

Analysis of world trends in soybean production

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Abstract. The article is devoted to the main trends in soybean production in the world. The paper analyzes the dynamics and structure of sown areas, gross harvest volumes and soybean yields in the world for the period 2014-2023 in the context of leading producing countries. The increase in sown areas and increased yields ensures the growth of global soybean production. In 2023, the global gross soybean harvest amounted to 398.2 million tons, of which 1.71% was produced in Russia. According to the current structure of the soybean sown area in the world, almost 80% is concentrated in three main leading countries - Brazil, the USA and Argentina. Based on statistical data from the U.S. Foreign Agricultural Service, The Department of Agriculture (USDA) conducted a ranking of the yield level, thereby identifying the main leading countries with the highest yield level - Turkey (41.2 c/ha), the United States and Brazil (34.0 c/ha), and Canada and Argentina - (30.9 c/ha) and (30.3 c/ha), respectively. The dynamics and structure of domestic soybean consumption confirms the importance and uniqueness of soybean as one of the main agricultural crops in the world. As a result of the study, the main global trends in soybean production were identified.

1 Introduction

For the period from 2014 to 2023, the area under soybeans in the world increased by 20.3 million hectares, amounting to 139.4 million hectares (Figure 1). Throughout the entire study period, there were no sharp jumps in the volume of sown areas - in most cases there was an increase, but sometimes there were slight decreases in the indicator. Over the past 5 years, there has been no decline in the volume of acreage occupied by soybean cultivation in the world - there has been a gradual increase.

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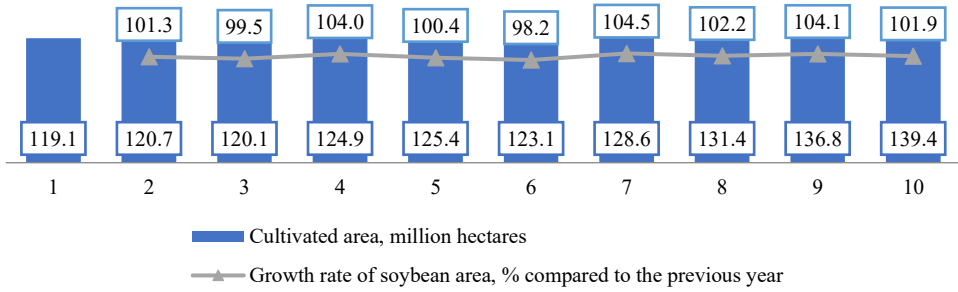


Figure 1 – Dynamics of soybean acreage in the world

The leading soybean producing countries (Brazil, the USA, Argentina) account for 68.6% of the total soybean planting area in 2023 (Figure 2). The next largest crop areas are India and China (9.3% and 7.5%, respectively) [1].

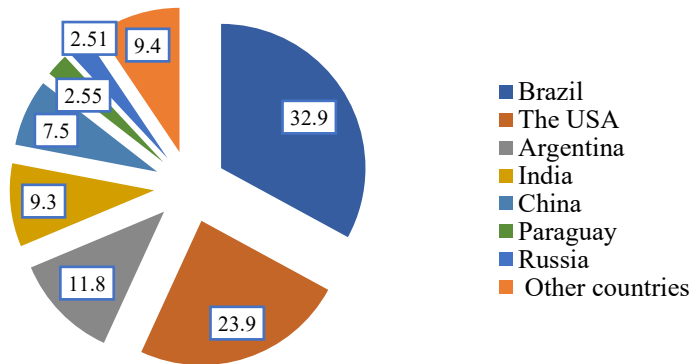


Figure 2 – Structure of the global soybean planting area by country in 2023, %

2 Materials and methods

To analyze the global soybean production market, data from official statistical indicators and collections were used. Empirical base served open statistical data from Foreign Agricultural Service US Department of Agriculture (USDA). During the research process, a complex of scientific research methods was used: statistical, comparison method.

3 Results

The top 10 largest soybean producing countries in the world include Brazil, the USA, Argentina, China, India, Canada, Russia, Paraguay, Bolivia and Ukraine. These 10 countries accounted for more than 80% of global soybean production in 2023. Brazil and the United States are the world's two largest soybean-producing countries, together accounting for more than 65% of global production. According to official statistics from Foreign Agricultural Service U.S. Department of Agriculture (USDA) global gross soybean harvest in 2023 amounted to 398.2 million tons, which is 20.1 million tons more than in 2022 (Figure 3).

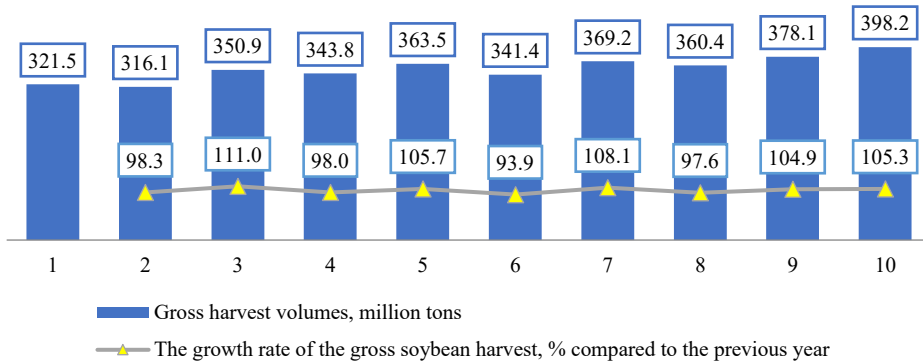


Figure 3 – Dynamics of the global volume of gross soybean harvest, million tons

Compared to 2014, the growth in production volumes amounted to 23.9% or 76.7 million tons in physical terms. The average growth rate for the study period was 104.4%. The minimum growth rate of gross soybean yield equal to 93.9% was noted in 2019. At the same time, the maximum growth rate of gross soybean yield was achieved in 2016 and amounted to 111.0%.

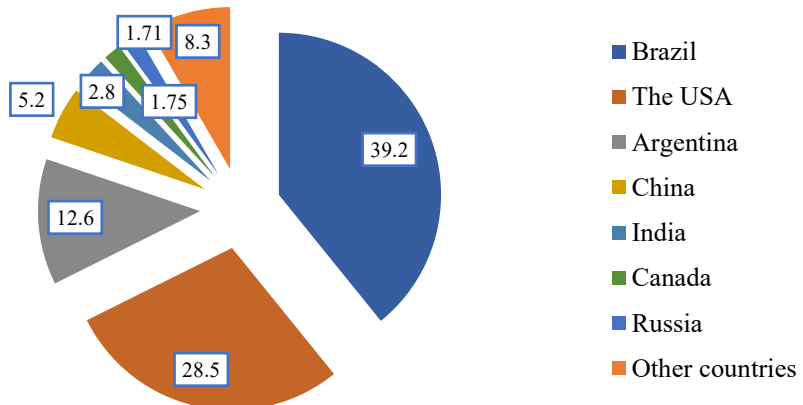


Figure 4 – Structure of world soybean production by country in 2023, %

The top three leaders in soybean production volumes are as follows (Figure 4) :

1. Brazil - 39.2% (156.0 million tons)
2. The USA – 28.5% (113.3 million tons)
3. Argentina – 12.6% (50.0 million tons) [2]

The production volume of the countries following the top three is an order of magnitude lower - for example, the volume of soybean production in China is only 5.2% (20.8 million tons). Russia's share in global production is 1.71% (6.8 million tons).

According to Figure 5 , based on data for 2023, the average soybean yield in the world was 28.6 c/ha. Compared to 2014, this figure increased by 1.6 c/ha or 5.9%. The maximum yield was recorded in 2016 - 29.1 c/ha.

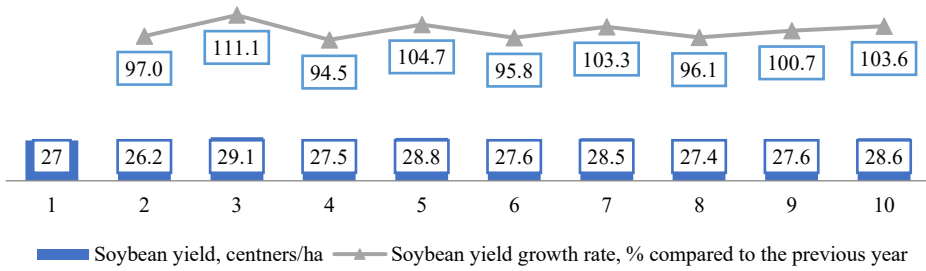


Figure 5 – Soybean yield in the world, c/ha

By analogy, the growth rate of soybean yields in the world was calculated - on average it was 100.8%. The highest growth rate was established in 2016 and amounted to 111.1%, while in 2017 there was a sharp drop to the minimum yield growth rate of 94.5%.

The authors ranked soybean yields by country in 2023. The highest yield was recorded in Turkey - its value is 41.2 c/ha. The USA and Brazil follow with equal yield levels – 34.0 c/ha. Canada and Argentina close the top three with almost equal yield values – 30.9 c/ha and 30.3 c/ha, respectively.

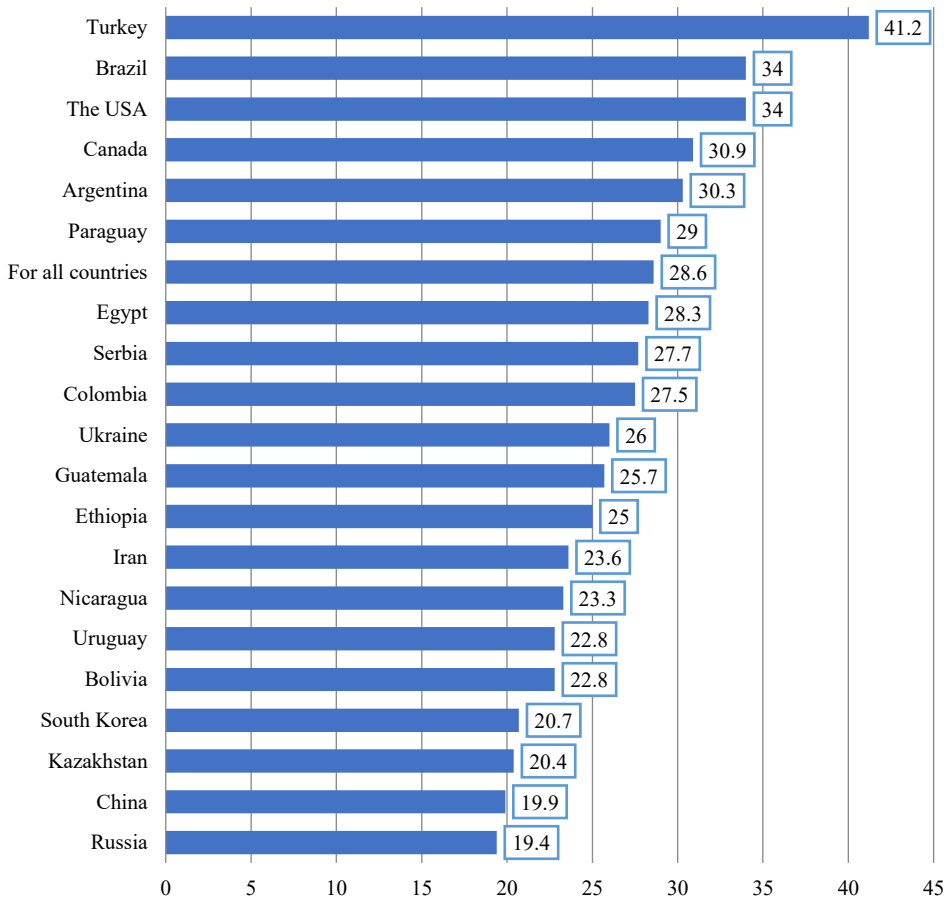


Figure 6 – Soybean yield by country in 2023, c/ha

Russia in Figure 6 is presented at the end of the list and is almost 2 times behind the leading countries - its indicator was 19.4 c/ha. This low rate is due to the use of less productive soybean varieties. The main advantage of Russia is the use in sowing only those varieties that do not contain GMOs. Technical and technological lags are also the reason for low soybean yields in Russia.

4 Discussion

The volume of soybean consumption in the world in 2023 compared to 2014 increased by 79.2 million tons. These figures confirm the importance and uniqueness of soybean as a key agricultural crop (Figure 7). The growth in consumption is associated, on the one hand, with the use of soybeans as feed for the livestock industry, and on the other hand, as a source of protein of plant origin [3].

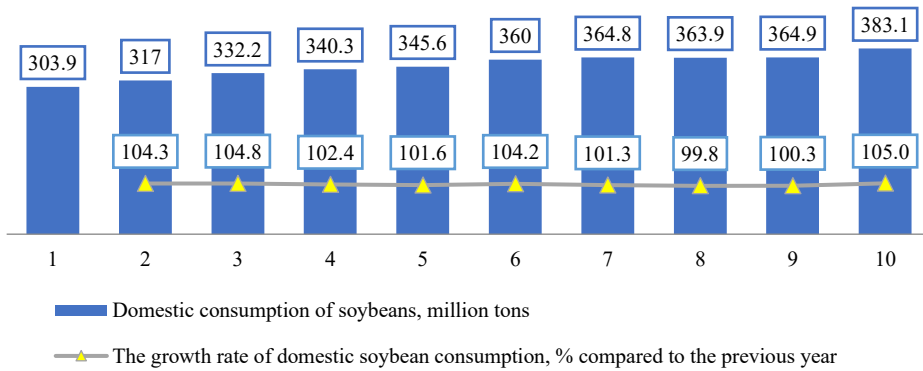


Figure 7 – Dynamics of domestic soybean consumption

China is in first place in terms of consumption with an indicator equal to 120.5 million tons or 31.5% of the total volume (Figure 8). Following it in second place is the United States - 65.9 million tons (17.2%) - the annual consumption volume of this country is 1.8 times less than that of China. And Brazil closes the top three in terms of consumption with 57.5 million tons (15.0%). For Russia, this figure as of 2023 is within 1.7% (6.6 million tons).

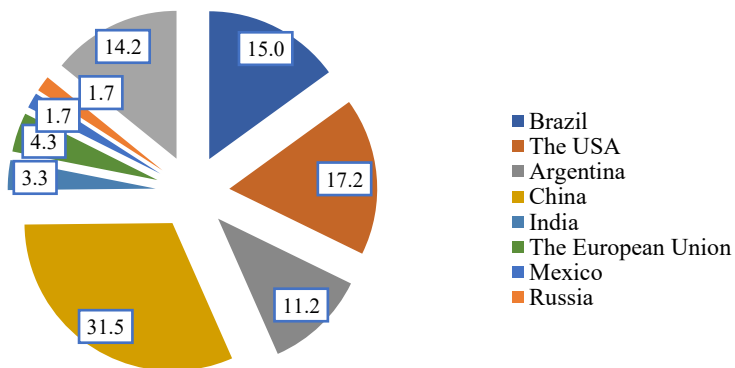


Figure 8 – Structure of domestic soybean consumption by country of the world for 2023

The active growth of soybean production is stimulated by increasing domestic consumption in countries with growing livestock production and interest in soybean food products [4]. Based on the data in Figure 4, China's production volumes are 20.8 million tons, and consumption volumes are disproportionately higher and amount to 120.5 million tons. It can be concluded that the country cannot independently meet the needs of its large population, so there is a high dependence on soybean imports. The USA and Brazil are not characterized by a deficit in the ratio of production and consumption volumes.

5 Conclusions

Global soybean market trends:

1. Difficult geopolitical situation. According to the current situation in the political arena, many countries of the world, including leading countries, have to reconsider their main partners in the global soybean market. Russia is also establishing new contacts to sell the harvested soybeans, while changing supply directions [5].
2. Dependence on prices for agrochemicals. The cost of crop protection products is a key indicator that can affect the situation in the global soybean market. Russia is characterized by dependence on supplies of Chinese active ingredients; supplies from other unfriendly countries contradict the import substitution policy.
3. Rising prices for fuels and lubricants and spare parts for the machine and tractor fleet.
4. Rising prices for seed material. For Russia, the primary goal is to reduce the share of foreign-produced seeds by replacing them with volumes of domestic seeds.
5. Disruption of supply chains. The search for new logistics solutions and adaptation to them can cause serious damage to the economies of individual states and entire regions.
6. Fluctuations in energy prices. Many events in the global political arena lead to a sharp increase in the cost of gas, oil and other resources. These changes are reflected in the final price of soybeans and soybean products.

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