Improving the selection of cows according to a complex evaluation indicator

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Abstract. The expediency of improving the indicators of judgment assessments of individual breeding characteristics of the Hereford cattle breed is justified. The proposed method of selecting cows according to a complex evaluation indicator is based on the principle of a point assessment with the correction of the selection significance of the absolute value of some economically useful characteristics that are definitely related to the economy of animal breeding. At the same time, it is characterized by the Breeding Value Index (BVI), which allows you to complete a selection group of cows in breeding herd with breeding value from 70 points and above. The main values of constructed index must select or create such genotypes that would combine the most important and desirable combinations of breeding traits. The method is universal for cows of different breeds, types, herds, provides breeding and formation of more highly productive and technological animals on the basis of meat productivity.

1. Introduction
Properly organized breeding work includes the systematic selection of the most productive and constitutionally strong animals [1, 2, 3]. The breed-forming process is currently associated not only with the creation of new breeds and types of animals, but also with the preservation of valuable widely used breeds and their improvement [4-6]. Differentiated selection provides a specific consideration of the relationship "genotype-environment" and the norm of the body's response in zootechnical assessment methods. It ensures the appropriate productivity: under what conditions of feeding and maintenance the most effective use of the reared genotypes [7, 8]. The source of the qualitative transformation of beef cattle breeding is still the breeding farms. Breeding work has its own complex technological specifics on a beef farms, and one of its main requirements is the qualitative grouping of breeding animals as a result of evaluation and determination their purpose [9].

The aim is to analyze and justify the breeding selection of cows of the desired type for the formation of the breeding group of the herd of Hereford cattle of the breeding reproducer "Risk" of the Chelyabinsk region.

2. Materials and methods
When developing a new method of breeding selection, the main elements of the current complex assessment [10, 11] and selection of the best cows for further reproduction of the herd were taken into account. Inaccuracies in the class assessment of the main characteristics of the breeding value were
reflected in the selection result and the grouping into the breeding core with the definition of its selection group.

So, among the cows of the elite-record class (the highest rank of breeding value), there are many individuals with absolute phenotypic indicators of productivity of the elite class. The above fully applies to the elite class, a significant part of the animals met the level of requirements of class I (breed standard).

The predominant breeding of beef breeds of cattle in territories with a sharply continental climate and unfavorable environmental factors has shown that some provisions of the current complex assessment by class need to be revised and adjusted [12-14]. Therefore, the zootechnical concept of "desirable type" was included in the breeding work to improve the selection of the best cows. The breeding significance of the studied traits in the proposed method was established in comparison with the breed standard (class I).

The introduction of an additional estimate of the live weight of the offspring (calf) at the age of 12 months into the Breeding Value Index allows better than at the same age (7 months) identify the potential constitutional value of a beef cow of the desired type in terms of milk content and at the same time in terms of weight growth in the post-weaning period [15]. This feature of selection is like the center of the "communication node" and the output of meat products per meat cow for the annual production cycle of the content largely depends on it. A sufficiently high live weight of the heifer at this age justifies the possibility of letting them in at the age of 14 - 15 months for mating, which will also help to increase the economy of meat production.

Since beef cattle will always have an advantage in the rational use of natural pastures, it is worth noting the improvement of breeding work to reduce the negative impact of the shortage of pasture feed in the summer months. Heavy-weight cows are sensitive to significant driving distances, do not feed enough because of the weak grass stand. Cows of this type are quite difficult to maintain a proper condition of fatness. Underfeeding for them is very dangerous, because in the summer, the animal's body evolutionarily rhythmically prepares for the physiological stress associated with the breeding season, to be ready for fertilization in necessary time. This made it possible to classify the score in a new way in the direction of decreasing per live weight.

In principle, the method is as follows: each selection trait is given a value (elite-record, elite, I class) and a share of significance (score) as a measure of the severity of the desired type. The individual indicator of the breeding value of each cow is the Breeding Value Index (BVI). Index is calculated according to the following formula BVI=Mn+Dn+Zn+An+Hn, where M – milk production, D - live weight of offspring at 12 months, Z - reproductive capacity, A - live weight, H - measurement height in the sacrum, n - grading of the trait according to productivity from 1 to 3. The evaluation scale for the main breeding characteristics that determine the economic and breeding value of a Hereford cow is shown in table.

Statistical processing. When processing experimental data, we used methods of variation statistics using the office software package "Microsoft Office "using the program" Excel "("Microsoft", USA) with data processing in"STATISTICA 10.0"("StatSoft Inc.", USA). The significance of inter-group differences was assessed by the aposteriori method "Tukey's criterion for unequal N". The values at P≤0.05 were considered reliable.

3. Results
The developed index method of acquisition makes it possible to differentiate the breeding cows of the breeding herd “Risk” by a set of main characteristics, to select the most desirable types for the breeding group of the breeding herd.

When evaluated by a set of attributes, a meat cow can get a maximum of 100 points. Significant attention, a maximum of 30 points is provided for milk production by weaning live weight of offspring in 205 days (day), reproductive capacity for the inter-calving period is 30 points and for the live weight of offspring in 12 months is 30 points. This emphasizes the economic significance of these traits as the main selected traits and the predicted high efficiency of breeding a particular cow or an
improved breeding herd. The ability to quickly increase the severity of any feature of the animal "herd" is not the result of the use of outstanding producers, but as an extension of the breeding method of the breeding stock, which is an important means of increasing the efficiency of breeding meat breeds of livestock, as well as improving the economy of production of beef cattle.

Table 1. Evaluation of cows by a set of characteristics.

| №  | Trait cipher and grading | Selection trait and productivity | The significance of the trait in the index structure, score |
|----|----------------------------|----------------------------------|---------------------------------------------------------|
| M  | Milkiness (weaned live weight of calves (heifers) in 7 months (205 days) at the class level: |                                    |                                                         |
| 1  | M₁ elite-record           |                                  | 30                                                      |
|    | M₂ elite                  |                                  | 15                                                      |
|    | M₃ I class                |                                  | 10                                                      |
| D  | Live weight of calves (heifers) in 12 months. at class level: |                                    |                                                         |
| 2  | D₁ Elite-record           |                                  | 30                                                      |
|    | D₂ elite                  |                                  | 15                                                      |
|    | D₃ I class                |                                  | 10                                                      |
| Z  | Reproduction capacity     |                                  |                                                         |
| 3  | Z₁ annual calving         |                                  | 30                                                      |
|    | Z₂ inter-calving period (366-401) |                              | 15                                                      |
|    | Z₃ inter-calving period (402-438) |                              | 10                                                      |
| A  | Live weight at class level: |                                  |                                                         |
| 4  | A₁ elite-record           |                                  | 1                                                       |
|    | A₂ elite                  |                                  | 3                                                       |
|    | A₃ I class                |                                  | 5                                                       |
| H  | Sacrum height at class level: |                                  |                                                         |
| 5  | H₁ Elite-record           |                                  | 1                                                       |
|    | H₂ Elite                  |                                  | 3                                                       |
|    | H₃ I class                |                                  | 5                                                       |

Let us consider specifically the application of a new method of selection for completing the selection group and breeding core of a herd of Hereford cattle. From a Hereford cow with an individual number (chip) 20, we received a calf at the age of 7 months (205 days) with a live weight of 214 kg or elite-record class. The milkiness score was 30 points (M₁). At the age of 12 months, the control heifer-offspring of estimated cow reached a live weight of 303 kg. For this body weight of the elite class, 15 points (D₂) are assigned.

In the analyzed year, cow № 20 brought a calf, the inter-body period (the period between calving) was 361 days. The reproductive capacity score is 30 points (Z₁). According to the live weight of 530 kg, the studied cow met the requirement of class 1 (breed standard) and received 5 points. The cows of the breeding core in terms of appearance and typicality must meet high-at least 85 points for meat articles, there is a prerequisite for successful breeding work with the herd. This cow was evaluated for the development of meat articles in 86 points and met the preliminary conditions for the formation of breeding groups. At the same time, the Hereford cows were presented with an additional requirement that the number of points is set depending on the size of the measurement - the height in the sacrum. Therefore, the Hereford cow judgment, having a height of 126 cm in the sacrum, and an assessment for the development of meat articles of the exterior equal to 86 points, receives a maximum of 5 points. It met the requirements for the exterior of the recommended selection method.

Using data on the development of breeding traits in points for the Hereford cow with chip number
20, the Breeding Value Index (BVI) was derived using the formula 
\[ BVI = M_1 + D_2 + Z_1 + A_3 + H_3 = 30 + 15 + 30 + 5 + 5 = 85 \text{ points}. \]
This allowed us to include this cow in the breeding group of the breeding herd.

Cow № 21, having a massive live weight (591 kg), met the requirements of the elite-record class, but when scoring according to the new method, it receives 1 point for the value of this selection trait. When weaned after conversion to the age of 205 days, the live weight of the offspring of the goby was 219 kg and met the requirements of the elite class. The point score corresponds to the number 15. In addition, for the reproductive capacity for the inter-calving period of 376 days, the cow is estimated at 15 points. The live weight of the weaned offspring with further cultivation by the age of 12 months was 308 kg and met the requirements of I class, so cow receives 10 points according to this criterion of breeding evaluation. For the exterior assessment, this animal is rated at 1 point in accordance with the requirements of the scale. Evaluated cow receives 42 points in a complex assessment according to the formula, which does not meet the requirement for selection even in the breeding core of the herd.

The selection of a cow with an individual number 13 in the breeding core of the herd with a Breeding Value Index of 49 points was due to compliance with the milkiness, live weight of the offspring in 12 months, the inter-calving period with the requirements of the elite class, and the live weight of the cow and the measurement in the sacrum – the first class, the breed standard.

The optimal idea of the breeder about the desired type of the improved breeding herd of Hereford cattle in a specific breeding situation was focused on the individual characteristic of the productivity of the cow with chip number 14. Thus, the judgment cow met the requirements of the elite class in terms of milk content and live weight of the offspring at 12 months, the inter-calving period with the requirements of the elite class, and the live weight of the cow and the measurement in the sacrum. These examples show the opportunity of evaluation and selection cow of desirable quality for the breeding group taking into account specific productive traits with the Breeding Value Index of 70 points or higher.

4. Conclusion
In beef cattle breeding, the offspring and its live weight gain is the only type of product. Therefore, in the proposed method of selection, an important place is occupied by the purposeful formation of stable high indicators of the weight growth of young animals and the reproductive ability of cows for the specific conditions of breeding the Hereford breed cattle. The use of a new method of selection in comparison with the generally accepted class differentiation of individuals has led to a reduction in statistical errors in accounting for individual productivity data of breeding cows, which gives grounds to complete the selection group and the breeding core of the herd according to the actual productivity indicators and their complex of characteristics, taking into account the constantly acting environmental factor. Depending on the level of breeding potential of the breeding stock and the environmental conditions of breeding, the initial indicators of the index of breeding value of the cows selection in the breeding group or in the breeding core of the herd will be different depending on the program of selection of animals.

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