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RESEARCH ON ANIMAL PRODUCTION TRENDS IN 2014-2020 IN ROMANIA

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Abstract

The paper aims to analyze the actual trends in animal production in Romania. The statistical data were provided by the National Institute of Statistics for the period 2014-2020, and in order to highlight the evolution trends, the following statistical indicators were calculated: arithmetic mean, standard deviation, coefficient of variation and annual growth rate. The species with the most livestock in 2020, in Romania is represented by poultry (71,183,431 heads), of which adult laying birds (36,648,478 heads); cattle (1,875,169 heads), of which cows, buffaloes and heifers (1,230,717 heads,) and sheep (10,281,473 animals). Regarding animal production, we have the following statistical data: the live weight of cattle for slaughter was 172,586 tons, by approx. 6% lower than in 2014, pigs live weight decreased by 7%, reaching 498,098 tons in 2020. Finally, the live weight of sheep and goats increased by 12% during the period under review, reaching 120,571 tonnes in 2020. The largest increase of 36% was noticed in poultry live weight.

Key words**:** *Romania, livestock, animal production, prices*

INTRODUCTION

The livestock industry offers high quality foods, they have a higher energy value per unit weight and contain a high volume of protein. In Romania, the number of animal farms is significant. Farms are of various sizes, the most predominant being the family farms. Romanian farmers are also struggling to survive to meet market needs, but the shortage between supply and demand has led to an increase in imports of animal products, mainly from EU countries. The livestock sector has significantly diminished its importance in the value of total production, due to the decrease in the number of herds for cattle, pigs and poultry. According to the data presented by the National Institute of Statistics, in 2020, the animal sector contributed with approx. 30% of total agricultural production [8].

Animal production provides consumers with the following product categories: meat, milk, eggs and other products of animal origin and also meets the requirements industry for raw materials. Animal production is currently facing significant changes in the number of farms, diversification of production, technologies applied, structure of animal species and categories, product quality, production costs, agricultural inputs, productivity and economic efficiency. Moreover, animal production is a source of agri-food products for export, contributing to international trade [3].

Cattle breeding is the branch with the greatest importance in animal husbandry, due to the volume, diversity and value of productions and products obtained from this activity. Cattle contribute 90-96% of the total milk production consumed worldwide, 30-35% of the meat produced and about 90% of the total animal skins processed in the world tannery industry. In optimal operating conditions, a cow can cover the optimal consumption required for 6 to 8 inhabitants. At present, beef production is declining significantly, in this context it is necessary to make imports to cover the gap between production and consumption. The main cause of the decline in

production is the reduction in livestock, due to the high level of prices at agricultural inputs and the low price per kg of meat [4,10].

In Romania, the meat sector has been and continues to be affected by African swine fever, recording a significant loss. Pork is the most preferred assortment of meat by the Romanian consumer, in this context, an increase in trade imbalance is expected in the coming years which will generate an increase in prices [9,10].

Romania has a self-sufficiency for sheep meat of 150%, being among the first Community countries in terms of the number of registered cattle. The main reason why sheep meat production has remained constant, with increasing trends, is the Orthodox tradition during the Easter holidays, when demand increases significantly for this category of products [10, 2].

Romania has a long tradition in terms of milk production, due to its geographical position, with a wide variety of relief and a large area of agricultural land, as well as pastures and meadows for raising cattle, sheep and goats. In Romanian agriculture, milk production ranks second in importance, after meat production. The milk and dairy products sector is one of the most important fields of Romanian agriculture. Approximately 95% of the total milk production in Romania is obtained in the sector and provides the largest amount of milk for processing. The areas with the largest contribution to domestic milk production in Romania are represented by the central region and the North-East region, dairy products are processed mainly in the central part of the country, in the South-Muntenia region and the Bucharest-Ilfov region. In terms of cheese production, the North-West, Central and North-East regions have the highest cheese production in the country [7, 1].

MATERIALS AND METHODS

The data used in this study were provided by the National Institute of Statistics in Romania, based on which the following indicators were calculated: mean, standard deviation, coefficient of variation and growth rate.

- standard deviation:

$$= \sqrt{\frac{\sum(xi - \overline{x})^2}{n-1}}$$

∂ = standard deviation;
xi = data series values over a number of years;
n = the number of years considered.

- coefficient of variation:

$$C = \frac{\partial}{\overline{X}} * 100$$

s = standard deviation;
x= average level of a variable;

- growth rate:

$$r = \sqrt[n-1]{\prod\left(\frac{p\,n}{p\,n-1}\right)} - 1$$

r = average annual growth rate;
$\prod$pn/pn-1 = chained growth indicators.

The research method used consisted in the quantitative and qualitative analysis of the data to highlight the evolution of the analyzed indicators.

The data used showed the number of animals, animal production and basic prices of products of animal origin in Romania in the period 2014-2020.

RESULTS AND DISCUSSIONS

In the period 2014-2020, the herds of animals registered a decreasing trend for the following species: cattle (-9.36%), cows and heifers (-5.86%), pigs (-24.94%), poultry (-5.65%) and adult laying birds (-14.25%) (Figure 1).

At the opposite pole, the species represented by sheep (8.02%) and goats (13.73%) registered an increasing trend during the analyzed period (Figure 1).

From the analysis of statistical indicators calculated for the total number of animals in Romania in the period 2014-2020, there were identified the trends and variations mentioned below.

Cattle herds varied between 1,875,169 heads and 2,092,414 heads, obtaining an average of the period equal to 1,999,690 heads and a standard deviation of 79,443 heads.

Regarding the coefficient of variation, a good homogeneity of the data series is observed,

this having a value below 10%, respectively 3.97%. The annual growth rate showed a negative value (-1.63%) indicating a reduction in cattle during this period.

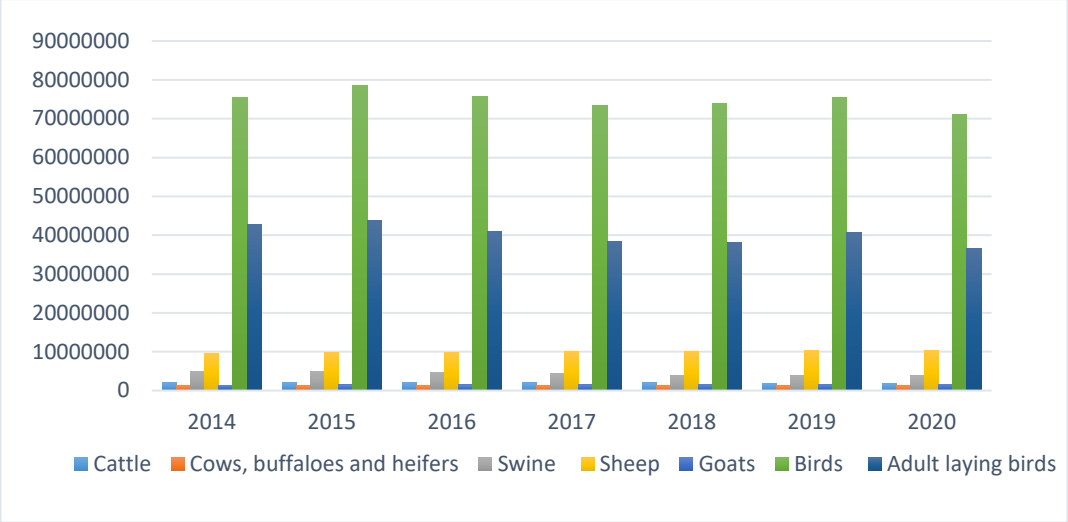

Fig. 1. Evolution of livestock in Romania at the level of the period 2014-2020 (number)
Source: National Institute of Statistics, NIS, data processing, Accessed on 20.06.2022 [6].

The herds of cows, buffaloes and heifers showed oscillations between 1,230,717 heads and 1,314,900 heads, with an average of the period equal to 1,282,913 heads and a standard deviation of 34,286 heads. The coefficient of variation is equal to 2.67% and indicates a homogeneity of the data series, and the annual growth rate is -1%, its negative value indicates a downward trend in the period analyzed.

-The herds of pigs were between 3,784,507 heads and 5,041,788 heads, highlighting an average of 4,375,196 heads and a standard deviation of 532,972 heads. An average value of the coefficient of variation of 12.18% was noticed, which suggests an average variation of the data series. Regarding the annual growth rate, there was a downward trend by -4.67%.

-The flocks of sheep registered variations between 9,518,225 heads and 10,358,699 heads, obtaining an average of the period equal to 10,000,236 heads and a standard deviation of 295,306 heads. The coefficient of variation of 2.95% marks a homogeneous series of data, and the annual positive growth rate (1.29%) underlines the trend of positive/increasing evolution of the data series (Table 1).

Table 1. Statistical indicators calculated for livestock in Romania at the level of the period 2014-2020

Nr. crt.	Categories of animals	MIN	MAX	AVERAGE	STANDARD DEVIATION	* COEFFICIENT OF VARIATION (%)	ANNUAL GROWTH RATE (%)
1.	Cattle	1,875,169	2,092,414	1,999,690	79,443	3.97	-1.63
2.	Cows, buffaloes and heifers	1,230,717	1,314,900	1,282,913	34,286	2.67	-1.00
3.	Swine	3,784,507	5,041,788	4,375,196	532,972	12.18	-4.67
4.	Sheep	9,518,225	10,358,699	10,000,236	295,306	2.95	1.29
5.	Goats	1,417,176	1,611,785	1,512,815	73,742	4.87	2.17
6.	Birds	71,183,431	78,648,098	74,802,061	2,322,050	3.10	-0.96
7.	Adult laying birds	36,648,478	43,662,606	40,151,041	2,567,192	6.39	-2.53

* Coefficient of variation: <10 - small; 10-20 - medium; > 20 - large.
Source: NIS, data processing, Accessed on 20.06.2022 [6].

The goat herds oscillated in the analyzed period between 1,417,176 heads and 1,611,785 heads, obtaining an average of the period equal to 1,512,815 heads. Following the analysis of the calculated statistical indicators, a coefficient of variation of 4.87% and an annual growth rate of 2.17% resulted, its positive value highlighting the growth trend.

-The flocks of birds and adult laying birds registered values between 71,183,431 and 78,648,098, respectively 36,648,478 and 43,662,606. The low value of the coefficient of variation (3.10%, respectively 6.39%) characterizes the data series as a homogeneous one, and the negative annual growth rate (-0.96%, respectively -2.53%), puts in highlights the decreasing trend (Table 1).

In Romania, at the level of the period 2014-2020, the meat production, respectively the live weight of the animals destined for slaughter for consumption registered an increase of 12% for the sheep and goat species.

The most significant increase in the analyzed period, of 36% was registered in birds. With regard to beef and pig meat production, decreases of 6% for cattle and 7% for pigs were recorded during the period considered. In the case of pigs, the decrease in production can be attributed to the spread of swine fever, which has generated economic losses for the pork sector (Figure 2).

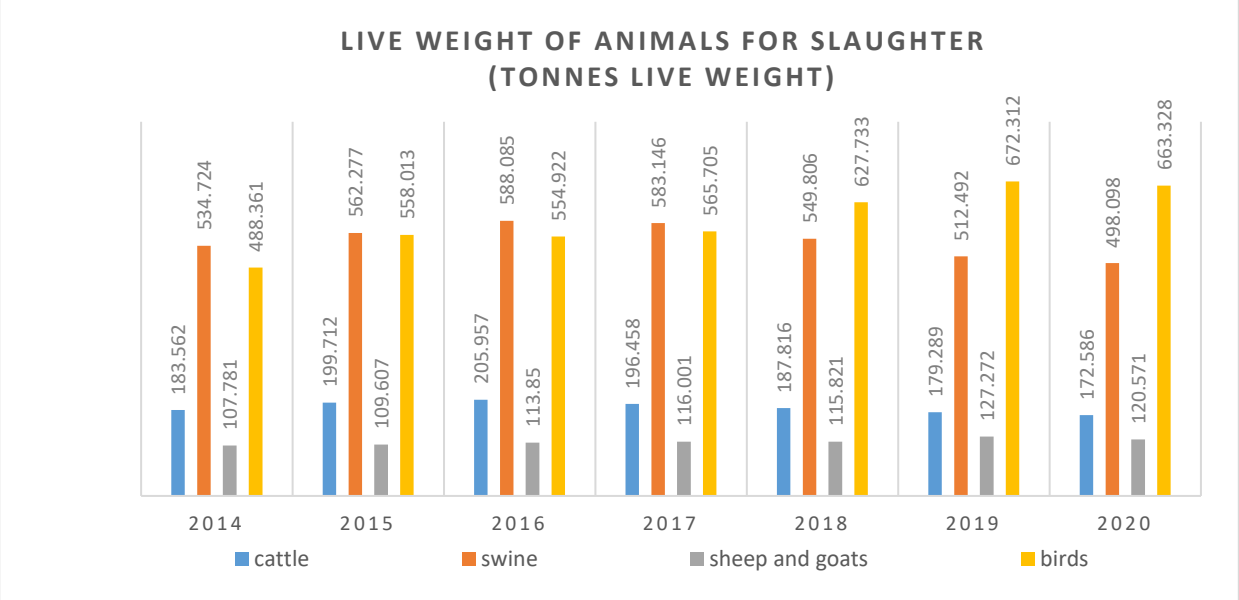

Fig. 2. Evolution of the live weight of animals destined for slaughter for consumption in Romania at the level of the period 2014-2020 (tons live weight)
Source: NIS data processing, Accessed on 20.06.2022 [6].

Analyzing the production of the main categories of animal products in Romania in the period 2014-2020, it showed a decrease. By product categories there was a decrease by 7.59% for milk production which includes the consumption of calves, and for that which excludes the consumption of calves the decrease was by 8.59%. The most significant decrease was recorded in egg production, which was 18.20% in the analyzed period.

Regarding the wool production, the trend was one of evolution, being highlighted an increase by approx. 5.68% during this period (Table 2).

From the analysis of statistical indicators calculated for animal production by product categories in Romania in the period 2014-2020, the following data were recorded: the milk production that includes the consumption of calves varied between 46,161 and 50,535 thousand hectoliters, registering an average of the period equal to 47,720 thousand hectoliters and a standard deviation of 1,623 thousand hectoliters. Regarding the milk production that excludes the consumption of

calves, a variation between 42,113 and 46,615 thousand hectoliters was observed with an average period of 43,918 thousand hectoliters and a standard deviation equal to 1,637 thousand hectoliters. During this period, wool production averaged 22,740 tonnes, with variations ranging from 21,817 to 23,824 tonnes and a standard deviation of 722 tonnes. For egg production, the average for the period was 6,011 million pieces, with oscillations between 5,428 and 6,636 million pieces, and the standard deviation was equal to 473 million pieces (Table 3).

Table 2. The evolution of the production of the main categories of animal products in Romania in the period 2014-2020

Crt. No.	Product categories	Years							2020/2014 %
		2014	2015	2016	2017	2018	2019	2020	
1.	Milk production (including consumption of calves) -total (physical) -thousands of hectoliters	50,535	49,156	48,133	46,615	46,741	46,161	46,697	-7.59
2.	Milk production (excluding calves) - total (physical) -thousands of hectoliters	46,615	45,385	44,504	43,082	43,121	42,113	42,609	-8.59
3.	Wool production -tons	21,817	22,343	22,277	22,401	23,459	23,824	23,057	5.68
4.	Egg production -millions of pieces	6,636	6,555	6,182	5,996	5,713	5,564	5,428	-18.20

Source: NIS, Accessed on 20.06.2022 [6].

The coefficient of variation showed values between 3.40% for milk production which includes the consumption of calves and 7.88% for the production of eggs for consumption. Its low value, below 10%, indicates a homogeneous series of data. Regarding the coefficient of variation, it recorded negative values for milk production which includes calf consumption (-1.31%), which excludes calf consumption (-1.49%) and egg production (-3.29 %), indicating a downward trend of the data series in the analyzed period. Regarding the wool production, the evolution trend was an increasing one, the annual growth rate being a positive one of 0.93% (Table 3).

Table 3. Statistical indicators calculated for production of the main categories of animal products in Romania at the level of the period 2014-2020

Nr. crt.	Product categories	MIN	MAX	AVERAGE	STANDARD DEVIATION	* COEFFICIENT OF VARIATION (%)	ANNUAL GROWTH RATE (%)
1.	Milk production (including consumption of calves) -total (physical) -thousands of hectoliters	46,161	50,535	47,720	1,623	3.40	-1.31
2.	Milk production (excluding calves) - total (physical) -thousands of hectoliters	42,113	46,615	43,918	1,637	3.73	-1.49
3.	Wool production -tons	21,817	23,824	22,740	722	3.18	0.93
4.	Egg production -millions of pieces	5,428	6,636	6,011	473	7.88	-3.29

* Coefficient of variation: <10 - small; 10-20 - medium; > 20 - large.
Source: NIS data processing, Accessed on 20.06.2022 [6].

At the level of 2020, the milk production, including the consumption of calves in Romania reached the value of 46,697 thousand hectoliters, by approximately 7.59% lower than the one registered in 2014. From the calculation of the linear regression it

results that the milk production, including the consumption of calves in Romania decreased on average by approx. 2,111 thousand hectoliters per year (Figure 3).

According to the equation of trend y = 129.96x^2-1,752x + 48,327, milk production, excluding the consumption of calves decreased on average annually, during the analyzed period, by about 1,752 thousand hectoliters. At the level of 2020 (42,609 thousand hectoliters) there was a decrease in production by about 9% compared to the production recorded in 2014 (46,615 thousand hectoliters) (Figure 4).

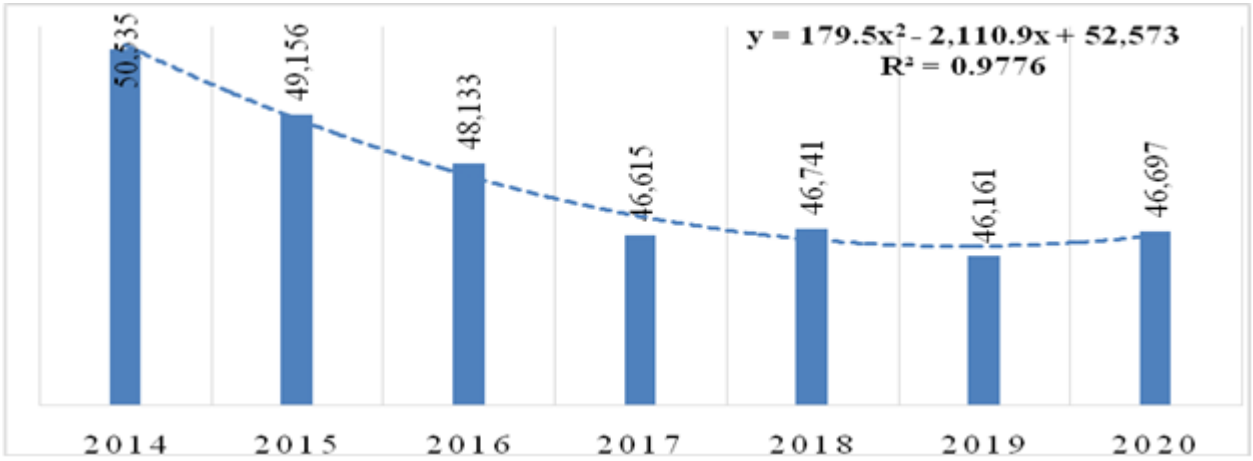

Fig. 3. Evolution of milk production (including calf consumption) - total (physical) - thousand hectoliters
Source: NIS data processing, Accessed on 20.06.2022 [6].

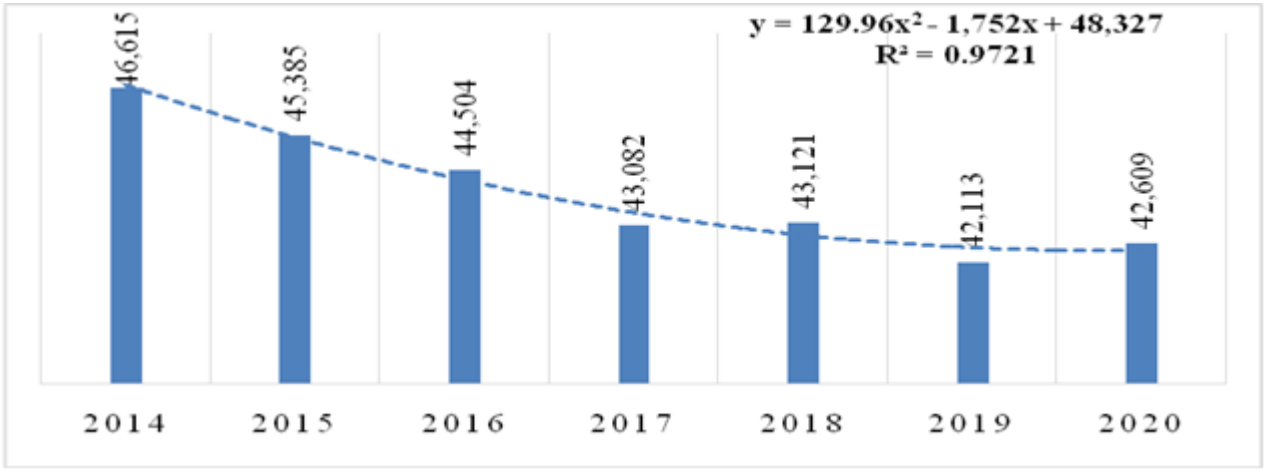

Fig. 4. Evolution of milk production (excluding calf consumption) - total (physical) - thousand hectoliters
Source: NIS data processing, Accessed on 20.06.2022 [6].

Calculating the trend equation y = -29.071x^2 + 513.43x + 21,267, it is found that on average annually, wool production increased by 513 tons. Also, there is a very strong link between the two variables, the variation of wool production being explained in proportion of 72.8% by the time factor, the rest being the influence of other factors not included in the model (Figure 5).

In the period 2010-2020, it was observed that egg production in Romania had a downward trend, registering values between 5,428 million pieces in 2020 and 6,636 million pieces in 2014, obtaining an average of the same period of 6,011 million pieces. During the analyzed period, an annual growth rate of -3.29% was registered, so that at the end of 2020 egg production was 22.25% lower than in the reference year 2014. By calculating the trend equation it is found that that egg production decreased on average during the analyzed period by 98.4 million pieces per year (Figure 6).

The basic prices of animal products registered an increase in the period 2014-2020, less poultry meat which registered a decrease of

5%, from 4,000 lei/ ton to 3,810 lei/ton. The largest increase in the basic price was noticed for eggs, their price registering an increase of approx. 30%, from 9,600 lei/ton to 12,400 lei/ton, followed by raw wool and beef that recorded an increase of about 23% during this period (Figure 7).

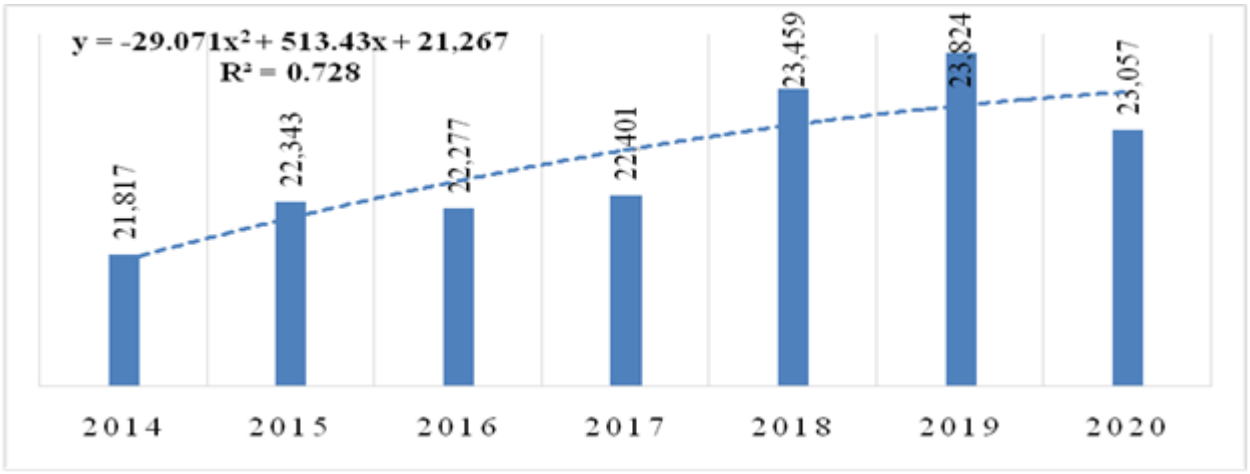

Fig. 5. Evolution of wool production - tons
Source: NIS data processing, Accessed on 20.06.2022 [6].

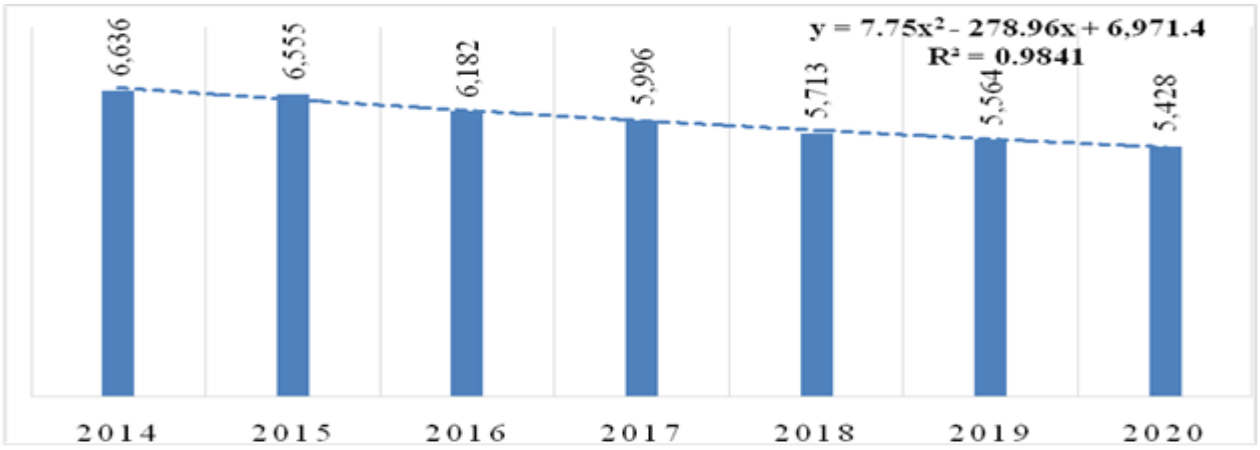

Fig. 6. Evolution of egg production - million pieces
Source: NIS data processing, Accessed on 20.06.2022 [6].

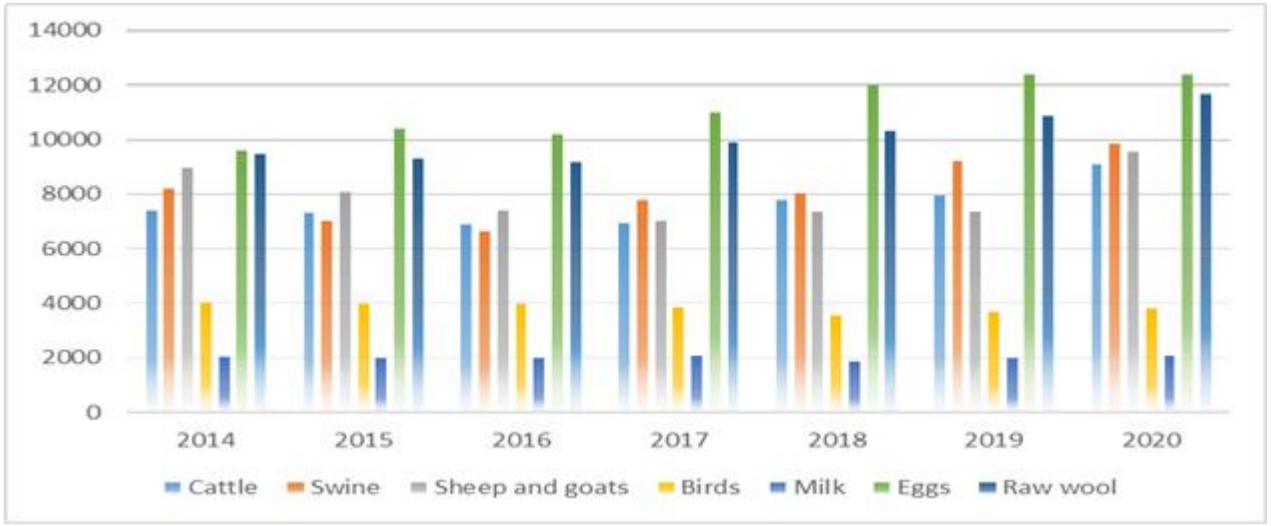

Fig. 7. Evolution of basic prices for the main categories of animal products (lei/ton)
Source: NIS data processing, Accessed on 20.06.2022 [6].

CONCLUSIONS

The livestock sector provides staple foods: meat, milk and eggs for consumption. These products are very attractive to Romanian consumers, being among the most consumed products in the food industry. Following the research, the following were found:

In the period 2014-2020, the herds of animals had a downward trend, except for sheep and goat species, which recorded increases by 8.02% and 13.73%, respectively. With regard to animal production, there was a decrease in production for all product categories, with the exception of wool production, which increased by 5.68% during the period considered. The most significant decrease was observed in egg production, of 18.20%.

Taking into account the fact that animal products are staple foods, they must be promoted among Romanian consumers and also to be sold on international markets.

Also, the national aids and the coupled support received from the Romanian government and the EU are

especially important for livestock farmers, help them to better develop production in this sector.

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