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The Belgorod Model of Pig Breeding Development: Investments & Competitiveness and Food Security

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Abstract

The article deals with topical issues of investment development of pig breeding by the example of the Belgorod region. To develop high-tech investment projects, there is a great necessity for a qualitative improvement in the selection-and-breeding work of domestic pig farms to achieve the best world and domestic results. In the context of globalization of the agro-food market and the need to develop exports of agricultural products of the Russian Federation, the article concludes the need to develop organizational measures and financial-and-economic mechanisms to increase the competitiveness of export-oriented pig-breeding agro-industrial formations. Consumer market saturation with meat and meat products of domestic production at the level of 85-90%, and, consequently, achievement of the major parameters of the Food Security Doctrine of the Russian Federation, that leads to the gluts of pig products on the market. Tougher competition in domestic and foreign agri-food markets initiates the search for effective forms and methods of regulating the pig meat market, especially since the production capacities of specialized pig breeding complexes are increasing from year to year.

Disciplinary: Agribusiness Management.

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1 Introduction

Over the past two decades, Russian pig breeding has undergone a number of tremendous changes. Due to them it has developed from a deeply backward agricultural sector into a high-tech one, where highly intelligent developments are regularly implemented to increase the efficiency of management. However, as the study showed, the current measures to support the industry are not enough to compete successfully at the world markets, moreover, the industry needs more and more investment resources with every coming year to modernize existing production facilities. Thus, we studied the experience of development of pig breeding and analyzed the mechanisms for stimulating the export in the largest pig producing countries in order to introduce the most effective measures and methods that will encourage the competitiveness of domestic pig producers.

The study of investment activities and competitiveness improvements are basic for ensuring the country's food security in modern economic conditions, both at the level of state and regional policies and the development of mechanisms for the economic sustainability at a particular enterprise.

Since the middle of the 20th century, the scientific community has begun to pay great attention to the formation of economic aspects of food security, as the problems of shortage of world food resources were urgent. Such global organizations as the UN (United Nations Organization), UNICEF (UN Children's Fund), FAO (Food and Agriculture UN), WHO (World Health Organization) and others had the most important role in developing solutions to these problems. It was at the World Food Conference in 1974 that the term “food security” was first introduced, which meant “maintaining stability in food markets with the availability of basic foodstuffs for all countries of the world.” [1] Later the concept has been expanded significantly, and today food security means not only physical and economic access to food but also social.

The issues related to food security, investment and competitiveness are studied by many scientists. Russian scientists have formed and proved the theory of the progressive development of economic systems, developed main provisions in the concept of economic security, which determine the essence of food security and its role in the system of economic security. The monographs and scientific articles of the scientists depict the status and variability of the modern food security system under the influence of negative external factors. By degree of food availability, as a rule, one distinguishes total, partial and imported food security. We have the total food security if the state provides its population with its own basic food products fully.

Following this concept, the agricultural scientists, in particular, who studied the pig industry, agree that issues on investments in the industry and its competitiveness affect directly the availability of pork meat at the domestic market, which is the main factor in achieving the level of the doctrine of food security in the Russian Federation. Based on the studied literary sources, we can conclude that this issue requires further systematic studies and the development of specific proposals to achieve the declared parameters of the food supply.

2 Materials and Methods

In the period after the collapse of the Soviet Union (starting from the 90s), the Russian Federation was undergoing a transition to a market economy, which caused fundamental changes in the country's agriculture and agro-industrial complex. The most significant changes affected the organizational structure of the agro-industrial complex, the management system, land relations, which resulted in the transformation of the principles of functioning of the economic system in agriculture as a whole. These changes encouraged the government of the Russian Federation to develop practical tools for the development of market relations, state support, and the formation of material and technical resources at enterprises that contribute to improving the efficiency of the agro-industrial complex as a whole.

To solve these tasks the Priority National Project "Development of the Agro-Industrial Complex" [2] was developed and implemented in 2005-2006, its main direction was the development of animal husbandry as the most labor-intensive and problematic area of agricultural production. This made it possible to occupy a huge part of the country's able-bodied population, to attract it to the real agrarian sector of the economy. It is a fact, that animal husbandry has a leading role as a food source for the population and a means of developing its own independent food base. The accelerated development of animal husbandry within the framework of the Priority National Project made it possible to make conditions for the development of the production of competitive import-substituting products.

The most urgent problem was the contribution of animal husbandry to the total volume of agricultural production, as its share tended to decrease annually. Thus, in 2004 it was 45% (in 2001 - 47%). At the same time, the world practice shows that in highly developed countries, the largest part of agricultural production falls on animal husbandry (in Germany, it is 52%). Moreover, the growth potential of agricultural production with the growth of livestock production is much higher, that is, it acts as a kind of locomotive for the development of related industries, consuming significant volumes of crop production.

In addition, the social realities of that time required a significant growth in the meat and meat products market: according to indicators of meat consumption per capita, it was 53 kg in the Russian Federation in 2005-2006, while in developed countries this figure was 80-100 kg.

However, the most important task of agriculture is not only to provide the country's population with food, and industry with the necessary raw materials. Within the formation of a market economy, this problem could be solved only by increasing the economic efficiency of agricultural production. This was the basis for the development and adoption in 2010 of the Food Security Doctrine of the Russian Federation [3], according to which the share of domestic agricultural raw materials and food in total sales on the market should be not less than:

- meat and meat products 85%;
- milk and dairy products (in terms of milk) 90%;
- fish and fish products 80%;

- grains and potatoes 95%;
- sugar 80%;
- vegetable oil 80%.

3 Results and Discussion

Since 2008 the Priority National Project "Development of the Agro-Industrial Complex" has transformed into the State Program on Development of Agriculture and Regulation of the Markets of Agricultural Products, Raw Materials and Food (State Program) for 2008-2012. While its implementation, investing of agricultural organizations and agro-industrial enterprises was carried out mainly by attracted sources of financing, that is, bank loans, which resulted in an increase of accounts payable to credit institutions. To confirm this fact, we should consider the growth rate of the credit burden of the Ministry of Economic Development of Russia (a ratio of the volume of debt on bank loans and loans of agricultural organizations to the total revenue in the industry), which in 2005-2012 increased from 40% to 92%, while the average indicator for the economy increased from 21% to 70%. Subsequently, the State Program for 2008-2012 was transformed into the State Program on Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets (State Program) for 2013-2020, and a consolidated volume of investments in fixed capital of agriculture, as well as in the food and processing industry, was expected to be 3,289 billion rubles. The developed measures contributed to the adaptation of the agro-industrial complex to function in new realities after the Russian Federation's joining the WTO, as well as to development of import substitution of agricultural products. Further, when the State Program will be extended until 2025, the planned total volume of state support for agricultural producers for 2013-2025 will be 8,016 billion rubles, 40% of which comes from the federal budget, 6% from the budgets of the constituent territories of the Russian Federation and 54% from extrabudgetary sources [4]. (Table 1)

Table 1: Parameters of financial support of the State Program on Development of Agriculture and Regulation of Agricultural Products, Raw Materials and Food Markets for 2013-2025, million rubles

Indicator	Total	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total volume of financial support	8015590	260961	262123	254982	295929	257529	165607	793740	746757	731798	811733	842244	846588	745000
Volume of budget fund allocations of federal budget	3157568	158748	170149	187864	2370000	215852	241986	303620	283592	256175	279792	295468	317372	209951
Volume of budget fund allocations of consolidated budgets of constituent territories of RF	493497	75665	73378	53512	47360	29044	44966	21329	16435	29394	33567	39745	14532	14569
Volume of funds from extrabudgetary sources	4364524	26548	18596	13606	11569	12632	878655	468791	446730	446229	498374	507030	514684	521080

Source: State programs for the development of agriculture and the regulation of agricultural products, raw materials & food markets.

The response of the business community in some constituent territories of the Russian Federation to the developed support measures was active, in a short period, with the help of state authorities, large livestock enterprises were designed and put into operation, and the Central Federal District (CFD) had the most significant contribution to increasing production at the domestic market. Such regions as the Belgorod, Kursk, Tambov, and Oryol, ones have become locomotives for the development of agricultural animal breeding. The production of livestock and poultry for slaughter (in live weight) increased from 10.549 thousand tons in 2010 to 15.563 thousand tons in 2020 (a 147.5% increase). However, the greatest development was in industrial pig breeding and poultry farming, which over the previous nine years showed an increase of 65.5% and 76.5%, respectively (Table 2).

Table 2: Production of the major livestock products in the Russian Federation, thousand tons

Products of animal origin	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020 to 2010. %
Livestock and poultry for slaughtering (in live weight)	10549	10955	11596	12189	12843	13397	13896	14513	14880	15164	15563	147.5
Cattle	3028	2857	2874	2864	2855	2820	2777	2738	2798	2827	2978	98.3
Pigs	3097	3207	3292	3615	3812	3951	4329	4550	4797	5032	5126	165.5
Poultry	3878	4338	4875	5152	5585	6039	6191	6618	6671	6709	6845	176.5
Milk	31508	31204	31197	29865	299995	29887	29787	30158	30612	31351	32450	103.0

Source: The Federal State Statistics Service of the Russian Federation

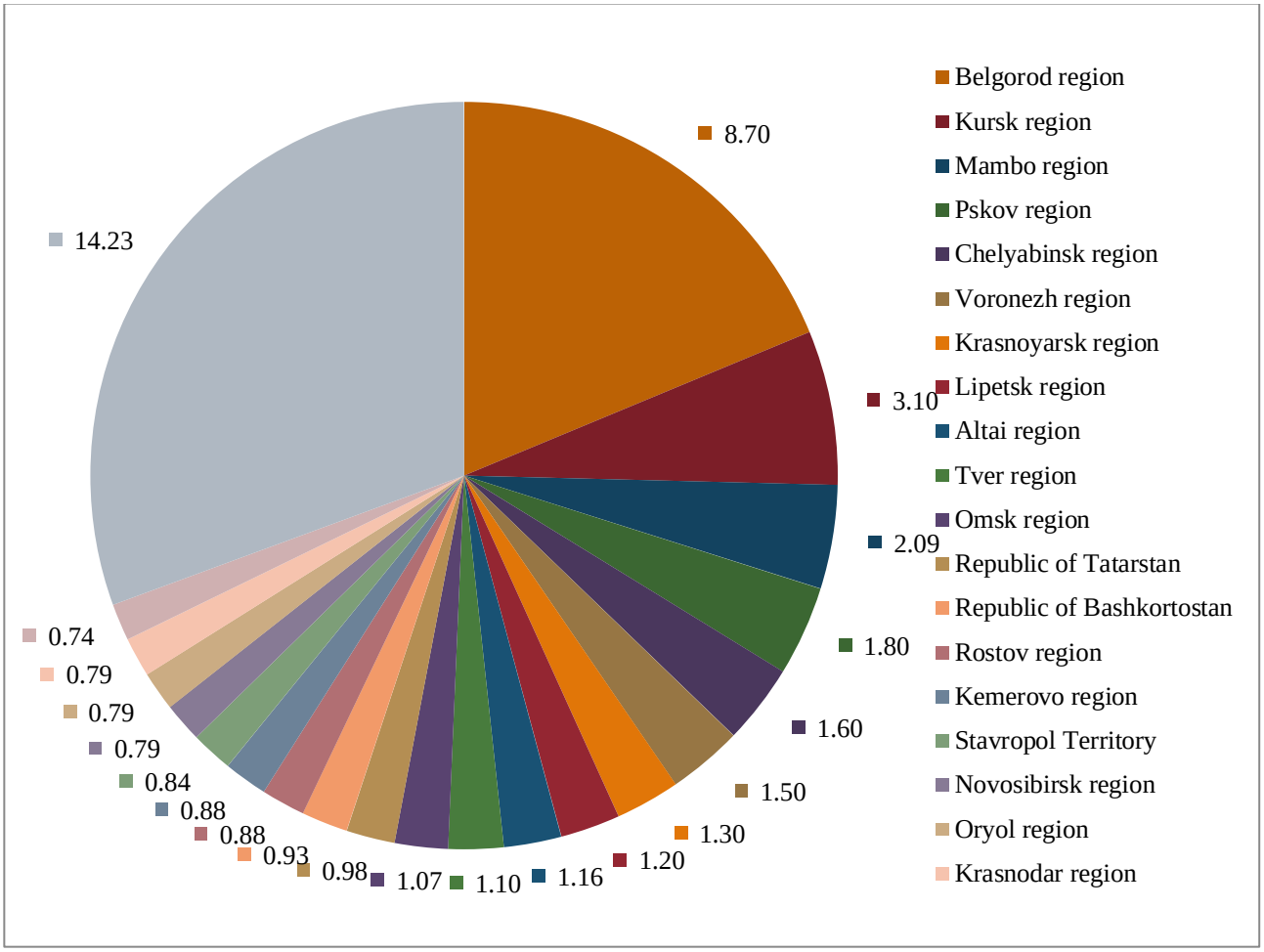

Figure 1: The pig population by the RF regions in 2019, mln heads

Source: agricultural community Direct.Farm https://direct.farm

The state policy aimed at intensifying the production in the livestock industry has shown that with a well-designed approach and purposeful cooperation of authorities and businesses, it is possible in a short period of time to achieve not only the main parameters of the Food Security Doctrine but also the target indicators of import substitution. So, in 2018, the Russian Federation reached full self-sufficiency in pork with an indicator of 3.744 million tons in slaughter weight.

Table 3: Dynamics of indicators in the pig breeding industry in terms of holding structures

Indicators	Agricultural holdings					
	«Agro-Belogorye»	«Miratorg»	«Rusagro»	«Belgrankorm»	«DON»	«Promagro»
Average annual population, thousand heads						
2017	964	1570	418	320	257	229
2018	1094	1628	388	332	379	284
2019	1292	1578	527	332	385	283
2020	1345	1598	563	335	391	289
Volume of sold products, tons						
2017	179130	303322	76204	53856	73818	29993
2018	219697	208242	44209	57315	80773	22771
2019	238767	310804	104855	61218	79991	19550
2020	247630	315740	108560	63874	81541	20128
Cost price of 1 kg of sold products, rubles						
2017	66.13	47.70	61.94	67.00	73.28	113.23
2018	69.94	48.03	54.88	67.75	70.80	99.03
2019	75.01	55.06	93.98	73.07	77.63	68.56
2020	78.10	56.32	94.78	74.10	78.90	69.78
Price of 1 kg of sold products, rubles						
2017	83.00	94.20	89.98	112.02	91.52	154.10
2018	92.07	101.41	86.21	115.19	95.94	151.53
2019	85.54	92.56	107.17	100.39	86.58	87.75
2020	86.54	93.74	108.37	101.25	87.56	87.53
Profit from product sales, thousand rubles						
2017	3022155	1414100	2136873	2424586	1346522	1225861
2018	4862287	16452881	1384874	2663363	2030845	1195507
2019	2465925	11653864	1383142	1672015	715884	375125
2020	2543675	11753687	1394145	1684236	725476	389745
Profitability of production, %						
2017	26	97	45	67	22	36
2018	32	111	57	68	36	53
2019	19	68	14	37	12	28
2020	19	69	15	39	14	29

Source: The Department of Agro-Industrial Complex and Environmental Reproduction of the Belgorod Region

For greater clarity, it is necessary to show the dynamics of the main production and economic indicators of pig-breeding agro-industrial formations of a holding type on the territory of the Belgorod region - a leader in the development of the pig-breeding industry in the Central Federal District and the Russian Federation as a whole. Since the beginning of the implementation of priority national projects and state programs in the Belgorod region, the main agricultural production pig-breeding capacities have been formed due to vertically integrated agro-holding

structures with a closed cycle (from field to counter), which has become a main competitive advantage of the region. Today, several vertically integrated agro-industrial holdings with a closed production cycle operate on the territory of the Belgorod Region - from growing basic crops on their own fields, which are processed at their own feed mills to produce feed for the whole animal population raised at pig farms, to processing and selling finished products at meat processing plants and in trading houses [5]. Such a structure of the pig-breeding business made it possible to restore commercial production of pork in a short time and achieve import substitution indicators (Table 3).

Table 3 shows that the annual increase in the pig population and the number of products sold is accompanied by the growing production cost. So, for example, with the average annual growth in livestock population in "Agro-Belogorye" in 2020 compared to 2017, product sales increased by 72.3%, at the same time, the production cost increased by 84%, which resulted in a decrease in profit by 19% and a decrease in profitability from 26% in 2017 to 19% in 2020. The analyzed processes in the context of globalization of the economy and development of integration processes in the agro-industrial complex, in particular in the pig breeding industry, are becoming more and more relevant. And the annual increase in the volume of the domestic market encourages large agricultural enterprises of the pig industry to increase their competitiveness with all available tools – to improve the quality of products by introducing high-tech innovations, to reduce the production costs by investing in production processes and regulating pricing policy through government measures support.

In addition, even the best pig breeding complexes of the Russian Federation get behind the leading firms and companies of the EU countries in many value indicators (parameters) related to the productivity of the breeding stock of pigs and young animals. Without specifying each indicator, we should mention one of the most important parameters of the efficiency of pig production - the average daily weight gain in young pigs. In the pig-breeding company "Egeborg" (Denmark) this indicator is 972 grams, which is almost three times higher than the average in Russia and one and a half times higher than in the best Russian pig-breeding agro-industrial formations. Certainly, the indicator of the productivity of young pigs affects directly the production period: the duration of fattening pigs to the optimal weight of one head of 110 kg. In particular, this indicator in the EU countries ranges from 77-120 days, while in Russia the best pig farms achieve the optimal slaughter weight of 110 kg in 120 days, and on average this period is 280 days in our country.

To achieve a high level of competitiveness, the domestic producers need to stimulate investment in innovative developments aimed at the development of the genetic potential of the industry. Large-scale breeding work must be carried out. Its result is establishing all-Russian breeding centers with purebred animals, which will be able to provide the domestic market with a breeding base with animal characteristics not lower than the imported ones.

Currently, the domestic experts in pig breeding agree that "... the industry has reached maturity, fully met the needs of the domestic market, and now its further development is directly connected with export opportunities" [6]. Considering the world experience in the development of pig breeding, one can notice a regular pattern - even with full self-sufficiency world leaders continue to increase production and aim at exports. Thus, the Netherlands has a level of self-sufficiency in pork of about 200%. Denmark, the world's leading producer of breeding pigs, is also a major exporter, producing five times more pig products than is needed for domestic consumption. Spain, increasing actively the number of pigs in recent years, has become the EU leader in the export of pork and pork products. The experience of these countries shows that in the long term, the financial stability of pork producers will be largely ensured by the growth of product exports, in particular to China, due to the spread of African swine fever (ASF) in the country since 2018. Such losses have made China one of the largest potential importers of pork. So, in 2019, China exported almost 2 million tons of pork, which is 67% more than the previous year.

In 2019 the government of the Russian Federation developed the federal project "Export of agricultural products", according to which, the export of agrarian products should grow to 45 billion dollars by 2030. According to experts, these figures are quite ambitious, considering that "the three pillars of the Russian Agro-industrial complex exports (grains, oil-and-fat products, fish) have reached maturity, and their increase is unlikely. An increase is possible only through a systematic increase in almost all other categories of the agro-industrial complex" [7]. So, special attention should be paid to the development of state support for pig breeding as the most dynamically developing industry in the last decade and as it has reached the level of complete import substitution. Undoubtedly, the developed programs to support the export of agricultural products, such as preferential loans, compensation of costs for transportation, and certification of products, will be systematically implemented in the Russian Federation and stimulate agricultural producers to increase the export volume of products, however, in our opinion, they are not enough. The developed mechanisms do not fully contribute to increasing the competitiveness of pig products that is why domestic products are significantly behind the foreign competitors in world markets [8].

For the successful development and implementation of the export potential of the Russian Federation, it is necessary to study thoroughly the experience of foreign countries exporting agricultural products and, based on this information, to transform the experience and introduce working tools into methods of Russia state support for export-oriented industries.

For example, the United States of America (USA) is one of the largest agricultural exporters. According to UNCOMTRADE, the export of agricultural products from the United States in 2018 was more than 145 billion dollars. Today the United States has a multi-level national export support system that operates both at the institutional and financial levels. For example, the most important link in this system is the Export-Import Bank of the United States (Exim Bank), which provides domestic exporters with credit, guarantee and insurance programs and annually finances export contracts for more than 15 billion dollars (the main share falls on export credits).

The experience of Israel is also interesting, where the Israeli State Export Insurance Corporation (The Israel Export Insurance Corp. Ltd., ASHR'A) has been established to help Israeli exporters insure export credits and investments abroad.

ASHR'A insures medium-term and long-term export credits (for 1-15 years) and Israeli investments abroad (mainly in developing countries) against political and commercial risks. The Corporation covers up to 95% of losses from political risks, such as wars, mass riots in the country of a buyer, nationalization, etc., and up to 90% of losses from commercial risks, such as smashup of a buyer, etc.

China has a powerful mechanism for supporting foreign economic activity (FEA), especially in the financial sector, as well as institutions that are improving the tools for this support. The key body responsible for the development and implementation of foreign policy is the PRC Ministry of Commerce, and the basis of the financial system for supporting exports is the Eximbank of China (The Export-Import Bank of China), funding some credit lines often exceeds 1 billion dollars [9].

Having studied foreign experience, state support in developed countries occupies a special place in foreign economic policy and promotes domestic products to export markets. It is necessary to use a set of measures, both institutional and financial, ranging from making favorable conditions for exporters to introducing various incentive measures that will allow pig-breeding enterprises to enter the international market with higher technologies and compete with global pork producers.

4 Conclusion

The studied Belgorod model of development of pig breeding is a highly effective production-and-economic structure, covering many sub-sectors of agriculture. It played a key role in ensuring the import substitution of pig products in the Russian Federation, which is confirmed by the data presented. The Belgorod region has a strong foundation for transferring the pig industry to an innovative development path. It has involved state support instruments in federal and regional programs on the development of agriculture in general and the pig breeding industry in particular.

At the same time, the saturation of the domestic market with pig products, combined with the simultaneous stagnation of solvent consumer demand questions the business, government authorities and science about increasing the competitiveness of pig products and finding ways to enter foreign markets. To achieve these goals, it is necessary to stimulate additional investments in innovative agricultural developments for making own breeding base, which should be comparable with the production indicators of the world's leading breeding and genetic enterprises, as well as to introduce energy-saving and feed-reducing technologies that will reduce the cost of the final product and make it competitive at world markets.

And it is extremely important to consider the many years of experience of world leaders in the export of agricultural products, as its analysis proves the important role of a state in promoting products to foreign markets by stimulating export-oriented producers by institutional and financial methods, without violating domestic production potential.

To achieve high parameters of competitiveness, the enterprises of a pig breeding sub-sector need to take a comprehensive approach to solve all issues and distribute the resources for development in all of these areas. The authorities should develop and implement methods focused primarily on the needs of potential exporters of pig products. The considered measures will make it possible to bring the Russian Federation with its agro-industrial complex into the rank of the leading exporting countries of agricultural products, in particular, pig products.

5 Availability of Data and Material

Data can be made available by contacting the corresponding author.

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