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**Conference Paper**

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# THE EFFICIENCY OF USING THE BODY CONDITION INDEX FOR IMPROVING MANAGEMENT IN DAIRY FARMS

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**Abstract:** *The present work was carried out for the economic efficiency of dairy cow farms by using the body condition index. The body condition index is a subjective indicator that evaluates the subcutaneous fat deposits of dairy cows. For its interpretation, a scale from 1 to 5 with fragmentation from 0.5 points to 0.5 points is used. With the help of this indicator, the maintenance condition of the cows is monitored and the fodder ration is made more efficient so that there are no cachectic or obese animals in the herd. The present research was carried out at the Research and Development Institute for the Breeding Cattle of Balotesti, on a herd of 72, cows of the Romanian Black Spotted breed. This work was carried out to correct the production and reproduction deficiencies with the help of the maintenance condition of the cows. The body condition index was reported both to the reproductive indicators: the number of IA/G, service-period and the calving interval, as well as to the production indicators: milk production on the control day and milk production/lactation. From the analyzed data, it was found that by using this indicator, the economic efficiency of the farm increased by improving the production and reproduction performances.*

**Keywords:** *body condition score, cow, index production and reproduction*

**Classification: JEL:** Q01,Q18

## INTRODUCTION

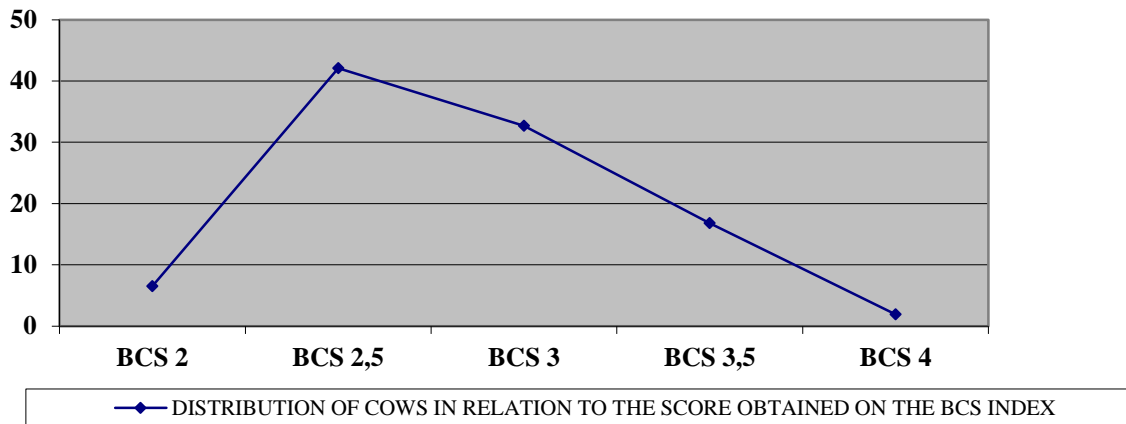
The body condition represents a relative new concept introduced in our country and analyzes the state of maintenance and exploitation of dairy cows. This appreciation indicator was taken to help nutritional and reproductive management in farms, because it corrects technological mistakes and makes considerable contributions in improving production and reproduction performances. The evaluation system used to assess body condition uses grades from 1 to 5 (Carissa M. Truman, 2005), with a difference of 0.5 points, to assess subcutaneous fat deposits.

## MATERIAL AND METHOD

The present work was carried out at the Research and Development Institute for the Breeding of Balotesti Cattle, on a herd of 72 heads, cows of the Romanian Black Spotted breed. The analyzed data captured the activity on the farm in the period 01.01.2020 - 31.12.2021. The milk production was obtained from the personnel performing the Official Control of Milk Production and the reproduction data were extracted from the reproduction program Taurine.exe. which belongs to the Institute. The evaluation of the physical condition was carried out by specialists from the institute. The statistical interpretation of the obtained data was carried out with the help of the Microsoft Excel program.

## RESULTS AND DISCUSSION

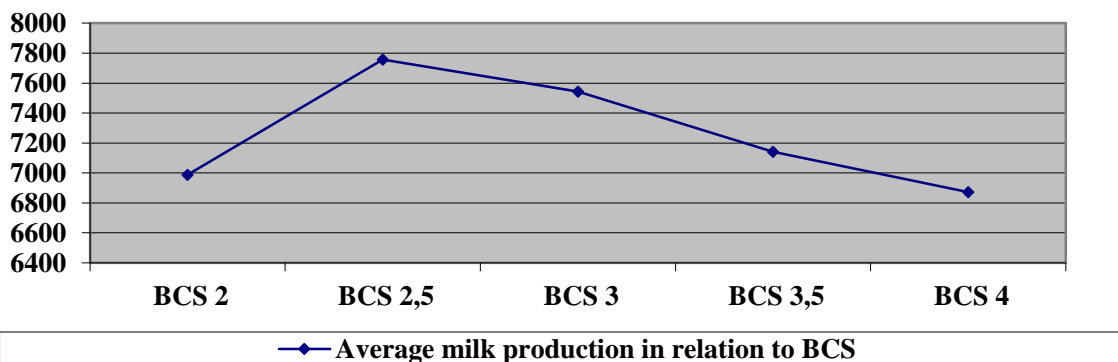
In the graphic image below, we have analyzed the state of maintenance of the cows in relation to the score obtained on the body condition index



**Figure 1. Distribution of the batch of cows according to the score obtained on the BCS index**

From figure 1, it can be seen that the largest share of the analyzed batch has the cows that obtained a score of 2.5 on the body condition index, approximately 42.1%. In second place were the cows that obtained grade 3 in the body condition index, approximately 32.7%. Overweight cows ranked 3rd with a weight of 16.8% and cachectic cows ranked last with a weight of 6.5% and obese cows with a weight of 1.9%. From the data presented above, it can be seen that the analyzed batch of cows has a good state of maintenance, in which the largest share is occupied by cows that received scores between 2.5 and 3.5 on the body condition index.

Dairy farms operate according to the principle of profitability. Thus, if the animals are productive, they will be kept in the herd. In any other conditions, they will be reformed. Starting from this principle, we analyzed the productivity of the cows according to the score obtained on the body condition index. The graphic image below shows the average milk production obtained by the cows in the monitored group according to the grade obtained for the body condition indicator.



**Figure 2. Distribution of cows' productivity according to the score obtained on the BCS index**

From figure 2, it can be seen that the highest average milk production was obtained from the cows that received a score of 2.5 on the body condition index, approximately 7756 kg. In second

place were the cows that received a score of 3 on the body condition index. The average milk production obtained from them was 7543.5 kg. The difference in productivity between the first two ranked was 2.81% in favor of the first. The cows that received a score of 3.5 on the body condition index, with a production of 7142.3 kg, ranked third. The difference in productivity between the leading group and them was 8.59%. Lean cows with an average milk production of 6987.5 kg were ranked 4th. The difference in productivity between the first place and them was 10.99%. Fat animals ranked last. From these, an average milk production of 6871 kg was obtained. The productivity difference between the first and the last place was 12.88%. From the above results, it can be seen that the highest milk productions were obtained from cows with good maintenance. They made the best use of the fodder ration, having the best conversion ratio of fodder into milk. The lowest productions were obtained from the lots with cachectic and fat cows ( J J Domecq 1997).

For there to be milk production, there must be reproduction. The better the reproductive activity in a farm, the higher the income and the lower the economic losses. The main indicators that analyze the reproductive activity in dairy farms are: fecundity, fertility, service period and calving interval.

Fecundity represents the physiological process through which the spermatozoon and the ovule merge and form the zygote. The higher the fecundity, the higher the economic efficiency. The specialized literature appreciates that a farm has a high fecundity when 80% of the herd is represented by pregnant animals.

The table below shows the fecundity analysis according to the grade obtained on the body condition index.

**Table 1. Analysis of fecundity of cows from the experimental group**

FECUNDITY	BODY COBDITION SCORE					Total
	2	2,5	3	3,5	4	
BCS	2	2,5	3	3,5	4	
COWS AI	5	28	24	12	3	72
PREGNANT COWS	3	20	21	9	1	54
% GESTATION	60	71,42	87,5	75	33,3	75
AI PERFORMED	10	36	30	17	4	97

From table 2 it can be seen that in the analyzed time interval 72 cows were inseminated from which 54 pregnancies were obtained, which is equivalent to a fecundity percentage of 75%. The best fecundity, of 87.5%, was obtained from the group of cows that obtained grade 3 on the body condition index. On the II and III places were the batches of cows that received marks of 3.5 and 2.5 respectively on the BCS index. In these groups, the fecundity was 75% and 71% respectively. Cachectic and obese cows ranked last (López-Gatius F. 2003). The fertility in these batches was 60% and 33%, respectively. This low fecundity recorded in obese animals is caused by fat deposits in the ovaries that prevent their normal functioning. The low fecundity recorded in weak animals is caused by the lack of subcutaneous energy deposits. A weak cow, at the beginning of lactation, when the energy balance is negative (Butler WR,2005), cannot support the vital functions, high milk production and good functioning of the reproductive system from the ingested energy. Following the results obtained, it can be stated that for increasing fecundity in dairy farms, it is preferable to avoid animals having a BCS index score lower than 2.5 and higher than 3.5.

From the analysis of indicator no. AI/G states that the fewest artificial inseminations/gestations, 1.42, were carried out in the group of cows that obtained grade three on the

BCS index. Moreover, this score equates to a very good fecundity. The cows that obtained marks of 2.5 and 3.5 on the BCS index were ranked next. For these batches, 1.8 AI/G and 1.9 AI/G were required. The scores obtained by these groups of cows equate to good fecundity. The lowest scores were recorded in the groups of obese and cachectic cows. These required 4 AI/G and 3.33 AI/G respectively. These results equate to low fecundity. From the analysis of the AI/G number indicator, it is found that the most effective from the point of view of fecundity are the cows with a good state of maintenance and the economic losses are produced by thin and obese cows due to the large amount of frozen semen used. Once the pregnancy is established, the fertility of the cows is monitored. This represents the ability of an animal to obtain viable offspring. Specialized literature appreciates that fertility is good when it is 60% of the herd in operation. Table 2 shows the fertility of the cows in the analyzed batch.

**Table 2. Fertility analysis of cows from the experimental group**

FERTILITY	BODY COBDITION SCORE					Total
	2	2,5	3	3,5	4	
BCS	2	2,5	3	3,5	4	
PREGNANT COWS	3	20	21	9	1	54
CALVES OBTAINED	1	17	19	8	1	46
Embryonic mortality/abortion	1	2	2	1	0	6
NON VIABLE CALVES	1	1	0	0	0	2
VIABLE CALVES	1	17	19	8	1	46
% fertility	33,33	85	90,47	88,88	100	85,18
% mortality	66,33	15	9,53	11,12	0	14,82

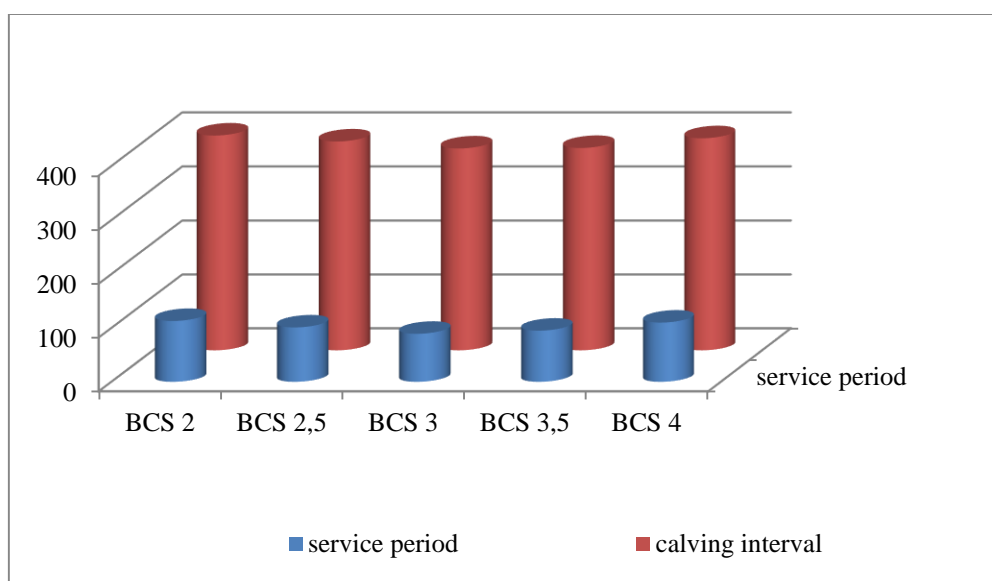
From the data presented in table 2, it can be seen that 46 calvings were obtained from the cows in the experimental group, which equates to a fertility of 63.88%. The most offspring, 19, were obtained from cows that received a score of 3 on the body condition index. In second place were the cows that received a grade of 2.5 on the BCS index. 17 cattle were obtained from them. In third place was the batch of cows that received a grade of 3.5 on the BCS indicator. 8 cows resulted from these. The fewest calvings were recorded in the groups of cows that received marks of 2 and 4 respectively for the same indicator.

The analysis of the fertility of cows through the lens of the number of viable offspring obtained shows that the best fertility was recorded in fat animals. In second place were the cows that received grade 3 on the BCS index (O Markusfeld, 1997). The fertility recorded in this lot was 90.47%, which equates to good fertility. In third place were the cows that received a score of 3.5 in the body condition index. Fertility in this lot was 88.88%, which equates to good fertility. On the 4th place were the cows that obtained a fertility percentage of 85% according to the BCS index, which equates to good fertility. The group of thin cows ranked last. For them, the fertility was 33.33%, which equates to low fertility. Moreover, the specialized literature appreciates that a farm under normal operating conditions and with cows in an optimal state of maintenance has a fecundity of 80% and a fertility of 60%. This shows that in specialized literature, fecundity losses of up to 20% are considered acceptable for a farm to be economically viable. From the data obtained by us and reported in the specialized literature, it is found that except for the group of weak cows, the other batches had acceptable losses of fecundity.

The analysis of reproductive indicators, service-period and the calving interval shows both the time elapsed from calving to the fertile mount and the time elapsed between two calvings. As

service period represents the mobile component of the calving interval, it is preferable that it does not exceed 80 days and the calving interval should be 365 days for a farm to be economically efficient.

Figure 3 will show the duration of service-period indicators and the calving interval in relation to the grade obtained on the body condition index.



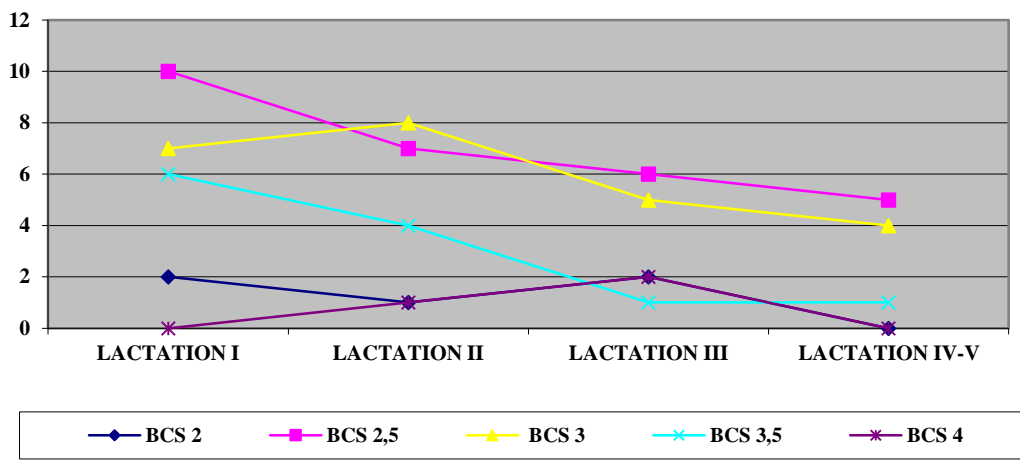
**Figure 3. Analysis of service-period and calving interval indicators in relation to the grade obtained on the BCS index**

From figure 3 it can be seen that the best scores were recorded for the group of cows that received grade 3 for the body condition index. In this group of cows, service period was approximately 89 days and the calving interval was approximately 374 days. In second place were the cows that scored 3.5 on the body condition index. In this group of cows, the duration of the reproductive indicators analyzed was 95 days and 375 days, respectively. The reduction of the calving interval in this group is due to the duration of the pregnancy, which had a somewhat shorter average of 280 days. In 3rd place were the cows that obtained a grade of 2.5 at the BCS. In these, the duration of service period was approximately 101 days and the calving interval had an average of 387 days. Weak cows ranked last with an average of 113 days of service period and 398 days calving interval (Virginia A. Ishler 2018). The Fisher test analysis shows that there are no significant differences between the analyzed groups ( $p > 0.05$ ). From the resulting data, it can be seen that cows with good maintenance are the most efficient from the point of view of the reproductive indicators analyzed (Mareike Maak 2018). In any farm, the longer the distance between the fronts, the lower the economic efficiency. This is explained by the relationship between production and reproduction. Since the duration of lactation is 305 days and the breast rest is 60 days, it is ideal that the calving interval is 365 days. An increase of it is accepted only in the case of cows with high productions, which can justify the low score recorded by the cows that received a grade of 2.5 on the BCS index.

Increasing the calving interval represents a sufficient argument for the reformation of cows. In recent years, the age of reformation, worldwide, has dropped to 2.8 lactations. As the growth of replacement youth represents the largest share of a farmer's expenses, it is preferable to increase the period of exploitation of cows in order to increase income. The reformation of young cows can make small farmers who have holdings of up to 5 cows vulnerable. Besides, they own the largest share of

the cow herds in our country, according to MADR, approximately 93%. Thus, increasing the longevity of cows is a priority to ensure the maintenance and growth of existing herds.

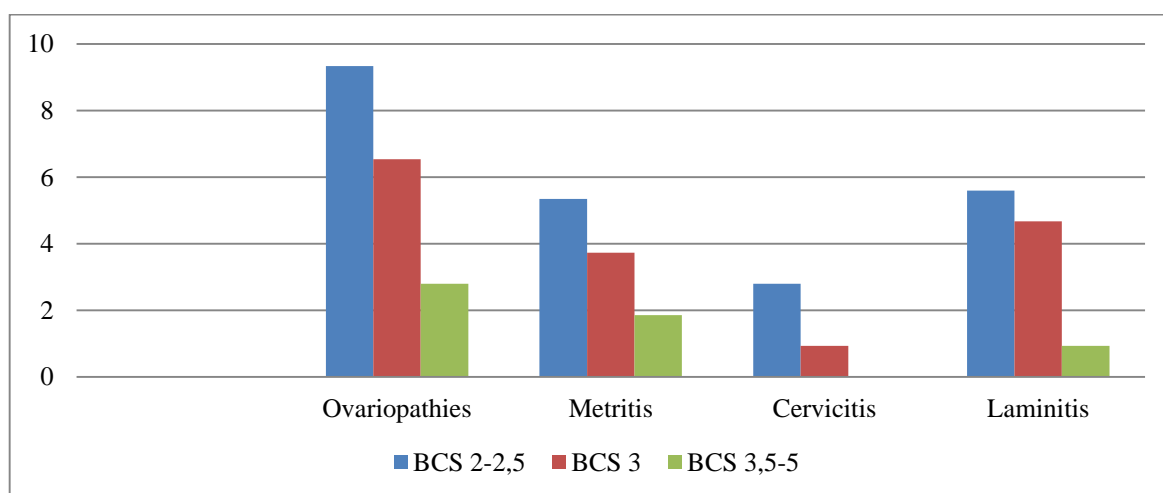
The graphic image below shows the longevity of cows in relation to their maintenance status.



**Figure 4. Analysis of longevity in relation to the BCS index**

From fig. no. 4 it is found that the cows that received a grade of 2.5 on the body condition index have the greatest ability to delay their reformation. On the next position are the cows that received grade 3 at BCS. Overweight and obese cows have the lowest share among the cows in the analyzed group, which proves that they had the least productive arguments to be kept in the herd. It should be noted that among the animals that have reached the IV and V lactations, there is no cachectic or obese cow, which shows that these animals are poorly productive and it is not an advantage to maintain them in the herd. These differences show that the longevity of cows can be increased by adjusting body condition.

In graphic image no. 5 shows the conditions associated with infertility in relation to the grade obtained on the body condition index.



**Figure 5. The incidence of pathology associated with infertility in relation to the BCS index**

From graphic image number 3, it can be seen that the most reproductive disorders were registered in the group of cows that received marks of 2 and 2.5 respectively at BCS (Wissal

Souissi2019). In these groups, the most common conditions were ovarioopathies. Of this group of diseases, the most common were ovarian hypotrophy and ovarian cyst disease. In second place from the point of view of pathology associated with infertility, cows with foot diseases were ranked. From this group of diseases, the most common was infectious bulbar necrosis. In third place were the cows that presented metritis. From this group of diseases, the most common was endometritis.

Cows that received grade 3 at BCS were ranked II in terms of case history associated with reproductive disorders. From the graphic image above, we can see a decrease in reproductive disorders compared to the cows that received grade 2 at BCS. This decrease in the number of cases is due to subcutaneous fat deposits that provide the energy needed to support production and reproduction activities and favor better utilization of feed, thus preventing the occurrence of ruminal imbalances that can contribute to the installation of foot ailments.

The fewest diseases were recorded in overweight cows. It seems that the popular saying 'the more a cow eats, the cheaper it eats' is valid for this group of cows

### CONCLUSIONS:

The highest milk production was obtained from cows that scored 2.5 on the BCS index (+12.88%)

The best fecundity of 87.5% was recorded in cows that obtained grade 3 on the BCS index (+16.66% compared to the average of the analyzed batch)

The longest-lived are cows with good maintenance

The fewest reproductive disorders were recorded in cows with good maintenance.

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