Abstract. The article discusses the issue of optimizing the process of programming the development of agriculture in terms of livestock breeding based on the potential productivity in dairy cattle breeding. As is known, a significant part of the milk obtained from cows is formed due to the genetic characteristics of the animals. Therefore, the fastest result in increasing productivity can be achieved through the intensification of targeted breeding work. This is precisely what the state needs to focus on when leaving programs for the development of the agro-industrial complex. Increasing the genetic potential of a region (territory) and its use should be the basis for drawing up targeted programs. The purpose of the study is to formulate the concept of the genetic potential of the region and determine the possibility of increasing it through commodity lending. Among the instruments of state support for agriculture, the use of commodity lending in livestock farming will make it possible to quickly disseminate favorable breeding achievements throughout the region. For example, in the Samara region, out of 98.8 thousand heads 29.6 thousand cows belong to the population with low genetic potential (29.9%). According to calculations, with minimal financial investments it is possible to completely replace an unproductive herd in the region.

1 Introduction

Dairy farming is undoubtedly one of the most important branches of agriculture. Domestic farmers keep beef cows, but quite rarely. The main purpose of raising cattle is to produce milk [1-4].

In terms of cow productivity, the Russian Federation is in 10th place in the world - 5000 kg of milk, slightly inferior to the Republic of Belarus and China [5, 6].

In 2022, global raw milk production decreased by 1 million tons compared to 2021. This was facilitated by a number of factors: rising prices for feed, feed additives and energy, as well as a reduction in livestock in the countries of the European Union, the USA, New Zealand and Canada. In addition, the dry weather that prevailed in the European Union in the
summer of 2022 had a negative impact on the procurement of livestock feed, which also contributed to a decrease in production volumes [7-10].

The pace of development of dairy farming in Russia lags significantly behind those determined by the Doctrine of Food Security and the Agricultural Development Program, and the gap between the established and achieved indicators is increasing every year [11].

An increase in milk production in the Russian Federation until 2030 is not only not predicted, but a slight average annual decline is expected: from 2017 to 2020 - 0.2%, from 2020 to 2030 - 0.3%. These indicators are the same for two scenarios of scientific and technological development (STD) of the industry: “local growth” and “global breakthrough”. It is assumed that natural milk will be replaced by substitutes. All this determines the relevance of this study.

2 Materials and methods

The purpose of the study is to formulate the concept of the genetic potential of the region and determine the possibility of increasing it through commodity lending.

The work uses integrated and systematic approaches, as well as methods of comparative analysis, synthesis, induction and deduction, logical, historical and statistical.

The object of the study is agricultural producers engaged in milk production.

Research objectives:
- analyze the current state of milk production in the Samara region;
- define the genetic potential of the region;
- calculate the genetic potential of the Samara region;
- propose ways to increase milk production by increasing the genetic potential of the region, taking into account the possibilities of using commodity lending.

3 Results

Today, in the State Program for the Development of Agriculture for 2013-2030, dairy farming is identified as one of the main directions [12-14]. One of the main tasks in the field of dairy farming is to increase animal productivity and obtain high-quality dairy products.

Productivity is the quantity and quality of products obtained from one animal over a certain period (day, month, lactation, year, throughout life). The most common opinion is that the basis for increasing productivity is animal feeding. Indeed, this is very important. Agronomists say: if you don’t prepare a sufficient amount of high-quality feed, you won’t get a lot of milk [15].

Productivity is determined by heredity and depends on the species, breed, age, and individual characteristics of the animal. In cows, milk production is determined by breeding. The best milk yield comes from dairy animals, and slightly less from universal breeds.

Different reasons have different effects on milk yield and fat mass fraction: milk quality indicators largely depend on the following factors: genetic (40%), animal health (15%), climatic conditions (10%) [16-20].

The breed characteristics of cattle make it possible to determine the level of milk yield and the quality of the product, and to adjust the methods of breeding work. Breeds that are renowned for their milk production and are of global importance are being improved through pure breeding. In dairy farming, in addition to purebred breeding, crossbreeding with the best breeds in the world is widely used, which allows increasing the rate of genetic improvement of the population [21-25].

The demand from agricultural producers for the breed composition of cattle imported into the Russian Federation in the period 2020-2022 is relatively stable. More than 90% of the total imported quantity are Holstein animals.
As the data shows, the largest share in the structure of breeds imported to Russia is occupied by Holstein cattle; 28,126 heads were imported in 2022. On average over 3 years, the share of Holstein cattle is 92%, other breeds amounted to only 8% [26-31].

It should be noted that there has been a reduction in the breed diversity of cattle imported into the Russian Federation. The number of imported breeds decreased from 8 to 5. The number of imported livestock also decreased. In 2022, cattle imports decreased by 11.4% compared to 2020, and by 36.8% compared to 2021. This is due to the introduction of numerous sanctions in 2022 against the Russian Federation, as well as the high cost of imported breeding animals, since their cost is tied to the euro exchange rate [32].

Today, the average cost of 1 head of Holstein cattle is 143 thousand rubles, so in 2022 the cost of purchasing livestock abroad amounted to more than 4022 million rubles [33].

The Holstein breed is currently the most common in our country. Since 2010, the relative number of Holstein cattle has increased by 50%. The results of the breed inventory show that the relative abundance of the Holstein breed in 2022 alone increased by 19.6% compared to 2021 and is more than 54%. At the same time, the number of black and motley cattle decreased by 17.1%, red and motley by 0.74%, and Kholmogorsky by 0.87% [34-36].

This is due to the fact that Holstein cattle have a high adaptability to various soil and climatic conditions, suitability for use in high-performance milking machines, exceptionally high milk productivity of cows,

The dynamics of increasing productivity of Holstein cattle can be seen using the example of Canada. The skillful selection work of Canadian scientists led to the fact that in 1975 the average productivity of cows of this breed of Canadian selection was 6907 kg of milk with a fat content of 256 kg (3.7%), protein - 207 kg (3%) in terms of adult equivalent (ME). And today the productivity of cows has almost doubled. In cows born in 2017, the average milk yield (ME) was 12,468 kg, the fat content in milk reached 495 kg (3.97%), protein - 403 kg (3.23%) [37-40].

Producing milk is the main goal of keeping dairy cattle, and therefore it is not surprising that increasing productivity has been the meaning of breeding work throughout almost the entire history of dairy cattle breeding.

Dairy cattle breeding has comparative advantages precisely in regions with low agrobiological potential, which belong to the zone of risky farming for grains and leguminous crops, but a guaranteed harvest of perennial grasses, where milk production provides the highest profitability per 1 hectare compared to the production of other products competing for agricultural land. Therefore, the development of dairy farming in most regions of the Non-Black Earth Region, where mainly medium-sized dairy farms predominate, can ensure the sustainable development of the industry [41].

Dairy farming in the Samara region has significant development potential. The analysis allows us to conclude that, along with endogenous ones, there are exogenous factors that are intensifying and inhibiting the development of dairy farming in the region, such as:

— the absence at the federal level of a system of direct support for an investment project that does not fall into the project financing system and does not have the opportunity to take advantage of the preferential investment lending system;

— lack of effective mechanisms for the redistribution of agricultural land from ineffective to efficient owners;

— orientation of state support towards large and super-large manufacturers.

The breed composition of cows in the region is represented by the following types: Ayrshire, Red-and-motley, Black-and-motley (including Samara type), Holstein, Brown Swiss, as well as other outbred cattle.

Having considered the breed composition of the cattle herd in the Samara region. We will calculate the possible gross milk yield based on the genetic potential of the region.
The genetic potential of a region is the total maximum possible productivity of livestock, based on the breed composition in the region and its genetic characteristics.

As the data in Table 1 shows, the Samara region has great genetic potential to increase gross milk yield by almost 2 times compared to the existing one.

<table>
<thead>
<tr>
<th>Breed composition of cows</th>
<th>Number of cows, heads</th>
<th>Possible gross milk yield (based on genetic potential), t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td>5232</td>
<td>36624</td>
</tr>
<tr>
<td>Red-and-motley</td>
<td>458</td>
<td>4580</td>
</tr>
<tr>
<td>Black-and-motley including Samara type</td>
<td>34582</td>
<td>224783</td>
</tr>
<tr>
<td>Holstein</td>
<td>2644</td>
<td>17186</td>
</tr>
<tr>
<td>Brown Swiss</td>
<td>2644</td>
<td>17186</td>
</tr>
<tr>
<td>Others (animals with low genetic potential)</td>
<td>29600</td>
<td>148000</td>
</tr>
<tr>
<td>Total</td>
<td>98800</td>
<td>718881</td>
</tr>
</tbody>
</table>

Livestock farming in the Samara region has a fairly high genetic potential: milk yield per cow is at the level of 7276 kg of milk per lactation.

But it is worth noting the negative trend that the number of cows in the Samara region in 2022 decreased by 3% compared to 2021, while gross milk production decreased by 0.5%. On the one hand, this means that milk production per cow has increased, but on the other hand, it must be remembered that an increase in cow productivity with a declining population cannot ensure an increase in milk production and saturation of the domestic market.

To solve problems with saturation of the domestic market with milk and natural reproduction of the herd, we propose to use the indicator of the genetic potential of the region. Almost 30% of cows in the herd structure are animals with low genetic potential. By increasing the proportion of high-breed cows (for example, Holstein breed) in the main herd, it is possible to increase milk yield with the same number of livestock.

Due to the reduction in the number of cows, we propose to purchase 1000 heads of Holstein cows with the help of a regional commodity lending operator, the cost of purchase will be 143,000 thousand rubles.

In the Samara region, the regional operator of commodity lending is JSC Veles. As part of its statutory activities, Veles JSC purchases commercial and pedigree cattle outside the Samara region and transfers it to legal entities, peasant (farm) enterprises, individual entrepreneurs, personal subsidiary plots of citizens carrying out agricultural activities in the Samara region on contractual terms [42].

It should be noted that only over the last 7-8 years of operation of JSC Veles, the genetic potential of the region in dairy cattle breeding has increased by 1.0-1.5 thousand kg of milk per lactation, which became possible thanks to the introduction of commodity lending for the purchase of high-breed cattle. Previously, it took 10-12 years to increase the genetic potential of 1000 kg of milk per lactation.
We propose to increase the genetic potential of the region by inseminating cows from the group of animals with low genetic potential with the semen of sires with high genetic potential. The calculated data are presented in Table 2. By changing the breed structure of cattle, we will increase the genetic potential of the region.

By genetically improving animals, profits increase from generation to generation, resulting in long-term benefits. If the average genetic potential of a herd is low, more management efforts should be made. This requires additional time and financial resources.

To increase the genetic potential in the first year, we will spend on the purchase of 1000 heads of Holstein cows and the purchase of 29,600 doses of biological material for insemination of 14,800 heads of cows (50% of the animal population with low genetic potential). The cost of 1 dose of biological material is 800 rubles. Thus, the costs in the first year will amount to 166,680 thousand rubles. The total cost for 7 years will be 340,134 thousand rubles.

Using the possibilities of commodity lending will make it possible to invest this amount, and this will lead to the fact that in 7 years it is possible to increase the genetic potential of the region by 13%, increase the gross milk yield by more than 2 times in relation to the existing level, and form a highly productive herd.

In terms of milk supply, the Samara region is one of the imported regions. Large milk processing complexes operate in the region, which use imported raw materials from neighboring regions in their production. Increasing the genetic potential of the region would cause an increase in milk production. And this would make it possible to cover the needs for raw materials on our own, and would also help to attract additional funds to the budget.

The indicator of the genetic potential of a region can be used as an indicator for assessing the effectiveness of state programs both at the federal level and individual regional programs.

Today, using the possibilities of commodity lending to the agricultural sector would ensure the growth and development of the country’s economy. The experience of introducing commodity lending in the Samara region gave a new round to the development of the livestock industry.

The successful activities of the commodity lending operator in the Samara region ensured an increase in the number of highly productive livestock in the structure of the dairy herd, as a result of which there is an annual increase in gross milk yield.

In the near future, it is planned to expand the scope of activities of JSC Veles, covering all new infrastructure areas (breeding work, quarantine, etc.). It is proposed to expand the possibilities of commodity lending - to purchase not only commercial and breeding livestock, but also to purchase equipment.
4 Conclusion

The proposed areas of diversification and improvement of commodity lending will allow:

- cover the shortage of dairy raw materials through self-sufficiency;
- increase the number of dairy herds, as well as increase the proportion of highly productive livestock in it;
- ensure the development of regional software digital products for implementation in the agro-industrial complex industry;
- stimulate the development of production of equipment for the livestock industry.

All this will have a positive impact on the development of the region, on its investment attractiveness, and will help attract additional funds to the budget.

References


