

## **REVIEW OF THE GOAT SECTOR IN THE REPUBLIC OF NORTH MACEDONIA: DISTRIBUTION, FARM SIZE, BREED STRUCTURE AND MILK PRODUCTION CAPACITIES**

**Kocho Porchu<sup>\*</sup>, Vladimir Dzabirski**

Ss. Cyril and Methodius University in Skopje, Faculty of Agricultural Sciences and Food-Skopje, Republic of North Macedonia

\*corresponding author: koco\_porcu@yahoo.com

### **ABSTRACT**

Goat sector is livestock branch that has its own specific unique history. Extensive to semi-extensive breeding system is the most prevalent in the country with moderate level of milk production. Recognition of the importance of goat breeding can be noted by continuous state support in the goat breeding. Variation of national goat flock is present with appearance of ascending and descending trends. There is a decrease in the number of farms, especially farms that breed from 1 to 5 and from 6 to 10 heads, but also an increase in the number of heads per farm, especially on farms with size from 25 to 50 and from 51 to 100. Most prevalent goat breeds in the country is Balkan goat (47.51 %). Different distribution of goat breeds is recorded in the country regions, East and Southeast region are leading regions in goat breeding. Raw milk production is in the range from 13584 t in 2015 up to 22864 t in 2018. Moderate milk yield per goat is present, the highest in 2011 (298 litres) and the lowest in 2015 (243 litres). Average purchase price of raw goat milk ranged between 0.29 and 0.31 euros/per litre in the period 2013-2019, which is twice less than the purchase price in EU countries. The improvement and utilization of the genetic capacity of the goat breeds, improvement of farming and feeding practices and continuous state support, education and research, as well as better organization of the farmers can be pointed out as general recommendations for improvement of the sector.

**Key words:** goat, farm size, breed structure, regional distribution.

### **INTRODUCTION**

Goat breeding in the Republic of North Macedonia has a specific history. The government of the former Socialist Republic of Macedonia has imposed an administrative ban on goat breeding on the territory of Macedonia in 1947 (Official gazette, no. 88, 1948, Y: IV), a measure that had disastrous consequences for goat production. Unfavourable state measures significantly affected the further development of goat breeding, resulting with the loss of goat breeding tradition as well as the loss of consumption habits of goat products. The goat breeding prohibition period lasted for more than forty years. As a consequence, the number of goats was rapidly reduced from 516800 heads in 1947 to 47000 in 1949, whereas more than 90 percent of the goats in the entire territory of the former Socialist Republic of Macedonia were slaughtered (Dzabirski et al., 1997). With the introduction of the law for goat breeding in 1989 (Official gazette, no. 21, of 18 May, 1989, Y: XLV), goat production was allowed after 42 years. Since then, the goat production in the country is characterized by spontaneous and continuous development, with increasing interest of farmers for goat production. Unfortunately, in the period after 1989 the number of goats in the country had not yet reached the registered number of goats in 1947. The specificity of goats is that they are easily adaptable to different farming systems, climatic conditions and terrains, where they can

take advantage of low-quality resources and transform them into high-quality products (Ruiz Morales et al., 2019).

The main aim of this paper is to assess the regional distribution, farm size and breed structure of goats and production level in the country as main indicators which will serve to evaluate the production capacity of different regions in the country, but also to recommend future activities for improving and increasing production from ruminants.

## **EU TRENDS IN GOAT SECTOR**

Small ruminant breeding sector constitutes just small share of the output of the EU livestock sector as a whole. It often takes place on pastureland in remote and disadvantaged rural areas, maintaining economic activity and delivering public goods in terms of landscape and biodiversity conservation. EU goat sector is oriented to milk production and is highly organized (with application of modern breeding programs, artificial insemination, record keeping, consultant services and developed dairy industry). The world dairy goat population, in the period 2007-2017, increased approximately for 22 % (Miller and Lu, 2019). Dairy goat products are present in both traditional and new markets, they are highly preferred for their health and nutritional benefits (Haenlein, 2004). European goat producers are oriented to raw milk and cheese production. Intensification and specialization of European goat sector can be noted by the level of production, 15.1 % of goat milk and 35.1% of goat cheese in the world are produced in Europe, although only 1.9% of world goat population is present in EU (Pirisi et al., 2007; FAO, 2019; Miller and Lu, 2019; Pulina et al., 2017). Greece, Spain, Romania and France are characterized with highest national goat flocks (6.3, 3.0, 1.5, and 1.2 million heads, respectively). Increased level of goat production in the period between 2007 and 2017 is noticeable in France (2.8 %), Greece (12.4 %) and Holland (35 %) (FAOSTAT, 2014). High level of goat biodiversity is present in EU, 187 breeds are existing in the continent or 33 % of the worldwide goat breeds. The most of them are autochthonous goat breeds and milk production is mainly based on few dairy goat breeds (Saanen, Alpine and Murciano-Granadina) (Gahal S., 2005; Ruiz Morales et al., 2019). Several types of goat production and management systems can be observed (continuous grazing, seasonal grazing, transhumance, or natural and cultivated pastures), with the grazing system as the most prevalent breeding system in South Eastern Europe (Ruiz Morales et al., 2009; Gelasakisa et al., 2017). Application of a specific breeding system is influenced by different factors such as agro ecological zones of the region and availability of agricultural land, pasture and labour (Ruiz Morales et al., 2019). One of the factors that had a positive impact on the development of the goat sector in Europe was the adoption of the European legislation on quality and hygiene standards set for milk and dairy products (Directives [EU] 92/46 and 94/71). As a result of the application of these measures, investments in machine milking were increased, which resulted in improved milk quality and goat flock health (Ruiz Morales et al., 2019). Diversification in EU small ruminant sector is represented through differentiation of flock size, breeds and scale of production. It is also characterized by low average income, low level of attractiveness to young farmers, remoteness of the production areas and infrastructure weaknesses, low level of modernisation, lack of training, ageing farmers, and structural and policy changes, which have a negative influence on the sector (Rossi, 2017; 2018).

## **GOATBREEDING –COUNTRY PROFILE**

The goat management system in the country is very seasonal. The mating starts at the end of September and kidding occurs from February to March. The birth-weight of the kids is around 2-2.5 kg and the body weight at 30 days is 7 kg. The kids are sold on the local markets at the same price as lambs, with live-weight between 10 and 15 kg. Most of the milk is sold to the dairy plants, but there is an increasing tendency for cheese production at a farm

level. Moreover, a proper market for goat products has not been established yet, even though there is a certain demand from export markets for standardized types of goat cheeses. The access of new markets for goat dairy products as a dietary and organic food is a very important topic in the country. Extensive goat dairy management is predominant, goats are mainly hand milked and there is a low level of application of modern systems for machine milking. Housing period of goats is highly dependent on the region where the farm is located but it is also connected with the goat breeding system and goat breeds present at a specific farm. Farms that are located in the country regions with mild winters and hot summers (Southeast and Vardar region) mainly breed Balkan goat. Housing period of goats is mainly in December, but only for a few days (when snow falls). Goat farms that are located in country regions with Continental climate conditions and farms that are located at a higher altitude have a longer housing period. There, the housing period starts from the middle of November until the end of February. Goat farms located in the Northeast, Polog and Pelagonija region have a shorter grazing period compared to farms located in the Southeast region. In these farms, the grazing period begins from the end of February or the middle of March and ends in October or the first half of November. The goat-grazing period in the country is divided in three groups that are defined by climate conditions of the region where the farms are located. In the first group, goats are grazing almost all year around and it lasts for 11 months. In the second group they are grazing up to 9 months, and in the third group, goats are grazing seven up to 8 months. Only one goat breeding organization exist in the country, Recognized Breeding Organization for Balkan goat. State support is available for each oat head with individual ear tag, each animal recorded in the state system of identification and registration of animals. Goat breeders can apply for direct payments (16.26 euros/head) if they breed at least 10 heads, or at least 5 heads if the agriculture holdings are registered in settlements with altitude greater than 700 m; second category are agricultural holdings with 50 up to 150 heads, they receive 17.89 euros/head. If goat farmers are breeding autochthonous Balkan goat and they are members of recognized national breeding organization than can receive additional direct payments of 8.94 euros/per registered breeding head (farmers should breed at least 50 breeding goats). All farmers can apply for additional direct payments for retained female breeding kid, direct payments are 0.19 euros per retained female breeding goat, aged at 6 to 18 months. Another direct payment measure is connected to the produced goat milk delivered to dairy plant/distribution centre. Farmers are receiving 0.07 euros/litre for sheep and goat milk. Registered organic goat farmers are eligible for direct payment for certified organic goat breeders, the breeder receives 8.13 euros per head.

## **REGIONAL DISTRIBUTION OF NATIONAL GOAT FLOCK**

The number of goats in the period 2000-2019 according to the State Statistical Office (SSO), and according to Food and Veterinary Agency (FVA) is presented in Figure 1. The size of national goat flock is followed by variation of goat number. According to official data from SSO in the period 2001-2005, there was a decreasing trend in the number of goats, than in the period 2007-2008 goat number is almost doubled regarding previous period. Next four years (2009-2012) are characterized with continuous reduction of national flock, and again in the period 2013-2018 continuous growth of national flock can be observed, to record a decline in the number of goats in 2019. In this study, two available sets of data are compared, data from SSO and FVA. A difference in data quantity between the two institutions is noted, especially in the period 2016-2018.

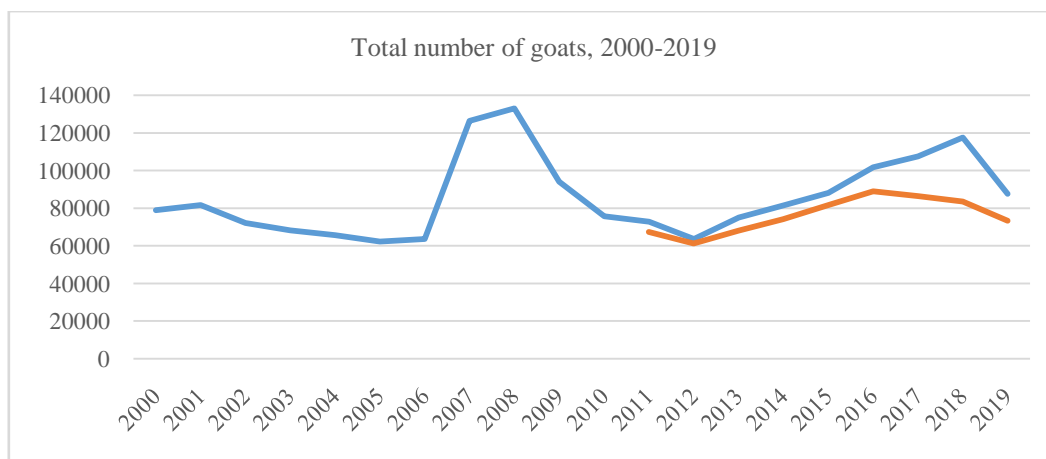


Figure 1. Goats’ number in the country

### GOATFARM SIZE

According to the FVA data, number of registered goat holdings in the period 2011-2019 is continuously decreasing, resulting in a decrease of 45.88% in the period of nine years. A short stabilization stage in the number of registered goat holdings is observed in the period 2013-2015, and downward trend is again noticed in the following years starting from 2017.



Figure 2. Registered goat holdings in the country

Goat breeding holdings in the country, according to FVA, are registered as holdings that breed: 1 to 5, 6 to 20, 21 to 50, 51 to 100, 101 to 200, 201 to 500 and over 501 heads. Trends in goat breeding holdings, regarding the goat number per holding, are presented in Figures 3 and 4. The data indicate significant changes in the structure of the holdings, reduction of the number of farms that breed one to five (number of farms is decreased by 19 % in the analysed period and the number of goats in these holdings was decreased for 10 %). Almost stable condition was recorded in the holdings with six to 10 heads. Tendency of increasing of the number of farms that breed 11 to twenty goat heads was detected (number of farms is increased for 7 % in the analysed period, but the number of heads in these holdings decreased for 6 %). Number of farms that breed 21 to 50 heads increased for 9 % in the analysed period and the number of goats in these holdings increased for 5 % (Figure 3). Positive tendency towards increasing the number of farms is present in the holdings with 51 up to 100 heads (number of farms is increased for 5 % and number of goats for 9 %), and in the farms that breed 101 do 200 heads (number of farms is increased for 1.45 %, followed with increased

number of heads in these holdings for 7 %). The number of farms with 201 up to 500 heads is slightly growing (0.36 %) but the number of goats increased for 5 %, while the number of farms with more than 501 heads is almost unchanged with recorded positive trend. The data indicate that although there is a downward trend in the total number of farms in the country, this reduction is especially expressed in farms that breed 1 to 5 goat heads. However, there is a pronounced consolidation and growth rate of the number of farms that have serious production capacities (especially farms with a size of 21-50 and 51 to 100 heads) (Figure 4).

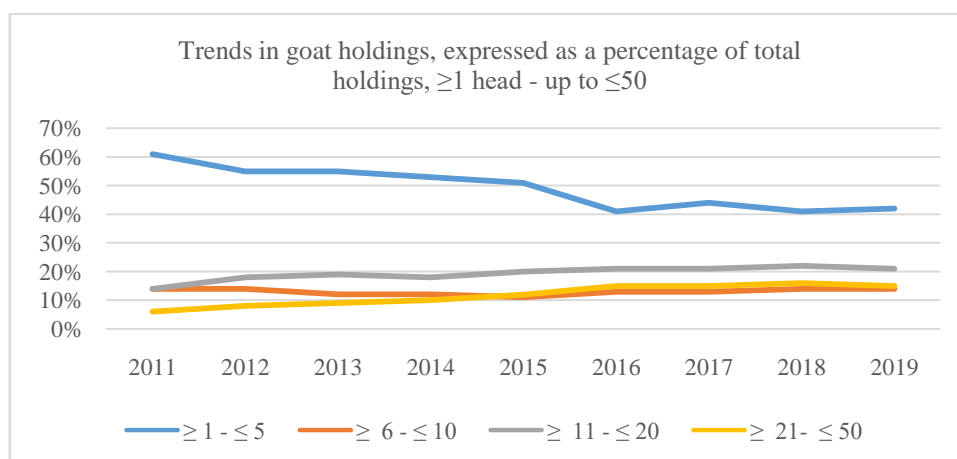


Figure 3. Trends in goat holdings that are breeding more than 1 and less than 50 heads

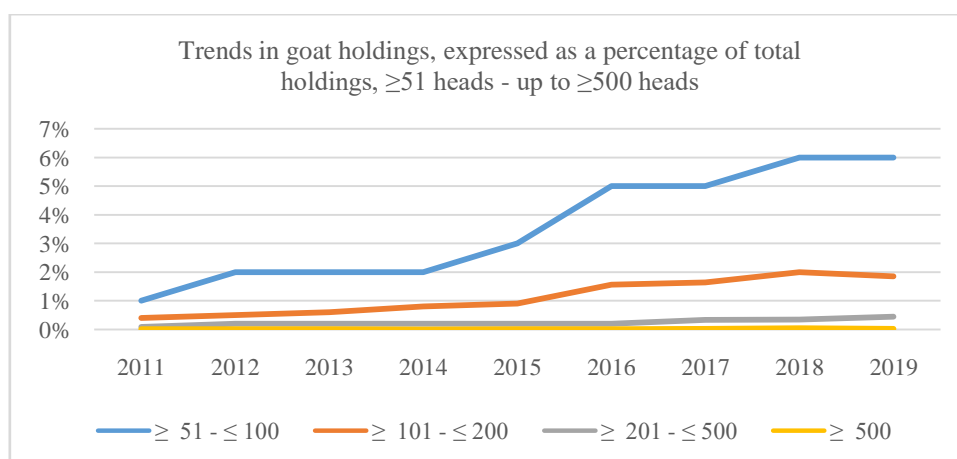


Figure 4. Trends in goat holdings that are breeding more than 51 and more than 500 heads

### GOAT BREEDS DISTRIBUTION

Identification and registration of animals in the country is carried out by FVA and authorized veterinary stations. According to them, autochthonous Balkan goat breed is the main goat breed in the country (47.51 % of the total number of goats belongs to this goat breed). Second most common goat type/genotype in the country is different/undefined types of crosses, represented with 22.02 % of goat population. From total number of the goats, 10.72 % belong to Alpine goat breed and 10.54% belong to Alpine crosses. Saanen goat breed is present with 4.60 %, while Saanen crosses with 4.24 %, and Murciana goat breed is the least (0.38%) represented goat breed (Figure 5). Applied breeding, management system and present goat breeds have a significant impact on the level of goat production in the country. Generally, in the country there is an unfavourable goat breed structure, with a low

degree of representation of dairy goat breeds and high level of presence of different kind of crosses.

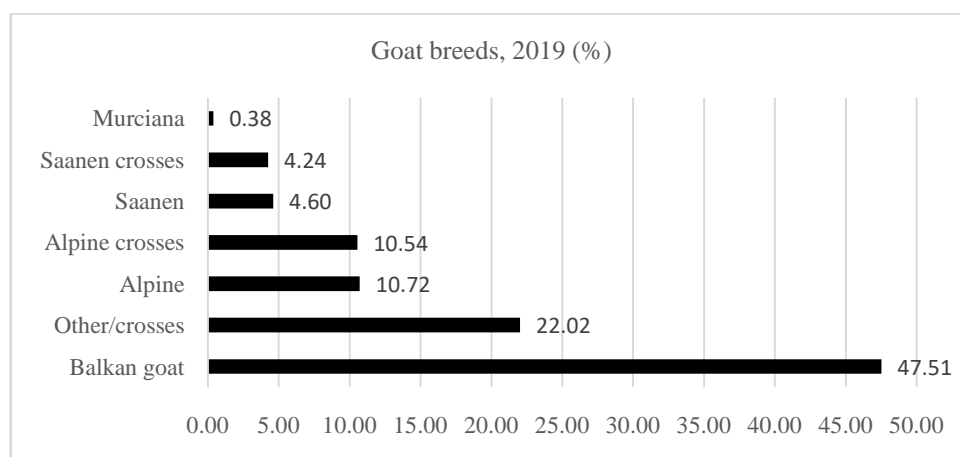


Figure 5. Goat breeds in the country, 2019

Different distribution of goat breeds is recorded in the country regions. Balkan goat breed is predominant goat breed in the Polog, Southwest, Southeast and Vardar region, Alpine and Alpine crosses are more frequent goat breeds in Skopje and Pelagonija region, while other/undefined types of crosses are most present in the Northeast and East region.

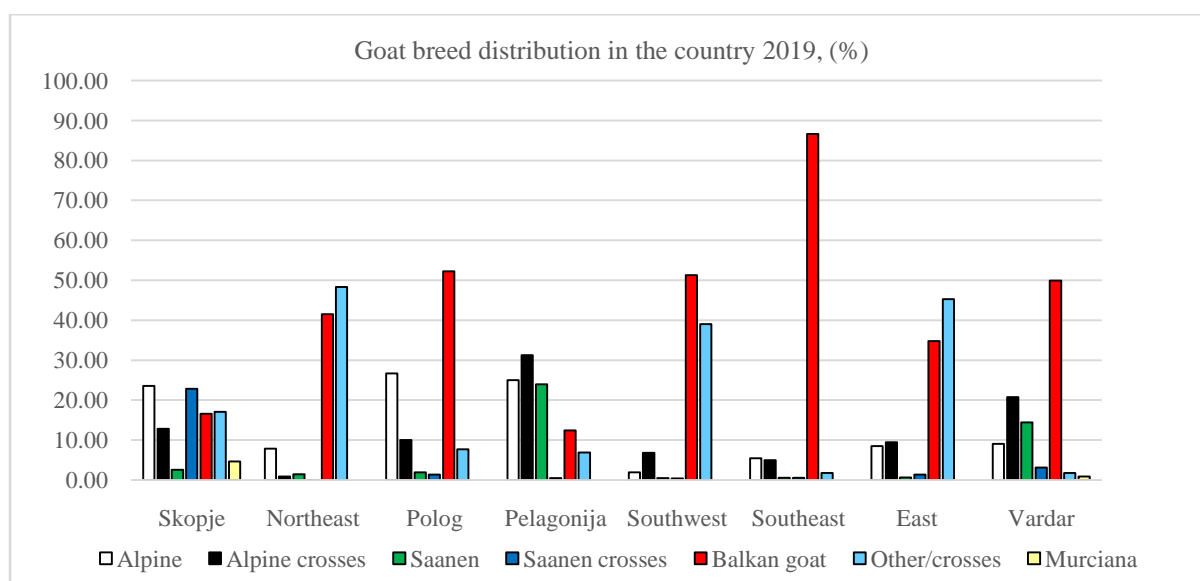


Figure 6. Goat breed distribution in the country regions 2019 (%)

Leading goat regions in the country are East (22.99%-30.07% of national flock is located in the East region) and Southeast region (24.19%-16.77% of national goat flock share, although there is a tendency of decreasing the number of goats). In Northeast (10.80%-7.92% of national flock), Vardar (10.55%-4.85% of national flock) and Polog region (8.65%-6.43% of national flock), goat breeding is less attractive and decreasing tendency in goat number is present. In Southwest (10.53%-18.48% of national flock) and Skopje region (6.18-13.45%) positive trends towards increasing goat number was recorded form 2016 up to 2018 and

reduction of goat number in both regions was recorded in 2019. The situation with the number of goats in the Pelagonia region (3.87%-5.25%) is almost unchanged (Figure 7).

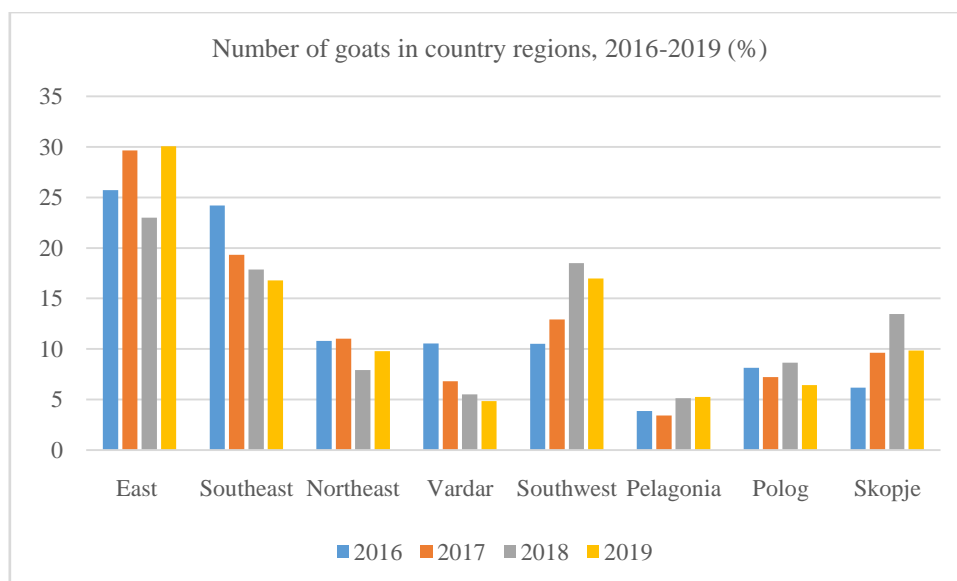


Figure 7. Number of goats in country regions, 2016-2019 (SSO, 2016-2019)

Trends in the number of milking goats in the country are presented in Figure 8. Total number of dairy goats in the country has a decreasing trend in the period 2009-2012, which stopped in 2012. Since 2013, the number of dairy goats is increasing, the highest number of milking goats is noted in 2018. The decline in the number of milking goats reappeared in 2019 at the equivalent of 2015 (Figure 8). The number of milking goats is strongly related to the total number of goats in the country, and the variation in the number of total goats in the country is highly reflected in the number of milking goats.

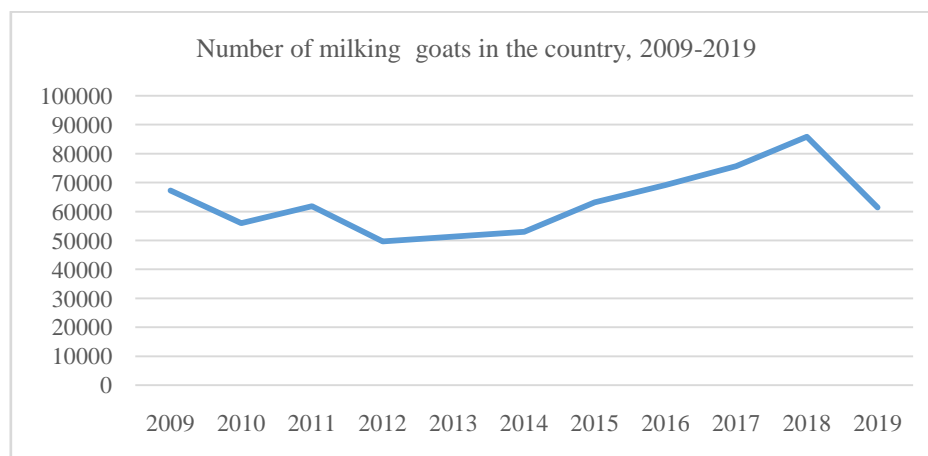


Figure 8. Number of milking goats in the country, 2009-2019 (Source: SSO, 2009-2019)

In the analysed period (2009-2019) the lowest raw goat milk production was recorded in the period 2010-2015, with the lowest value recorded in 2014 (Figure 9). Increased goat milk production was recorded in period 2016 (19 337 000 litres) and 2017 (19 250 000 litres) and it is equal to annual raw milk production in 2009. The highest annual raw goat milk production in the country was observed in 2018 (22 846 000 litres), downward trend in total

goat milk production is present in 2019 (Figure 9). Variation in raw goat milk production in the country is often connected with variation in total number of milking goats in the country.

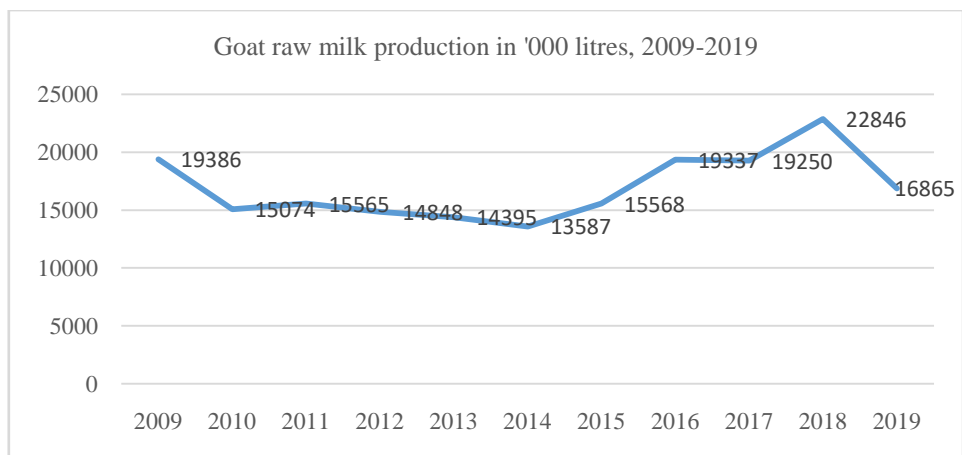


Figure 9. Goat raw milk production in '000 litres, 2009-2019 (Source: SSO, 2009-2019)

The average raw milk yield per goat (in the period 2009-2019) is 265 litres in the analysed ten year period, with the highest average raw milk production per milking goat in 2012 (298 litres) and the lowest recorded in 2015 (243 litres). In the analysed period, there were decreasing trends of average raw milk yield per milking goat. The first decreasing trend is recorded in the period 2009-2011, the second one was noted in 2012-2015 and the third one in the period 2016-2018 (Figure 10).

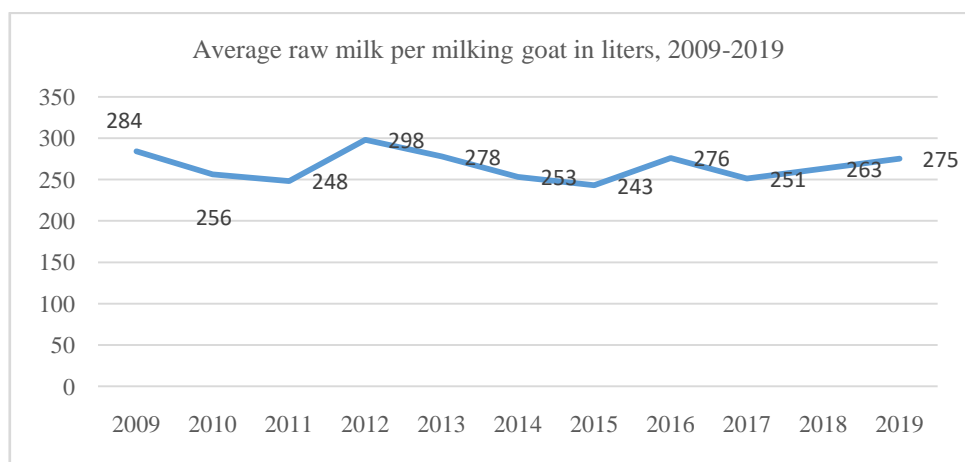


Figure10. Average raw milk per milking goat, 2009-2019, (Source: SSO, 2009-2019)

Main goat milk producing regions in the country are East and Southeast region. An increasing tendency of goat milk production was noted in the Eastern region in 2017, while decreasing tendency was present in the Southeast region in 2017. Vardar, Northeast, Polog and Skopje regions are the second goat milk production regions in the country, although they produce twice less than first two regions. There is a visible tendency that the reduction of the total milk produced is present in the most regions of the country. A growing tendency of the total milk produced is present only in the Southwest region (Figure 11).



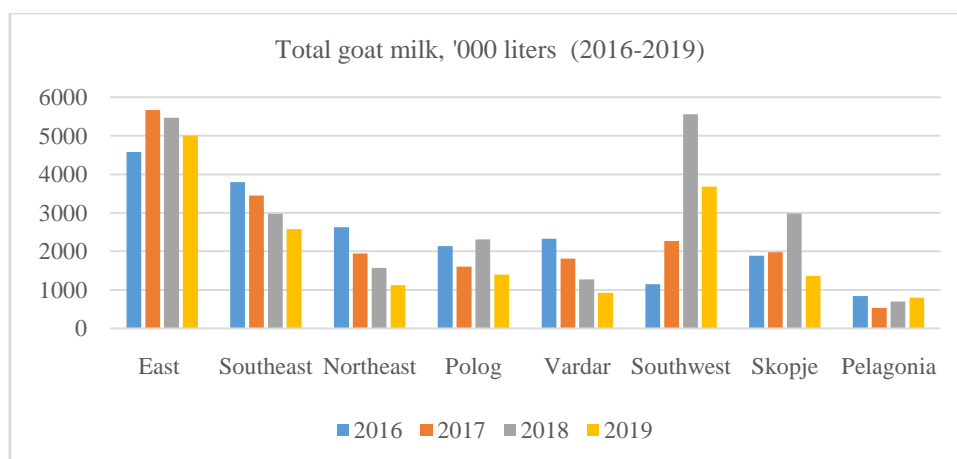


Figure 11. Total goat milk in country regions, 2016-2019, (Source: SSO, 2019)

The highest average raw milk yield per milking goat in the analysed period was recorded in Polog and Vardar regions, continuous average raw milk yield per milking goat was noticed in the East and Southeast region, while only in the Southwest region a continuous growth of average raw milk yield per milking goat was present. Decrease of average raw milk yield per milking goat was recorded in Skopje, Northeast and Pelagonia regions (Figure 12).

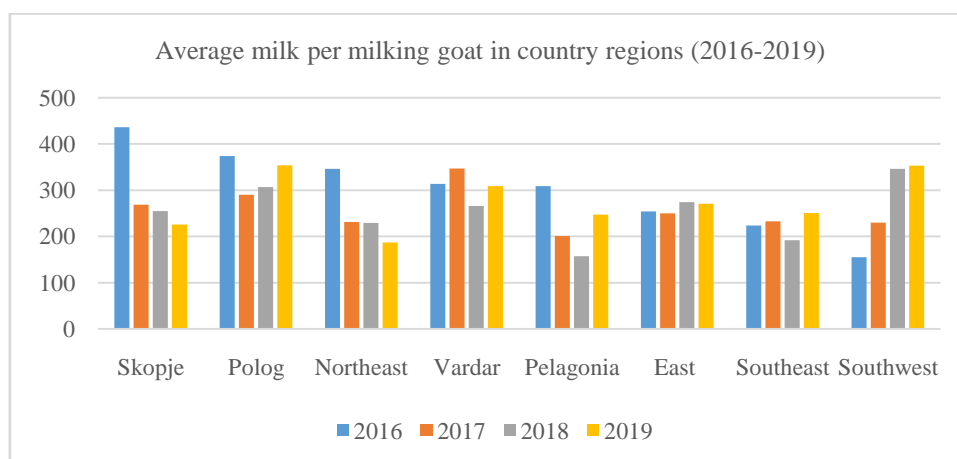


Figure 12. Average raw milk yield per milking goat in country regions, 2016-2019, (Source: SSO, 2019)

Table 1. Average raw milk yield per milking goat

Republic of North Macedonia	Average raw milk yield per milking goat (litres)				Average data 2016-2019 (litres)
	2016	2017	2018	2019	
	276	251	263	275	266.25

At country level, average raw milk yield per milking goat (litres) is in the range of 251 litres (in 2015) up to 276 litres (in 2016). Average milk yield per milking goat (Table 1) is higher than the average milk yield recorded in Greece and Italy (250 and 153.3 litres, respectively), but significantly lower than data recorded in France and Italy (589.3 and 421.5 litres, respectively) (Pulina et al., 2017).

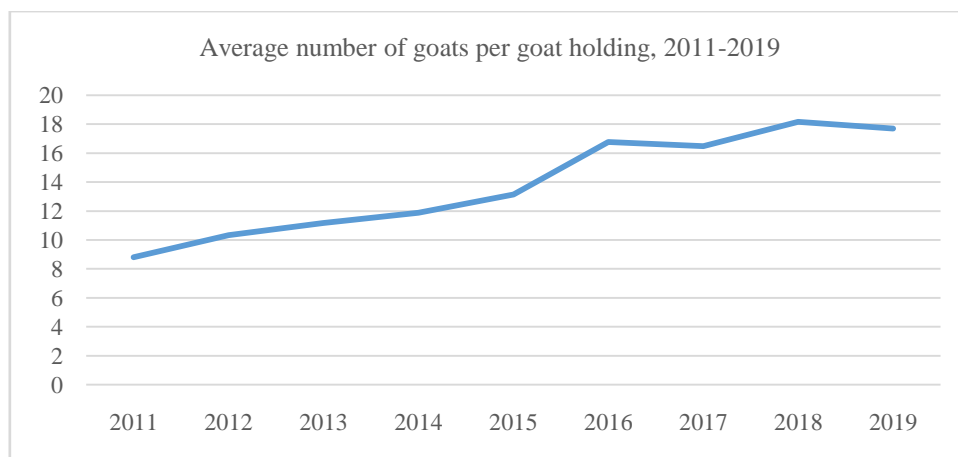


Figure 13. Number of goat heads per farm/holding

The average number of goats per holding (average flock size) in the analysed period is doubled (from 8.79 heads per holding in 2011 up to 18.15 heads per holding in 2018) and has clear increasing trend. Although this desired direction in development of goat breeding is present (increasing the average number of goat heads per farm) goat farms in the country are characterized with significantly lower average number of goat heads per farm compared with goat farms in countries with developed goat breeding. Reported average milking does/farm in France are 190.0 milking does/farm, in Greece 160.2 milking does/farm, in Italy 35.5 milking does/farm and in Spain 63.5 milking does/farm (Pulina et al., 2017). The average number of goats per farm in the country is even smaller compared to the data reported by Ruiz Morales et al., (2019) in grazing dairy goat farms in France (245 heads/farm, milk production, 100 heads/farm in farmhouse cheese production), in Spain (372 heads/farm) and in Greece (254 heads/farm).

The average purchase prices of raw goat milk in 2013-2019 (Table 2) were between 0.29 and 0.31 euro/per litre. Season of goat milk purchase in the country is from February to October. Purchase prices of raw goat milk in the country (Table 2) is twice lower compared to purchase price of raw goat milk in France, Spain, Italy and Greece (€ 0.514/L to € 0.695/L in France ; € 0.483/L to € 0.616/L in Spain; € 0.66/L to € 0.77/L in Italy and € 0.60/L in Greece) (Pulina et al 2017).

Table 2. Average purchase prices of raw goat milk, euro/per litre (Source: Agricultural and market informative system, MAFWE, 2013-2019)

Year	2013	2014	2015	2016	2017	2018	2019
Got milk (raw)	0.29	0.30	0.31	0.31	0.29	0.29	0.31

## CONCLUSIONS

Favourable climatic conditions in the county, restored tradition of goat breeding, developed national legislation in breeding and health care, continuous state support to the goat breeders provide preconditions for further development of the sector. Goat breeding in the country was influenced by a breeding ban, but this sector is successfully recovering. Traditional breeding system is present in the country, main goat breed is Balkan goat breed and the presence of goat dairy breeds is very small. A trend of reducing goat holdings with increasing goat heads per holding is noticeable. The difference in goat distribution between country regions is present, with high concentration of goats in some country regions and low interest for goat breeding in other regions. Variation of the number of milking goats has

significant influence on raw goat milk production. Average raw milk per milking goat is moderate and differs between country regions, but it is lower than recorded in goat leading countries. Goat milk purchase price is twice smaller than in the leading EU goat producing countries. The development of goat sector should be oriented towards increasing farm specialization and farm size, application of modern production technologies in dairy farming, improvement of breed structure on farms, improvement of feeding techniques and breeding dairy goat breeds. Goat breeding offers the possibilities to use natural pastures, self-employment and connection with other industries in the country.

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