

INNOVATIVE DEVELOPMENT OF GRAIN PRODUCTS SUBCOMPLEX AS THE DRIVER OF NATIONAL FOOD SECURITY PROVISION

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Abstract

The research is devoted to problems of national food security provision. Issues of grain production innovative development were under study. The aim of the article was to identify trends and factors that determine the impact on improving the efficiency of grain subcomplex business entities economic activity. The study was conducted on the basis of state statistics of Russian agriculture development in 2010 – 2017. The results of the study show that there is a reduction of the fertilizer application influence determinants along with the enhancement of the degree of technical equipment as drivers of the grain product complex development. Resources for further growth of grain productivity due to the application of mineral fertilizers are exhausted. Further broader use of inorganic substances will designate the abatement of grain organoleptic characteristics, along with the upturn of soil mineralization parameters, which will naturally clarify its degradation. The upturn of business entities equipment marks with agricultural machinery as a reserve for the growth of grain productivity level has also exhausted its influence. It is determined that increasing the level of national food security requires the development of new innovative ways to improve the efficiency of grain production. This situation is particularly relevant from the standpoint on recent risk connected with agroindustrial production, along with strengthening the policy of sanctions and trade restrictions in world economy. Operational and strategic ways of grain subcomplex innovative development were defined.

Key words: innovations, development, food security, grain production, agriculture

INTRODUCTION

The problem of food security provision and agricultural production development is decisive from the point of view of national interests' advancement and protection. Having a stable position in international food markets is an important tool for achieving economic and political leadership in the modern world. Modern policy of sanctions and trade restrictions shows high actuality of the researched sphere.

In this case, a special role is played by the output of farming industry (its grain branch), which is the ground for fabrication of strategically important food commodity items. Researched branch of farming industry forms the raw-material base for the fabrication of feed and, accordingly, livestock products. The increase of competition in the world grain

markets, as well as increased tensions in international politics – significantly affect the parameters of the agro-industrial business structures functioning.

In these conditions, the most important resource for success in the competition is innovation, ensuring the growth of labor efficiency, productivity and capacity of major crops, which respectively determines the reduction of costs and increase profitability. Business efficiency along with state support form preconditions for strategic development of agrarian sector, form resource base for its research and development branch.

The problem of farming industry grain branch in the Russian Federation has been identified as the subject of a series of scientific researches. Theoretical framework of the study concerns the results of well known scientific works of scientists from Russia and

other countries who focuses their attention on the shortcomings of agroindustrial innovative development. In this case, we should mention works of A.I. Altukhov [1; 2; 3], J.V. Chutcheva and T.S. Mahmudova [4], S.A. Sharipova [15], P.A. Eriashcheva [5], T.I. Gulyaeva and O.V. Sidorenko [7]. Significant results were obtained in works devoted to the progress of farming industry grain branch in certain regions of Russia. Notably, the issues of grain output in Siberia [10], Saratov [17] Amur [12], Bryansk [16] regions were studied. Peculiar focus is to be made on the research results of Ukrainian farming industry grain branch [8; 9; 13].

Despite the considerable scientists' regard, problems of Russian farming industry grain branch innovative development remain poorly studied. It should also be noted that investigation of the outlined group of issues is worth to be performed with regard to present problems in the sphere of national food security insuring.

MATERIALS AND METHODS

Investigation grounds on the base of information formed by official statistics data of the Russian Federation [14], Food and Agriculture Organization of the United Nations [6], financial and operative reports of agrarian business entities. Research covers the period of 2010 – 2017. As the information base were also used programme regulations of Russian Government and local administrations. The study is based on the complex use of research methods set. During the research routine were used financial analysis tools, statistics method, historical and monographic methods.

RESULTS AND DISCUSSIONS

At the present stage of Russian agro-industrial production development there are positive trends in the field of innovative activity of business structures. Since 2016, domestic agricultural producers have started the production of innovative products (Table 1). Thus, the policy of resisting foreign sanctions

and the protectionist response started to bear results only two years after their imposition. The Russian Federation continues to be a producer of primary agricultural commodities, which are largely export-oriented. The domestic market of finished food products remains largely dependent on imports.

There is a significant need to increase the depth of Russian agricultural raw materials processing entire the country. To a large extent this applies to grain crops. High rates of grain yield bring Russia to the leading position in world grain exports, but this kind of expansion leads to the development of the opposite effect. There is a decline in world grain prices. Grain production and export lose their commercial attractiveness.

Table 1. Main indicators of innovative activity in Russian national economy and agro-industrial production (2012 – 2017)

	2012	2013	2014	2015	2016	2017
Produced and shipped goods, performed works and services by domestic business entities, trln. Rubles, including:	35.9	38.3	41.2	45.5	51.3	57.6
- innovative products, works, services	2.9	3.5	3.6	3.8	4.4	4.2
Share of innovative goods, works, services in total volume of the shipped goods, performed works and services, %	8	9.2	8.7	8.4	8.5	7.2
Shipped innovative agricultural products, billion rubles including:	0	0	0	0	22.2	28.4
- plant growing	0	0	0	0	6.5	11.5
- farming	0	0	0	0	14.9	16.6
- mixed agriculture	0	0	0	0	0.6	0
- providing services in the field of plant growing, ornamental horticulture and animal husbandry, except veterinary services	0	0	0	0	0.1	0.3

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/> [14].

At the same time, it should be taken into account that the entire Russian economy on average for 2010 – 2017 did not produce more than 8% of innovative products. Agriculture did not participate in the innovation process and, accordingly, accumulated a significant backlog.

Fertilize activity

Dynamics of grain production indicators (and its features) in Russia in the period of 2010 –

2017 can be traced on the basis of the following analytical data (Fig. 1, Table 2).

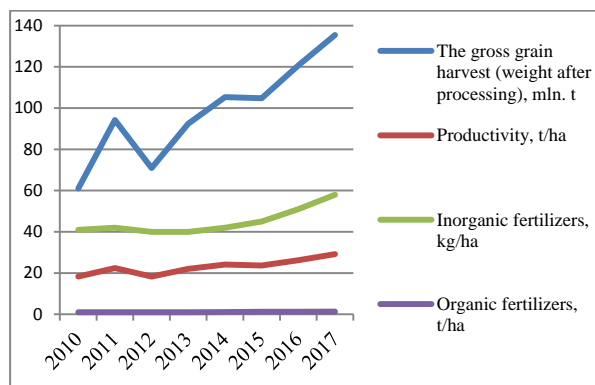


Fig. 1. Indicators of grain production in the Russian Federation (2010 – 2017)

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>; FAO, <http://www.fao.org/home/en/> [6 ; 14].

Table 2. Indicators of grain production in the Russian Federation (2013 – 2017)

	2013	2014	2015	2016	2017
The gross grain harvest (weight after processing), mln. t	92.4	105.3	104.8	120.7	135.4
Productivity, t/ha	22	24.1	23.7	26.2	29.2
Inorganic fertilizers, kg/ha	40	42	45	51	58
Organic fertilizers, t/ha	1	1.1	1.2	1.2	1.3

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>; FAO, <http://www.fao.org/home/en/> [6 ; 14].

In this case, we have analyzed the data on the gross grain harvest (in weight after processing), their yield, as well as the volume of organic and inorganic fertilizers.

The presented data make it possible to draw a conclusion about the decrease in the efficiency of Russian grain subcomplex. The growth of gross harvest significantly exceeds the dynamics of yield, which indicates only that the positive dynamics of grain harvest due to the increase in acreage. However, in our opinion other circumstances deserve attention. In 2015 – 2017, the dynamics of inorganic fertilizers significantly exceeded the rates of yield, which can point out a reduction in the impact of the mineral fertilizer determinant on the output of farming. In the meantime, the application of organic fertilizers remains at a low level and does not show significant positive dynamics.

The main drivers of growth in grain yield of crops is the usage of inorganic fertilizers. Application of organic fertilizers does not correspond to the degree of the enhance of the inorganic stuff application. Occurs the enlargement of the space of cultivated land. Thus, we should talk about the strict need for the introduction of new technologies and innovations in the farming industry grain branch of Russian agriculture. This is important in terms of food security because of the significant risks in crop production. A significant part of the Russian agricultural areas are in the zone of risky agriculture. This negative factor requires appropriate compensation, which is also due to significant climate change. Water scarcity is becoming a common phenomenon in the regions, with sufficient water resources were free available for a long time.

These conclusions are confirmed on the basis of the analysis of growth rates of the above indicators (Fig. 2, Table 3).

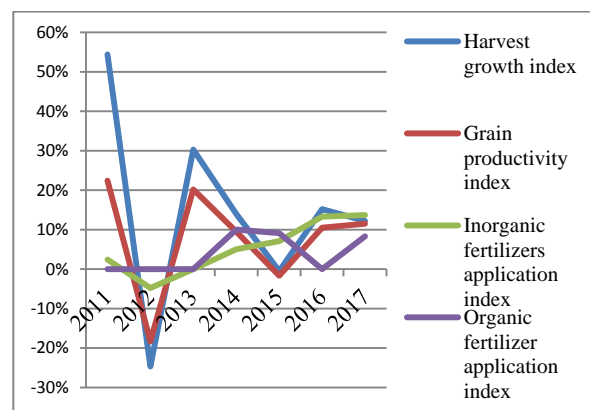


Fig. 2. Growth indices of grain production in the Russian Federation (2010 – 2017)

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>; FAO, <http://www.fao.org/home/en/> [6 ; 14].

Table 3. Growth indices of grain production in the Russian Federation (2013 – 2017)

	2013	2014	2015	2016	2017
Harvest growth index	30.3%	14.0%	0.5%	15.2%	12.2%
Grain productivity index	20.2%	9.5%	-1.7%	10.5%	11.5%
Inorganic fertilizers application index	0%	5%	7.1%	13.3%	13.7%
Organic fertilizer application index	0%	10.0%	9.1%	0%	8.3%

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>; FAO, <http://www.fao.org/home/en/> [6 ; 14].

In the situation of sustainable growth of inorganic substances volume fertilized by farmers, there is instability in the values of the resulting yield. Traditional, conservative methods of increasing the productivity of grain crops show a decrease in efficiency.

Quality of output

Worth to mention that such aspect of increase in volumes of gathering grain crop and its productivity as quality of the received production. This parameter in modern conditions is inversely proportional to productivity and gross yield. This problem is devoted to the work of Meleshkina E. P. [11] In the context of the elaboration of the researched food market and enhancing attractiveness the southern regions of the country (Rostov, Krasnodar and Stavropol Regions), producers have shifted to the production of relatively lower quality classes of grain (mainly 4th).

Traditionally, the southern region is considered to be the breadbasket of Russia, which used to grow the strongest and most valuable quality grain – high-quality, high-glass with a high content of good quality gluten. The orientation of the primary territories of commodity fabrication specializing in the cultivation of grain (predominantly IV category) due to formed demand for wheat of low quality has led to a further decline in the quality of Russian wheat. In contrast to the period when the share of food grain gradually began to increase at the expense of the 3rd and 4th classes, in modern conditions the share of wheat of the IV and V classes rises, and the characteristics of wheat in the Central and Volga Federal districts already becomes traditionally higher than in the southern district. In modern conditions, we can expect the rate of decline in quality is lower than before [11].

Technical provision

It is also important to study the impact of agricultural producers’ technical provision on the results of grain cultivation.

The factor of capital and technical security is decisive from the point of view of achieving technical perfection in production processes. We also note that the availability of modern technology significantly increases productivity. Accordingly, all this affects the financial performance of grain producers.

Increase in quality and quantity of the let-out equipment for agriculture in Russia allows to solve problems of increase of technical

security of agricultural producers. In this case, it is noteworthy that even under the conditions of foreign financial and economic sanctions, Russia in 2016-2018 became an exporter of agricultural machinery, in particular harvesters. Analysis of agricultural machinery provision gives information base for further conclusions in the sphere of grain productivity.

With this aim, the indicators of the number of crop productivity and agricultural machinery produced in the Russian Federation were analyzed (Table. 4).

Table 4. Park of agricultural machinery produced in the Russian Federation (2012 – 2017)

	2012	2013	2014	2015	2016	2017
Park of agricultural machinery, thousand units						
Tractors	276.2	259.7	247.3	233.6	223.4	216.8
Ploughs	76.3	71.4	67.8	64.1	61.6	59.7
Cultivators	108.7	102.2	97.8	93.2	90.3	87.6
Seeders	115.4	107.5	100.7	93.6	87.8	82.8
Grain combines	72.3	67.9	64.6	61.4	59.3	57.6
Produced agricultural machinery, thousand units						
Tractors	12.5	7.6	6.7	5.1	6.4	7.2
Ploughs	4.3	3.4	2.8	3.2	19.5	20.7
Cultivators	24.4	16.5	14.2	13.0	71.4	57.5
Grain combines	5.8	5.8	5.5	5.5	6.1	7.3
Growth rates of the main types of agricultural machinery park						
Tractors	-5.6%	-6.0%	-4.8%	-5.5%	-4.4%	-3.0%
Ploughs	-6.8%	-6.4%	-5.0%	-5.5%	-3.9%	-3.1%
Cultivators	-4.7%	-6.0%	-4.3%	-4.7%	-3.1%	-3.0%
Seeders	-6.6%	-6.8%	-6.3%	-7.1%	-6.2%	-5.7%
Grain combines	-5.6%	-6.1%	-4.9%	-5.0%	-3.4%	-2.9%
Growth rates of production of the main types of agricultural machinery						
Tractors	-5.3%	-39.2%	-11.8%	-23.9%	25.5%	12.5%
Ploughs	-37.7%	-20.9%	-17.6%	14.3%	509%	6.2%
Cultivators	-15.3%	-32.4%	-13.9%	-8.5%	449%	-19.5%
Grain combines	-10.8%	0.0%	-5.2%	0.0%	10.9%	19.7%

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>[14].

The growth rates of the park of agricultural machinery and productivity in the analyzed period were also compared (Fig. 3).

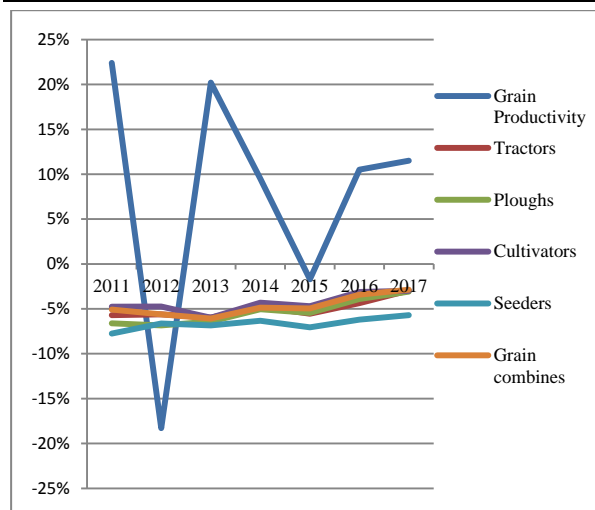


Fig. 3. Growth rates of agricultural machinery park and grain productivity in the Russian Federation, % (2010 – 2017)

Source: Federal State Statistics Service of Russia, <http://www.gks.ru/>[14].

The results of the data analysis makes it possible to conclude that the change in the degree of technique availability in the short and medium term does not affect the rise in the intensity of agricultural production. It is vital to search for new factors that increase the level of domestic grain production. The basis for achieving results in the studied field of activity is innovative activity aimed at improving the efficacy and intensification of national grain production. The rise in the fleet of agricultural machines and the quantity of fertilizers in the near future will not affect the improvement of the parameters of grain subcomplex functioning. In this case, can only increase the mineralization of soils and deteriorate the quality of products. The main driver of growth is innovation and know-how aimed at finding new (including hidden) reserves of productivity growth and production efficiency.

CONCLUSIONS

Areas of innovative development should first focus on priorities that can be ranked according to the planning horizon. In the operational perspective (1-3 years) it is necessary to carry out approbation works on adaptation of the best practices in the sphere of grain crops production, storage and processing. In the operational perspective, it is

also necessary to determine the promising areas of domestic research and development for the strategic perspective.

The strategic plans (5 years) should focus on genetic research, which should take into account climate change and the characteristics of the new agricultural zoning. In this context, scientific investigation in the sphere of efficacy wheat production provision in the terms of water scarcity and the need for its effective use are also becoming relevant. It is vital to direct financial and scientific efforts to address the issues of effective technical equipment of modern grain production. Agricultural engineering should give answers on these questions.

A perspective topic for further research is the direction of development on integration processes in the Post-Soviet market of grain producers. The formation of Eurasian region producers cartel of such participants as Russia, Ukraine, Belarus, Kazakhstan and partners from Eastern Europe opens up opportunities to strengthen their market positions. Balancing supply and demand, as well as the qualitative characteristics of the products can be a significant argument in trade wars, which have become commonplace.

The global globalization project is coming to an end. The chain of global production and consumption is collapsing. Foreign trade sanctions and artificial barriers form the need for the creation of new business clusters. All this is taking place in conditions of the beginning of the world food crisis. The world population is growing faster than the productive forces. Food shortages are increasing. The grain ceases to be a largely forage crop. Quality grain is becoming scarce in the food market. At the same time, drinking water becomes a scarce resource, access to which is absent for many inhabitants of our planet. It should also be noted in mind that a number of countries – the world's energy producers - are net food importers. The effective demand in the world for food grain is only growing. Note also China, which plays a significant role in global grain purchases.

At the same time, only innovations have the potential to significantly increase the yield

and consumer quality properties of grain subcomplex products. The results of research and development should be replicated and put into management practice of the majority of Russian agricultural producers. The efficiency and quality of production processes are the main conditions for increasing the investment attractiveness of the industry and, accordingly, the formation of a resource base for financing innovative developments.

Public-private partnership and national planning should be harmonized with the research and education policy. The solution of all the above issues will significantly improve the performance of Russian agriculture.

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