

# *Strategic directions of development of dairy cattle breeding in the region in the conditions of modern challenges*

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**Abstract** — The development of dairy cattle breeding in the country and regions was given a new impetus in modern economic and geopolitical conditions. The success of the opportunities provided directly depends on the prevention of threats associated with the receipt of cheap non-regional and imported products, difficulties in the sale of milk due to the lack of dairy factories, extreme weather conditions leading to a lack of fodder. Despite the fact that there is a positive trend in milk production in Astrakhan region, annual growth remains insufficient to ensure the lower threshold of food security of milk and dairy products.

The attention was given to the following methods of research: methods of comparative analysis; economic and statistical methods; method of SWOT analysis and economic and mathematical modelling. Using the economic-mathematical model based on polynomial growth curves, development trends are predicted and long-term prospects for the successful functioning of the dairy cattle breeding sector are defined. The strategic directions of development of the sector in the region should include orientation to large-scale production with the creation of agro-clusters including the production, processing and selling of dairy products; food reserve optimization; improving the breeding and productive abilities of cows through the use of local genetic material and not through the purchase of expensive young breeders from abroad. The implementation of the proposed strategic directions will allow the region to solve the problem of food security of milk and dairy products.

**Keywords** — *region, dairy cattle breeding, strategic directions, food security*

## I. INTRODUCTION

Food security issues are reflected in the classic works of foreign researchers like T. Maltus [1], P. Ehrlich [2], J. Rogers [3]. Most authors emphasize the difficulty of ensuring food security at the global level.

The studies of the Russian scientists such as A.A. Shutkov [4], I.G. Ushachev [5], E.N. Krylatykh [6], A.I. Altukhov [7], N.Novoselova [8], G.G. Onishchenko [9], E.N. Antamoshkina, G.V. Timofeeva [10], V. Rerikh [11] indicate that the problem of food self-sufficiency has not yet been solved in the Russian Federation in some basic types of food.

The sanctions imposed by the United States and Western European countries are forcing the Russian Federation to implement import substitution strategies, to focus on the development of domestic agriculture, to develop measures aimed at improving the economic efficiency of import-dependent sectors such as dairy cattle breeding, greenhouse vegetables production, fruit growing, etc.

Currently, Russia does not provide food security for high-quality milk and dairy products. At the same time, M.N. Volgarev [12], V.I. Pokrovsky [13] note that only high-quality food can be the basis of a healthy diet.

There are many reasons for the poor development of dairy cattle breeding. One of the main ones are: low breeding abilities of animals; low adaptability of livestock to local conditions; unbalanced fodder reserve. In the USSR the basis of irrigated crop rotations were fodder crops whose share reached 50-60% in some regions. During the transition to a market economy, livestock production was recognized as a loss-making sector. The number of cattle including cows decreased dramatically, as a result of which the areas under fodder crops were significantly reduced. The destruction of

high-intensity fodder production led to a lack of fodder and the inability to develop dairy cattle breeding on an innovative basis.

Russia sought to solve the problem of meat and meat products shortage due to the accelerated development of pig breeding and poultry farming as the earliest ripening and quickly paid up branches of livestock production. At the same time, the pace of the development of dairy cattle breeding continued to be insufficient, this sector developed by inertia and, as a result, the state lost food security of milk and dairy products.

In addition to that, in the second half of the 20th century many highly developed countries developed cattle breeding at an accelerated pace seeking to strengthen the fodder reserve and increase the livestock of agricultural animals. Russia was following and is still following a different path.

According to Z.N. Kozenko and others [14], in modern conditions the main reasons hindering the development of livestock production are its labor intensity, the absence of livestock houses, the high cost of their construction, the high cost of fodder production and the acquisition of combined fodder.

V.I. Laenko [15] notes that the most important factors for the sustainable development of the dairy cattle breeding sector are full animal feeding and properly organized herd reproduction. Currently, unfortunately, these two conditions are not always fulfilled.

At the same time, during the transition to a market economy, livestock production was unprofitable due to an imperfect pricing policy. The production of milk and meat became unprofitable as a result of the fact that the cost price of a unit of livestock production significantly exceeded the selling price. For example, dairy factories accepted and continue to accept milk at the lowest possible prices, as a rule, 30-40 percent lower than the cost of its production. In this regard, in order to improve pricing policy and restore price parity, it is important to determine the real costs of the bulk of rural producers in the formation of purchase prices and ensure their reimbursement during the subsequent exchange of goods.

N. Borkhunov, A. Nazarenko [16]; N. Borkhunov, O. Rodionova [17] propose to revive the system of guaranteed purchase prices, especially for products of animal origin since current prices do not cover the costs of production.

According to E. Ovechkina [18], rational pricing allows to solve the following tasks:

- covering the costs of production, sales and ensuring profit sufficient for the normal functioning of the industry;
- increasing market share;
- considering product interchangeability in pricing;
- solving social and environmental problems.

D.A. Medvedev [19] notes that for the successful development of the livestock production sector, it is necessary to create a modern distribution and primary processing infrastructure for livestock products in the near future.

One of the ways to revive dairy cattle breeding can be the implementation of strategic management of the sector as a basis for survival of agricultural enterprises in the long term, the change of concentrated growth strategies to integrated growth strategies with the development of vertical "forward" and "backward" integration and the creation of agroclusters with a closed cycle of production, processing and sale of finished products to the final consumer [20].

## II. MATERIALS AND METHODS (MODEL)

The successful experience of strategic management of crop farms in the Russian regions is indisputable. However, today the practical application of the principles of strategic management in livestock enterprises is of great importance. Let us present materials on the prospects for the use of strategic management in Astrakhan region, a typical South-Russian region, in farms specializing in the production of milk and beef. Dairy cattle breeding in the region is a strategically significant and the most complex sub-sector of livestock production. In 2018 the production of 169 kg of milk per capita was ensured, which is almost 25% higher than in 2004. At the same time, a significant increase in the productivity of cows as part of the modernization of the sector (updating the pedigree composition of the cattle herd, building new and modernizing existing farms and complexes) does not fully provide the region with its own-produced milk. The lack of raw milk, especially in the autumn-winter period, hinders the development of milk processing enterprises and affects the increase in the import of dairy products. It should also be noted that the high cost of milk production is a deterrent to the development of the sub-sector - 24.6 rubles with an average selling price of 16.14 rubles for processing.

It should be noted that due to the natural and climatic conditions, the fodder production in the region is underdeveloped, as a result of which the physiological needs of livestock of farm animals in fodder are not sufficiently satisfied, which ensures the use of the genetic potential of productivity by only 50-70%.

In order to meet the nutrient requirements of farm animals and create prerequisites for the manifestation of their maximum productivity, as well as to reduce the financial burden on agricultural producers, the state program includes measures aimed at switching to new technologies for keeping and feeding animals. As a result, by 2020 the annual production of milk in farms of all categories may reach 201.1 thousand tons with an increase of 117.3% compared to 2014, cheese and cheese products - 0.17 thousand tons with an increase 105 % compared to 2014.

It should be noted that in the state program, the final indicators of the development of the dairy cattle breeding sector in Astrakhan Region for the period up to 2020 are far from the parameters of food self-sufficiency in terms of high-quality milk and dairy products. In modern conditions a number of unsolved problems remain in the region, such as insufficient stock of highly productive livestock, poor fodder reserve, emphasis on small-scale production, in particular, household plots, practical absence of modern processing enterprises specializing in primary processing, processing,

packaging of milk and dairy products, increased import of dairy products in the absence of export.

In 2014 the volume of milk production in the region amounted to 171.8 thousand tons or 44% of the needs of the population of the region. In 2017 milk production reached 191.1 thousand tons and self-sufficiency in milk was 60%. But these indicators are significantly lower than the parameters of food security. Significant volumes of milk import constituting 55% of the gross production in Astrakhan region cannot drastically change the situation for the better. The diets of the inhabitants remain deficient in the consumption of milk and dairy products. Milk export to other regions of Russia does not exceed 0.002% of the production volume (Table.1).

**TABLE I. BALANCE OF RESOURCES AND USE OF MILK AND DAIRY PRODUCTS IN ASTRAKHAN REGION, THOUSANDS TONS**

Indicators	2014	2015	2016
Stocks at the beginning of the period	3.1	1.8	1.9
Production	171.8	172.7	173.5
Coming-in including import	91.7	94.6	95.2
Total resources	266.6	269.1	270.6
Productive consumption	45	47	48
Coming-out including export	0.1	0.2	0.3
Personal consumption	219.7	220	220.4
Total use	264.8	267.2	268.7
Stocks at the end of the period	1.8	1.9	1.9

Astrakhan region continues to be dependent on import of breeding animals of dairy productivity; and the success of some agricultural enterprises specializing in milk production is largely attributed to the acquisition of highly productive livestock from Slovakia and other countries. At the same time, the expediency of purchasing breeding livestock from abroad remains doubtful, since it is an expensive transaction and is associated with the risk caused by the presence of various animals' diseases. In addition, imported cattle is often characterized by poor adaptation to local conditions, which often causes significant death, etc. In many civilized countries local genetic material is used to improve breeding and productive abilities of dairy cattle rather than buying farm animals of foreign selection. As a rule, the purchase of genetic material of the required breeds is much cheaper and does not require additional investments related to providing the purchased livestock with optimal feeding and housing conditions.

The analysis of the environment is considered to be a starting point of the strategic management process, as it provides the basis for formulating the mission and defining the objectives of the organization, as well as for developing

business development strategies. When developing a strategy for the dairy cattle breeding development in the region, it is necessary to take into account all groups of factors influencing this process. The SWOT analysis showed that the dairy cattle sector has good prospects for expanding its activities and entering new markets both within the region and beyond.

The development of highly intensive fodder production on irrigated lands, as well as on cultivated hayfields and pastures will ensure the optimal food reserve for livestock and will help solve the food safety problem regarding milk and beef (Table 2).

**TABLE II. SWOT-ANALYSIS OF THE DEVELOPMENT OF THE DAIRY CATTLE BREEDING SECTOR**

Strengths	Weaknesses
- high demand for milk - high quality products, biological full-value and environmental safety	- unbalanced fodder reserve - lack of highly skilled staff with strategic management skills
Opportunities:	Threats
- expansion of markets, going beyond the region; - increased demand for milk	- low purchasing power of the population - competition on the part of regional and non-regional producers

In conducting the study, the following methods were used to summarize and systematize information, identify dependencies of the analyzed indicators and substantiate strategic areas: methods of comparative analysis, economic and statistical methods, method of SWOT analysis, economic and mathematical modelling.

### III. RESULTS AND DISCUSSION

In modern conditions in the region the share of agricultural organizations in total production of milk and beef is insignificant and does not exceed 1%. It should be noted that "Kartubinskoe" LLC remains the undisputed leader in milk production for a number of years among the agricultural organizations of Astrakhan region and it specializes in breeding Simmental cattle (Table 3).

**TABLE III. AGRICULTURAL ENTERPRISES LEADERS OF MILK PRODUCTION IN REGIONAL AIC**

Business name	Production volume, q1	Market share, %
Collective farm named after the XX CPSU Congress (Ikryaninsky District)	1683	0.1
"Kartubinskoe" LLC (Krasnoyarskiy District)	13760	0.8
"Poima" LLC (Privolzhskiy District)	3399	0.2

The average milk yield in this farm is 3.500-4500 litres per year. Unfortunately, "Kartubinskoe" LLC does not have so many competitors, but still there are some of them: a collective farm named after the XX CPSU Congress and "Poima" LLC. The closest competitors of "Kartubinskoe" LLC are several times inferior to it in terms of milk production and, accordingly, in market share.

It seemed that with an increase in production volumes, the costs per unit of a product should decrease. However, the data of the organizations contradict this statement and testify that the costs per unit of a product increase with the growth of production volumes in these farms.

Thus, the analysis showed that large agricultural enterprises of Astrakhan region do not seek to develop cattle breeding. At the same time, a preferential focusing on household plots in the long term can lead to degradation of meat and dairy cattle breeding in the region. Cows in the structure of the cattle livestock according to the recommendations of leading scientists in the field of livestock production should be at least 30% of the total herd size. The optimal livestock of cattle in farms of all categories in the region is at least 473 thousand heads including 142 thousand cows.

The difficulty of overcoming the shortage of milk production in the next decade is confirmed by the developed economic-mathematical trend model based on polynomial growth curves (Tables 4 and 5).

TABLE IV. CALCULATION OF INTERMEDIATE INDICATORS FOR EVALUATING REGRESSION PARAMETERS (MILK PRODUCTION)

Year	Indicators				
	$Y_t$	$t-tcp$	$(t-tcp)x(t-tcp)$	$y-y_{cp}$	$(t-tcp)x(y-y_{cp})$
1	152.6	-4.5	20.25	-15.7	70.7
2	155.5	-3.5	12.25	-12.8	44.8
3	159.9	-2.5	6.25	-8.4	21
4	164	-1.5	2.25	-4.3	6.5
5	170.1	-0.5	0.25	1.8	-0.9
6	171.4	0.5	0.25	3.1	1.6
7	171.8	1.5	2.25	3.5	5.3
8	172.7	2.5	6.25	4.4	11
9	173.5	3.5	12.25	5.2	18.2
10	191.1	4.5	20.25	22.8	102.6
Total	1683.3		82.5		280.8
Average	168.3				

The study covers a 10-year period from 2008 to 2017. Milk production from 2008 to 2017 increased 1.3 times. Evaluation of regression parameters:  $a_1 = 280.8/82.5 = 3.4$ ;  $a_0 = 168.3 - 3.4 \times 5.5 = 149.6$ .

The calculations made it possible to identify trends in the development of dairy cattle breeding in Astrakhan region (Table 5).

TABLE V. TRENDS IN THE DEVELOPMENT OF DAIRY CATTLE BREEDING IN ASTRAKHAN REGION

Extrapolated indicator	Trend Equation
Milk production, thousand tons	$tE=149.6+3.4t$

According to the results, milk production is in a positive trend. However, the annual growth remains insufficient, and Astrakhan region will not be able to reach the lower threshold of food security of milk and dairy products in the next 10 years.

Let us consider the prospects for the development of dairy cattle breeding on the example of the enterprise-leader "Kartubinskoe" LLC. The total land area of the enterprise is 1278 hectares including agricultural land - 1278 hectares, of which arable land - 800 hectares, pastures - 173 hectares and haymaking - 305 hectares. "Kartubinskoe" LLC has a favorable location, and the agro-climatic conditions are quite favorable for the effective management of agricultural production.

The livestock-breeding complex in "Kartubinskoe" LLC was built according to European standards. In the structure of fixed assets the largest share is occupied by buildings (60.1%); the productive livestock (5.4%) is in second place. Relative share of buildings and productive livestock indicate a developed livestock sector.

The analysis of the current state of the enterprise using SWOT-analysis allows to determine the strengths and weaknesses of the organization.

*Step 1. Determination of strengths and weaknesses of "Kartubinskoe" LLC.* This is a financially stable and dynamically developing enterprise specializing in raising dairy cows for dairy production. Dairy products are sold on the wholesale markets of Astrakhan and Astrakhan Region (Table 6).

The presence of strengths of this organization, first of all, is caused by competent management, the presence of high professional competences and entrepreneurial qualities of the enterprise director. The strengths of the production sector should include a highly productive livestock of Simmental cattle of a combined productivity. It is well adapted to the local conditions and gives both milk and meat. The strengths of the enterprise also include a modern livestock-breeding complex that meets European requirements and provides the opportunity of year-round milk and dairy products trade.

**TABLE VI. SWOT-ANALYSIS ON THE EXAMPLE OF "KARTUBINSKOE" LLC**

Evaluation parameters	Strengths	Weaknesses
1. Organization	High level of qualification and entrepreneurial attitude of the head of "Kartubinskoe" LLC	Lack of strategic enterprise management system
2. Production	Highly productive breeding stock; the cost of production is higher than that of regional competitors by 10-30% depending on the diet and livestock	Insufficient quality of dairy products and a weak range
3. Finances	-	Seasonal nature of the main cash flow
4. Innovations	Livestock-breeding complex meets European standards	Unbalanced diets for farm animals
5. Marketing	The opportunity to trade products all year round	No marketing department; low recognition of products on the market

*Step 2. Determination of market opportunities and threats "Kartubinskoe" LLC.*

At the same time, the enterprise has a number of weaknesses which do not allow the organization to develop at an accelerated pace and conduct expanded reproduction. There is a lack of strategic enterprise management, an insufficiently high product quality, a weak range, an unbalanced food reserve, a lack of a marketing department and, as a result, a "Dairy products of Kartubenskoe" brand, as well as a weak financial component. Detailed consideration of the weaknesses will allow to develop the ways to overcome the existing situation. These ways are aimed at improving the competitiveness of milk and dairy products produced by "Kartubinskoe" LLC.

Let us define the opportunities and threats for the enterprise in the following areas: competition, sales, demand, natural, environmental and economic factors (Table 7).

**TABLE VII. DETERMINATION OF MARKET OPPORTUNITIES AND THREATS OF "KARTUBINSKOE" LLC**

Evaluation parameters	Opportunities	Threats
1. Competition	Expansion of the range of dairy products due to the introduction of new technologies.	Import of cheap products
2. Sale	Expansion of the sales network; market presentation of packaged and sorted products	Difficulties in product sales due to the lack of dairy factories
3. Demand	Consumption volumes of milk processing products increase with the income growth of the population	-
4. Natural and environmental factors	The possibility of breeding locally adapted Simmental cattle.	Bad weather conditions (frosts, rain, hail) that reduce the yield and quality characteristics of fodder grasses, which adversely affects the dairy products quality
5. Economic factors	The imposition of sanctions became an incentive for the development of domestic and regional dairy cattle breeding.	Drop in demand due to lower incomes

The analysis of Table 7 showed that the enterprise should link further opportunities with expanding the range of manufactured dairy products, implementing innovative technologies for the production and processing of milk, using modern packaging, creating branded products, increasing the number of Simmental cattle in the farm.

Thus, the analysis showed that "Kartubinskoe" LLC develops dairy cattle breeding based on the intensification of production processes, selection of highly productive cattle breeds that are well adapted to local conditions. These factors to a certain extent increase the cost of production per unit of production. At the same time, milk production of cows, gross milk yield and volumes of milk sold are increasing, which generally has a positive effect on the growth of financial and economic indicators of the enterprise and helps improve the situation with the provision of the population with milk and dairy products.

#### IV. CONCLUSION

A detailed analysis of the development of dairy cattle breeding sector in the region allowed us to determine the strategic directions of development that include:

1. developing organizational and economic measures aimed at stimulating agricultural enterprises to raise livestock of dairy productivity.
2. creating large integrated formations including agricultural enterprises for dairy cattle breeding, dairy factories, enterprises of wholesale and retail trade.
3. accelerated development of the processing industry, construction of dairy factories that meet European standards.
4. radical improvement of natural forage lands, saturation of irrigated crop rotations with fodder crops with high nutritional value, creation of a green conveyor for uninterrupted supply of farm animals with fodder.
5. improving the breeding and productive abilities of livestock through the purchase of genetic material and not through the acquisition of expensive animals poorly adapted to local conditions of feeding and housing.

Implementation of these strategic directions will significantly increase milk production in Astrakhan region and solve the problem of food security of high-quality dairy products.

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