Scientific Papers. Series D. Animal Science. Vol. LXIX, No. 1, 2026
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

PRODUCTIVE PERFORMANCE OF CHAROLAISE CATTLE EXPLOITED IN EXTENSIVE AND SEMI-INTENSIVE SYSTEMS ON FARMS IN SUCEAVA COUNTY, ROMANIA

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Abstract

The present study aims to analyze the productive performance of Charolaise beef cattle exploited in extensive and semi-intensive systems on farms in Suceava county. The biological material consists of animals under official production control through which body weight is monitored at birth (BW), at 200 days (W200) and at 365 days (W365) and based on the results obtained through measurements, it was calculated the average of daily weight gain (DWG). The primary data were statistically processed using specific computer programs, calculating the values of the estimators and testing the differences in means. For BW, the average of animals in the semi-intensive system was insignificantly lower by 0.54 kg ($p<0.05$). The differences are significant in favor of this system only for the W365 and DWG365 environments which are higher by 32.93 kg and 138.18 g/day respectively, the performances at one year being influenced by the management applied

Key words*: Charolaise, meat, production performance.*

INTRODUCTION

Meat and milk are the animal food for which animal husbandry technologies have been developed to increase their performance. Beef is a animal food with high biological value and special organoleptic qualities, containing 18.7% protein and 15.7% fat, the energy value of one kilogram of meat being 2270 kcal. The biological value of meat proteins is 74%, the net utilization coefficient is 74% and the digestibility is 97% (Gociman et al., 2019).Through the digestion and absorption of proteins following meat consumption, the entire spectrum of essential amino acids is made available to the human body (Maciuc, 2006). The weight gain of animals and the development of tissues is influenced by the neuro – endocrine system through the hormones produced, among which we mention somatotropic hormone, thyroxine, insulin, adrenal medullary hormones, etc. (Hozáková et al., 2020; Maciuc et al., 2015).

A particular influence on meat production has the management of technology and external environmental factors, the most important being feeding and ration structure, sanitation and water temperature, but also the thermal stress present during the summer months, especially in the case of animals raised on pastures (Gociman et al., 2020; Grossi et al., 2021; Amariții et al., 2026)

Among the meat breeds raised in Romania is the Charolaise breed, which was formed in France by improving local breeds and which were later crossed with the Simmental and Shorthorn breeds. As a result of the applied improvement programs, animals belonging to this breed have more abundant muscle mass and reduced fat content. In the case of intensively fattened calves, are recorded average daily weight gain (DWG) up to 1.4 kg.

The Charolaise breed is recognized as having a good capacity for body development, the improvement of productive performances being dependent on the correct use of exploitation technologies and the application of adequate management, especially nutritional. Some studies highlight that the bulls of this breed have a very good feed conversion and the achievement of the best average daily gains of 1.313 kg for the fattening period of 12-18

months which are represented by higher intramuscular fat deposits (Ünal et al., 2025). The quality of the meat in the carcass is different compared to other meat breeds, because Charolaise cattle and their crossbreeds gain weight during the fattening period due to the development of muscle mass in the front part of the trunk (pectoral muscles and neck region) and the accumulation of intramuscular fat (Robelin et al., 1990; Młynek et al., 2006). The slaughter age of the animal is very important for obtaining quality carcasses and superior meat and the target weights established for each breed are based mainly on consumer preferences and the economic efficiency of production (Kostusiak et al., 2023).

The nutritional management of these animals remains the determining factor of the productive performance, the level of concentrates in the ration significantly influencing the amount of meat in the carcass (Serrano et al., 2007). The productive performance of calves is influenced by the management of milk feeding. Corn silo is considered a very good source of food for fattening cattle due to the energy and fiber intake (Álvarez-Rodríguez et al., 2010; Cozzi et al., 2008).

Growth performance is influenced by the level of animal welfare through environmental factors and housing conditions that can reduce stress of any kind and thus influence health status (Cozzi et al., 2005; Álvarez-Rodríguez et al., 2010; Skaperda et al., 2021).

In Romania, the beef cattle herd is growing, this sector being supported by subsidies that stimulate farmers. The animals are registered in the Official Production Control (OPC) and based on the standardized methodology, the main indicators of animal growth are monitored until the age of one year. At the national level, in 2023 there were 207 farms that raised Charolaise animals, registered in the Genealogical Register, with the following herd structure: 5887 lactating cows, 1838 calves, 1920 heifers and 224 bulls used for breeding.

This paper work was carried out with the aim of contribution to the study of the performances achieved in Romanian farms by Charolaise cattle.

MATERIALS AND METHODS

The study is based on the analysis of data on the productive performance of animals born from January 2022 to December 2024 and belonging to the Charolaise breed, raised on farms in Suceava County, of which 7 apply semi-intensive breeding technologies and 24 raise animals in an extensive system. For these animals, the OPC is carried out, which is the basis for the development of the national breeding program for this breed.

For the evaluation of meat production, the most important parameter is the live weight of the animals. The animals whose performances were studied are raised and exploited both in extensive and semi-intensive systems. After birth, the calves are suckled by mother cows that are not milked, their weaning taking place naturally, 6-7 months after calving. The animals are raised on pastures during most of the year and the ration is supplemented with concentrates. The calves graze alongside the base herd and after weaning they are fattened for slaughter or to be used for reproduction if they are valuable. During the winter, the animals are kept in stables, being tied in the extensive system or free in the case of the semi-intensive system. The analyzed characters were the birth weight (BW), the weight at 200 days (W200) and at 365 days (W365), and based on these, the daily weight gain achieved is calculated (DWG).

In the extensive system, 24 farms and a total of 432 heads were taken into account, of which 182 males and 250 females. In the 7 farms analyzed that raise animals in a semi-intensive system, 164 males and 205 females were born during the reference period.

The primary data are those included in the OPC bulletins and were statistically processed using the PrismaGraph9 software program to perform descriptive statistics, apply the Fisher and Tukey tests, determine the significance of differences and coefficient of Pearson correlations. For the indicators describing the animal performances, the differences in the means of the achieved performances were tested and the correlations were calculated: arithmetic mean ($\bar{X}$), arithmetic mean error ($\pm s_{\bar{X}}$), standard deviation (s), coefficient of variation (V%), Fisher test and Tukey test.

The test result *p*, given as a number between 0 and 1, represents the probability of making an error if we reject the hypothesis H_0. If *p* is less than the chosen significance threshold α – usually α = 0.05 – we reject the hypothesis H_0 and accept the hypothesis H_1 as true.
The interpretation of p-values in most tests is as follows:
- $p < 0.05$, the difference is significant (S, 95% confidence interval, marked *);
- $p < 0.01$, the difference is significant (S, 99% confidence interval, marked **);
- $p < 0.001$, the difference is highly significant (HS, 99.9% confidence interval, marked ***);
- $p < 0.0001$, the difference is extremely highly significant (HS, 99.99% confidence interval, marked ****);
- $p > 0.05$, the difference is not significant (NS).

The Pearson correlation coefficient (r) is a measure of the linear association between two variables and has values between –1 and +1, with the significance of positive/negative association depending on the sign of the coefficient.
If the value $r_{XY} = 0$, the lack of association between the variables is signified.
The statistical significance of the values is as follows:
- $0 < r < 0.19$ – very weak association;
- $0.20 < r < 0.25$ – weak association;
- $0.26 < r < 0.40$ – moderate association;
- $0.41 < r < 0.69$ – strong association;
- $0.70 < r < 1$ – very strong association.

RESULTS AND DISCUSSIONS

The evolution of daily weight gain is an indicator of the degree of adaptation of a breed to the conditions of husbandry and animal handling (Hozáková et al., 2020; Maciuc, 2006). Animals of this breed have the highest body weights at maturity, bulls reaching 1000-1650 kg and cows between 700-1200 kg. (www.okstate.edu)
Table 1 presents the statistical values for the data from the period 2022-2024 for animals raised on farms in Suceava County, values presented separately depending on the maintenance system. It can be seen that there are differences in animal performance between the two raising systems, as expected as a result of management measures regarding technological factors.

Table 1. Statistics of productive performances achieved in young Charolaise cattle raised on farms in Suceava County during 2022-2024

Livestock farming system	Parameters	n	$\bar{X}$	S	$s_{\bar{x}}$	V %	Minimum	Maximum
Extensive	BW (kg)	*432*	42.59	7.1	0.34	16.68	30	66
	W200 (kg)	*413*	223.69	35.94	1.77	16.07	126.23	354.99
	DWG200 (g/day)	*413*	905.52	181.64	8.94	20.06	416.67	1589.93
	W365 (kg)	*237*	337.54	57.41	3.73	17.01	153.31	487.14
	DWG365 (g/day)	*237*	743.05	289.37	18.8	38.94	56.82	1452.38
Semi-intensive	BW (kg)	*369*	42.05	4.05	0.21	9.63	34	61
	W200 (kg)	*352*	228.17	40.87	2.18	17.91	104.97	410.31
	DWG200 (g/day)	*352*	930.83	204.17	10.88	21.93	339.84	1861.54
	W365 (kg)	*256*	370.48	50.6	3.16	13.66	204.3	534.51
	DWG365 (g/day)	*256*	881.23	261.39	16.34	29.66	109.89	1835.16

As can be seen, the average weight of calves born to cows raised in the extensive system was 42.59 kg, 0.54 kg heavier than calves obtained in the semi-intensive system whose average weight was 42.05 kg.
The fact that in the extensive system the animals are on average somewhat heavier at calving draws attention to the management of the last part of the gestation in the case of cows in the semi-intensive system in terms of exercise regime, feeding or other internal factors. Monitoring body condition score (BCS) in cows is a good management measure.
However, in the semi-intensive system the lowest calving weight was 34 kg, higher by 11.76% (Table 1) and that the batch of calves is homogeneous for this character, compared to

the extensive one which is medium homogeneous.

The calves in the extensive system had an average W200 of 223.69 kg and W365 of 337.54 kg with corresponding average daily weight gains (DWG) of 0.905 kg and 0.743 kg respectively. For DWG200, the maximum value recorded was 1.59 kg/day and at one year the daily weight gains were a maximum of 1452.38 kg/day. The variability is high because the values of the V% coefficient are 20.06 and 38.94 respectively, due to the large number of extensive farms analyzed (24).



Figure 1. Production performances achieved in extensive and semi-intensive systems

The performance of animals raised in semi-intensive system was better, as shown in the data in Table 1 and the graphic representation in Figure 1. Calves had a better growth rate because the average weights were W200 of 228.17 kg and for W365 of 370.48 kg, values higher by 2.19% and 8.89% respectively compared to the average body weights achieved by calves raised extensively.

The DWG200 and DWG365 were on average 0.931 kg/day and 0.881 kg/day, which means a daily gain of 26 g/day and 138 g/day respectively compared to the extensive system. The upper limit of DWG200 for variation range was for 1.861 kg/day and for DWG365 was 1.835 kg, the variability of the performances being high in this case, with V % values of 21.9 and 29.66.

Up to 200 days the rearing system does not influence W200 because the differences are insignificant, both systems ensuring relatively similar conditions for this period, being feeding based on maternal milk consumption in both cases to ensure nutrients. Discrepancies appear for the period that occurs, up to one year, with semi – intensively raised animals being significantly heavier, which means that feeding management differentiates the two systems.

Table 2 details the values of the statistics that describe the performances obtained by calves and heifers raised in extensive and intensive systems.

Table 2. Statistics of performance indicators achieved by Charolais calves and heifers in both rearing systems

Livestock farming system		Extensive					Semi-intensive				
Parameters		BW (kg)	W200 (kg)	DWG200 (g/day)	W365 (kg)	DWG365 (g/day)	BW (kg)	W200 (kg)	DWG200 (g/day)	W365 (kg)	DWG365 (g/day)
CALVES	n	*182*	*180*	*180*	*60*	*60*	*211*	*152*	*152*	*101*	*101*
	$\bar{X}$	43.78	233.44	948.26	354.99	820.42	42.81	238.22	974.51	386.03	917.23
	s	7.257	33.99	173	63.4	298.78	3.691	44.13	220.73	59.51	29.53
	$s_{\bar{x}}$	0.538	2.533	12.89	8.185	38.57	0.254	3.58	17.9	5.921	296.74
	V%	16.58	14.56	18.24	17.86	36.42	8.623	18.53	22.65	15.42	32.35
	Minimum	31	147.52	461.54	153.31	162.01	35	105	339.84	204.30	109.89
	Maximum	66	355	1590	487.14	1452.38	61.00	410.31	1861.54	534.51	1835.16
HEIFERS	n	*250*	*233*	*233*	*177*	*177*	*205*	*200*	*200*	*155*	*155*
	$\bar{X}$	41.72	216.15	872.50	331.63	716.83	40.97	220.54	897.63	360.34	857.78
	s	6.871	35.66	181.6	54.15	282.18	3.938	36.5	184.37	40.97	233.56
	$s_{\bar{x}}$	0.435	2.336	11.9	4.07	21.21	0.275	2.581	13.04	3.291	18.76
	V%	16.47	16.50	20.82	16.33	39.36	9.61	16.55	20.54	11.37	27.23
	Minimum	30.00	126.23	416.67	154.57	56.82	34.00	114.52	377.62	231.38	163.84
	Maximum	65.00	350.14	1535.71	449.32	1345.24	57.00	333.37	1455.36	454.08	1477.71

For birth weight, males have higher weights than females, in the extensive system they are on average 2.06 kg heavier and in the semi-intensive the difference is 2.42 kg. Comparing the rearing systems, the average birth weights are higher in the case of calves and heifers born in the extensive system which also presents greater character variability, being a homogeneous environment. From the data presented and represented in figures 2 and 3, it can be observed that the animals have different body development depending on sex in both exploitation systems, sexual dimorphism being a recognized factor of influence of body development.

Compared in the two rearing systems, calves have different weight gains. In the intensive system, males reach W200 of 238.22 kg and W365 of 386.03 kg, values that are 2% and respectively 8.04% higher compared to the extensive system where calves reach 233.44 kg at 200 days and about 355 kg at one year. In both groups analyzed, the variability of the character is moderately homogeneous and the differences become significant ($p < 0.05$) for the weight achieved at one year of age.

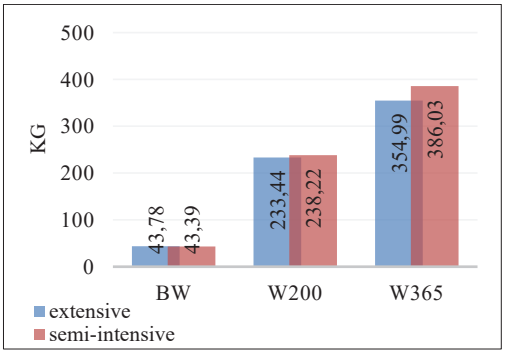


Figure 2. Body weight (kg) for calves in both rearing systems

Regarding the average daily weight gains achieved by males, they are different because in the extensive system the value of DWG200 is 0.948 kg/day and DWG365 is 0.820 kg/day in the latter case the variability being very high in the herd for V% of 36.42. In the semi-intensive system, calves achieve better DWG, because up to 200 days they grow by 0.975 kg/day and DWG365 is 0.917 kg/day values that are higher by 2.77% and 10.58% respectively compared to the extensive system, the differences being significant ($p < 0.05$) for DWG365.

If we analyze the evolution of the weight of calves in the both systems, it can be seen from table 2 and figure 3 that they are superior in the semi-intensive one. Although the calving weight is on average 40.97 kg, 0.8% lower than that of calves in the extensive system, subsequent performances are better. Thus, semi-intensively raised calves achieve a weight of 220.54 kg at 200 days with a DWG200 of 0.897 kg/day and at one year old the weight is on average 360.34 kg by achieving a DWG365 of 0.858 kg/day. These performances are highly significant ($p < 0.0001$) for the weight achieved by calves at one year old and for dwg365 compared to those achieved in the extensive system where calves reach an average W365 value of 331.63 kg based on a DWG365 of 0.717 kg/day.

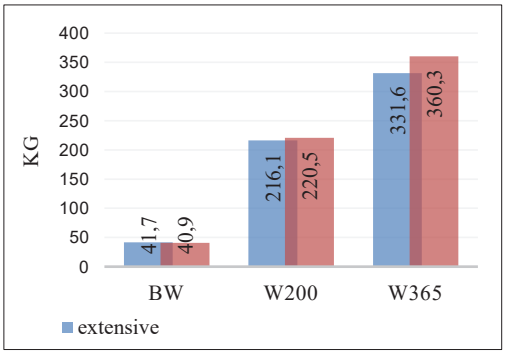
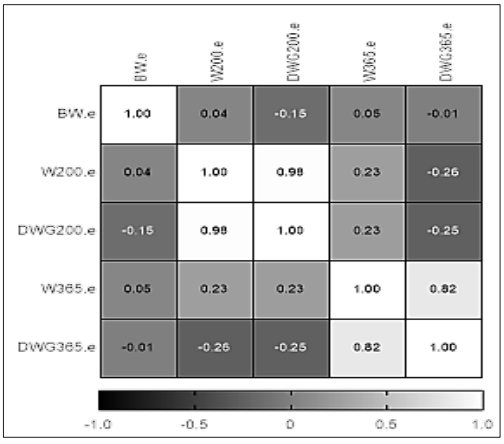


Figure 3. Body weight (kg) for heifers in both rearing systems

It is worth noting the variability of these traits for which the batches of calves are on average homogeneous for W200 and DWG200 and remain on average homogeneous for W365 with the lower value in the intensive system where V% is 11.37 compared to 16.33. The variability increases when we analyze DWG365 because in the case of calves raised extensively for this trait the batch is more heterogeneous (V % = 39.36) compared to the case of calves in the semi-intensive system (V % = 27.23). This means that animal feeding management is a major factor influencing performance which, by adjustment, can reduce variability in both situations. By testing the differences between the average performances by sex and between the two rearing systems,

they are statistically insignificant between farms for BW, W200 and DWG200 regardless of the group. This highlights the fact that the rearing system does not significantly influence BW of the animals and their growth performance in the first 200 days of life.

For W365 and DWG365 there are highly statistically significant differences for W365 and DWG365 between the exploitation systems but also between groups of animals of the same sex raised in this two different systems. Semi-intensive farms record final weights (W365) and DWG up to one year higher than extensive one as a result of better growth management that primarily targets animal nutrition, which is reflected in higher weight gains of animals after the age of 7 months.



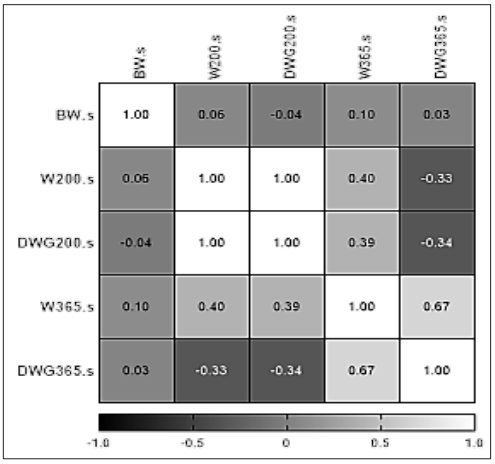
e – extensive

Figure 4. Pearson correlation coefficient values between BW, W200 and W365 in extensive systems

The statistical analysis of the data also included the calculation of Pearson correlation coefficients (r) between the characters for both rearing systems (Figures 4 and 5), to explain the linear relationships between the variables.

Even though they have negative values, the correlations between BW on the one hand and W200 and W365 are weak and very weak, which means that this indicator is not a predictor of subsequent weight gain, which depends mainly on the management of the animals. Animals with lower birth weights tend to have lower DWG in the extensive system but at the end of the control period, in the semi-intensive system, these animals could have slightly higher W365 (r = 0.03)

Positive correlations exist between W200 and W365 of the animals, being moderate also in extensive (0.23) and in semi-intensive (0.40) which means that the weight reached by the animals at the age of 200 days (at weaning) influences the weight they will have at the age of one year. The DWG of each period is very important in achieving the performances we want, a statement supported by the high values of the correlation coefficients which in extensive system is +0.82 and +0.98 and in semi-intensive system it is perfect (r = +1) at 200 days and strong (r = +0.67) for 365 days.



s – semi-intensive

Figure 5. Pearson correlation coefficient values between BW, W200 and W365 in semi-intensive systems

Animals in the extensive system have a lower growth rate up to 200 days compared to those in the semi-intensive system, due to fluctuations in animal feed, but increase their growth up to 365 days, because the correlation coefficient between DWG365 and W365 in the extensive system is higher. The way animals are fed in the post-weaning period is very important because those in the extensive system can also have similar performances up to 365 days. The values of the DWG200 and DWG365 correlation coefficients draw attention to the fact that the weaning weight of animals is more strongly influenced and supported by the average daily weight gain than the weight reached at the age of one year, for which the correlations remain strong but are lower in value. Also, because there are weak-moderate negative correlations between

DWG200 and DWG365, it means that animals with a higher growth rate until weaning will have a lower growth gain after this period. In an extensive system the calves can recover W365.

CONCLUSIONS

The influence of the semi-intensive rearing system is reflected in the better performances achieved by the animals, especially after the age of 200 days, regardless of the sex of the animal. Thus, even if the differences are insignificant between the exploitation systems in terms of BW, W200 and DWG200 days, they become evident and very significant when we analyze the performances between calves and heifers raised in the two systems.

In semi-intensive farms, the animals are heavier and have a higher average daily gain, especially in the period 200-365 days, which confirms the fact that this system brings benefits through the management applied, especially in terms of nutrition, which translates into better growth rates of the animals.

Other conclusions that can be drawn from the analysis performed:

- although there are differences in birth weight and animal growth up to 200 days of age between the two systems, these are not significant;
- the birth weight of the animals is not a limiting factor of subsequent performances which were, however, superior in the case of males compared to females;
- raising animals in a semi-intensive system leads to obtaining superior results for the W365 of the animals, the differences being highly significant ($p < 0.0001$) compared to the extensive system;
- comparing the performances achieved separately by calves and heifers in the two systems, there are differences for W365, significant in the case of calves ($p < 0.05$) and highly significant ($p < 0.0001$) in the case of heifers, which reveals the fact that the phenotypic expression is conditioned primarily by the exploitation system;
- for calving weight, the batches are homogeneous, being moderately homogeneous in the case of the W200 and W365;
- given the correlations, the strong relationship between W365 and W200 must be taken into account;
- there are negative correlations between DWG200 and DWG365, after 200 days the tendency is for the growth rate of the animals to decrease;
- in the intensive system, W200 moderately predicts W365, the controlled feeding of the animals supporting the predictability of their growth;
- animals with a lower DWG200 can recover the weight difference for up to one year if they are provided with optimal conditions after weaning.

The recommendations refer in particular to the management of the breeding system applied on farms:

- improving animal nutrition, especially in the extensive system, to increase the productive performance of the animals and the quality of the milk consumed by the young until weaning;
- evaluating both breeding systems to identify the causes that determine the very high variability of the batches in terms of their performance, which suggests the non-uniformity of technological factors, the most important being nutrition (quality of feed, unequal access to pastures, etc.);
- management measures regarding nutrition of cows in the last part of gestation in the intensive system;
- improving environmental conditions during the housing period to ensure the welfare of the animals and maintain their health;
- W365 should be the evaluation criterion for the animals due to the compensatory growth of the animals that occurs during this period.

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