Development of dairy cattle breeding in the Tambov region

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Abstract. The article shows that dairy farming is one of the most dynamically developing branches of agriculture, existing under the influence of internal and external environments, defined as: compliance with the breed standard, medical standards for milk consumption, increased investment in the industry, its resource potential. On the basis of a retrospective analysis, the evolution of technological structures in dairy cattle breeding in Russia is considered: pre-industrial, collective farming with agricultural mechanization, industrial, intensive technocratic, biotechnological. In addition, on the basis of the organizational and economic analysis of dairy cattle breeding in the Tambov region, the trends of its functioning have been determined: a decrease in the self-sufficiency of the region's population with milk and dairy products; destructuring of the production sector with an increase in the share of enterprises with low-intensity and extensive milk production; low intensity of reproduction of a herd of cattle; a wide variety of breed composition of dairy cattle. It was found that agricultural enterprises of the region, as a rule, specializing in the development of dairy cattle breeding, choose the direction of organizing a purebred herd with standardized exterior features. This is a fundamentally different way of breeding work from all-Russian trends. On the basis of the research carried out, the priority directions of the development of dairy cattle breeding in an innovation-oriented context are substantiated.

1. Introduction
Dairy farming is one of the fundamental branches of agriculture. As of the beginning of 2019, the domestic consumer milk market in Russia is provided only by 81.5% against 83.0% of the target indicator of the state program for the development of agriculture and by 90% in comparison with the Doctrine of the country's food security. This determines the high market potential for milk demand in Russia. However, the accumulated crisis economic phenomena “force” producers of this type of agricultural products to face the problem of limited effective demand, and not an acute competition for the consumer. Meanwhile, both of these problems provide for and make it necessary to address the issues of increasing the efficiency of milk production at the expense of internal growth reserves.

It seems possible to do this only in conditions of increasing the efficiency of the industry on an innovative basis. In connection with this vector, there is a need to select the priority directions for the development of dairy cattle breeding, characteristic of each region of the country, to develop an integral strategy for the development of the industry, which predetermines the relevance of the research topic [1].

When studying the development of dairy cattle breeding, we used a methodological approach to assessing dairy cattle breeding, based on the study and comparison of the forces of action of its internal and external environments, defined as: compliance with the breed standard, medical standards for milk
consumption, increased investment in the industry, its resource potential. For this, on the basis of the organizational and economic analysis of dairy cattle breeding in the Tambov region, we have identified negative trends in its development. These are a steady decline in the scale of the industry, accompanied by a decrease in the self-sufficiency of the region's population with milk and dairy products; destructuring of the production sector with an increase in the share of enterprises with low- and non-intensive milk production. These also include low intensity of reproduction of a herd of cattle; a wide variety of breed composition of dairy cattle, which predetermines the technological specifics of the organization of production processes at agricultural enterprises [2-4].

2. Materials and methods
In the study of the problems of the development of dairy cattle breeding on an innovative basis, the works of domestic and foreign scientists, regulatory acts of the Russian Federation and the Tambov region, regulating the development of the agricultural sector of the economy, publications in the media were used.

In this work, we used abstract-logical, monographic, computational-constructive, scenario, expert assessments, economic-mathematical, economic-statistical and other methods of economic research.

3. Results and Discussion
However, conducting a historical excursion, it should be noted that dairy farming is one of the most dynamically developing branches of agriculture during the twentieth century. Thus, the rate of increase in cow productivity during this period amounted to almost 400%, and grain yield – to only 320% [5, 6]. In addition, the industry "passed" four technological paradigms – from subsistence farming with 100% manual labor to the use of industrial methods of conducting the industry using flow-shop milk production technology. And today it is already using the fifth technological paradigm on a large scale – robotization (Table 1).

| Table 1. Evolution of technological structures in dairy cattle breeding in Russia |
|-----------------------------------------------|--------------------------|-----------------|----------------------------------|
| Technological structures | Periods | Share of manual labor in total labor costs, % | Average milk yield per 1 cow, kg / year | System / way of keeping |
|--------------------------|---------|-----------------------------|---------------------------------|--------------------------|
| 1. Preindustrial         | 1880-1920 | 100                         | 800-900                        | Stable-pasture / loose   |
| 2. Collective farming with agricultural mechanization | 1920-1970 | 40                          | 1100-1200                      | Stable-pasture / loose   |
| 3. Industrial            | 1970-1990 | 12-15                       | 2600-2800                      | Stable-camp, boxed, tethered boxed |
| 4. Intensive technocratic | 1990-2020 | 10                          | 3500-3700                      | boxed                  |
| 5. Biotechnological      | 2020 and further | 10           | Over 6000                      | Loose, using robots     |

One should agree with the opinion of Academician G.V. Bespakhotny, who sees the problems of dairy farming development in the absence of taking into account the specifics of the industry in investment programs [4].

Overcoming the current situation and ensuring food security on the basis of increasing milk production is possible only with the participation of the state (at the macro- and meso-levels) as a coordinator and co-investor of industry modernization projects on an innovative basis.

According to the Ministry of Agriculture of Russia, in 2019 self-sufficiency remains below the threshold values of the Doctrine of Food Security: for milk and dairy products – 84.4%, which is 5.6 percentage points below the threshold (at least 90%) (+0.5 % by 2018) [3, 7].
Nevertheless, according to the National Report, the total volume of milk production in the country as a whole has grown. However, this trend is not typical of the Tambov region. Milk production in the region is decreasing, and, accordingly, the region’s share in total production is decreasing (Table 2).

Table 2. Milk production in farms of all categories, thousand tons

|          | 2014   | 2015   | 2016   | 2017   | 2018   |
|----------|--------|--------|--------|--------|--------|
| In general for the Russian Federation | 29,887 | 29,787 | 30,185 | 30,611 | 31,338 |
| Tambov region | 220.3  | 200.2  | 194.9  | 195.8  | 192.3  |
| Share of the region in total production, % | 0.74   | 0.67   | 0.65   | 0.64   | 0.61   |

To overcome the current situation in the Tambov region, since 2014, the strategy for the development of large specialized dairy farms has been more actively implemented. As of January 1, 2020, there are 4 dairy complexes in the region: limited liability company (LLC) “MegaFarm Sheremetyevo” of the Pichaev District, limited liability company (LLC) “Dairy Farm Zhupikov” of the Sosnovska District, agrarian complex “Tambovsky” of the Tambov District and limited liability company (LLC) “Suvorovo” of the Uvarovo District.

In addition, there are breeding farms in the region focused on breeding purebred black-and-white and Simmental cattle: breeding farm “Prigorodny” and breeding plant named after Lenin of the Tambov region, educational farm-breeding plant "Komsomolets" of Michurinsk region, agricultural production complex "Viryatinsky" of Sosnovka region, "Golitsino" of Nikiforovka region.

It should be noted that the productivity of the dairy herd tends to grow. So, in 2019, the country as a whole produced 6,492 kg of milk per 1 cow in agricultural organizations (excluding micro-enterprises), which is 401 kg or 6.6% more than in 2018. In 2020, the productivity of cows in agricultural organizations (excluding micro-enterprises) increased by 6.6%. The indicated dynamics is also typical of agricultural organizations of the Tambov region, where the average milk yield per cow at large, medium and small agricultural enterprises in the region in January-December 2020 amounted to 6,592 kg, against 6,171 kg in January-December 2019 (Table 3).

Table 3. Productivity of dairy cattle breeding in agricultural organizations of the Tambov region

| Indicators                  | 2019 year | 2020 year | Ratio, % |
|-----------------------------|-----------|-----------|----------|
| Milk yielded per 1 dairy cow, kg | 6,171     | 6,592     | 106.8    |
| Gross milk yield, t         | 73,759.5  | 77,189.8  | 104.7    |
Despite the continuing positive trend, there are certain reserves for further growth in milk productivity. So, among them, it is advisable to highlight the more complete use of the genetic potential of the dairy herd, the creation of a solid feed base, the provision of a balanced feed ration, the use of innovative technologies for keeping animals.

In addition, one of the factors in the increase in milk production is the technical modernization carried out in dairy cattle breeding. In 2019, 193 new dairy farms and complexes were built, reconstructed, modernized and put into operation in the Russian Federation. Additional milk production due to these activities amounted to 232 thousand tons.

A total of 1324 dairy cattle breeding facilities were commissioned, reconstructed and modernized in 2014-2018. The commissioning of new, as well as the reconstruction and modernization of existing facilities made it possible to increase the number of livestock places in 2019 by 90.6 thousand units. Newly built and reconstructed dairy complexes and farms, as a rule, are equipped with modern technologies for keeping and feeding, equipped with highly productive animals [8, 9].

In the Tambov region, the black-and-white and Simmental breeds of dairy cattle are most widespread. Together, they occupy 50.8% of the breed structure of the herd (Figure 2). In December 2012, Holstein-Friesian cattle heifers were brought to the region. As of December 2018, the herds of “Dairy Farm Zhupikov” LLC and “Suvorovo” LLC were formed from cows of this breed. The share of cows of this breed in the total livestock is 17%. Another the most promising cattle breeds in the region are the Swiss breed. From cows of this breed, the herd of AC “Tambovskiy” of the Tambov region was formed.

![Figure 2. Structure of the breed composition of dairy cows in the Tambov region, 2018, %](image)

It should be noted that agricultural enterprises in the region, as a rule, specializing in the development of dairy cattle breeding, choose the direction of organizing a purebred herd with standardized exterior features. This is a fundamentally different way of breeding work from all-Russian trends.

4. Conclusion
The strategy for the development of dairy cattle breeding should be focused on the effective use of conditions formed by the external environment, which is expressed in stabilizing the possibilities of increasing the economic potential of agricultural producers by improving the organization of the reproduction process. An impetus for the development of dairy farming can be given by the massive introduction of industry innovations.

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