

Opportunities for agricultural industry in Russia

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Abstract. The principal global manufacturers of agricultural products are: on the American continent: the USA, Canada, Brazil, Mexico; on the European continent: France, Germany, Italy, Belgium; in Asia and Australia: China, India, Indonesia, Philippines, Japan, and Australia. Due to its large areas of farmland and arable land, Russia also occupies a leading position in the manufacture of the main types of agricultural products, both in crop and in animal husbandry. Russia is second only to China, India and the United States in terms of wheat performance. It makes 3.8% of the world's milk production, and it is second only to the United States and China in terms of meat production.

1 Introduction

As the world's population increases, the problem of food supply is rising sharply. Agriculture, as an industry, develops differently in various countries. This is influenced mainly by natural and climatic conditions, and secondly by the economic state of countries, the number of people and other factors. There is an overproduction in some countries. An opportunity for export arises, while in other countries, food resources come only from imports. The main exporters of agricultural products are: The United States, Canada, France, Belgium, the Netherlands, Spain, Italy, Australia, and Turkey.

The purpose of the study is to identify the opportunities of Russian agriculture.

Goals: to analyze the world agricultural production; to determine the place of Russia in the world agriculture; to analyze the technical capacity of the world's leading agricultural producers and Russia; to propose ways and directions for the upgrade of agricultural production in Russia.

2 Materials and methods

The study was performed on the basis of statistical data from the world community, Russia, and techniques for the formation of technical capacity [1-6]. The following methods were used: dialectical, fact-finding, comparative analysis, economic-statistical, computational-constructive, economic-mathematical, balance.

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3 Results

It should be mentioned that in the world community there is something like a specialization in the production of agricultural products. Owing to natural and climatic peculiarities, different goods are produced on different continents. Thus, the largest number of cattle is kept in the countries of the Asian continent (India, China, Pakistan, etc.) – about 49%, and therefore the manufacture of animal products: the production of cattle meat is about 27% of world production, milk – about 37%. The stocks of swine are the largest in the countries of the Asian continent (China, Vietnam, India, etc.) – 55.2%, a fairly large number in Europe (Germany, Spain, France, etc.) – 21.2%, in the American continent (USA, Brazil, Canada, etc.) - 19.4% of the population, the remaining 4.2% are African countries. Pig meat production is 59.7% in Asia, 21.3% in Europe, and 13.4% in the United States and other countries of North and Latin America. The remaining countries account for 5.6% of the total production.

The main production of grain crops is accounted for in Asia - 60.9% (China, India, Indonesia, Pakistan), and grain production in the American continent – 32.5% of world production (USA, Canada, Brazil, Mexico). European countries accounted for about 6.4% of global grain production (France, Germany, Romania, Italy, etc.), while the remaining nations of the global community accounted for about 0.2%.

The yields of grain crops vary significantly, both by continent, by country, and by the type of grain crops. The largest grain yields in Australia and Oceania – 87.9 c/ha, followed by Europe (67.4 c/ha) and America-58.6 c / ha. The maximum yield of cereals (wheat, barley, rye, etc.) is in Ireland (95.4 c/ha), the minimum is in Turkmenistan – 10.8 c/ha. [7,8]. The maximum yield of rice is in Australia (103.9 c/ha), the minimum in the Congo – 5.9 c/ha. The maximum yield of corn is in Israel (230 c/ha), the minimum is in Morocco – 9.3 c/ha [9]. The yield is also varied by the types of grain crops. If for corn the maximum yield is 230 c/ha (Israel), for rice 103.9 c/ha (Australia), then the maximum yield of cereals is 95.4 c/ha (Ireland).

The main land area under grain crops is also focused in Asia-46.7% (287.6 million hectares), then in America – 20.2% (124.1 million hectares), on the African continent-17% (104.8 million hectares), in Europe-10.5% (64.9 million hectares), the remaining is in Australia and Oceania.

Russia's share in world agricultural production is described by the following data: the area of arable land under grain crops – 44.2 million hectares, grain yield-46.5 c/ha [10]. We are going to evaluate the condition of Russia's agricultural production in comparison with the leading countries of various continents: China, the USA, France, and Nigeria [11]. The data is given in Table 1.

Table 1. Features of grain production in the leading nations of the global community and Russia.

Indicators	Countries				
	China	America	France	Nigeria	Russia
The area of arable land under grain crops, million hectares	102.5	53.1	9.4	19.7	44.2
Grain yield*, total, c / ha	61.3	77.1	63.1	14.6	46.5
Including cereal grains, c / ha	54.1	35.4	53	7.6	26.8
Rice, c / ha	70.3	86.2	54.8	20.3	57.6
Corn, c / ha	59.5	109.6	81.6	15.9	55.1

* The grain yield is estimated as the average of the yield of cereals, rice and corn.

When analyzing the table. 1 the following data is shown:

- the grain yield in Russia is lower than that of the leading world powers (with the exception of Nigeria) - China by more than two times, the United States by 24.3%, and France by almost two times (1.98 times);
- the rice yield is 18.1% lower in China, 33.2% lower in the United States, and the same as the rice yield in France;
- the corn yield is almost on the same level as China, but below the yield in the United States by almost two times (1.99 times), the yield in France by 32.5 %.

Notwithstanding the fact that agriculture in Russia, as an economic sector, is dependent on natural and climatic conditions, which is much more important than the countries listed in Table 1, it is essential to increase the grain yield of:

- grain crops (wheat, barley, rye, oats, etc.) at the first stage to the level of 35-40 c/ha, (the level of US productivity), and then to the level of the countries with high-tech, highly efficient agriculture-50-60 c/ha;
- rice to the level of China and the United States;
- corn to the level of the leading European countries (France, Portugal, Belgium), i.e., to the level of 80-90 c / ha.

The increase in the yield of agricultural crops and the increase in gross taxes are essential to provide the food security of the country. Also, it is necessary to increase the export potential and, finally, to enhance the efficiency of the entire agricultural production. Raising the yield and gross yield of cereals, as well as forage crops, is crucial for animal husbandry. Being a branch of agriculture, animal husbandry also requires deliberate attention from researchers, agricultural specialists, and government authorities to improve the productivity and safety of animals, through the development of technologies for keeping, foraging, and preparing and distributing feed.

To raise the gross yield of agricultural crops, the following issues need to be solved:

1. To introduce unused (abandoned) land into agricultural circulation, especially with high bioclimatic potential.
2. To use technologies with the application of “precision sowing”, GPS-navigation, and IT-technologies.
3. To carry out as much as possible agrochemical survey of fields for the use of technologies of spot application of fertilizers and means of protection.
4. To make the technical potential of agriculture to comply with the standards and to bring the availability of the main types of agricultural machinery closer to the indicators of the availability of agricultural production in the leading foreign countries.
5. To bring the energy ratio, specific energy per unit weight of agricultural production to the indicators, ensuring the effective operation of economic activity.
6. To form the best structure of the fleet of transport and technological machines, providing the performance of all agricultural tasks in the optimal agrotechnical terms.

The technical potential of the industry, as the basis for the development of all agricultural production, in comparison with the countries shown in Table 1, is considered in more detail.

Table 2. Quality features of grain production.

Indicators	Countries				
	China	America	France	Nigeria	Russia
Land for grain production, thousand hectares	102493.1	53149.2	9381.0	19747.8	44241.0
Tractor availability, thousand units.	989.1	4389.8	1176.4	24.8	206.7
Tractors per 1000 ha of arable land, units.	8.4	27.1	64.0	0.67	2.71
Grain yield, c / ha	61.3	77.1	63.1	14.6	46.5

The data given in Table 2 shows that the grain yield in countries with a high availability of tractors exceeds the yield in Russia from 24% to 40%. Without exception, in all countries, the lowest grain yield is the profit of cereals. In this case, we will simulate the value of the yield of cereals for Russia, depending on the availability of tractors. The results will be presented in Fig. 1.

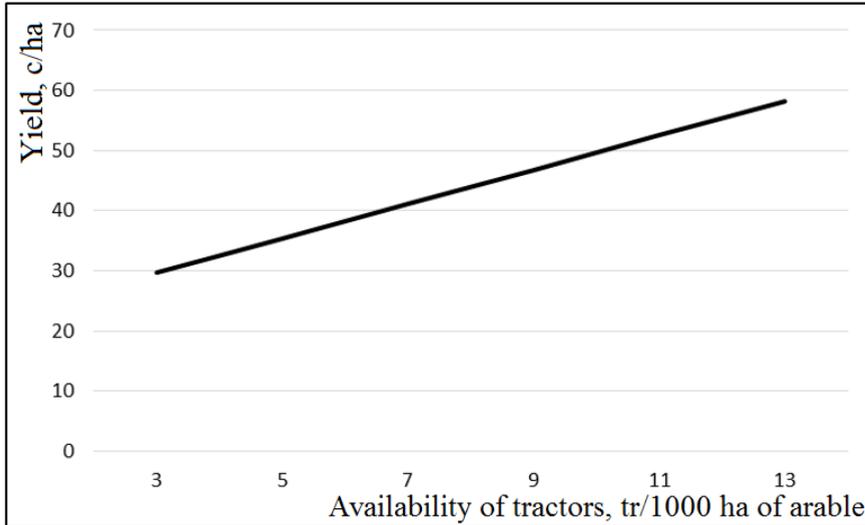


Fig. 1. Possible grain yield of cereals, depending on the availability of tractors.

The requirements for agricultural machinery, approved in 2012 [12, 16], defined the number of tractors per 1000 hectares of arable land – 10.18 fl. units, in accordance with the recommended structure of the park. It is 12.9 physical tractors. When we reach the regulatory availability of tractors, we may expect to reach a yield of about 60 c / ha in Russia. It will give an additional production of 115.2 million tons of grain.

However, to what degree this is realistic, it is imperative to analyze the indicators of the development of agriculture in Russia from the 90s of the last century to the present. The data is given in Table 3.

Table 3. Dynamics of the development of agriculture in Russia [13-15].

Indicators	Years						
	1990	1995	2000	2005	2010	2015	2020
Arable land area, million hectares	208 (117.7)	102.5	84.7	75.8	74.9	78.6	79.9
Area under grain crops, million ha	109.5 (63.1)	54.7	45.6	43.6	43.2	46.6	47.9
Grain yield, c / ha	19.9 (18.5)	13.1	15.6	18.5	18.3	23.7	28.6
Tractor availability in agricultural organizations, thousand units.	2666.2 (1365.6)	1052.1	746.7	480.3	310.3	233.6	206.7
Production of agricultural tractors, thousand units.	495	21.2	19.2	8.6	7.6	5.5	6.9

Agricultural tractor supply, units/1000 ha of arable land.	12.8 (11.6)	10.3	8.8	6.3	4.1	3.0	2.6
Gross grain, million tons	116.7	71.7	71.1	80.7	79.1	110.4	137.0

In the data presented in Table 3, it can be seen that the area of arable land in Russia reduced from 1990 to 2020 by 32.1%. The area under grain crops-by 24.1%. The data for 1990 shows the area of arable land and the area under grain crops of the USSR, in parentheses of the Russian Federation. The yield over this period has grown almost 1.5 times. Till 2010, there is a direct dependence of grain production on the availability of agricultural tractors per 1,000 hectares of arable land. The availability has dropped by 2.8 times, and the yield has remained practically unchanged for 20 years. The result is a 32.2% decrease in grain production in the country. Since 2010, notwithstanding a further downturn in food security, there has been an increase in the area of arable land and under grain crops, an up-growth in crop yields, and an enhancement in grain production. The availability of tractors for the period 2010-2020 still declined by 36.6%, the area of arable land and under grain crops increased by 6.7% and 10.9%, respectively, and the yield grew by 1.56 times.

In our opinion, the growing grain production became possible as a result of the introduction of modern technologies for the cultivation of agricultural crops, using the achievements of modern science, both domestic and foreign, the use of energy-saturated tractors and wide-coverage combined agricultural machines. The reduction in the number of tractors in agricultural enterprises is to some degree owing to the increase in the average engine power of one tractor. Thus, the power of one tractor engine for 30 years has grown by 46.9%, almost 1.5 times. In this case, the availability of agricultural tractors may be provisionally considered as 3.8 units/1000 ha of arable land. The dynamics of changes in engine power is shown in Fig. 2.

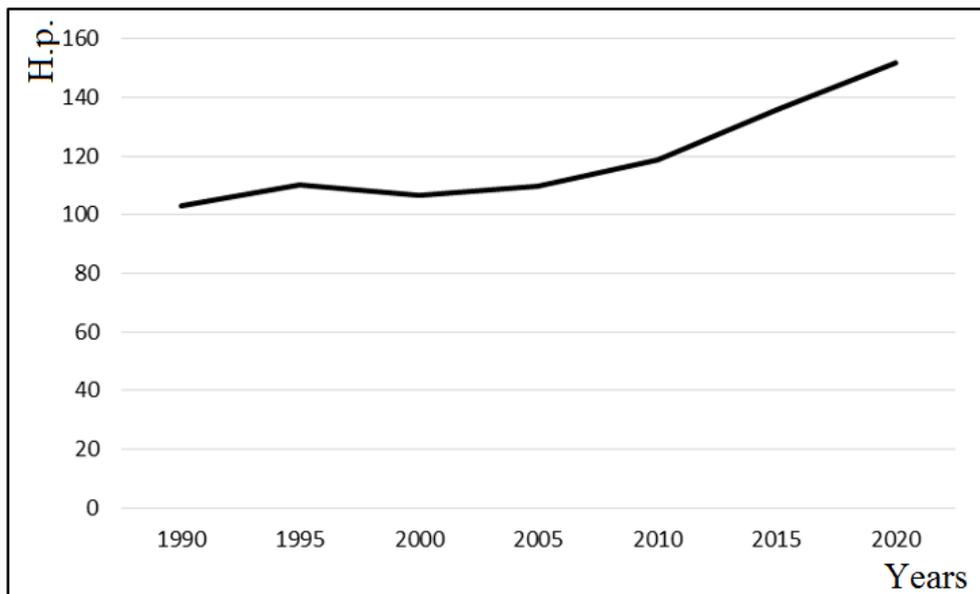


Fig. 2. Tractor engine power change.

According to the data given in Fig. 2, the tractor engine power remained virtually unchanged until 2005. It was at the same level as in 1990, with an average annual increase of 0.4% over 15 years. Since 2005, the average annual increase has been 2.2% per year.

Conclusion. The purpose of this research is to reveal the opportunities of agricultural production in Russia, based on the analysis of statistical data, the causal relations of the directions of development of agricultural production in foreign countries and the Russian Federation are traced. The Russian Federation is worse than the world producers of agricultural products in many positions.

The Russian Federation is a country with two percent of the world's population, and has significant areas of agricultural land, arable land, and grain crops (4.5% of agricultural land, the third largest in terms of arable land, and produces more than 8% of the wheat crop). Resulting from the high availability of farmland per person, the fulfillment of Programs aimed at the development of the agricultural sector, agricultural engineering, the adoption of the latest academic achievements, the use of advanced experience and technologies, it can be concluded that Russia is capable of having a significant potential for the production of agricultural products. Thereby, it is able to make a significant contribution to provide food security of the country and the world community as a whole.

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