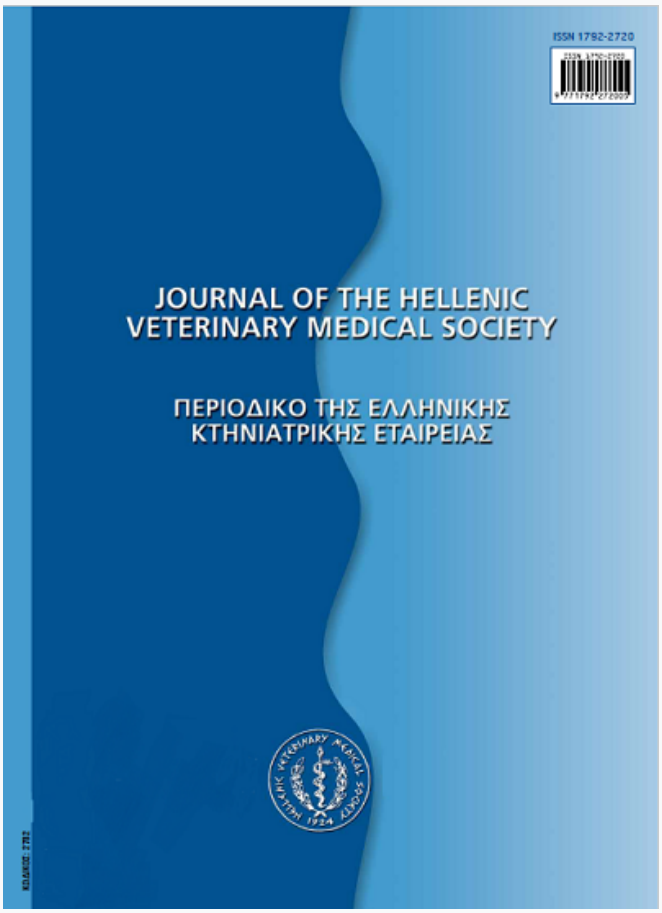
Journal of the Hellenic Veterinary Medical Society

Vol 69, No 1 (2018)



An overview of sheep farming features and management practices in the region of south western Peloponnese and how they reflect on milk microbial load

E. MANOLOPOULOU, A. AKTYPIS, C. MATARA, P. TSIOMI, E. KONSTANTINOU, K. MOUNTZOURIS, S. KLONARIS, E. TSAKALIDOU

doi: 10.12681/jhvms.16421

To cite this article:

MANOLOPOULOU, E., AKTYPIS, A., MATARA, C., TSIOMI, P., KONSTANTINOU, E., MOUNTZOURIS, K., KLONARIS, S., & TSAKALIDOU, E. (2018). An overview of sheep farming features and management practices in the region of south western Peloponnese and how they reflect on milk microbial load. *Journal of the Hellenic Veterinary Medical Society*, *69*(1), 759–770. https://doi.org/10.12681/jhvms.16421

J HELLENIC VET MED SOC 2018, 69(1): 759-770
ΠΕΚΕ 2018, 69(1): 759-770

Research article
Ερευνητικό άρθρο

An overview of sheep farming features and management practices in the region of south western Peloponnese and how they reflect on milk microbial load

Manolopoulou E.[1*], Aktypis A.[1], Matara C.[2], Tsiomi P.[2], Konstantinou E.[2], Mountzouris K. [3], Klonaris S.[4] and Tsakalidou E.[1]

[1] *Department of Food Science and Human Nutrition, Agricultural University of Athens, Athens, Greece*

[2] *Hellenic Agricultural Organization-DIMITER, Athens, Greece*

[3] *Department of Animal Science and Aquaculture, Agricultural University of Athens, Athens, Greece*

[4] *Department of Agricultural Economics & Rural Development, Agricultural University of Athens, Athens, Greece*

ABSTRACT. In this study the demographic features, various farm characteristics and milk quality parameters were investigated in sheep farms (n =128) from the North West Peloponnese region, using a prescreen questionnaire. The interviewed sheep farmers were under the control of the regional milk control laboratory of the Hellenic Milk Organization ELGO «Dimitra», which provided us with the corresponding milk quality data for the first quarter of 2014. Our findings regarding the demographic data demonstrated that 23% of farmers were 31-40 years old, 64% of them were high school graduates and 28% had received relevant farming general training; namely 17% of them has designated as "young farmers" in the frame of Third Axis of the Operational Program «Rural Development-Regeneration of the Countryside 2000-2006» and 11% have attended briefings by veterinarians and agriculturists. In terms of farm characteristics, it has been revealed that the mean flock size was 148 sheep and regarding the farming system, the majority of the farms (89.15%) applied a mixed extensive / indoors system. Additionally, regarding building infrastructures and the way of milking, there was limited technological penetration, since the buildings were old-style (77%) and the milking procedure was performed by hands (83%). Concerning the milk composition, the measurements showed mean values of (%) content of fat, protein, lactose and non-fat dry matter (NFDM) at 6.54±0.88, 5.56±0.36, 4.59±0.23 and 10.95±0.42, respectively. Furthermore, the mean value of the total bacterial count (TBC) was found 5.38±0.55 log cfu/ml and the pH value at 6.71±0.11. In general, sheep farmers had a

Corresponding Author:
Eugenia Manolopoulou
E-mail: mae@aua.gr

Date of initial submission: 18-10-2016
Date of revised submission: 17-1-2017
Date of acceptance: 11-3-2017

good perception of the integrated management and their prospect for sheep farming was optimistic. The impact of this study is that farmers increase their trust to the educational institutions and are prompted to become more receptive to new adaptive trends.

Keywords: sheep; milk; farmers; management; perception; training

ΠΕΡΙΛΗΨΗ. Στην έρευνα αυτή εξετάσθηκαν δημογραφικά στοιχεία, ζωοτεχνικά χαρακτηριστικά και παράμετροι της ποιότητας του γάλακτος σε εκτροφές γαλακτοπαραγωγικών προβάτων, στην περιοχή της βορειοδυτικής Πελοποννήσου. Η έρευνα περιέλαβε 128 εκτροφείς προβάτων και διεξήχθη με χρήση προσχεδιασμένου ερωτηματολογίου. Οι παραγωγοί στους οποίους έγινε η έρευνα, ήταν υπό τον έλεγχο του ΕΛΓΟ «Δήμητρα» και παρέδιδαν το γάλα σε μη αυτοελεγχόμενες τυροκομικές μονάδες. Από τα στοιχεία της έρευνας προέκυψαν τα πιο κάτω δεδομένα. Το 23.26% των κτηνοτρόφων ήταν από 31 έως40 ετών. Το 64% αυτών ήταν απόφοιτοι δευτεροβάθμιας εκπαίδευσης και είχαν παρακολουθήσει κάποια ενημερωτικά σεμινάρια γεωργικού και κτηνοτροφικού περιεχομένου ως «Νέοι αγρότες» (17%) ή από ενημερώσεις κτηνιάτρων της κτηνιατρικής υπηρεσίας της περιοχής τους (11%). Το μέσο μέγεθος της εκτροφής ήταν 148 πρόβατα. Στο 77% των ερωτηθέντων οι υποδομές ήταν παραδοσιακού τύπου. Πολύ περιορισμένη ήταν η τεχνολογική διείσδυση στο θέμα της άμελξης αφού στο 83% διεξαγόταν με παραδοσιακό τρόπο. Σε ότι αφορά την ποιότητα του γάλακτος, από τα δεδομένα των μετρήσεων που μας παραχωρήθηκαν από το εργαστήριο ποιοτικού ελέγχου του ΕΛΓΟ «Δήμητρα», υπολογίστηκαν οι μέσες τιμές της (%) περιεκτικότητας σε λίπος, πρωτεΐνη, λακτόζη και στο στερεό υπόλοιπο άνευ λίπους, στα 6.54 ± 0.88, 5. 56 ± 0.36, 4.59 ± 0.23 και 10.95 ± 0.42 αντίστοιχα. Επιπλέον, η μέση τιμή του συνολικού μικροβιακού φορτίου βρέθηκε στο 5.38 ± 0.55 log cfu/ml και η μέση τιμή του pH των εξετασθέντων δειγμάτων γάλακτος ήταν στο 6.71 ± 0.11. Από την επεξεργασία των απαντήσεων στις ερωτήσεις που απευθύνθηκαν στους κτηνοτρόφους, προέκυψε ότι σε γενικές γραμμές, οι εκτροφείς των προβάτων είχαν καλή αντίληψη σε θέματα που αφορούσαν την ολοκληρωμένη διαχείριση και η προοπτική για την εκτροφή προβάτων στο μέλλον φάνηκε να είναι αισιόδοξη. Ως αντίκτυπος της μελέτης αυτής φάνηκε ότι ενισχύθηκε η εμπιστοσύνη των κτηνοτρόφων στα εκπαιδευτικά ιδρύματα και από τη συζήτηση μαζί τους προέκυψε ότι είναι δεκτικοί σε αλλαγές και επιζητούν την ενημέρωση και τη γενικότερη υποστήριξη.

Λέξεις κλειδιά: Πρόβατο, γάλα, κτηνοτρόφοι, διαχείριση, αντίληψη, εκπαίδευση

1. INTRODUCTION

Sheep and goat farming in Greece is one of the most important sectors of animal production; it has been practiced for thousands of years by exploiting mountainous and semi-arid regions, which are not suitable for crop cultivation (Degen, 2007). Despite the existing difficulties and constraints, the sector remains of high economic and social significance for the country as a whole. It is thus considered that any decline will greatly affect large areas of the country, leading, among others, to the loss of a culture that has survived almost unchanged for centuries (Zygoyiannis, 2006).

The sheep and goat livestock in Greece extents to 9.5 million sheep and 4.5 million goats, compared to just 154.000 dairy cows. As a result, sheep and goat milk production amounts almost up to 60% of the total milk production while the remaining 40% stands for cow milk. Nearly 80% of sheep and goat milk derives from small and family farms, which are highly dependent on family labour, with almost 115.000 families engaged in farming and over 300.000 people working part or full time in dairy sheep farming sector. The small ruminant farming is more laborious considered mainly semi-intensive rather than intensive. Additionally, the milk processing sector comprises 53 big dairy companies processing > 5.000 tons of milk per year and 671 small and medium-sized enterprises (SMEs) or family dairy units processing < 5.000 tons of milk per year. A total of 730.589 tons of cow milk, 735.669 of sheep milk and

Table 1. List of Farms' characteristics

	Replies	(%) Percentage of replies
Demographic data		
Farmers' age		
	25-30	8.53
	31-40	23.26
	41-50	36.43
	51-60	22.48
	61-70	9.30
Farmers' educational level		
	Elementary	30.23
	Secondary	64.34
	Higher	5.43
Farmer' training		
	Yes	27.91
General Characteristics		
Farms' location		
	Hills	58.14
	Mountains	36.43
	Lowland	5.43
Flock size		
	<100	45.00
	100-300	49.00
	>300	6.00
Farming system		
	Mixed	89.15
	Indoor	7.75
	Transhumance	3.10
Breed		
	Local sheep	61.71
	Lacaune	6.20
Milk yield (kg)		
	<1,5	42.63
	1,5-2,0	52.64
Milking		
	Traditional	82.95
	Mechanical	17.05
Infrastructures		
	Traditional	77.34
	Organized	9.40
	Semiorganized	13.26

350.871 tons of goat milk is processing to a big variety of products, with the major ones being pasteurized milk, yogurt and cheese (Parpouna, 2016).

In Greece, the farms have a small herd size and are highly dependent on family labour. Usually lack mechanised milking systems, despite the attempts of restructuring and modernization in recent years. At the same time, it should be stressed that 19 out of the 21 Greek Protected Designation of Origin (PDO) cheeses are produced from sheep or goat milk or mixtures of them; EC Regulation 510 (2006), thus reinforcing the need to produce milk of good quality. However, there is still a need for intensifying reform efforts at both the level of animal farming and the milk processing. Proper training and life-long learning of farmers and cheese makers should be the basis of these efforts. The training programs should cover issues ranging from animal feeding and hygiene to the quality of the final products, as all these determine the value of the products and thus the economic cost-benefit ratio of the small enterprises.

Taking the above into account, the objective of this study was to provide an overview of sheep farming features and management practices in North Western Peloponnese and to evaluate milk and dairy products quality therein.

2. MATERIAL AND METHODS

2.1 Study area and participants

According to Hellenic Agricultural Organization - DIMITER (HAO-DIMITER) published data for 2013, the Greek sheep breeders for milk production, for 2011, amount to 40.000. However, the study area of the present work represents North Western Peloponnese and in particular the regions of Korinthos, Achaia and Eleia

Fig 1. The study area

(Figure1), which according to retrieved data from Hellenic Statistic Authority (HSA), for the year 2010 accommodate 4.000 sheep farms consisting the 10% of the total exclusive sheep farmers of Greece. Among them only the 176 exclusive sheep farmers are routinely controlled by the local quality control laboratory of HAO-DIMITER representing the 4.4% of the area sheep farmers. Out of them 128 were surveyed. The farmers' participation was voluntary and the participants hold the right to withdraw consent at any time, without excuse.

2.2 Data Collection

Research was carried out via personal interviews with the sheep farmers. For the purpose of this survey, a questionnaire of 36 questions was drawn up to obtain information about demographic and general farm data (10 questions) and estimate farmers' perception about welfare and health management aspects (15 questions), the animal feeding and milk yield issues (3 questions) the milk and dairy products' quality aspects (6 questions) and finally two questions concerned the perspective of farming conditions improvement and possible modification of flock size.

In order to assess the produced milk microbial load of the 128 surveyed sheep farms, data regarding 1318 milk samples were provided by HAO-DIMITER (Table 3), during the first semester of 2014 including two monthly measurements in average. After excluding outliners and log10 transformation in total bacteria counts data of milk properties were summarized by descriptive statistics.

2.3 Data analysis

Data collected from the farmers' replies were analyzed by Stat graphics Centurion Software (version XVII). Presentation of answers as (%) percentage is shown in Tables 1 and 2. Data were tested for Normality by the *Kolmogorov-Smirnov* test. For the milk microbial load evaluation, the mean values ± standard deviation of fat, protein, lactose, non-fat dry matter content, temperature, pH and bacteria total

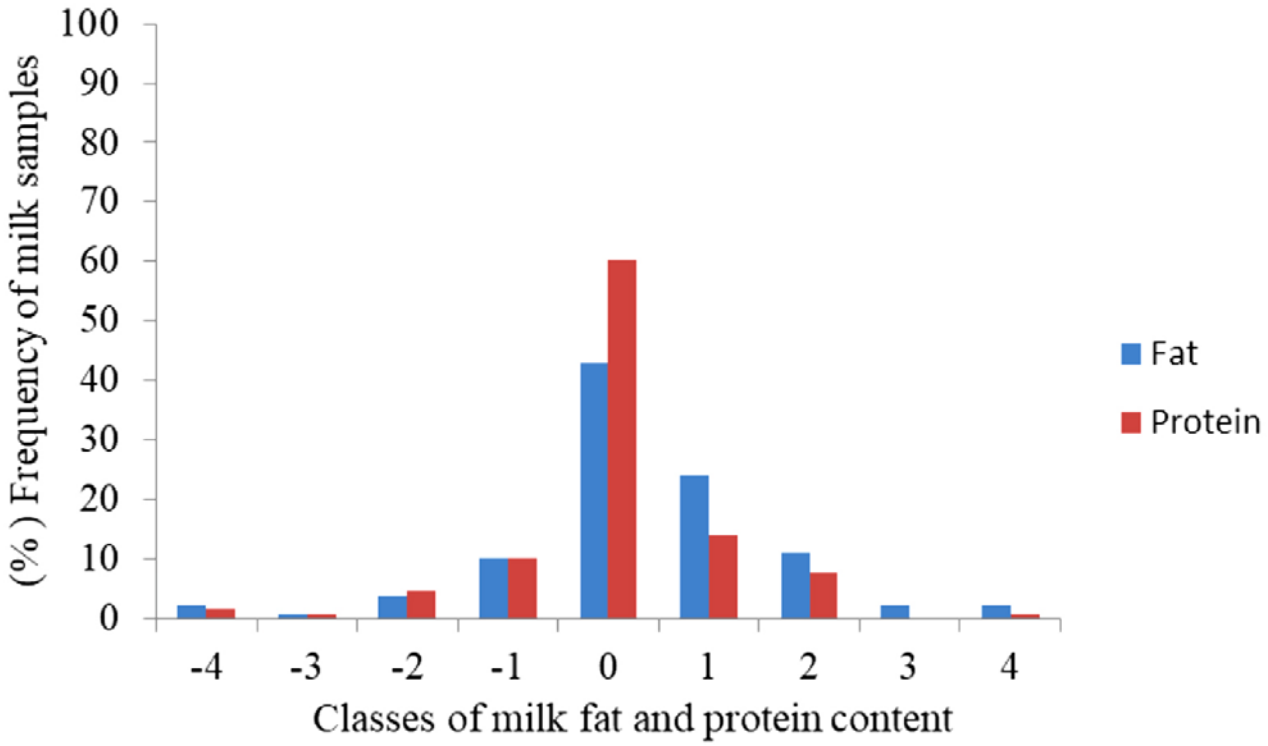


Fig 2. Classification of milk samples - Fat and Protein classes

counts' measurements were calculated. Particularly, data of fat content were classified in nine classes; one basic (0) ranging from 6.09 to 6.69, four awarding with increasing rate value of 0.3 coded as (1) 6.69-6.99, (2) 6.99-7.29, (3) 7.29-7.59 and (4) >7.59) and four penalizing classes with increasing rate value of 0.3 coded as (-1) 5.79-6.09, (-2) 5.49-5.79, (-3) 5.19-5.49 and (-4) <5.19). Regarding the protein content the rating was: one basic class coded as (0) from 5.33 to 5.73 four awarding classes with increasing rate value 0.2 coded as follows: (1) 5.73-5.93, (2) 5.93-6.13, (3) 6.13-6.33 and (4) >6.3 and four penalizing with increasing rate value of 0,2 characterized as (-1) 5.13-5.33, (-2) 4.93-5.13, (-3) 4.73-4.93 and (-4) <4.73. The milk microbial load expressed as colony forming units per ml (cfu/ml) was classified according to the evaluation of milk hygienic quality published by Pirisi et al. (2007), into four classes, namely class AA (≤ 200.000 cfu/ml), class A (200.000-500.000 cfu/ml, class B (500.000-1.500.000 cfu/ml) and class C(≥ 1.500.000 cfu/ml). From the above classification concerning fat and protein content and total bacteria count, emerged an estimation of the milk quality produced in the 128 farms as shown in (Figures 2 and 3).

3. RESULTS

3.1 Sheep farmers' demographic data and farm characteristics

The replies of the 128 farmers on the 36 questions are presented in Tables 1 and 2. All farms were conventional, family owned and operated. The majority of the farmers (68%) were between 25 to 50 years old while the rest (32%) over 50 years. Concerning educational and training level, even though 64 % of the farmers were high school graduates only 28 % has been trained on relevant sheep farming key topics, such as breed selection, pregnancy, lambing, grazing management, milk production, and/or sheep health. Regarding farm location the 58.14% of 128 farms was located on hills while the 36.43% and 5.43% were located on mountains and lowlands respectively. The total amount of sheep in all farms was 18.985,

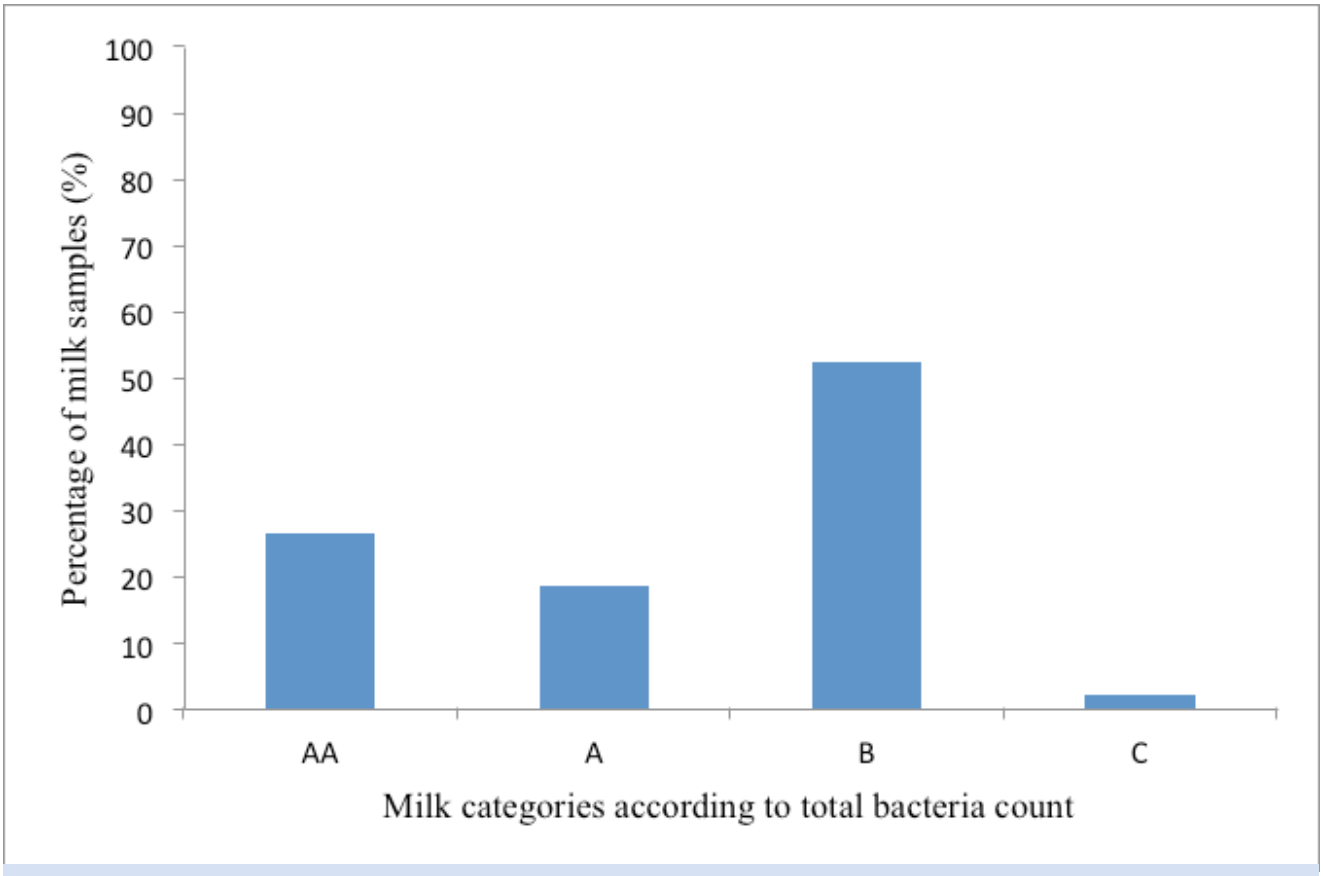


Fig 3. Classification of milk samples - Total Bacteria Count classes

averaged at 148 ± 11.29 with reliability 95% and confidence limit ±22.21. The flock size varied considerably among flocks, ranging from < 100 to over 300 sheep. Precisely, 84.49% of the farmers owned up to 200 sheep and only 15.51% between 200 and 1000 sheep. On the basis of the animal feed origin (farming system), the majority of the farms (89.15%) applied a mixed extensive / indoors system, 7.75% an intensive one, and only 3.1% was characterized as pastoral, as farmers move within the region and use the rights to graze on common pastures. The local breed was found in 61.71% of the farms. The daily milk yield was 1.5 kg at 52.64% (Table.2) during a milking period of 160-180 days. In most cases, milking was performed traditionally (83%) and only 17% of the farmers used milking machines. The bedding in the majority of the farms (77.34%) was wheat straw and there was no distinct parlour of milking.

Almost all farmers (99.2%) knew about the existence of differences among sheep and perceived the significance of this issue in sheep farming. The same was valid regarding the impact of the weather conditions (99%) and the farmer's behavior (100%) on sheep welfare, while 73.64% believed that pasture grazing favors best sheep living when compared to indoors feeding (10%) or combination 15.5%.

Farmers in their vast majority (99%) had understood the advantage of prevention vs. therapy and also the importance of udder anatomy in the sheep health (95%) and milk microbial load (89%) and thus they used it as an animal selection criterion for their flocks**.**

Regarding risk effects deriving from grazing, 70% of the farmers believed that these mainly affect the animal health while the rest 30% the milk microbial load. The one half of the farmers believes that these risks are related with bacteria and pests and the other with chemical substances.

As regards clinical or subclinical mastitis the 75% of them receive occasionally advice by a vet but only for the 35.94% of farmers the vet hold the health records; however, all farmers administered antibiotics to diseased animals even applying old prescrip-

Table 2. List of questions in the survey for sheep farmers' practices and perceptions

Questions	(%) percentage of positive replies
Do you believe that among sheep there are differences	99.20
Do you believe that farmer's behavior effect sheep welfare	98.45
Do you believe that weather affects the sheep welfare	100.00
Do you believe that pasture grazing is better for sheep welfare	73.64
Do you believe that indoors living system is good for sheep welfare	10.08
Do you believe that a combined living system is good for sheep welfare	15.50
Do you believe prevention is better than therapy for sheep health	98.45
Do you consider the udder shape of primary importance for the animals' selection	95.35
Do you consider the udder anatomy an important factor in milk quality	89.15
Do you consider as grazing risks the bacteria and pests or the chemical substances	50.00
The mentioned grazing risks affect the animal health or the milk quality	70.00
Is the diagnosis of mastitis performed by veterinarians	74.40
Do you apply antibiotics	99.22
Do you reject the milk of diseased and treated with antibiotics sheep	100.00
Who keeps the sheep health records	
The farmer	64.06
The veterinarian	35.94
For increased milk yield do you consider as more important,	
The food energy content	70.00
The food quantity	30.00
Does the feeding modification during lactation affect,	
The milk yield	20.00
The milk composition	40.00
Inadequate food consumption is estimated by	
The physical body condition	70.00
The milk yield	30.00
Do you consume raw milk	7.75
Do you consider raw milk as hazard for human health	90.00
Do you know that the bulk tank temperature is a risk factor for milk quality	98.40
Do you believe that raw milk quality ensures the safety and quality of dairy products	99.22
Does the manufacturing process affect the product quality	72.09
Do you know that the milk fat content is affected by the roughages' consumption	89.84
Can you improve,	
Feeding	38.75
Hygienic factors	27.90
Both of them	50.38
Do you plan to continue sheep farming	49.63

Table 3. Bulk tank milk samples characteristics

Milk parameters	Number of measurements (n)	Milk Parameter (Mean value ± s.d.)
Temperature (°C)	1308	4.37±0.65
Freezing Point (°C)	1170	0.56±0.01
pH	1318	6.71±0.11
Fat (%)	1238	6.54±0.88
Protein (%)	1240	5.56±0.37
Lactose (%)	1240	4.59±0.24
NFDM (%)	1239	10.95±0.43
Log (cfu/ml)	1223	5.38±0.56

*NFDM=Not Fat Dry Matter

tions. All were convinced that the milk of diseased sheep must be rejected in accordance to the instructions of the recommended therapy.

The nutrition was a primary concern for all farmers but the feeding system is not part of this article, which is only dealing with the farmers' opinions only on specific feeding aspects as shown in Table 2. The majority of the farmers (70%) considered the food energy content as the main factor for a high milk yield in contrast to the rest that considered the food quantity. However, 40% believed that the feeding system modifications during lactation affect milk quantity and composition. Moreover, 70% of the farmers trusted the physical condition as a good criterion for feeding assessment while the rest 30% considered the milk yield.

In order to determine farmers' perceptions on issues related to consumers' safety aspects, the 92.25% that means the 118 farmers comprehended that the raw milk consumption is hazardous for human health. The 125 (98%) considered the bulk tank temperature as the main factor for milk deterioration. All of them were convinced that the raw milk microbial load vastly ensures the quality and the safety of the dairy products while the 70% of them assessed the importance of the manufacturing process in the milk quality aspects. Regarding milk composition the 115 farmers (90%) knew about the effect of roughages' consumption in the milk fat content (Table 2).

When farmers were asked about factors that could improve the effectiveness of feeding and the hygienic conditions of their sheep farms, interestingly enough, almost 33% of the farmers replied that there is no space for improvement in the management of flocks and milk. Others believed that they could improve both feeding and hygienic conditions (50%) or simply hygienic conditions (28%).

Half of the farmers intended to continue the sheep farming either with the same flock size or they planned to increase it (Table 2).

3.2 Milk quality

All chemical and microbiological data were fitted to the Normal distribution when tested by the *Kolmogorov-Smirnov* test P-values, 0.477 and 0.29 respectively. The evaluation of milk samples' composition is shown in Figure 2. Regarding fat and

protein content 43 and 60% were fitted in the basic quality class respectively, which included the mean values for fat (6.54±0.8813) and then protein content (5.56±0.3665). The penalizing classes for both fat and protein content were found at the same level (17.18%), while the awarding ones were at 40 and 23% respectively. The microbial milk microbial load is shown in Figure 3. Thus, 26.56% of the samples were classified in class AA (excellent quality) and 18.75% in class A (very good quality). This means that 45.31% of the samples had a bacterial count load less than 500.000 cfu/ml, which it accepted as a critical threshold for the processing of raw milk without thermal treatment. On the contrary, the majority of the samples (52.34%) belonged to class B, which is considered as accepted by EC regulation 1662/2006 for cheese manufacturing after milk thermal treatment.

4. DISCUSSION

According to the results on the demographic characteristics, sheep farming is mainly practiced by men (87%) and in a lesser degree by women (13%). These results agree with a previous study on the region of Thessaly, Greece (Lioutas et al., 2010) and are higher than 76% with those reported by Giannenas et al. (2008) concerning Eordea Kozanis area in Northern Greece. Data regarding the age follow normal distribution with a maximum in the category of 41-50 and this is in accordance with the corresponding data of the above mentioned studies.

The 64.34% were high school graduates. In general, training is needed not only for knowing but also for behaving differently and managing their farms better. Even though farmers wish to attend training seminars, the majority of them (84%) replied that this is practically not feasible, since a) training seminars are usually conducted far away from their villages, b) according to their opinion, the seminar's content they do not meet their needs, and c) their opinion that their participation in an educational process will make them feel uncomfortable. Nevertheless, 27.91% have participated in training programs and it is high enough in relation with 3.4% reported by Lioutas et al. (2010).

Regarding the flock size, it was shown that most sheep farms were of low-intensity with a few animals, nevertheless flocks were bigger than those reported by Zervas et al. (1996) for the same area and smaller than the corresponding ones in North-Eastern Greece (Alexopoulos et al., 2011).

In regard to the farming system, differences were observed when compared to data reported for North-Eastern Greece by Alexopoulos (2011). Our findings revealed transhumance, indoor and mixed systems for 3.1%, 7.75% and 89.15% of the farms, respectively, while in North-Eastern Greece the respective numbers were 5%, 43% and 52%. The indoor farming system was very limited and this is in accordance to Zervas et al. (1996), who concluded that farming in Feneos, a location included in our study area, is characterized by an extensive livestock production system. As farmers admitted, the farming system depended "on their economic status and the weather conditions". According to their statement "the sheep farming is extensive when the weather is good and intensive when finances are prosperous".

Genetic material of various types and origins from different geographic areas has contributed to the foundation of Greek sheep breeds which date back to the very remote past, Hatziminaoglou et al., 1990. Since many foreign breeds have been imported into the country and are used in breed crossing with local ones, a large breed biodiversity appeared in sheep farms. This was confirmed by the current situation of the surveyed farms; where about 60% of the sheep consisted of a "specific local breed" according the farmers, while the rest of the animals were crossbred with either the Greek breeds Karagouniko and the sheep of Chios (34.00%) or the foreign breeds Lacaunae (6.20%). According Kominakis et al. (2001), the absence of integrated rational approach of breed improvement has led to reduction or even extinction of some rare indigenous breeds.

The mean daily milk yield was around the 1.5 kg at 95.27% of flocks and only for 4.73% the yield was around 2.5 kg. The increased milk yield may be attributed to the foreign breeds, like Lacaunae, joined in flocks (6.20%). In the study area the mechanical milking does not seem to be an extended practice, in contrast to the North-Eastern Greece where it is applied at 91%. It is known that although mechanical milking for small ruminants was intro-

duced in Greece in the early 1980s it has not been widely applied, probably due to either the insufficient diffusion of its advantages, or to the high investment cost. Maybe the size of farms and the limited financial sources were the reasons that in the majority of farms there was one main room divided in two places where milking system was available. This data are similar with the findings of Giannenas et al. (2008).

Regarding sheep welfare, farmers were aware of the fact that different behaviour among sheep could designate sheep diversity. The weather and the farmer's behaviour were considered as stressful conditions, when these were improper. According to welfare guidelines for sheep farmers the weather is a key factor (Guideline, 2003). This fits with the majority of the farmers who agree with the above and moreover believe that sheep live better, when these are free in grasslands.

Concerning health management, for 95% of the farmers the udder anatomy is a major criterion in animal selection, as it influences animal health, facilitates milking and affects the milk microbial load. The majority of the farmers (74%) collaborates with veterinarians rather fragmentary and applies treatment with antibiotics (99%) thus the 25% of farmers self-activate without preceding veterinary consulting. However, all farmers verified that milk from sheep treated with antibiotics must be rejected. Some farmers believed that the veterinarians were not qualified enough to properly deal with health management aspects, as previously reported by Kristensen and Enevoldsen (2008). The lack of systematic subsequent support from the side of veterinarians is pointed out by the low percentage (36%) of farmers, who replied that the health-treatment records were kept by the veterinarians.

All farms aim at increased milk yield of high quality for good milk price and manufacturing of quality products. Given that there are no official and global regulations on fat and protein content except the minimum requirements, in the frame of this study the bulk tank milk evaluation has been done only by fat and protein content and total bacteria count, according to Pirisi et al. (2007). This has been revealed that in the 83% of examined samples the (%) fat and protein content was equal or bigger to the threshold values of class (0) and at the 17% of the samples these were found lower. Regarding the evaluation of microbial quality bulk tank, the 98% of the samples appeared acceptable count. In addition, the microbial count of 45.31% of samples was less than 500.000 cfu/ml, the limit that permits to the milk to be treated without any previous thermal treatment. These findings were very interesting to evaluate production processes and cleaning given the great bacteria diversity found in the sheep farms, the lack of milking machines and maybe the inadequate operation of cold tanks according to D'Amico et al 2010. Freezing point estimation has also been used to identify adulteration due to water addition and the pH value as an estimator of milk microbial load (Morgan et al., 2001). The mean values were in accordance with values stated at the Codex Alimentarius (2003) (data not shown).

As small ruminants' milk is mostly transformed into cheese, its quality is mainly comprised in fat and protein content (Zervas, thus Tsiplakou 2011) thus the feeding is the major factor affecting sheep milk chemical quality and consequently the yield in cheese. According to Kitsopanidis (2000) from a productivity analysis of the farm resources used in sheep farming, the need for better use of the available pasture and more quantities of silage instead of concentrates, have been pointed out. Animal feeding affects animal energy balance, milk composition, and nutrition value especially in early lactation stage (Nudda et al., 2014) as well as the "terroir" profile of milk products (Martin et al., 2005). In this study, 70% of the farmers were aware of this, while 30% believed that the feed quantity has an impact mainly on milk yield and not on the nutritional value of milk.

The study highlights that the majority of farmers were aware of the risk factors associated with milk and dairy products quality; 90% of them knew that their health was in risk by consuming raw milk but, it was not clear to the farmers whether grazing risks could also influence milk microbial load. The farmers' perception that the herd size and the farm management practices influence bacteria counts in bulk tank milk is in accordance with Kelly et al., (2009) which studied the associations between herd management factors and bulk tank total bacterial count in grass-based dairy herds as well as the study of Alexopoulos et al., 2011, which also explored the role of different factors on

the quality of raw ovine milk. **T**he statement of 39% of farmers, that they should improve nutrition, could be correlated with farmers who supply milk of low fat and protein content, or those who follow unsatisfactory feeding. Concerning the microbial quality of milk, even though the high percentage of samples with high bacterial load, only a small percentage of farmers believed that they should improve the hygienic conditions of their farm. This is indicative of farmers' insufficient training on issues concerning the hygienic production.

Overall, despite these shortcomings, it is very optimistic that about 50% of farmers plan to continue the job of sheep farming and increase their flock size. The mean herd size consisted of 100-200 sheep while the herd had low genetic potential and therefore low productivity. The mean profile of the sheep farmer that emerged from this survey was a man of less than 50 years old, with high school educational level. He considered sheep farming as primary occupation and deals with this job for many years. He had not attended any training program even he very much wanted to do so. He had no feeding strategy. The limited farmers' finances resulted in insufficient veterinary support. The farming management was almost empirical. His knowledge was well established especially on milk hygienic quality issues and thus the microbiological milk microbial load was greatly within the limits of EC regulations. Even though in general he was not satisfied, he wanted to keep on farming but needs state support, technical assistance and training to improve the overall management and increase the consequent income as well.

5. CONCLUSIONS

The present study depicted the sheep herds' of NW Peloponnese current status and investigated the sheep farmers' level of knowledge with regards aspects of integrated production management of milk and dairy products. The survey highlighted positive outcomes regarding the age, the educational level, the good perception of many farming aspects and the willingness to continue and improve the sheep farming. On the contrary, as negative findings emerged the limited knowledge input through agricultural education/ training programs, the small flock size and the traditional farm infrastructures. Regarding the milk quality evaluation, the survey represented that objective of farmers must be to increase the milk quantity, to stabilize the composition in protein and fat and their ratio since protein ensures the cheese quantity and fat the cheese quality. Additionally, must be mentioned the farmers' belief that the establishment of a farmer-friendly environment is necessary and could contribute to the improvement of the sector growth, the advancing of the productivity, the labor conditions and their incomes. Considering the limited of actual farm data from Greek sheep flocks, the development of a technical manuscript addressing useful issues for the farm management system should be a useful future approach.

ACKNOWLEDGMENTS

We would also like to thank the scientific staff of the Hellenic Agricultural Organization-DIMITER for providing us with data and constant feedback that was essential for specific tasks of our study. Special thanks go to the dairy units' owners for their cooperation and the time they took to respond to the questionnaires designed in the context of the study. Authors are grateful to Eleni Kakrida, who teaches English at Agricultural University of Athens, for her assistance and assiduity in editing the study in the English language.

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