STUDY ON THE AGE AT FIRST CALVING AND THE LONGEVITY OF BEEF COWS
HÚSHASZNOSÍTÁSÚ TEHENEK ELSŐ ELLÉSI ÉLETKORÁNAK ÉS ÉLETTARTAMÁNAK VIZSGÁLATA

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ABSTRACT

The age at first calving, the life span and the longevity of cows have great importance in cattle husbandry, especially in beef cow husbandry, because the cost of raising weaned calves depends largely on how early cows calve and how long they remain in production. If cows are productive extendedly and raise more progeny, specific costs of raising per calf decrease proportionally. Consideration of life span and, specifically, longevity plays an important role in practical breeding. The present work summarizes the results of the studie conducted in this field. A database of altogether 2115 cows belonging to five breeds (Hungarian Grey, Hereford, Aberdeen Angus, Limousin and Charolais) and two crossbred genotypes (Simmental x Hereford F_1, Simmental x Limousin F_1) born between 1977-1992 was evaluated. Age at first calving (AFC), age at culling (ACU), moreover longevity (LONG) were studied. Ms Excel and SPSS for Windows 11.0 were used for statistical analyses. The mean values of AFC, ACU and LONG obtained were 2.71, 9.47 and 6.77 year, respectively. Breed/genotypes and birth year had significant influence ($P<0,01$) on each evaluated trait, whereas birth month statistically affected only the AFC.

KEYWORDS: age at first calving, age at culling, live span, breeds

ÖSSZEFOGLALÁS

A szerzők öt fajtába (magyar szürke, hereford, aberdeen angus, limousin és charolais), valamint két keresztezett (magyar tarka x hereford F_1 és magyar tarka x limousin F_1) állományba tartozó, 1977 és 1992 között született, összesen 2115 hústípusú tehén adatait dolgozták fel. Vizsgálták az első ellési (EÉ), a selejtezési (SÉ) életkor és a hasznos élettartam (HÉ) alakulását. A statisztikai értékelést az MsExcel és SPSS for Windows 11.0 programokkal végezték el. A vizsgálat eredménye szerint az egyes tulajdonságok főátlaga a következő volt: EÉ 2,71-, SÉ 9,47-, HÉ 6,77 év. A fajta, illetve genotípus, valamint a születés éve szignifikánsan ($P<0,01$) befolyásolta mindhárom vizsgált tulajdonságot, míg a születés hónapja csak az első ellési életkorra (EÉ) hatott bizonyíthatóan.

KULCSSZAVAK: első ellési életkor, selejtezési életkor, hasznos élettartam, fajta

RÉSZLETES ÖSSZEFOGLALÁS

A termelési időszak hossza, amelyet a húshasznú tehén az állományban tölt, fontos a húsmarhatartás gazdaságossága szempontjából. Ennek ellenére e tulajdonságról meglehetősen kevés a publikáció hazánkban és külföldön egyaránt. Ebből kiindulva a vizsgálat célja a húshasznú tehenek néhány, a termelési időszakkal összefüggő életkor adatainak értékelése volt. A szerzők öt fajtába (magyar szürke, hereford, aberdeen angus, limousin és charolais), valamint két keresztezett (magyar tarka x hereford F_1 és magyar tarka x limousin F_1) állományba tartozó, 1977 és 1992 között született, összesen 2115 hústípusú tehén adatát dolgozták fel. Vizsgálták az első ellési (EÉ), a selejtezési (SÉ) életkor és hasznos élettartam (HÉ) alakulását. A hasznos élettartamot az első ellés és a selejtezés időpontjai közötti évek számával fejezték ki. A statisztikai értékelést az Ms Excel és SPSS for Windows 11.0 programokkal végezték el. A vizsgálat eredménye szerint az egyes tulajdonságok főátlaga a következő volt: EÉ 2,71, SÉ 9,47, HÉ 6,77 év. A fajta, illetve genotípus, valamint a születés éve szignifikánsan ($P<0,01$) befolyásolta mindhárom vizsgált tulajdonságot, míg a születés hónapja csak az első ellési életkorra (EÉ) hatott bizonyíthatóan. Az első ellési életkor (EÉ) értékei fajtánként, illetve genotípusonként a fenti sorrendben a következők voltak: 3,51; 2,08; 2,76; 2,82; 3,02, 2,03; 2,62 év. Legfiatalabb korban a hereford keresztezett és fajtatiszta, legidősebb korban pedig a magyar szürke tehenek borjaztak először. E tulajdonságra vonatkozó értékek 2,54 és 2,94 év között változtak a születési évtől függően. A selejtezési életkor (SÉ) a vizsgált fajták, illetve genotípusok esetében az előbbi sorrendben az alábbiak szerint alakult: 12,42; 11,09; 11,03; 10,61; 10,89; 12,73; 8,15 év. Az adatok szerint leghosszabb életkort a hereford keresztezett és a magyar szürke tehenek, legrövidebbet pedig a limousin keresztezett tehenek érték meg. E tulajdonság csökkenést (15,35 évről 5,91 évre) mutat az 1977 évi születésűektől az 1992. évi születésűek felé haladva. A hasznos élettartam (HÉ) értékei fajtánként, illetve genotípusonként ugyancsak az említett sorrendben az alábbiak voltak: 8,59; 9,08; 8,29; 7,81; 7,91; 10,79; 5,55 év. A leghosszabb hasznos élettartamot a keresztezett és fajtatiszta hereford tehenek, legrövidebbet pedig a limousin keresztezett tehenek érték meg. E tulajdonság is csökkenést mutatott (12,45 évről 3,31 évre) az értékelt születési időszakban, 1977-1992 között.

INTRODUCTION

The age at first calving, the life span and the longevity of cows have great importance in cattle husbandry, especially in beef cow husbandry, because the cost of raising weaned calves depends largely on how early cows calve and how long they remain in production. If cows are productive extendedly and raise more progeny, specific costs of raising per calf decrease proportionally.

In the case of cattle, natural death is nearly unknown by the present time, since the animals are culled at a relatively early age, out of necessity or on a voluntary basis. This is all the more true for beef cows, as after a late winter / spring calving period empty cows are usually culled in the fall. The natural life span of the species is estimated as 30-35 years, but significantly higher longevities have also been recorded. According to Csukás [2], cows may live for as long as 40 years.

The longevity of cows is the time elapsing between first calving and culling and its length is affected both by the age at first calving and by the age at culling. Thus, analysis of these age parameters yields valuable information on longevity. According to Szabó [11], the mean value of the age at first calving of purebred Hereford cows was 31.65-33.31 months, i.e. it varied between 2.63 and 2.77 years. In the case of crossbred Hereford cows the value of the same parameter was 27.55-30.81 months (2.29-2.56 years). Gáspárdy et al. [4] determined the same parameter as 27.33 months (2.27 years). Ráki and Szajkó [8] reported ages at first calving of 35, 34.53 and 35.06 months for Charolais, Limousin and Hereford breeds, respectively.

Ages at first calving are reported by national herd-book societies and the data are compiled in the yearbook annually published by the National Institute for Agricultural Quality Control (NIAQC), presenting the results of cattle husbandry [16]. The cumulative data for the years 1998-2003 are shown in Table 1.

According to the data shown in Table 1, based on the age at first calving of altogether 13651 first-calf cows recorded in the course of the six evaluated years, Hungarian Grey cows calved at the latest age (3.82 years) and Hereford (2.23 years), Hereford crossbred (2.29 years), Galloway (2.30 years), Angus (2.35 years) and Red Lincoln cows (2.44 years) at the earliest age. The ages at first calving of Belgian White-Blue (2.60 years), Simmental (2.64 years), Charolais (2.87 years), Limousin (2,90 years), Limousin crossbred (2.99 years) and Blonde d'Aquitaine (2.88 years) are intermediate between those of Hungarian Grey and British breeds.

The longevity of Simmental x Hereford (F_1 generation) was reported to be 5.6 years [7]. Varga [14] studied culling data of the year 1988 of the registered beef cow population and found that the average ages at culling of Hereford, Limousin, Charolais and Hungarian Grey cows were 8.5, 5.9, 7.9 and 10.1 years, respectively. Limousin crossbred cows were removed from breeding

Table 1. Age at first calving of performance tested beef cows (NIAQC 1998-2003)

BREED	YEAR													
	2003		2002		2001		2000		1999		1998		**Total**	**Mean**
	n	age	n	age	n	age	n	age	n	age	n	age	n	age
Hungarian Grey	554	3.75	265	-	398	3.83	264	3.85	281	3.85	-	-	1762	3.82
Hereford	214	2.41	228	2.22	86	2.47	114	2.24	142	2.00	114	2.08	898	2.23
Aberdeen agus	257	2.45	176	2.16	118	2.16	219	2.41	80	2.58	74	2.37	924	2.35
Limousin	200	2.83	249	2.88	168	2.97	108	3.06	123	3.03	188	2.66	1036	2.90
Charolais	190	2.94	165	2.95	149	2.91	68	2.76	176	2.82	152	2.87	900	2.87
Hereford cossbred F1	233	2.45	259	2.50	352	2.21	273	2.33	399	2.00	423	2.29	1939	2.29
Limousin crossbred F1	629	2.83	505	3.05	486	3.12	439	3.16	415	3.25	474	2.58	2948	2.99
Simmental	554	2.66	324	2.82	408	2.67	383	2.68	582	2.47	742	2.56	2993	2.64
Blonde d'Aquitaine	33	2.91	20	2.80	10	2.90	13	2.92	17	2.91	-	-	93	2.88
Belgian blue	3	2.45	10	2.71	8	2.71	7	2.65	7	2.36	16	2.75	51	2.60
Red Lincoln	32	2.45	10	2.37	8	2.28	14	2.59	14	2.53	-	-	78	2.44
Galloway	7	2.05	6	2.05	6	2.82	-	-	6	2.50	4	2.08	29	2.30
Total	2906		2217		2197		1902		2242		2187		13651	
Mean		2.68		2.59		2.75		2.78		2.69		2.47		

at the age of 7.8 years and Hereford crossbreds at the age of 7.0 years. According to Szabó [12] Hereford and Angus cows were culled at the age of around 8 years. Selymes [10] determined the minimum life span of beef cow lines as 8 years but, in his opinion, 10 years would be optimal. The average life span of purebred Hereford, crossbred beef cow and crossbred dairy cow populations was reported as 4.2 years [1]

Longevity (in the ordinary sense of the word) is a decidedly weakly heritable trait, whose manifestation is deeply influenced by environmental factors and keeping, feeding and breeding conditions. Nagy and Takács [6] report a heritability of 0.2-0.4, similar to the value described by Horn [5] (0.2-0.3) and Szabó [13] (0.1), whereas Rogers et al. [9] determined a value of 0.14. According to several authors, there may also be certain differences between the individual breeds.

Consideration of life span and, specifically, longevity plays an important role in practical breeding. The present work summarizes the results of our studies in this field.

MATERIALS AND METHODS

The present study is founded on a database containing pedigrees as well as calving data, made available to us by the breeders' associations. The Hungarian controlled stocks could be found everywhere in the country, but the feeding and keeping conditions are the nearly same. We used the pedigrees of cows born between 1977 and 1992, thus even the youngest individual studied could theoretically have been in production for at least 12 years.

Data of altogether 2115 cows of the following breed distribution: Hungarian Grey, 254; Hereford, 98; Aberdeen Angus, 83; Limousin, 491; Charolais, 521; Simmental x Hereford crossbred, 635; Simmental x Limousin crossbred, 33 were analyzed. All crossbreds were of the F_1 generation. Individuals with complete data sets were included in the analysis. Only the data of individuals already culled were analyzed, in order to be able to determine longevity. Cows of the population studied were culled between 1982 and 2002. Animals could also have been culled before 1982 and the distribution of age at culling in the different years could have been slightly modified by the data of these animals; however, the original database did not contain the data of these animals.

In the course of the analysis, three traits were evaluated: (1) age at first calving (AFC), (2) age at culling (ACU) and (3) longevity (LONG), all of which can be expressed in days, months or years. In order to facilitate comparisons, we calculated ages in years. The age at first calving is the period of time elapsed between the date of birth and the date of the first calving; the age at culling is, naturally, the length of time elapsed between the date of birth and the date of culling, whereas longevity is the period of time elapsed from the date of first calving to the date of culling [3].

The data were prepared for analysis using MS Office Excel and statistical analyses were carried out using SPSS for Windows 11.5. In addition to evaluating the basic statistical parameters (mean, standard error of the mean, standard deviation, maximum and minimum values), the effect of various influencing factors on the variables was represented by generalized linear modelling (GLM).

It was also seeked to determine whether or not the month and the year of birth have a statistically significant effect on age at first calving, age at culling and longevity and to what extent these traits are influenced by breed. The applied model incorporates as fixed effects the year of birth (yob), the month of birth (mob) and the breed or genotype (b/gen).

The model is described by the following equation:

$$Y_{ijk} = \mu + f_i + e_j + h_k + \varepsilon_{ijk}$$

where

μ is the mean of the population
f_i is the fixed additive effect of the i-th breed/genotype
e_j is the fixed additive effect of the j-th year of birth
h_k is the fixed additive effect of the k-th month of birth
ε_{ijk} is other effects (e.g. the error of the model)

RESULTS

The results of the inclusive analysis of the entire database are summarized in Table 2. The average age at first calving for all breeds and genotypes was 2.59±0.65 years, whereas the average age at culling was 10.24±4.08 years. The earliest age heifers could be introduced to breeding was 1.70 years and the latest, 4.98 years. The oldest cow culled was 21.81 years old and the youngest, 2.28 years old. The average longevity was 7.65±4.04 years; the minimum value of this parameter was 0 years and the maximum value 17.87 years.

Statistical analysis of the raw data revealed that the differences between the groups obtained by classification on the ground of breed/genotype and year of birth were significant ($p<0.01$) for all three traits studied, whereas in the case of groups formed according to month of birth, statistically significant differences were observed only in the case of age at first calving. The results of the analysis

Table 2. The mean values of the evaluated traits

Denomination	N	mean	std.error	std. deviation	minimum	maximum
Age at first calving	2115	2.59	0.01	0.65	1.70	4.98
Age at culling	2115	10.24	0.08	4.08	2.28	21.81
Longevity	2115	7.65	0.08	4.04	0	17.87

Table 3. Reliability of the effects influencing age data

Traits	effects		
	breed	year of birth	month of birth
Age at first calving	**	**	**
Age at culling	**	**	ns
Longevity	**	**	ns

**P<0.01

Table 4. Distribution of variance components

Effects	traits		
	age at firs calving	age at culling	longevity
Breed and genotype	97.85	31.56	45.33
Year of birth	1.45	68.43	54.66
Month of birth	0.68	-	-

are shown in Table 3.

The contribution of the individual factors, i.e. breed, year of birth and month of birth to total variance is presented in Table 4. According to the data in the Table, breed/genotype was the most determinant factor in the case of age at first calving: its contribution to total variance was 97.85%. Breed/genotype played a much less important role in the case of the other two traits; its contribution was 31.56% and 45.83%, respectively. Total variance was affected by the year of birth in the opposite way: its contribution was only 1.45% for age at first calving but 68.43% for age at culling and 54.66% for longevity. Age at first calving was influenced the least by the month of birth, with a contribution of 0.68% to total variance. In the case of age at culling and longevity it became clear at an early stage of statistical analysis that the differences between the individual groups are independent of the month of birth and may therefore not contribute to total variance.

Values of life span for the different breeds/genotypes are summarized in Table 5 and Figure 1. Data of age at first calving reveal that Hungarian Grey cows took the longest time to raise (3.51 years), followed by Charolais (3.02 years), Limousin (2.82 years), Angus (2.76 years), Limousin crossbred (2.62 years), Hereford (2.08 years) and Hereford crossbred (2.03 years).

The trend of our results is in agreement with the data published by the NIAQC (1998-2003), according to which Hungarian Grey cows were the oldest at the age of first calving (3.82 years old), followed by the group comprising Limousin crossbred (2.99 years), Limousin (2.90 years), Charolais (2.87 years) and Hereford crossbred (2.29 years) and, very close together, by Angus (2.35 years) and Hereford (2.23 years).

Based on the results of data processing, age at culling is the highest for Hereford crossbred cows (12.73 years), slightly preceding Hungarian Grey cows (12.42 years). Hereford (11.03 years) and Angus (11.09 years) are next with nearly identical values, followed by Charolais (10.89 years) and Limousin (10.61 years).

Longevity is the highest in the case of Hereford crossbred cows (10.79 years), followed by the group comprising Hereford purebred (9.08 years), Hungarian Grey (8.95 years) and Angus (8.28 years). The longevities of

Table 5. Evaluated traits according to breed and genotype

Traits	Breed	n	Age and life-span (year)				
			mean	Std.error	Std. deviation	Minimum	Maximum
Age at first calving	Hungarian Grey	254	3.51	0.03	0.57	2.05	4.98
	Hereford	98	2.08	0.04	0.21	1.75	3.96
	Aberdeen Angus	83	2.76	0.04	0.66	1.70	4.71
	Limousin	491	2.82	0.02	0.39	1.94	4.61
	Charolais	521	3.02	0.02	0.35	1.77	4.89
	Hereford crossbred F_1	635	2.03	0.03	0.07	1.78	2.98
	Limousin crossbred F_1	33	2.62	0.06	0.24	2.13	3.08
Age at culling	Hungarian Grey	254	12.42	0.20	4.99	2.28	21.81
	Hereford	98	11.09	0.34	2.91	2.75	14.88
	Aberdeen Angus	83	11.03	0.36	2.53	3.39	13.67
	Limousin	491	10.61	0.16	4.42	2.31	19.13
	Charolais	521	10.89	0.16	3.02	2.32	18.32
	Hereford crossbred F_1	635	12.73	0.15	3.25	3.03	19.76
	Limousin crossbred F_1	33	8.15	0.53	3.13	2.53	12.65
Longevity	Hungarian Grey	254	8.95	0.20	4.91	0	17.87
	Hereford	98	9.08	0.34	2.86	0.85	10.93
	Aberdeen Angus	83	8.28	0.36	2.67	1.20	11.71
	Limousin	491	7.81	0.16	4.39	0	16.48
	Charolais	521	7.91	0.15	3.06	0	15.45
	Hereford crossbred F_1	635	10.79	0.15	3.25	1.04	17.81
	Limousin crossbred F_1	33	5.55	0.53	3.14	0	10.38

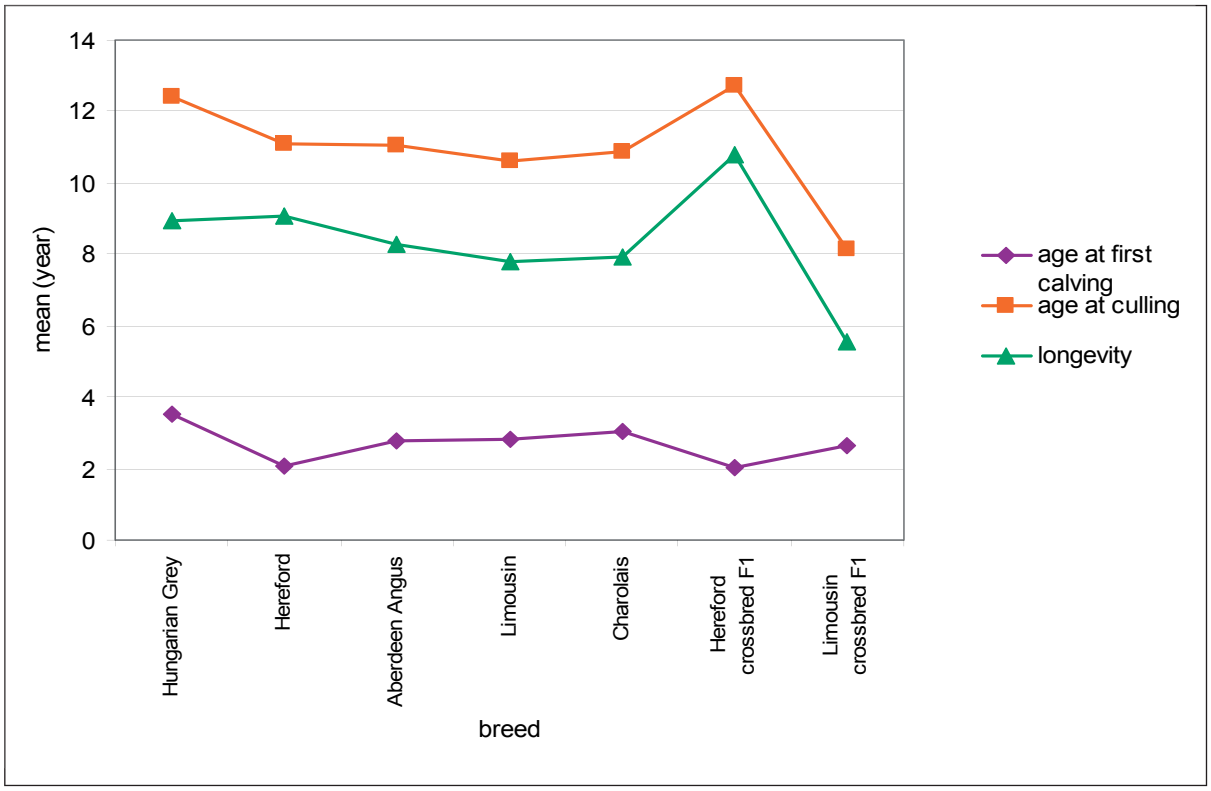

Figure 1. Evaluated traits according to breed and genotype

Table 6. Evaluated traits according to year of birth

Traits	Year of birth	n	Age and life-span (year)				
			Mean	Std.error	Std.deviation	Minimum	Maximum
Age at first calving	1977	27	2.96	0.07	0.44	2.99	4.96
	1978	37	2.75	0.06	0.57	2.69	4.94
	1979	27	2.77	0.07	0.52	2.78	4.92
	1980	86	2.93	0.05	0.53	2.20	4.98
	1981	127	2.54	0.04	0.47	2.12	4.18
	1982	94	2.71	0.04	0.75	1.82	4.84
	1983	153	2.69	0.03	0.76	1.84	4.93
	1984	107	2.71	0.04	0.67	1.77	4.16
	1985	157	2.59	0.03	0.56	1.84	4.08
	1986	143	2.62	0.03	0.54	1.83	4.12
	1987	137	2.63	0.03	0.54	1.82	4.00
	1988	179	2.67	0.03	0.64	1.81	4.89
	1989	245	2.64	0.02	0.55	1.75	4.71
	1990	264	2.64	0.02	0.56	1.83	4.27
	1991	159	2.61	0.03	0.52	1.70	4.52
	1992	173	2.64	0.03	0.53	1.82	4.45
Age at culling	1977	27	15.35	0.61	5.39	4.86	21.81
	1978	37	15.41	0.53	4.58	6.35	20.80
	1979	27	15.01	0.62	4.69	4.07	19.80
	1980	86	12.72	0.35	4.86	3.11	20.16
	1981	127	13.39	0.31	4.60	2.28	19.46
	1982	94	13.52	0.33	1.91	10.27	19.76
	1983	153	12.07	0.26	3.64	3.32	18.72
	1984	107	11.78	0.31	3.76	2.61	17.78
	1985	157	9.82	0.25	3.27	2.79	16.85
	1986	143	10.22	0.26	3.15	2.31	16.28
	1987	137	9.45	0.27	2.74	2.93	14.90
	1988	179	8.66	0.24	2.93	2.53	14.13
	1989	245	8.13	0.21	2.73	2.73	13.07
	1990	264	7.67	0.20	2.28	2.32	12.03
	1991	159	6.71	0.25	2.02	2.67	11.10
	1992	173	5.91	0.25	1.74	2.74	9.97
Longevity	1977	27	12.45	0.61	5.59	0.95	17.84
	1978	37	12.71	0.53	4.58	2.40	17.87
	1979	27	12.29	0.62	4.75	0	16.79
	1980	86	9.85	0.35	4.79	0	15.34
	1981	127	10.88	0.31	4.47	0	16.48
	1982	94	10.85	0.33	2.15	6.51	17.81
	1983	153	9.43	0.26	3.73	0.58	16.81
	1984	107	9.13	0.31	3.88	0.13	15.81
	1985	157	7.28	0.25	3.49	0.32	14.92
	1986	143	7.63	0.26	3.13	0	13.81
	1987	137	6.87	0.27	2.95	0	12.81
	1988	179	6.03	0.24	3.18	0	11.81
	1989	245	5.52	0.21	2.84	0	10.81
	1990	264	5.07	0.21	2.38	0	9.81
	1991	159	4.12	0.25	2.22	0.16	8.88
	1992	173	3.31	0.25	1.87	0.18	7.83

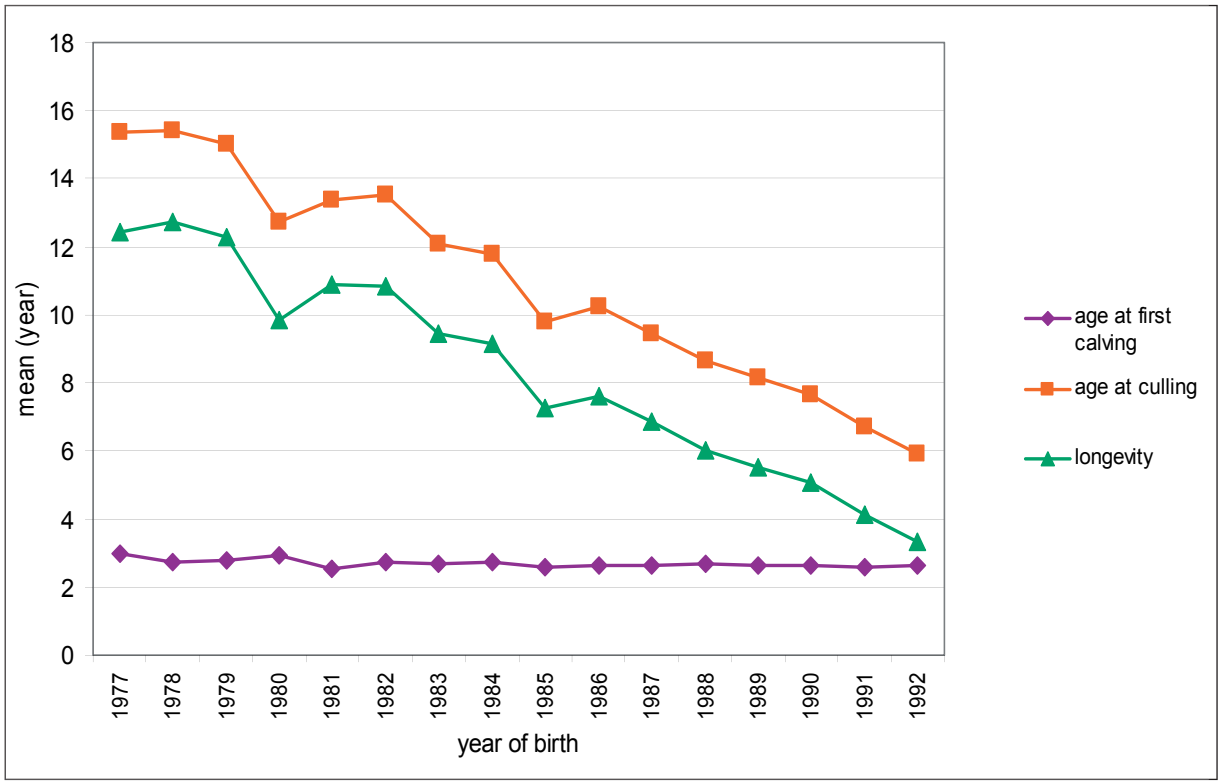

Figure 2. Evaluated traits according to year of birth

Table 7. Cow numbers in Hungary

Year	Beef type	Dual purpose	Dairy type	Total
	tuousand			
1972	-	761	-	761
1975	56	693	11	760
1980	73	438	191	692
1985	101	277	310	688
1990	75	161	394	630
1991	66	140	354	560
1192	48	124	325	497
1193	38	110	302	450
1194	24	101	290	415
1995	25	92	304	241
1996	24	86	304	414
1997	20	80	303	403
1998	19	84	304	407
1999	20	79	300	399
2000	21	77	292	390
2001	22	76	282	380
2002	24	71	280	375
2003	39	45	253	337

Table 8. Evaluated traits according to month of birth

Traits	Month of birth	n	Age and life-span (year)				
			mean	Std.error	Std. deviation	Minimum	Maximum
Age at first calving	1.	91	2.75	0.04	0.48	2.20	4.61
	2.	224	2.64	0.03	0.42	2.13	4.21
	3.	488	2.67	0.02	0.67	1.77	4.98
	4.	825	2.59	0.02	0.55	1.83	4.96
	5.	177	2.66	0.02	0.69	1.75	4.90
	6.	92	2.61	0.03	0.98	1.93	4.22
	7.	69	2.64	0.04	0.23	1.99	3.53
	8.	38	2.77	0.06	0.32	2.05	3.84
	9.	17	2.74	0.08	0.63	2.25	4.08
	10.	24	2.77	0.07	0.61	1.75	4.52
	11.	31	2.73	0.06	0.51	1.70	4.12
	12.	39	2.77	0.06	0.31	1.94	3.38
Age at culling	1.	91	11.07	0.35	4.46	2.28	21.00
	2.	224	11.01	0.24	4.41	2.53	20.87
	3.	488	10.14	0.17	4.51	2.31	21.81
	4.	825	10.96	0.17	3.57	2.75	20.77
	5.	177	11.10	0.25	4.02	2.67	20.63
	6.	92	10.64	0.33	4.83	3.29	20.58
	7.	69	10.47	0.39	3.79	2.73	16.93
	8.	38	11.29	0.51	3.52	2.93	18.49
	9.	17	10.87	0.74	4.06	3.16	15.57
	10.	24	10.77	0.63	2.84	4.34	13.75
	11.	31	11.53	0.57	3.16	3.24	13.69
	12.	39	10.51	0.51	2.67	2.88	15.35
Longevity	1.	91	8.31	0.35	4.43	0	17.75
	2.	224	8.36	0.24	4.39	0	17.78
	3.	488	8.47	0.18	4.39	0	17.87
	4.	825	8.36	0.17	3.54	0	17.77
	5.	177	8.43	0.25	3.88	0	16.88
	6.	92	8.04	0.33	4.68	0	16.96
	7.	69	7.82	0.39	3.84	0	14.26
	8.	38	8.57	0.51	3.52	0	15.89
	9.	17	8.12	0.74	4.22	0.67	13.26
	10.	24	7.99	0.63	2.81	0.62	11.23
	11.	31	8.79	0.57	3.29	0.16	10.70
	12.	39	7.73	0.51	2.71	0.39	12.53

Charolais and Limousin were close to 8 years (7.91 and 7.81 years, respectively), whereas that of Limousin crossbreds was below six years (5.55 years).

Data of age and life span arranged as a function of the year of birth are presented in Table 6 and Figure 2. The age of first calving is relatively independent of the year of birth and the data show little variation, with the lowest value recorded for cows born in 1981 (2.54 years) and the highest for those born in 1977 (2.96 years). In the case of the age at culling, a tendency to decrease is observed with the progress of years. The highest age was reached by the animals born in 1978 (15.41 years), whereas those born in 1992 had the shortest lives (5.91 years). The same decrease can be observed in the values of longevity: the 1978 generation spent an average of 12.71 years in production, whereas the average value of the same parameter is only 3.31 years for the 1992 age group. For cows born later than 1992 the period studied was of course shorter, but in the case of those born in 1992 there still remained 12 years between birth and the end of data collection. This value, however, is well above the average age at culling, 5.91 years. In the group of

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cows born in 1992 even the cow culled at the latest age was less than 10 years old.

The explanation for the latter results, i.e. that age at culling and longevity show a decreasing tendency may be that the size of the Hungarian beef cow population has also decreased during the period studied (Table 7). Owing to the unfavorable economic position of beef cow husbandry, cow numbers in the herds studied also decreased. Breeders reduced their herds and also culled animals that they would most probably have retained in a situation of boom and expansion.

Data of age and life span as a function of the month of birth are listed in Table 8. As mentioned above, a statistically significant difference linked to the time of birth was established only in the case of age at first calving. Individuals born in the spring and summer months usually calved at an earlier age than did those born in the fall and winter months. For instance, cows born in April calved at an average age of 2.59 years, whereas those born in December did at an average age of 2.77 years. The difference is 0.18 years, i.e. 2.16 months.

CONCLUSIONS

The conclusions of our analysis generally support the results of earlier studies and practical observations. Namely, our study demonstrates that, in addition to the breeders' decisions, the age and longevity of beef cows are also significantly affected by the breed/genotype and by the environmental effects manifesting themselves in intergenerational differences.

Our results also reveal that there are considerable differences between the individual breeds and genotypes, especially as regards the age at first calving. Among the breeds studied in the present work, Hungarian Grey cows calved the latest, followed by the French breeds. The earliest calvers were the breeds of British origin, and among those, Hereford cows. Our results are also supported, in terms of tendencies, by the official data published by the NIAQC. Values of age at first calving in the two data sets only differ by a few months.

As a consequence of differences between ages at first calving and between ages at culling, differences in longevity also exist. Among the breeds and genotypes studied in this work, the longevity of cows of Hereford linage was the highest, followed by Hungarian Grey, Angus, Charolais and, finally, by animals of Limousin linage.

The ages of culling and longevities of the populations studied exhibit a decreasing tendency over the years. The reason for this most certainly is that the numbers of the overall beef cow population decreased during the period studied, since breeders culled more animals than they would have under more favorable conditions.

It is important to stress that values of the age at introduction to breeding and the age at culling, consequently longevity are predominantly determined by conditions of raising, keeping, feeding and tending as well as by the breeders' decisions. Our results should therefore be considered only as tendencies and they hold only for the populations kept under the conditions studied.

A new approach of our study in comparison to the information already in the specialized literature was the evaluation of the influencing traits. We proved that the month of birth is not an influencing factor. For breeders the longevity is one of the most important trait, our study helps them to select the right breed.

For researchers it is interesting how the longevity of a breed could change when the individuals are put in a neighborhood different from the original. Our research gives useful in formations about longevity who would like to study the development of certain breed in Hungary.

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