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# Efficiency of breeding work in dairy cattle breeding

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**Abstract.** The purpose of the work is to study the effectiveness of breeding work in dairy cattle breeding. The main indicators of efficiency in dairy cattle breeding are systematized, specific indicators for dairy cattle breeding are highlighted. Analysis of the dynamics of milk production showed the dependence of the development of the industry on government support measures, allowed to extract reserves for production growth. It was concluded that in terms of productivity per cow per year, the Sychevsk and brown Schwyz breeds are inferior to the Holstein breed, but the duration of use, the service period and the output of calves in Holstein breed are much lower. The lifetime productivity of these breeds was calculated. It is concluded that the genetic potential is not fully disclosed in any breed.

## 1. Introduction

For the organization of the production process in animal husbandry, it is necessary to raise livestock, reproduce the herd, keep and feed the animals.

The efficiency of production of dairy cattle breeding can be determined for the industry as a whole, for a specific unit of the herd, based on the feed area required for the production of this type of livestock production, for the organizational form of the industry (farm, complex, team, etc.) for the type of product.

The main indicators used to assess the effectiveness of dairy cattle breeding, systematized and presented by us in the diagram (Figure 1). The groups of general and specific indicators, as well as indicators that assess individual activities and breeding work in general, are highlighted.

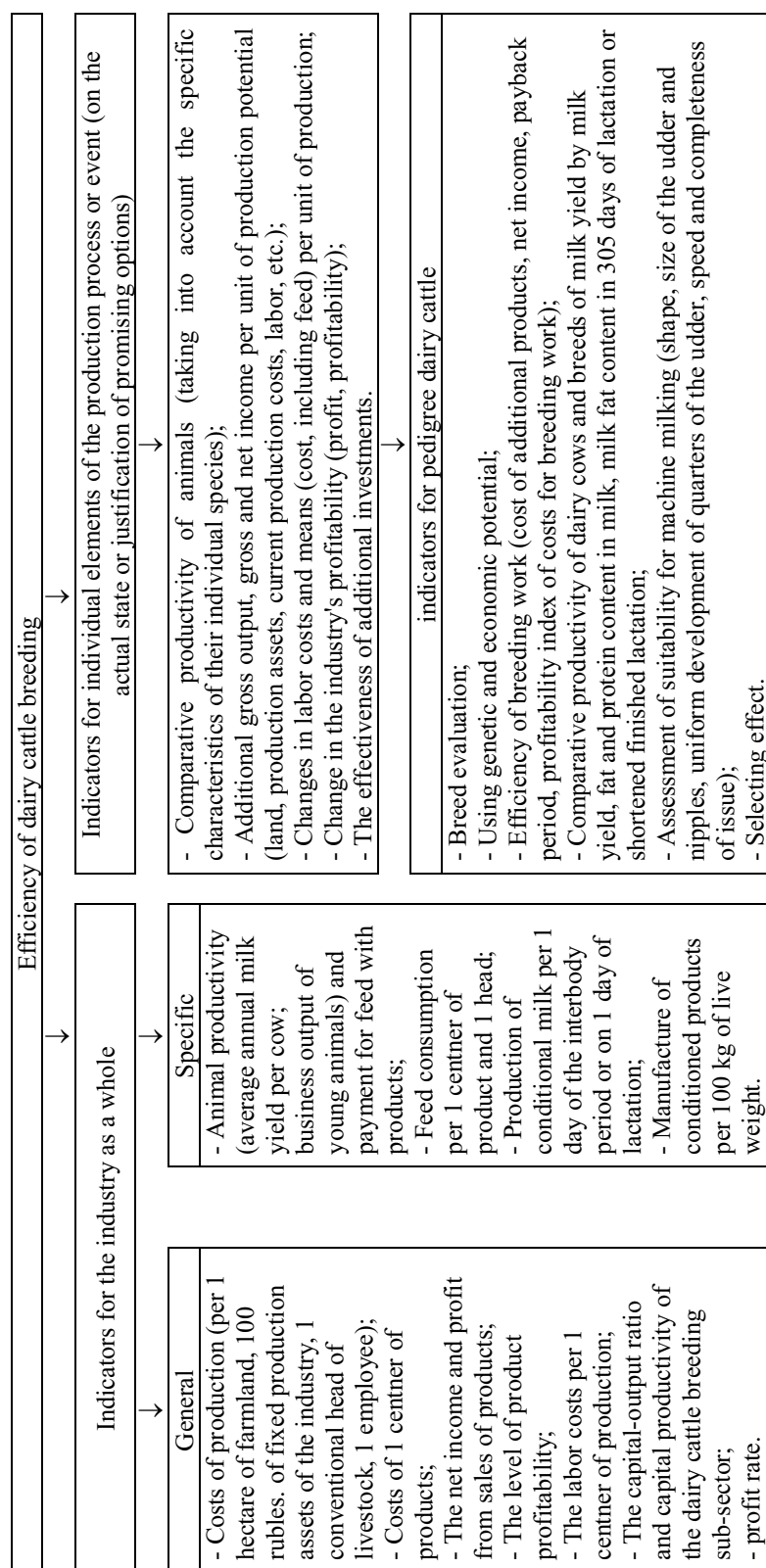
Breeding work in cattle breeding is aimed at improving the genetic and productive qualities of animals based on the selection of the most valuable animals, aimed selection of parent pairs, directed rearing, creating good conditions for the animals and feeding [1].

The efficiency of breeding work can be determined at the level of commodity economy, at the level of breeding and replication of the super-repair molonyak, at the level of carrying out selection and breeding work. Modern reproduction of competitive breeding resources uses new reproductive informational, genomic technologies. Competitive breeding herd is the “growth point” for the stable development of cattle breeding.

## 2. Methods

Calculated-constructive, economic-statistical, and monographic methods of research were used. The data came from Rosstat and OJSC “Smolenskoye” (reportings on breeding).





**Figure 1.** The system of performance indicators in dairy cattle, including breeding.

### 3. Results and Discussions

In dairy cattle breeding for 2013-2017, the productivity growth (1.93%) lags behind the rate of reduction in the livestock of cattle (up to 10.67%), the increase in livestock is observed only in peasant (farmer) farms (Table 2).

**Table 1.** Dynamics of changes in the number of livestock in farms of various categories, thousand heads.

Indicators	2013	2014	2015	2016	2017	2017 to 2013
Cattle livestock (all categories of farms)	19 564	19 263,7	18 992	18 752,5	18 643,9	95,30
including cows	8661	8530,8	8408,1	8263,7	8202,8	94,71
Cattle livestock in agricultural enterprises	8800,5	8522,6	8447,8	8355,9	8242	93,65
including cows	3532,5	3439,3	3387,4	3359,5	3319	93,96
Cattle population in households	8715	8596	8301	8016,9	7915,6	90,83
including cows	4088,5	4005,4	3881,8	3716,6	3652,1	89,33
Cattle livestock in peasant farms	2048,5	2145,1	2243,2	2379,8	2486,3	121,37
including cows	1040	1086,1	1138,9	1187,7	1231,6	118,42
Reference:						
Gross milk yield in farms of all categories, million tons	30,53	30,79	30,8	30,76	31,12	101,93

The increase in the productivity of dairy cattle was largely achieved through the implementation of state programs and through a complex of veterinary and zootechnical measures, improved feeding and housing conditions, automation of complexes, herd renewal, purchase of breeding material (semen and embryos), and also import of purebred cattle. As of January 1, 2018, the number of dairy cows in the dairy direction of productivity is 1 million heads. The share of domestic breeding products in total sales in 2017 in dairy cattle was 60%.

One of the factors affecting the increase in milk production is technical modernization, including both the construction of new and the reconstruction of existing farms (Table 2).

**Table 2.** Increase in milk production on the newly built, reconstructed, and modernized farms [2].

Indicators	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2017 to 2008
Introduced new objects, units	109	73	75	79	81	140	112	120	117	161	147,7
Milk production at the commissioned facilities, thousand tons	119,7	133,9	110,4	88,0	101,9	138,2	155,6	119,3	170,4	141,6	118,3
Reconstructed and modernized facilities, units	368	176	148	92	107	131	94	99	119	70	19,0
Additional volume of milk production due to reconstruction and modernization, thousand tons	92,4	56,2	30,1	18,7	21,1	41,4	6,5	57,2	61,7	17,8	19,3
The share of additional production at the constructed and modernized facilities in the total volume of milk production, %	0,7	1,2	1,7	2,0	2,4	0,59	0,52	0,57	0,75	0,51	-0,2
The number of places created for livestock due to the introduction of new objects, units	67439	50647	46703	49563	38069	47504	46351	47710	53682	65357	96,9
Number of places created for livestock due to reconstruction and modernization, units	125529	43288	36660	19563	15624	25983	12071	21880	24957	49876	39,7

The improvement of domestic dairy cattle by the Holstein breed provides favorable prerequisites for obtaining 5000 kg of milk from a cow per year. The use of absorbing crosses has led to the widespread transfer of leading breeding farms to the status of improving breeds. Holsteinization of domestic dairy breeds leads to a loss of their genetic specificity.

**Table 3.** Production use of cows of the Sychevsk, brown Schwyz and Holstein breeds in the Russian Federation.

Breed	Breeding farms							
	Number of cows, thousand heads	yield, kg	% fat	% protein	Live weight	Age		Output calves on 100 cows
						1 calving days	Retirement, calving	
Brown Schwyz	10,0	4906	3,97	3,29	534	926	4,31	84,6
Holstein (black and motley)	136,7	8100	3,85	3,24	570	768	2,78	78,7
Sychevsk	3,6	4556	3,88	3,28	536	973	4,29	90,1

Analysis of the production use of cows showed that in terms of productivity per cow per year, the Sychevsk and brown Schwyz breeds are inferior to the Holstein breed, but the duration of use, service period, and output of calves in Holstein breed are much lower.

It is established that the coefficient of heritability of milk productivity is 20-25%, the fat milk content is 30-50%, the protein milk content is 30-50%, the body weight is 20-30%, etc. Therefore, the transfer of quantitative traits by parents to offspring occurs only to a certain extent and depends on heredity.

The efficiency of using domestic cattle breeds of the dairy direction of productivity was determined by us for the period from 2013 to 2017 on the example of the Smolensk region (Table 4) [3].

**Table 4.** The genetic potential of the bulls-producers of Sychevsk, brown Schwyz and Holstein breeds of OJSC "Smolenskoye" by breeding work.

Breed	On January 1, 1990				On January 1, 2018				01.01. 2018	01.01.2018
	Number of heads	Mother's productivity			Numbe r of heads	Mother's productivity			by	+/- to
		Yield, kg	Fat content			Yield, kg	Fat content		01.01.1990	01.01.1990
			%	kg			%	kg	for the yield of mothers, ±, kg	on the fat content, kg
brown Schwyz	22	7794	4,11	320,3	12	10623	4,00	424,9	+2829	+104,6
Holstein	14	12260	4,19	513,7	7	12515	4,24	530,6	+255	+16,9
Sychevsk	10	6364	3,87	246,3	14	8006	4,00	320,2	+1642	+73,9

Genetic potential is not fully disclosed in any breed. The reasons hindering the realization of the genetic potential of the dairy herd are the condition of the food supply, protein deficiency and energy in the feed.

Comparing indicators of the use of cows with optimal, E. I. Semenova [4] notes a lower yield of calves per 100 cows (85-95%), a higher duration of the dry period for 3-5 days (optimum 50-60 days), the average age at the first calving is 2 months, the low age of retirement cows (3.58 calving), i.e. until they reach maximum productivity. Reproduction rates do not correspond to the optimum not only in ordinary farms but also in breeding plants and pedigree farmers.

V. I. Fisinin estimates losses of livestock enterprises up to 13 billion rubles due to the lack of getting of the offspring and milk due to the content of barren cows [5]. At the 14th World Congress of Animal Reproduction, a decrease in the efficiency of reproduction with an increase in the milk productivity of cows was emphasized. The main causes of reduced reproductive functions are metabolic diseases caused by a prolonged negative energy balance (NEB) stage [6-8].

Dairy cattle breeding has reserves to increase production. The main producers of milk are large-scale farms with higher productivity of livestock and the proportion of breeding livestock in the population. Milk production in small farms is characterized by the use of extensive technologies, reduction of the number of cows.

**Table 5.** Possible increase in milk production in the Russian Federation due to the restoration of the livestock of cows and their productivity.

Farm category	1990	2002	2007	2012	2017	Possible increase in livestock, thousand heads
	Livestock of cows, thous. heads on 01.01.					
Households of all categories	20556,9	11854,2	9320,2	8858,6	8226	4181,4
Agricultural organizations	15322,1	5652,9	3974,5	3640,1	3315,5	3323,1
	The actual productivity of cows, kg					Possible increase in productivity, kg
Households of all categories	2731	2797	3501	3898	4368	294,7
Agricultural organizations	2783	2802	3758	4541	5660	64,9
Possible increase in milk production in all farms, thousand tons						1232,2
Possible increase in milk production in agricultural organizations, thousand tons						215,7

According to the Table 5, when the livestock of cows is restored to the average value for the analyzed period and when the productivity level of cows is reached, there are opportunities to double its production compared to the actual level of 2017, which is primarily due to the large-scale production [9, 10].

#### 4. Conclusions

Investments in breeding, technical, and technological modernization of the dairy cattle breeding industry, strengthening the feed base contribute to the growth of milk production. Further innovative development will make it possible to effectively use the resource potential available in the industry, to solve the problem of providing the country's population with high-quality dairy products of domestic production.

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