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BEEF CATTLE BREEDING OF THE WEST KAZAKHSTAN REGION: JUSTIFICATION OF OPTIMAL PARAMETERS

БАТЫС ҚАЗАҚСТАН ОБЛЫСЫНЫҢ ЕТТІ МАЛ ШАРУАШЫЛЫҒЫ: ОҢТАЙЛЫ ПАРАМЕТРЛЕРДІ НЕГІЗДЕУ

МЯСНОЕ ЖИВОТНОВОДСТВО ЗАПАДНО-КАЗАХСТАНСКОЙ ОБЛАСТИ: ОБОСНОВАНИЕ ОПТИМАЛЬНЫХ ПАРАМЕТРОВ

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Abstract. Beef cattle breeding is the most important branch of agro-industrial complex of Kazakhstan, since providing the population with beef of the required quantity and quality is the most important component of the country's food security strategy. *Aim* – based on the analysis, to calculate the optimal parameters for production of cattle meat in the West Kazakhstan region, necessary to improve its efficiency. *Methods* – the study used a systematic approach, tools for contextual data and cause-and-effect relationships, correlation-regression and linear optimization. *Results* – studies confirm the importance of increasing this valuable product in the near future. To the greatest extent, this subcomplex is developed in Akzhaik, Baiterek, Kaztalovsky, Zhangalinsky districts, which are characterized by a favorable combination of natural and economic factors. The article analyzes the dynamics of the rate of meat production in live weight for all categories of farms. The regression dependence of the influence of livestock on the level of profitability and sales of livestock products is determined. The proposed justified concept makes it possible to develop methodological techniques for identifying the highest production indicators in beef cattle breeding and modeling their impact on efficiency. *Conclusions* – an increase in productivity of beef cattle is possible with a change in the conditions of keeping animals, structure of the herd, and use of market mechanisms. An increase in the number of livestock population should be ensured by expanding the material and technical base, the availability of premises for cattle and feed. Based on the study of the existing territorial organization of agriculture in the region,

recommendations were developed for changing the territorial structure of this sector of agro-industrial complex. To maintain a competitive position in regional market of meat and meat products, agricultural producers and processors need to actively attract investment resources in modernization and reconstruction of production facilities. The results of the study can be used to form a clear idea of regional priorities for the development of beef cattle breeding.

Аңдатпа. Етті мал шаруашылығы-Қазақстанның агроөнеркәсіптік кешенінің маңызды саласы, өйткені халықты қажетті мөлшерде және сапада сиыр етімен қамтамасыз ету – елдің азық-түлік қауіпсіздігі стратегиясының маңызды құрамдас бөлігі болып табылады. ***Мақсаты*** – талдау негізінде Батыс Қазақстан облысында ірі қара мал етін өндірудің тиімділігін арттыру үшін қажетті оңтайлы параметрлерін есептеу. ***Әдістері*** – зерттеуде жүйелік тәсіл, контекстік мәліметтер мен себеп-салдарлық байланыстардың құралдары, корреляциялық-регрессиялық және сызықтық оңтайландыру қолданылған. ***Нәтижелері*** – зерттеулер жақын болашақта осы құнды өнімді арттырудың маңыздылығын растайды. Бұл шағын кешен ең көп табиғи және экономикалық факторлардың қолайлы үйлесімімен сипатталатын Ақжайық, Бәйтерек, Казталов, Жанғалы аудандарында дамыған. Мақалада шаруашылықтардың барлық санаттары бойынша тірі салмақта ет алу қарқынының динамикасы талданған. Мал басының мал шаруашылығы өнімінің рентабельділігі мен сатылу деңгейіне әсерінің регрессиялық тәуелділігі айқындалған. Ұсынылған негізделген тұжырымдама етті мал шаруашылығындағы ең жоғары өндірістік көрсеткіштерді анықтауға және олардың тиімділікке әсерін модельдеуге мүмкіндік береді. ***Қорытындылар*** – етті бағыттағы сиырлардың өнімділігінің артуы малдарды ұстау жағдайлары, табын құрылымы, нарықтық тетіктерді пайдалану өзгерген кезде мүмкін болады. Мал басының санын көбейту материалдық-техникалық базаны кеңейту, ІҚМ және жемге арналған үй-жайлардың болуы есебінен қамтамасыз етілуі тиіс. Өңірдің ауыл шаруашылығының қолданыстағы аумақтық ұйымдастырылуын зерделеу негізінде АӨК-нің осы секторының аумақтық құрылымын өзгерту бойынша ұсынымдар әзірленген. Ет және ет өнімдерінің өңірлік нарығында бәсекеге қабілетті позицияны сақтау үшін ауыл шаруашылығы тауарын өндірушілер мен қайта өңдеушілер өндірістік қуаттарды жаңғырту мен реконструкциялауға инвестициялық ресурстарды белсенді тартуы қажет. Зерттеу нәтижелері етті мал шаруашылығын дамытудың аймақтық басымдықтары туралы нақты түсінік қалыптастыру үшін пайдаланылуы мүмкін.

Аннотация. Мясное животноводство – важнейшая отрасль агропромышленного комплекса Казахстана, поскольку обеспечение населения говядиной нужного количества и качества – важнейшая составная часть стратегии продовольственной безопасности страны. ***Цель*** – на основе анализа рассчитать оптимальные параметры производства мяса крупного рогатого скота в Западно-Казахстанской области, необходимые для повышения его эффективности. ***Методы*** – в исследовании использованы системный подход, инструментарий контекстных данных и причинно-следственных связей, корреляционно-регрессионный и линейной оптимизации. ***Результаты*** – исследования подтверждают значимость наращивания этого ценного продукта в ближайшей перспективе. В наибольшей степени данный подкомплекс развит в Акжаикском, Байтерекском, Казталовском, Жангалинском районах, характеризующихся благоприятным сочетанием природно-экономических факторов. В статье проанализирована динамика темпов получения мяса в живом весе по всем категориям хозяйств. Определена регрессионная зависимость влияния поголовья скота на уровень рентабельности и реализации продукции животноводства. Предложенная обоснованная концепция позволяет разработать методические приемы для выявления наивысших производственных показателей в мясном скотоводстве и смоделировать их влияние на эффективность. ***Выводы*** – рост продуктивности коров мясного направления возможен при изменении условий содержания животных, структуры стада, использовании рыночных механизмов. Увеличение численности голов скота должно обеспечиваться за счет расширения материально-технической базы, наличия помещений для КРС и кормов. На основе изучения существующей территориальной организации сельского хозяйства региона разработаны рекомендации по изменению территориальной структуры данного сектора АПК. Для сохранения конкурентоспособной позиции на региональном рынке мяса и мясопродуктов сельхозтоваропроизводителям и переработчикам необходимо активно привлекать инвестиционные ресурсы в модернизацию и реконструкцию производственных мощностей. Результаты исследования могут быть использованы для формирования четкого представления о региональных приоритетах развития мясного животноводства.

Key words: agricultural sector, beef cattle breeding, cattle, meat production, optimal parameters, material and technical base, competitiveness.

Түйінді сөздер: аграрлық сектор, етті мал шаруашылығы, ірі қара мал, ет өндірісі, оңтайлы параметрлер, материалдық-техникалық база, бәсекеге қабілеттілік.

Ключевые слова: аграрный сектор, мясное животноводство, крупный рогатый скот, производство мяса, оптимальные параметры, материально-техническая база, конкурентоспособность.

Introduction. The effective functioning of agricultural enterprises, farms and meat-oriented households is the basis for the sustainable development of meat sub-complex of the region [1].

Beef cattle breeding is of increasing importance in the development of the region's economy. If the current trends continue, the production volumes of all types of meat will gradually increase steadily. The rational organization of livestock enterprises production is of some importance at the present time, since it is important to search for opportunities, resources that ensure efficient production [2]. Hence the problems of improving the management system of the industry. The direction, efficiency and complexity of the industry development, determination of optimal values of production and economic indicators of the industry development require separate consideration.

Econometric and optimization models make it possible to calculate main components of agricultural production development for the purposes of operational and strategic planning and forecasting. They are used to study the current composition of agricultural production, make it possible to determine the most effective directions for spending resources and the potential for increasing the volume of livestock production, based on real data for previous periods [3, 4]. The set of constraints and variables in the model, types of input information and possible modeling methods are most often similar to a large number of other economic and mathematical models. The scheme implementation for determining the optimal size of the parameters for the development of beef animal husbandry in the region allows us to solve the following problems:

* to develop methodological techniques for determining optimal size of main production and economic indicators of beef cattle breeding development in the region;

* to model the impact of cost and production indicators of beef cattle breeding development on its efficiency;

* to identify regional priorities for beef cattle breeding development.

Material and methods of research. To determine optimal size of the parameters for beef cattle breeding development in the region, an appropriate calculation scheme has been developed, which includes a block of correlation-regression modeling of the relationship between the level of production and economic indicators and the number of livestock; an optimization modeling block that involves compiling a model for calculating the optimal levels of production and economic indicators for beef cattle breeding development, including livestock, at the regional level; block for calculating the optimal size of production and economic indicators of the industry development and the optimal size of livestock population.

Source materials include statistical data on beef cattle breeding development in West Kazakhstan region for 1991-2020 and the results of actual surveys. Statistical information was processed in the context of administrative regions. The obtained and systematized data made it possible to apply differentiated methods of comparative analysis, analysis and synthesis in the study of spatial organization of individual branches of beef animal husbandry, identifying differences in the production efficiency of the main types of products.

When analyzing the dynamics of beef cattle breeding development in the region, basic and chain indices were used. Basic indices with a constant base of comparison are calculated by comparing the indexed indicator of each period with the corresponding indicator of one period taken as the base of comparison. The year 1991 was taken as the base of comparison. Chain indices (indices with a variable base of comparison) are obtained by comparing the indexed indicator of each subsequent period with the indicator of the period preceding it.

Chain indices were calculated according to the formula:

$$R = \sqrt[n-1]{\frac{Q_1}{Q_2}} \qquad (1)$$

where R – average annual rate of decline;

n – number of years;

Q_1 – production in the reporting year;

Q_0 - production in the base year [5].

To build a multifactorial model, statistical information on the development of beef cattle breeding in West Kazakhstan region was used and the following steps were carried out:

mathematical and statistical analysis, building multifactorial regression model, checking constructed model for adequacy, analyzing results [6, 7]. Factors were checked for multicollinearity. The method of "exclusions" was used to select a set of factors that could presumably affect the performance indicator and, in turn, excluded those factors in which the lowest correlation coefficient (according to the statistics matrix) and the value of partial F-criteria do not exceed the normative values. Only those variables remain that meet the conditions discussed above.

At the next stage of analysis, the model adequacy was tested using determination coefficient, Fisher's F-criterion and Durbin-Watson criterion. At the last stage, the analysis and interpretation of the model was carried out [8]. Statistica 7.0 and MS Office Excel 2007 software products were used to build regression and optimization models. The results are included in Resultsand discussion chapter.

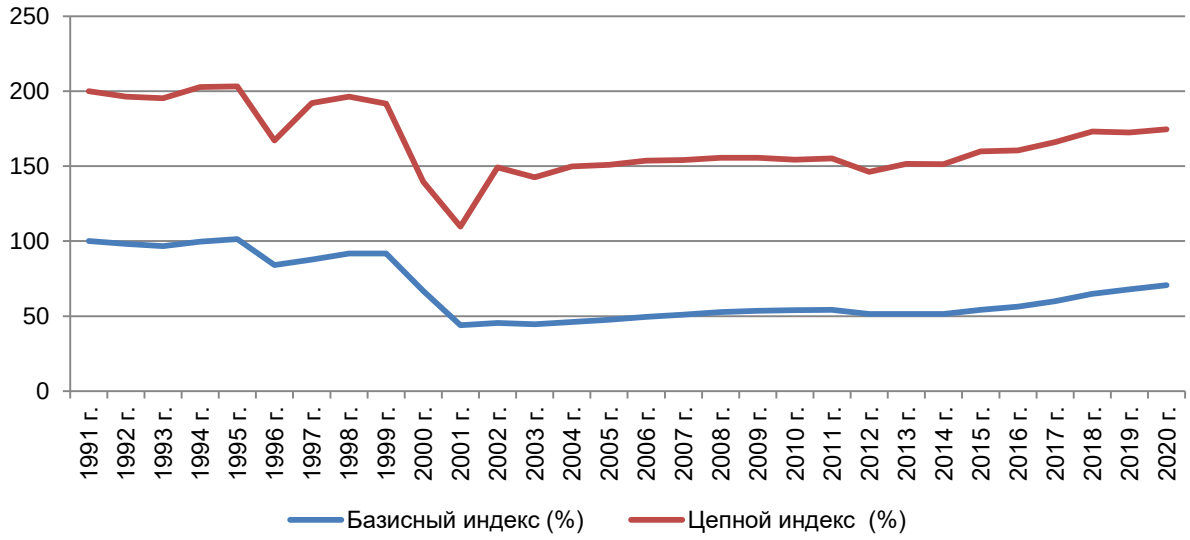
Results and their discussion. Beef cattle breeding in West Kazakhstan region is traditionally the leading industry. In the republican system of territorial division of labor, the region is the main supplier of meat resources.

In the gross regional product structure, agriculture accounts for 7.0%. In the gross agricultural output, livestock occupies 62.7%. In terms of meat production, the region is in fourth place, and in terms of consumption of meat and meat products - in second place in the country. All this suggests that the region under consideration has a relatively good agricultural potential, including meat production. Leading branches of animal husbandry - beef cattle breeding, sheep breeding, pig breeding.

Additional industries are dairy cattle breeding, camel breeding, horse breeding and poultry farming. Having a relatively small share in the structure of marketable products, these industries contribute to a more complete use of land resources, material resources and perform an important function in meeting the local needs of the population for products [9, 10].

Beef cattle breeding is the most developed in the northern and central regions, where the share of cattle (cattle) in the structure of livestock harvesting is 70%, sheep breeding is developed in the central and especially in the southern regions, which is explained by an increase in the share of pastures and hayfields in the structure of agricultural land. In the structure of preparations, the share of mutton is 19.4% on average in the region, and in the southern regions it increases to 45% [11, 12].

The trends in the functioning of beef cattle breeding can be presented in a longer term dynamics (1991-2020) and the annual rate of change in meat production in the region using basic and chain indices (figure 1).



Note: compiled by the authors according to the source [13]

Figure 1 - Rate of change in meat production in West Kazakhstan region, in live weight, all categories of farms

The development of production in the studied dynamics is extremely unstable: from a sharp decline (1993-1996) to a rise (1997-2003). The maximum meat production was achieved in 1993 (144.9 thousand tons). Then, since 1998, there has been an annual decline in production, which is due to a significant decline in production in agricultural enterprises and organizations, as well as unfavorable weather conditions that affected the

production and procurement of fodder (2000-2003). The general pattern of changes in the production has a negative indicator (decrease). Since 2001, the growth of meat production begins, due to significant state support for the industry.

Chain indices reflect the rate of change in meat production. The largest increase in production was observed in 1995, due to a sharp drop in livestock, as fodder was not harvested in the required volume due to drought. The average annual rate of decline is 9.3%.

Considering the production in terms of districts, it should be noted that all districts of the region are engaged in it, however, the level of development of the industry is not the same. The largest contribution to the filling of the market is made by Akzhaik district (11.6%), Baiterek (11.9%), Kaztalovsky (13.3%), Zhangalinsky (11.1%), which supply about half of all raw meat.

Thus, it can be argued that beef cattle breeding is of increasing importance in the development of the region's economy. If the current trends continue, the production volumes of all types of meat will gradually increase steadily. Moreover, the largest volumes of production will remain in the third zone, the first and second zones have approximately equal development trends. Hence the problems of improving the management system of the industry. The direction, efficiency and complexity of the industry development, determination of optimal values of production and economic indicators of the industry development require separate consideration.

In the districts of West Kazakhstan region, there are adequate dependences of livestock impact on the profitability of beef animal husbandry (in the context of cattle, sheep and goat breeding) (table 1).

Table 1 - Regression dependencies of livestock impact on profitability of production and sales of livestock products in West Kazakhstan region

Brief description of model	Regressione quation	Checkingadequacyofmodels			
		R^2	Fisher' scriterion	Average error	Durbin-Watsontest
Influence of cattle number in agricultural organizations, farms and households on livestock production profitability	$y - 22.53 + 0.032 * x1 + 0.067 * x2 + 1.623 * x3$	0.95	F(3.9)=167 table value F(3.9)= 3.86	9.33	1.95
Influence of sheep and goats number in agricultural organizations, farms and households on sheep and goat production profitability	$y - 13.26 + 0.008 * x1 + 0.142 * x2 - 0.552 * x3$	0.71	F(3.9)=32 table value F(3.9)= 3.86	10.82	1.89

As shown by the results of factor analysis, the effectiveness of beef cattle breeding development in the region does not depend on the amount of cattle sold for slaughter.

A model for optimizing the specific values of cattle development at various agricultural enterprises was developed:

Conventions:

x_1 – number of cattle per 1 agricultural enterprise; x_2 – number of cattle per 1 farm; x_3 – number of cattle per 1 household.

Objective function:

$$FRent(x1, x2, x3)\ max \quad (2)$$

Limits:

$$fPlochPomSHOrg(x1) >= PlochPomSHOrgmin \quad (3)$$
$$fPlochPomSHOrg(x1) <= PlochPomSHOrgmax \quad (4)$$
$$fPlochPomKFH(x2) >= PlochPomKFHmin \quad (5)$$
$$fPlochPomKFH(x2) <= PlochPomKFHmax \quad (6)$$
$$fKolTrakKFH(x2) >= KolTrakKFHmin \quad (7)$$
$$fKolTrakKFH(x2) <= KolTrakKFHmax \quad (8)$$
$$fKolAvtKFH(x2) >= KolAvtKFHmin \quad (9)$$
$$fKolAvtKFH(x2) <= KolAvtKFHmax \quad (10)$$
$$fPlochPomHN(x3) >= PlochPomHNmin \quad (11)$$
$$fPlochPomHN(x3) <= PlochPomHNmax \quad (12)$$
$$fKolTrakPrHN(x3) >= KolTrakPrHNmin \quad (13)$$

$fKolTrakPrHN(x3) <= KolTrakPrHNmax$ (14)

$fKolAvtHN(x3) >= KolAvtHNmin$ (15)

$fKolAvtHN(x3) <= KolAvtHNmax$ (16)

Model description:

(2) – profitability of cattle production and sale in agricultural organizations, farms and households tends to the maximum;

(3), (4) – the desired value of the area of premises for cattle per 1 agricultural enterprise should not be less than the observed minimum value in the districts of the region and cannot be greater than the maximum observed value in the districts of the region;

(5), (6) – the desired value of the areas of premises for cattle on 1 farm should not be less than the observed minimum value in the districts of the region and cannot be more than the maximum observed value in the districts of the region;

(7), (8) – the required number of tractors per 1 farm should not be less than the observed minimum number in the districts of the region and cannot be more than the maximum observed number in the districts of the region;

(9), (10) – the desired number of trucks per 1 farm should not be less than the observed minimum number in the districts of the region and cannot be more than the maximum observed number in the districts of the region;

(11), (12) – the desired value of the areas of premises for cattle per 1 household of the population should not be less than the observed minimum value in the districts of the region and cannot be more than the maximum observed value in the districts of the region;

(13), (14) – the desired number of tractor trailers per 1 household of the population should not be less than the observed minimum number in the districts of the region and cannot be more than the maximum observed number in the districts of the region;

(15), (16) – the desired number of trucks per 1 household of the population should not be less than the observed minimum number in the districts of the region and cannot be more than the maximum observed number in the districts of the region [14].

The target function of the model is described by the regression equation of the influence of the number of cattle in agricultural organizations, farms and households on the profitability of livestock production (table 2). The system of restrictions is also described by the regression equations of the relationship between the number of cattle and the parameters limits [15].

Conventions:

x_1 – number of cattle per 1 agricultural enterprise; x_2 – number of cattle per 1 farm; x_3 – number of cattle per household of population.

Target function - maximizing profitability of cattle in various farms of the region:

$-22.5 + 0.03 * x_1 + 0.07 * x_2 + 1.62 * x_3 max \rightarrow$ (17)

Restriction system:

– area of premises for cattle per one agricultural enterprise cannot be morethan the maximum and should not be less than the minimum observed value in the region:

$447.07 + 5.03 * x1 >= 20.80$ (18)

$447{,}07 + 5{,}03 * x1 <= 3901.18$ (19)

– area of premises for cattle per one farm cannot be more than the maximum and should not be less than the minimum observed value in the region:

$-132.95 + 5.53 * x2 >= 15.15$ (20)

$-132.95 + 5.53 * x2 <= 608.33$ (21)

– number of tractors per farm cannot be more than the maximum and must not be less than the minimum observed value in the region:

$-7.75 + 0.42 * x2 >= 0.69$ (22)

$-7.75 + 0.42 * x2 <= 37.83$ (23)

– number of trucks per one farm cannot be more than the maximum and should not be less than the minimum observed value in the region:

$-2.09 + 0.04 * x2 >= 0.09$ (24)

$-2.09 + 0.04 * x2 <= 10.17$ (25)

– area of premises for cattle per household cannot be more than the maximum and must not be less than the minimum observed value in the region:

$-1.42 + 1.53 * x3 >= 0.54$ (26)

$-1.4185 + 1.53 * x3 <= 25.19$ (27)

– number of tractor trailers per household cannot be more than the maximum and must not be less than the minimum observed value in the region:

$0.01 + 0.003 * x3 >= 0.02$ (28)

$0.01 + 0.003 * x3 <= 0.07$ (29)

– number of trucks per household cannot be more than the maximum and must not be less than the minimum observed value in the region:

$0.003 + 0.003 * x3 >= 0.01$ (30)

$0.003 + 0.003 * x3 <= 0.05$ (31)

As a result of this model implementation, optimal specific values of cost effective development of beef cattle breeding in West Kazakhstan region were obtained (table 2).

The number of cattle per agricultural enterprise in the districts of the region should

increase from 142 heads up to 686 heads, i.e. 4.83 times; the number of cattle per one farm should increase by 2.37 times - from 46 heads up to 108 heads; the number of cattle per household should increase from 6 heads up to 14 heads - 2.29 times. The growth of livestock population should be ensured by an increase in the material and technical base: the area of premises for cattle per agricultural enterprise - by 3.36 times; area of premises for cattle per one farm - by 3.88 times; area of premises for livestock per one household - by 2.51 times.

It is also necessary that the number of tractors per one farm increased by 3.29 times; the number of trucks per one farm increased by 3.69 times; the number of tractor trailers per one household - by 2 times; the number of trucks per one household - by 2.5 times. These model values should become the basis for increasing the profitability of beef cattle breeding in the region up to 29.89%.

Table 2 - Optimal values of parameters for beef cattle breeding development in West Kazakhstan region

Name of indicator	2020	Optimal value	Optimal value by 2020, times
Livestock of cattle per 1 agricultural enterprise, heads	142.07	686.26	4.83
Livestock of cattle per 1 farm, heads	45.76	108.31	2.37
Livestock of cattle per 1 household, heads	6,29	14.38	2.29
Area of premises for cattle for 1 agricultural enterprise, sq. m	1 162.12	3 901.18	3.36
Area of premises for cattle per 1 farm, sq. m	120.16	466.15	3.88
Number of tractors per 1 farm, units	11.51	37.83	3.29
Number of trucks per 1 farm, units	2.44	9.00	3.69
Area of premises for cattle per 1 household, sq. m	8.21	20.60	2.51
Number of tractor trailers per 1 household, units	0.03	0.06	2.00
Number of trucks per 1 household, units	0.02	0.05	2.50
Profitability of production and sale of cattle, %	-4.74	29.89	-
Note: calculated by the authors			

The model for optimizing specific values of sheep and goat breeding development at various agricultural enterprises when substituting the calculated regression equations has the following form.

Conventions:

x_1 – number of sheep and goats per 1 agricultural enterprise; x_2 – number of sheep and goats per 1 farm; x_3 – number of sheep and goats per 1 household.

The target function is to maximize the profitability of sheep and goat breeding in various farms of the region:

$$-13.6 + 0.01 * x_1 + 0.14 * x_2 - 0.55 * x_3 max \rightarrow \quad (32)$$

Restriction system:

– area of premises for sheep and goat breeding per one agricultural enterprise cannot be more than the maximum and should not be less than the minimum observed value in the region:

$$62.39 + 0.89 * x1 >= 22.73 \quad (33)$$

$$62.39 + 0.89 * x1 <= 3\,238.33 \quad (34)$$

– area of premises for sheep and goat breeding per one farm cannot be more than the maximum and should not be less than the minimum observed value in the region:

$$-39.76 + 1.03 * x2 >= 10.00 \quad (35)$$

$$-39.76 + 1.04 * x2 <= 283.33 \quad (36)$$

– number of trucks per one farm cannot be more than the maximum and must not be less than the minimum observed value in the region:

$$-2.09 + 0.04 * x2 >= 0.09 \quad (37)$$

$$-2.09 + 0.04 * x2 <= 10.17 \quad (38)$$

– area of premises for sheep and goat breeding per one household cannot be more than the maximum and should not be less than the minimum observed value in the region:

$$-0.61 + 0.47 * x3 >= 0.01 \quad (39)$$

$$-0.61 + 0.47 * x3 <= 14.72 \quad (40)$$

– number of trucks per one household cannot be more than the maximum and must not be less than the minimum observed value in the region:

$$0.01 + 0.001 * x3 >= 0.01 \quad (41)$$

$$0.01 + 0.001 * x3 <= 0.05 \quad (42)$$

As a result of this model implementation, it was revealed that the number of sheep and goats per one agricultural enterprise should increase by 6.61 times from 539.89 heads up to 3 567.30 heads (table 3); the number of sheep and goats per one farm must be increased by 2.7 times; at the same time, the number of sheep and goats per one household should be reduced by 87%.

Table 3 - Optimal values of parameters for sheep and goat breeding development in West Kazakhstan region

Name of indicator	2020	Optimal value	Optimal value by 2020, times
Livestock of sheep and goats per 1 agricultural enterprise, heads	539.89	3 567.30	6.61
Livestock of sheep and goats per 1 farm, heads	106.89	289.09	2.70
Livestock of sheep and goats per 1 household, heads	9.95	1.31	0.13
Area of premises for sheep and goat breeding per 1 agricultural enterprise, sq. m	543.06	3 238.33	5.96
Area of premises for sheep and goat breeding per 1 farm, sq. m	71.37	260.80	3.65
Number of trucks per 1 farm, units	2.44	10.17	4.17
Area of premises for sheep and goat breeding per 1 household, sq. m	4.10	0.01	0.00
Number of trucks per 1 household, units	0.02	0.01	0.50
Profitability of production and sales of sheep and goat products, %	0.82	56.19	-

The area of premises for sheep and goat breeding per one enterprise should increase by 5.96 times from 543.06 sq.m. up to 3 238.33 sq.m.; the area of premises for sheep and goat breeding per one farm should increase by 3.65 times. Also, the number of trucks per one farm should increase by 4.17 times from 2.44 units up to 10.17 units, etc. The proposed changes should result in an increase in the profitability of production and sales of sheep and goat products up to 56.19%.

Conclusion

1. To improve the efficiency of animal husbandry in agricultural enterprises, it is necessary to use the most important factors of production, identify and activate all internal reserves of enterprises, and optimize the use of relevant production resources.

2. The essence of the problem of optimizing production on meat farms was to determine the most advantageous herd structure from the point of view of the goal set, while simultaneously calculating the structure of feed production, as well as optimizing the sales strategy for livestock products, taking into account product market behavior.

3. The systematic solution of these closely related issues increases the number of feasible solutions to the problem and is the source of the optimization effect. The variance in solving the problem arises due to:

● selection of the most effective fodder crops and their combination;

● changes in the structure of animal feeding rations within the limits that do not contradict the requirements of animals for feeding, without a negative impact on their productivity or development;

●changes in the structure of the meat herd;

● selection of the most rational strategy for the sale of industry products, taking into account market conditions.

Further research will involve predictive calculations of increasing the production of the main types of meat livestock products in the region by increasing the productivity of animals through the use of more efficient, resource saving technologies and taking into account zonal natural and economic conditions. It is necessary to determine the effectiveness of state support for beef animal industries of the region for their further development.

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