

ANALYSIS OF SHEEP AND GOATS LIVESTOCK AND MILK AND MEAT PRODUCTION IN ROMANIA, 2007-2016

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Abstract

The paper aimed to analyze the trends in sheep and goat livestock, at national level and in the territory, animal density, milk and meat production, meat consumption, meat export, import and trade balance based on the empirical data provided by the National Institute of Statistics and Eurostat Data base in the period 2007-2016. For 11,358 thousand sheep and goats in 2016, Romania comes on the 4th position in the EU after United Kingdom and Spain. Also, it is on the 5th position for sheep and goats density (85.5heads/100 ha) after Greece, United Kingdom, Spain and Netherlands. Sheep and goats are raised all over the country, but sheep are mainly grown in the Central area, NW, W, and SE, while goats are especially in SE, S West Oltenia, S Muntenia, and N E. In Romania the concentration of sheep and goats livestock in the territory is a moderate one, as confirmed by the Herfindhal-Hirschman and Gini-Struck indices. In 2016, sheep and goat milk production accounted for 6,113 thousand hl in 2016, but only 6.95 % is collected by the industrial units, the remaining is destined to cover household needs. Sheep and goat meat production reached 182 thousand tonnes in 2015, reflecting a high growth rate (65 %) in the analyzed period. Sheep and goat meat is mainly produced in the SE, S Muntenia and W. Romania comes on the 10th position in the EU for sheep meat production after United Kingdom, Spain, France, Ireland, Greece, Italy, Germany, Netherlands, and Portugal. Romania is an net exporting country of sheep meat, as long as it has a surplus, and the domestic consumption is low. Romania has a high potential for producing more meat for the internal market and export. This requires the organization of sheep and goats raising associations specialized in young sheep males fattening, with a corresponding farm size to assure a high production and carcass quality. The national aids and coupled support help the breeders to develop meat and milk production in this sector.

Key words: sheep, goats, livestock, concentration, milk, meat, production, trade, Romania

INTRODUCTION

Sheep and goats are ruminants which could produce more milk and meat to feed the world population. Sheep and goats produce healthy milk and meat for human consumption. Their milk is rich in protein and fats, lactose and calcium, and other minerals and vitamins. The therapeutic effects of the goat milk are benefic for the people allergic to cow milk [17].

Sheep and goat meat is tasty, flavored and succulent, has a high nutritive and energy value [1].

In 100 g sheep milk, there are: 82.9 % water, 5.5 % protein, 5.9 % fat, 4.7 % casein, 4.8 % lactose, 197.5 mg calcium, 138 mg potassium, 141 mg phosphorus, 39 mg sodium, 19.5 mg magnesium, while in 100 g of goat milk there are: 87.6 % water, 3.7 % protein, 3.8 % fat, 2.4 % casein, 4.1. % lactose, 130 mg Calcium,

185.5 mg potassium, 109 mg phosphorus, 39.5 mg sodium, 14.5 mg magnesium.

In 100 g of sheep meat, there are: 144 kilocalories, 20 g proteins, 6.5 g fats, water 72 %, while in 100 g of lamb meat has 62 % water, 260 kilocalories, 18 g proteins, 20 g fats, and also B and C vitamins, calcium, iron. In 100 g goat meat, there are: 143 calories, 27 g proteins, 30.5 g fats, A, B, C,D,E,K vitamins, and iron [3, 7].

At the world level, in 2008, sheep and goats livestock accounted for 861.9 million heads, and respectively 1,087.2 million heads, the ratio between the two species being 1/1.25. Sheep are mainly raised in Asia (42 %) and Africa (26.7%)[2].

In 2013, world sheep livestock accounted for 1,172.8 million heads, of which Asia 44.8 %, Africa 27.73 % and Europe 11% [6]. In 2013, world goats livestock reached 1,005.6 million

heads, of which Asia 59.3 % and Africa 35 % [26].

World sheep milk production accounted for 10,4 million metric tonnes, of which Asia 46.54 % and Africa 23.5 % in the year 2014 [6]. In 2013, goat milk production reached 17.8 million MT [26].

World sheep meat accounted for 8.9 million MT, of which Asia 49.7 %, Africa 19.6 %, Oceania 13.5% and Europe 12.7 % [6]. And world goats meat production reached 5.3 million MT in 2012 being by 7.5 % higher than in 2008 [26].

A high demand for sheep meat is still available in the countries with a long tradition in production and consumption such as Australia, New Zealand, United Kingdom, Argentina and in the Arabian and African countries.

In the Western and Transoceanic countries, consumer preferences are oriented mainly to the meat produced by young fattened animals (35-49 kg/head at 5-6 month age), in the South-Eastern Europe, consumers prefer lamb meat (12-14 kg/head at the age of 45-55 days; 20-26 kg at 100 days), and in the Middle East countries it is preferred meat coming from the culled adult animals which are fattened for about 30-40 days. Meat coming from adult animals is extremely required for export in the Middle East countries [25].

Raising sheep and goats, people from the rural areas could have a useful activity in their household and farm, producing milk and meat for their family needs and for the market as well. Sheep and goats are able to graze the lands unsuitable for cultivated crops, in the marginal areas, and also the pastures and meadows. In this way, they do not compete with humans and other species for cereals consumption. At the same time, they could be a source of natural manure improving soil fertility, and also an important factor for preserving biodiversity, maintaining the local breeds and avoiding the "genetic erosion" caused by the utilization of specialized crossbreds [5, 11].

In the EU, there are 87.1 million sheep and 12.78 million goats, and the livestock has varied from a year to another, with a slight increase to 2016. The main EU countries

raising sheep are United Kingdom (23.82 million), Spain (15.96 million) and Romania (9.88 million), representing 49.66 % of the EU sheep livestock. The main countries growing goats are: Greece (3.9 million), Spain (3 million) and Romania (1.48 million), all together accounting for 66.19 % of the total EU goats livestock.

Sheep meat production recorded an important growth due to the contribution of about 85 % brought by United Kingdom, Spain, France, Ireland and Greece to the EU sheep meat output, while goat meat production is produced by Greece, Spain and France which together assure 93 % of the EU goat meat output [12].

The entry of the CEECs in the EU has determined a new orientation in sheep and goat raising from producing milk, live lambs, and wool, to produce meat and milk for the local and European market, and wool and skins for the domestic needs. Most of sheep and goats are grown in small subsistence and semi-subsistence households characterized by a low productivity in close connection with the low reproduction performance. However, a refreshment in sheep and goat sector is observed during the last years due to opportunities for live animals and meat export [24].

In Romania, sheep and goat raising is a traditional activity closely linked to transhumance in the Balkan area. Sheep and goats growing is advantaged in Romania due to its geographical position, the large variety of relief: mountains, hilly areas and plains with about 33 % of each, large surfaces of pastures (3.3 million ha) and meadows (1.5 million ha), representing 14 % and respectively 7 % of the total 14.6 million ha agricultural land.

Sheep and goats are well adapted to the local climate conditions, and are raised in small subsistence and semi-subsistence farms, requiring low maintenance costs and low energy consumption. Their milk and meat have a lower production cost compared to other farm species. The two species are a source of jobs and income for the local population and a factor of environment protection and development [27].

Sheep and goats could be grown in the marginal areas (mountain and submountain areas, etc) with semi-natural vegetation, contributing to the preservation of natural biodiversity, and at the same time stimulating production even in the subsistence and semi subsistence extensive systems of animal production by means of pastorship, transhumance and organic agriculture. More than these, sheep growing will continue the history of the Romanians within the Carpathian-Danube-Pontic space as a proof of the nation existence [8, 9].

In this context, the purpose of the paper was to analyze the dynamics of sheep and goat sector in Romania the period 2007-2016 emphasizing the main trends and Romania's potential in producing milk and meat for the local and EU market.

The evolution of the sheep and goat livestock, and its dispersion in the territory by micro regions, and its concentration degree in terms of Herfindhal-Hirschman index and Gini - Struck index. Also, the performance in milk and meat production, mainly in the industrial units have been also approached. Finally, the paper makes some remarks on sheep and goat meat export, import and trade balance.

MATERIALS AND METHODS

Data collection. In order to set up this paper, the empirical data have been collected from the various sources such as: Eurostat Statistics Explained, and National Institute of Statistics, Tempo online Data base for the period 2007-2016.

The main specific indicators taken into consideration have been the following ones: sheep and goat livestock, the density of sheep and goat per 100 ha, the distribution of sheep and goats in the territory by micro region, the livestock structure by micro region, the concentration degree of sheep and goats in the country, sheep and goat milk production at national level and collected by the industrial units, sheep and goat meat production at national level and collected by the industrial units, meat consumption, meat export, import and trade balance, Romania's position among

the EU countries regarding sheep and goat livestock and meat production.

The applied methodology consists of:

Fixed Index Method was used to reflect the changes of the variable value in the analyzed period, based on the formula: $I_{FB} = (X_n / X_1) * 100$, where: X = the variable taken into consideration, $n = 1, 2, 3, \dots, i$, the years of the chronological series. The term of reference was the year 2007=100.

Statistical parameters: mean, standard deviation, and variation coefficient.

Herfindhal-Hirschman Index (HHI) was used to determine the concentration degree, based on the formula:

$$HHI = \sum_{i=1}^n g_i^2 \quad (1)$$

Gini-Struck Index (GSI) was used to assess the concentration degree based on the formula:

$$GSI = \sqrt{\frac{n \sum_{i=1}^n g_i^2 - 1}{n-1}} \quad (2)$$

Comparison method was used to point out the position of Romania among the other EU countries regarding sheep and goat livestock and meat production.

The main results were tabled, illustrated in graphics and interpreted.

RESULTS AND DISCUSSIONS

Sheep and goat livestock has registered a continuous increase in the analyzed period.

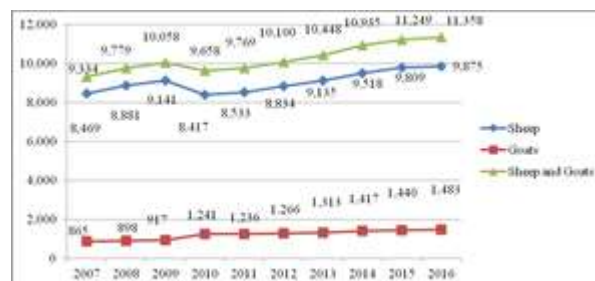


Fig.1. The dynamics of sheep, goats and sheep and goats livestock in Romania, 2007-2016 (Thousand heads)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The number of sheep grew up by 16.60 % from 8,469 thousand heads in the year 2007 to 9,875 thousand heads in the year 2016.

At the same time, the number of goats recorded a higher growth rate accounting for 71.44 % in the same interval of time, increasing from 865 thousand heads in 2007 to 1,483 thousand heads in the year 2016.

Taking into account sheep and goats together, the livestock increased by 21.68 %, from 9,334 thousand heads in 2007 to 11,358 thousand heads in 2016 (Fig.1.)

According to Eurostat, in 2016, Romania came on the 4th position for the sheep and goats livestock, accounting for 9.88 sheep and 1.48 goats million heads, after United Kingdom (23.82 sheep and 0.10 goats million heads) and Spain (15.96 sheep and 3.09 goats million heads).

Romania's sheep and goats livestock represented 11.3 % of the number of sheep and 11.6 % of the number of goats in the EU-28 (Table 1).

Table 1. Romania's position among the top EU countries growing sheep and goats in 2016

Country	Sheep livestock		Goats livestock	
	Million heads	%	Million heads	%
EU-28	87.10	100.0	12.78	100.0
United Kingdom	23.82	27.3	0.10	0.8
Spain	15.96	18.3	3.09	24.2
Romania	9.88	11.3	1.48	11.6
Greece	8.74	10.0	3.89	30.4
Italy	7.28	8.3	1.03	8.0
France	7.16	8.2	1.20	9.3
Ireland	3.44	3.9	-	-
Portugal	2.07	2.3	0.35	2.7
Germany	1.57	1.8	0.18	1.4
Bulgaria	1.36	1.5	0.24	1.8
Total	81.28	92.9	11.57	89.4

Source: Own calculation based on the data from Eurostat, Sheep population, Annual data, [14]

However, the growth of sheep and goat livestock is benefic for the EU-28 where it is an unbalanced demand/offer of sheep meat in the market. In the EU-28, the population of sheep declined by 1.5 % in the period 2007-2016, with just a slight increase in the year 2016 compared to 2015.

The highest decrease of 3.7 % was achieved by the goats population between 2010 and 2016. However, in 2016, the goats livestock in the EU increased by 2 % compared to 2015.

Romania has deeply contributed to the growth in goats number by +43 thousand heads, besides other contributors such as: Spain (+385 thousand heads), Italy (+65 thousand heads) and Netherland (+36 thousand heads) [12, 19].

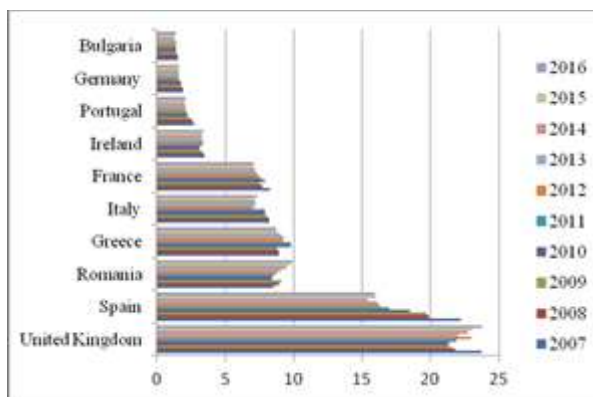


Fig.2. The dynamics of sheep livestock in Romania compared to the top EU breeding countries, 2007-2016 (Million heads)

Source: Own design based on the data from Eurostat Data base, 2017 [13]

The density of sheep and goat livestock.

Regarding the density of sheep and goats livestock, Romania comes on the 5th position in the EU, with 85.5 heads/100 ha, after Greece (332.9 heads), United Kingdom (140.4 heads), Spain (100 heads) and Netherlands (85.8 heads) (Fig.3.)

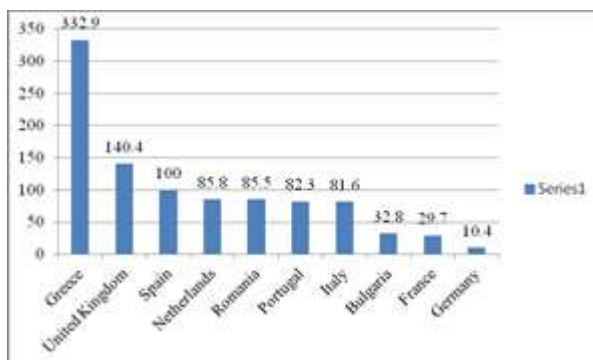


Fig.3. Sheep and goats density in Romania compared to the other top EU countries growing these species (heads/100 ha)

Source: Own design based on the National Institute of Statistics, Press Release no.124/May 15, 2017 [22]

The highest density of sheep accounting for more than 105 heads/100 ha was found in the Central region of Romania and the lowest one in Bucharest-Ilfov area (less than 25 heads/100 ha). The highest density of goats, more than 15

heads/100 ha, was found in the South region and the lowest density (3 heads/100 ha) in the West region [4].

The evolution of sheep livestock in the territory by micro region. The sheep livestock not uniformly distributed in the territory of Romania taking into account the soil and climate condition, the existence of pastures and meadows and of other feeding resources, and tradition.

In 2016, the highest number of sheep was concentrated in the Central part of Romania, 2,152 thousands heads, and the lowest number of sheep is raised in Bucharest-Ilfov area, only 31 thousand heads.

The importance of micro regions in sheep growing, in the decreasing order is: Central area, North West area, West region, South East, North East, South Muntenia, South West Oltenia and Bucharest-Ilfov.

In the Central area, the sheep number increased from 1,693 thousand heads in 2007 to 2,152 thousand heads in 2016. In the North West area, the sheep livestock grew up from 1,199 thousand heads in 2007 to 1,669 thousand heads in 2016. In the West region, the number of sheep increased from 1,137 thousand heads in 2007 to 1,515 thousand heads in 2016. In the South East area, it decreased from 1,491 thousand heads in 2007 to 1,485 thousand heads in 2016. In the North East region, it also declined from 1,432 thousand heads in 2007 to 1,403 thousand heads in 2016. In the South Muntenia, the sheep livestock increased from 823 thousand heads in 2007 to 934 thousand heads in 2016. In the South West Oltenia region, it increased from 671 thousand heads in 2007 to 686 thousand heads in 2016. Finally, in Bucharest-Ilfov area, the sheep number increased from 24 thousand heads in 2007 to 31 thousand heads in 2016.

In the analyzed period, in some regions, the sheep livestock increased: + 39.19 % in the North West, +33.24 % in the West region, +29.16 % in Bucharest-Ilfov area, +27.11 % in the Central region, +13.48 % in the South Muntenia, and + 2.23 % in the South West Oltenia, while in two regions, it declined by: - 0.41 % in the South East part, and - 2.03 % in the North East part of Romania (Fig.4).

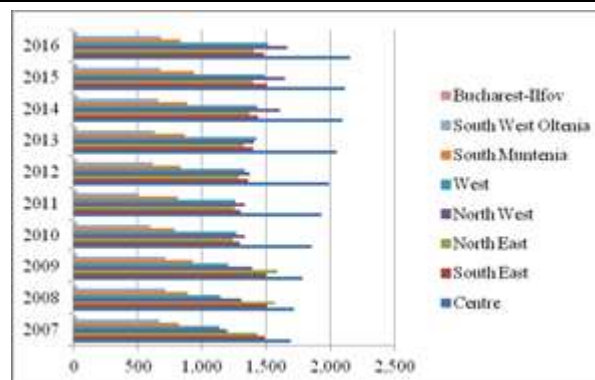


Fig.4. The dynamics of sheep livestock by micro region in Romania, 2007-2016 (Thousand heads)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The evolution of goats livestock in the territory by micro region. The number of goats is relatively differently distributed in the territory compared to the sheep livestock. The situation of the micro regions in the decreasing order of their number of goats is the following one: South East, South West Oltenia, South Muntenia, North East, Centre, North West, West and Bucharest-Ilfov.

In South East region, the number of goats increased from 173.8 thousand heads in 2007 to 288.6 thousand heads in 2016. In South West Oltenia, the goats livestock grew up from 145.5 thousand heads in 2007 to 231.9 thousand heads in 2016. In South Muntenia area, the goats number increased from 125.7 thousand heads in 2007 to 209.3 thousand heads in 2016. In North East area, the number of goats increased from 96.3 thousand heads in 2007 to 173.5 thousand heads in 2016. In the Central region, the goats livestock grew up from 69.3 thousand heads in 2007 to 108.7 thousand heads in 2016. In North West region, the goats livestock increased from 59.3 thousand heads in 2007 to 84.4 thousand heads in 2016. In the West region, the number of goats accounted for 36.4 thousand heads in 2007 and 55 thousand heads in 2016, while in Bucharest-Ilfov it registered 6.9 thousand heads in 2007 and 9.5 thousand heads in 2016. In the analyzed period the number of goats registered an important growth rate in all the micro regions as follows: + 80.16 % in North East, +66.50 % in South Muntenia, + 66.05 % in South East, + 59.38 % in South Oltenia, + 56.85 % in the Central area, + 51.09 in the

West region, +43.32 % in North West, and + 37.68 % in Bucharest-Ilfov (Fig.5).

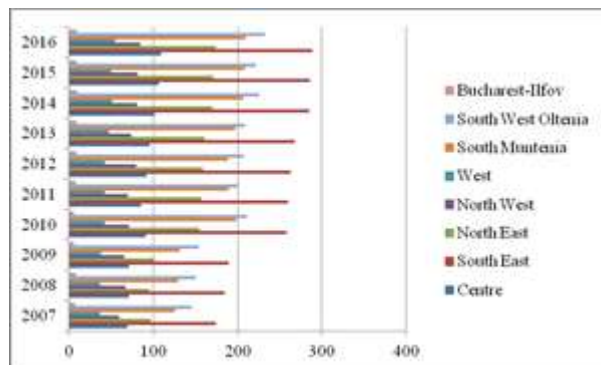


Fig.5. The dynamics of goats livestock by micro region in Romania, 2007-2016 (Thousand heads)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The dispersion of sheep livestock by micro region. In 2007, the dispersion of sheep livestock in the territory was the following one, in the decreasing order of the regions: Central area (19.9 %), South East (17.6 %), North East (16.9 %), North West (14.1 %), West (13.4 %), South Muntenia (9.7 %), South Oltenia (7.9 %) and Bucharest-Ilfov (0.5 %).

Table 2. The dispersion of sheep and goats livestock by micro region in 2007 and 2016, Romania (%)

Region	Dispersion of sheep livestock (%)		Dispersion of goats livestock (%)	
	2007	2016	2007	2016
Centre	19.9	21.8	9.7	9.4
South East	17.6	15.0	24.4	24.9
North East	16.8	14.2	13.5	14.9
North West	14.1	16.9	8.3	7.3
West	13.4	15.3	5.1	4.7
South Muntenia	9.7	9.5	17.6	18.0
South West Oltenia	7.9	6.9	20.4	20.0
Bucharest-Ilfov	0.5	0.4	1.0	0.8

Source: Own calculations based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

In 2016, the dispersion of sheep number by region has changed as follows: Center region remained on the top position (21.8 %), North West region passed from the 4th position in 2007 to the 2nd position (16.9%), West region

passed from the 5th position in 2007 to the 3rd position (15.3 %), South East region passed from the 2nd position in 2007 to the 4th position (15%), North East passed from the 3rd position in 2007 to the 5th position (14.2 %), South Muntenia remained on the 6th position (9.5 %), South West Oltenia remained on the same 7th position (6.9 %), and Bucharest-Ilfov remained on the last position (0.4 %) (Table 2).

The dispersion of goats livestock by micro region. In 2007, the percentage distribution of goats livestock, in the decreasing order, was the following one: South East (24.4 %), South West Oltenia (20.4 %), South Muntenia (17.6 %), North East (13.5 %), Center (9.7 %), North West (8.3 %), West (5.1 %), and Bucharest-Ilfov (1 %).

In 2016, the hierarchy of the micro regions remained the same regarding their contribution to the goats structure in the territory as follows: South East (24.9 %), South West Oltenia (20 %), South Muntenia (18%), North East (14.9 %), Centre (9.4 %), North West (7.3 %), West (4.7 %), and Bucharest-Ilfov (0.8 %) (Table 2).

The concentration of sheep livestock in the territory in terms of Herfindhal and Hirshman index and Gini-Struck index. The values of Herfindhal -Hirschman index (HHI) varied between 0.15232 in the year 2007 to 0.15540 in the year 2016. The highest HHI value (0.15645) was recorded in the year 2012, while the lowest HHI value (0.15142) was recorded in the year 2009. The HHI values are situated between 0.15 and 0.25 (0.15 < HHI < 0.25), reflecting that in Romania it is a moderate concentration of sheep livestock in the regions.

The same situation was confirmed by the Gini-Struck index (GSI), whose values varied between 0.1766 in the year 2007 and 0.1864 in the year 2016. The highest GSI (0.1895) was found in the years 2012 and 2014, and the lowest value (0.1738) in the year 2009. Therefore, Romania has a moderate concentration of sheep livestock in the territory (Table 3).

Table 3. The evolution of sheep and goats livestock concentration in Romania's territory in terms of Herfindhal-Hirschman index and Gini-Struck index, 2007-2016

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Sheep livestock										
HHI	0.1523	0.1517	0.1514	0.1554	0.1558	0.1564	0.1563	0.1564	0.1554	0.1559
GSI	0.1766	0.1747	0.1738	0.1854	0.1878	0.1895	0.1894	0.1895	0.1864	0.1878
Goats livestock										
HHI	0.1693	0.1698	0.1716	0.1777	0.1778	1.1771	0.1751	0.1749	0.1744	0.1730
GSI	0.2251	0.2263	0.2308	0.2454	0.2459	0.2440	0.2393	0.2387	0.2376	0.2343

Source: Own calculations based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The concentration of goats livestock in the territory in terms of Herfindhal and Hirshman index and Gini-Struck index.

The values of Herfindhal -Hirschman index (HHI) varied between 0.1693 in the year 2007 to 0.1730 in the year 2016. The highest HHI value (0.1778) was recorded in the year 2011, while the lowest HHI value (0.1693) was recorded in the year 2007. The concentration of the goats livestock is a moderate one in Romania as confirmed by the HHI values ranging between 0.15 and 0.25 (0.15 < HHI < 0.25). However, the HHI index in case of goats livestock is a little higher compared to the one recorded by the sheep livestock.

In case of sheep livestock, in the analyzed period, the HHI increased by 2.33 %, and the GSI increased by 6.34 %.

The same situation was confirmed by the Gini-Struck index (GSI), whose values varied between 0.2251 in the year 2007 and 0.2243 in the year 2016. The highest GSI (0.2459) was found in the years 2011, and the lowest value (0.2251) in the year 2007. Therefore, Romania has a moderate concentration of goats livestock in the territory.

In the analyzed period, in case of goats livestock, the HHI values increased by 2.18 %, and the GSI values increased by 4.08 % (Table 3).

The dynamics of sheep and goat milk production.

Sheep and goat milk production registered a large variation from a year to another depending on the sheep and goats milking livestock and the climate conditions with a deep influence on forage production.

In the year 2007, sheep and goat milk production accounted for 6,173 thousand hl, and in the year 2016 it reached 6,113 thousand

hl, meaning by 1 % less than in 2007. However, the top milk production, 6,520 thousand hl, was recorded in the year 2014, due to the increase of female milking livestock and a good year for forage production. The lowest milk production, 5,813 thousand hl, was registered in the year 2009 (Fig.6).

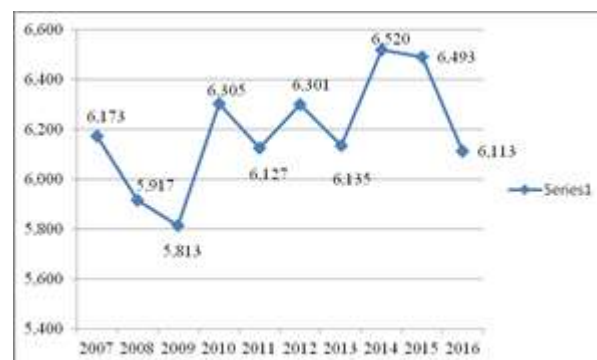


Fig.6. The dynamics of sheep and goats milk production in Romania, 2007-2016 (Thousand hl)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

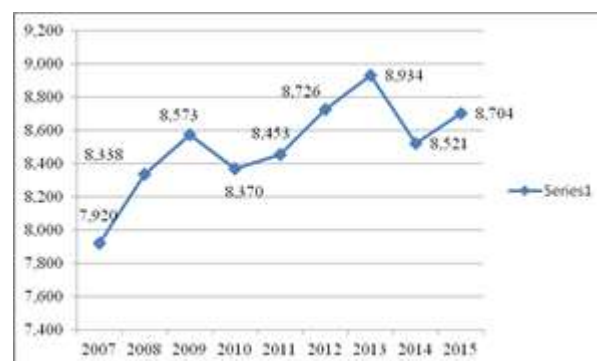


Fig.7. The dynamics of female sheep and goats milking livestock, 2007-2015 (Thousand heads)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The evolution of sheep and milk production was determined by the dynamics of the female sheep and goats milking livestock. In 2007, it

accounted for 7,920 thousand heads, while in the year 2015, it reached 8,704 thousand heads, by 9.89 % higher than in 2007 (Fig.7).

Sheep and goats collected milk production in the industrial units, increased much more, by 135.3 % in case of sheep milk, and by 295.97 % in case of goats milk.

The highest sheep milk production, accounting for 29,679 tonnes, was collected by industrial units in the year 2015, and the highest goats milk production, accounting for 16,829 tonnes, was also collected in the year 2015. This was a result of the increased number of sheep and goats and also due to the slight growth in average milk production in case of the both

species. The amount of collected milk was stimulated by the higher price offered by processors and by their interest in the diversification of milk products for the market (Table 4).

Taking into account the total sheep and goat milk production in terms of tonnes, the share of total sheep and goat milk production collected by the industrial units is very small, but with an ascending trend from 2.65 % in the year 2007 to 6.95 % in the year 2016. This reflects that most of sheep and goat milk production remains in the household for human consumption and for producing cottage cheese (Table 4).

Table 4. Sheep and goats milk production collected by the industrial units, Romania, 2007-2015 (tonnes)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 %
Sheep milk	12,608	13,634	13,729	16,406	14,345	15,759	18,122	27,280	29,679	235.3
Goat milk	4,250	4,026	4,008	3,856	3,366	4,677	7,166	15,001	16,829	395.97
Total collected milk	16,850	17,660	17,737	20,262	17,711	20,436	25,288	42,281	46,508	276.01
Sheep and goat milk production in tonnes	635,800	609,400	598,730	649,400	631,100	649,000	631,900	671,500	668,800	105.19
Share in total sheep and goat milk production (%)	2.65	2.89	2.96	3.12	2.80	3.14	4.00	6.30	6.95	262.26

Source: Own calculations based on the National Institute of Statistics Press Releases on Meat, milk and milk products in the industrial units, 2008-2016 [23]

The dynamics of sheep and goat meat production. Sheep and goat meat production increased by 65.45 % from 110 thousand tonnes in 2007 to 182 thousand tonnes in 2015. The increase in meat production was stimulated by the growth of sheep and goats livestock in the country, but also by the increased number of slaughtered sheep and goats, the increased total live weight at slaughter and the average live weight per animal (Fig.8)

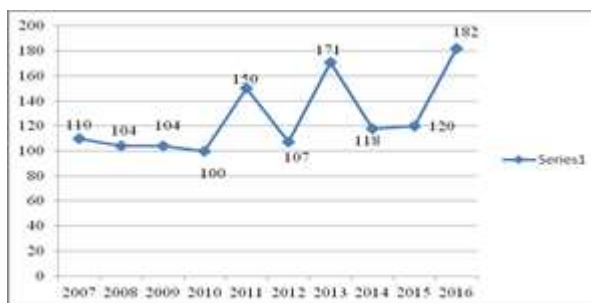


Fig.8. The dynamics of sheep and goats meat production in Romania, 2007-2016 (Thousand tonnes)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The average live weight of sheep and goats at slaughter increased by 33.33 %, from 18 kg/head in 2007 to 24 kg/head in 2016 (Fig.9).

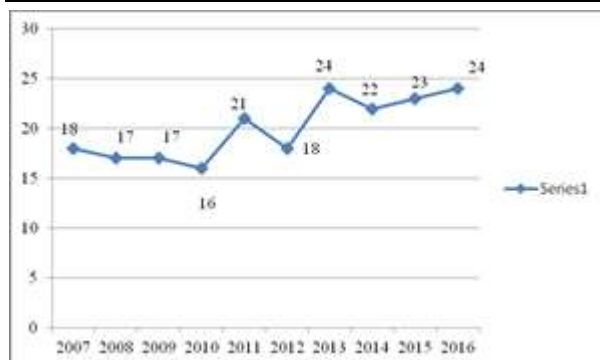


Fig.9. The dynamics of sheep and goats average live weight at slaughter in Romania, 2007-2016 (kg/head)

Source: Own design based on the National Institute of Statistics, Tempo-online Data base, 2017 [21]

The sheep and goats meat production achieved in the industrial units has recorded a continuous ascending trend. First, because of a larger number of slaughtered sheep and goats. In the industrial processing units, in 2016 there

were slaughtered 726 thousands sheep and goats, by 360.9 % more than in the year 2007 (157.5 thousand heads).

Also, the total live weight at slaughter increased by 452.16 %, from 3,723 tonnes in 2007 to 20,557 tonnes in the year 2015.

This situation was positively influenced by the increased number of sheep and goats, by the increased average live weight at slaughter and by the higher request for sheep and goat meat for export.

The average live weight at slaughter accounted for 28.3 kg/head, being by 19.9 % higher than in 2007, when it accounted for 23.6 kg/head.

As a consequence, the sheep and goat total carcass weight increased 5 times from 1,849 tonnes in 2007 to 9,256 tonnes in 2015 (Table 5).

Table 5. Sheep and goats meat production in the industrial units, Romania, 2007-2015

	MU	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015/2007 %
No. of slaughtered Sheep and goats	Thousand heads	157.5	198.2	120.2	376.8	357.6	190.3	259.4	379.3	726	460.9
Sheep and goats total live weight	Tonnes	3,723	4,397	2,683	9,348	9,248	5,176	7,119	10,650	20,557	552.1
Average live weight at slaughter	Kg/head	23.6	22.2	22.3	24.8	25.9	27.2	27.4	28.1	28.3	119.9
Sheep and goats total carcass weight	Tonnes	1,849	2,138	1,349	4,432	4,142	2,414	3,206	4,833	9,566	500.5

Source: Own calculations based on the National Institute of Statistics Press Releases on Meat, milk and milk products in the industrial units, 2008-2016 [23]

Table 6. The share of sheep and goats slaughters in the most important micro regions in the total slaughters in the industrial units in Romania, 2007-2015 (%)

2007	2008	2009	2010	2011	2012	2013	2014	2015
SE 43.7 % SMuntenia 24.9 % Center 14.9 %	SE 27.3 %, SMuntenia 29.2 %, West 16.7 %	SE 38.2 % SMuntenia 22.4 % Centre 9.5 %	West 40.1 % SE over 20% SMuntenia 14.2 %	West 40 % SMuntenia 35.5 % NW 9 %	West 37.5 % SMuntenia 26.4 % NW 10 %	WEST 51.4 % SMuntenia 18.7 % NW 9.6 %	West 50.1 % SMuntenia 30.3 %	West 35.3 % SMuntenia 28.4 % SE 20.1 %

Source: National Institute of Statistics Press Releases on Meat, milk and milk products in the industrial units, 2008-2016 [23]

This has determined a change in the structure of meat production.

In 2007, the situation was the following one: poultry meat 50.46 %, pork 38.72 %, bovine

meat 10.38 %, and sheep and goats meat 0.44 %. In 2015, the structure of meat production in the processing units has become the following one: poultry meat 49.38 %, pork 43.54 %, bovine meat 5.86 5 and sheep and goats meat 1.22 % [23].

In the analyzed period, the highest slaughters of sheep and goats were recorded in general in the regions with a high number of animals (Table 6).

Romania's position in the EU-28 sheep and goat meat production. Taking into account sheep meat production achieved in 2016, Romania is situated on the 10th position in the EU-28, after United Kingdom, Spain, France, Ireland, Greece, Italy, Germany, Netherlands, and Portugal.

The market share in the EU sheep and goat meat production is very small, just 1.1 %, compared to 40.6 % for the United Kingdom, 16.4 % in case of Spain, 11.6 % France, 8.5 % Ireland, 7.6 % Greece, 4.3 % Italy, 3 % Germany, 1.8 % Netherlands , and 1.4 % Portugal (Fig.10.).

However, having a high growth rate of sheep and goats livestock and also of sheep and goat meat production, Romania is considered an important meat producing country for the EU, where sheep meat production increased by + 2.5 % in 2015 compared to 2014. The increase of meat production in the EU is determined by the important growth of meat production in United Kingdom, Spain and Romania. In 2016 it increased by 2.1 % (+907 thousand tonnes)

compared to 2015. Goat meat production is relatively constant at about 45 thousand tonnes in 2015 and 2016 [12].

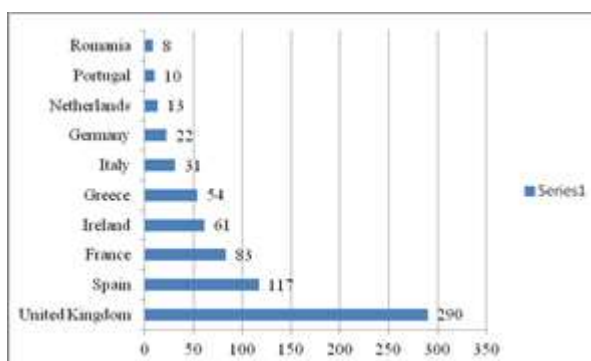


Fig.10. Romania's position among the top EU-28 sheep meat producing countries in 2016 (Thousand tonnes)
Source: Own design based on Eurostat Statistics Explained, Meat production statistics, [15].

Considering the positions occupied for sheep and goat livestock, the lower position kept for meat production reflects that the potential in meat production is not enough exploited in Romania. And the fact that in the EU is a high demand for sheep and goat meat, it is an opportunity for Romania to increase the average weight at slaughter and carcass quality in order to increase sheep and goat meat production and facilitate its intra-EU exports.

The statistical parameters of the main indicators characterizing sheep and goats sector. The values of mean, standard deviation and coefficient of variation for the main indicators characterizing sheep and goats sector in Romania are presented in Table 7.

Table 7. The statistical parameters of the main indicators characterizing sheep and goats sector in Romania, 2007-2016

	MU	Mean	St. Dev.	Var. Coeff. (%)
Sheep livestock	Thousand heads	9,172	994.14	10.83
Goats livestock	Thousand heads	1,174	436.99	37.22
Sheep and goats livestock	Thousand heads	10,346	1,431.18	13.83
Sheep and goats milk production	Thousand hl	6,143	424.20	6.90
Female sheep and goats milking livestock	Thousand heads	8,312	554.37	6.66
Sheep and goats meat production (Live weight)	Thousand tonnes	146	50.91	34.86
Average live weight of sheep and goats at slaughter	Kg/head	21	4.24	20.19

Source: Own calculations.

Sheep and goat meat consumption. In Romania, in 2013, mutton and goat meat consumption accounted for 2.4 kg capita (4.4% of the total meat consumption). At present, it is only 2.1 kg/capita, representing only 10 % of

the total meat consumption/inhabitant (60 kg/year), coming on the 4th position after pork, pork, and beef [20].

Sheep and goat meat is mainly consumed by the people living in the rural areas, in the

mountains, in the central part with a long tradition in shepherding, but also in the steppe and arid areas, and by the minority population of Turkish, Greek, Macedonian, Serbian, Bulgarian etc origin [16].

Compared to the EU sheep meat consumption representing only 2.5 % (1.9 kg/capita) of the total meat consumption, in Romania, the sheep meat consumption is a little higher by + 0.2 %). However, in the future, the demand/offer ratio will be not balanced as long as it is expecting as the sheep meat exports to continue the increasing trend and the import will continue its decline leading to a lower availability of sheep meat on the EU market.

As a result, in Romania, there is a surplus of sheep and goat live animals and also meat from these two species which could be exported.

This could be considered a niche for Romania which has to strengthen the sheep growing and slaughters and intensify its export on the EU market [10, 12, 27].

The dynamics of sheep and goats meat export. The sheep and goat meat export recorded a positive trend increasing by 52.42 %. Thus, the export increased from 20,546 tonnes in the year 2007 to 31,317 tonnes in the year 2015.

The import of sheep and goat meat has also increased but in a slight manner, only by 3.59 %, from 751 tonnes in 2007 to 778 tonnes in the year 2015.

As a result, the export/import ration is favorable for Romania, increasing by 47.16 %, from 27.35 in the year 2007 to 40.25 in the year 2015 (Table 8).

Table 8. The dynamics of the sheep and goat meat export, import and trade balance, Romania, 2007-2015

	MU	2007	2009	2011	2013	2015	2015/2007 %
Export	Tonnes	20,546	19,478	24,100	28,400	31,317	152.42
Import	Tonnes	751	573	500	600	778	103.59
Trade balance	Tonnes	+19,795	+18,905	+23,600	+27,800	+30,539	154.27
Export/Import ratio	-	27.35	33.99	48.20	47.33	40.25	147.16

Source: Own calculation based on the date provided by the National Institute of Statistics, Tempo online, 2016 [21].

Based on its sheep and goat meat export value, Romania is situated on the 5th position in the world among the top 12 countries exporting live sheep and goats, after Sudan, Somalia, Jordan and Australia [18].

Romanian producers are stimulated to better organize young ram fattening and deliver more animals in live weight for export and for slaughtering in meat processing industry to also increase export of high quality carcasses. The actual National Rural Development Programme 2014-2010 provides important measures for sheep and goat sector regarding national aids and coupled support which will result in an increased export of live sheep and goat and meat [16].

CONCLUSIONS

The paper analyzed the dynamics of sheep and goat livestock, at national level and in the territory, animal density, milk and meat production, meat consumption, meat export,

import and trade balance and pointed out Romania's position in the EU in the sheep and goat livestock and meat production.

Sheep and goats livestock increased by 21.68 % in the analyzed period reaching 11,358 thousand heads in 2016, placing Romania on the 4th position in the EU after United Kingdom and Spain.

Romania comes on the 5th position for 85.5 sheep and goats per 100 ha, after Greece, United Kingdom, Spain and Netherlands.

The decreasing order of the micro regions where sheep are raised is: Central area, North West area, West region, South East, North East, South Muntenia, South West Oltenia and Bucharest-Ilfov. The important of regions in goats raising si the following one: South East, South West Oltenia, South Muntenia, North East, Centre, North West, West and Bucharest-Ilfov.

The Herfindhal-Hirschman and Gini-Struck indices confirmed that in Romania the

concentration of sheep and goats livestock in the territory is a moderate one.

Sheep and goat milk production accounted for 6,113 thousand hl in 2016, by 1 % less than in 2007. However, it varied in the analyzed period in close relationship with the female milking livestock, forage production, and reproduction activity.

The industrial units collect and process only a small amount of sheep and goat milk production, representing 6.95 % of the total milk production from these two species in the year 2016. Therefore, a lot of milk is used in the households for covering family and animal needs.

Sheep and goat meat production reached 182 thousand tonnes in 2015, reflecting a high growth rate (65 %) in the analyzed period. This performance was influenced by the increased number of slaughtered animals, and by the average live weight at slaughter.

Carcass quality does not comply to the EU standards as long as the share of young fattened males is still very low.

The most important regions where sheep and goat meat is produced are: South East, South Muntenia and West.

Romania comes on the 10th position in the EU-28 for sheep meat production after United Kingdom, Spain, France, Ireland, Greece, Italy, Germany, Netherlands, and Portugal.

Sheep and goat meat consumption is small in Romania, where pork is on the top position, followed by poultry meat.

The sheep meat balance sheet pointed out that export exceeds import, and Romania is a net exporting country of this sort of meat.

All these are arguments in favor of the development of sheep and goat meat production in Romania as long as it is a good tradition, and potential for increasing the livestock and carcass quality.

The development of sheep and goat milk and meat production needs the organization of sheep and goats raising in associations, where young sheep males to be fattened in order to assure the requirements of the domestic and external market. Also, the sheep and goats breeders must be focused on sheep and goats breeding, using making a corresponding

selection and using high breeding value animals for reproduction and production. Farm size must be increased to assure an efficient meat production in fattening units. Sheep and goat carcasses must be classified according to the EU standards in order to assure a high quality.

Taking into account that sheep and goat meat is a healthy food, it must be promoted among consumers to develop the domestic meat consumption and also to increase export of sheep and goat meat.

The national aids and coupled support received from the Romanian government and the EU are very important for sheep and goats breeders to help them to better develop meat and milk production in this animal sector.

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