

TRENDS IN GOATS' LIVESTOCK AND GOAT MILK, MEAT AND CHEESE PRODUCTION IN THE WORLD IN THE PERIOD 1990-2019- A STATISTICAL APPROACH

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Abstract

The paper aimed to analyze the main trends in goat livestock and milk, meat, cheese and butter production at the world level during the last 30 years, more exactly since 1990 till present. The data collected from Faostat have been processed using fixed basis index, regression equations and coefficient of determination. The results proved that goats are important in the agriculture of many countries. They play a more and more important role in food security and safety, milk, meat, cheese, butter, yoghurt being called to complete dairy products offer and satisfy better consumers' demand. In 2019, the goat livestock reached the peak of the last three decades, accounting for 1,093.7 million heads, milk production was 19.91 million tonnes, meat production 6.25 million tonnes, cheese production 564 thousand tonnes and 7,427 tonnes butter. The highest number of goats is in Asia (54%) and Africa (38%), the highest meat production is also in Asia (73%) and Africa (23%), and the largest milk production is obtained also in Asia (54%), Africa (25%) and Europe (15%). Cheese production has the highest level in Africa (44%), followed by Europe (38%) and Asia (13.6%). Goat breeders are encouraged to continue their business raising goats due to the higher and higher demand for the goat products. The great challenges for goat producers are market fluctuations, price volatility, climate change which could affect forage resources. In this respect, goat breeders associations will play an important role in supporting the farmers with technical services and effective policies to sustain them to benefit from the demand growth.

Key words: goats, production, milk, meat, cheese, trends, world, EU-28

INTRODUCTION

Goats are among the first animals which have sustained human life across its evolution from the old times till present. After their domestication, they played a more and more important role in supplying milk, meat and other products for the globe population [1, 8, 17, 25].

More than 60% of the world goats are grown especially in the tropical and arid regions where the globe population is facing a deficit of food and has a low income per family. Here, goat milk is the basic food, the primary food resource which maintains life [32].

Goats are not appreciated only in the developing countries, but also in the developed ones in Europe and Americas, where, despite that goats livestock is less numerous, the productivity in milk production

is higher, as long as the intensive and semi-intensive rearing systems are successfully applied, processing technologies are well developed, transforming raw milk in high value added products like cheese, yoghourts and butter etc, and consumers are willing to pay more for these products compared to dairy products obtained from cow milk [4, 9, 11, 31].

Goat milk has not only a high nutritive value, but is also considered a real medicine and a protective food, being recommended to be consumed by the people allergic to cow milk or suffering of lung and digestive diseases [11, 14, 20, 22, 25].

Goats are important from an economic, social and environment point of view. First, because, goats products are an important source of protein, amino-acids and other essential nutrients for human body [21, 23, 24, 28].

Secondly, because goats farming is easy to be practiced, requiring low investments compared to cow rearing, goats are not pretentious about food, forage resources are easily to find, in many countries there are pastures and meadows where grazing is a common practice and goats do not compete with humans for cereals. or use the land destined to agricultural crops. Also, goats assures organic manure which favors soil fertilization [3, 10, 19].

Goats raising is a pleasant and accessible activity for the population living in the rural areas, being a job and income source [20, 25, 26].

Goats and sheep are a common presence in the landscapes of many countries, where they contribute to the maintenance of their beautiful sceneries and biodiversity. In other countries like in the Balkan region, goats and sheep contribute to the maintenance of transhumance, the traditional pastoral system which involves extensive grazing, environment protection, landscape conservation and stimulate organic agriculture [29].

That is why goat rearing have to continue to assure the conservation of genetic resources, food security of the population, to avoid poverty, to contribute to the sustainable development of agriculture, to improve productivity and efficiency in this economic sector [2, 6, 12, 15, 25].

In this context, the paper aimed to analyze the trends in global goats livestock and milk, meat, and cheese production during the last 30 years, more exactly between 1990 and 2019. Also, the top 10 countries with high contribution to the development of goat sector have been highlighted.

MATERIALS AND METHODS

This study is based on FAOSTAT data collected for the period 1990-2019 regarding the following indicators: goat livestock, milk production, meat production, cheese and butter production. The market share of each continent and the top 10 countries in each goat production have been calculated.

Fixed basis index, trend equations and coefficient of determination have been the main methodological procedures applied in this study to show the important aspects which deserved to be respond to the approached topic.

The results were illustrated in graphics and tables, and the corresponding comments were done. In the end, the main ideas resulting from this research were highlighted at conclusions.

RESULTS AND DISCUSSIONS

World goats livestock

Across the time, goats' role in human diet has continuously increased due to the high nutritive value of milk and meat, increased demand, importance of goats rearing for the rural population living especially in the developing countries where the opportunities for finding a job are limited and income level per family is low.

In the last 30 years, the number of goats has continuously grown so that in 2019, it exceeded 1,093,732,777 heads, being by 85.75% higher than in 1990, when it counted for 588,796,759 heads [27] (Fig. 1).

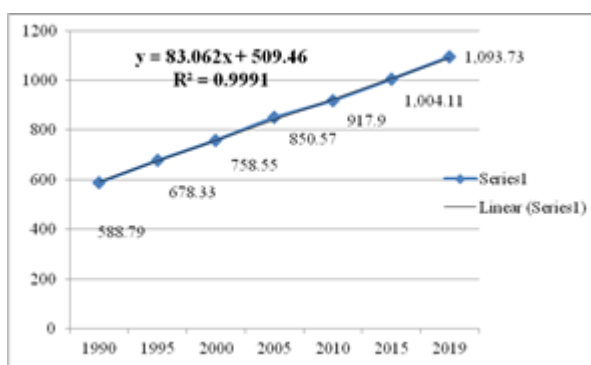


Fig. 1. Trends in goats' livestock in the world, 1990-2019 (Million heads)

Source: Own design based on the data from [7].

Goats are reared mainly in Asia and Africa, and in a lower proportion on the other continents. Therefore, the distribution of goats on the globe is different from a continent to another and from a country to another depending on soil and climate conditions, forage availability, tradition in goats growing and milk and meat consumption, the

opportunities for jobs in the rural areas, the need to preserve biodiversity and genetic resources, the requirements of animal protein in human diet if other sources are not sufficient.

About 54% of the total goats population existing in the world is raised in Asia, 39% in Africa, 3.5% in Europe, 3.4% in Americas and 0.1% in Oceania [13, 31].

The top 10 countries where the number of goats was the highest in 2019, in the decreasing order, are: India (13.61%), China (12.56%), Nigeria (7.49%), Pakistan (6.96%), Bangladesh (5.59%), Chad (3.55%), Kenya (3.22%), Ethiopia (3.11%), Sudan (2.93%) and Mongolia (2.68), all together keeping 674,701,285 goats, that is 61.7% of the global goats livestock (Fig. 2).

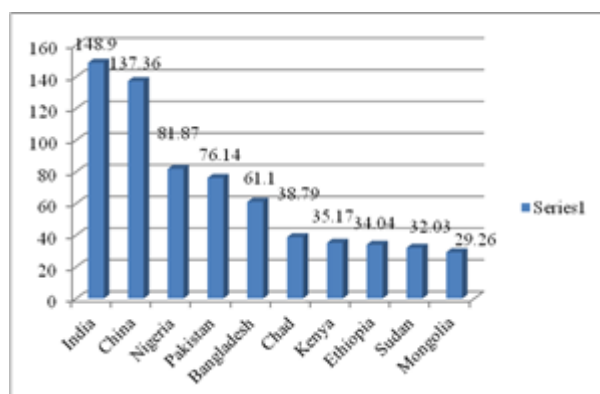


Fig. 2. The top 10 countries with the highest goats population in the world in the year 2019 (Million heads)

Source: Own design based on the data from [7].

Europe comes on the third position regarding the number of goats, but it is on the top position in the world for its industrialized sector and most organized market for goat products [13].

In the EU-28, goats livestock has registered a general decreasing trend, but in a few countries the number of goats increased. The main countries growing goats are: Greece (30%), Spain 922%), Romania (14%), France (10%), Italy (9%), Netherlands (5%), and Portugal (2.8%) [5].

World goat meat production

In general, goats are raised especially for milk and meat, but also for cheese, butter, hair etc. However, the purpose for which they are grown depends from a country to another.

Most of the goats belong to the double-purpose breeds, that is for milk and meat, but there are also breeds specialized only for milk production.

Goat meat is an important source of protein and other chemical compounds for a large part of the globe population and in the countries where consumption is traditional [18, 27].

During the last 30 years, the world goat meat production has also increased, from 2,665.8 thousand tonnes in 1990 to 6,252.5 thousand tonnes in 2019, meaning as level 2.34 times higher than in the 1st year of the period (Fig. 3).

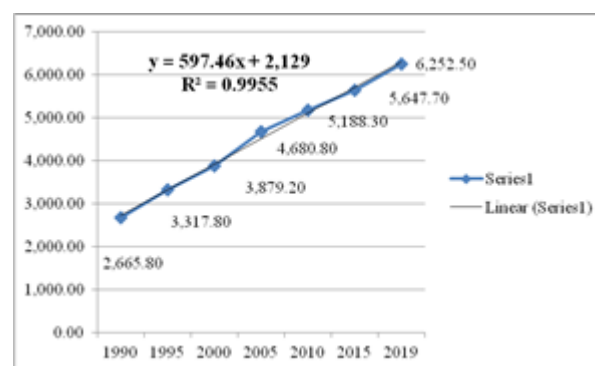


Fig. 3. Trends in the world goats' meat production, 1990-2019 (Thousand tonnes)

Source: Own design based on the data from [7].

Goat meat is mainly produced in Asia which in 2019 accounted for 72.7% in the global production, being followed by Africa with 23.46%, Americas with 2.2%, Europe with 1.28% and Oceania with 0.36%.

The top 10 countries producing goat meat worldwide in 2019, in the decreasing order of their market share, were: China (37.73%), India (8.85%), Pakistan (7.85%), Nigeria (4.26%), Bangladesh (3.62%), Myanmar (2.06%), Chad (2.01%), Sudan (1.92%), Mali (1.77%) and Ethiopia (1.54%). The meat production achieved by these countries accounted for 4,478,009 tonnes, representing 71.61% of the global goat meat output (Fig. 4).

In Europe, goat meat production is not so important, but it deserve to be mentioned Greece, Soain, France, Romania, Italy, Netherlands, Bulgaria and Portugal which produce the highest goat meat output [7].

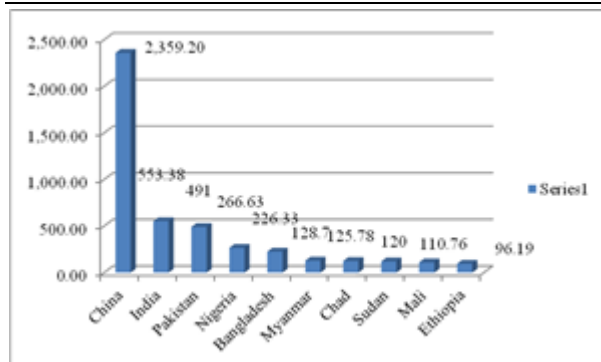


Fig. 4. The top 10 countries producing goat meat in the world in the year 2019 (Thousand Tonnes)

Source: Own design based on the data from [7].

World goat milk production

Due to the expanding demand, goats are primarily reared for milk production, milk being considered a "basic food" and being consumed as fresh milk or processed in various dairy products among which the most common are cheese, yoghurt, and rarely butter.

During the last 30 years, the world goat milk production has doubled its level, registering a continuous ascending trend from 10.16 million tonnes in 1990 to 19.91 million tonnes in 2019 (Fig. 5).

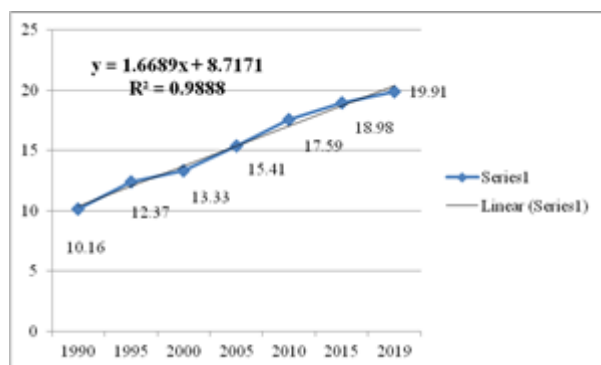


Fig. 5. Trends in the world goat milk production, 1990-2019 (Million tonnes)

Source: Own design based on the data from [7].

Of the total goat livestock, more than 250 million heads represent the dairy livestock, which accounts for 25%.

Goat milk production is by 47% higher than sheep milk production at the global level [31]. The highest contribution to the global goat milk output is given by the Asian countries (54.3%), and the African countries (25%), being followed by the European countries

(15.8%), Americas (4.5%) and Oceania (0.4%) [13, 31].

The top 10 goat milk producing countries in the world in 2019, in the decreasing order of their contribution to the global goat production, were; India (27.12%), Bangladesh (13.81%), Sudan (5.82%), Pakistan (4.72%), France (3.30%), Turkey (2.90%), Spain (2.69%), South Sudan (2.31%), Netherlands (1.94%), and Somalia (1.88%), all together carrying out 66.48% of the global goat milk (Fig. 6).

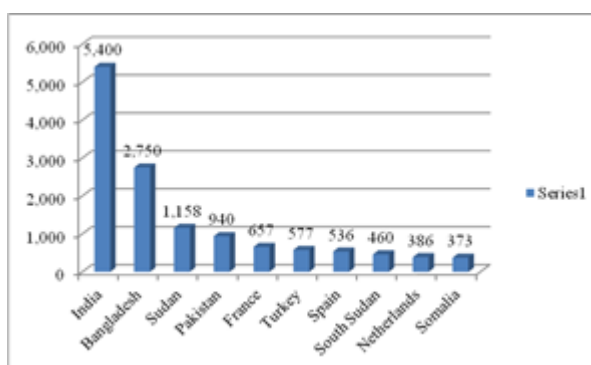


Fig. 6. The top 10 countries producing goat milk in the world in the year 2019 (Thousand Tonnes)

Source: Own design based on the data from [7].

Therefore, the highest milk production is coming from the goats raised in Asia, the most representative countries being India, Bangladesh and Pakistan, and then from Africa, where Sudan, South Sudan and Somalia are the main producers.

Europe comes on the 3rd position with almost 16% contribution to the global goat milk, the Americas are ranked the 4th with 4.5% market share and Oceania is the last with a negligible contribution.

Goats produced more milk than sheep, even though their livestock is less numerous than sheep population [31].

This is explained by the higher milk yield performance in case of goats, which are able to produce more than 75.3 liters per head compared to only 41.5 liters in case of sheep, as world average yield.

Yield level varies from a country to another depending on the breeds genetic potential, specialization profile, the applied growing

systems, feeding assurance and the development of milk processing industry.

The highest milk yield performance is achieved in Europe, where dairy goat sector is highly developed in France, Spain, Greece, Italy, Netherlands, but also in Romania, and Portugal.

Europe is on the top position for its industrialized dairy goat sector and very well organized market for dairy products, like fresh milk, cheese, yoghurt, butter etc. [16, 17, 20, 30].

Goats farming is practiced mainly in the intensive and semi-extensive systems with a high productivity assured by specialized breeds in milk production.

Milk processing technologies are highly industrialized, but also the main producing countries continue to preserve traditional on-farm manufacturing [13].

In Americas, goat dairy products are achieved in many countries playing an important economic, social and environmental role, the most important producers being Mexico, USA, Canada and Brazil [11].

World goat cheese production

The consumer preference for goat cheese is increasing and this has determine production growth.

In 2018, at the world level, there were produced 564,075 tonnes goat cheese, by 63.64% more than in the year 1990, when production accounted for only 344,707 tonnes (Fig. 7).

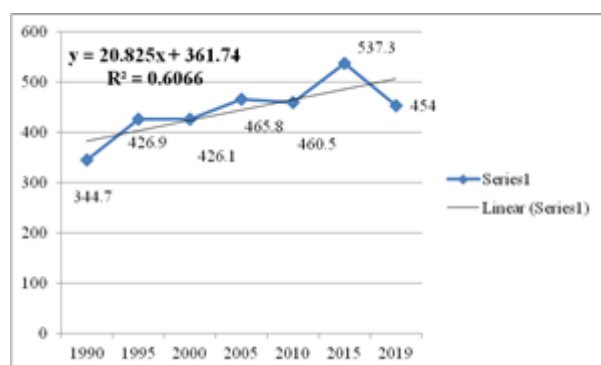


Fig. 7. Trends in the world goat cheese production, 1990-2019 (Thousand tonnes)

Source: Own design based on the data from [7].

Goat cheese is produced in about 35 countries in the world, mainly in Africa and Europe and

also in in Asia and Americas. In 2018, the distribution of goat cheese output by continent was: Africa 44.07%, Europe 38.03%, Asia 13.65% and America 4.23%.

The top 10 countries producing goat cheese and their market share was the following one in 2018: South Sudan 19.89%, France 17.66%, Sudan 16.17%, Spain 8.31%, Greece 7.31%, Niger 7%, Iran (Islamic) 6.03%, Mexico 2,99%, Tajikistan 2.48% and Afganistan 1.85%, all these countries together achieving 505.93 thousand tonnes, representing 89.69% of the global goat cheese output (Fig. 8).

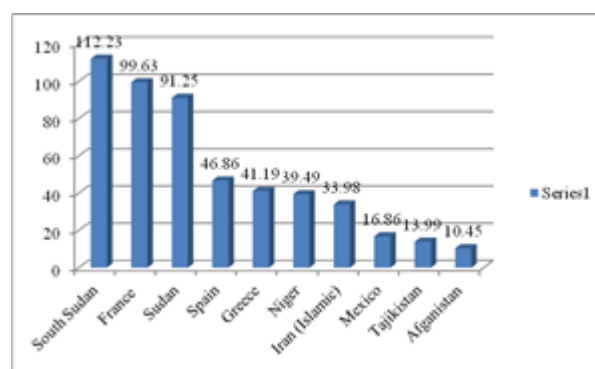


Fig. 8. The top 10 countries producing goat cheese in the world in the year 2019 (Thousand Tonnes)

Source: Own design based on the data from [7].

In Europe, mainly in the EU-28, goat cheese production is well developed in France, Spain, Greece and also in Italy, Bulgaria and Portugal.

The industrialized cheese making and also the traditional on-farm cheese manufacturing and selling is very common in these European countries.

Many sorts of cheese are of high quality and are Protected Designated Origin (PDO) products like in France, Spain, Greece, Italy, Netherlands and Portugal [13].

Goat milk butter production

Butter is rarely produced from goat milk. However, at the world level Spain is recognized as the main producer. In the year 2018 it carried out 7,427 tonnes butter, 2.34 times more than by 3,162 tonnes in the year 2015.

CONCLUSIONS

The statistical study confirmed that goats sector has become more and more important in the agriculture of many countries due to its importance for assuring milk, meat, cheese and even butter for consumers as their demand is higher and higher.

At the global level, the year 2019 registered the peaks of goat livestock: 1,093.7 million goats, milk production 19.91 million tonnes, meat production 6.25 million tonnes, cheese production 564 thousand tonnes and 7,427 tonnes butter.

The most numerous goat livestock is in Asia (54%) and Africa (38%), the highest meat production is also in Asia (73%) and Africa (23%), and the largest milk production is obtained also in Asia (54%), Africa (25%) and Europe (15%).

Cheese production has the highest level in Africa (44%), followed by Europe (38%) and Asia (13.6%).

The higher and higher demand for the goat products encourages breeders and processors to produce more and of a higher quality.

The great challenges for goat producers are market fluctuations, price volatility, climate change which could affect forage resources. In this respect, goat breeders associations will play an important role in assuring technical services and policies to support them to benefit from the demand growth.

REFERENCES

- [1]Bhardwaj, J.K., Kumar, V., Saraf, P., Kumari, P., Mittal, M., 2018, Current status and changing national scenario of goat population: A review, *Agricultural Reviews*, 39, 91-103, DOI: 10.18805/ag.-1752, <https://arccjournals.com/journal/agricultural-reviews/R-1752>, Accessed on Jan 3, 2021.
- [2]Biodiversity in development, *Livestock and biodiversity*, https://ec.europa.eu/europeaid/sites/devco/files/publication-biodiversity-in-development-brief-10-2001_en.pdf, Accessed on October 15, 2017.
- [3]Engindeniz, S., Ucar, K., 2014, Recent Developments in Turkish Goat Milk Production, *Conference: International Scientific Days 2014, Improving Performance of Agriculture and the Economy: Challenges for Management and Policy*, High Tatras, Slovakia,

<https://spu.fem.uniag.sk/mvd2014/proceedings/articles/Engindeniz.pdf>, Accessed on Dec.29, 2020.

[4]Eurostat, *Agricultural production - livestock and meat*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agricultural_production_-_livestock_and_meat&oldid=470510, Accessed on Jan 3, 2021.

[5]Eurostat, 2020, *Goats population*, https://ec.europa.eu/eurostat/databrowser/view/apro_mt_lsgoat/default/table?lang=en, Accessed on Jan 3, 2021.

[6]FAO, 2013, *Romanian strategy for a sustainable development of farm animal genetic resources Country Report for SoW-An-GR*, <http://www.fao.org/3/a1250e/annexes/CountryReports/Romania.pdf>, Accessed on Dec.29, 2020.

[7]FAOSTAT, 2020, www.faostat.org, Accessed on Dec.29, 2020.

[8]Grodea, M., 2018, *The sheep and goat farming sector in Romania- A new development perspective*, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol.18(3), 151-157.

[9]Guney, O.I., Sangun, L., 2019, *Determination of consumers' intention to purchase goat milk: the case of the Mediterranean Region*, *Anadolu Tarim Bilimleri Dergisi*, Vol.34(3), 289-295.

[10]Hum, J.S., 2015, *Introduction to the Dutch Goat Industry and a Cheese Making Farm*, *Journal of Dairy Science and Biotechnology*, Volume 33 Issue 1, 69-73

[11]Lu, C.D, Millar, B.A., 2019, *Current status, challenges and prospects for dairy goat production in the Americas*, *Asian-Australasian Journal of Animal Sciences (AJAS)* 2019; 32(8): 1244-1255. Special Issue Published online: July 1, 2019, <https://doi.org/10.5713/ajas.19.0256>, Accessed on Dec.29, 2020.

[12]Malabo Montpellier Panel report, *Meat, Milk & More: Policy innovations to shepherd inclusive and sustainable livestock systems in Africa* <https://www.mamopanel.org/news/in-the-news/2020/jul/17/ilri-overview-meat-milk-and-more-africa-four-count/>, Accessed on Dec.29, 2020.

[13]Miller, B., Lu, C. D., 2019, *Current status of global dairy goat production: an overview*, *Asian Australasian Journal of Animal Sciences* 32(8), DOI: 10.5713/ajas.19.0253

[14]Mushi, P.M., 2014, *A study on lactose intolerance and milk intake among people in Mgeta and Njombe areas, Tanzania*, Master Thesis, Norwegian University of Life Sciences, <https://core.ac.uk/download/pdf/52083614.pdf>, <https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/217128>, Accessed on Dec.29, 2020.

[15]Niznikowski, R., Strzelec, E., Popielarczyk, D., 2006, *Economics and profitability of sheep and goat production under new support regimes and market conditions in Central and Eastern Europe*, *Small Ruminant Research*, Vo.62(3), 159-165.

- [16]Pirvutoiu, I, Popescu Agatha, 2011, Analysis of Milk Supply and Trade Balance in the EU-27, International Symposium. "Bioengineering of Animal Productions", Timisoara, May 26-27, 2011, Scientific Papers: Animal Science and Biotechnologies, Timisoara, Vol.44(2), 494-499.
- [17]Pirvutoiu, I., Popescu Agatha, 2011, Study on the Trends in Romania's Meat Market, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.11(2), 133-139.
- [18]Pirvutoiu I, Popescu Agatha, 2013, Considerations on Trends in the Romanian Sheep and Goat Meat Market, 1990-2009, Scientific Papers: Animal Sciences and Biotechnologies, Vol.46 (2), p.412-417.
- [19]Popescu agatha, 2012, Research concerning the Economic Efficiency in Carabasa Sheep Breed raising in various sized farms, Scientific Papers:Animal Science and Biotechnologies, 45(2), pp.466-471.
- [20]Popescu Agatha, 2013, Study regarding the trends in the world and European Goat milk production, Scientific Papers Series Animal Science (Lucrari stiintifice Seria Zootehnie), Vol.59, 127-132.
- [21]Popescu Agatha, 2013, Considerations on Trends in the Romanian Sheep and Goat Meat Market, 1990-2010, Scientific Papers: Animal Sciences and Biotechnologies Timisoara, Vol.46 (1), p.397-403.
- [22]Popescu Agatha, 2015, Research on the trends in milking livestock and milk production in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 1/2015, p.377-386
- [23]Popescu Agatha, 2015, Research on the trends in milk production and consumption in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 1/2015, p.387-392.
- [24]Popescu Agatha, 2015, Research on the trends in Romania's milk and dairy products foreign trade, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.15, Issue 1/2015, p.391-398
- [25]Popescu Agatha, 2016, Analysis of sheep and goats livestock and milk and meat production in Romania, 2007-2016, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 17(4), 267-279.
- [26]Popescu Agatha, 2017, Trends in milk market and milk crisis impact in Romania, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.17(2)2017, p. 281-290
- [27]Popescu Agatha, 2017, Analysis of sheep and goats livestock and milk and meat production in Romania, 2007-2016, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.17(4)2017, p.267-280.
- [28]Popescu Agatha, 2020, Trends in sheep and goats livestock and meat production concentration and their economic impact in Romania in the period 2009-2018, Annals of the Academy of the Romanian Scientists, Series Agriculture, Silviculture and Veterinary Medicine Sciences, Vol.9(1)2020, pp.75-85.
- [29]Popescu Agatha, Marcuta, L.,Tindeche, C., Marcuta, A., Dorobantu, D.M., 2020, Ewes and goats' contribution to the raw milk delivered to dairies in Romania in the period 2009-2018 and forecast for 2019-2023 horizon, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.20, Issue 2/2020, pp. 371-378.
- [30]Popescu Agatha, Tindeche, C., Hontus, A., Marcuta, A., Marcuta, L., Angelescu, C., 2020, Ewes and goats' contribution to the EU-28 milk production in the period 2010-2018, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development, Vol.20, Issue 3/2020, pp. 431-442.
- [31]Pulina, G., Milan, M.J., Lavin, M.P., Theodoridis, a., Morin, E., Capote, J., Thomas, D.L., Francesconi, A.H.D., Caja, G., 2018, Current production trends, farm structures and economics of the dairy sheep and goat sectors, Journal of Dairy Science, 2018, Vol.101(8), 6715-6729.
- [32]Skapetas, B., Bampidis, V., 2016, Goat production in the World: present situation and trends, Livestock Research for Rural Development 28 (11) 2016, <http://www.lrrd.org/lrrd28/11/skap28200.html>, Accessed on Jan 3, 2021.

