

# Problems and factors of grain production in the conditions of digital economy development

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**Abstract.** The basis for research work is the works of both domestic and foreign authors. In their works, they reveal the main factors and problems of the development of grain production in Russia. These issues are raised in the materials of scientific conferences, articles in scientific journals, dissertations, monographs. The research uses various approaches and methods, such as abstract-logical, monographic, comparative method. The purpose of the study is to determine the factors and problems of grain production development. In order to determine the factors and problems of grain production development, it is necessary to solve the following issues: 1) determine the factors of grain production development; 2) to study the problems of grain production development within each group of factors.

## 1 Introduction

Ensuring the sustainable development of grain production is the basis of an effective reproduction system. The formation of the stability of grain production is carried out under the influence of various factors. The use of information technologies in the agricultural sector is carried out with varying degrees of intensity in all areas of activity from the production of raw materials to its processing. The formation of approaches to assessing the sustainability of grain farming is an important condition when choosing a strategy for achieving the target parameters of economic growth of agricultural organizations. The digital transformation of management in the agro-industrial complex of Russia is a task set by the time. Today, the agro-industrial complex demonstrates an increase in production indicators and is on the rise: record harvests are being collected, the tasks of accelerated import substitution are being successfully solved, the country has become a leader in grain export supplies. For many indicators, the target indicators laid down in the Food Security Doctrine have already been achieved. Russia is fully self-sufficient in grain, sugar, poultry and pork [24].

Today, many scientists in their works actively discuss the factors and problems of grain production development: Medvedeva A. [4, 12], Bundina O. I., Khukhrin A. S. [7], Burlakova E. [9], Semin A. N. [16], Paptsov A. [17], Kostyrev A. [18, 19], N. Kochelyagin. [20].

The problems of managing the efficiency of grain production in the context of the development of the digital economy are dealt with by such scientists as Ulezko, A.V.,

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## 2 Research methodology

All factors that have the greatest impact on grain production can be grouped into 4 groups: economic, environmental, sectoral and intersectoral. In turn, each group of factors has a range of problems that hinder the development of grain production.

Economic factors include the following problems.

1. The problem is the excess of grain production over the general need for it. The production, consumption and stocks of wheat in the world for the period 2017-2021 determined the large stocks of grain in the world. According to the FAO analysis, the total wheat reserves in the world as of January 1, 2021 amounted to almost 770 million tons, which is 25 million tons more than in 2019. [1].

2. Trade barriers. The year 2021 is marked by an increase in world grain prices. In February 2021, changes were made to the customs policy: tariff quotas for wheat exports were determined and increased customs duties were established in case of exceeding this quota. During the year, the list of grain quotas was expanded, restrictions were applied to the supply of barley and corn. Since June 1, 2021, the following innovations have been introduced: export quotas have been replaced by floating duties on exports of wheat, barley and corn. This may negatively affect the export supplies of these crops and decrease the share of Russia's presence as a grain exporter on world markets. [2].

3. Imperfection of state support. The amount of state support is insufficient. Information on the progress of state interventions is not always transparent, unstable access to information on world and domestic prices by types of grain crops, production costs, transportation and storage tariffs, and ways to obtain state support.

4. The low rates of development of the Russian economy, the presence of structural imbalance, underutilization of production capacities, a decrease in demand for goods and services, high interest rates on borrowed funds, an increase in production costs in all sectors restrain the development of grain production. The participants of the grain market are subject to strict requirements for conducting their business in terms of increasing its efficiency. Analysts note that even in such conditions, the agro-industrial complex of Russia is actively developing.

"In April 2020, the Government of the Russian Federation approved the "Strategy for the development of the agro-industrial and fisheries complexes of the Russian Federation for the period up to 2030", according to which by 2024 the gross value added created in agriculture should reach 5374.8 billion rubles (in 2019 - 3794.7 billion rubles)." [3].

Industry factors include the following problems.

1. The growth of costs in the crop industry. Due to the increase in prices for mineral fertilizers in the world, in our country in 2020 and in the first half of the current year, the demand for their purchase decreased, which may negatively affect grain harvests in the future. The following increase in prices is noted: for ammonium nitrate - by 25%, carbamide ammonium nitrate - by 30%, nitroammophos - by 50%, for sulfoammophos - more than twice. Against this background, it is necessary to increase the allocation of funds from the state to

compensate farmers for the purchase of mineral fertilizers [4].

This year, there has also been a sharp increase in world prices for metals, which has led to an increase in prices for agricultural machinery by 13-15%. Experts predict a possible continuation of the increase in prices for equipment and further. According to the data of the Rosspetsmash Association in 2021, the largest growth in quantitative terms occurred in the following segments: "production of plows - by 51% to 3110 units, harrows – by 40% to 5240 units, sprayers – by 36% to 1244 units, agricultural tractors – by 34% to 4259 units., combine harvesters - by 26% to 5494 units, seeders – by 17% to 5045 units." [5].

2. The presence of disproportions in the branches of crop production and animal husbandry. The analysis of sources allowed us to determine that, despite the spread of coronavirus infection and adverse weather conditions, in 2020, farms of all categories achieved an increase in indicators (indices) of production development by industry. Thus, in crop production, the index of production in 2020 it amounted to 101% compared to the level of 2019, and to the indicator of 2017 - 106.1%. In the livestock industry, the production index, respectively, amounted to 102% to the level of 2019 and 105.1% to the level of 2017 [6].

In the course of the study, it is necessary to agree with the authors' opinions that there is a symbiotic inter-industry relationship between the branches of crop production and animal husbandry [7].

According to Rosstat, the specific weight of the area with mineral fertilizers applied in 2000 was 27%, and in 2020 – 67% of the total sown area. And the specific weight of the area with organic fertilizers has increased by 7.2% since 2000, but still this year it is only 9.4% in the entire sown area. Forage crops decreased by more than 2.5 times during the period under review, and grain and leguminous crops increased by 105%. Of these, wheat crops increased by 126.9%. The disproportion can be considered as an indicator of the ratio of the area under crops of cereals and legumes to the area of forage crops. This indicator has changed over the period 2000-2020 from 1.5 to 2.9 times. The crops of perennial and annual grasses decreased by more than two times, respectively. The number of cows decreased by 38% compared to the level of 2000 and amounted to 7.9 million heads in the reporting year. The number of pigs in recent years tends to increase, the growth was 63% compared to 2000. [8].

3. Dependence of the Russian agro-industrial complex on imported seed material in crop production, feed production. In recent years, there has been an increase in the dependence of agribusiness on imported seed material. It should be noted that in order to solve the problem in the country there is a research project "Breeding 2.0", which is aimed at studying and analyzing all aspects of the functioning of the breeding and seed production industry in Russia, developing mechanisms for public and private cooperation in the field of crop breeding [9].

4. Lack of necessary breakthrough solutions and technologies in grain production. The Government of the Russian Federation considers the problem of the lack of necessary breakthrough solutions and technologies in the agro-industrial complex as a deterrent to the development of agribusiness [10].

It is noted that the market leaders - large agricultural holdings have financial resources and use mainly imported technologies. There is a weak level of commercialization of the use of research results. One of the reasons is the absence in the agricultural sector of a modern institute of scientific and technological development in the form of a private-state corporation, which would allow not only to provide financial support for developments and applied research, but also to manage their introduction into production [11].

5. Decrease in grain quality. In our country, the problem of reducing the quality of grain is being considered. According to the data of the Federal State Budgetary Institution "Russian Agricultural Center" (Rosselkhoznadzor), in the surveyed volume of the 2020 harvest, the

share of food wheat decreased, and the share of feed wheat increased by 11.4% compared to last year's level.

Experts noted that in 2020 in Russia (75 million tons of meat mass were produced) strong wheat of the 1st and 2nd classes received nine thousand tons, and soft wheat of the 3rd class — 24 million tons. The gluten level is mostly below the required values. One of the reasons is the active introduction of various chemical components into the soil.

Also, the effective development of agriculture is hindered by high price volatility and the lack of a balance of production and sales [12].

6. Reduction of soil fertility. According to the Department of Land Reclamation in Russia, about 60% of the land is in deep degradation, and 10% is in extremely serious condition. Analysts have determined that 1.5-2 million hectares of land degrades in Russia every year. This amounts to losses of up to 3.9 million tons of agricultural products in grain equivalent. The main reason: irrational use of arable land, an abundance of toxicogenic mold fungi. Quite often, high acidity and waterlogging, water and wind erosion are observed at the same time [13].

7. Reduction of financial stability of agricultural producers. According to Rosstat data, the amount of profit of agricultural producers in 2019 amounted to 302,803 million rubles, the amount of losses - 14,3003 million rubles. In 2019, 80.4% of the total number of operating organizations made a profit, and 19.6% made a loss. In 2020, agricultural commodity producers received state support in the amount of 192.8 billion rubles. The debt on loans in the field of livestock and crop production as of 01.1.2020 amounted to 1.9 trillion rubles. [8].

8. The use of intensive farming technologies. The phytosanitary condition of the soil deteriorates under chemical stress, poor optimization of the structure of the soil microflora, without taking sufficient measures to restore the natural microbiological activity of the soil. Every year Russia loses about 20 million tons of grain. Recently, scientists believe that the way out of the current situation in agriculture can be the process of implementing programs for the biologization of agriculture.

Biologization includes a whole system of interrelated organizational and technical measures focused on the use of modern scientific achievements, the competent application of the laws of nature, soil improvement, cost reduction and improvement of the quality of manufactured products [14].

9. Volatility of grain prices. Since the beginning of 2021, the Russian agro-business has faced an unexpected and at risk of becoming a serious problem. The Government of the country, in order to ensure stability and prices on the domestic grain market, has introduced a permanent export grain duty. According to experts, domestic farmers from their introduction will suffer damage in the amount of almost 2.8 billion dollars in the next 2 seasons [15].

10. Lack of deep processing of grain. In the sources of literature it is determined that the process of deep processing of grain in Russia is still only in the initial stage of development. The solution to this problem is associated with large investments not only in the grain processing process, but also in the development of the microbiological industry, the production of biomaterials, vitamins and biofuels. Since 1990, this industry has been almost destroyed.

11. One of the problems in the development of digital technologies in the agro-industrial complex is the creation of logistics providers in the field of integrated cloud services. PL optimizes the data of digital arrays in terms of agricultural machinery and provide information and financial flows. In addition, the integrated service will ensure the effective use of the digital array - remote sensing of the earth, hyperspectral aerial photography, weather forecast data, etc. Thus, the "cloud" service is based on a marketing approach in the management of the industry. Sometimes the authors said about importance the use of elements digital economic. New generation digital technologies have a number of advantages: will increase

the efficiency of investments in the agro-industrial complex; «Will become an important element of nonfinancial state support for agriculture» [24].

It should be noted that the main production for deep processing of grain is located mainly in the Central Federal District [15].

Environmental factors include unfavorable climatic conditions in 2021. Unfavorable climatic conditions of the current year, drought in spring, abnormal heat, lack of sufficient moisture contributed to the growth of agricultural producers' costs: the death of 10% of winter crops (in previous years, the death of winter crops was 5-7%), replanting of areas under winter crops on an area of almost 1.78 million hectares in the central regions of the country, in the Volga region and the Urals. The lack of moisture was reflected by serious crop losses in the Volga region and in the Southern Urals. According to statistics, the total grain harvest is less than the level of 2020 in Tatarstan - by more than 50%, and in Bashkiria and the Orenburg region losses amounted to 43-45%, in the Volga region the harvest was harvested by almost 38% less. At the same time, fairly good weather conditions contributed to record grain yields in the Kuban and in the Rostov region [16].

Scientists predict an increase in losses due to climate change in the following industries: crop production - 48%, animal husbandry – 35%, forestry – 5%, fish farming – 4%, other industries – 8% [17].

Intersectoral factors include problems, the characteristics of which we will consider in more detail:

- Incomplete utilization of production capacities of the food industry. In 2020, the level of use of the average annual production capacity of organizations for the production of certain types of products was: flour from cereals - by 56%, cereals – by 38%, bakery products of short-term storage - by 44%, pasta – by 59%, confectionery – by 63% [8].

- Insufficient capacity of port terminals. There is not enough capacity of port terminals to send grain for export. In such conditions, competition in the market of grain transshipment services is increasing every year and this affects the formation of a comprehensive rate for grain transshipment in Russia. The size of the bids has created a shortage of capacity. In 2020, tariffs were up to \$17-19 per ton. In the sources of literature it is noted that in our country this rate is twice as high as the global average. Tariffs are much higher than in the countries of America, Canada, Europe. It should be noted that the increased tariffs reduce the competitiveness of our grain on world markets. All expenses are a burden on agribusiness [18].

3. There are not enough grain wagons. There are not enough grain wagons in the country. Competition for grain transportation is increasing between rail transport, water transport and motor transport. According to Kommersant, the share of the railway in grain transportation is growing and may exceed 30% by the end of 2021. New grain carriers are expected to be put into operation this year. This will lead to an increase in transport services. As of November 15, 2021, 5.84 million tons (28%) were transported by rail in the direction of export corridors.

In 2019-2020, this share did not exceed 27%. "But in general, railway grain loading decreased by 5.1% year-on-year in ten months, and in October — by 25% by October 2020" [19].

4. Lack of grain storage elevator capacities. The main problem is that the main part of grain elevators was put into operation in the 1950s and 1970s, it is not always effective to introduce new technologies in them. The construction of new ones is not cheap, and therefore the depreciation of fixed assets and equipment averages 70-80%. Grain storage capacities of 115 million tons have been announced in Russia. Of these, 35% are represented by elevators, the rest are floor warehouses for grain storage.

Experts give different estimates of grain crop losses due to lack or deterioration of storage capacity.

The costs of receiving, cleaning, drying and storing one ton of grain in old elevators with old equipment are more than twice as high as in modern ones. with large grain yields, losses from improper storage can reach 2-3 million tons of grain per year, that is, about 2%. [20].

### 3 Research results

Based on the results of the analysis, the identified factors and problems affecting grain production are summarized in Table 1.

**Table 1.** Factors and problems affecting grain production

|   |
|---|
| Economic factors  |
| Problems:   |
| 1. Excess of grain production over the total demand for it.   |
| 2. Trade barriers.  |
| 3. Imperfection of state support.   |
| 4. Low rates of development of Russian economy.   |
| Sectoral factors  |
| Problems:   |
| 1. The growth of costs in the crop industry.  |
| 2. The presence of imbalances in the branches of crop production and animal husbandry.                              |
| 3. Dependence of the Russian agro-industrial complex on imported seed material in crop production, feed production. |
| 4. Lack of necessary breakthrough solutions and technologies in grain production.                                   |
| 5. Reduction of grain quality.  |
| 6. Reduction of soil fertility.   |
| 7. Reduction of financial stability of agricultural producers.  |
| 8. The use of intensive farming technologies.   |
| 9. Volatility of grain prices.  |
| 10. Lack of deep processing of grain.   |
| 11. Lack of logistics providers.  |
| Ecological factors  |
| Problem: unfavorable climatic conditions  |
| Intersectoral factors   |
| Problems:   |
| 1. Incomplete utilization of production capacities of the food industry.  |
| 2. Insufficient capacity of port terminals.   |
| 3. There are not enough grain wagons.   |
| 4. Lack of grain storage elevator capacities.   |

### 4 Results and discussion

Summing up the above, we can conclude that agricultural production is one of the most important branches of the economy of our country. Grain production and its sale are the most important indicators of enterprises' activity. Since the final results of enterprises' activities directly depend on the volume of production and sales. Efficiency is used to evaluate the effectiveness of all social production. From the point of view of the entire national economy, such a state will be considered effective when the needs of all members of society with these resources are most fully met. In the general understanding, efficiency is associated, firstly, with the effectiveness of work or action, and secondly, with cost-effectiveness. The

efficiency of grain production is influenced by economic, environmental, sectoral and inter-sectoral factors.

## 5 Conclusion

The creation of conditions for increasing the efficiency of the agro-industrial complex and sustainable development of rural areas will be possible thanks to the implementation of the digital agenda. It is not limited only to the use of information and communication technologies, but involves the use of new business processes, digital models, and the creation of digital assets [25].

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