Trends in the development of native horse breeding and ways to improve its efficiency

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Abstract. The paper analyzes the most important segment of horse breeding in the conditions of a fundamental change in the general economic situation in agriculture in general and the horse industry in particular. In a significant time aspect (1991-2018), the dynamics of the producing composition of the stud farms’ breeding stock and their placement in the federal districts of the Russian Federation are rigorously analyzed. The modern livestock of horse stud mares has been categorized, included in the state breeding register and in the main breeding areas. Changes in the producing composition of the breeding stock of all breed directions are investigated. Analysis of the number of horses in the country (for 28 years) shows that the total number of factory mares decreased from 6.3 to 3.4 thousand heads or by 49.2%. The number of saddle mares increased by 42.5%, from 362 to 516 heads. It was established that during the analyzed period, all production and economic indicators of horse breeding decreased. Successfully tested in many foreign countries, a system of financial sustainability and high efficiency of horse breeding in the form of targeted support (using the national equestrian sweepstake) has not been established in the industry.

1. Introduction
During the years of developing market relations, objectively significant changes occurred in the horse breeding of Russia. They were due to fundamental changes in agricultural production. The development of privatization and multi-layered processes led to the repeated reduction of large state and collective farm agricultural enterprises and the curtailment of the main branches of productive livestock raising in them, including those in the horse-breeding sector. The development of animal husbandry in private farms and in peasant (farmer) farms only partially compensated for the decline in the number of horses. As a result, in the period 1991-2018, the horse livestock in the country decreased from 2618.4 to 1283.0 thousand heads, i.e. in more than twice. At the same time, in regional terms, horse resources have become significantly higher in Siberia and the Far East compared to the central, European districts. Negative processes in the industry could not but affect the placement and development of pedigree horse breeding, and above all, its most valuable link – the stud farm. The study analyzes the dynamics of placement of the producing breeding stock of sources with different pedigree affiliation in the region’s stud farm. The paper also justifies the conditions and reserves for creating a stable economic situation in horse breeding.
2. Materials and Methods
The research is based on the following sources: (a) the information data directory *Indicators on the Economy of Stud and Hippodromes of the USSR for 1990*, compiled by the Department of Economics VNII Horse Breeding; (b) materials of the register of breeding horse enterprises as of January 1, 2019; (c) data of annual statistical reporting on the number of horses by categories of farms in the context of regions and federal districts; (d) results of annual reporting on the horse breeding of a number of stud farms. When conducting research, the following methods were used: economic-statistical, monographic, and groupings.

3. Results
The uniqueness of horse breeding is determined by a number of biological characteristics of horses, among which their high adaptation to extreme conditions of housing occupies a special place, as evidenced by the wide distribution of the industry in different climatic zones of the country. An analysis of current trends in the development of pedigree horse breeding in Russia, which is of high relevance for practitioners, has been carried out in the stud farms, where the main breeding core of factory breeds is concentrated. Their preservation and improvement is the most important task in the tribal and mass sectors of the industry.

The development of horse breeding has historically been determined by the main tasks facing the horse-breeding industry. Until the mid-twentieth century, a horse was an important energy tool in many branches of material production, and this animal was also widely used in military units. The main purpose of the country’s stud farms and breeding farms was to raise the breeding material to improve the working qualities of horses. In the second half of the last century, with an objective reduction in the role and importance of the horse as an energy vehicle, new directions for horse use began to develop, namely, meat herd, dairy, and sports and leisure. Horse breeding was reoriented to the cultivation of improvers to improve the working and productive qualities of horses, as well as horses for mass sports, tourism, rental, hippotherapy, and other goals of a social nature.

In the pre-reform period, there was a system of state leadership in horse breeding that was separate from other branches of animal husbandry. In the Union and a number of republican ministries of Agriculture, an Office of Special Horse Breeding was functioning. The most valuable tribal stud farms and racetracks were part of the All-Union Trust, which made it possible to plan and analyze the development of the industry and, above all, horse breeding.

On April 27, 1981, in order to effectively develop the horse-breeding industry, the CPSU Central Committee and the USSR Council of Ministers adopted Resolution No. 402 on *Measures for the Development of Horse Breeding*, during the implementation of which horse breeding followed the path of expanded reproduction. In the last five years of the pre-reform period (1986-1990), the number of horses in the USSR increased from 5781.5 to 6918 thousand heads (19.7%); the horse meat production increased from 213 to 270 thousand tons (26.8 %), koumiss from 31 to 35 thousand tons (12.9%). Mass equestrian sport, tourism, and horse rental were further developed.

The positive development of mass horse breeding had a positive effect on specialized horse breeding. Increased domestic demand for breeding horses led to a sharp increase in production and economic indicators of the industry. So, if in the whole country’s stud farms in the five-year period before the adoption of the above-mentioned directive document (1976-1980), the profitability level from selling the breeding horses was 15.2%, it reached 59.8% in 1981-1985 and 75.2% in 1986-1990.

Unfortunately, at the end of the pre-reform period (1990), only 65 out of 102 horse breeding factories for breeding factory breeds, with the exception of regional ones operated in Russia.

Placement of producing uterine composition of the horse breeding studs in Russia in the pre-reform period in the modern federal districts is presented in Table 1.
Table 1. Placement of uterine stock of horses in the stud farms of Russia (January 1, 1991).

| Federal districts | Breeding mares (aged 3 years and older) | Breeding mares per thousand horses in mass horse breeding, heads |
|-------------------|----------------------------------------|---------------------------------------------------------------|
|                   | Number | %                  | Number            | %                  |
| Central           | 1,405  | 22.2               | 4.5               |
| Northwestern      | 288    | 4.6                | 4.7               |
| Southern          | 1,948  | 30.7               | 9.4               |
| North Caucasus    | 374    | 5.9                | 3.1               |
| Volga             | 1,743  | 27.5               | 2.8               |
| Ural              | 191    | 3.0                | 1.0               |
| Siberian          | 276    | 4.4                | 0.4               |
| Far Eastern       | 109    | 1.7                | 0.5               |
| Total for the Russian Federation | 6,334  | 100.0              | 2.5               |

The largest herd of breeding mares was noted in the stud farms of the Southern (30.7%), Volga (27.5%), and Central (22.2%) federal districts. In total, 80.4% of the breeding uterine stock of horses accounted for these three districts [1].

Such placement of horse breeding is due to traditional historical factors of its development. Horse factories supplying a large number of army horses for cavalry and artillery units, postal purposes and carting, as well as with the aim of improving the working qualities in agriculture and other areas of factories supplying a large number of army horses for cavalry and ar

Table 2. Placement of the uterine stock of breeding horses in Russian stud farms (as of January 1, 1991).

| Federal districts | Breeding types | Trotter | Riding | Saddle | Draft |
|-------------------|----------------|---------|--------|--------|-------|
|                   | Heads | %      | Heads | %      | Heads | %      |
| Central           | 1041  | 43.5   | 25    | 6.9    | 45    | 2.3    | 294   | 18.1 |
| Northwestern      | 118   | 5.4    | -     | -      | 100   | 5.1    | 60    | 3.7  |
| Southern          | 60    | 2.5    | 93    | 25.7   | 1685  | 86.0   | 110   | 6.8  |
| North Caucasus    | -     | -      | 244   | 67.4   | 130   | 6.6    | -     | -    |
| Volga             | 864   | 36.1   | -     | -      | -     | -      | 879   | 54.3 |
| Ural              | 60    | 2.5    | -     | -      | -     | -      | 131   | 8.1  |
| Siberian          | 239   | 10.0   | -     | -      | -     | -      | 37    | 2.3  |
| Far Eastern       | -     | -      | -     | -      | -     | -      | 109   | 6.7  |
| Total for the Russian Federation | 2392  | 100    | 362   | 100    | 1960  | 100    | 1620  | 100  |

During the period of market reforms (1991-2018), a sharp reduction in the number of horses from 2,618.4 to 1283.0 thousand heads (by 51%) occurred in the country. In mass horse breeding, the number of horses decreased from 2,534 to 1,231 thousand heads (or 2.1 times), which objectively affected the decrease in the need of stud farms for breeding horses of factory breeds, including their breeding core.
The data from Table 3 provide an opportunity to judge the change in the number of factory females in the regional aspect. The largest number of breeding mares is concentrated in the Volga Federal District and amounts to 776 heads (23.4%) in the North Caucasus Federal District, the livestock is 720 heads (21.2%) and the Central Federal District, and the livestock is 687 heads (20.3%). The increasing number of breeding mares in the stud farms of the Siberian Federal District, from 276 to 373 heads (35%), is noted, which is explained by the increased demand for breeding horses and the increase in the number of horse owners in Siberia. Currently, per thousand horses in the mass horse breeding, the number of factory mares is 2.8 heads, whereas at the beginning of 1991 there were 2.5 heads.

**Table 3. Placement of the uterine stock of horses in the stud farms of Russia (January 1, 2019).**

| Federal districts | Breeding mares aged 3 years and older | Breeding mares per thousand horses in mass horse breeding, heads |
|-------------------|---------------------------------------|---------------------------------------------------------------|
|                   | Heads | %    |                                                                 |
| Central           | 687   | 20.3 | 18.8                                                          |
| Northwestern      | 142   | 4.1  | 71.0                                                          |
| Southern          | 602   | 17.7 | 6.5                                                           |
| North Caucasus    | 720   | 21.2 | 8.6                                                           |
| Volga             | 776   | 23.4 | 3.8                                                           |
| Ural              | 91    | 2.3  | 1.3                                                           |
| Siberian          | 373   | 11.0 | 0.9                                                           |
| Far Eastern       |       |      | -                                                             |
| Total for the Russian Federation | 3391 | 100.0 | 2.8 |

A sharp decline in the number of factory breeds (by 3.2 times) in the stud farms of the Southern Federal District is due to a significant decrease in the number of representatives of the high-draft breeds (Donskaya, Budenovskaya, and Trakenenskaya), which is confirmed by the data presented in Table 4.

**Table 4. Placement of the uterine stock of breeding horses in the Russian stud farms (January 1, 2019).**

| Federal districts | Breeding types | Trotter | Riding | Saddle | Draft |
|-------------------|----------------|---------|--------|--------|-------|
|                   | Heads | %    | Heads | %    | Heads | %    |
| Central           | 489   | 42.7 | -     | -     | 113   | 11.3 |
| Northwestern      | 50    | 4.3  | 45    | 8.7   | -     | -    |
| Southern          | -     | -    | 173   | 33.5  | 429   | 42.9 |
| North Caucasus    | -     | -    | 263   | 51.0  | 457   | 45.8 |
| Volga             | 348   | 30.4 | 35    | 6.8   | -     | -    |
| Ural              | 21    | 1.8  | -     | -     | -     | -    |
| Siberian          | 238   | 20.8 | -     | -     | -     | -    |
| Far Eastern       | -     | -    | -     | -     | -     | -    |
| Total for the Russian Federation | 1146 | 100  | 516   | 100   | 999   | 100  |

Currently, horses of the trotting trend, with a total reduction in their number by half, are still predominantly bred in the farms of the Central and Volga federal districts (42.7% and 30.4% of their total number). In the stud farms of the Siberian Federal District, the proportion of trotters increased from 10% to 20.8%. During the years analyzed, the number of horse mares in the horse-riding sector in the stud farms increased from 362 to 516 heads or by 42.5%; mainly, it is located in the North Caucasus and Southern federal districts and is 51% and 33.5%, respectively. The main mass of saddle mares is concentrated in the same districts, and it is 84.5%.

Unfortunately, during the analyzed period, the reduction of mares in horse-breeding factories in the draft mares from 1,620 to 730 heads or 2.2 times occurred. During the period of market reforms, the reduction in the number of mares producing composition in the stud farms was accompanied by a significant decrease in all production and economic indicators of the industry. However, the
reproduction of horses has deteriorated. The business output of foals per 100 mares was 72 heads in 1990, 60 heads in 2002 and 58 heads in 2017. Implementation of the breeding horses for every 100 mares (up to 39-40 heads) fell almost one and a half times. In comparison with 1990, an average annual domestic sales of breeding horses decreased 2.4 times, and the exports fell in more than four times.

According to some economists, the horse breeding has become a deeply unprofitable industry. In recent years, annual losses range from 300 to 400 million rubles. One of the reasons for this situation is an artificial transfer of costs from other spheres of production (in a number of farms) to the horse breeding, which distorts the real economic situation.

Based on the results of research, we found that in horse breeding there are a number of reserves to improve the efficiency of technological and organizational nature [3], [4]. First of all, this is connected with the improvement of horse reproduction, since the costs of maintaining the production composition (mares and stallions) are high and range from 41% to 45% of the total annual cost of rearing. These costs are fully transferred to the litter. Consequently, at high rates of business output of foals, their cost decreases. As an example, we can estimate the cost of a Russian draft breed at birth in the Vologda and Kuiedinsky stud farms for 2015-2017. In total, 23.5 million rubles were spent on the maintenance of the producing structure, which when receiving 179 foals (48 heads per 100 mares), the cost of one foal was 132 thousand rubles. If the business output of foals per 100 mares in these farms was at the level prevailing in the draft horse breeding in 1990, namely 77 heads, they would receive 286 foals with the cost price of one head 82 thousand rubles, i.e. 50,000 rubles lower.

Given the current situation with the reproduction of breeding horses, the state subsidies to breeding enterprises for the maintenance of the breeding stock using the “mare-foal” system seems appropriate [5]. In addition, stud farms incur significant additional costs for feeding horses, which is associated with the inefficient use of artificial pasture (paddocks). Our studies have found that the creation of highly productive cultivated pastures, with their rational use, reduces the cost of feeding by 1.5-2 times [6], [7].

Domestic and foreign experience testifies to the positive results of the introduction of group forms of keeping young stock of breeding horses and uterine stock, which contributes to increasing the efficiency of the breeding enterprises. Unlike the loose box technology, such methods of maintenance allow a 2-2.5 times increase in the labor productivity of horse breeders and reduce the cost of raising breeding horses by 15-20% [3].

In recent years, the costs of studs for the maintenance and hippodrome tests of horses have increased. Using the materials of the Novotomnikovsky stud farm as an example, we can conclude that the maintenance of one horse at the Central Moscow Hippodrome (tests were carried out for 2 years) cost the horse owner around 480-500 thousand rubles. Such high costs are due to insufficient use of reserves from sweepstakes and other sources of raising funds in the industry. Unfortunately, the share of revenues from sweepstakes decreased from 43.6% in 1991 to 10% in 2017. Calculations show that the effective operation of sweepstakes on previously profitable racetracks (Moscow, Pyatigorsk, Ramenskoye, by analogy with Rostovsky) makes it possible to additionally receive about 153 million rubles a year. This will allow horse owners not only to cover the costs of maintenance and testing of horses, but also to send significant amounts to other production purposes.

As the proven and successful experience of most foreign countries shows, the accelerated creation of the prize horse-breeding industry with a system of a single national equestrian sweepstake should be an important factor in improving the efficiency and sustainable economic functioning of horse breeding.

4. Discussion
At present, rational management of horse breeding should focus on the maximum use of intra-industry, organizational and technological reserves, tested in long-term practice. In the short term, the creation of functionally new production units in horse breeding, ensuring financial stability and self-sustaining profitable management of the stud farm, seems reasonable.
5. Conclusion

In the short term, the full satisfaction of the needs of mass horse breeding in pedigree improvers should form the basis of the principles of optimal placement of the industry. Also, there should be a clear program of the prize horse-breeding industry with a single system of national equestrian sweepstakes, forming the basis of the principles of optimal placement.

The leading areas for improving the efficiency of the horse breeding industry are the following: improving the reproduction of horses, rationalizing the technology of feeding and maintenance, enhancing the financial activities of racecourses, which requires considerable state support at the initial stage of formation.

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