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🔓 **Research Article**

ECONOMIC-MATHEMATICAL MODELS OF DEVELOPMENT OF OPTIMAL FEED RATION FOR LIVESTOCK

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ABSTRACT

For the application of economic and mathematical methods in practical activities in modern conditions, material, scientific and personnel prerequisites have been created. Their use makes it possible to carry out complex and very time-consuming calculations that were previously impossible. The article considers economic and mathematical methods, features of their application in livestock.

KEYWORDS

Economic mathematical modeling, livestock, optimal feed ration, types of feed, zootechnical limits, minimum cost.

INTRODUCTION

Development of the optimal feed ration of livestock is of great importance in animal husbandry. The need to develop an optimal feed ratio is related to the demand for complete feeding of livestock and the goal of obtaining maximum livestock products with the lowest cost of labour, material and monetary resources, fodder, etc. in animal husbandry. In addition, the need to develop an optimal feed ratio is explained by the fact that different feed - hashaks contain the same type of components, but these components are in different amounts. Therefore, some nutrients can be replaced with other nutrients. But economically, such a

substitution is justified in cases where the cost of a unit of the nutritional value of a feed is lower than the cost of a corresponding unit of another feed. Nutritious feeding of cattle is the basis for high productivity and productivity of adult cattle, helping young cattle to develop well and increase their live weight, which in turn is of great importance in increasing the efficiency of livestock farming.

Mathematical-economic modelling is the expression of economic processes and events through mathematical equations, inequalities, and functional, logical schemes.

Taking into account zootechnical and economic requirements, it is very difficult to calculate the optimal feed ration using traditional selection methods, and with a large collection of fodder it is almost impossible, therefore it is desirable to solve the problem using economic-mathematical methods and digital technologies.

To ensure the planned (intended) productivity, the ration should contain at least the required amount of nutrients in zootechnically acceptable proportions of separate groups and types of feed. The content of feeds in separate groups should not exceed the specified level.

As a criterion of optimality, the economic indicators of the ratio are considered. The most common of them is the cost of the ration. In addition, the criterion of optimality can be the minimum weight of the ration or the optimal ratio of feed units and digestible proteins.

Often, in the formulation of the problem in production, the optimality criterion is used according to the first option - the minimum cost of the ration.

After that, it is necessary to determine the meaning of the main and auxiliary variables of the problem, the content of the main and additional constraints. Therefore, the main variables of the economic-mathematical problem are the feed available on the livestock farm and the feed and various mineral, protein and vitamin supplements that the farm can purchase. The measurement units of these variables depend on the type of livestock and the period for which the ratio is calculated. The auxiliary variables of the matter reflect the total amount of nutrient units in the diet and the total amount of digestible protein. The need to include auxiliary variables is related to the establishment of zootechnical limits of the composition of individual feed groups. The main limitations of the economic-mathematical problem are the conditions of nutrient balance. The technical and economic coefficients of the variables in the main restrictions indicate the content of nutrients in the unit weight of the feed. In the diet, additional restrictions are set on the composition of feed groups by zootechnical standards. With the help of auxiliary restrictions, the total number of nutrient units and digestible proteins in the diet is recorded [1].

To develop an economic-mathematical model of the optimal feed ration of livestock, the following is proposed: to determine for which sex and age groups

the ration is calculated; determine the period for which the ration is calculated; to determine the physiological state of livestock and productivity during this period; study of the state of the fodder base of the economy; determining the daily need for nutrients of livestock; determining the types of feed grown on the farm and included in the diet; determine the physiologically acceptable limits of the introduction of different groups of nutrients and supplements into the diet; calculate the unit cost of each fodder type.

All restrictions of economic content in the model can be divided into the following groups:

1) according to the balance of nutrients;

2) according to the content of dry matter;

3) according to the relative weight of food groups in the diet;

4) to the relative weight of feed types within the group.

Ensuring the effective development of the livestock sector in the market economy depends on many factors. Consequently, the higher the level of livestock feeding, the higher their productivity and, accordingly, the cheapest feed cost per unit of fodder.

Therefore, the issue of feeding livestock remains one of the most urgent problems.

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