

INNOVATIVE DEVELOPMENT DIRECTIONS OF DOMESTIC BEEF CATTLE BREEDING BASED ON SYSTEM-STRUCTURAL ANALYSIS

A. Sayfedinov¹

¹ Department of Production and Innovation Activity Organization, Kuban State Agrarian University named after I.T. Trubilin, RUSSIA.

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ABSTRACT

The decomposition of the system of organization of production, processing and marketing of meat cattle products was performed, which allowed us to justify the priority directions of its innovative development and the factors that primarily determine the efficiency of its operation. The high technological dependence of domestic producers on foreign breeding material, feed additives, veterinary drugs, as well as machinery and equipment for equipping reproductive and feed farms and complexes has been established, and its overcome measures have been justified. The role of the transfer of breeding-genetic and technical-technological innovations for commercialization in production as an important element in the formation of the scientific and technical potential for the development of the sub-industry is determined. It has been established that in order to implement an import substitution program with filling the domestic market with competitively priced beef of own production, it is necessary to ensure a multiple increase in the number of livestock of specialized meat and cross breeds obtained as a result of artificial insemination of dairy cows with semen of high-value meat bulls. The economic efficiency of organizing a separate production cycle in beef cattle breeding during its restoration and development in regions with a large share of the area of pastures for cattle grazing during the warm season is justified. The priorities of state support for the sub-sector are justified.

Disciplinary: Agricultural Economics (Animal Economics),
Management Science.

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1. INTRODUCTION

In the last 15-20 years, domestic animal husbandry has developed mainly due to poultry and pig farming, which differ in economic and biological features of functioning with high asset turnover and

profitability, which in turn led to a noticeable imbalance in the structure of meat production and consumption in the country (Tikhomirov, 2018). Thus, in Russia, the number of livestock and production volumes of cattle meat (cattle) are still continuously decreasing, which in 2018 amounted to 2.8 million tons in live weight, or only 38% of the level of 1990, while the share of beef consumption in the structure of diets is decreasing in favor of cheaper pork and poultry meat. The development of beef cattle breeding in Russia is currently complicated by the large unprofitability of the sub-sector and the high share of imported beef in the commodity resources of the market, which limits the food security and independence of the country, with noticeable positive results in import substitution of other types of meat.

To ensure the rapid recovery of domestic beef cattle in these difficult conditions is possible only on the basis of innovation, providing for the increase of cattle specialized meat breeds and overcoming technical and technological backwardness due to the development in the production of breeding and genetic, technological, organizational, managerial, infrastructural and other innovations.

When economic justification of innovative development priorities is used, the processes of restoration and functioning of beef cattle breeding should be thoroughly studied, structurally ordered, and maximally adapted to the existing resource, scientific, technical, and natural-climatic potential of agriculture in each specific region of the country. Beef cattle breeding is a complex production and economic system, the decomposition of which into groups of elements and connections will form a solid scientific basis for solving the tasks set for the restoration and innovative development of this sub-sector of animal husbandry in Russia.

2. SYSTEM-STRUCTURAL ANALYSIS

Figure 1 shows the author's diagram of the system of organization of production, processing and sale of cattle meat to the final consumer at the market, which highlights the elements of state regulation, scientific, technical and resource support for the recovery, development and functioning of the sub-sector, as well as all the links of value creation in the chain of reproductive and fattening enterprises, meat processing plants, wholesale and retail trade organizations.

The generalization of the results of the conducted research allowed to determine the specialized beef cattle as a complex natural-biological and organizational-production system in livestock, providing the basis for reproduction and fattening of cattle for meat and mixed breeds, having advantages over dairy breeds in terms of productivity, feed conversion and product quality, meat processing enterprises with the raw material for the production of high quality beef in amounts that meet the existing capacity of the domestic market requirements of food security doctrine and practice of healthy nutrition of the population, and processes of the organization and functioning of which should be adapted to climatic and resource potential of the region's accommodation facilities through the development of breeding and genetic, technical-technological and organizational-managerial innovations, which in turn will allow the agricultural producers to overcome the current most unfavorable production gain of live weight of cattle and to ensure the expanded reproduction of the sub-sectors.

The scientific and technical potential for the development of domestic beef cattle breeding, realized in practice mainly in the form of selection-genetic and technical and technological innovations mastered in production, is presented in Figure 1 by the institutes of industrial science, as

well as pedigree cattle breeding enterprises, which, on the one hand, use in their activities the advanced achievements of science and technology in the field of genomic selection and molecular genetic research with the development of innovations in agricultural biotechnology (Tikhomirov, 2016), and on the other hand - must provide on this basis reproductive and fattening enterprises, as well as centers of artificial insemination of cattle breeding with high-tech breeding products of highly productive meat breeds, which, unfortunately, is currently not fully implemented in the country.

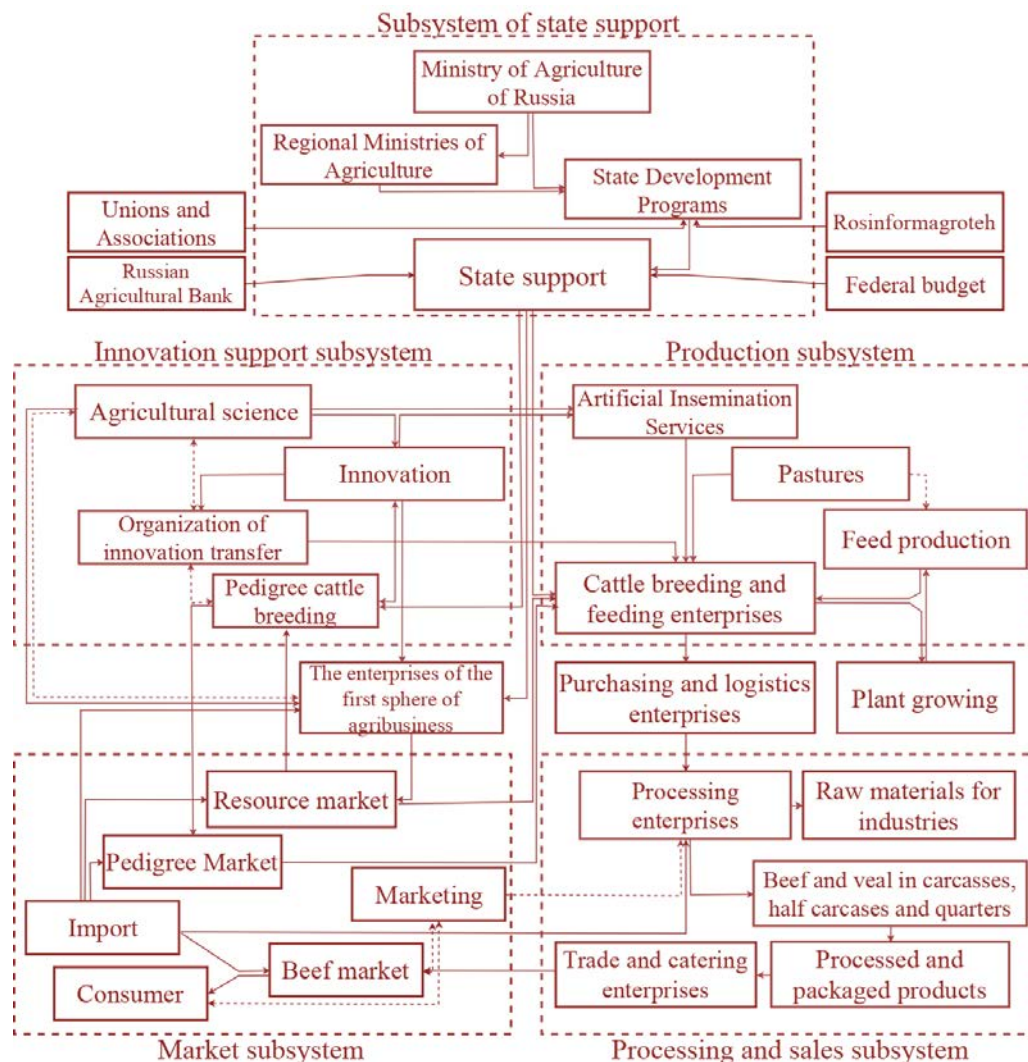


Figure 1: Scheme of the organization of production, processing and distribution of cattle meat

The subsystem for the production of sub-industry products in Figure 1 is represented by reproductive and fattening enterprises, fodder production and services for artificial insemination of cattle. Domestic beef cattle breeding is organized mainly on the basis of fattening animals of dairy breeds, while in countries with developed livestock manufacturers use specialized meat breeds of cattle that have great competitive advantages over dairy breeds in terms of productivity, feed conversion and meat quality (Ceyhan and Hazneci, 2010; Otieno et al., 2012; Rakipova et al., 2003). In Russia, in order to implement an import substitution program with filling the domestic market with competitively priced beef of own production, it is also necessary to ensure an increase in the number of livestock of specialized meat breeds and to bring its share in the total cattle stock to the level of developed countries in the medium term (more than 50%).

The subsystem of processing and sale of meat cattle products to end consumers is represented at

the market by meat processing enterprises, as well as wholesale and retail trade organizations. To ensure effective interaction with fair pricing in the value chain of beef cattle products in the country, the development and functioning of adequate economic mechanisms for the integration and cooperation of producers who organized cattle fattening, processing and trade enterprises, as well as purchasing and logistics companies are necessary.

The market subsystem in Figure 1 is represented by elements of markets for meat cattle products, mainly beef of various kinds and price segments, basic production resources, as well as breeding animals and semen material with critically large proportions of imported products.

The subsystem of the state support is represented by the Ministry of Agriculture of Russia, regional ministries and departments of agrarian profile, existing Federal and regional strategies and programmes for the development of domestic beef cattle, mainly determining the direction, shape, size, and targeting of state support of development of sub-sector under tight government budget restrictions.

3. RESULT AND DISCUSSION

The system-structural analysis of the elements and relationships of the scheme in Figure 1 allowed us to identify, systematize and rank the factors that primarily determine the economic efficiency of specialized beef cattle breeding, and identify the main problems currently holding back its recovery and development in the country (Figure 2).

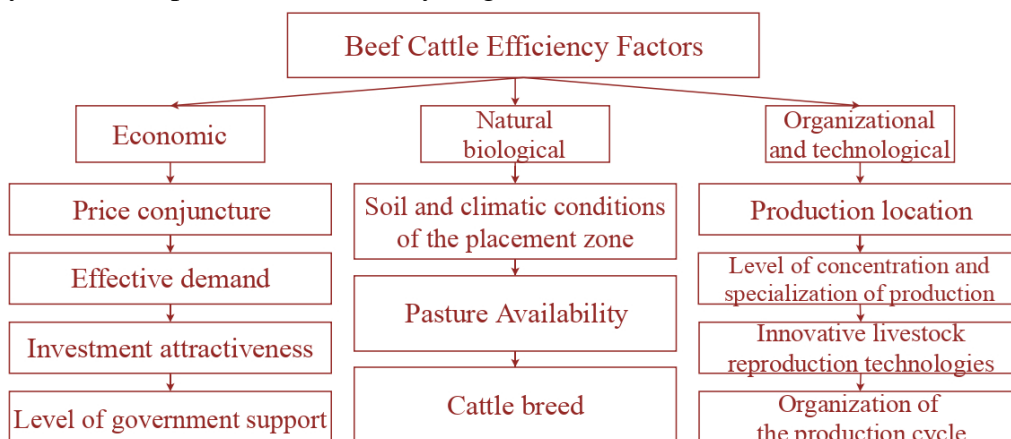


Figure 2: Classification of factors determining the effectiveness of specialized beef cattle breeding.

The group of economic factors includes the price situation on the cattle meat market, the effective demand of the population, the investment attractiveness of the sub-sector, as well as the level of state support for producers. In the group of natural-biological factors soil and climatic conditions of the area, species composition of livestock, largely determining the biological productivity potential and availability of pastures, which is an important element in the forage of beef cattle, are distinguished. The group of organizational and technological factors includes zonal placement, level of concentration and specialization of production, innovative technologies for reproduction of livestock, as well as the organization of the production cycle.

3.1 SUSTAINABLE DEVELOPMENT OF BEEF CATTLE BREEDING

When choosing cattle meat to increase the number of animals in domestic herds of domestic beef cattle breeding, it is important to take into account the research results available in pedigree plants and reproducers in the direction of increasing the productivity and adaptability of individual breeds to

the local climatic conditions of specific breeding regions. The analysis showed that the breeding base of domestic beef cattle breeding is mainly formed by animals of the Kalmyk, Hereford, Aberdeen-Angus and Kazakh white-headed breeds, which make up about 98% of its structure (Fedorenko et al., 2019).

Unfortunately, during the reforms of the agricultural sector of the economy in the 1990s-2000s, the system of forming and replenishing breeding herds of commodity farms and complexes in the domestic livestock industry was destroyed. Therefore, at present, when organizing the functioning of new production facilities in meat cattle breeding, producers use mainly breeding animals imported from the world's leading breeding centers and often have advantages over existing domestic breeds in terms of productivity potential, feed conversion and the quality of the final product.

Therefore, for the sustainable development of domestic beef cattle breeding, it is necessary, along with the acquisition of expensive breeding stock of western breeding livestock, to restore domestic sectoral science and increase the genetic potential of the existing herd's productivity in the country by improving genetic resources, developing and expanding the breeding base (Bershitsky et al., 2018) of breeds of domestic selection with high biological productivity potential, good resistance and adaptability to the natural and climatic conditions of a specific breeding region, which will allow in the future to overcome partially the large technological import dependence of the sub-sector and thereby reduce foreign economic risks and threats of a political, biological and financial nature and increase the efficiency of its functioning.

State support for breeding livestock should be aimed at compensating part of the costs of keeping breeding cattle in existing breeding plants and reproducers, as well as co-financing the construction and organization of functioning in the leading agricultural regions of the country of modern selection and genetic centers for meat cattle breeding, providing the sub-sector with high-quality breeding products, including embryos with a high degree of survival from outstanding parents in the breed (Chinarov et al., 2017).

A certain increase in volumes and production efficiency of cattle meat is also possible due to the formation of a large number of cross-breeding calf bulls, obtained as a result of artificial insemination of the share of dairy cows kept in dairy farms and households, divided by the semen of elite meat breeds by sex that will ensure high growth rates of cattle for fattening while minimizing investment in the purchase of expensive breeding stock of animals. At the same time, the size of this share of cows requires scientific justification and should not limit the possibility of expanded reproduction in domestic dairy cattle breeding.

3.2 TECHNOLOGY & INFRASTRUCTURE

In our country, the technology of artificial insemination of cows with gender-separated calf bull semen has not yet become widespread, which is explained by the lack of necessary production and infrastructure facilities, the lack of highly qualified personnel able to work with these innovative technologies, as well as high prices for imported seed material with often low quality, which forces producers to use up to 4-5 doses for successful artificial insemination of one cow. It is therefore necessary in parallel with the creation of its own infrastructure for the production and use of separated by sex of semen and embryos with a high degree of survival, to provide improval of staffing, and technologies to enhance the safety qualities of multiplication of the seed after separation, freezing and thawing.

The research has shown that improving the efficiency of specialized beef cattle breeding can be achieved by dividing the production cycle in the sub-sector into two stages. The first stage, related to the maintenance of the breeding stock of cattle, obtaining the offspring and growing it until the final fattening, should be organized in areas with sufficient areas of pasture for keeping and feeding animals in the warm season, which will allow producers to reduce the cost of feeding livestock by almost a half. The second stage of the production cycle in specialized beef cattle breeding includes the organization of the final fattening of calf bulls using concentrated diets and should be organized with the placement of feedlots in areas with the most favorable soil and climatic conditions for the effective production of concentrated feed. At the same time, we note that in this case it is important to ensure balance equality of capacities of existing and created reproductive and fattening enterprises, meat processing plants and transport logistics organizations that provide cost-effective and most comfortable movement of animals between the main production facilities with minimal stress of livestock and risks of spreading infectious diseases.

With the development of intra-industry territorial specialization in beef cattle breeding, which provides for separate processes of reproduction and fattening of cattle, it is important to justify fair price boundaries in the product chain of reproductive, fattening farms and complexes, processing enterprises, as well as wholesale and retail organizations.

3.3 MARKETING OF CATTLE MEAT

Currently, in this chain of product movement in the domestic market of cattle meat, unfair pricing has developed, in which an unreasonably large part of the income remains with processors and trade enterprises, and the established purchase prices for live weight cattle often do not even provide a return on the cost of reproduction, cultivation and fattening of animals at reproductive and fattening enterprises and do not allow for expanded reproduction in the sub-sector. Price imbalances in this chain can be eliminated as a result of the development of mutually beneficial integration and cooperation processes between all its participants, as well as improving the system of state regulation of the sub-sector. When organizing domestic specialized meat cattle breeding, it is necessary to include in this chain, as a result of creating an effective organizational and economic mechanism for cooperation, households that have a large resource base of cows for reproduction of domestic bulls and currently do not have access to innovative technologies and progressive forms of production organization, processing and distribution of products.

The studies conducted also showed that the current pricing of various breeds of cattle on the domestic market does not fully take into account the large differences in the quality and marbling of meat, and the additional income generated by these differences in the form of price premiums for the sale of marbled beef remains with processors and wholesale and retail organizations, which reduces the profit potential of agricultural producers who organized the reproduction and fattening of cattle of elite meat breeds.

3.4 MECHANISM & STATE SUPPORTS

The development of domestic beef cattle breeding is currently constrained by the lack of domestic machinery and equipment for livestock breeding, effective and safe feed additives and veterinary preparations, which forces producers to purchase imported analogues, the prices of which are growing at a faster pace during years of sharp fluctuations in the national currency, which leads to a forced increase in capital and current costs during the construction and organization of the operation

of production facilities and as a result reducing their effectiveness. To solve this problem as soon as possible, high material, financial and intellectual resources will be required in the scientific and technical sector of the agro-industrial complex with the organization of an effective mechanism for the transfer of technical and technological innovations created in it for subsequent commercialization in production, an important element of which is the information support of innovative processes currently carried out mainly through the organization of information and consulting services, specialized fairs and exhibitions.

3.5 DIRECTIONS OF LIVESTOCK DEVELOPMENT

The performed research shows that the existing sizes and directions of state support for beef cattle breeding do not fully provide the solution of the tasks set for the restoration and development of the sub-sector (Trubilin et al. (2018). With this in mind, as priorities of state support for domestic specialized beef cattle breeding at the first stages of its development, it is recommended to subsidize part of the interest rate on investment and short-term loans from commercial banks directed to the construction of new and modernization of existing breeding and fattening enterprises, as well as partial reimbursement of the cost of purchasing breeding animals of elite meat breeds for completing their breeding stock (Bershitsky, Sayfetdinov, 2017).

At the same time, the system of state support for domestic beef cattle breeding should be expanded to domestic producers of machinery and equipment for livestock breeding, feed additives and veterinary preparations, for which there is the greatest deficit in the market, and include the formation of favorable taxation regimes, the creation of effective concessional lending mechanisms and targeted distribution of direct subsidies from the federal budget, stimulating accelerated import substitution of the most important means and labor sub-sectors at the domestic market.

4. CONCLUSION

1. The generalization of the results of the conducted research allowed to determine the specialized beef cattle as a complex natural-biological and organizational-production system in livestock, providing the basis for reproduction and fattening of cattle for meat and mixed breed, having advantages over dairy breeds in terms of productivity, feed conversion and product quality, meat processing enterprises, the raw material for the production of high quality beef in amounts that meet the existing capacity of the domestic market requirements of food security doctrine and practice of healthy nutrition of the population, and processes of the organization and functioning of which should be adapted to climatic and resource potential of the region's accommodation facilities through the development of breeding and genetic, technical-technological and organizational-managerial innovations, which in turn will allow the agricultural producers to overcome the current most unfavorable production gain of live weight of cattle and to ensure the expanded reproduction of the sub-sectors.

2. Currently, the development of domestic beef cattle is constrained by unduly low proportion of cattle specialized meat breeds in the total livestock with low use of innovative industrial technologies, adapted to the conditions of the locations of production facilities; the accumulated problems in the selection and breeding work are not able to provide reproduction and fattening enterprises fully with breeding cattle of meat breeds of domestic selection, competitive with elite

foreign breeds, and the lack of an effective system of acquisition of breeding stock commodity herds; lack of effective economic mechanisms of pricing regulation in the chain of product movement of beef cattle from agricultural producers to final consumers in which currently there is a very unequal distribution of income with the formation of the greater part of the processing and trade enterprises; low level of state support for the sector.

3. For the effective restoration and development of domestic beef cattle breeding in each particular region, it is important to take into account factors of the natural biological, organizational, technological and economic groups, including the availability of pedigree resources of beef cattle adapted to the climatic conditions of the breeding site, the possibility of organizing a separate production cycle with concentration breeding stock with calves in reproductive farms located in areas with a high proportion of pastures, and further on fodder of young cattle at enterprises in areas with economically developed production of concentrated feed, as well as the prevailing pricing environment in the cattle meat market and the presence of effective demand from the population.

5. AVAILABILITY OF DATA AND MATERIAL

Information of this study can be made available by contacting the corresponding author.

6. ACKNOWLEDGMENT

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Dr. Alexander Rafailovich Sayfetdinov is an Associate Professor, Department of Organization of Production and Innovation, Kuban State Agrarian University, Russia. He holds a PhD in Economics. His research interests include the Application of Economic and Mathematical Methods in the study of Agricultural Production Systems, the Innovative Development of the Agroecomics/Agricultural Complex.

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