

## RESEARCH ON THE INFLUENCE OF FEED RATION ON THE PRODUCTIVITY OF THE HOLSTEIN-FRIESIAN BREED IN INTENSIVE FARMS IN SOUTH-EASTERN ROMANIA, CASE STUDY

Nicoleta OLTENACU

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd,  
District 1, 11464, Bucharest, Romania, Phone/Fax: 00 40 744 6474 10.E-mail:  
nicoleta\_oltenacu@yahoo.com

**Corresponding author:** nicoleta\_oltenacu@yahoo.com

### Abstract

*Cattle breeding is a very important branch of agriculture because it provides a large volume of animal products needed by humans, a large share of raw material for the food industry and light industry. The achievement of increased production and higher quality in line with market requirements is the focus of livestock specialists who, through their research work, contribute to the improvement and refinement of breeding, maintenance, feeding and breeding technologies. The present study aimed to analyse the influence of the feed ration administered to cattle, in a dairy cow breeding farm in the South-Eastern Romania, on milk production but also the economic calculation of feed costs to obtain one litre of milk. The ration is designed and formulated according to the needs of the cattle categories, their health, productive performance and age.*

**Key words:** dairy sector, fodder ration, milk cost, productivity, price

### INTRODUCTION

Milk is an important component of the human diet [9], dairy products are vital sources of nutrition (OECD-FAO, 2022) with implications for health [1, 4, 8], it also indicates the development level of a country [1, 2, 24].

Liquid milk value have the largest share on the dairy market [3, 5, 7]. The EU is one of the most important milk producer in the world and in 2022, it carried out 159.34 million tonnes raw milk, of which 154.3 million tonnes (96.43%) came from cows. Milk is produced in each member state, but the top producers are Germany, France, Poland, Netherlands and Italy and the lowest one Malta. Cow milk delivered to dairies accounted for 145.6 million tonnes, meaning 97.13%, the rest being supplied by buffaloes, sheep and goats [5, 7, 17]. Romania is situated on a lower position in the EU, producing a smaller milk amount for consumption (400 thousand tonnes). [16, 20, 21, 24].

Milk is a basic food and also a strategic food for the whole population of the world [1, 15]. About 6 billion people, that is more than 80

percent of the world's population, regularly consume fresh milk or other dairy products [3, 7, 16]. Milk and dairy products have a high nutritive value being an import source of protein and lactose, a large variety and minerals and vitamins, and this is a reason to be more and more produced [9, 13]. Dairy cows are responsible of the highest part of milk produced in the world. From 996.36 million cattle population existing in the world in 2018, about 270 million are dairy cows [27, 9]. The EU is an important contributor to the world milk production and dairy farming and processing is an important sector in the EU agriculture and food industry [20, 21, 22]. Europe produced 226.4 million tonnes of milk, representing 26.8 % of the world production, and by 0.9 % more than in 2017 [20]. The EU-28 contributes by 28 % to the world milk production, coming on the 2nd position after Asia (30%), and being followed by Americas ( 27%), other European countries (9%), and Africa and Oceania, each with 5 %. Milk production is stimulated by the population and consumption growth [5, 7, 22]. In the E.U. countries the current trend is to reduce the number of cattle and compensate

for animal production by increasing production, using modern breeding methods and improving exploitation technologies. As a result, world agriculture has seen a development in all fields in recent years, marked by a process of intensification, specialization by branch, concentration on production direction, increase in labor productivity, reduction of specific consumption [13, 15, 16, 17].

Milk production is a long traditional activity in Romania [4, 8]. The percentage of milk delivered to processors decreased because only a few farms managed to cover the EU requirements regarding the production and quality of the delivered milk.

[13, 19, 20].

The reasons why Romania was a modest milk producer are: a big number of small holdings, the decreasing number of milking cows, the low number of dairy cows per farm, extensive technologies, difficulties in assuring a normal feeding, high production cost, low producer's price, problems with milk quality. All these reduced the profit obtained and reduced the interest of the Romanian farmers. During the interval 2018-2022, in Romania, the evolution of the cattle herd was in decrease. [14, 15]. For this reason, in order to cover the needs of the population, it was necessary to import both, milk and dairy products. [19, 22, 24]. The highest proportion of milk comes, in Romania, from dairy cows [8, 16].

In Romania, the highest contribution at milk production are in the Central region and North East region. For fresh dairy products, the Central and South Muntenia and Bucharest and Ilfov County are the most important. The areas where the largest amount of cheese is produced are North-West, Central and North Eastern Romania [2, 22, 24].

Milk production cost is influenced by a large range of environment factors, but the main ones are represented by feeding cost, labor cost, heifer for replacing the culled cow, medicines and veterinary services, frozen semen from the highest breeding value bulls and artificial insemination service, depreciation of sheds and specific equipment, water and electricity cost, rental value of land owned by dairy farmer [1, 2, 6, 23].

The highest share in milk production cost is represented by feeding, labor and veterinary services cost [10, 15, 23]. The basic food in animal feeding is corn, either as concentrated feed or as corn silage during the winter [10, 18, 21].

Provided the imperative implementation of sustainable development, the improvement of the forage quality for silo maize is a major objective [11, 12, 18].

In Romania, maize occupies the largest grown area due to its high productivity and high yields per unit area [10, 11, 18]. The area grown with maize varies between 2.5-3.1 million ha depending on the level of precipitation in the cold season or as a result of the compromise of the autumn crops during the winter [10, 11, 12].

Among environmental factors, nutrition is the basic factor (60-70% of all factors) influencing milk production. Using well-balanced rations, satisfying the nutritional requirements of cows always have a positive effect on productivity [10, 11, 12].

Insufficient level as well as overfeeding negatively influence milk production.

In this context, the goal of the paper is to study the influence of the feed ration administered to cattle, in a dairy cow breeding farm in the South-Eastern Romania, on milk production but also the economic calculation of feed costs to obtain one litre of milk

## MATERIALS AND METHODS

The case study was carried out at one of the competitive agricultural companies in Călărași County, at the contact area between the Bărăgan Plain and the Danube Valley, more precisely at the eastern limit of the second terrace of the Danube. During 2022, the structure of feed rations, the quantities fed per day and per total period, and the cost of obtaining a litre of milk were monitored.

The exploited breed is the *Holstein Friesian* known as the most productive but demanding dairy breed. If a balanced ration and good management is not provided, health problems can easily occur. The breed originates from the Netherlands and is black and white in

colour. However, through the improvement process, the white and red and uniform red colour has subsequently appeared. On intensive farms where feeding is carefully monitored and stress is reduced, the Holstein Friesian breed can reach a productivity of 10,000-13,000 litres of milk/lactation

(lactation = 305 days) and if no attention is paid to feeding, productivity can drop below 5,000 litres/lactation.

Table 1 shows that the farm has a total of 406 livestock units, of which more than 50% are dairy cows.

Table 1. The structure of cattle livestock in 2022

Cows prod. > 25 litres	Cows prod. <25 litres	Heifers + Weaned cows	Calves 0-6 months	Young female cows 6-18 months	Total
126 LSU	90 LSU	67 LSU	58 LSU	65 LSU	406 LSU

Source: company documents

\*LSU = livestock unit

## RESULTS AND DISCUSSIONS

The animals are provided with fodder twice a day, consisting of grain maize, barley grain, wheat grain, peas, wheat bran, which are ground in the single feed technology trailer (Table 2).

In addition to these grains, maize silage, alfalfa hay and wheat straw are also fed into the technology trailer. Watering is done

automatically through constant level watering troughs, so the animals have water at their discretion.

Calves are suckling twice a day. Calves are fed on powdered milk until they are three months old. Until weaning, calves are kept in four-units collective stalls respecting the rules of animal welfare, watering and feeding at discretion.

Table 2. Total feed consumption during 2019-2022 (tonnes)

Item no.	Product	2019	2020	2021	2022
1	Barley	260	256	301	252
2	Maize	320	350	370	277
3	Peas	137	128	120	131
4	Maize silage	2,700	3,300	3,580	3,400
5	Alfalfa	300	490	310	450
6	Wheat bran	60	52	75	30
7	Wisan	138	166	140	143
8	Panto R-60 (premix)	13.62	14.4	14.7	14.84
9	Panto R-56 (premix)	2	1.4	1.75	0.6
10	Power mix (premix)	10	11	18	21
11	Calcium carbonate	8	8	6	5
12	Ascomilk (milk powder)	6	8	7	7
13	Wheat	123	123	126	131
14	Straw	180	178	182	185
<b>15</b>	<b>Total consumption</b>	<b>4,257.62</b>	<b>5,085.8</b>	<b>5,251.45</b>	<b>5,047.44</b>

Source: Own calculation based on the company documents.

During the first 20 days, the calves are disbudded and tagged. Special attention is paid to the dry period because it is very important both in the growth and development

of the calf and in the milk production of the future lactation. The optimal dry period is 60 days.

Feeding cows during the first dry period is based on a ration with more fibrous and juicy feed, about 1/3 dry matter. In the second part of dry period, the ration is supplemented with mixed feed. Cows having calved are kept together with calves until 7 days of age, then transferred to the group of lactating cows >25 litres and the calves go to the nursery group.

Table 2 shows that the largest amount of feed consumed during the period analysed is corn silage, which is also the basic feed in the cows' ration during the cold weather. Along with this, barley and maize grains, alfalfa, premixes, straw are also included in the ration. The quantities consumed were lower in

2019, namely 4,257.62 to compared to the quantities consumed in 2020, 2021, 2022-over 5,000 to. The differences were due to the livestock and age categories existing at that time. Feed rations are made up according to productive performance and age.

#### **Ration for cows producing more than 25 litres/day (126 livestock units)**

The daily feed consumption is 6,432.3 kg which means a consumption of 51.05 kg feed/livestock unit/day. This is a balanced ration that is fed to recently calved cows and cows that are in early gestation (up to the fifth month of gestation) with yields of more than 25 litres/day.

Table 3. Expenditure on feed ration for dairy cows with production >25 litre/lactation/day (126 livestock units)

Item no.	Fodder	Kg/LSU/day	Total kg /day	Lei/kg feed	Lei/day
1	Grain maize	2.7	340.2	1.20	408.24
2	Barley grain	2.7	340.2	0.48	163.29
3	Grain wheat	1	126	0.92	115.92
4	Peas	1	126	0.70	88.2
5	Wheat bran	0.5	63	1.10	69.3
6	Panto R-60 (premix)	0.200	25.2	5.75	144.9
7	Panto Power mix	0.400	50.4	8.90	448.56
8	Wissan	2	252	3.32	836
9	Wheat straw	0.5	63	0.05	3.15
10	Alfalfa hay	2	252	0.40	100.8
11	Corn silage	24	3,024	0.31	937
12	Alfalfa semi-silage	10	1,260	0.40	504.8
13	Calcium carbonate	0.050	6.3	0.57	3.65
14	Water	4	504	-	-
15	<b>Total consumption</b>	<b>51.05</b>	<b>6,432.3</b>		<b>3,823.81</b>
16	<b>Cost/LSU/day</b>				<b>30.34</b>

Source: Own calculation based on the company documents.

In this category of animals, the ration is divided into two meals, with half of the ration being fed in each meal. The feed expenditure for each animal in this category are 30.34 lei/day (Table 3).

#### **Ration for cows producing less than 25 litres/day/90 LSU**

This ration is fed to cows in the second part of gestation and to cull cows with less than 25 litres/lactation/day. The consumption of this group is 3,944.7 kg/feed/day which means a consumption of 43.83 kg of feed per cow. In this category, the daily feed cost per animal is

lower at 20.20 lei (Table 4). The ration is divided into two portions, half in the morning and half in the afternoon.

#### **Ration for cows in dry period and heifers 67 livestock units**

This ration is fed to heifers and animals in dry period, the fodder is fed in one meal, in the morning. From what can be seen in the ration shown in Table 5, it is a fodder richer in fibrous and succulent cereals. The total feed consumption in this category is 1,323.25 kg/day which means a consumption of 19.75 kg/LSU/day.

Table 4. Expenditure on feed ration for dairy cows with production <25 litre/lactation/day (90 LSU)

Item no.	Fodder	Kg/LSU/day	Total kg /day	Lei/kg feed	Lei/day
1	Grain maize	2	180	1.20	216
2	Barley grain	1.5	135	0.64	87.75
3	Grain wheat	1.2	108	0.92	99.36
4	Peas	0.6	54	0.70	38.88
5	Wheat bran	0.5	45	1.10	50.4
6	Panto R-60	0.160	14.4	5.75	82.8
7	Panto Power mix	0.120	10.8	8.90	96.12
8	Wissan	1.2	108	3.23	348.84
9	Wheat straw	0.5	45	0.05	2.25
10	Alfalfa hay	2	180	0.40	72
11	Corn silage	22	1,980	0.31	613.8
12	Alfalfa semi-silage	8	720	0.40	288
13	Calcium carbonate	0.050	4.5	0.57	2.56
14	Water	4	360	-	-
15	<b>Total</b>	<b>43.83</b>	<b>3,944.7</b>		<b>1,998.76</b>
16	<b>Cost/LSU/day</b>				<b>22.20</b>

Source: Own calculation based on the company documents.

Table 5 .Expenditure on feed rations for heifers and cows in dry period (67 LSU)

No.	Fodder	Kg/LSU/day	Total kg /day	Lei/kg fodder	Lei/day
1	Grain maize	0.200	13.4	1.20	16.08
2	Barley grain	1	67	0.64	42.88
3	Grain wheat	1	67	0.92	60.3
4	Peas	0.500	33.5	0.70	23.45
5	Calcium carbonate	0.050	3.35	0.57	1.90
6	Straw	4	268	0.05	13.4
7	Alfalfa	3	201	0.40	80.4
8	Corn silage	10	670	0.31	207.7
9	<b>Total</b>	<b>19.75</b>	<b>1,323.25</b>		<b>446.11</b>
10	<b>Cost/head/day</b>				<b>6.65</b>

Source: Own calculation based on the company documents.

Figure 1 shows an increase in milk production over the period analysed. In 2019 the farm achieved a production of 1,749,999 litres of milk, in 2022 it recorded a production of 1,949,121 litres of milk which means that the production increased by 199,122 litres of milk compared to 2019. Figure 1 shows that milk production fluctuates from year to year. This is due to the number of milked livestock units and the fodder quality. The factors that caused these fluctuations were the higher number of milked cows, the genetics used on the farm, the higher quality of the feed administered and the balanced and scientifically composed rations.

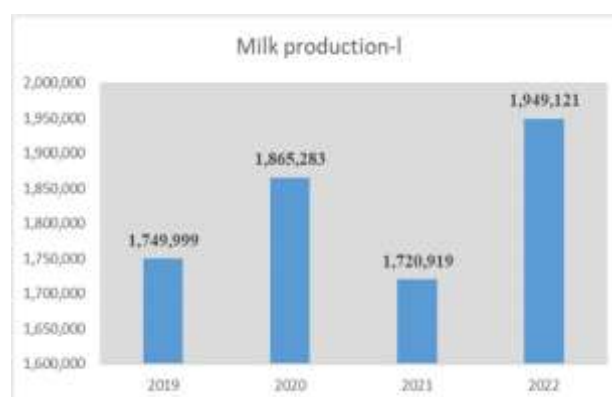


Fig. 1. Milk production during 2019-2022

Source: own design and calculation.

Figure 2 shows that in 2019, the cost of fodder to obtain one litre of milk was 0.80 lei and in

2022 we have a cost of 1.44 lei. This means that we have an increase of 0.64 lei, and this is due to the increase in cereal prices. Milk was valued in 2022 at 2.25 lei/l to which the fat and protein bonuses are added reaching 2.5 lei/l.

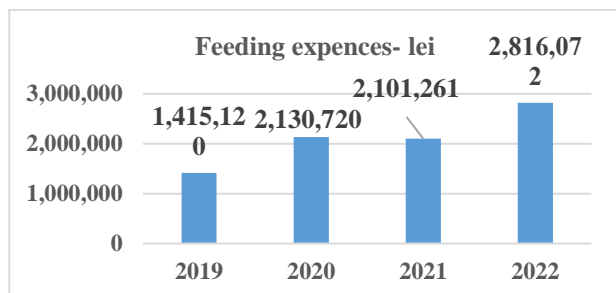


Fig. 2. Feeding expences  
Source:own calculation.

## CONCLUSIONS

The farm under review manages to make a profit every year. This is possible due to the good management practised at the farm level, with the management staff applying in practice the latest trends in animal breeding. It aims to get more value from the fodder for the animals by using artificial seeding with bulls that imprint these traits. The aim is for the animals to have a smaller waist and consume a reduced amount of fodder without affecting productivity. If in 2019 the cost of obtaining a litre of milk was 0.80 lei, in 2022 it reached 1.44 lei. This increase is the result of the increase in the price of fodder, taxes, electricity, etc.

Milk production is increasing year by year, if in 2019 milk production was 1,749,999 litres of milk, in 2022 the farm recorded a production of 1,949,121 litres resulting in an increase of 199,122 litres of milk. This is due to breed improvement, fodder quality, increase in livestock units, etc.

2022 has brought 50% increases in all areas of activity, including the bovine sector. Due to substantial increases in supplies and the rate of inflation, raw milk production costs have risen substantially. Without a balanced adjustment of the price ratio between the processing and production sectors, there is a risk of a decline in livestock numbers. A revival of the cattle breeding sector is needed to boost cow milk production and financial support for milk production to balance the farm gate price in line with the EU.

## REFERENCES

- [1]Bleasdale, M., Richter, K.K., Janzen, A. ... et al. 2021, Ancient proteins provide evidence of dairy consumption in eastern Africa. *Nat. Commun.*, 12, 632. <https://doi.org/10.1038/s41467-020-20682-3>
- [2]Defta, N., Vidu, L., Mihai, R., Dragomir, N., Posan, P., Oprea, I., 2023, Dynamics of cattle livestock, milk production and fresh dairy products in Romania between 2016-2020, *Scientific Papers. Series D. Animal Science.* Vol. LXVI(2), 465-470. [https://animalsciencejournal.usamv.ro/pdf/2023/issue\\_2/Art55.pdf](https://animalsciencejournal.usamv.ro/pdf/2023/issue_2/Art55.pdf), Accessed on Nov. 19, 2023.
- [3]De Lucia, C., Paziienza, P., Vecchione, V., 2017, The Milk and Dairy Sector in the European Union: Environmental and Policy, Chapter 5.1.1, <https://onlinelibrary.wiley.com/doi/10.1002/9781118906460.ch5a>, Accessed on Nov.10, 2023.
- [4]Enea, D.,N., Ben Fraj, S., Nicolae, C., G., Marginean, Gh. E., Vidu, L., 2023, Study regarding the improvement of milk production according to the sires values, *Scientific Papers. Series D. Animal Science.* Vol. LXVI(2), 294-299, [https://animalsciencejournal.usamv.ro/pdf/2023/issue\\_2/Art33.pdf](https://animalsciencejournal.usamv.ro/pdf/2023/issue_2/Art33.pdf) Accessed on Nov. 19, 2023.
- [5]European Commission Communication, An European strategy for an intelligent, ecologic increase favorable to inclusion, <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:RO:PDF>, Accessed on Nov. 19, 2023.
- [6]FAO, 2019, Overview of global dairy market developments in 2018, *Dairy Market Review*, <http://www.fao.org/3/ca3879en/ca3879en.pdf>, Accessed on January 7, 2024.
- [7]Eurostat Statistics Explained, 2023, Milk and milk product statistics, [https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Milk\\_and\\_milk\\_product\\_statistics&oldid=617758](https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Milk_and_milk_product_statistics&oldid=617758), Accessed on January 20, 2024.
- [8]Grorcinschi, V., 2023, Romania among the countries with the lowest milk production for consumption (România, printre țările din UE cu cea mai mică producție de lapte de consum), <https://agrointel.ro/261159/romania-printre-tarile-din-ue-cu-cea-mai-mica-productie-de-lapte-de-consum/#:~:text=Nici%20m%C4%83car%20o%20jum%C4%83tate%20de,de%20Croatia%20C8%9Bia%20Slovacia%20Slovenia>, Accessed on Nov. 19, 2023.
- [9]Kapaj, I., Kapaj, A. M., 2021, An Analysis of Household Consumption of Dairy Products. *Archives of Business Research*, 9(1), 148–153.
- [10]Oltenacu, N., Oltenacu, C.,V., Gidea, M., 2010, Influence of chemical fertilization on silo maize production, *Scientific Papers, Series A, Vol. LIII*, 2010, 346-351, <https://agronomyjournal.usamv.ro/pdf/issue2010.pdf>, Accessed on Nov. 19, 2023.
- [11]Oltenacu, N., Burcea, M., Oltenacu, C.,V., Pirvu (Fulga), M., Gidea, M., 2023, Researches on behavior of

two maize hybrids grown in conventional system in climate conditions of the Romanian plain, Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 23(4), 597-604

[https://managementjournal.usamv.ro/pdf/vol.23\\_4/Art59.pdf](https://managementjournal.usamv.ro/pdf/vol.23_4/Art59.pdf), Accessed on January 20, 2024.

[12]Oltenacu, C. V., Burcea, M., Oltenacu, N., Dima, F. M., 2022, The evolution of cultivated areas and the productions obtained at four agricultural crops cultivated in a conventional and ecological system in the period 2016-2020 in Călărași county. *AgroLife Scientific Journal*, 11(2).<https://doi.org/10.17930/AGL2022216>.

<https://agrolifejournal.usamv.ro/index.php/agrolife/article/view/339>, Accessed on Nov. 19, 2023.

[13]Popescu, A., 2016, The milk market concentration and competition thresholds in Romania, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development* Vol. 16(2), p 247-251,

[https://managementjournal.usamv.ro/pdf/vol.16\\_2/Art33.pdf](https://managementjournal.usamv.ro/pdf/vol.16_2/Art33.pdf), Accessed on Nov. 19, 2023.

[14]Popescu, A., Condei, R., 2014, Study on the average marketed milk as a measure of profitability threshold in dairy farms, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol.14(4):219-222.

[15]Popescu, A., 2014, Research on milk cost, return and profitability in dairy farming, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development* Vol. 14(2), 219-222.

[16]Popescu, A., 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(1), 377 -385,

[https://managementjournal.usamv.ro/pdf/vol.XV\\_1/Art56.pdf](https://managementjournal.usamv.ro/pdf/vol.XV_1/Art56.pdf).

[17]Popescu, A., 2017, The Intra-Industry Trade in Agro-Food Products - The Case of Romania, 29th IBIMA International Conference on Education Excellence and Innovation Management through Vision 2020: from Regional Development Sustainability to Global Economic Growth, Vienna, May 4-5, 2017, 29th IBIMA Conference Proceedings, pp.1261-1278.

[18]Popescu, A., 2018, Maize and wheat – top agricultural products produced, exported and imported by Romania. *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, 18(3), 339-352. [https://managementjournal.usamv.ro/pdf/vol.18\\_3/volume\\_18\\_3\\_2018.pdf](https://managementjournal.usamv.ro/pdf/vol.18_3/volume_18_3_2018.pdf), Accessed on January 10, 2024.

[19]Popescu, A, Angel, E., 2019, Cow raw milk quality and its factors of influence in relationship with milk price, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol.19(1): 421-440.

[https://managementjournal.usamv.ro/pdf/vol.19\\_1/Art55.pdf](https://managementjournal.usamv.ro/pdf/vol.19_1/Art55.pdf)

[20]Popescu, A., Stoian, E., Serban, V., 2019, The EU28 milk sector trends in the period 2009-2018, *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development* Vol. 19(4), 249-264.

[https://managementjournal.usamv.ro/pdf/vol.19\\_4/Art36.pdf](https://managementjournal.usamv.ro/pdf/vol.19_4/Art36.pdf), Accessed on Nov. 19, 2023.

[21]Sarkerer, D., Kumar, G.B., 2008, Economics of Milk Production in West Bengal: Evidence from Cooperative and noncooperative Farms, *Journal of Economics and Business*, Vol. XI – 2008, No 1 & No 2.

[22]Statista, 2023, Cow milk production worldwide from 2015 to 2023 (million metric tonnes),<https://www.statista.com/statistics/263952/production-of-milk-worldwide/>, Accessed on December 20, 2023.

[23]Ursu, A., Nicolescu, A., Toma, D. A., 2008, Practical technical-economic and management guide: animal production, University Book Publishing, Bucharest, 7-9.

[24]Vidu, L., 2002, Research on the operation of dairy cows in reference farm modules for the private sector, USAMV, PhD. thesis, Bucharest.

