

## LIVESTOCK AND MILK AND MEAT PRODUCTION IN THE TOP FIVE EU COUNTRIES REARING SHEEP AND GOATS, 2012-2021

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### Abstract

*The paper aimed to analyze the dynamics of livestock and milk and meat production in the top five EU countries growing sheep and goats: Spain, Romania, Greece, France and Italy. The empirical data from Eurostat and Faostat for the period 2012-2021 were processed using usual methods and procedures like fixed basis and structural indices, trend regression equation, determination coefficient and points method. The comparison between these five countries pointed out the decline of sheep number in four countries, except Romania and the decrease in goats number in Greece and Spain, but an increase in Romania, France and Italy. Ewe milk production increased in three countries, except Spain where it remained relatively constant and Romania where it declined. Goat milk production raised in three countries, except Greece and Romania. Sheep meat output increased in France and Spain, but in the other countries went down, while goat meat output increased only in Spain, the other four states recording a decline. In the year 2021, these five countries all together counted 46.1 million sheep, representing 76.% of the EU sheep livestock, and also they had 9.4 million goats, meaning 82.1% of the EU goats livestock. In 2020, all these countries produced 2.73 million tonnes sheep milk and 1.87 million tonnes goat milk, accounting for 1.7% and respectively 1.16% in the EU milk output. These countries also contributed by 85% to the EU sheep and goat meat production. This reflects the importance of small ruminants in the EU animal livestock and production. These species have to help the EU for greening agriculture, as they could valorize natural resources from the mountains and less favored areas and also could be grown in organic farming system, assuring jobs and income to the local population, food security and at the same time contributing to the biodiversity preservation and production of renewable energy.*

**Key words:** livestock, milk, meat, European Union, top five countries rearing sheep and goats, trends

### INTRODUCTION

The need to cover milk and meat market needs at the global level, but also in the EU has determined a more specific orientation to the economic, social and environment importance of the small ruminants [26, 30, 45].

Even thou their contribution is smaller than from other farm species, they offer benefits regarding production diversification with natural products, traditionally obtained mainly in the mountain areas, improving the income

and living standard and satisfying better the population needs [42, 47].

Of over 70 million small ruminants existing in the EU, 85% are sheep and 15% are goats. The EU main countries dealing with sheep and goats rearing are Spain, Romania, Greece, France and Italy, but also other countries like Ireland, Netherlands, Portugal, Poland etc pay a special attention to these species.

Geographically, the EU countries with sheep and goats could be divided into Northern member states and Southern states situated in the Mediterranean area. In the Northern

countries, sheep and goat milk production is small, while in the Southern states has a higher volume.

In the EU, 14 countries have more than 500,000 sheep and only five member states rear more than 500,000 goats [13].

Sheep and goats are mainly reared in the regions where agricultural land is not suitable for cropping, like the mountain areas, semi-mountain zones, semi-arid regions and less favored areas [7].

For these reasons, sheep and goats have an important role in sustaining the local economy, offering jobs and income to the local population, valorizing the natural resources, assuring food security, preserving biodiversity and the beauty of the landscapes, diminishing environment pollution and assuring a valuable resource for renewable energy [12].

However, profitability in sheep and goat farming is not high and this depends on a large range of factors: the geographical location of the farm, farm size, genetic material and its production potential, technologies applied regarding reproduction, feeding, milking, and farm management as a whole, farmer's experience and training etc. [27].

Sheep and goats are reared in a large variety of farm sizes, farm structures and production systems which differ from a country to another and even from a region to another.

About 50% of sheep livestock is reared in flocks over 500 heads, while a little over 51% goats livestock is grown in flocks of over 200 heads.

Sheep and goat milk contribute by 3% to the EU milk output, while meat production from these species represents 1.4 % of the total EU agricultural output.

Milk produced by ewes and goats are special milk sorts of high nutritional value and also with hygienic qualities. They have a higher digestibility than cow milk and for this reason they are a suitable alternative for the consumers who have no tolerance to cow milk. The explanation is related to the existence of small globules of fat which are able to favor digestion, and in addition, in

case of infants to stimulate brain development and immunity [18].

Ewes and goats are an exceptional source of natural milk as they are reared on pastures and meadows where fertilization is naturally sustained by manure and where organic farming system is practiced on larger and larger surfaces.

Their milk is mainly destined for producing cheese, but also other dairy products like yogurts and chilled desserts on the farm and also in small manufacturing dairies, where the artisan processes are practiced contributing to the preservation of culinary traditions and production of natural tasty products in the regions where sheep and goats are grown [22, 46, 48].

In the major EU ewe and goat's milk producing countries, cheese and other milk products are carried out under organic technologies and are protected by the EU regulation concerning Protected Designation of Origin (PDO) and Protected Geographic Indication (PGI), designation which assure the protection of biodiversity regarding: regions of origin, animal species from which they are achieved, farming practices, production systems, microbiological characteristics of cheeses.

In the five EU main producing countries, sheep and goat cheese is already recognized by its well-known names:

- "Feta" cheese which is a white and salty cheese made of ewes' milk 70% and of goats' milk per PDO in Mainland Greece and Lesbos island, Greece [49].

- "Pecorino" Romano cheese which is a hard and salty cheese produced of ewe's milk in Lazio, Sardinia and Tuscany in Italy [51].

- "Roquefort" cheese is produced by Roquefort sheep breed reared in the South of France, and it is well-known for one of the best blue cheeses. Its technology imposes the natural maturation in the Combalou caves of Roquefort-sur-Soulzon [52].

- "Manchego" cheese is made of ewes' milk and has its origin in La Mancha region of Spain [50].

- "Romanian Telemea" is a white salty cheese prepared in Romania either from cow milk or

from ewe's milk or goats' milk or a mixture of these milk types [2, 21, 48].

However, in this study it was not analyzed cheese production, but only sheep and goats livestock, ewe and goat's fresh milk production achieved on farm and which also represent a source of high value raw material for dairies and finally sheep and goat meat production.

Meat production from these species depends on the category of animals destined to be slaughtered, the number of slaughtered animals and their live weight.

Lambs are not fattened in Greece and Italy, while in Spain, France and Romania, lambs delivered to the market are both fattened and not fattened. In Ireland, lambs are fattened having more than 13 kg at slaughter.

The EU offers financial support to sheep and goats breeders by subsidies per income named "direct payments" which are justified as the average agricultural income is always behind the average income at the EU economy level.

There are many types of direct payments like: basic payments, payments for greening, payments for young farmers, and other sorts of payments, but in the prospect 2023-2027 there are expectations of changes adapted to the new PAC reform [9].

Production level is below the consumption requirements of lamb, mutton and goat meat and that's why about 20% of consumption is covered by imports, the main suppliers being New Zealand, Australia and the countries included in Mercosur agreement [28].

However, regarding sheep and goat meat, there are two categories of consumers: the ones who like these types of meats knowing their unique taste, appreciating that they are natural and healthy foods and the second category who dislike the smell and taste of these meats [19, 31].

The EU exports accounts for about 10% of total meat output from these species, but also the EU sells live sheep in the countries of the Middle and Far East and also in the Northern Africa [10].

Therefore, the products obtained from sheep and goats are subject of international trade called to cover better the needs of the internal

markets, to improve the trade and payment of the suppliers [28].

In this context, the paper aimed to analyze the dynamics of sheep and goats livestock and milk and meat production in the EU top five countries rearing these species, in the last decade 2012-2021 emphasizing the main trends and changes across the time and the differences among these countries.

The idea started from the supposition that the decline of livestock is required but this does not affect production level as long as yield performance and product quality is increasing.

## MATERIALS AND METHODS

The research work required the study of the literature background in the field, the collection of the empirical data in the selected EU countries rearing sheep and goats: Spain, Romania, Greece, France and Italy and the data processing. The sources of statistical data have been Eurostat and FAOSTAT and the period of reference was 2012 and 2021 for livestock and 2012-2020 for milk and meat output for which the official data were available. The studied indicators were: sheep and goats number, ewe's' and goat's fresh milk production and sheep and goat meat production. The main trends were displayed in graphics, being sustained by regression equations and coefficient of determination.

Fixed indices were calculated for showing the percentage increase/decrease between the performance recorded in the year 2020 or 2021 versus the level of the year 2012.

The results are synthesized in tables and illustrated in graphics for a better understanding of the variations in time of the selected indicators.

Finally, the conclusions summarized the main ideas resulting from this statistical research.

## RESULTS AND DISCUSSIONS

### Dynamics of the livestock

#### *Sheep livestock*

Sheep farming represent an important agricultural animal sector in Spain, Romania, Greece, France and Italy. In the year 2021, the

sheep number of all these five countries accounted for 46,106 thousand heads, representing 76.7% of the EU sheep livestock (60,094 thousand heads).

Compared to 45,853 thousand sheep in the year 2012, this means a slight growth of +0.55%.

However, in the analyzed decade 2012-2021, important changes took place varying from a country to another.

While in Romania the number of sheep registered a continuous upward trend and growth rate accounted for +13.77% compared to the 2012 level, in the other four countries, the sheep livestock declined by -21.28% in Greece, -7.7% in Spain, -6.16% in France and -4.10% in Italy.

**In Spain**, the sheep number started to decrease even from the year 2012 when it was 16,339 thousand heads and reached 15,431 thousand heads in 2015. Then, it increased to 16,026 thousand heads in the year 2016, but after that year it has continuously recorded a downward trend to 15,081 thousand heads in the year 2021.

**In Romania**, the sheep livestock was 8,833 thousand heads in the year 2012 and since that time it recorded an upward trend till the year 2020, when it reached the maximum level,

accounting for 10,464 thousand heads, but in 2021, it declined to 10,050 thousand heads, meaning a loss of -4%.

In Romania there are many types of sheep breeds, a part of them being specialized on milk production, other breeds on meat and the third category are for a dual purpose like meat and wool [29].

**In Greece**, the reduction of sheep number attained the highest percentage accounting for -21.28% in the last decade. The largest number of sheep was registered in the year 2013 and accounted for 9,356 thousand heads. Then, the sheep number declined up to the lowest level of 7,253 thousand heads in the year 2021.

**In France**, the sheep livestock recorded a continuous downward trend from 7,453 thousand heads, the peak recorded in 2012 to 6,877 thousand heads in 2017, the lowest level. In 2018, a slight recovery was noticed, the livestock increasing to 7,166 thousand heads, but then, it declined to 6,994 thousand heads in 2021.

**In Italy**, the number of sheep had an up and down variation across the time, with the peak of 7,215 thousand heads in 2016 and the lowest level of 6,728 thousand heads in 2021 (Fig. 1).

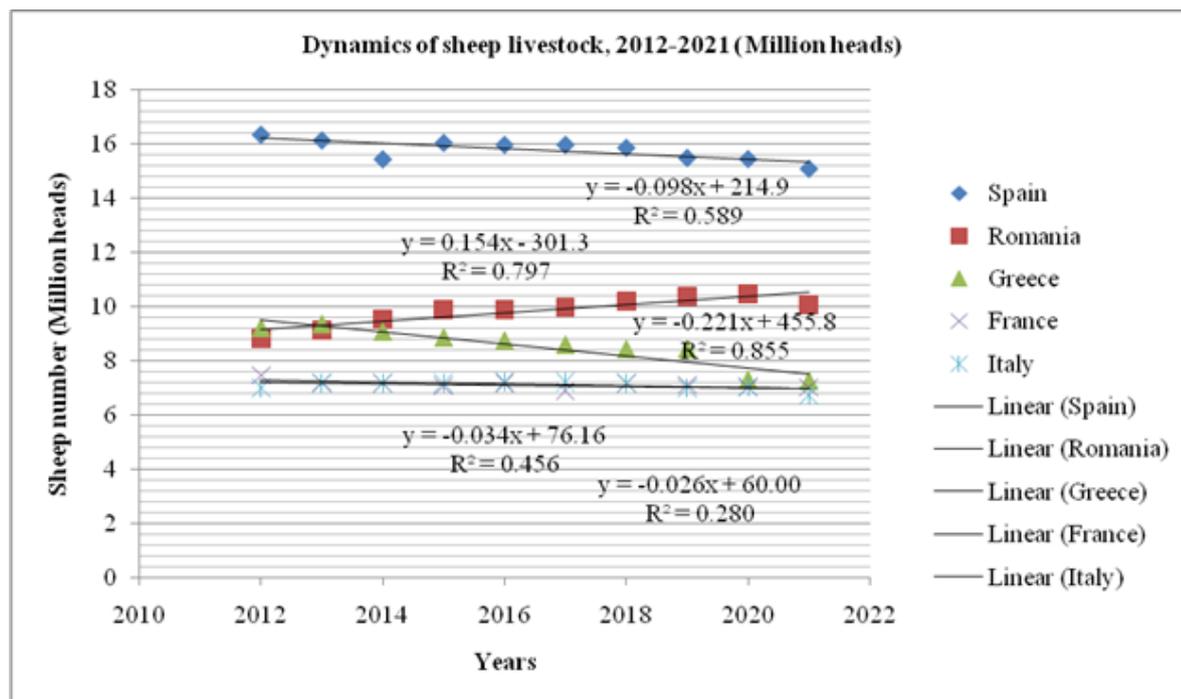


Fig. 1. Dynamics of sheep number in the period 2012-2021 in the EU top rearing countries ( Million heads)

Source: Own design based on the data from Eurostat, 2022 [15].

The evolution of the sheep number has determined a change in the year 2021 compared the level of the year 2012 and also

in the share of the EU sheep livestock as presented in Table 1.

Table 1. Sheep livestock in 2021 versus 2012 in the selected countries and its changes in the EU sheep number

|                                 | MU            | Spain | Romania | Greece | France | Italy |
|---------------------------------|---------------|-------|---------|--------|--------|-------|
| 2012                            | Million heads | 16.34 | 8.83    | 9.21   | 7.45   | 7.01  |
| 2021                            | Million heads | 15.08 | 10.05   | 7.25   | 7.00   | 6.73  |
| 2021/2012                       | %             | 92.30 | 78.72   | 113.77 | 93.84  | 95.90 |
| Share in the EU sheep livestock |               |       |         |        |        |       |
| -in 2012                        | %             | 25.83 | 13.96   | 14,56  | 11.78  | 11.09 |
| -in 2021                        | %             | 25.09 | 16.72   | 12.06  | 11.63  | 11.20 |
| Difference 2021-2012            | pp            | -0.74 | +2.75   | -2.50  | -0.15  | +0.11 |

Source: Own calculations based on the data from Eurostat, 2022 [15].

### Goats livestock

Taking into account the number of goats, the five EU member states rearing the largest livestock are: Greece, Spain, Romania, France and Italy.

In 2012, all these five countries had 10,394 thousand goats representing 83.45% of the EU goats livestock, in 2021, they registered 9,409

thousand heads, meaning 82.45% of the EU level. Despite that in the EU, the number of goats is not so high compared to the livestock of other farm species and in the analyzed decade it decreased by 8.4%, accounting for only 11.41 million heads in the year 2021, in the four of these five countries the number of goats increased, except Greece.

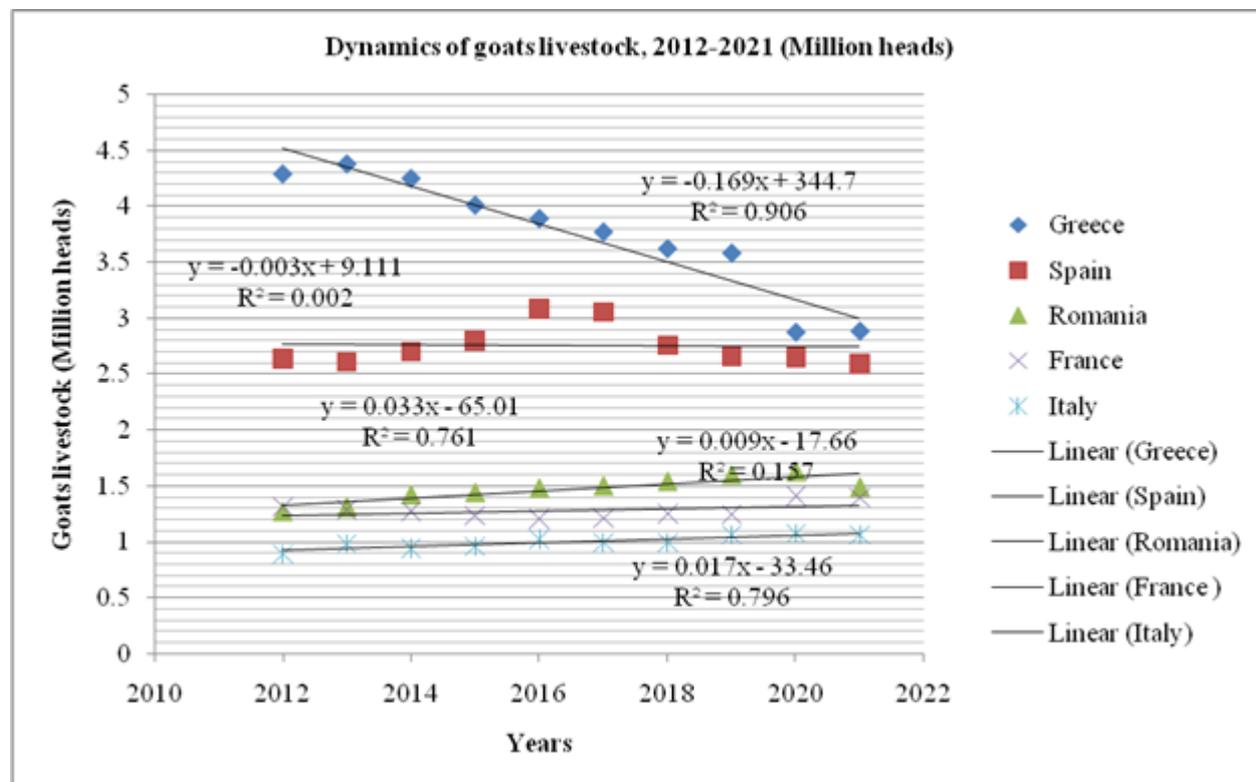


Fig. 2. Dynamics of goats number in the period 2012-2021 in the EU top rearing countries ( Million heads)

Source: Own design based on the data from Eurostat, 2022 [14].

**Greece** registered a high decline in goats number, accounting for -32.83%, from 4,293 thousand heads in 2012 to 2,884 thousand

heads in 2021. The maximum livestock was registered in the year 2013, but after that year, the goats number declined year by year.

**Spain** recorded a decrease in goats number from 2,637 thousand heads in 2012 to 2,590 thousand heads in 2021, meaning -1.79% less. The maximum number of goats was 3,088 thousand heads in the year 2016, but then, it started a downward from a year to another.

**In Romania**, the goats number increased by 17.335 in the analyzed interval from 1,266 thousand heads in 2012 to 1,486 thousand heads in 2021. However, the maximum number was 1,630 thousand heads, achieved in the year 2020, being by +28.75% higher than in 2012. But, in 2021, a loss of 144 thousand heads was noticed, meaning -8.84% compared to the previous year.

**In France**, the goats number declined from 1,306 thousand heads in 2012 till the year 2016, when it registered the lowest level of 1,204 thousand heads, but then, it increased so

that in the year 2020, it reached the highest level accounting for 1,414 thousand heads, being by +8.26% higher than in 2012. But, in 2021, the number declined to 1,388 thousand heads, meaning by -1.84% less compared to the level of the previous year. Therefore, in 2021, the number of goats in France was by +6.27% higher than in 2012.

**Italy** increased its goats livestock from 892 thousand heads in 2012 to 1,061 thousand heads in 2021, reflecting +18.74% growth in the whole decade. However, the record number of 1,066 thousand heads was attained in the year 2020, but in the year 2021, there were lost 5,000 heads (-0.01%) (Fig. 2).

Taking into account the evolution of the goats livestock, the share of the goats number in the EU goats livestock changed in 2021 compared to the 2012 level as shown in Table 2.

Table 2. Goats livestock in 2021 versus 2012 in the selected countries and its changes in the EU goats number

|                                 | MU            | Greece | Spain | Romania | France | Italy  |
|---------------------------------|---------------|--------|-------|---------|--------|--------|
| 2012                            | Million heads | 4.29   | 2.64  | 1.27    | 1.31   | 0.89   |
| 2021                            | Million heads | 2.88   | 2.59  | 1.49    | 1.39   | 1.06   |
| 2021/2012                       | %             | 67.17  | 98.21 | 117.37  | 106.27 | 118.94 |
| Share in the EU goats livestock |               |        |       |         |        |        |
| -in 2012                        | %             | 34.46  | 21.17 | 10.16   | 10.48  | 7.16   |
| -in 2021                        | %             | 25.27  | 22.69 | 13.02   | 12.16  | 9.29   |
| Difference 2021-2012            | pp            | -9.19  | +1.52 | +2.86   | +1.68  | +2.13  |

Source: Own calculations based on the data from Eurostat, 2022 [14].

Despite that Greece registered a decline of -9.19 percentage points in 2021 versus 2012 or -32.83% in goats number, it remained the major EU country growing sheep.

### Dynamics of milk production

#### Sheep milk production

In 2020, the milk produced in the EU farms accounted for 160.1 million tonnes. The milk coming from cows represented 154.4 million tonnes (96.4%), and the milk provided by ewes accounted for 3 million tonnes (1.87%), by goats 2.5 million tonnes (1.56%) and by buffalos 0.3 million tonnes (0.17%).

Of the total milk output, 149.4 million tonnes (93.31%) were delivered to dairies, of which 145.2 million tonnes were represented by cows' milk (90.6%). This means that the difference of 4.2 million tonnes (9.4%) was provided by ewes, goats and buffaloes [16].

These figures reflect how important are small ruminants in producing milk in the EU. More than this, at the global level, the EU's contribution to the world sheep milk is about 50%, which reflect the high performance in milk production of this species.

In the year 2021, five countries: Greece, Spain, Italy, Romania and France, all together, produced 2,735 thousand tonnes sheep milk by +2.89% more than 2,658 thousand tonnes in the year 2012. This means that these five countries are able to carry out over 90% of the EU's sheep milk output.

**In Greece**, despite that the sheep livestock has substantially declined in the last decade, ewes' milk production increased by +21.52% from 777.97 thousand tonnes in 2012 to 945.43 thousand tonnes in the year 2020, when production achieved its peak level.

From a geographical point of view, Greece, as a Mediterranean country has a high share of the rural areas in its territory, especially mountainous regions, semi-mountainous and semi-arid areas and sheep and goats are adapted to these conditions and successfully sustain farming in large parts of the less favored regions, maintain people's work, and living standard by producing feta and other specific sorts of cheeses, most of them having protected designation of origin (PDO) [21].

The sustainable development of agriculture in Greece is based on small ruminants sector where traditional producing systems are supported by milk processing on farm, the use of short supply chain (SSC) and qualitative labels [48].

However, in the last three years, Greek sheep and goats breeders were facing the reduction in the milk sale price due to the milk amounts imported at a lower price than the production cost. This was a terrible challenge for the Greek farmers to sustain their business and avoid failure [11].

**Spain** also was facing the decline of sheep livestock, but sheep milk production remained at a relatively stable level and even registered a slight increase of only +0.67% in the analyzed decade.

The peak of production was 600.56 thousand tonnes recorded in the year 2013, but since that time, sheep milk production started to decrease reaching 544.10 thousand tonnes in 2017, the lowest level, but in 2020 it recovered a little.

Like Greece, Spain pays a special attention to small ruminants which are able to sustain the rural areas and to give an important contribution to the gross animal production.

Spanish paste cheeses like Manchego, Zamorano and Calabozo are the most famous Spanish cheeses.

But, as milk production is not enough, Spain imports cheese and yogurt and fermented milk products [53].

**In Italy**, sheep number declined, but milk production increased by +18.66% from 406.17 thousand tonnes in 2012 to the maximum level of 495.91 thousand tonnes, attained in the year 2019, but then it declined

to 481.97 thousand tonnes in 2020, meaning about -3% compared to the previous year.

Of the total milk production delivered to dairies, sheep milk represents about 3.47% and goat milk about 0.25%.

Around 43.3% of total milk utilization is destined for producing PDO cheese. In Italy, pecorino cheese with controlled origin is well-known and intensively used by consumers.

In 2016, of the total cheese production in Italy, accounting for 1,232.230 tonnes., the cheese made of cow milk accounted for 89.56%, the cheese made of ewe's milk had 5.89% and cheese made of goat's milk represented only 0.5% [3, 22].

**In Romania**, despite the high contribution of dairy cows to milk production, sheep and goats have an increasing number in the last period of time and their contribution to milk output went up [37, 44].

The farms rearing sheep and goats are numerous in Romania, but they have a small size and production system is more extensive than intensive and that is why profitability is not high [41].

Despite of the high growth rate of +13.77% in sheep livestock in the analyzed decade, sheep milk production registered a serious decrease, accounting for -34.66% from 650.91 thousand tonnes in 2012 to 426 thousand tonnes in the year 2020 [34]. The main causes are related to the low milk price at farm gate and the high price of farm inputs [36, 39].

In Romania sheep and goats rearing is a traditional activity, from these species there is obtained a large range of products with a reduced energy consumption and forages used in feeding which do not compete with humans like other farm species [35].

Sheep and goats farming assures the sustainability of milk and meat sector in Romania, but also in the EU. Romania 's exports of live sheep could bring important income to the breeders [20, 38, 43].

**France** with almost 7 million sheep livestock in the year 2021, by -6.16% smaller than in 2012, has succeeded to sustain milk production which in the analyzed decade increased by + 20.24%, the highest growth

rate among the five these important EU countries rearing sheep.

If in 2012, sheep milk output was 270.7 thousand tonnes, in 2020, it reached 325.5 thousand tonnes, the maximum level.

This performance is based on the efforts made in the field of sheep breeding to increase milk yield. The Lacaune breed is well known for its high milk yield obtained by a long selection process. For its high record, this breed is imported in many counties to improve yield of the local breeds [1].

As mentioned before, sheep milk is successfully utilized for producing tasty yogurts, chilled desserts and cheese. The French local breeds from different regions were genetically improved in Roquefort area, Manech region, Pyrennees and Corsican island which led to various crossbreeds and new breeds wearing the name of the region of origin [8, 46].

The dynamics of sheep milk production in the EU five main producing countries is shown in Fig. 3.

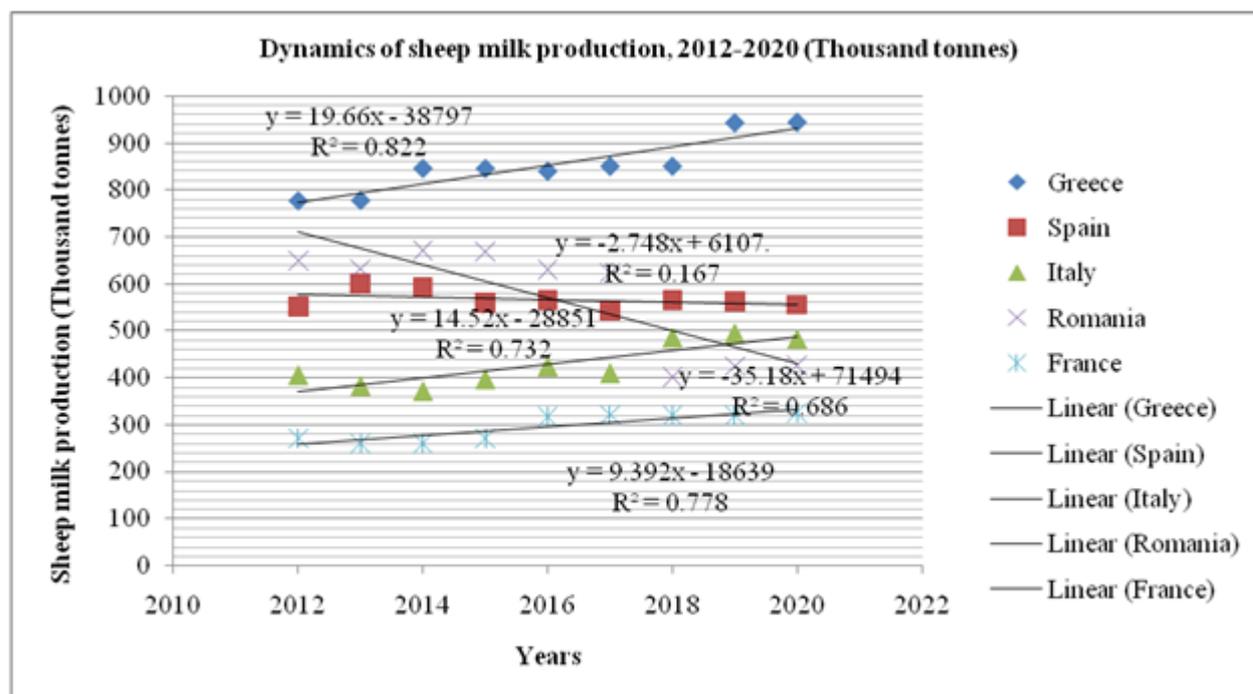


Fig. 3. Dynamics of sheep milk production in the EU five main producing countries, 2012-2020 ( Thousand tonnes)  
 Source: Own design based on the data from [17].

Table 3. Sheep milk production in 2020 versus 2012 in the selected countries countries

|           | MU              | Greece | Spain  | Italy  | Romania | France |
|-----------|-----------------|--------|--------|--------|---------|--------|
| 2012      | Thousand tonnes | 777.97 | 552.52 | 406.18 | 650.91  | 270.71 |
| 2020      | Thousand tonnes | 945.43 | 556.25 | 481.97 | 426.00  | 325.50 |
| 2020/2012 | %               | 121.52 | 100.67 | 118.66 | 65.44   | 120.24 |

Source: Own calculations based on the data from [17].

The production level in 2020 versus 2012 level is shown by selected country in Table 3.

### Goat milk production

As mentioned before, goat milk output represents 2.5 million tonnes in the EU, meaning 1.56% of the EU total milk production [16].

Apparently, it is looks to be a small contribution to milk output, but goats produce a very special milk of high nutritive and hygienic value.

Taking into account the level of goat milk production achieved by the five selected countries, their decreasing order is the

following one: France, Spain, Greece, Romania and Italy.

**In France**, goat milk output increased by +10.68% from 613.71 thousand tonnes in the year 2012 to 679.30 thousand tonnes in 2020. If we look at the statistical data, France produces more goat milk than sheep milk. In 2020, goat milk output accounted for 679.3 thousand tonnes and sheep milk production was 325.5 thousand tonnes, that is by more than 2 times smaller, reflecting the importance that French farmers allocate to this species in milk production to better satisfy consumer preferences and protect their health. Goat milk price had a continuous upward tendency in the last years raising from Euro 73.72/100 lt in 2019 to Euro 79.24/100 lt in 2021 [4].

**In Spain**, goat milk production increased by +18.09% from 443.62 thousand tonnes in 2012 to the peak of 535.79 thousand tonnes in 2019, but then it declined in 2020 to 523.9 thousand tonnes.

In Spain, goats' milk production is almost equal to sheep production, which in 2020 accounted for 523.90 thousand tonnes, and, respectively, 556.25 thousand tonnes.

In Spain, goats milk sale price is smaller than sheep milk price. If in 2016, average sheep milk price accounted for Euro 0.891/liter, in 2021, it reached Euro 1.002/liter, while average goat milk price ranged from Euro 0.579/liter in 2016 to Euro 0.776/lt in 2021 (Fig. 4).

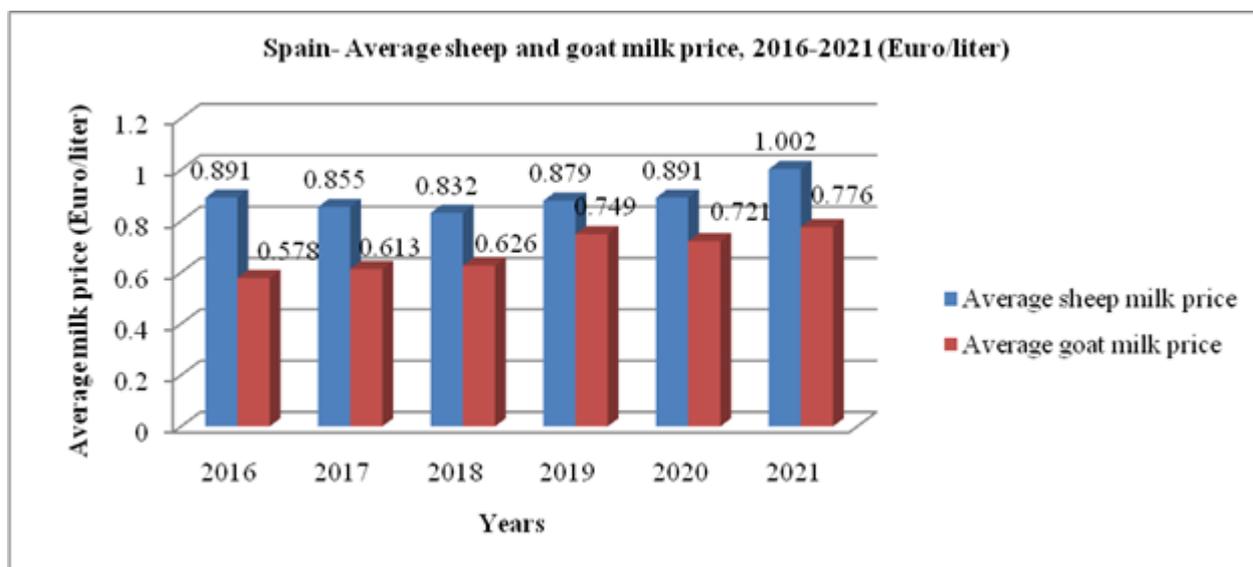


Fig. 4. Average sheep and goat milk sale price in Spain, 2016-2021 (Euro/liter)  
 Source: Own design based on the data from [5, 6].

**In Greece**, goats milk production is 2.6 times smaller than sheep production. In 2020, Greece produced 361.35 thousand tonnes goats milk and 945.43 thousand tonnes sheep milk. In the analyzed period, while sheep milk output increased by +21.52%, goats milk production decreased by -21.94%.

If for sheep milk production growth it is an explain, that the farmers paid more attention to the improvement of milk yield per ewe by selection and breeding, in case of the decline of goat milk output the main cause is the decrease of the goats livestock by -38.83% and the lack of interest to improve yield.

**In Romania**, goats milk production is about 2 times smaller than sheep production. In 2020, Romania achieved 426 thousand tonnes sheep milk and 240.80 thousand tonnes goats milk. It is normal to be so taking into account the sheep livestock is much higher than the number of goats. In 2020, goats milk output recorded a decline of -33.94% compared to 364.51 thousand tonnes in 2012 [34].

**Italy** registered 61.24 thousand tonnes goat milk in the year 2020, a level 2.19 times higher than in 2012.

However, sheep are more important than goats in Italy, as long as, sheep milk

production is 7.87 times higher than goats milk production and the goats livestock is also much smaller (Fig. 5).

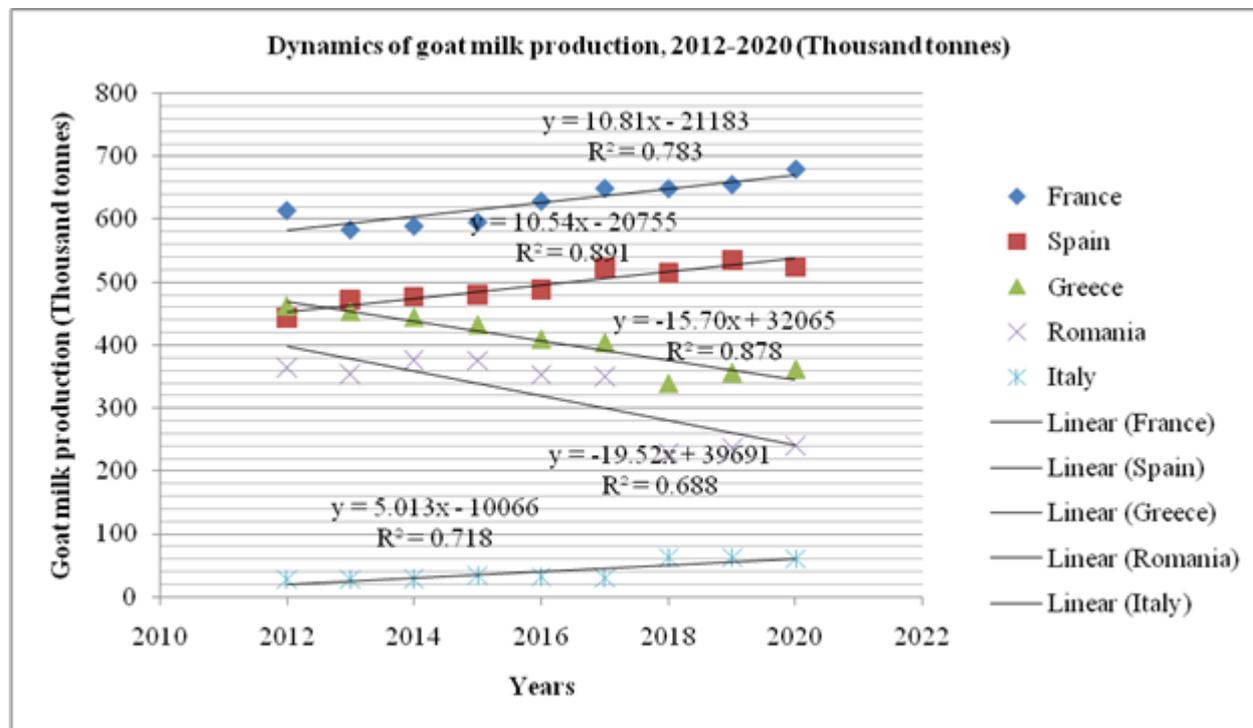


Fig. 5. Dynamics of goats milk production in the EU five main producing countries, 2012-2020 (Thousand tonnes)  
 Source: Own design based on the data from [17].

Table 4. Goats milk production in 2020 versus 2012 in the selected countries

|           | MU              | France  | Spain  | Greece | Romania | Italy  |
|-----------|-----------------|---------|--------|--------|---------|--------|
| 2012      | Thousand tonnes | 613.711 | 443.62 | 462.87 | 364.51  | 27.94  |
| 2020      | Thousand tonnes | 679.30  | 523.90 | 361.35 | 240.80  | 61.24  |
| 2020/2012 | %               | 110.68  | 118.09 | 78.06  | 66.06   | 219.15 |

Source: Own calculations based on the data from [17].

The production level in 2020 versus 2012 level is shown by selected country in Table 4.

### Dynamics of meat production

#### Sheep meat production

From this point of view, the hierarchy of the EU top countries producing sheep meat is: France, Spain, Greece, Romania and Italy.

**France** comes on the 1st position showing an increasing trend in sheep meat output starting from 777.97 thousand tonnes in 2012 to 945.43 thousand tonnes, the maximum level attained in the year 2020. The growth rate for the whole interval accounts for +21.52%.

In the other four producing countries, sheep meat production decreased as specified below.

**In Spain**, sheep meat production registered the highest level of 122 thousand tonnes in

2021, but then it varied from a year to another. The minimum production was 114.22 thousand tonnes achieved in the year 2014. In the coming years, a slight recovery was noticed reaching the peak of 121.34 thousand tonnes in 2019, but in 2020, it declined to 115.12 thousand tonnes, meaning by -5.65% less than in 2012.

**In Greece**, the maximum sheep meat production was registered in 2012, accounting for 91.99 thousand tonnes and since that year, it recorded a continuous descending trend so that in 2020, it accounted for only 60.62 thousand tonnes, the minimum level, being by -34.1% lower than in 2012.

**In Romania**, sheep and goat meat have a low share in meat production and consumption.

However, the rural population dealing with sheep and goat rearing in the hilly and mainly in the mountain areas, consume a high amount of mutton along the year and lamb meat especially at Easter, as lamb is traditional at that holly fest [37].

In 2012, sheep meat output was 68.50 thousand tonnes and after two years of decline, in 2015 and 2016, it was noticed a slight recovery with the peak of production of 77.37 thousand tonnes in 2016. After that, production decreased by -35.31% in 2018 and

then it registered again a slight recovery in 2020, accounting for 50.57 thousand tonnes, but this level was by -26.18% smaller than in 2012 [32, 33, 40].

**In Italy**, the maximum sheep meat production was achieved in 2012 when it accounted for 45.56 thousand tonnes. In the coming years, it varied between 34.83 thousand tonnes in 2018 and 25.31 thousand tonnes. In 2020, the level of sheep meat production accounted for 29.21 thousand tonnes, being by -35.89% less than in 2012 (Fig. 6).

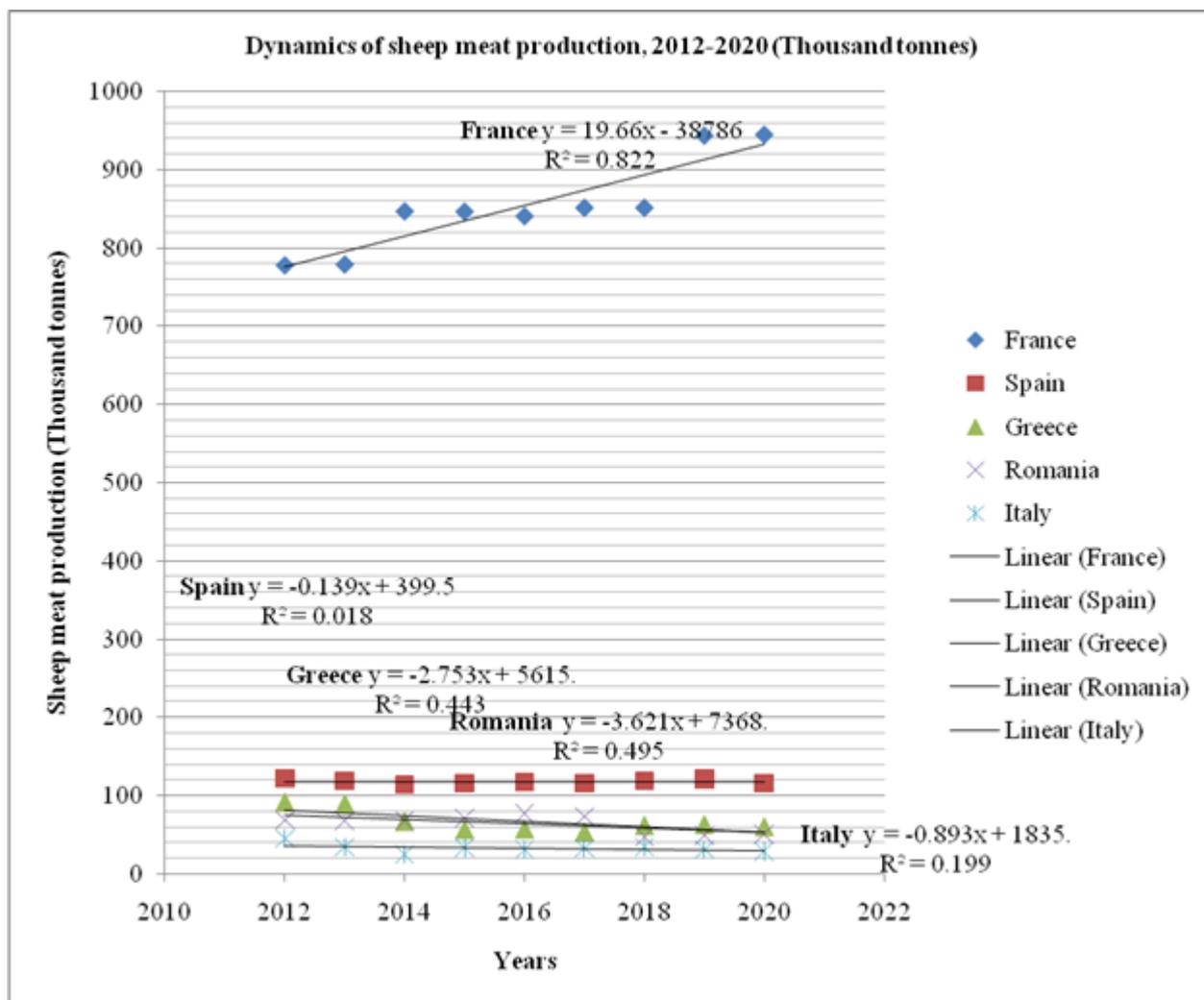


Fig. 6. Dynamics of sheep meat production, 2012-2020 (Thousand tonnes)  
 Source: Own calculations based on the data from [17].

Fig. 6 and Table 5 show the huge discrepancy between France and all the other countries producing sheep meat. In 2020, the production carried out by France was 8.21

times higher than in Spain, 15.59 times higher than in Greece, 18.69 times higher than in Romania and 32.36 times higher than in Italy.

Table 5. Sheep meat production in 2020 versus 2012 in the selected countries

|           | MU              | France | Spain  | Greece | Romania | Italy |
|-----------|-----------------|--------|--------|--------|---------|-------|
| 2012      | Thousand tonnes | 777.97 | 122.00 | 91.99  | 68.50   | 45.56 |
| 2020      | Thousand tonnes | 945.43 | 115.12 | 60.62  | 50.57   | 29.21 |
| 2020/2012 | %               | 121.52 | 94.35  | 65.90  | 73.82   | 64.11 |

Source: Own calculations based on the data from [17].

### Goat meat production

Compared to sheep meat production, goat meat output is much smaller in all the selected countries, as this species is mainly used for its high value milk suitable for preparing cheese and its livestock is less numerous than the sheep number.

Based on the performance in goat meat output, the top five EU countries have to be considered in the following order of

importance: France, Greece, Spain, Romania and Italy.

If in 2012, these five countries all together produced 534.35 thousand tonnes goat meat, in 2020 they achieved only 399.88 thousand tonnes, meaning by -25.17% less and this was caused by the decreasing trend registered in France, Greece, Romania and Italy, except Spain where goat meat production increased.

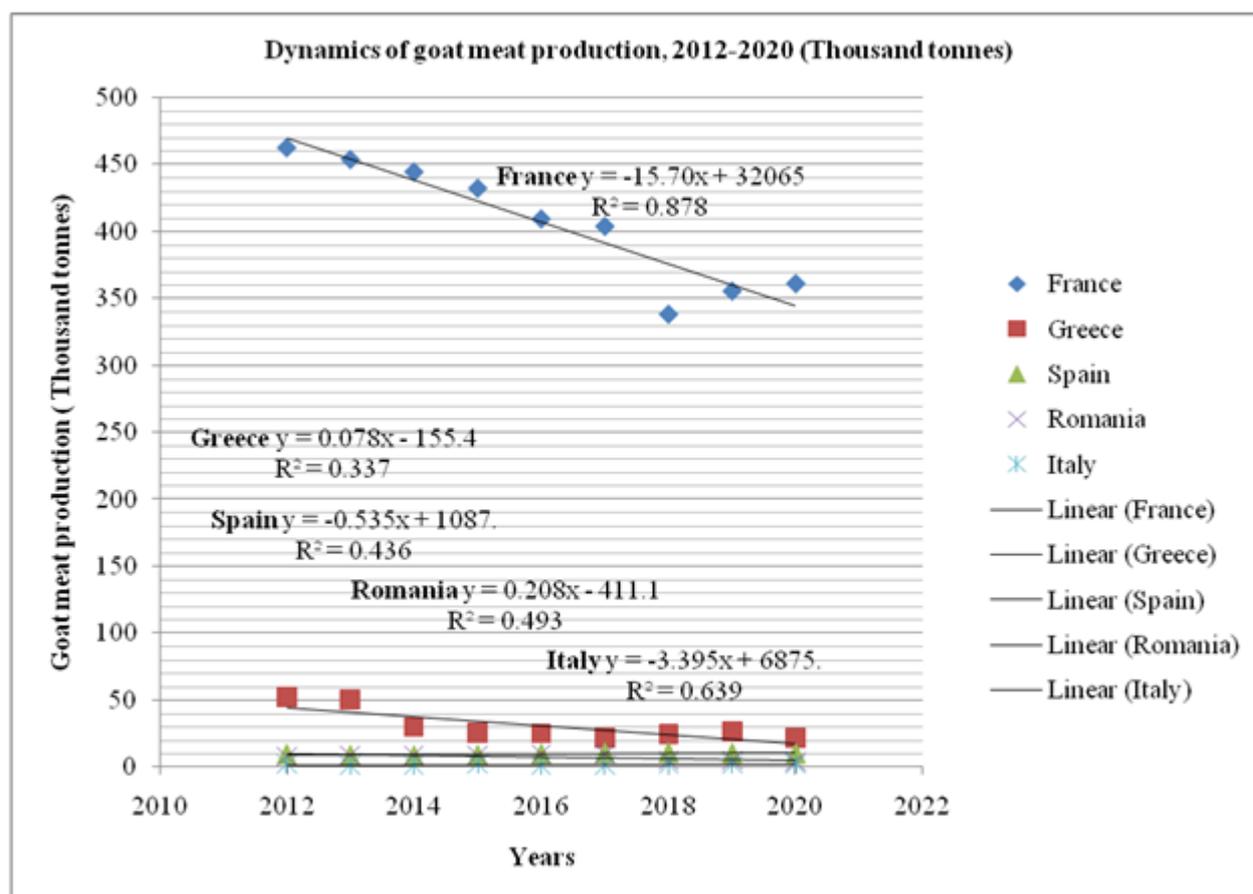


Fig. 7. Dynamics of goat meat production, 2012-2020 (Thousand tonnes)  
 Source: Own calculations based on the data from [17].

**In France**, goat meat output declined from 462.87 thousand tonnes, the maximum level registered in 2012, to 361.35 thousand tonnes in 2020, reflecting a reduction by -22.27%.

**In Greece**, goat meat production also decreased starting from 51.96 thousand tonnes in 2012 to 22.25 thousand tonnes in 2020,

when it was by -57.19% smaller than at the beginning of the analyzed decade.

**In Spain**, in 2012, there were produced 9.7 thousand tonnes goat meat. In 2014, production was smaller, but after that it started to grow so that in the year 2018 it was achieved the maximum level of 10.97 thousand tonnes. In the coming years, it declined a little, reaching 10.15 thousand tonnes, but this level was by +4.68% higher than in the year 2012.

**In Romania**, goat meat production started from 7.73 thousand tonnes in 2012 and registered an ascending tendency till the year 2017, when it reached the highest performance, accounting for 9.73 thousand tonnes. But, in the coming three years it deeply declined and in 2020, it recorded the

minimum level of 4.07 thousand tonnes, meaning by -47.37% less than in 2012.

However, in the analyzed decade, sheep and goat meat production in Romania is much higher than it was in the previous two decades 1990-2010 [23].

**In Italy**, at the beginning of the decade, goat meat production was 2.08 thousand tonnes, but in 2013 it decreased and reached the minimum level of 1.31 thousand tonnes. Since 2014, it recorded up and down variations and in 2019 it registered the peak accounting for 2.29 thousand tonnes. In 2020, it declined by -10% compared to the previous year and reached 2.06 thousand tonnes, a level by -1.3% lower than the one recorded in 2012 (Fig.7 and Table 6).

Table 6. Goat meat production in 2020 versus 2012 in the selected countries

|           | MU              | France | Greece | Spain  | Romania | Italy |
|-----------|-----------------|--------|--------|--------|---------|-------|
| 2012      | Thousand tonnes | 462.87 | 51.96  | 9.69   | 7.73    | 2.09  |
| 2020      | Thousand tonnes | 361.35 | 22.25  | 10.15  | 4.07    | 2.06  |
| 2020/2012 | %               | 77.73  | 42.81  | 104.68 | 52.63   | 98.70 |

Source: Own calculations based on the data from [17].

France is again in the top position, this time for goat meat output, far away from the level of the other four main producing countries.

#### **A synthetic overview on each country regarding the development of sheep and goat sector**

In order to rank each country based on its performance regarding the number of animals and their records in milk and meat production, it was used the Point Method and the obtained results are presented in Table 7.

The data show the following aspects:

##### *Regarding livestock:*

-Spain comes on the 1st position for the number of sheep, being followed by Romania, Greece, France and Italy;

- Greece is in the top for the number of goats, being followed by Spain, Romania, France and Italy;

- Taking into consideration the sheep and goats livestock, the hierarchy remains: Spain, Romania, Greece, France and Italy.

##### *Regarding milk production:*

-the highest ewe's milk output is obtained by Greece, followed by Spain, Italy, Romania and France;

-the highest goat milk output is achieved by France, followed by Spain, Greece, Romania and Italy;

-for ewe's and goat's milk production, on the top position is France, followed by Greece, Spain, Romania and Italy.

##### *Concerning meat production:*

- the highest sheep meat production is obtained by France, followed by Spain, Greece, Romania and Italy;

-the highest goat meat production is achieved by France, also followed by Spain, Greece, Romania and Italy;

- for sheep and goat meat output, it is obvious that France comes on the 1st position, being followed by Spain, Greece, Romania and Italy.

Table 7. The rank of the EU main countries rearing sheep and goats in the year 2021

|   | Spain | Romania | Greece | France | Italy |
|---|-------|---------|--------|--------|-------|
| Sheep number                                      | 1     | 2       | 3      | 4      | 5     |
| Goats number                                      | 2     | 3       | 1      | 4      | 5     |
| TOTAL POINTS FOR Sheep and goats number           | 1     | 2       | 3      | 4      | 5     |
| Ewe's milk production                             | 2     | 4       | 1      | 5      | 3     |
| Goat's milk production                            | 2     | 4       | 3      | 1      | 5     |
| TOTAL POINTS FOR Sheep and goats' milk production | 3     | 4       | 2      | 1      | 5     |
| Sheep meat production                             | 2     | 4       | 3      | 1      | 5     |
| Goat meat production                              | 2     | 4       | 3      | 1      | 5     |
| TOTAL POINTS FOR Sheep and goat meat production   | 2     | 4       | 3      | 1      | 5     |

Source: Own conception and calculation based on the performance recorded by each country.

Therefore, the differences regarding the position occupied by each country for livestock and for production are given by the changes of performance in yield.

The countries having a lower livestock have recorded a better performance in milk or meat production which have been sustained by the efforts done to increase yield using genetic factors, selection and breeding, a better feeding, reproduction, animal health and welfare and farm management.

## CONCLUSIONS

In the year 2021, the study pointed out that Spain, Romania, Greece, France and Italy have all together the largest number of sheep in the EU, accounting for 46,106 thousand sheep, meaning 77% of the EU sheep livestock (60,094 thousands heads) and the largest number of goats, summing 9,369 thousand heads, accounting for 82.1% of the EU goats livestock.

In the year 2020, taking into account milk production, Greece produces the highest amount of sheep milk, being followed by Spain, Italy, Romania and France, while the largest amount of goats milk is achieved by France, whose position is far away from Spain, Greece, Romania and Italy/

Regarding sheep and goat meat, the highest production is carried out by France, followed with smaller amounts by Spain, Greece, Romania and Italy.

In the countries with the highest production, the livestock declined was justified and the

efforts to improve yield have led to a higher performance.

However, the profitability per head is smaller in sheep and goat farming as it is practiced in regions with a limited agronomic potential like mountain area, semi-mountain, semi-arid and less favored areas.

To increase milk yield or meat per head it is important to grow the flock size or reorienting the farm on dairy production.

The diversification of the activity on farm is also an alternative to increase breeders' income and help rural areas to develop.

In this respect, the valorization of fresh milk and meat in products with high value added obtained by traditional processing technologies and certified for their origin and geographical designation is a guarantee of quality and could satisfy consumer's preferences.

Rural policy has to sustain sheep and goat farmer by direct support, but the lack of subsidies for the product and for animals have to complete the list of support measures.

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