



Phenotypic Estimation of Highly Productive and Healthy Dairy Cows

Ward M. Ashraf^{1*}, Al Zlitne A. Rabia¹, Aswehli A. Abdelatef¹,
Alkurdi M. Abdulraouf¹, Hdud M. Ismail², Elhafi A. Giuma³
and Jurewicz-Ward Katarzyna⁴

¹Department of Preventive Medicine, Faculty of Veterinary Medicine, University of Tripoli, Tripoli, Libya.

²Department of Pathology and Clinical Pathology, Faculty of Veterinary Medicine, University of Tripoli, Tripoli, Libya.

³Department of Poultry and Fish, Faculty of Veterinary Medicine, Alzzytona University, Tarhona, Libya

⁴Zespół Szkół Technicznych w Olecku, Poland.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

Editor(s):

(1) Dr. Armando Zepeda Bastida, Professor, Veterinary Biotechnology in Agricultural Science Institute, Autonomous University of Hidalgo State, Mexico.

Reviewers:

(1) Francisco Diniz, University of Trás-os-Montes and Alto Douro, Portugal.

(2) Kamran Baseer Achakzai, Pakistan.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/52628>

Original Research Article

Received 24 September 2019

Accepted 28 November 2019

Published 10 December 2019

ABSTRACT

When breeding dairy cattle, evaluation of the animal by the exterior is of paramount importance, since the appearance of the animal and its internal properties are closely related to dairy products. Body condition scoring (BCS) is the most widely used method to assess changes in body fat reserves, which reflects its high potential to be included in on-farm welfare assessment protocols. Body condition score is an important management tool. The condition of the cow shows if the ration meets the need of the animal. A cow that is fed according to its needs functions optimally. Health problems can be encountered by animals that are too fat (especially at the end of lactation) or too skinny animals (especially at the beginning of lactation). The first livestock farmers who created local livestock breeds by the method of folk selection drew attention to the relationship between the exterior and animal productivity.

*Corresponding author: E-mail: ashrafward@yahoo.com, wardashraf@hotmail.com;

The first breeders who created local breeds of livestock by the method of national selection drew attention to the relationship between the exteriors and the productivity of animals. One of the founders of the doctrine of the exteriors, the English cattle breeder R. Beckwell, who created the Shorthorn breed, in the 18th century put forward the idea of creating model animals with the ideal exterior for each direction of productivity. The ideas of Beckwell in Russia were developed by the domestic cattle breeder MG Livanov in the 19th century.

To determine a highly productive animal, the assessment of its exterior type is of great importance, since the shape and function of the body are closely related. Assessment of the exterior of cows, despite its well-known subjectivity and conventionality, occupies an important place in dairy cattle breeding. The glomerular assessment of animals on the exterior has been known since ancient times. It arose from the requests of practice and was the first attempt to give an economic assessment of animals in their appearance.

Keywords: Dairy cattle; genetic parameters; phenotype; body condition score.

1. INTRODUCTION

Body condition score is an indicator of how well the animal maintains energy reserves, reflective of the relationship between nutrition and milk production in a herd. But nowadays there is also more interest in body condition score (BCS) from the breeding side. BCS could be an indicator for robust cows. The breeding goal for dairy cows is selecting for a cow, which efficiently produces a lot of milk during a long time without problems. The actual direct selection for the past 20-25 years has been on milk production traits and conformation. Later on, longevity was added but a little attention was given to traits like fertility. This has changed the last couple of years. Now world wide, traits like fertility get more attention. One of the major challenges for good fertility in dairy cows is the negative energy balance during the first part of the lactation: the energy output, in production, is higher than the energy input, via feed intake, causing mobilization of fat reserves. Solution for this disturbance is, or better attention for feeding during dry period and the beginning of the lactation, or genetic selection. Particular attention was paid to the exterior by breeders when breeding Holstein cattle. Special attention was paid to the exteriors by breeders when breeding Holstein cattle. In 1922 in Philadelphia at a meeting of leading breeders, boniters and founders of exhibitions was first developed a general idea of the desired type of animals Holstein breed. This allowed more successful breeding in controlled herds. In 1929, the development of a system for classifying animals according to the exterior type was started, which included the evaluation of animals by external characteristics. This work was carried out in 66 herds for livestock of 1957 cows. By 1972, studies covered 3,585 herds with 130,997 animals [1,2,3].

As a result of prolonged breeding work aimed at breeding animals of specialized milk type with the maximum milk productivity and strong constitution, a kind of cattle was created in the USA and Canada, which differed significantly from the European one. Such animals, in comparison with the European black-and-white cattle, have a large live mass, greater chest circumference, less developed musculature, better expressed milk forms. The udders of the Holstein cows are bulky, broad, firmly attached to the abdominal wall, with a uniformity index of 42-44%, with a high rate of lactation [1,3,4].

A proper evaluation of the dairy cattle exterior makes it possible to determine the productive and breeding potential of both individual animals and the entire herd as a whole. Since the exterior is closely related to dairy productivity, selecting the animals by the exterior, the breeder indirectly selects them for productivity. The assessment of the exterior includes both the overall impression of the animal (typicality, severity of milk forms, the presence of defects and deficiencies), and specific measurements of individual parts of the animal's body, anatomically related to each other, which are called stati. The more detailed the exterior of the animal, the more it stands for articles. For example, in horses, about 60 articles are allocated, in cattle - about 30. Exterior evaluation is most often an integral part of a complex assessment of an animal - bonitovy [4,5,6].

There are several ways to assess the exterior of animals: the eye, the taking of measurements, the calculation of indices, the construction of exterior profiles, photography. As a rule, the more serious the level of the evaluation of the exterior, the greater the number of articles and measurements included in the characteristic. So, if an animal is non-tribal, and one needs to

evaluate its exterior only at the economic level, it is enough only for a brief description of the articles and several basic measurements. If the animal is recorded in a pedigree book, it has an important selection value, in which case its exterior is examined in more detail [7,8].

Estimate the exterior of the animal is best in an open area with an even surface. Evaluating the animal by the exterior, first examine its general appearance at a distance, then close. Pay attention also to its features in motion. After that, they begin to describe and measure the articles. It should be remembered that when dealing with an animal, it is necessary to observe safety rules: do not approach the animal all at once, call it, touch it with your back, approach from the side, but not behind. To take the measurements, the animal uses special tools - a measuring tape, a measuring stick and a compilation of Wilksens. It should also be noted that there is no ideal method for assessing the exterior, each of the methods has its advantages and disadvantages. All methods complement each other.

Assessment of cows by the exterior and constitution is carried out on the 2-3th months of lactation of the 1st and 3rd calving. If the evaluation was not conducted after the first calving, it is done after the 2nd calving. Bulls are estimated annually up to 5 years of age. If the animal was not evaluated for age and constitution in the specified ages, it is assessed during the next bonitation. When evaluating the exterior and the constitution, special attention is paid to the expression of the rock type, the harmony of the build, the bulls to the lumbar strength and especially the hind limbs, the cows to the udder size, its shape and its suitability for machine milking. The main assessment of the ex-terrier of bulls and cows in our country is carried out according to the regulations of 1974. According to this instruction, animals are assessed on a 10-point scale with an accuracy of 0.5 points.

The score is supplemented by mandatory indication of the main defects and shortcomings of the exterior.

Evaluation of the young in the exterior is carried out on a five-point scale: excellent - 5, good - 4, satisfactory - 3, unsatisfactory - 2, bad - 1. Allows refinement of the five-point score by applying half-points (4,5, 3,5, etc.). An excellent score (5 points) is given to the animal with good signs of the breed and sex, good development and growth, excellent development of the chest

(wide, deep, without interception behind the shoulder blades), a straight line of the back, waist, sacrum, well developed pelvis, and strong bone, without re-development and coarseness [9,10].

At present, in most countries with developed dairy cattle, a linear method is used to assess the type of cattle exteriors. It allows to obtain an objective assessment of individual animals, groups of animals and herds as a whole, to carry out corrective selection to eliminate the revealed shortcomings of the animal's exterior and thus influence the type of physique. This method also makes it possible to evaluate and rank the bulls-producers according to the type of their daughters' physique, to carry out selection on the basis of milk characteristics [11,12].

Each of the signs used in the linear assessment has an independent value and is evaluated separately from others on a scale of 1 to 9 points: the average value of the sign is 5 points. Biological extremes (-, +) development are taken into account in the evaluation of the trait. Points 1 and 9 mean extreme deviations of the characteristic. 18 tests of the exterior are used as the evaluated tests. In addition to the attributes included in the linear type evaluation, take into account the disadvantages of the exterior, which affect the health, production of milk and meat. It should also be noted that in the world there is no single system for linear evaluation of dairy cattle exteriors. In different countries, a different number of both attributes and scores for evaluation is used. For example, according to the European method, for each feature an animal can be awarded from 1 to 9 points, according to the American one, from 1 to 50 [1,13,14].

BCS is a good indicator for cow's energy reserves during the lactation and could be a good measure for cow's which can balance in a good way between milk production and feed intake. Animals, which stay in good condition during the first part of the lactation, show shorter calving intervals. To get data for genetic selection herdbook organisations in several countries started to score cows for BCS. But to get extra value out of this data herdbook organisation could also think about the scoring of BCS as extra support or service for the farmer his management.

The type of cow build, oriented to endurance and high productivity plays an important role in the

effective production of dairy cattle. The linear system for assessing the type of physique is an image of the articles, based on the description of some of the most important exteriors that are of functional significance and can be accounted for. The linear method of assessing the exteriors makes it possible to obtain an objective idea of individual animals and herds as a whole, allows zootechnicians-breeders to carry out corrective selection in order to eliminate individual shortcomings in the exterior of cows and influence the type of constitution of animals [1].

Correct application of the results of evaluation of the type of build in the selection of dairy cattle promotes an increase in the productivity of cows, easy flow of calving and an increase in the duration of their life [15].

Cows of 1 calving in the organizations for breeding livestock and other enterprises that are approved by the bodies of the state pedigree service as a base for testing bulls-producers on the quality of offspring are subject to a linear evaluation according to the type of constitution. Cows should be evaluated between 30 and 120 days of lactation. Estimation of bulls by the type of physique of daughters is carried out on the first daughters of at least 30 heads. Bulls-producers, identified as fathers of young bulls, are evaluated according to the type of physique of daughters during the entire period of their sperm use. When assessing bulls as a daughters, all daughters of checked bulls are taken into account, except for patients who have aborted, with complete atrophy of 2 or more udders. The construction of the linear profile of the bull-producer according to the type of the physique of the daughters is carried out for all the daughters assessed, but not less than 30. The cow is assessed according to the type of constitution by a bonitour who has the appropriate certificate of the state pedigree service authority for the right to classify the animals. The assessment of cows is not allowed for persons belonging to organizations that own the estimated bulls-producers.

Condition scoring is a technique for assessing the condition of livestock at regular intervals. The purpose of condition scoring is to achieve a balance between economic feeding, good production and good welfare. Condition scoring is particularly useful as an aid to dry cow and pre-calving management. The objective is to ensure that cows calve down safely whether they are on a controlled diet indoors or outdoors at grass. Subsequently, in early lactation, the cow is

under considerable nutritional pressure and body condition is a vital indicator of excessive weight loss. This can lead to metabolic disorders and other welfare problems and should be avoided.

Body condition score is a subjective assessment of the amount of fat or stored energy a cow carries within her body. Scoring a cow requires only a simple visual assessment of certain parts of the cows where adipose tissues tend to accumulate. Body condition score has become a simple, yet powerful tool to adjust feeding and management practices:

- to maximize milk production
- to minimize metabolic disorders in early lactation (ketosis, fatty cow syndrome)
- to minimize reproductive problems (avoid excess negative energy balance in early lactation)

Most trial work on cow condition has had the objective of showing the ideal condition for maximum production e.g. linking condition at calving with milking potential or fertility, but equally important is establishing the correct score for ease of calving. (Body condition score and body weight effects on dystocia and stillbirths and consequent effects on post-calving performance.

Each of the characteristics included in the linear system of assessment has an independent value and is evaluated in isolation from others on a linear scale from 1 to 9. Average score 5. Numbers 1 and 9 points mean extreme deviations of the trait. Evaluation is done visually, but in case of doubt, animals can be measured. In recent years, the method of linear evaluation of the dairy cattle exterior in our country is used on different breeds - not only golshтинizirovanoe black-and-white cattle, but also other foreign and domestic. Carrying such an assessment, we should not forget that each breed has its own standards and features related to the exterior, and therefore the evaluation system should be adjusted [16,17,18].

2. MATERIALS AND METHODS

The data were prepared for analysis using MS Office Excel and statistical analyses were carried out using SAS for windows. The analysis was aimed at determining the factors that affect reproductive performance of the animals using the General Linear Model (GLM) procedure method of Statistical Analysis System (SAS) employing the following models to run the least-squares analysis.

Our studies of the ex-terrier were conducted on a herd of highly productive cattle. The milk yield per forage cow in the farm is at the level of 7000 kg. Cows have a pronounced milky body type in most dairy cows. Dry, light bones, dry light head, long neck, thin, elastic skin, deep enough, bulky belly. Back, waist and sacrum are even, straight, wide enough without blemishes and flaws. The figures of most of the cows of the herd fit into the triangle. The udder is of regular shape, mostly cup-shaped, or round. Only a small part of the animals have an atypical exterior - short stature, angular shape, improper setting of limbs, udder of a goat's shape. In recent years, the farm has been intensively breeding work to improve not only milk productivity, but also the typical, on obtaining cows with an exteriors most characteristic for highly productive dairy cattle. These two processes in selecting animals should go simultaneously, because only typical animals can show the maximum milk production.

2.1 Scoring Method

Score the trailhead area by feeling the amount of fatness. This gives a better estimate than visual inspection alone because of the set of tailhead and thickness of coat.1) Similarly score the loin area, using the same hand, when the cow is relaxed.2) Assess the scores to the nearest half-point on a 5-point scale or one point on a 9-point scale. Cows must be handled for accurate assessment of half points on the 5-point scale or of one point on the 9-point scale.

3. RESULTS AND DISCUSSION

To characterize the exterior of the population as a whole, we made a sample of 60 random animals. The main measurements and signs of the ex-terrier were evaluated by the standard method [1.10], and the selection and genetic

parameters of the exteriors were calculated by biometric processing of data on a personal computer using an analysis package in Excel. Each attribute was evaluated either in absolute units or in points on a 9-point scale.

In Table 1 presents data characterizing the features of the structure of dairy cows: height, strength of build (width of chest bone), length of sacrum, width of pelvis, position of pelvis, severity of milk forms, muscularity. The average value of each characteristic is shown, as well as parameters characterizing the variability of the characteristics: limits, standard deviation (σ) and coefficient of variability (Cv).

Analysis of the data shows that for a number of features of the constitution, dairy cows have a fairly high variability. Thus, the signs evaluated in points from 1 to 9, for example, muscularity, the severity of the milk forms, the position of the pelvis, occupied almost the entire scale of variability. Their limits coincided with the limits of evaluation of the characteristic in points. The most objective indicator of the variability of the trait is the coefficient of variability, since it, expressed in percent, is universal for any trait. By calculating the coefficient of variability, we can compare the signs that have different units of measurement. The analysis of coefficients of variability of different features of the constitution of highly productive dairy cows in our example shows that such signs as animal growth (3.33%), body depth (9.29%), sacrum length (11.69%) are least variable. On these grounds the animals are the most leveled. The maximum variability was the width and position of the pelvis (25.33% and 48.90%, respectively), as well as musculature and the development of milk forms (29% each). On these grounds, a more successful selection is possible than for features with a low coefficient of variability.

Table 1. Selection -genetic parameters of signs of a constitution of dairy cows

Name of feature, measurement	Selective-genetic parameters			
	Average, x	Limits (min-max)	Standard deviation (σ)	Coefficient of variability (Cv),%
Height, cm	138.83 \pm 0.59	125-147	4.62	3.33
Depth of trunk, cm	75.91 \pm 0.91	60-95	7.05	9.29
Strength of build (width of chest), cm	23.02 \pm 0.54	14-36	4.16	18.07
Length of the sacrum, cm	50.73 \pm 0.77	38-78	5.93	11.69
Pelvic width, cm	24.32 \pm 0.80	15-40	6.16	25.33
Pelvic position, score	4.56 \pm 0.29	1-8	2.23	48.90
Milk forms, point	5.85 \pm 0.22	2-8	1.72	29.40
Muscularity, point	5.18 \pm 0.20	1-9	1.55	29.92

Table 2. Selection -genetic parameters of udder measurements of dairy cows

Name of feature, measurement	Selective-genetic parameters			
	Average, x	Limits (min-max)	Standard deviation (σ)	Coefficient of variability (Cv),%
Length of anterior lobes of udder, cm	20.27 \pm 0.50	7-28	3.85	19.00
Height of attachment of udder's posterior lobes, cm	24.10 \pm 0.48	14-33	3.68	15.27
Width of hind portion of udder, cm	21.38 \pm 0.50	14-31	3.91	18.29
Furrow udders, cm	3.55 \pm 0.34	0.5-6.5	0.78	21.97
Position of the udder's bottom relative to the hock joint, cm	9.47 \pm 0.65	1-21	5.05	53.33
Distance between front nipples, cm	12.65 \pm 0.52	3-24	3.99	31.54
Length of nipples, cm	5.42 \pm 0.21	3-9	1.59	29.34
Attachment of the front udder, score	6.05 \pm 0.20	1-9	1.53	25.29

Table 3. Selection-genetic parameters of the signs reflecting statement of extremities at dairy cows

Name of feature, measurement	Selective-genetic parameters			
	Average, x	Limits (min-max)	Standard deviation (σ)	Coefficient of variability (Cv),%
Setting the hind legs, point	5.08 \pm 0.18	2-9	1.44	28.35
Hoof angle, point	4.12 \pm 0.22	1-7	1.70	41.26

Table 4. Correlation coefficients between the signs of constitution in dairy cows

Name of feature, measurement	Growth	Strength of build (width of chest)	Depth of trunk
Strength of build (width of chest)	-0.16		
Depth of trunk	+0.26	+0.13	
Milk molds	+0.18	-0.40	-0.02
Muscularity	+0.04	-0.14	+0.13

Table 5. Coefficients of correlation between signs of milk and udder measurements in cows

Name of feature, measurement	Attachment of anterior lobes of the udder	Length of anterior lobes of the udder	The height of attachment of the back lobes of the udder	Width of hind portion of udder	Distance between front nipples	Nipple Length
Length of anterior lobes of the udder	+0.39					
The height of attachment of the back lobes of the udder	+0.33	+0.19				
Width of hind portion of udder	+0.04	+0.29	-0.18			
Distance between front nipples	-0.11	+0.05	-0.01	-0.16		
Nipple Length	-0.01	+0.10	+0.02	-0.05	+0.20	
Milk molds	+0.40	+0.37	+0.41	+0.05	-0.04	-0.03

In Table 2 presents an analysis of data characterizing the structure of the udder of highly productive dairy cows. Features such as the length and attachment of the front udder lobes, attachment height and width of the posterior lobes, the size of the udder fissure and its position relative to the hock joint, as well as the distance between the nipples and the length of the nipples, were analyzed. An analysis of the data shows that the cows are quite diverse in all the features of the udder. Even the minimal coefficients of variability for such attributes as the attachment height and width of the udder's posterior lobes amount to 15 and 18%, respectively. The most variable features are the position of the udder's bottom relative to the hock joint (53.33%), the distance between the front teats and their length (31.54 and 29.34%, respectively). Signs of the structure of the udder are of major technological importance in machine milking. Such a wide variety of these features suggests that the herd will have a large selection of work for the creation of animals that are most suitable for this critical technological process.

In Table 3 presents data characterizing the setting of limbs in dairy cows. Healthy, strong, properly placed limbs - this is also one of the most important signs of the dairy cattle exterior. We analyzed the setting of the hind legs and the angle of the hoof.

When assessing the setting of the hind legs, the magnitude of the angle formed by the hock joint is analyzed. The minimum score is set if the animal has elephantiasis - a direct setting of the legs. If the hindlimb is strongly curved - this is another extreme, this animal has a saber, for which the maximum score is put. Thus, the optimal size of the angle of the hock is in the middle between the elephant and the saber. For this setting, the animal receives about 5 points. In our example, the average score was exactly at this optimal level, but the deviations from the arithmetic mean were significant (from 2 to 9 points). This is also confirmed by the magnitude of the coefficient of variability (28.35%).

The angle of hoof placement is estimated on the opposite scale - for an acute hoof a minimum score is assigned, for a maximum one. In our studies, the average value of the angle of the hoof is estimated at 4.12 points, which is somewhat below the norm. This means that in all the cows under investigation the hoof setting is slightly more acute than the norm. The magnitude of the coefficient of variability is even

more significant than in the setting of the hind legs (41.26%). This indicates the need to improve in this herd both the setting of limbs and hooves, to which there is a good predisposition due to the high variability of these characteristics.

In addition to the variability of signs of the exterior of dairy cattle, another important characteristic is the relationship between them. Many symptoms are positively, or negatively related to each other. In addition, the relationship between symptoms can be strong, or weak. Evaluation of such a parameter as the coefficient of correlation between the signs will help predict the so-called indirect selection, when selecting one attribute, we indirectly change the other associated with it. In Table 4 shows the magnitude of the correlation coefficients between the various characters of the constitution in the examined livestock.

Data analysis Table 4 shows that with the growth of animals, such indicators as the depth of the trunk and milk forms are positively and rather strongly associated. There is almost no connection between the growth and muscularity of animals, the weak negative - between growth and strength of the build, that is, the higher the animal, the less it is slightly leaner, which is quite logical. Also strong enough is a strong negative relationship ($r = -0.40$) between the constitution (width of the chest) and the milk forms, that is, the broader, more powerful the animal, the less developed its milky forms. A weaker negative relationship is found between breast width and muscularity ($r = -0.14$), and a weak positive connection is found between the chest width and the trunk depth ($r = + 0.13$). Also in this herd there is almost no connection between the depth of the trunk and the milk forms. Weakly positively the depth of the trunk is associated with muscularity ($r = +0.13$).

Of great importance in the evaluation of the exterior is a detailed analysis of the correlation between individual udder measurements, since the knowledge of these bonds facilitates the selection, allows it to be carried out more intensively. Data on these relationships are presented in Table 5.

Analysis shows that the attachment of the front udder shares most strongly positively correlates with such features as the length of the anterior lobes, the height of attachment of the posterior lobes and the milk forms. It should also be noted that, with most of the measurements and signs of

the udder, the cow's milk forms are generally strongly positive (except for the width of the posterior lobes and the measurements of the nipples). This indicates the successful indirect selection of animals for udder quality when selecting them for milk forms.

The most common deficiencies of the exterior should be attributed primarily to those that are due to the underdevelopment of animals: short stature and live weight, as well as leg defects that are expressed in weak headstock and x-shape. Cows met with atrophy of one lobe of the udder (3 nipples) as a consequence of mastitis. Underdevelopment of cows is primarily due to the lack of directed rearing of heifers. The imbalance in rations for individual food items of cows of different ages remains a problem to this day.

The length of the front lobes of the udder is strongly positively related to the measurements of the posterior lobes, which indicates a harmonious development of the udder as a whole in highly productive dairy cattle. The distance between the nipples is positively related to the length of the nipple ($r = + 0.20$), which indicates that the longer the nipples are, the farther they are from each other. The remaining correlation links are rather weak.

Adequate body fat reserves promote milk production, reproductive efficiency and herd longevity. Excessively fat cows or overly thin cows run much greater risks of metabolic problems, lower milk yield, poor conception rates and dystocia (difficult calving). Failure to attain proper body condition or rapid changes in body condition score during early lactation may indicate problems in herd health or feeding management. Condition score should be monitored at each reproductive examination, including:

- At calving,
- Postpartum examinations,
- Breeding,
- Pregnancy checking,
- Late lactation (about 250 days in milk), and
- At dry-off.

The modern dairy cow cannot consume enough feed in early lactation to provide her with enough energy to meet her needs for maintenance and milk production. Under these circumstances, the cow mobilizes body fat to be used to supply the

needed energy and as a result, loses body condition.

During a normal lactation cycle (the period between two consecutive calvings), cows change their body conditions. In early lactation, a cow loses adipose (fat) tissues that supply a substantial amount of energy. Here is a shortlist of practical facts that research has helped us discover:

- Cows mobilized adipose tissues from a few days before calving until approximately 8-10 weeks after calving
- During this early lactation period, a cow may lose from 0.5 to 1.0 kg of body weight per day.
- One kg of body weight mobilized (i.e., lost), provides an amount of energy equivalent to the production of approximately 7 kg of milk.
- In mid to late lactation cows recover the body condition loss in early lactation more slowly (0.25 to 0.5 kg/day) and over a longer period (from week 10 to 40 or whenever the lactation ends).

The information collected when scoring cows help us determine whether the feeding program of groups of cows within a herd needs to be adjusted or not. Are cows in early lactation losing too much >>weight<< too fast? or maybe cows in mid and late lactation tend to become too fat.

4. CONCLUSION

Body condition score can give management information for the dairy farmer. First, the farmer can use the score of the classifier as a reference for his body condition scores. Second, the handbook could use the BCS to present trend in the herd in time, which can help the farmer to analysis his (feed) management. Body condition scores are of interest for the farmer as it has a strong relation with milk production and fertility. Body condition of a cow is a heritable trait with genetic variation. Selection is possible. Breeding values on BCS for bulls could help to breed a more robust cow which can produce a lot of milk while keeping enough body condition as a sign for enough energy (feed) intake. Cows with enough body condition have fewer problems with fertility and health. Therefore BCS is a tool in selecting cows which balance production, fertility and health in the right way.

Body condition scoring can contribute significantly to good husbandry and management of dairy cows. This will help to ensure that the cow is in the correct condition for each stage of her annual cycle and that appropriate dietary changes can be made to correct any deficiencies. For dairy cows, the crucial periods are at calving and during early lactation. Achieving correct body condition at calving is important to avoid calving difficulties and losses. While in early lactation it is important to prevent excessive weight loss when meeting the extra nutritional demands of high yielding cows.

Estimates of phenotypic parameters are essential strategic step in launching a breeding programs which could be used as a tool for implementation of selective breed improvement in a population. Therefore, the correct estimation of phenotypic parameters that guarantee for accurate prediction of genetic merit of an individual is essential. Thus, the study of selection and genetic parameters of the signs of exteriors in highly productive dairy cattle helps to improve the work of the breeder. The estimation of the parameters of variability makes it possible to assess the situation with the equalization of animals in separate articles, measurements, to some extent predict the success of breeding. Data on the correlation between individual traits also facilitates the conduct of selection work, since by selecting animals according to one characteristic, we indirectly change the others associated with them.

In the future, the livestock breeder of the farm needs to regularly conduct strict culling of newly introduced heifers based on an assessment of their exterior and productive indicators. This event will create a herd of cows of the same type, increase their milk production and the duration of economic use.

ETHICAL APPROVAL

Animal ethic Committee approval has been collected and preserved by the author.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Loginov Zh. G, Prokhorenko PN, Popova NV. Methodological recommendations on

- the linear estimation of the exterior type in dairy cattle breeding. - M. 1994;40.
2. Loginov Zh. G, Shishkina NV. Linear estimation of the exterior of Holstein cows // *Zootechny*. 2017;6(2):5.
 3. Loginov Zh. G, Prokhorenko PN, Didkovskiy AN. Methodical recommendations on the estimation of bulls according to the type of their daughters obtained by absorbing crossing cows of domestic breeds with Holstein. - L. 1989;31.
 4. Loginov Zh. G, Prokhorenko PN, Didkovskiy AN. Linear evaluation of the type of descendants of Holstein bulls in interbreeding / / Genetic progress in increasing the productivity of farming. *Animals / Sat. n. tr. VNIIGRJ*. - St. Petersburg. 1991;61:73.
 5. Kazarbin DR. Linear estimation of the dairy cow exteriors and its application in Russian cattle breeding: Autoref. d. .. Dr. s.-h.nauk / *VIZh. Dubrovitsy Moskobl*. 2019;46.
 6. Karlikov D, Shcheglov E, Kazarbin D, etc. A new system for the external evaluation of dairy cattle. *Zootechniya*. 1992;1(2):5.
 7. Orlovsky IA, Thomson ZG. Methodical manual on the study of the exterior and constitution of farm animals. - Gorki. 2017;42.
 8. Chizhik IA. Constitution and the exterior of farm animals. - L. : Kolos. 2016;376.
 9. Instructions for the bonitirovanie of cattle milk and milk-meat breeds. - M. 1974;32.
 10. Collection of normative materials on the evaluation of pedigree material. *VNIIPLEM*. 2019;T(1): 233.
 11. Litvinov I, Tyapugin S. Linear estimation of bulls-producers in the Vologda region // *Milk and meat cattle breeding*. 2004;3:22-23.
 12. Martynova E, Devyatova Yu. Linear estimation of cows' exteriors and its relation to productivity // *Dairy and meat cattle breeding*. 2004;8:23.
 13. Khmelnichy LM. Linear estimation of the dairy cattle exterior // *Zootechny*. 2015;7:4-6.
 14. Guryanov AM, Vel'matov AP. Linear estimation of the ex-terrier of animals of red-motley breed // *Dokl. RAKHN*. 2005;4:4-7.
 15. Zubryanov VF, Lyashenko VF, Morozov IM. Exterior and productivity of black-and-white cattle of Volga type // *Zootechnics*. 2017;4:4-6.

16. Oblivantsov V. Linear estimation of the ex-terrier of cows of brown breeds of Ukraine // Dairy and meat cattle breeding. 2004; 7:35-38.
17. Prozherin VP, Zavertyaev BP, Yaluga VL, Mohnatkina Yu. M. Linear estimation of the ex-terrier of cows of the Kholmogory breed // Zootechnics. 2008;12:3-4.
18. Prokhorenko PN, Kondratieva TN. Linear assessment of the physique of Airshire cattle and its relation to dairy productivity // Zootechny. 2018;12:2-5.

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