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To cite this article: Arzu Gökdağ, Engin Sakarya, Barbara Contiero & Flaviana Gottardo (2020) Milking characteristics, hygiene and management practices in Saanen goat farms: a case of Canakkale province, Turkey, Italian Journal of Animal Science, 19:1, 213-221, DOI: [10.1080/1828051X.2020.1718006](https://doi.org/10.1080/1828051X.2020.1718006)

To link to this article: <https://doi.org/10.1080/1828051X.2020.1718006>



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## Milking characteristics, hygiene and management practices in Saanen goat farms: a case of Canakkale province, Turkey

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### ABSTRACT

In order to determine the current status of milking characteristics, hygiene and health protection practices in Saanen goat farms in Turkey, data were obtained from 92 farms through surveys in Çanakkale province. The farms are grouped according to the number of animals as small-scale (25–75 heads), medium-scale (76–150 heads) and large-scale (151 and overheads). As a result of the data observed, it has been seen that the majority of the farms (63.04%) had primary education and only 8.69% had education at the university level. While 44 farms have a milking machine or milking system in their farms, the other 48 farms use the hand milking. The 72.8% of the farms stated that they did not receive any training on milking hygiene and milking machines. Breast diseases are among the most common health problems in the farms (61.9%), followed by, digestive system diseases (8.6%), bacterial diseases (5.4%), foot diseases (2.1%) and viral diseases (4.3%), respectively. The prevalence of mastitis which is the leading cause of breast disease differs statistically in terms of scale ( $p < .05$ ). In this period, the scale of the farms increased and the use of machine milking became widespread in dairy goat farms. Considering that Saanen breed goats, which have high milk yield, are also sensitive to diseases and are delicate breeds, it is important for the farmers to be educated and informed about breeding, herd management, and milking hygiene practices in order to increase milk production and quality and to prevent economic losses.

### HIGHLIGHTS

- The current status of milking hygiene and practices was evaluated.
- Mastitis was the most common disease (39.1%) observed in Saanen goat farms.
- To prevent economic losses due to diseases, farmers should be trained on hygiene and management practices.

### ARTICLE HISTORY

Received 30 May 2019  
Revised 20 November 2019  
Accepted 13 January 2020

### KEYWORDS

Dairy goat; milking characteristics; hygiene practices; management; Saanen

## Introduction

As in the world, there is an increase in the presence of animals in Turkey parallel to the increase in population. Animal production makes a significant contribution to the national economy in terms of healthy and balanced nutrition of the increasing population, provide employment, prevent of rural migration, a supply of raw materials for industry and incomes from foreign sales. However, goat breeding in Turkey; usually consists of livelihood and food supply of low-income families in rural and forested areas (Kaymakçı and Engindeniz 2010).

In small ruminant breeding, which is the sub-branch of the livestock sector and is usually made in

the extensive system, goat breeding generally comes to the fore as due to the ease of maintenance and feeding. In taking measures to protect herd and animal health at the farm level; factors such as education level, socioeconomic structure, costs and financial resources, farm-scale, geographical and climatic features, epidemiological conditions and legal regulations come to the forefront.

According to Turkey Statistical Institute's data from 2018, there are 10.922.427 goats in Turkey and 97.95% of the presence of this goat population consists of hair goats. However, with the 5.327.166 milking goats in a total, 561.826 tonnes of goat's milk production

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 Supplemental data for this article can be accessed [here](#).

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has been achieved (TURKSTAT 2019). Most of the milk obtained from goats in Turkey is consumed in household, or is sold to dairy as a raw milk or is converted to cheese for sale in local markets (Kaymakçı and Engindeniz 2010).

Besides hair goats, especially in Western Anatolia, Aegean and Marmara regions goat breeding with cultivation of Saanen hybrid has been started in recent years. In the province of Çanakkale, studies on hair goat breeding date back to the 1970s. During this period, the work started with two Saanen × Hair goat crossbreeds from Ege University. In the following years, Saanen material was brought to this business from various universities and institutions. As a result of the increase in milk yields per unit provided by this breed, dairy goat breeding type in which producers depend on pasture has decreased and turned into a semi-intensive production system (Savaş et al. 2011).

Saanen goats are one of the most milk-producing goat breeds all over the world. It has been reported that the average milk yield of a Saanen goat, which raised in good conditions, hardly can be reached by 10 hair goats (Görgülü 2014). Saanen goats over 2.5 years of age under good care and feeding conditions can be delivered between 280 and 300 d in a lactation period and can provide a total of 700–900 L milk. The preservation of this yield in Saanen goats is related to their health status besides the breed of animal. If any disease is seen in the herd, the average milk yield decreases and the costs of medical and veterinary services are incurred. This can eventually lead to the removal of the animal from the herd and decrease on the profit level. In this context, the costs of animal health protection in the herd are much lower than the costs of medicine and treatment (Yaylak et al. 2016). On the other hand, it is important for the sustainability of the production and profitability of the farm in case of the owner is aware and conscious of the infectious and parasitic diseases that may occur in the herd. In this sense, the regular and timely maintenance of preventive and therapeutic veterinary services can make a significant contribution to the minimisation of costs, an increase in productivity and milk quality.

There are numbers of studies (Taşkın et al. 2010; Yalçın et al. 2010; Koçyiğit et al. 2016; Yaylak et al. 2016) about milking characteristics, hygiene and health protection practices in dairy cattle farms. However, the studies conducted in this area and focuses on dairy goat farms especially in Saanen goats which are spread all over the world are not encountered. The aim of this study is; (i) to determine milking

methods, hygiene and health protection practices based on the farm scales and districts in Çanakkale provinces where Saanen goat breeding activity is performed intensively in Turkey; (ii) to present the differences between hand milking and machine milking in terms of some production values and (iii) to focus on diseases which is mostly seen and can cause economic losses such as decrease on milk production and yield in Saanen goats.

## Materials and methods

Saanen goat breeds adapt with certain regions of Turkey and farmers began to achieve a very good and high milk yield. In Turkey, Çanakkale is the province where Saanen goat breeding is the most intensive and has the largest number of the animal population. Indeed, 25.51% of the total 852.871 Saanen goats in Turkey (Saanen goat, Saanen goat hybrid and Turkish Saanen goats) is located in Çanakkale province (TURKSTAT 2016). The number of farms registered in the Ministry of Food, Agriculture and Livestock system in Çanakkale province having only Saanen hybrids was determined as 801.

The main material of the study was the data obtained from the face-to-face survey method from 92 farms located in Çanakkale province and districts. For collecting data, a survey model with both multiple choices with farmer's possible responses and open-ended questions has been used in 2017. Within the scope of the study, farms were divided into three groups according to their scale size. The farms with 25–75 heads are classified as small, while the farms with 76–150 heads are classified as medium and the farms with 151 or over 151 heads are classified as large-scale. In evaluating the obtained data besides the farms' scales, the districts, where the farms were concentrated, were also taken consideration and classified into three groups as: 'Bayramiç', 'Central' and 'Others'. All work was conducted without using any clinical trials on animals. The protocol of the study did not consider any procedure that would require a specific permission by an ethical board.

Data were transferred to a computer with MS Excel 16.21 software. For the statistical analysis of data, SAS/STAT (Inst. Inc., Cary, NC), XLSTAT (Addinsoft, New York, NY) and IBM SPSS version 22.0 (IBM SPSS Statistics, Armonk, NY) were used. Descriptive analysis has been conducted using Proc UNIVARIATE (SAS version 9.3; SAS Institute Inc., Cary, NC). Chi Square analysis has been applied to compare the difference between the group means of the variables based on

**Table 1.** Distribution of farms including sampling in Çanakkale by district and scale size.

District	Small (25–75 Heads)	Medium (76–150 Heads)	Large (151 And Overheads)	Total
Bayramiç	8	17	9	34
Central	3	12	8	23
Others	9	13	13	35
Total	20	42	30	92

the scale and district classes by using XLSTAT (Addinsoft, New York, NY). In addition, independent sample *t*-test was carried out to determine the differences between the independent groups by using the IBM SPSS version 22.0 (IBM SPSS Statistics, Armonk, NY).

As shown in Table 1 and Figure S1, a total of 20 small-scale farms, 42 medium-scale farms and 30 large-scale farms, each from different districts, were included in the sample. In terms of regions, 34 farms from Bayramiç district, 23 farms from the Central district and 35 farms from other districts were examined within the scope of the sample.

## Results

In order to prevent any disease that may occur in the herd, the protection methods and hygiene practices applied before the disease appear in the herd is very important both in the economic sense and animal health. For this reason, when the farmers recognise the diseases that may occur in animals and regularly perform protective hygiene practices, the incidence of diseases in the farms reduces.

Inadequate demand for veterinary services of small-scale family farms has been identified as an important factor in the spread of infectious diseases and the producers explained that this situation was related to their income insufficiency. At this point, it is important to determine whether the farmers have received any training on the level of breeding and education.

It was observed that 63.04% of the farmers have education at the primary school level and the farmers with the university graduate constitute 8.69% of the total sample. However, it is noteworthy that the majority of education level at the primary school constitutes all of the farm scales. When the education level was taken into consideration by districts, it was seen that the education level of the university was higher in Bayramiç district and the level of primary education was higher in other districts. There was no statistically significant difference between the average education level according to the scales of the farms and the districts they took part in.

With the increase in the animal population, the use of machinery during milking has become widespread by minimising labour use and increasing the amount of product. In total, 44 farms from 92 farms have milking machines or milking systems in their farms. It was observed that the farms that have machine milking were generally concentrated on large scale farms. There was a statistically significant difference between application efficiency by the districts of the farms ( $p < .05$ ).

## Findings on herd health protection practices and health problems in the farms

Table 2 presents the distribution of herd health protection practices and findings related to health problems in Saanen goat farms based on districts and scales. In all of the farms, it was determined that protective vaccines were regularly applied and vaccination times were taken into consideration. Even though foot bath and nail care applications that play a role in preventing the formation of foot diseases are more widely applied in dairy cattle breeding a certain proportion (8.7%) of these farms which is insufficient were performing these applications. It has been seen that this practice was mostly applied in large scale farms in Bayramiç region.

It is important that internal and external parasite applications are regularly applied in order to prevent parasitic diseases caused by flocks. Internal and external parasites interferences were performed at least once a year. The effectiveness of these practices was found to be sufficient in 71.7% of the farms, while 28.3% stated that the practices were insufficient and not effective. The prevalence of fleas and the failure of the drugs after treatment have been the most frequently reported issue among farms. In this respect, the difference between efficiency in the application of fleas by regions was found statistically significant ( $p < .05$ ).

The 55.4% of farms have a special birth area reserved for pregnant animals. This ratio was the highest in small-scale farms (75%) and in the Central region (60.9%). The majority of the farms (55.4%) do not prefer to transfer the animal to the flock from outside because they want to keep the high degree of purity and to prevent spreading diseases among the flock.

The number of farms with milking machines was 44. In order to maintain breast health and to ensure full milking, the milking machine should be operated according to the standards of use and should be maintained on a regular basis. It has been determined

**Table 2.** Distribution of findings regarding herd health protection practices and health problems in farms by regions and scales.

Findings	Farm districts								Farm scales							
	Bayramiç		Central		Others		Total		Small		Medium		Large		Total	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Application of foot bath																
Yes	3	8.82	2	8.69	3	8.57	8	8.69	2	10.00	2	4.76	4	13.33	8	8.69
No	31	91.17	21	91.30	32	91.42	84	91.30	18	90.00	40	95.23	26	86.66	84	91.30
Application of nail care																
Yes	22	64.70	12	52.17	15	42.85	49	53.26	13	65.00	21	50.00	15	50.00	49	53.26
No	12	35.29	11	47.82	20	57.14	43	46.73	7	35.00	21	50.00	15	50.00	43	46.73
Struggling parasites																
Effective	28	82.35 <sup>a</sup>	12	52.17 <sup>b</sup>	26	74.28 <sup>a,b</sup>	66	71.73	16	80.00	30	71.42	20	66.66	66	71.73
Insufficient	6	17.64 <sup>a</sup>	11	47.82 <sup>b</sup>	9	25.71 <sup>a,b</sup>	26	28.26	4	20.00	12	28.57	10	33.33	26	28.26
Birth place existence																
Exist	18	52.94	14	60.86	19	54.28	51	55.43	15	75.00	19	45.23	17	56.66	51	55.43
It does not exist	16	47.05	9	39.13	16	45.71	41	44.56	5	25.00	23	54.76	13	43.33	41	44.56
Frequency milking machine head replacement																
Once in a year	10	29.41	5	21.73	6	17.14	21	22.82	3	15.00	10	23.80	8	26.66	21	22.82
Twice in a year	3	8.82	3	13.04	3	8.57	9	9.78	3	15.00	0	0	6	20.00	9	9.78
Three times in a year	1	2.94	0	0	2	5.71	3	3.26	0	0	1	2.38	2	6.66	3	3.26
In case of need	3	8.82	4	17.39	4	11.42	11	11.95	1	5.00	7	16.66	3	10.00	11	11.95
No usage of milking machine	17	50.00	11	47.82	20	57.14	48	52.17	13	65.00	24	57.14	11	36.66	48	52.17
Frequency of vacuum control																
Once in week	0	0	3	13.04	2	5.71	5	5.43	1	5.00	2	4.76	2	6.66	5	5.43
Once in a month	1	2.94	1	4.34	3	8.57	5	5.43	2	10.00	1	2.38	2	6.66	5	5.43
Once in a year	11	32.35	4	17.39	7	20.00	22	23.91	1	5.00	13	30.95	8	26.66	22	23.91
Twice in a year	5	14.70	4	17.39	3	8.57	12	13.04	3	15.00	2	4.76	7	23.33	12	13.04
No usage of milking machine	17	50.00	11	47.82	20	57.14	48	52.17	13	65.00	24	57.14	11	36.66	48	52.17
Providing animals from outside																
Yes	15	44.11	14	60.86	12	34.28	41	44.56	11	55.00	17	40.47	13	43.33	41	44.56
No	19	55.88	9	39.13	23	65.71	51	55.43	9	45.00	25	59.52	17	56.66	51	55.43
By whom the treatment is made in case of any disease seen in a herd?																
Veterinarian	0	0 <sup>a</sup>	4	17.39 <sup>b</sup>	0	0 <sup>a</sup>	4	4.34	0	0	2	4.76	2	6.66	4	4.34
Owner	5	14.70 <sup>a</sup>	5	21.73 <sup>a</sup>	12	34.28 <sup>a</sup>	22	23.91	8	40.00	9	21.42	5	16.66	22	23.91
Both	29	85.29 <sup>a</sup>	14	60.86 <sup>a</sup>	23	65.71 <sup>a</sup>	66	71.73	12	60.00	31	73.80	23	76.66	66	71.73
Mastitis presence																
Yes	11	32.35	8	34.78	17	48.56	36	39.13	9	45.00 <sup>b</sup>	17	40.50 <sup>b</sup>	10	33.33 <sup>a</sup>	36	39.13
No	23	67.65	15	65.22	18	51.44	56	60.87	11	55.00 <sup>b</sup>	25	59.50 <sup>b</sup>	20	66.66 <sup>a</sup>	56	60.87

<sup>a,b</sup>Different letter in the same row refers to statistically significant association at  $p < .05$ .

that the majority of farms that use milking machine change the machine head and perform vacuum control in the event of a malfunction at least once a year.

It has been understood that when any disease is seen in the farms, the owners of farms first carry out the treatment process and, when they need the support, they call for veterinary services. The use of veterinarians varies according to the region or the scale of the farms. In some regions, the size of the farm scale, together with the geographical and transportation conditions, affects the demand for veterinary services. However, within the reasons as small-scale family farms have few goats or sporadic disease in a few animals and have low-income level, etc., the veterinary service has been insufficient. In case of need in some districts, veterinary services can be easily provided while in some regions this situation becomes severely difficult. Veterinarians are notified by the owners of the farms that due to travel costs they are hesitant to come to the farms in case of a disease in a single animal. The difference between receiving veterinary services was found to be significant in terms of farm districts ( $p < .05$ ).

Mastitis has been found as the most common disease in the farms. In spite of regular protective vaccination practices and care, the rate of the farms encountering this disease was 39.1%. The difference between the rates of mastitis in each farm scale was statistically significant ( $p < .05$ ). While small and medium-scale farms were similar in terms of encountering mastitis, it was observed that the ratio of mastitis incidence in large-scale farms was the lowest among (33.3%). This can be explained by the use of the milking machine in large-scale farms as well as greater attention to hygiene practices and the fact that large-scale farm owners are more conscious and educated about milking hygiene and health protection practices (33.3%).

### **Findings related to hygiene and milking characteristics in the farms**

When Table 3 is examined, the distribution of the findings regarding the hygiene and milking characteristics in farms by districts and scales can be seen.

**Table 3.** Distribution of findings regarding hygiene and milking characteristics in farms by districts and scales.

Findings	Farm districts								Farm scales							
	Bayramiç		Central		Others		Total		Small		Medium		Large		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Milking method																
Milking machine	0	0 <sup>a</sup>	8	34.78 <sup>b</sup>	1	2.85 <sup>a</sup>	9	9.78	1	5.00	3	7.14	5	16.66	9	9.78
Milking room	17	50.00 <sup>a</sup>	4	17.39 <sup>b</sup>	14	40.00 <sup>a,b</sup>	35	38.04	6	30.00	15	35.71	14	46.66	35	38.04
Hand milking	17	50.00 <sup>a</sup>	11	47.82 <sup>a</sup>	20	57.14 <sup>a</sup>	48	52.17	13	65.00	24	57.14	11	36.66	48	52.17
Training on hygiene and milking machine																
Yes	12	35.29	4	17.39	9	25.71	25	27.17	4	20.00	11	26.19	10	33.33	25	27.17
No	22	64.70	19	82.60	26	74.28	67	72.82	16	80.00	31	73.80	20	66.66	67	72.82
Using gloves during milking																
Yes	2	5.88	5	21.73	2	5.71	9	9.78	2	10.00	3	7.14	4	13.33	9	9.78
No	32	94.11	18	78.26	33	94.28	83	90.21	18	90.00	39	92.85	26	86.66	83	90.21
Using antiseptic during milking																
Yes	6	17.64	7	30.43	10	28.57	23	25.00	9	45.00 <sup>a</sup>	4	9.52 <sup>b</sup>	10	33.33 <sup>a</sup>	23	25.00
No	28	82.35	16	69.56	25	71.42	69	75.00	11	55.00 <sup>a</sup>	38	90.47 <sup>b</sup>	20	66.66 <sup>a</sup>	69	75.00
Applying for milking order																
Yes	33	97.05	18	78.26	31	88.57	82	89.13	19	95.00	36	85.71	27	90.00	82	89.13
No	1	2.94	5	21.73	4	11.42	10	10.86	1	5.00	6	14.28	3	10.00	10	10.86
Feeding time																
Before milking	8	23.52	2	8.69	8	22.85	18	19.56	5	25.00	9	21.42	4	13.33	18	19.56
During milking	7	20.58	5	21.73	7	20.00	19	20.65	3	15.00	7	16.66	9	30.00	19	20.65
During milking/after milking	8	23.52	6	26.08	4	11.42	18	19.56	3	15.00	6	14.28	9	30.00	18	19.56
After milking	11	32.35	10	43.47	16	45.71	37	40.21	9	45.00	20	47.61	8	26.66	37	40.21
Separate place for sick animals																
Yes	18	52.94	14	60.86	22	62.85	54	58.69	10	50.00	23	54.76	21	70.00	54	58.69
No	16	47.05	9	39.13	13	37.14	38	41.30	10	50.00	19	45.23	9	30.00	38	41.30
Disinfection of the milking machine after each milking																
Yes	16	47.05	10	43.47	15	42.85	41	44.56	7	35.00	17	40.47	17	56.66	41	44.56
No	1	2.94	2	8.69	0	0	3	3.26	0	0	1	2.38	2	6.66	3	3.26
No usage of milking machine	17	50.00	11	47.82	20	57.14	48	52.17	13	65.00	24	57.14	11	36.66	48	52.17
Frequency of cleaning pen																
Every day	17	50.00	9	39.13	13	37.14	39	42.39	8	40.00	17	40.47	14	46.66	39	42.39
Two or three times in a week	17	50.00	14	60.87	22	62.86	53	57.61	12	60.00	25	59.53	16	53.34	53	57.61
Frequency of changing based material																
Every day	3	8.82	0	0	0	0	3	3.26	1	5.00	1	2.38	1	3.33	3	3.26
Once in a week	3	8.82	2	8.69	3	8.57	8	8.69	2	10.00	2	4.76	4	13.33	8	8.69
Twice in a week	16	47.05	8	34.77	17	48.56	41	44.56	10	50.00	19	45.25	12	40.01	41	44.56
Once in a month	3	8.82	2	8.69	6	17.14	11	11.95	2	10.00	6	14.28	3	10.00	11	11.95
No usage of base	9	26.47	11	47.82	9	25.71	29	31.52	5	25.00	14	33.33	10	33.33	29	31.52

<sup>a,b</sup>Different letter in the same row refers to statistically significant association at  $p < .05$ .

In general, of the farms, it was seen that the milking method was 52.2% by hand milking, 38% by milking system in a separate milking room and 9% by milking machine in the pen. When this distribution is analysed by scales, it has been generally expected that the presence of milking rooms and milking machine system in large-scale farms is to be seen. However, statistically, significant differences were found in terms of milking method between districts ( $p < .05$ ). Farms with milking rooms and systems are concentrated in the region of Bayramiç. The districts in the other group follow this ratio and in terms of this feature, it is similar to both the Central district and the district of Bayramiç.

The increase in milk yield and production in farms is not only related to the goat breed but also related to the farmers being educated on milking hygiene, pen cleaning and disinfection. The majority of the farms (72.8%) did not have any training on

milking and milking machines and stated that they have continued this work with years of experience. However, the majority of the farms also stated that they were aware of the training, but due to time constraints, they were not able to fix the time to attend.

The use of gloves and antiseptics during milking was not a commonly applied practice as a whole. There was a significant difference in terms of the use of antiseptic during milking between farm scales ( $p < .05$ ). It has been seen that 89.1% of the farms implement milking order during milking. It was declared by the owners that they milk the sick animal in last order and separate their milk.

When feeding time of animals was examined, it was seen that 40.2% of farms prefer feeding after milking. It has been observed that the farms that have milking room and milking system generally feed the animals during the milking in the lock system.

**Table 4.** Descriptive analysis of some variables according to the milking method.

Findings	Milking machine				Hand milking			
	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
Total milking animal number (heads)	110.30 <sup>a</sup>	4	594	105.58	63.21 <sup>b</sup>	11	251	40.42
Total milk production, kg/year	40,897.72 <sup>a</sup>	6.00	170.00	32,467.08	29,745.83 <sup>b</sup>	4.50	90.00	19,836.15
Milk yield, kg/d/goat	1.86	0.43	4.37	0.90	2.04	0.48	4.80	1.08
Lactation duration, d/year	231.59	180	300	35.82	225.00	120	300	37.25
Building and equipment maintenance-repair and depreciation costs (TL)	9844.56 <sup>a</sup>	1.40	64.08	13,078.16	5530.20 <sup>b</sup>	526.40	23.02	5025.10

<sup>a,b</sup>Different letter in the same row refers to statistically significant association at  $p < .05$ .

1\$=3.65 TL (average exchange rate in 2017).

Keeping sick animals separate from other animals (quarantine application) is an important factor in preventing the spread of diseases and providing hygiene conditions. When the farms were examined in terms of this feature, it was determined that 58.7% of farms had a separate section for the sick animals.

It was observed that the farms that have the milking machine and system were conscious about hygiene practices besides the annual maintenance of the machine. About 44.6% of these farms perform the machine disinfection process after each milking period and apply it regularly.

The pen cleaning process is done 2–3 times a week in more than half of the farms (54.3%). This is followed by the frequency of cleaning every day (42.4%).

### **Descriptive analysis of some data according to milking method used in farms**

Table 4 presents the findings of the descriptive analysis of some variables according to the milking methods applied in the farms. According to the findings, large-scale farms constitute the majority of farms that use milking machines. It is observed that the number of animals in the farms with the milking machine is higher on average. The difference between these two groups was statistically significant for this variable ( $p < .05$ ). In the farms with the milking machine, total milk production was found higher on average with the number of animals comparatively (40,897.72 kg/year). There was a statistically significant difference in milk production between the two groups ( $p < .05$ ).

Milk yields per animal were calculated as 2.10, 2.07 and 1.70 kg/d by small, medium and large-scale farms, respectively. According to the milking method, when the milk yields per animal were compared, it was found that the milk yield was 2.04 kg/d for hand milking method and 1.86 kg/d for machine milking. It has been seen that the maximum average milk yield per animal is 4.37 kg/d in machine milking. In terms of the duration of lactation, it was determined that the

duration was increased in the farms that apply the method of milking machine.

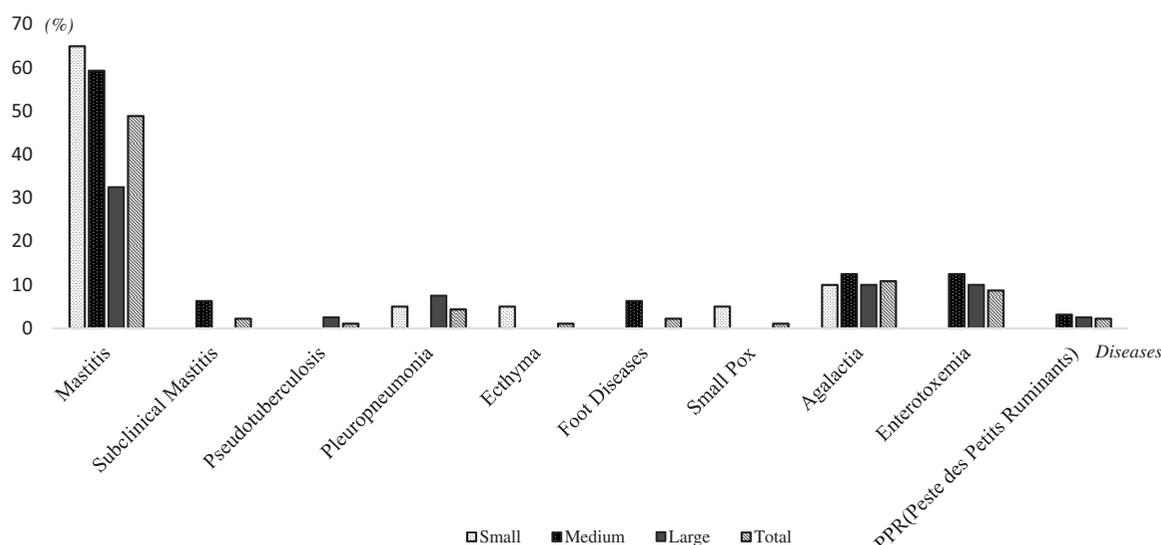
As the average building equipment maintenance repair and depreciation costs are compared, it was seen that this value was higher in the farms with the milking machine. Significant differences were found between the groups in terms of total maintenance and depreciation cost ( $p < .05$ ).

It is important to know the health problems frequently encountered in animals in order to take measures to protect animal health and to manage herd management effectively. Figure 1 shows the distribution of the diseases seen in farms in terms of scales. Breast diseases are among the most common health problems in the farms (61.9%), followed by, digestive system diseases (8.6%), bacterial diseases (5.4%), foot diseases (2.1%) and viral diseases (4.3%), respectively. In terms of scales, it was found that mastitis was the most common problem in small farms and the incidence decreased as the farm scale enlarged. The method of hand milking in small-scale farms increase the incidence of disease in herds in case of the lack of adequate attention to hygiene rules during the application, the low rate of training of the owners in terms of breeding, and the lack of sufficient knowledge about herd management and protection from diseases.

### **Discussion**

Saanen goats constitute the whole goat breed raised in the farms covered in the study. This breed has the ability to adapt to different climatic conditions. However, high milk yield can only be achieved under good care and feeding conditions (Ceyhan and Karadağ 2009). Achieving these conditions is also closely related to training levels of farm owners and education on hygiene.

In a study on goats, primary, secondary and high school education levels were found to be 65%, 10% and 25%, respectively (Koyuncu et al. 2006). In another study which was carried out in Diyarbakır province, the education level of the farmers has been reported



**Figure 1.** Distribution of diseases in farms by scale (%).

as 73.6% of primary school, 21.6% secondary level and 4.8% level of education at high school level (Araç and Daşkiran 2010). In a study conducted in small ruminants' farms in Van province, primary, secondary, high school and university education levels were found as 46.10%, 17.88%, 7.5%, and 0.6%, respectively (Karakuş and Akkol 2013). In our study, it was observed that 63.04% of the farms had the primary education, 14.13% of them had a secondary and high school education, 8.69% of them had university education level. It is noteworthy that the level of education of farm owners was concentrated in the primary school level. The low level of education in the farms and the lack of technical knowledge can be related to the other problems (increase in the incidence of the disease, the level of production and the low quality).

In a study conducted on goat farms in Northern Italy, 8.7% of the farms use hand milking method while 91.3% of them perform machine milking. The farm with a separate milking room has been determined as the rate of 48% and using gloves during milking was 18.8% (Sandrucci et al. 2018). However, Delgado-Pertiñez et al. (2003) have found in a study conducted in Spain, that even machine milking was more hygienic, the farms using machine milking had a greater bacteriological contamination, and those using hand milking with few animals had lower somatic cell number. In another study carried out in Italy on Sardinian goat farms, the ratio of using milking machine has been found 27% in total of 151 farms (Usai et al. 2006). It is known that the use of machine milking and milking systems as the milking method has started to become widespread in Turkey. However, this ratio was low compared to Italy,

which is a member country of the EU. In another study, they stated that the milking method was 1.5% milking with machine and 98.5% milking by hand (Kızıloğlu and Karakaya 2014).

Steenveld et al. (2012) have examined the technical efficiency of the use of automatic milking system in dairy cattle farms and the investment cost was found to be higher because of high maintenance and depreciation costs. Similarly, in our study, maintenance-repair and depreciation costs of building and equipment were higher in farms where the milking method was applied with a machine than in the ones apply manual milking method.

In another study, the most common diseases of Saanen breed goats for 3 years and the effectiveness of protection methods from these diseases were examined (Üstüner et al. 2011). Among the common diseases, they stated that there were 44.3% of the diseases of the digestive system, 23.3% of the respiratory system diseases, 4.9% of the foot diseases, 2.3% of eye diseases and 7.4% of the diseases of the breasts have been observed. In Turkey where Saanen goat breeding is developing, they emphasised that some respiratory diseases, diarrheal diseases and especially ecthyma, which may cause big economic losses, should be considered carefully in health protection and herd management practices. In one study, it has been found out that the external parasites (31.6%) were a main problem in goat farms (Bilginturan and Ayhan 2008). In our study, the most encountered diseases were similar and the most common disease was breast diseases.

In one study carried out in goat farms in Çanakkale province has been seen that 68.4% of the farms made

pen cleaning every day and 79% of them were called to veterinarians for health problems and vaccination. These rates were found to be greater than the results of our study. Similarly, to our study, it has been observed that all of the farms struggle for internal and external parasites at least once a year. However, only 20% of the farms had a separate birth area at a lower rate than our study (Koyuncu et al. 2006). In another study, it was found that the rate of having a birth area was 17.2% in the farms and 8.3% in a separate area for sick animals (Kızıloğlu and Karakaya 2014).

One of the measures to be taken in the prevention of foot diseases that may occur in farms is the regular application of foot bath and nail cutting. Especially in animals that do not leave for long periods of nail elongation was observed that this situation can cause diseases such as lameness and limping observed in the animal walking (Bingöl and Mevliyaoğulları 2015). In our study, although the majority of the farms leave the animals into the pasture, nail care was applied in more than half of the farms (53.3%). In relation to this, the rate of foot diseases in farms was lower than other diseases.

In one study carried out on dairy goat farms with different type of breeds in Greece, Katanos et al. (2005) have mentioned that traditional milking technique has a negative impact on the quality of milk and its products as well. The average milk yield per day was found as  $1.99 \pm 0.11$  kg in Saanen breed and it was higher compared to other breeds such as Damascus, Saanen  $\times$  Local, Saanen  $\times$  Alphin and (Saanen  $\times$  Local)  $\times$  Saanen. It has been stated that higher milk yield is positively correlated with the adaptation of different breeds of animals to the machine milking. The value of yield was found to be greater than our value which is 1.86 kg/d with machine milking.

From the perspective of economic efficiency, one of the main objectives of using automatic milking system in both cattle and ovine dairy farms is to maximise milk production (Bach and Cabrera 2016). When we look at the results of our study, it was seen that the amount of milk production in the farms using the milking system was higher in terms of this target.

## Conclusions

In this study, milking methods, hygiene and health protection practices and the most common diseases occur in the farms located in Çanakkale provinces and districts which have a significant share in Turkey in terms of Saanen goat breeding has been revealed. Generally, widely used automatic milking systems in dairy cattle herds in Turkey have been used in small

ruminants in recent years. This system has become indispensable to save the labour and to protect against the diseases which may occur in the herd with the increase of the animal population. As a result of the data analysis, it was determined that the rate of getting training about herd management and hygiene practices and the availability of milking machine and milking system was higher in large-scale farms, while various diseases occurring in the herd were higher in small and medium-scale farms. As the number of animals in the farms increased, it was observed that the desire to adapt to technology and innovation increased in parallel. Within this study, it has been determined that there is a need for information and awareness on raising and training activities about health and milk hygiene, herd and disease management issues in ensuring the products in compliance with EU hygiene and standards. In addition to the breeding improvements on Saanen goat in Turkey, it will be possible to reach the milk yield and production of Saanen goats like in other Mediterranean countries, that has an important place in goat milk production (such as France, Spain, Italy, Greece, etc.) in case of increasing the training and education level of the producers on milking hygiene standards and management practices based on the EU standards. As a result, in case of milking hygiene and health protection practices that directly affect milk yield, production and quality is applied, patient registration systems are kept regularly in the farms and farm owners are informed about hygiene and herd management practices, Saanen goat breeding can provide economic return to farms and can ensure sustainability in Turkey. Besides, if the EU standards are provided in the farms in terms of milk quality, hygiene and management conditions, Turkey can also take its share in global market as long as the EU countries don't reach self-sufficiency in sheep and goat production.

## Acknowledgments

We would like to thank to Çanakkale Sheep Goat Breeders Association, which provides coordination in communication with goat farmers, and to Saanen goat farmers who patiently responded to the survey questions and shared their precious time with us.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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