary feeding during mating		
Yes	93	71,54
No	37	28,46
Birth preparation activities		
Yes	78	60.00
No	52	40.00
Umbilical cord care status		
Yes	71	54.62
No	59	45.38
Colostrum feeding management		
Yes	108	83.08
No	22	16.92
Feeding methods for motherless lambs		
With another mother	53	40.77
With a bottle	77	59.23
Disposal of fetal membranes		
Burying	36	27.69
Giving to a dog	21	16.15
Throwing in the trash	73	56.15
Primary causes of lamb mortality		
Undernourishment - Weakness - Unable to find the mother	17	13.08
Cold	13	10.00
Weak Birth	61	46.92
Diarrhea	37	28.46
Crushing	2	1.54
Nail care and grooming status		
Yes	96	73.85
No	34	26.15
Hoof care and maintenance		
Yes	22	16.92
No	108	83.08
Frequency of lameness		
Rarely	91	70.00
Sometimes	22	16.92
Frequently	17	13.08
Official vaccination status		
Yes	112	86.15
No	18	13.85
Special vaccination status		
Yes	77	59.23
No	53	40.77
Annual cleaning frequency		
None	0	0.00
1-2	66	50.77
3-5	64	49.23
Manure cleaning method		
Manually	97	74.62
Mechanically	33	25.38
Utilization of farm manure		
In the agricultural activities of the enterprise	69	53.08
By selling to other businesses	61	46.92

The vast majority of farms (86.15%) regularly administer official vaccinations, while 59.23% regularly administer special vaccinations. Farm cleaning is done at least once a year, but most often 1-2 times (50.77%) or 3-5 times (49.23%). 74.62% of manure cleaning is done manually, and more than half of the fertilizer produced (53.08%) is used in the farm's own agricultural activities (Table 3).

Findings on Pasture Use and Feeding Practices

According to the findings regarding pasture use, the overwhelming majority of breeders (95.38%) utilize village common pastures and/or pastures under highland ownership, and the maximum grazing period for animals on pastures is determined to be 6 months (58.46%).

Although the region experiences a harsh continental climate, 60.00% of breeders reported taking their animals out to pasture during the winter season. This finding should be interpreted not as intensive grazing for nutritional purposes, but rather as short-term exercise or 'stretching' the flock in fallow fields and stubble areas near the farm during days with low snow cover. This practice is common in traditional Central Anatolian sheep farming to provide physical activity and utilize residual forage, even when the primary nutritional needs are met through indoor feeding in closed (50.00%) or semi-open (45.38%) shelters. A large portion of the enterprises (90.00%) believe that the pastures in the region are insufficient, and the primary reason for this insufficiency is cited as the inadequacy of pasture areas (57.69%) (Table 4).

When it came to feeding practices, 67.69% of the livestock farmers supplemented their pasture use with feed, while almost all farmers (95.38%) used licking stones for mineral supplementation. The high prevalence of licking stone use (95.38%) contrasted with the relatively low adoption of feed additives (32.31%) reveals a specific preference for mineral supplementation methods among local breeders. This discrepancy suggests that breeders favor licking stones as a practical, low-cost, and labor-efficient method for meeting basic mineral needs. However, there is a notable hesitation toward more complex, ration-based feed additives that require precise dosing and technical knowledge. This finding highlights a need for extension services to demonstrate the performance benefits of advanced nutritional supplements beyond basic mineral blocks. Furthermore, it was noted that the age at which supplementary feeding of lambs began was 30-40 days of age, with a rate of 66.15% (Table 4).

Discussion

This study, which examines the structural characteristics and flock management practices of the sheep sector in Alaca district (Çorum), reveals the strengths and weaknesses of local breeding activities by identifying the main limiting factors and fundamental obstacles impeding the sector's development. The breeder age profile is a significant indicator of innovation and future orientation in the sheep sector. Although research yields varying results, the average age of sheep breeders is generally reported to be over 40 in the literature (Dellal, 2000; Koyuncu et al. 2006; Tüfekçi and Oflaz, 2015). However, this value was determined to be 34.4 in our study, representing a significant deviation from previous findings.

Table 4. Some Statistics on Pasture Use and Feeding Activities in the Enterprise

Survey Questions	Frequency	
	N	%
Who owns the pastures you use?		
Village common pasture + Highland	124	95.38
Private property	6	4.62
How long do animals graze on pasture? (months)		
6	76	58.46
7-8	42	32.31
>8	12	9.23
Do you take your animals out to pasture in winter?		
Yes	8	60.00
No	122	40.00
Do you send calves to graze with their mothers?		
Yes	11	60.00
No	119	40.00
Do you supplement pasture use with your animals?		
Yes	88	67.69
No	42	32.31
How long do your animals spend on pasture daily? (Hours)		
<8	9	6.92
8-12	113	86.92
>12	8	6.15
Are the pastures in your area sufficient?		
Yes	13	10.00
No	117	90.00
What do you think is the reason for the inadequate pastures in your area?		
Irregular use	22	
Insufficient pasture areas	75	57.69
Use for purposes other than intended	7	5.38
Inadequate maintenance and irrigation	26	20.00
Do you use feed additives on your farm?		
Yes	42	32.31
No	88	67.69
Do you use licking stones on your farm?		
Yes	124	95.38
No	6	4.62
How long do your lambs nurse on their mothers? 2 Months		
4 Months	42	32.31
6 Months	57	43.85
When do you start supplemental feeding for your lambs?	31	23.85
From 15-20 days of age		
From 30-40 days of age	44	33.85
Who owns the pastures you use?	86	66.15

This difference, stemming from the demographic structure of the survey group, reveals a young (66.92% are in the 18-40 age range) and highly organized (90.77%) breeder profile, which is an important indicator of the sector's high potential for adapting to innovations and changes. Previous studies have determined that the education level of a large proportion of breeders in the sheep sector is concentrated at the primary school level (61.2% (Bakır and Mikail, 2019); 67.6% (Ayalp et al., 2025)) and this finding has been evaluated as a reflection of the sector's current traditional structure (Bakır and Mikail, 2019; Ayalp et al., 2025). However, the results obtained in this study distinctly deviate from the general trend, showing that the largest share of breeders consists of high school graduates (46.92%) and that the proportion of university graduates (13.85%) significantly exceeds the rates found in the literature. The fact that only 14.62% are at the primary school or literate level proves that the breeder profile in the region has a higher education level compared to the sector average across Türkiye. When evaluated together with the demographic data indicating a predominantly young breeder profile (37.69% aged 18-30) and a high education level (46.92% high school graduates), these findings suggest that the breeders in Alaca district have a high capacity for adapting to modern flock management techniques and innovations. This demographic structure points to a significant potential for increasing the sheep sector's productivity in the region. Household size in sheep farms varies with cultural differences. Research conducted by Bakır and Mikail (2019) determined this average to be 7.16 people in Muş. The average household size of 5.86 people found in Çorum in this study remains at a medium level and suggests that family labor still plays a significant role in carrying out sheep farming activities.

A significant portion of the farms (68.46%) considers livestock farming as their main source of income, which supports the sector's fundamental socio-economic role in rural development (Kaymakçı et al., 2003). However, the high focus of production on Slaughter and Sacrifice Animal Fattening (60.77%) suggests that the market is adapted to seasonal demand, but diversification in high value-added areas such as breeding stock and milk is insufficient (Çiftçi and Kopuzlu, 2025). The high absence rate of milking parlors (86.92%) in the studied farms is primarily attributed to the production focus of the enterprises in the Alaca district. As the majority of the farms (60.77%) are dedicated to slaughtering and sacrificial animal fattening rather than commercial milk production, a specialized milking infrastructure is not a priority for these breeders. Furthermore, in traditional family-run sheep farms, milking is often performed manually in open areas or within general-purpose sections of the barn rather than in a dedicated parlor. The fact that most farms are medium-sized (50-200 head, 65.38%), while supporting sustainability through family labor, negatively affects long-term economic sustainability due to limitations in economies of scale and modernization (Özalp and Sayın, 2018). The fact that 70% of the farms own 51 decares and more land (with the largest share, 36.15%, being over 101 decares) shows similarity with the findings of Bilginturan (2008). However, the average farm size varied compared to previous studies (Karaca et al., 1993; Dayan, 2007; Kaymakçı et al., 1998). The observed land ownership indicates the potential to meet the province's roughage needs. In terms of ownership, while the majority of farms (59.23%) operate on their own property (parallel to Ünal and Dellal, 2023), the 30.00% rate of joint ownership signals strong cooperation. Furthermore, the fact that a large majority of participants (69.23%) are members of unions or cooperatives demonstrates a high level of organization, which is parallel to the effort to maximize economic empowerment and support (Bakır and Mikail, 2019; Karakaya and Kızıloğlu, 2014). As a reflection of the 'shepherd problem' caused by the increasing migration from rural to urban areas and the resulting decrease in the young population (Cengiz et al., 2015), it was determined that more than half of the farms in our study (52.31%) are forced to carry out care and feeding activities through the cooperation of family and a shepherd. Regarding support policies, while previous studies (Demir and Tuncer, 2022; Satar and Sakarya, 2021) indicated the inadequacy of support (e.g., according to

Satar and Sakarya (2021), the contribution was only 2.73%), the current research found that livestock support is overwhelmingly (83.08%) directed towards Ewe/Goat Mother Support; this suggests that the focus of support is on providing direct income that encourages staying in production, rather than growing the enterprise. According to the breeders' self-reports, a high level of adequacy was observed regarding environmental factors such as lighting (91.54%) and ventilation (85.38%). While these perceptions suggest a positive outlook regarding the principle of 'freedom from discomfort' (FAWC, 1993; Webster, 2001), it should be noted that these findings are based on subjective observations rather than objective technical measurements. The high satisfaction rates regarding lighting (91.54%) and ventilation (85.38%) stand in stark contrast to the total absence of shearing areas (100.00%) and the widespread lack of milking parlors (86.92%). This paradox suggests that breeders do not perceive the absence of modern technical infrastructure as a welfare constraint, instead defining 'adequacy' based on traditional practices rather than scientific standards. This perceptual gap highlights that the modernization of the sheep sector in the region requires not only physical investment but also targeted training to align breeder awareness with modern livestock management requirements. Therefore, further empirical studies with precise environmental measurements are needed to confirm the full fulfillment of these welfare standards.However, high rates of deficiency in specialized sections such as feeders (25.38%) and particularly sick animal pens (48.46%) and lambing pens (45.38%), as stated in many studies in Turkey (e.g., Dereli Fidan, 2012), indicate that animals' needs for protection from disease and special care (isolation, post-natal hygiene) are not adequately met, thereby compromising the principle of "freedom from pain, injury, and disease" (Broom, 1991). Furthermore, the complete absence of shearing areas (100%) in all farms and the lack of footbath/sheep dip facilities in 74.62% of farms emphasize the inadequacy of preventive health management and stress-reducing routine care practices (Grandin, 2000) that directly affect animal welfare.

In this research, a comparative evaluation of sheep farms' management practices with the current scientific literature reveals critical management gaps that potentially limit the overall productivity of the farms while providing information about the causes and consequences of deficiencies in practice.

In the context of reproductive management, the fact that the majority of farms (60.00%) report first breeding their replacement ewes at 15 months of age, although reasonable in pasture-based systems (Verdon, 2023), indicates that they lag behind the target age of 12 months for high-yielding breeds, potentially slowing down the rate of economic return (Gebre, 2009). Furthermore, although keeping rams in the flock only during the breeding season (79.23%) suggests controlled breeding, the high ratio of ewes per ram, concentrated between 30 and 40 (68.46%), places it at the upper limit of scientific standards (25-30 ewes/ram). Combined with the widespread free mating (86.92%) method, this poses a risk of overworking the rams and reducing pregnancy rates in the flock (Maquivar et al., 2021).In the analysis of lamb care and mortality, despite farms knowing the importance of colostrum (83.08%), the high rate of those not performing umbilical cord care (45.38%) shows that this vital knowledge is not reflected in practical application, thereby increasing lamb mortality due to Omphalitis and sepsis during the neonatal period. The determination of weak birth (46.92%) and diarrhea (28.46%) as the primary causes of lamb deaths points to the dominant role of factors such as insufficient dam nutrition, lack of hygiene, and unsuitable environmental management on lamb viability (Dwyer, 2008). A significant paradox is observed between breeding and late-gestation management; while 71.54% of breeders practice supplementary feeding during the mating period , weak birth remains the primary cause of lamb mortality at 46.92%. This suggests that although breeders are aware of 'flushing' practices to increase ovulation, they fail to maintain the same nutritional intensity during late gestation, when fetal growth is maximal. This nutritional gap during the critical final stage of pregnancy leads to low birth weights and subsequent neonatal losses.

In health management and hygiene practices, despite farms reporting performing hoof care (73.85%), the exceptionally high rate of those not performing hoof care when lameness is observed (83.08%) indicates that hoof care is a reactive application rather than a preventive routine, creating a management gap in the control of foot diseases exacerbated by the lack of footbaths (Kaygısız et al., 2022). Furthermore, despite the high rate of official vaccine application (86.15%), the low rate of private/special vaccine application (59.23%) suggests a lack of proactive protection against specific causes of lamb mortality. In terms of biosecurity and environmental management, the prevalence of methods such as disposing of post-natal membranes in the trash (56.15%) and giving them to dogs (16.15%) stands out as the most serious deficiency, increasing the risk of infectious disease agents like Brucella spreading into the environment and reinfecting the flock to an unacceptable degree, indicating the need for intensified biosecurity education (Wapenaar et al., 2017; Moriyón et al., 2023). The primary limitation of this study is that animal welfare indicators were evaluated based on breeders' self-declarations regarding management practices, rather than through direct clinical measurements or standardized welfare scoring systems such as the Animal Needs Index (ANI 35 L). Consequently, the findings represent the breeders' subjective perceptions rather than technical engineering data. Future research in the region should aim to incorporate objective welfare assessments to corroborate these self-reported findings.

Conclusion

The Sheep sector in Çorum province demonstrates significant social potential for innovation and adaptation, owing to its young and highly educated breeder profile. However, while basic environmental requirements are largely met, the widespread lack of specialized facilities such as sick animal pens, birthing bays, and shearing areas indicates a failure to meet modern biosecurity and animal welfare standards. The most critical management deficiencies are concentrated in lamb mortality, which is primarily caused by weak births (pointing to inadequate late-gestation nutrition)

and poor hygiene practices exacerbated by unsuitable environmental management. Furthermore, the practice of hoof care as a reactive measure rather than a proactive routine, coupled with the inappropriate disposal of fetal membranes, creates unacceptable risks for herd health and biosecurity. The fact that a high proportion of enterprises report pasture inadequacy constitutes the biggest macro obstacle to economic sustainability. Consequently, although the sector's support policies are aimed at increasing animal numbers, it is deemed appropriate that traditional management habits concerning infrastructure, hygiene, and preventive medicine be improved through applied training, and that regional pasture rehabilitation efforts be prioritized, to fully utilize the young and dynamic potential of the sector.

Declarations

Ethical Approval Certificate

This study was conducted in accordance with ethical standards and was approved by the Hitit University Non-Interventional Research Ethics Committee (Protocol number: 30.03.2023; Decision number:2023-86).

Author Contribution Statement

Şeyma Aydemir: Collection of field data (survey/observation), analysis of farm structural characteristics, drafting of the first draft, and literature review. Development of the research hypotheses and working model, planning and execution of statistical analyses.

Bülent Bayraktar: General supervision of the project, contribution to the writing of the article and the methodology section, editing and revision of the final text.

Gökşad Cemil Kotan: Project supervision, determination of animal welfare criteria, evaluation of analysis results, and text editing. Cleaning and validation of the data set, visualization and reporting of findings using tables and figures.

Gülben Küçük: Assistance in the collection of field data (survey implementation) and data entry processes, contribution to the preliminary analysis of the findings, and support in the preparation of visual materials (tables and figures) for the final draft.

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Conflict of Interest

The authors declare no conflict of interest.

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