

LONGEVITY AND MILK PRODUCTION ECONOMICS IN ROMANIAN BLACK AND WHITE COWS REARED IN THE SOUTH-WESTERN ROMANIA

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Abstract

The aim of the paper was to quantify the longevity and milk production economics of a Romanian Black and White cow population from Timiș (TM) and Caraș-Severin (CS) counties. A number of 625 cows from TM and 62 cows from CS that finished their productive life by 01.01.2007 were studied. Life length, from birth to cull, was 6 years 11 months and 10 days in TM, being by 2 years and 26 days shorter than in CS (9 years and 6 days, $p < 0.001$). Exploitation length, from first calving to cull, was 4 years 1 month and 11 day in TM and 3 years 8 months and 15 days in CS. Exploitation index, exploitation length and life length ratio, was 0.58 in TM and 0.42 in CS ($p < 0.001$), at an equal number of lactations of 3.09 and 3.03, respectively. At a similar number of days of lactation per life, of 1075.43 and 1048.03 days, respectively ($p > 0.05$), cows from TM produced a higher milk yield than cows in CS (16461.1 kg vs. 14173.29 kg, $p < 0.05$). Milk yield per day of life and per day of lactation were significantly higher ($p < 0.001$) in TM than in CS (6.35 kg and 15.07 kg vs. 4.42 kg and 13.65 kg, respectively). Per day of exploitation, the milk yield produced by cows from the two counties was similar (10.94 kg vs. 10.71 kg, $p > 0.05$). In conclusion, the milk production economics was higher in cows from TM than for cows from CS.

Key words: longevity, economics, dairy cows, milk, Romanian Black and White

INTRODUCTION

Rearing period length, which is non-productive, represents about 30% of the total length of life of the cows. Shortening this period by early insemination of heifers was, is and will be evidently an economic efficiency problem, which during time have been in focus of the dairy cattle farmer [6].

Literature shows data regarding the aptitudes of certain cattle breeds to produce a high milk yield during their lifetime. In Holstein-Friesian these cases are not that often seen because the high milk production during the first two lactations drive to distress of cows and culling these cows at an early age.

Studying the relationship among the lifetime production traits and linear type traits strong genetic correlations have been found between lifetime production and angularity and dairy character [2]. Between longevity and linear type traits the genetic

correlations were low (between -0.10 and 0.05 [3]).

Significant associations between reproduction traits and longevity were observed [4].

Lifetime milk production is mainly an economic criterion for total milk production, because the expenses for rearing the heifers up to the first calving will be covered at the third lactation.

In Romania the maximum milk production in Holstein-Friesian cows (technical optimum) have been attained at the age of 5.85 years [1]. Optimizing the economic and biological limits of the length of productive life (harmonisation of the technical and economic optimums) it was concluded that the optimum length of productive life of cows should be 9.35 years.

The aim of this paper was to assess the exploitation longevity and economics for milk production of a Romanian Black and

White cows population reared in Timiș and Caraș-Severin counties.

MATERIAL AND METHOD

Researches were carried out on 687 Romanian Black and White cows, from Timiș (n=625) and Caraș-Severin (n=62) counties. Information needed to calculate the longevity and economic traits were collected from the official performance control. Only the cows that finished their productive life before January 1, 2007 were analysed.

Longevity was defined using the following indices:

1. **Life length** calculated by subtracting the birth date of cow from the culling date, and was given in days.

2. **Length of productive life** represented the time from the first calving to the culling of cow, considering the last one as the last day in milk.

Because expressing these traits only in days was difficult to understand, both life length and length of productive life were transformed in years and months, as well.

3. **Exploitation index** was calculated as the ration between the length of productive life and life length. This index shows the efficiency of exploitation through the reproduction (calving interval), production (lifetime days in milk) and precocity (age at first calving) indices.

4. **Average lifetime lactations** was the lactation the cow was culled from the farm.

Lifetime milk production was defined using the following indices:

1. **Lifetime days in milk** obtained by adding days in milk for each lactation.

2. **Lifetime milk yield** was the sum of total milk yield from each lactation of the cow.

3. **Lifetime fat yield** was the sum of the total fat yield from each lactation of the cow.

4. **Lifetime protein yield** was the sum of the total protein yield from each lactation of the cow.

Lifetime milk production economics was defined using nine indices:

1. **Milk yield per day of life** obtained by dividing the lifetime milk yield to the life length, expressed in days.

2. **Fat yield per day of life** obtained by dividing the lifetime fat yield to the life length, expressed in days.

3. **Protein yield per day of life** obtained by dividing the lifetime protein yield to the life length, expressed in days.

4. **Milk yield per day of productive life** obtained by dividing the lifetime milk yield to the length of productive life, expressed in days.

5. **Fat yield per day of productive life** obtained by dividing the lifetime fat yield to the length of productive life, expressed in days.

6. **Protein yield per day of productive life** obtained by dividing the lifetime protein yield to the length of productive life, expressed in days.

7. **Milk yield per day of lactation** obtained by dividing the lifetime milk yield to the lifetime days in milk, expressed in days.

8. **Fat yield per day of lactation** obtained by dividing the lifetime fat yield to the lifetime days in milk, expressed in days.

9. **Protein yield per day of lactation** obtained by dividing the lifetime protein yield to the lifetime days in milk, expressed in days.

For each of these traits the averages and dispersion indices were calculated per county. The differences between counties were tested using the variance analysis (ANOVA).

RESULTS AND DISCUSSION

Life length (Table 1) was, on average, 2535.26 days, that is 6 years 11 months and 10 days in Timiș county and 3291.18 days, that is 9 years and 6 days in cows reared in Caraș-Severin county.

It was observed that cows reared in Timiș county were culled at an earlier ($p < 0.001$) age by 755.92 days, that is 2 years and 26 days, than cows reared in Caraș-Severin county.

Length of productive life (Table 1) was 4 years 1 month and 11 days (1501.49 days) in cows from Timiș county and 3 years 8 months and 15 days (1354.02 days) in cows from Caraș-Severin county. The difference

between counties of 147.47 days (4 months and 26 days) was a tendency to be significant ($p=0.06$).

Analysing the data representing the life length and length of productive life we could observe that cows from Timiș county, even they had a shorter life than cows from Caraș-Severin county, were exploited for milk a longer period of time. This is explained by the fact that heifers belonging to this breed

were inseminated later in Caraș-Severin county, where the Romanian Black and White cows are reared in household and family small farms, compared to Timiș county where cows belonging to this breed are reared in large commercial farms.

Also, a longer length of productive life in cows from Timiș county shows that the average calving interval was higher than in cows reared in Caraș-Severin county.

Table 1 Averages and dispersion indices for longevity in Romanian Black and White cows from the South-western Romania

Trait	County				Difference and significance
	Timiș (n=625)		Caraș-Severin (n=62)		
	X±Sx	cv	X±Sx	cv	
Life length (days)	2535.26±25.584	25.2	3291.18±115.301	27.6	-755.92***
Length of productive life (days)	1501.49±24.071	40.1	1354.02±64.991	37.8	147.47 ^t
Exploitation index	0.58±0.005	19.7	0.42±0.017	31.1	0.16***
Average lifetime lactations	3.09±0.054	43.5	3.03±0.154	40.0	0.06 ^{ns}

* - $p<0.05$, ** - $p<0.01$, *** - $p<0.001$, t - $p=0.06$, ns - $p>0.05$

Table 2 Averages and dispersion indices for lifetime production traits in Romanian Black and White cows from the South-western Romania

Trait	County				Difference and significance
	Timiș (n=625)		Caraș-Severin (n=62)		
	X±Sx	cv	X±Sx	cv	
Lifetime days in milk	1075.43±19.089	44.4	1048.03±51.998	39.1	27.40 ^{ns}
Lifetime milk yield (kg)	16461.10±347.835	52.8	14173.29±718.480	39.9	2287.81*
Lifetime fat yield (kg)	653.65±13.677	52.3	554.97±28.052	39.8	98.68*
Lifetime protein yield (kg)	457.76±9.008	48.9	441.68±22.631	38.9	16.08 ^{ns}

* - $p<0.05$, ** - $p<0.01$, *** - $p<0.001$, t - $p=0.06$, ns - $p>0.05$

Exploitation index, representing the ratio between length of productive life and life length of cows (Table 1) was more favourable to cows reared in Timiș county. Thus, in Timiș county the length of productive life represented 58% from the total life length, while in cows from Caraș-Severin county this index was only 42%. The difference between the two counties (16%) was statistically significant ($p<0.001$).

In Romanian Spotted cows and their hybrids with Red Holstein breed, from Timiș county the exploitation index varied between 0.54 and 0.56 [5].

Average lifetime lactations (Table 1) was similar in cows reared in Timiș (3.09 lactations) and Caraș-Severin (3.03 lactations) counties. Difference of about 27 days between the two counties did not attained the level of significance ($p>0.05$).

Analysing the lifetime production traits (Table 2) it is to be observed that at a similar number of days in milk, cows from Timiș county produced higher milk and fat yields than cows from Caraș-Severin county, but a similar amount of milk protein. This is due, again, to the exploitation system of the cows in the two counties.

Lifetime days in milk was similar in cows reared in the two counties ($p>0.05$), being 1075.43 days in Timiș and 1048.06 days in Caraș-Severin.

Lifetime milk yield was higher in cows from Timiș county by 2287.81 kg ($p<0.05$) compared to that produced by cows from Caraș-Severin county (14173.29 kg).

Lifetime fat yield was significantly higher in cows reared in Timiș county by 98.68 kg ($p<0.05$) than that produced by cows reared in Caraș-Severin county (554.97 kg).

Lifetime protein yield was similar in the two counties (457.76 kg in Timiș county and 441.68 kg in Caraș-Severin county, $p>0.05$), because the protein percentage in milk was, generally, higher in cows reared in Caraș-Severin county.

Economics of lifetime milk production was expressed as milk production per day of life, day of productive life and day in milk (Tables 3, 4, and 5).

Milk yield per day of life (Table 3) was significantly higher in cows reared in Timiș county (6.350 kg), being 1.929 kg higher ($p<0.001$) than that produced by cows reared in Caraș-Severin county.

Fat yield per day of life (Table 3) was 0.245 kg in cows from Timiș county and 0.173 kg in cows from Caraș-Severin county. Difference of 0.074 kg attained the statistical significance level ($p<0.001$).

Protein yield per day of life (Table 3) produced by cows reared in Timiș county was 0.175 kg, being significantly higher than that produced by cows from Caraș-Severin county (0.139 kg, $p<0.001$).

Milk yield per day of productive life (Table 4) was similar in cows reared in Timiș county to that of cows reared in Caraș-Severin county (10.937 kg and 10.707 kg, respectively), differences being statistically non-significant ($p>0.05$).

Fat yield per day of productive life (Table 4) was 0.435 kg in cows reared in Timiș county and 0.421 kg in cows reared in Caraș-Severin county. Difference of 0.014 kg did not reach the statistical significance level ($p>0.05$).

The fact that between the two counties there was not a significant difference regarding the milk and fat yields per day of productive life is explained by that the lifetime milk yield in cows from Timiș was higher, while the length of productive life in cows from Caraș-Severin county was shorter.

Protein yield per day of productive life (Table 4) was significantly higher in cows reared in Caraș-Severin county compared to cows reared in Timiș county (0.340 kg vs. de 0.312 kg, $p<0.05$). This is because the higher protein percentage in milk of cows reared in Caraș-Severin county.

Milk yield per day of lactation was 15.073 kg in cows reared in Timiș county and 13.649 kg in cows reared in Caraș-Severin county. The difference of 1.424 kg in favour of cows from Timiș county attained the statistical significance level ($p<0.001$).

Fat yield per day of lactation was significantly higher ($p<0.001$) in cows reared in Timiș county (0.599 kg) compared to cows reared in Caraș-Severin county (0.536 kg).

At a similar number of lifetime days in milk, cows from Timiș county, producing significantly higher milk, had a better economic efficiency of the milk and fat yield per day of lactation.

Protein yield per day of lactation was similar for cows from the two counties, and the small difference of 0.003 kg was statistically non-significant ($p>0.05$). This is because of a higher protein percentage in cows reared in Caraș-Severin county.

In the tables presented in this paper, the variability of the longevity, lifetime production and economic traits was very high, in some cases the variability coefficient being over 50% (lifetime milk and fat yields in Timiș county, Table 2). A lower variability was observed for traits expressing the economic efficiency of the milk production (Tables 3, 4, and 5). Generally, in all analysed traits, the variability was lower in cows reared in Caraș-Severin county.

Table 3 Averages and dispersion indices for economic efficiency traits per day of life in Romanian Black and White cows from the South-western Romania

Trait	County						Difference and significance
	Timiș (n=625)			Caraș-Severin (n=62)			
	X±Sx	s	cv	X±Sx	s	cv	
Milk yield per day of life (kg)	6.350±0.0923	2.3074	36.3	4.421±0.1883	1.4827	33.5	1.929***
Fat yield per day of life (kg)	0.247±0.0037	0.0916	36.3	0.173±0.0075	0.0589	34.0	0.074***
Protein yield per day of life (kg)	0.175±0.0026	0.0653	36.4	0.139±0.0060	0.0463	33.3	0.036***

Table 4 Averages and dispersion indices for economic efficiency traits per day of productive life in Romanian Black and White cows from the South-western Romania

Trait	County						Difference and significance
	Timiș (n=625)			Caraș-Severin (n=62)			
	X±Sx	s	cv	X±Sx	s	cv	
Milk yield per day of productive life (kg)	10.937±0.1260	3.1494	28.8	10.707±0.3126	2.4613	23.0	0.230 ^{ns}
Fat yield per day of productive life (kg)	0.435±0.0050	0.1261	29.0	0.421±0.0135	0.1061	25.2	0.014 ^{ns}
Protein yield per day of productive life (kg)	0.312±0.0041	0.1012	32.4	0.340±0.0128	0.0984	29.0	-0.028*

Table 5 Averages and dispersion indices for economic efficiency traits per day of lactation life in Romanian Black and White cows from the South-western Romania

Trait	County						Difference and significance
	Timiș (n=625)			Caraș-Severin (n=62)			
	X±Sx	s	cv	X±Sx	s	cv	
Milk yield per day of lactation (kg)	15.073±0.1241	3.1016	20.6	13.649±0.2823	2.2230	16.3	1.424***
Fat yield per day of lactation (kg)	0.599±0.0050	0.1238	20.7	0.536±0.0127	0.0998	18.6	0.063***
Protein yield per day of lactation (kg)	0.431±0.0043	0.1078	25.0	0.434±0.0132	0.1017	23.5	-0.003 ^{ns}

CONCLUSIONS

Based on results obtained in this study on the Romanian Black and White cows reared in Timiș and Caraș-Severin counties, it was concluded that the longevity traits were satisfactory, the production traits were low, especially in cows from Caraș-Severin county, and the economic efficiency for milk production was satisfactory, predominantly in cows from Timiș county.

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