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# MILK MARKET - SITUATION AND PERSPECTIVE

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## Abstract

*A very large number of people around the world consume milk and dairy products every day. Milk and dairy products are not only an essential source of nutrition being a source of calcium, but also a conjuncture and opportunity for both farmers and processors, traders and other members of the value chain. The raising of dairy cattle is a central point in the livestock sector in Romania, representing the main occupation in most rural areas and mountain areas. The paper presents the evolution of the main indicators regarding the herds, the milk production obtained and the milk consumption in Romania as well as a forecast of the milk production until 2030.*

**Keywords:** milk market, milk production, forecast

**JEL classification:** Q10, Q12

## INTRODUCTION

The last years have been characterized by a considerable increase in the demand for milk and dairy products in Romania due to the evolution of the dairy market, both at European and national level, as well as the change of preferences and orientation of consumers towards a healthier diet.

In Romania, milk is a basic product in human nutrition, consuming on average about 243 l/inhabitant/year, the main type of milk consumed being cow's milk. Romania ranks ninth among the countries of the European Union, in terms of the number of cattle, with a number of 1.88 million herds in 2020 and a total production of 42.6 million hectoliters of milk. The dairy sector is essential for a good overall development of the economy, as it contributes to creating links between agriculture and the food industry (Ladaru, 2020).

Raising animals, especially cattle, is a basic occupation of the rural population generating constant incomes and the stability of the local labor force. In many cases, for cattle farmers, milk is the only source of trade and maintenance.

Studies have been conducted on the milk market, for example Popescu A., in the paper entitled "Trends in milk market and milk crisis impact in Romania" claims that about 90-96% of total milk production that is consumed worldwide it is cow's milk. In addition, the same study states that the demand-supply ratio is unbalanced. The milk crisis affected Romania, the milk market facing problems related to the impossibility of ensuring the quantity of milk necessary for national consumption, this being ensured through imports.

## MATERIAL AND METHOD

This study presents the analysis and evolution of the main indicators on the number of livestock (cattle, sheep and goats) including milk production obtained for each category of livestock, as well as the evolution of average annual milk consumption. In addition, statistical indicators such as standard deviation, coefficient of variation and growth rate were calculated.

The standard deviation is a statistical indicator that measures the dispersion of a data set in relation to its average, being defined by the formula:  $\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{(n-1)}}$ , where: x = sample mean; n = sample size;

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The coefficient of variation is a statistical indicator that measures the dispersion of data points in a series of data around the mean, using the formula:  $Cv = \frac{\sigma}{\mu} \times 100$ , where:  $\sigma$  = population standard deviation;  $\mu$  = population average;

Growth rate measures the percentage change in a value over a period of time, using the formula:  $\bar{R} = (\bar{I} \times 100) - 100$ , where:  $\bar{I}$  = the general average growth index.

At the end of the paper, a model of forecasting the total milk production was made, in order to show its trend. The estimation was performed using the SPSS program. Chronological series estimation was performed by using a model to predict future events based on known past events.

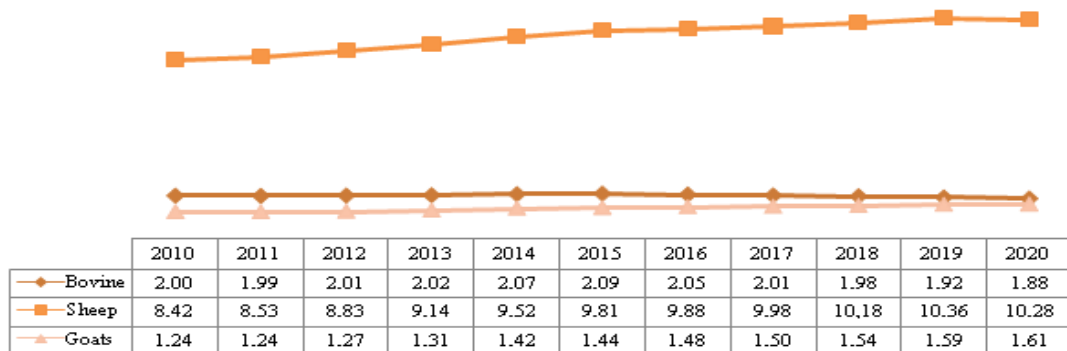
## RESULTS AND DISCUSSIONS

The evolution of the main indicators regarding the herds of animals (cattle, sheep and goats), the milk production obtained and the average annual milk consumption in Romania were analyzed.

Cattle herds increased until 2015, when the maximum number of cattle of 2.09 million head was noted, and by 2020 cattle will fall sharply, below the threshold of 2 million (1,92 million heads in 2019, respectively 1.88 million heads in 2020), representing a decrease of about 5.34% compared to the base year, 2010.

At national level, in the sheep and goat sector there is an increasing trend of herds throughout the analyzed period, so that in 2020 the sheep were 22.09% more than the first year analyzed while the goats were 29,83% more, registering an annual rate of 2.02% and 2.65% respectively.

**Figure 1. The evolution of the number of animals, in Romania, in the period 2010-2020 (million heads)**



Source: processing based on data provided by the National Institute of Statistics, accessed on 16.04.2021

From the analysis of the statistical indicators calculated for the herds of animals, in the analyzed period the following resulted:

- the standard deviation for livestock was limited to 0.06 million head for cattle and 0.70 million head for sheep;
- the coefficient of variation for livestock ranged between 3.10% for cattle and 9.79% for goats, which indicates that the analyzed series has a high degree of homogeneity;
- in terms of growth rate, positive values were recorded for most animal species, except for cattle, which recorded a negative growth rate.

**Table 1. The main technical indicators calculated for the main herds of animals in Romania, 2010-2020 (million heads)**

Category	Min	Max	Average	Standard deviation	Variation Coeff. (%)	Growth rate (%)
Bovine	1,89	2,09	2,00	0,06	3,10	-0,65
Sheep	8,42	10,36	9,54	0,70	7,34	2,02
Goats	1,24	1,61	1,42	0,14	9,79	2,65
<b>Total</b>	<b>12,43</b>	<b>14,30</b>	<b>13,55</b>	<b>0,69</b>	<b>5,09</b>	<b>1,32</b>

Source: own calculations based on INSSE data

\* Coefficient of variation: <10 = small; 10-20 = medium; > 20 = large.

**Figure 2. Milk production (excluding calf consumption) - total, in Romania, in the period 2010-2020 (million hectoliters)**



Source: processing based on data provided by the National Institute of Statistics, accessed on 16.04.2021

The total milk production in the country in the analyzed period registered a downward trend, overall, in 2020 an amount of 42.6 million hectoliters was obtained, which is 5% lower than in 2010 when they were obtained. 44.80 million hectoliters. Cow's and buffalo's milk represent 86% of the total milk production obtained, while sheep's and goat's milk have a share of 14%.

From the analysis of the calculated statistical indicators, in the analyzed period the following resulted:

- the standard deviation for the obtained production registered limits between 0.18 million hectoliters for sheep's and goat's milk and 1.40 million hectoliters for cow's and buffalo's milk;
- the coefficient of variation ranged between 2.80% for sheep and goat milk and 3.69% for cow and buffalo milk, which indicates that the variation of the characteristic is small, the analyzed data series is homogeneous, the average being representative.
- in terms of growth rate, there were positive values for the production of sheep's and goat's milk (0.23%) and negative values for the production of cow's and buffalo's milk (-0.63%).

**Table 2. The main technical indicators calculated for total production of main livestock species 2010-2020 (mil. hectolitri)**

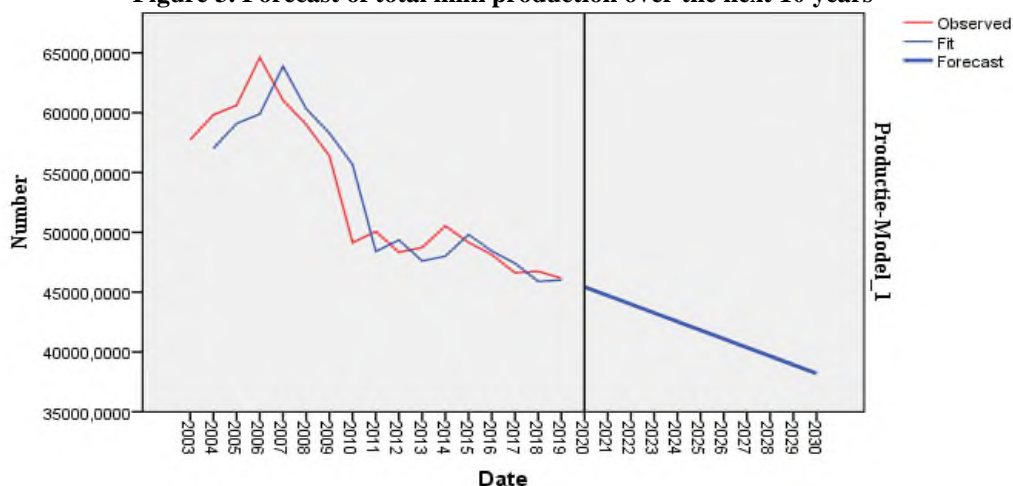
Categorie	Min	Max	Average	Standard deviation	Variation Coeff. (%)	Growth rate (%)
Milk production (excluding calf consumption) cow and buffalo	35.71	40.10	38.00	1.40	3.69	-0.63
Milk production – sheep and goats	6.05	6.52	6.27	0.18	2.80	0.23
Milk production (excluding calf consumption) - total	<b>42.11</b>	<b>46.62</b>	<b>44.28</b>	<b>1.42</b>	<b>3.20</b>	<b>-0.50</b>

Source: own calculations based on INSSE data

\* Coefficient of variation: <10 = small; 10-20 = medium; > 20 = large.

In 2003, approximately 44.8 million hectoliters of milk were produced. Therefore, observing the downward trend of total milk production, a model was created in which its evolution in the next period was predicted, until 2030.

**Figure 3. Forecast of total milk production over the next 10 years**



Source: processing based on INSSE, ITC data

While overall production needs to increase to meet growing demand, it is expected that there will be a decrease in total milk production. According to the model, in 2030 Romania could produce up to 38 million hectoliters, which would mean 20% less compared to 2003.

From the point of view of the analysis of milk consumption at national level, as a whole, it has an increasing trend, consuming on average approximately 243 l/inhabitant/year. In 2020, there was an increase of 6.36% compared to 2010, due to the change in consumer behavior of the population.

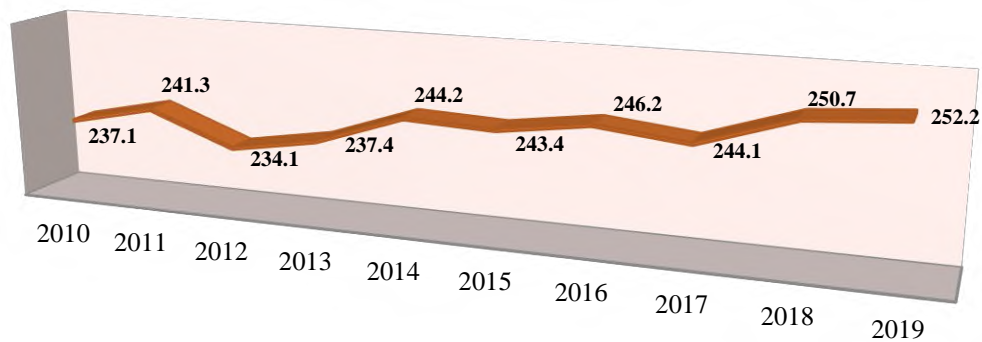
**Table 3. Total milk production obtained, including the estimate by 2030**

Production obtained (thousand hectoliters)	Year
44,832	2003
53,386	2004
53,852	2005
57,886	2006
54,991	2007
53,329	2008
51,270	2009
44,799	2010
45,872	2011
44,172	2012
44,786	2013
46,615	2014
45,385	2015
44,504	2016
43,082	2017
43,121	2018
42,113	2019
42,609	2020
44,714	2021
43,991	2022
43,267	2023

Production obtained (thousand hectoliters)	Year
42,544	2024
41,820	2025
41,097	2026
40,374	2027
39,650	2028
38,927	2029
38,203	2030

Source: own processing in SPSS, based on INSSE data

**Figure 4. Analysis of the evolution of the average annual milk consumption per capita (liters)**



Source: processing based on INSSE data

## CONCLUSION

The analysis of the indicators shows that in 2020, the number of sheep is the highest, representing 75% of the total livestock \*, while cattle and goats represent 14% and 12% of the total. Calculating the statistical indicators, it turned out that the standard deviation has values between 0.06 million heads and 0.70 million heads, the coefficient of variation is between 2.80% and 3.69% and the growth rate has positive values for the herds. of sheep and goats, with the exception of cattle, which recorded a negative growth rate.

The total milk production is on average 44.28 million hectoliters, the highest percentage being represented by cow's and buffalo's milk, 85% and only 15% represent the goat's and sheep's milk from the total production obtained. The standard deviation has values between 0.18 and 1.40 million hectoliters of milk, the coefficient of variation is between 2.80% and 3.69% and the growth rate records negative values only for cow's and buffalo's milk.

Milk production is expected to follow a downward trend in the coming years in 2030 and it is estimated that only 38 million hectoliters of milk will be produced, while overall production needs to increase to meet growing demand.

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