



## Reproductive performance indicators in a dairy cattle farm from Bistrita-Nasaud County

Vasile Cighi, Bogdan A. Vlaic, Bogdan Georgescu, Anca Boaru, Cornel I. Burzo

Faculty of Animal Science and Biotechnology, University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania. Corresponding author: B. A. Vlaic, bogdan.vlaic@usamvcluj.ro

**Abstract.** The process of reproduction is a factor of great importance in determining the efficiency of animal production. The reproduction process influences the rate of numerical increase and qualitative improvement of the cattle herd, with direct effects on the farm profitability. This study aimed to determine some main reproduction parameters from a dairy cattle farm in Bistrita County, Romania. In order to achieve the proposed goal we have considered the following objectives: The insemination index (I); gestation length (GL); age at first calving (AFC); service-period (SP); mammary repose (MR); calving interval (CI); birth rate (N%). The I value averaged at 1.90; the GL had an average of 283.24 days; the AFC had an average of 834.64 days (27.4 months); SP in the studied population had an average duration of 138.30 days; MR had a duration 61.21 days on average; CI averaged at 421.54 days and N% averaged at 88.80%.

**Key Words:** Bălțata Românească breed, breeding, dairy cattle, reproductive indices.

**Introduction.** Up to the early 2000s, dairy genetic selection programmes in dairy producing countries traditionally selected predominantly for milk yield, often at the expense of other dairy relevant traits, including fertility and health (Crowe 2007; Wickham et al 2008; Crowe et al 2018). The evaluation of the reproduction efficiency in a cattle farm is synthetically assessed by calculating and analyzing the reproduction indices. When monitoring the reproductive performance, time interval measurements are frequently used as reproductive performance indicators and many are calculated in relation to the cow's individual calving date. Examples of such indicators are the calving interval (CI), days to first service (CFI) and days to conception or last insemination (CLI) (Löf et al 2012). Reproduction indices allow permanent knowledge of the quality of reproductive activity and avoid situations that can cause economic losses (Acatinăi 2010). The reproduction process is a factor of particular importance in determining the efficiency of animal production. Thus, the reproduction process influences the rhythm of numerical augmentation and quality. The evaluation of reproductive efficiency in a cattle farm is synthetically assessed by calculating and analysing breeding indexes. Reproduction indices allow the preparation of business plans from different projects and feasibility studies for farm development or the opening of financing and lending lines for agricultural activities (Onaciu 2013; Han & Bobis 2019). This study aimed to determine some main reproduction parameters from a dairy cattle farm in Bistrita County, Romania. The monitorized parameters are: the insemination index (I); gestation length (GL); age at first calving (AFC); service-period (SP); mammary repose (MR); calving interval (CI); and birth rate (N%).

**Material and Method.** In order to achieve the research objectives, the entire herd of cattle from the farm was studied: 69 heads, of which 35 are dairy cows. The studied breed is Bălțată Românească - Simmental, being raised and exploited for milk production. The working method consisted in the analysis of the main reproductive parameters on lactation and on the total animal count with the help of the data from the COP (Official

Production Control), of the analysis bulletins from the farm records between 2015-2021. Data were statistically analysed using the "Statistica version 9".

**Results and Discussion.** The mean and dispersion indices for the main reproductive indices in cows studied in successive lactations are presented in Table 1.

Table 1  
Reproductive indices mean on successive lactations

<i>L.</i>	<i>Parameters</i>	<i>I</i>	<i>GL</i>	<i>AFC (days)</i>	<i>SP (days)</i>	<i>MR (days)</i>	<i>CI (days)</i>
	n	24	24	24	24	24	24
Lactation I	Mean (X)	1.86	282.36	834.64	138.57	62.21	420.93
	Error (Sx)	0.21	1.14	15.86	12.34	3.00	12.20
	Std. dev. (s)	1.03	5.57	77.69	60.45	14.69	59.77
	Coef. var. (V%)	55.31	1.97	9.31	43.63	23.62	14.20
	Min.	1	271	708	64	42	348
	Max.	4	293	1027	273	97	553
	n	22	22		22	22	22
Lactation II	Mean (X)	2.07	281.53		148.40	60.73	429.93
	Error (Sx)	0.27	1.27		15.60	2.53	15.52
	Std. dev. (s)	1.28	5.95		73.16	11.85	72.80
	Coef. var. (V%)	61.93	2.11		49.30	19.52	16.93
	Min.	1	269		42	47	326
	Max.	5	294		264	90	558
	n	19	19		19	19	19
Lactation III	Mean (X)	1.94	283.06		145.19	62.69	428.25
	Error (Sx)	0.34	1.68		17.43	3.68	17.27
	Std. dev. (s)	1.48	7.33		75.97	16.03	75.27
	Coef. var. (V%)	76.48	2.59		52.32	25.57	17.58
	Min.	1	266		43	48	333
	Max.	5	295		302	101	586
	n	15	15		15	15	15
Lactation IV	Mean (X)	1.89	284.56		133.22	59.33	417.78
	Error (Sx)	0.35	1.88		19.63	2.63	20.01
	Std. dev. (s)	1.36	7.30		76.04	10.20	77.51
	Coef. var. (V%)	72.22	2.57		57.07	17.19	18.55
	Min.	1	275		46	44	322
	Max.	4	297		237	79	532
	n	27	27		27	27	27
Over 5 <sup>th</sup> Lactation	Mean (X)	1.75	285.06		124.56	60.38	409.63
	Error (Sx)	0.24	1.43		12.70	2.08	13.02
	Std. dev. (s)	1.24	7.43		65.99	10.83	67.65
	Coef. var. (V%)	70.76	2.61		52.98	17.93	16.52
	Min.	1	272		40	42	318
	Max.	5	301		271	93	552
	n	107	107	24	107	107	107
Total lactation mean	Mean (X)	1.90	283.24	834.64	138.30	61.21	421.54
	Error (Sx)	0.12	0.65	15.86	6.65	1.24	6.65
	Std. dev. (s)	1.25	6.69	77.69	68.75	12.80	68.79
	Coef. var. (V%)	65.94	2.36	9.31	49.71	20.92	16.32
	Min.	1	266	708	40	42	318
	Max.	5	301	1027	302	101	586

Note: I - insemination index; GL - gestation length; AFC - age at first calving; SP - service-period; MR - mammary repose; CI - calving interval.

The insemination index represents the average number of inseminations performed to obtain a gestation. It is influenced by the technology of rearing (feeding, maintenance, calving season, etc.), the insemination labor performed, the optimal moment of breeding or insemination performed, the breed, the species, the age of the animal and the amplitude of milk production. It has average values between 1-2, but it can have values

of even 4. We consider that the average obtained (Figure 1) on successive lactations of 1.90, with a minimum of 1.75 days at V+ lactation and a maximum of 2.07 days at lactation II is good, this demonstrating that the causal factors represented by the technology of growth, labor and the optimal time of insemination, breed, age of the animal, etc. were respected.

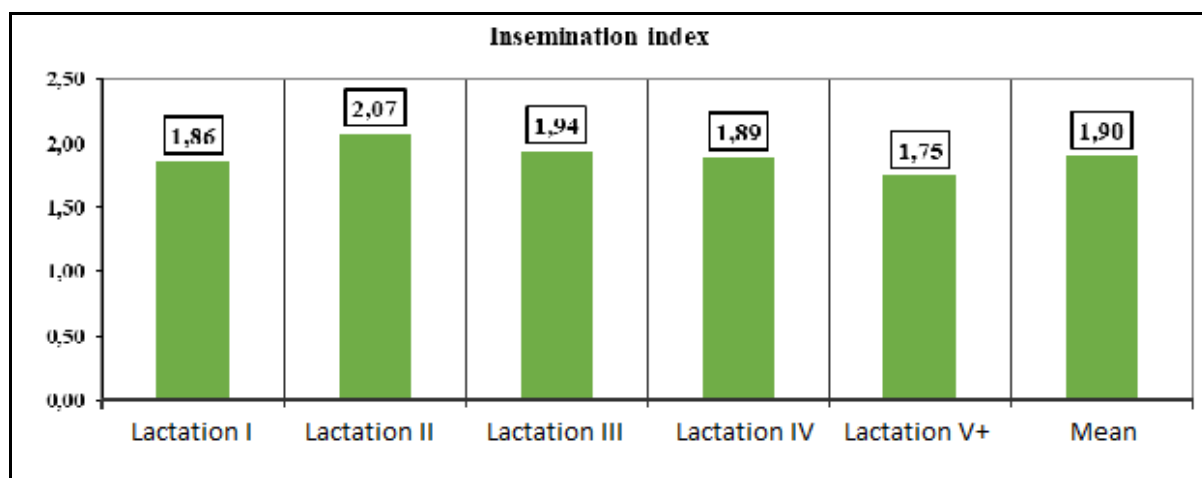


Figure 1. Evolution of insemination index on successive lactations.

Gestation length (GL) in cows is 285 days, with limits of 240-311 days, and can be influenced by the following factors: maternal, fetal, genetic and environmental. Variations in gestation length within characteristic physiological limits are genetically determined, and care and nutrition at the level of requirements shorten gestation in most farm animal species (Miclea et al 2010).

In the studied population on successive lactations (Figure 2), the gestation length had an average of 283.24 days, with a minimum of 281.53 days in lactation II and a maximum of 285.06 days in lactation V+. We consider that the obtained results are within the normal limits for the Bălțată Romaneasca breed.

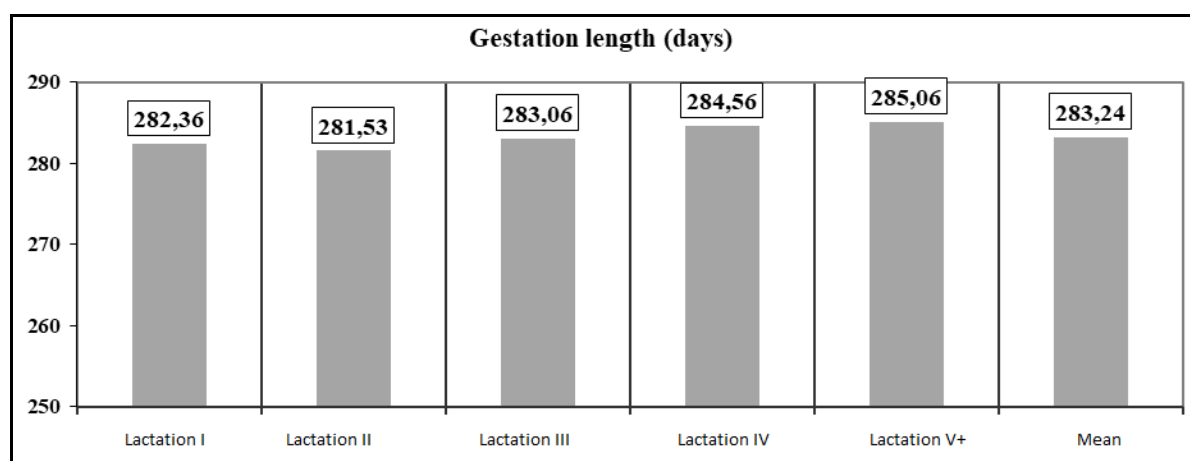


Figure 2. Gestation length on successive lactations.

The age at first calving (AFC) is expressed in months and is an individual or average synthetic indicator on the farm, calculated only for heifers. It is recommended to have the age of the first calving at 25-27 months in the Baltata Romaneasca and Bruna breeds (Onaciu 2016). AFC is usually calculated as the sum of the age of first insemination and gestation duration. In our study, the average age at the first calving was 834.64 days (27.4 months), with limits between 708 and 1027 days, which corresponds to an average age of the first calving of 552.29 days (18.1 month), with limits between 430 and 743

days. The average values of these indicators show a relatively good reproductive precocity of the studied population, which highlights a normal growth of the young female and its introduction to reproduction at the optimal moment.

The service period (SP) is the time interval between the last calving and the first fertile insemination with the installation of gestation. This indicator can show normal values between 60 and 115 days (Onaciu 2013; Onaciu & Jurco 2014). The service period on successive lactations (Figure 3) in the studied population had an average duration of 138.30 days, with limits between 124.56 days for V+ lactation, and 148.40 days for II lactation. The value of this index shows an exceeding of the normal values of 60-115 days, which requires the monitoring of the puerperal period and the improvement of the technological parameters.

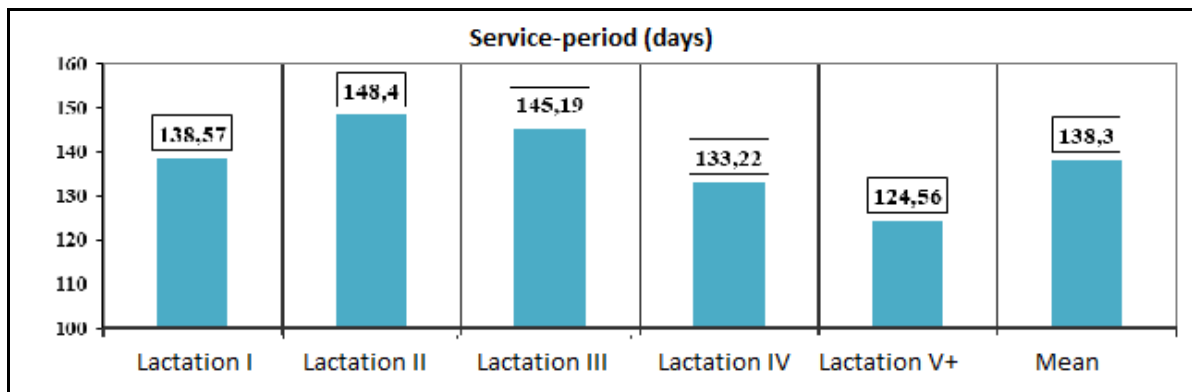


Figure 3. The service period on successive lactations.

Mammary repose (MR) it is on average 60 days and is not recommended to be shorter than 40 days. It must be mentioned that the length of mammary repose is not the same for all cows, differing depending on age, productive level, state of maintenance, health status, feeding and exploitation conditions, etc. Onaciu (2013) considers that mammary repose should be at least 6 weeks and it is absolutely necessary. If the mammary repose is less than 6 weeks or more than 8 weeks, the milk production in the next lactation will be very low. This range is very important for future milk production.

The mammary repose in the studied population (Figure 4) had an average duration of 61.21 days, with limits between 59.33 days in lactation IV and 62.69 days in lactation III. It can be observed that the normal value of 60 days is exceeded, caused by many factors, especially technological factors.

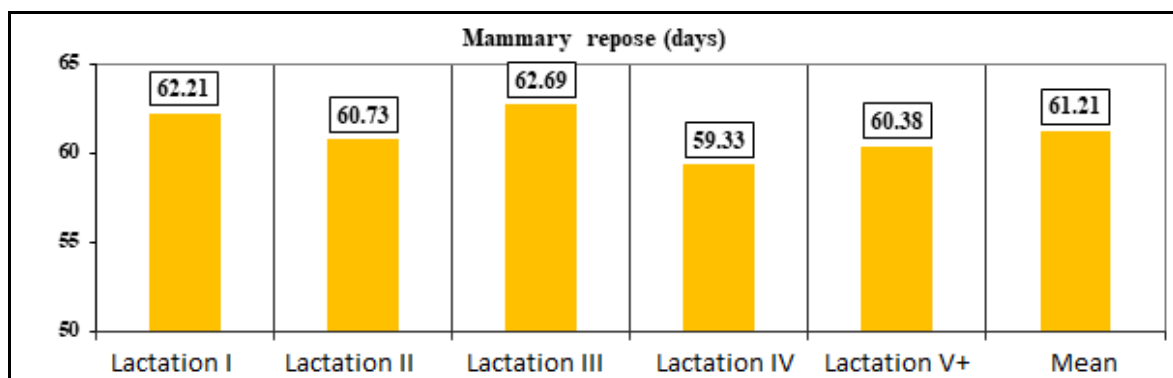


Figure 4. The mammary repose on successive lactations.

Calving-interval (CI) is expressed in days and represents the period between two successive births, and must have values between 365 and 400 days. Based on this parameter, the natality is calculated. Calving interval is calculated only for the second

and later lactations (Onaciu 2016). Calving interval is the reproductive parameter that expresses the care given to the cow (maintenance, feeding, care, etc.).

The interval between calvings or calving interval in the population studied on successive lactations (Figure 5) was on average 421.54 days, with a minimum value of 409.63 days in V+ lactation and a maximum of 429.93 days in lactation II. It can be seen that it exceeds the optimal limit (less than 390 days), which indicates the existence of deficiencies in the reproduction process.

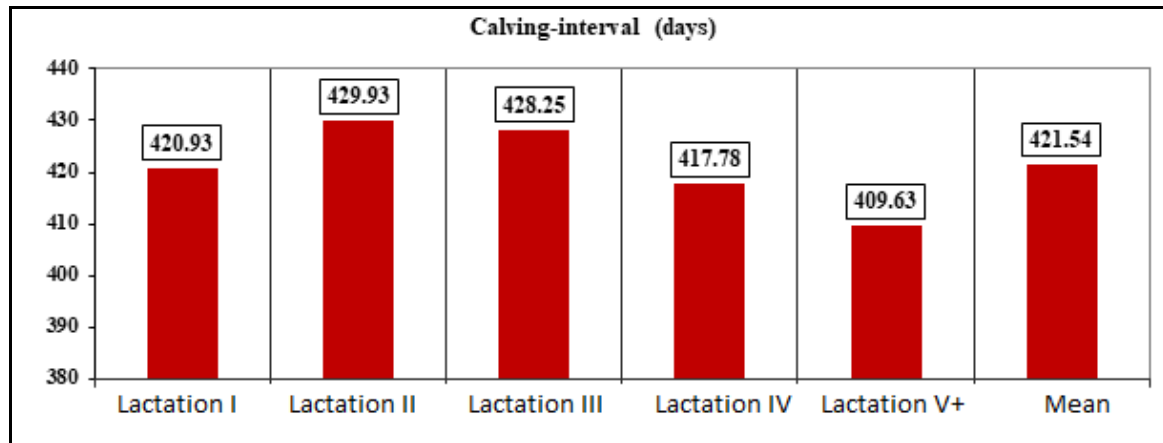


Figure 5. Calving-interval on successive lactations.

Nativity index (N) is the technical reproductive index of the breeding function, calculated on the basis of the number of live and viable calves regardless of sex, obtained over a period of time (usually 365 days) from 100 heads, cows and heifers. The individual and average birth rates in the studied cows were calculated based on the length of the interval between the births:  $N\% = 365/CI$ .

Nativity index in the studied cows was calculated based on the duration of the calving interval. The values of this index (Figure 6) had an average of 88.80%, with a minimum of 87.28% for lactation II, and a maximum of 91.27% for lactation V+. This result shows a good reproductive activity in the studied population.

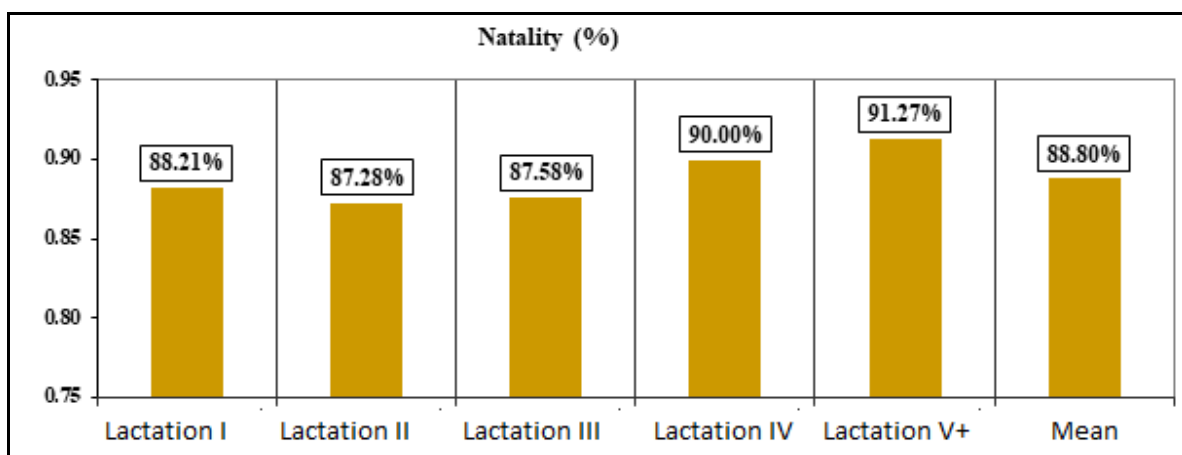


Figure 6. Nativity index on successive lactations.

**Conclusions.** The insemination index (I) had an average of 1.90. We consider this value to be good because it was below 2. The gestation length (GL) was 283.24 days. We consider that the obtained results fall within the normal limits for the Băltață Românească breed. The age of first calving (AFC) averaged at 834.64 days (27.4 months). The value of this indicator shows a relatively good reproductive precocity of the studied population. The service period (SP) in the studied population had an average

duration of 138.30 days. The value of this index shows an exceeding of the normal values of 60-115 days, which requires the monitoring of the puerperal period and the improvement of the technological parameters. Mammary repose (MR) had an average duration of 61.21 days. Thus, the normal value of 60 days is exceeded. Calving interval (CI) averaged at 421.54 days. It can be seen that it exceeds the optimal limit (less than 390 days), which indicates the existence of deficiencies in the reproduction process. The natality (N%) averaged 88.80%. This result shows a good reproductive activity of the studied population.

Animal production in general is highly dependent on reproductive activity. Consequently, this important function (that of reproduction) in cattle must be monitored and coordinated efficiently for the entire period of activity of the animal. Reproductive activity through its implications for changing the genetic structure of the animal population from one generation to the next can lead to faster or later promotion of genetic progress, which has a direct effect on animal performance and farmer income.

**Conflict of Interest.** The authors declare that there is no conflict of interest.

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Authors:

Vasile Cighi, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, Calea Mănăştur no. 3-5, 400372 Cluj-Napoca, Romania, e-mail: [vasile\\_cighi@yahoo.com](mailto:vasile_cighi@yahoo.com)

Bogdan Alin Vlaic, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, Calea Mănăştur no. 3-5, 400372 Cluj-Napoca, Romania, e-mail: [bogdan.vlaic@usamvcluj.ro](mailto:bogdan.vlaic@usamvcluj.ro)

Bogdan Georgescu, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, Calea Mănăştur no. 3-5, 400372 Cluj-Napoca, Romania, e-mail: [georgescu.bogdan63@yahoo.com](mailto:georgescu.bogdan63@yahoo.com)

Mihaela Ancuta Boaru, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, Calea Mănăştur no. 3-5, 400372 Cluj-Napoca, Romania, e-mail: [anca.boaru@usamvcluj.ro](mailto:anca.boaru@usamvcluj.ro)

Ioan Cornel Burzo, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Faculty of Animal Science and Biotechnologies, Calea Mănăştur no. 3-5, 400372 Cluj-Napoca, Romania, e-mail: [burzoioancornel@gmail.com](mailto:burzoioancornel@gmail.com)

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